METRO'S PHASE I ESEE ANALYSIS
April 2005

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METRO
People places • open spaces
Clean air and clean water do not stop at city limits or county lines. Neither does the need for jobs, a thriving economy, and good transportation choices for people and businesses in our region. Voters have asked Metro to help with the challenges that cross those lines and affect the 24 cities and three counties in the Portland metropolitan area.

A regional approach simply makes sense when it comes to protecting open space, caring for parks, planning for the best use of land, managing garbage disposal, and increasing recycling. Metro oversees world-class facilities such as the Oregon Zoo, which contributes to conservation and education, and the Oregon Convention Center, which benefits the region's economy.

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CHAPTER 1: INTRODUCTION

Purpose and Objectives

Metro's authority to plan for fish and wildlife habitat protection in the region derives from State Land Use Planning Goal 5: Natural Resources, Scenic and Historic Areas, and Open Spaces. The Goal 5 administrative rule (OAR 660-023) recognizes Metro's unique planning role and gives Metro the option to develop a functional plan to protect regionally significant fish and wildlife habitat[1] (OAR 660-023-080(3)). In 1996 the Metro Council voted to recognize the regional significance of fish and wildlife habitat and include protection in the functional plan.

In October 2000, the Metropolitan Policy Advisory Committee (MPAC) approved a vision for fish and wildlife habitat protection for the region, which was adopted by the Metro Council.

> The overall goal is to conserve, protect and restore a continuous ecologically viable streamside corridor system, from the streams' headwaters to their confluence with others streams and rivers, and with their floodplains in a manner that is integrated with the surrounding urban landscape. This system will be achieved through conservation, protection and appropriate restoration of streamside corridors through time. (Metro 2000)

In achieving the overall goal, the vision statement emphasizes the importance of balancing several goals, including livable communities and a strong economy with protection and enhancement of fish and wildlife habitat. Integrating the needs of people with the needs of fish and wildlife in an urban environment is not an easy task. There is debate on the value of protecting habitat in urban and developing areas, considering the difficulty many species have cohabiting with humans and the economic value of developable land in urban areas. Metro's policies have consistently placed a high level of importance on the protection of the natural environment as a means of maintaining the high quality of life citizens of this region expect.

The general economic, social, environmental, and energy (ESEE) tradeoffs of allowing, limiting, and prohibiting conflicting uses in fish and wildlife habitat areas are described in this report. The next step of Metro's planning process is to identify the specific ESEE tradeoffs of several program options, after which the Metro Council will make a decision to allow, limit, or prohibit conflicting uses in fish and wildlife habitat areas.

Description of the Goal 5 ESEE process

The Goal 5 process follows three steps. The first step is to identify regionally significant fish and wildlife habitat, which Metro completed in 2002. The economic, social, environment and energy (ESEE) analysis is the second step. Metro is now completing the first phase of a regional ESEE analysis. Metro will next apply the tradeoffs identified in the first phase of the analysis to several options for protection to evaluate where and how to protect fish and wildlife habitat. This will provide the Metro Council the information they need to make a decision about where development should be allowed, limited, or prohibited. The third step is to develop a program to

[1] In this report, when we use the term "fish and wildlife habitat" we are referring to "regionally significant fish and wildlife habitat" as identified in Metro's Goal 5 Inventory.

protect significant fish and wildlife habitat. After Metro adoption, local cities and counties will have 2-4 years to comply with the regional fish and wildlife habitat protection program.

Oregon State Planning Goal 5 requires an analysis of the economic, social, environmental, and energy (ESEE) consequences that could result from a decision to allow, limit, or prohibit conflicting uses in fish and wildlife habitat. The rule requires that this analysis be completed before actions are taken to protect or not protect any regionally identified fish and wildlife habitat. Specifically, the rule requires the following steps:

1. Identify conflicting uses;
2. Determine the impact area;
3. Analyze the ESEE consequences; and
4. Develop a program to achieve Goal 5.

First, governments must identify conflicting uses that exist, or could occur, with regard to significant Goal 5 resource sites (fish and wildlife habitat). A conflicting use is a land use or activity that may negatively impact fish and wildlife habitat. Second, the rule requires a determination of the impact area, representing the extent to which land uses or activities in areas adjacent to habitat could negatively impact the habitat. The impact area identifies the geographic limits within which to conduct the ESEE analysis for significant fish and wildlife habitat. Third, the ESEE consequences analysis considers the impact of a decision to either fully protect fish and wildlife habitat, fully allow conflicting uses, or limit the conflicting uses. Jurisdictions that choose to limit conflicting uses must do so in a way that "protects the resource to the desired extent." The standards identified by the state for completing the ESEE analysis are procedural rather than substantive. Findings must show that the steps of the ESEE analysis are met, but OAR 660-23-040 states that: "[t]he ESEE analysis need not be lengthy or complex, but should enable reviewers to gain a clear understanding of the conflicts and consequences to be expected."

Regional policies guide Metro's ESEE analysis

Metro's role in identifying fish and wildlife habitat protection measures and incentives within its boundary has been established with adoption of the *Regional Urban Growth Goals and Objectives (RUGGOs), Region 2040 Growth Concept* and the *Urban Growth Management Functional Plan*. Fish and wildlife habitat, by their very nature, cross jurisdictional boundaries and require management through regional, watershed-wide protection strategies. Metro has a role in working with local jurisdictions to determine the protection of these important habitats, just as it determines parking standards, transportation networks and land use densities for the region. Through extensive public involvement, the Metro Council has identified the need to balance natural resource protection with urban development while the region grows.

The Metro Council has adopted several policies following the direction of citizens that influence the ESEE consequences analysis. These policies provide the framework for protecting natural resources while managing urban growth in the region. Fish and wildlife habitat play a key role in maintaining the livability of the Metro region. Table 1-1 below summarizes key regional policies guiding Metro's work.[2]

[2] More extensive descriptions of these policies may be found in *Appendix A*.

Table 1-1. Regional policies guiding habitat protection efforts.

Policy	Description and relevance to habitat protection
Metro Charter *1992*	Required Metro to address issues of regional significance, such as land use and transportation planning as well as regional parks and open spaces. Identified the protection of natural systems – floodplains, rivers, streams, and wetlands – as a cornerstone for regional policies.
Greenspaces Master Plan *1992*	Articulated the vision for a cooperative, interconnected system of parks, natural areas, trails, and green ways for fish, wildlife and people. Recommended tools to protect greenspaces, such as acquisition, education and restoration. In 1995, voters passed a bond measure directing Metro to purchase regionally significant natural areas. Since then, more than 8,000 acres of natural areas have been acquired for permanent protection.
Future Vision Report *1995*	A key document in guiding land use management for the protection of fish and wildlife habitat. While not a regulatory document, it has greatly influenced the content of Metro's regional plans. States that the region should manage watersheds to protect, restore and maintain the integrity of streams, wetlands and floodplains, and their multiple biological, physical and social values. Identifies the need for restored ecosystems protected from future degradation.
Metro 2040 Growth Concept *1994*	Describes the preferred form of growth and development for the region, including how much the UGB should ultimately be expanded, ranges of density within the boundary, and which areas should be protected as open space. Basic philosophy is to preserve access to nature and build better communities.
Regional Urban Growth Goals and Objectives (RUGGO's) *1995*	Identifies goals and planning activities for the Metro region. Two objectives relate to water resources, and a third relates to wildlife habitat: Objective 12, Watershed Management and Regional Water Quality and Objective 13, Urban Water Supply; Objective 15, Natural Areas, Parks, Fish and Wildlife Habitat calls for an open space system capable of sustaining or enhancing native wildlife and plants.
Regional Framework Plan *1998*	Sets out the land-use, transportation, parks, water resources, natural hazards and related policy directives for the region's future. Three chapters address fish and wildlife habitat: Chapter 3: protection of lands outside the UGB for natural resource, future urban or other uses; Chapter 6: parks, open spaces and recreational facilities; and Chapter 7: water sources and storage.
Stream and Floodplain Protection Plan (Title 3) *1998*	Adopted by Metro as part of the Urban Growth Management Functional Plan, it establishes regional performance standards to address water quality and floodplain management. Recommends actions for the protection of fish and wildlife habitat. The completed sections of Title 3 meet the requirements for Statewide Planning Goal 6 (water quality) and Goal 7 (flood management).

As shown in the table above, Title 3 of Metro's Urban Growth Management Functional Plan addresses water quality, flood management, and fish and wildlife habitat conservation. Section 5(C) of Title 3 describes the steps that Metro must follow in order to establish a program to protect fish and wildlife habitat. These steps, shown below, relate to the process outlined in the state's Goal 5 administrative rule.

1) Establish criteria to define and identify regionally significant fish and wildlife habitat areas.
2) Adopt a map of regionally significant fish and wildlife areas after (a) examining existing Goal 5 data, reports and regulations from cities and counties, and (b) holding public hearings.
3) Identify inadequate or inconsistent data and protection in existing Goal 5 data, reports, and regulations on fish and wildlife habitat.
4) Complete Goal 5 economic, social, environmental, and energy (ESEE) analyses for mapped regionally significant fish and wildlife habitat areas only for those areas where inadequate or inconsistent data or protection has been identified.

5) Establish performance standards for protection of regionally significant fish and wildlife habitat that must be met by the plans' implementing ordinances of cities and counties.

Steps 1 and 2, establishing an inventory of regionally significant fish and wildlife habitat, have been completed and were adopted by the Metro Council in 2002.[3] Step 3 requires Metro to conduct an analysis of local jurisdictions' existing Goal 5 programs to determine inadequacy or inconsistency of these programs across the region. Metro's *Local Plan Analysis* satisfies the requirement (step 3) by providing a thorough analysis of local Goal 5 city and county programs (Metro 2002a). The analysis concludes that there are many inconsistencies and inadequacies in fish and wildlife habitat protection in the Metro region. Step 4 is the economic, social, environmental, and energy (ESEE) analysis. A region-wide analysis must be conducted that considers the economic, social, environmental, and energy consequences of allowing, limiting, or prohibiting conflicting uses before a program can be developed (Step 5).

Metro's approach to the analysis

Goal 5 has previously been completed by city or county governments, focusing on the natural resources (or other Goal 5 resources) that fall within their specific jurisdictions. However, Metro was given the ability to choose to protect Goal 5 resources at a regional level in the state administrative rule. Streams and rivers, forests and meadows, and the fish and wildlife that inhabit them do not acknowledge jurisdictional boundaries. The economy of the region also functions at a larger scale than just one city or county. Just as it makes sense to plan for transportation needs across the Portland metropolitan region (Metro region), consideration of the protection of fish and wildlife habitat at a larger scale allows for greater understanding of the connections between habitats and the functions of the ecosystem as a whole. Now the task at hand is to weigh the economic, social, environmental, and energy (ESEE) consequences of protecting fish and wildlife habitat within the Metro region. Many issues are similar to those encountered at a city or county; however, some are different such as Metro's ability to add land to the urban growth boundary (UGB) to prevent a net loss of buildable land due to fish and wildlife protection.[4]

Metro's approach for conducting a region-wide ESEE consequences analysis focuses on achieving the goals of the 2040 Growth Concept. The goals in the Growth Concept, the Future Vision, the Regional Framework Plan (implemented through the Urban Growth Management Functional Plan) and Metro's Vision Statement for Protecting Fish and Wildlife Habitat all specify that the region should manage growth while protecting the natural environment, maintaining a high quality of life, and providing affordable housing options.

Development of the 2040 Growth Concept included the balancing of goals in some ways similar to an ESEE analysis. Citizens and policymakers chose to increase density in centers and along major transportation routes (e.g., light rail, main streets) to minimize sprawl and avoid the addition of more land to the urban growth boundary. Green corridors and protection along streams and rivers was identified as a critical component of maintaining a high quality of life in a densely populated region. Transportation plays a critical role in the overall concept: without

[3] See Metro's *Riparian corridor and wildlife habitat inventories* (Metro 2002d) and *Technical Report for Goal 5* (Metro 2002c).
[4] This topic is discussed in more detail at the end of this chapter.

efficient public transit as well as opportunities to walk, bike or drive from home to shops, jobs, and recreation the compact communities envisioned would not function. Metro's current efforts to protect fish and wildlife habitat help further the goals in the 2040 Growth Concept.

Metro has taken a regional approach to the ESEE analysis, considering the overall tradeoffs of protecting or not protecting fish and wildlife habitat. The analysis is general and contains qualitative and, where possible, quantitative, descriptions of tradeoffs. The conflicting use and economic analyses contain specific acreage figures but at a regional scale. Additional analysis will be conducted in the next step of the planning process in the evaluation of the tradeoffs of several program options. Frequently, a consequence could fall in more than one ESEE category. For example, flooding has negative economic consequences (cost to repair damaged structures), social consequences (families lose irreplaceable items like photos), environmental consequences (changes to the stream system), and energy consequences (energy used to repair buildings). Many consequences cross categories and Metro staff used professional judgement to determine which category was most effective for describing the consequences.

This ESEE analysis does not result in a final decision to allow, limit, or prohibit conflicting uses in fish and wildlife habitat. The analysis describes the tradeoffs in a general fashion to help the Metro Council evaluate program options during the next step of the planning process. The Metro Council will complete the ESEE by making allow, limit, or prohibit decisions for fish and wildlife habitat.

Local Goal 5 programs

Most of the local jurisdictions in the Metro region have adopted Goal 5 programs that have been acknowledged by Oregon's Department of Land Conservation and Development as being in compliance with the state rule. Some of these programs were developed prior to Goal 5 rule revisions in 1996, while a few have been done more recently. The rule requires local jurisdictions to balance the need to protect natural resources against other state goals such as housing (Goal 10) and transportation (Goal 12) while providing ample opportunity for citizen involvement (Goal 1). Thus, the state rule allows local jurisdictions' Goal 5 programs to be in compliance with state law while being inconsistent with each other. However, Metro's code required an analysis of the consistency of local fish and wildlife protection prior to conducting a regional ESEE analysis and a regional protection program.

Metro staff conducted an analysis of local Goal 5 programs beginning in 1999 and culminating in a report to the Metro Council (Metro 2002a). The analysis demonstrated that there are many inconsistencies and inadequacies in fish and wildlife protection in the Metro region. An important reason for the inconsistency in local protection is that the Goal 5 rule does not set a specific standard, rather it lays out a process for jurisdictions to follow. The process described by state law allows jurisdictions to choose which resources to protect and the level of protection received after balancing the consequences of protection with the economic, social, and energy needs within the jurisdiction. Most jurisdictions choose to "limit" conflicting uses in fish and wildlife habitat areas, the Goal 5 rule defines this choice as "conflicting uses should be allowed in a limited way that protects the resource to the desired extent." This language gives local governments wide discretion in designing protection programs.

Metro's Regional Urban Growth Goals and Objectives (RUGGOs) and the Vision Statement emphasize the importance of protecting fish and wildlife habitat and recognize the need to provide a more consistent level of protection throughout the region. Metro's ESEE analysis identifies the tradeoffs of allowing, limiting, or prohibiting development consistently across the region.

Federal and state habitat protection policies

There are many policies that focus attention on the protection of fish and wildlife habitat. This section provides a brief overview of the key federal and state policies that set requirements for jurisdictions and agencies for fish and wildlife habitat protection.[5] While Metro is not required by law to address most of the policies described in Table 1-2 on the following page, a regional fish and wildlife habitat protection plan will help to meet the goals described by many of the federal and state policies.[6]

The federal Endangered Species Act and the Clean Water Act most specifically relate to Metro's current efforts to protect fish and wildlife habitat. NOAA Fisheries is currently developing recovery plans for listed salmon species. Metro's inventory of regionally significant fish and wildlife habitat has identified habitat upon which listed salmon depend for some part of their life histories. Coordinating Metro's program with NOAA Fisheries recovery plan as it is developed will not only assist in long-term recovery of the species, but also with local compliance with the ESA.

The Oregon Department of Environmental Quality (DEQ) is required by the federal Clean Water Act to maintain a list of steam segments that do not meet water quality standards, called the 303(d) list (DEQ 2003a). Many of the region's streams are 303(d) listed as water-quality impaired due to elevated temperatures.[7] Once a stream or river segment is 303(d) listed, the DEQ is responsible for developing water quality standards that protect beneficial uses of rivers, streams and lakes. These standards, called Total Maximum Daily Load (TMDL) determinations, are specific to 303(d) listed segments of rivers and streams and the problems identified in those segments, but are developed using a comprehensive approach that considers a larger geographic area, such as a watershed (DEQ 2003).

TMDLs outline how much pollution a water body can receive and still not violate water quality standards. Once TMDL standards are established, the state monitors water quality and reviews available data and information to determine if these standards are being met and water is protected. A stream or river segment can be "de-listed," or removed from the 303(d) water quality limited list, when TMDL determinations are made, or when new data indicates the

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[5] Additional descriptions of these policies may be found in *Appendix A*.

[6] Metro must address activities on land owned by Metro, such as the take provisions of the ESA, local standards adopted to comply with the CWA, and state wetland laws.

[7] Appendix B includes two tables showing the DEQ's 1998 and 2002 303(d) listings of water quality limited water bodies in the Metro region (courtesy Don Yon, Oregon DEQ, 2003). Note that the 1998 list is substantially longer than the 2002 list. This does not mean that the water quality has improved; stream reaches that were on the 1998 list, but not on the 2002 list, typically indicate that a TMDL was developed, not that the particular pollution problem was solved.

waterbody meets water quality standards. The 303(d) listing identifies the problem(s); TMDLs provide a plan to improve water quality and meet federal clean water standards.

Metro's Stream and Floodplain Protection Plan (Title 3), described earlier, addresses water quality. However, many streams in the region still suffer from degraded water quality, and more recent science calls for greater protections than were in place when Title 3 was developed. Current efforts to improve water quality for fish habitat will also help to meet the federal standards in the Clean Water Act.

Table 1-2. Federal and state policies guiding fish and wildlife habitat protection.

Policy	Description
Federal policies	
Endangered Species Act (ESA)	The purpose of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." Requires federal agencies to identify critical habitat for endangered and threatened species, create a recovery plan for those species and in some circumstances issue regulations that provide for the conservation of such species. Above all, the act prohibits any individual, group of individuals, states, cities and counties from "taking" a listed species.[1] Twelve species of salmon and steelhead are listed as either threatened or endangered in the Columbia River and Willamette River Basins.
Clean Water Act (CWA)	Sets a national goal to "restore and maintain the chemical, physical and biological integrity of the Nation's waters." In Oregon, the CWA is implemented by the DEQ with review and approval by the U.S. EPA. The DEQ has the responsibility for protecting the beneficial uses of rivers, streams and lakes of the state. Beneficial uses include drinking water, cold water fisheries, industrial water supply, recreation and agricultural uses.
Northwest Power Act	Requires the Bonneville Power Administration to implement a Fish and Wildlife Program that mitigates for the degradation to both fish and wildlife habitat caused by the Columbia Hydropower System. Complying with the Fish and Wildlife Program is achieved primarily through subbasin plans developed with oversight from the Northwest Power Planning Council.
Magnuson-Stevens Fishery Conservation and Management Act	Requires federal agencies to consult with NOAA Fisheries on activities that may adversely affect essential fish habitat (EFH). Defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." The Pacific Fishery Management Council identified EFH for pacific coast salmon. Those areas generally include "waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and … a healthy ecosystem."
State policies	
Oregon Plan for Salmon and Watersheds	The mission of the Oregon Plan is "to restore our native fish populations – and the aquatic systems that support them – to productive and sustainable levels that will provide substantial environmental, cultural and economic benefits." Initiated to address restoration of coastal coho salmon, the Oregon Legislature later incorporated other related efforts into one overarching framework. Designed to restore the healthy function of Oregon's natural aquatic systems.
Native Fish Conservation Policy	The purpose of the policy is: "to ensure the conservation and recovery of native fish in Oregon." Focuses on "naturally produced native fish" which are those fish species that "reproduce and complete their full life cycle in natural habitats." The reason for this focus on naturally produced fish is that those "native fish are the primary basis for Endangered Species Act de-listing decisions and the foundation for long-term sustainability of native species and hatchery programs."
Oregon Endangered Species Act	Intended to manage the listed "species and their habitats so that the status of the species improves to a point where listing is no longer necessary." Species are listed when they are: (1) native, and (2) in danger of extinction throughout any significant portion of its range (endangered) or (3) likely to become an endangered species within the foreseeable future throughout any significant portion of its range (threatened).
Oregon Wetland Regulatory Program	The Oregon Division of State Lands (DSL) administers Oregon's removal/fill law. Using similar definitions as the federal government, DSL determines wetland boundaries and water bodies that meet the definition of "waters of the state." A permit is required for fill or removal equal to or exceeding 50 cubic yards or more of material in any waters of the state at one location.
Essential Indigenous Anadromous Salmonid Habitat	In an effort to identify and protect essential habitat for salmon and trout, the Oregon Legislature in 1993 required DSL to identify essential indigenous anadromous salmon habitat. DSL has defined such habitat as: "habitat that is necessary to prevent the depletion of indigenous anadromous salmonid species during their life history stages of spawning and rearing."

[1]The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.

Acronyms: DEQ: Department of Environmental Quality; EPA: Environmental Protection Agency; NOAA: National Oceanic and Atmospheric Administration.

Public opinion on habitat protection

In a national survey on biodiversity, respondents strongly agreed (69 percent) with the statement "[w]e have a personal responsibility to the earth to protect all plant and animal life"; and strongly agreed (71 percent) with the statement "[n]ature provides me with inspiration and peace of mind." (Belden, Russonello & Stewart, 2002). Residents of the Metro region are known for placing a high value on the natural environment, which some believe adds to a high quality of life. Many people move to the region to take advantage of the close proximity to hiking, biking, boating and other outdoor activities. Residents also enjoy access to nature in the city: hiking in Forest Park, boating on the Willamette, birding at Smith and Bybee Lakes. Residents of the region have emphasized the protection and restoration of parks and open spaces through public surveys over the last several years. Metro has been particularly interested in public opinion regarding the protection of fish and wildlife habitat in recent years.

Several opinion surveys were conducted in 2001, including a May 2001 Davis and Hibbits phone survey commissioned by Metro, an October 2001 Moore Information survey sponsored by KGW-TV and the Portland Tribune, and an informal "SurveyPoint" poll available by phone and on Metro's website. Results from all three studies demonstrated that Metro residents place great value on protecting natural resources and maintaining the region's quality of life. In 2002 Davis, Hibbitts, & McCaig conducted a survey for Clean Water Services in Washington County that showed a mix of values related to healthy streams. The general public and streamside property owners rated clean drinking water, clean rivers and streams, and open space for fish and wildlife habitat as being "most important"; but rated healthy fish populations in local streams and adequate water in streams for fish and wildlife as being "least important". This contradiction is especially interesting since clean rivers and streams locally are a requirement for healthy fish populations regionally.

Metro held "Coffee Talks" from September 2001 through January 2002, a series of 93 small group dialogues in various locales throughout the urban region. Discussions focused on the urban growth boundary, fish and wildlife habitat protection, and transportation. The Coffee Talks were advertised via local radio, television, and newspapers. In addition, approximately 90,000 citizens received an October 2001 "Let's Talk" about fish and wildlife newsletter, including some 45,000 property owners with land in the inventory. An important component of these talks involved whether the public thought it was important to protect fish and wildlife habitat in the urban region and if so, how this should be accomplished. This public feedback was distributed to Metro staff and Councilors for consideration in the planning process. One important outcome of this process was indication of strong public support for Metro's efforts to maintain and enhance natural habitat areas.

In March 2002, Metro held a regional conference and five localized workshops to garner public opinion and participation entitled "Let's Talk" (Metro 2002b). Metro undertook a major notification process to encourage attendance to these activities, including the fall 2001 Natural Resource Protection mailing of nearly 90,000 to property owners and interested parties; press releases to major and local newspapers; partnership with KGW, a major local television station; and follow-up calls to neighborhood associations, business interests and other parties to encourage participation. About 1,000 people attended the conference and workshops. The results confirm the importance of natural resource protection to the area's citizens, and interest in several strategies for natural resource protection emerged – perhaps most notably, financial incentives for protection as well as disincentives for failing to protect these resources.

Overview of Metro's fish and wildlife habitat inventory

Metro has the authority pursuant to Oregon Administrative Rule chapter 660, division 23, to identify "regional resources." A regional resource is defined by the Goal 5 rule as "a site containing a significant Goal 5 resource, including but not limited to a riparian corridor, wetland, or open space, which is identified as a regional resource on a map adopted by Metro ordinance." Metro's Goal 5 work addresses the following Goal 5 resources: riparian corridors, associated wetlands, and wildlife habitat. This report uses the term "regional resource" or "resource" interchangeably with "riparian corridors and upland wildlife habitat," or simply "fish and wildlife habitat." A regional approach to inventorying fish and wildlife habitat requires a consistent level of data and analysis across the entire Metro region. Metro's fish and wildlife habitat inventory is based on the best available information that can be applied consistently at a regional scale.

Metro completed its inventory of fish and wildlife habitat in 2002. Metro took an ecological functions approach to define the riparian corridor and identify upland wildlife habitat, based on its extensive scientific literature review (Metro 2002c). This approach combines geographic information system (GIS) mapping technology, scientific recommendations, and fieldwork for an inventory that encompasses the entire Metro region. The methodology assigns values to fish and wildlife habitat features that allows comparison of their cumulative importance. Below is a short overview of the current state of fish and wildlife habitat in the region, followed by a description of the inventory methodology.

State of the region's fish and wildlife habitat

Habitat loss, alteration, and significant increases in the amount of impervious land cover characterize the Metro region. More than one-fourth of all surface streams (about 400 miles) have been removed or piped underground, and many of the remaining stream miles suffer from degraded water quality, fragmentation, and simplification (loss of structural and functional diversity) of riparian corridors for fish and wildlife. Ninety-six percent of the land in the Willamette basin under 500 feet in elevation is privately owned and has been converted to agricultural or urban use (Willamette Urban Watershed Network 2000). A recent study of tree cover in the Willamette/Lower Columbia Region found a reduction in tree canopy cover from 46 percent in 1972 to 24 percent at present (American Forests 2001). Average tree cover in the region's urban areas is only 12 percent, down from nearly 21 percent in 1972. Eleven percent of the Metro region's natural areas[8] were lost between 1989-1999, with accompanying adverse effects on watershed hydrology and wildlife habitat.

Below are some examples of changes in our region's fish and wildlife habitat over time. The Metro region has experienced substantial vegetation loss, harming wildlife and habitat. For example:

[8] Identified by Metro's Parks and Greenspaces Department, includes undeveloped areas providing fish and wildlife habitat value.

- There has been a ***43 percent decline in forest cover*** from levels prior to substantial urbanization (i.e., 1850's), with very serious repercussions for wildlife and hydrology. Forest composition has also changed due to loss of old growth forests and white oak woodlands. The species depending on these habitats are disappearing (Metro 2002c).
- ***Current riparian/wetland forest is only 17 percent of historic levels***. Riparian wildlife habitat has more closely associated species (64, excluding fish) than any other terrestrial habitat type, including 11 species at risk in Oregon and/or nationally, with at least two more species now lost from this region (Metro 2002c).
- Of all habitat types in the Metro region, the greatest change in vegetation type has been the ***near-complete loss of grassland and oak savanna***; current estimates are that less than one percent of the historic extent still exists in small, scattered patches. ***Grassland bird species are declining precipitously*** in the Metro area, with several species lost and more that will disappear from the region if trends continue.[9]
- ***Agriculture and urban land uses comprise 55 percent*** of the land area in the region. Urban land cover is overtaking agricultural lands in the Metro region, with important hydrologic and wildlife repercussions.[10]

The riparian corridors and wildlife habitat that remain in our region, especially those providing a high ecological functional value, are scarce and diminishing as more land is urbanized.

Riparian corridors

As described in Metro's Technical Report for Goal 5 (science review; Metro 2002c), the riparian corridor refers to the land and vegetation adjacent to waterbodies such as streams, rivers, wetlands and lakes that are influenced by perennial or intermittent water. According to the scientific literature reviewed, riparian corridors provide important ecological benefits for fish and wildlife including:

1. Microclimate and shade
2. Streamflow moderation and water storage
3. Bank stabilization, sediment and pollution control
4. Large wood and channel dynamics
5. Organic matter input

The ecological functions listed above provide the basis for Metro's delineation of riparian corridors. In the spring of 2001, Metro launched an effort to map the ecological functions of riparian corridors and the specific landscape features that are associated with these functions. Features include stands of trees, woody vegetation, meadows, wetlands, steep slopes, and flood areas that are located along the region's streams and rivers. Based on the scientific literature, Metro identified areas where landscape features make a substantial, or "primary," contribution to providing an ecological function to the stream. Areas identified as "primary" receive a score of

[9] See Table 8 in Metro's *Riparian Corridor and Wildlife Habitat Inventories*, Metro 2002d.
[10] Agricultural lands are more water-permeable than urban lands, and are used by grassland species as "surrogate" grassland habitat.

six points. Landscape features that fall within the outer part of the range described in the scientific literature provide riparian function to a lesser degree and are said to serve a "secondary function" and receive one point. All areas that provide function to the stream are thus mapped and receive a score.

The scores are additive for any given landscape feature and reflect relative ecological function at any given point on the map. For example, a location on the map could contribute significantly to all five functions listed above and receive a score of 30 (five primary functions times six points each). Another location may receive primary scores for three functions (three primary functions times six points) plus secondary functions for up to two other functions (18 points for primary functions, plus two points for secondary functions). Still another location may receive only a single point for one secondary function (for example, developed floodplains). ***The Metro Council determined that all areas receiving a score for providing riparian ecological function are regionally significant.***

Wildlife habitat

The Goal 5 rule defines wildlife habitat as

> …[A]n area upon which wildlife depend in order to meet their requirements for food, water, shelter, and reproduction. Examples include wildlife migration corridors, big game winter range, and nesting and roosting sites. (OAR 660-023-0110(1)(b)).

The rule does not provide specific guidance on how to identify significant wildlife habitats other than referring to the standard inventory process (OAR 660-23-030) and minimum consultation requirements outlined in OAR 660-23-110. The Goal 5 rule allows a jurisdiction flexibility in defining the area for which a significance determination must be made.

Metro's approach to identifying the region's important wildlife habitats was based on a combination of: (1) best available scientific literature; (2) GIS modeling; (3) field studies to address the Goal 5 rule to determine the location, quantity and quality of potential wildlife habitat, as well as the adequacy of that information; and (4) local expertise to identify locations of sensitive species and habitats (Habitats of Concern). The model assigns values to wildlife habitat features that allow comparison of their cumulative importance to the regional wildlife habitat network. In early 2001, Metro mapped wildlife habitat based on specific features associated with these characteristics. Features include stands of trees, woody vegetation, meadows, and wetlands located within the region. The wildlife model is based on four criteria:

1. habitat patch size (minimum patch size of 2 acres unless a Habitat of Concern),
2. proximity to water sources,
3. proximity to other natural areas, and
4. forest interior habitat.

In brief, larger habitat patches are more valuable to native wildlife than smaller patches because more species are retained over time, and species sensitive to human disturbance still have a place to live. Rounder patches are better than long, narrow patches to reduce negative edge effects. Water within or near habitat patches is important so animals can drink. Connectivity to other natural area patches is key to maintaining biodiversity; sometimes local populations become extinct and connectivity provides the means for reintroducing that species, as well as maintaining the genetic diversity important to the long-term health of a population.

Metro's model accounts for edge effects and habitat quality, as verified by scientific fieldwork conducted in 2001. The habitat attributes positively associated with increasing scores[11] in Metro's GIS model include:

- More downed wood and logs
- More food resources
- A wider variety of food resources
- Food availability over longer periods
- Fewer non-native trees
- Fewer non-native shrubs
- Fewer non-native herbs
- Increased structural diversity
- More wildlife cover available throughout the year
- More nesting and den sites (snags, root wads, rocky crevices, etc.)
- Less human disturbance onsite or nearby
- Better wildlife diversity onsite
- More year-round availability of water
- Healthier stream channel morphology
- More vegetative cover near water sources
- More types of water resources (streams, wetlands, etc.)

Each habitat patch was ranked and assigned a score for each of the model criteria, relative to other habitat patches. Sites were subsequently separated into three classes, of up to three possible points, for each criterion. The scores are additive for any given habitat patch and reflect relative wildlife habitat value for each of the habitat patches identified on the map. In addition to the wildlife habitat model, Metro worked with local experts and agency staff to identify "Habitats of Concern." Habitats of Concern are those sites known to be critical for sensitive species or to be scarce and declining in the Metro region. ***The Metro Council determined that all areas receiving a score of two or greater are regionally significant, plus sites identified as a Habitat of Concern.***

Fish and habitat classification

Metro's inventories of fish and wildlife habitat provide a wealth of information on the relative ecological value of specific sites across the region. The inventory methodology distinguished between habitat function with as much precision as possible to make an informed decision on regional significance. The upland wildlife habitat was evaluated separately from the riparian wildlife habitat areas. However, a method of classifying the fish and wildlife habitat together becomes useful in the ESEE to facilitate distinguishing the tradeoffs of protecting or not

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[11] Statistically significant results of simple linear regression. For more detailed statistical findings, see Metro's *Riparian corridors and wildlife habitat inventory* (Metro 2002c).

protecting the habitat areas and, later, in the protection program. For the ESEE analysis, Metro classified fish and wildlife habitat based on the ecological function scores into six classes, under two main categories: riparian/wildlife and upland wildlife. Each class covers a geographically discrete portion of the inventory, and may include riparian and/or wildlife functions and also may be a Habitat of Concern. Class I riparian/wildlife and Class A upland wildlife are the highest value. More description of the classification system may be found in the *Conflicting Uses* chapter.

Definition of allow, limit, prohibit

In Metro's ESEE analysis the consequences of allowing, limiting, or prohibiting identified conflicting uses on fish and wildlife habitat are described. The Goal 5 rule requires that a program be developed that is based on and supported by the ESEE analysis, and that describes the degree of protection intended for the fish and wildlife habitat. Although the ESEE consequences analysis is described in terms of "allow, limit, or prohibit," the Goal 5 program may be some combination of the three scenarios, such as "strictly limit" (between prohibit and limit), "limit," or "moderately limit" (between limit and allow).

Allow a conflicting use

According to the Goal 5 rule, "a local government may decide that the conflicting use should be allowed fully, notwithstanding the possible impacts on the resource site." The Goal 5 rule also requires that the ESEE analysis "demonstrate that the conflicting use is of sufficient importance relative to the resource site, and must indicate why measures to protect the resource to some extent should not be provided." [660-23-040 (5)(a)] For example, the economic and social benefits of allowing an industrial use may outweigh the environmental and energy benefits of protecting the fish and wildlife habitat because of the additional jobs and increased tax base the development may create.

A decision to allow the conflicting use does not necessarily preclude habitat protection. All development in a fish and wildlife habitat area would be subject to existing local, state, and federal government regulations. For example, Title 3 (water quality) setbacks are required for new development along streams. In addition, incentives and/or educational materials could be developed to encourage stewardship and other voluntary protection measures.

Limit conflicting use

According to the Goal 5 rule, "a local government may decide that both the resource site and the conflicting uses are important compared to each other, and, based on the ESEE analysis, the conflicting uses should be allowed in a limited way that protects the resource site to a desired extent." [660-23-404(5)(b)]

A program to limit a conflicting use can be designed to allow some level of development with certain restrictions to protect the fish and wildlife habitat to the maximum extent possible. For example, the disturbance area may be limited in size ("x" number of square feet) and location (as far from the water feature as possible). Design standards may also be required to lessen the impact on the habitat (e.g., tree retention, cluster development, impervious surface reduction, etc.). In addition, mitigation standards may be required to replace lost habitat functions (e.g., plant native vegetation).

Prohibit a conflicting use

A Goal 5 resource (i.e., fish and wildlife habitat) would receive the highest level of protection with a decision to prohibit conflicting uses. According to the Goal 5 rule, "a local government may decide that a significant resource site is of such importance compared to the conflicting uses, and the ESEE consequences of allowing the conflicting uses are so detrimental to the resource, that the conflicting uses should be prohibited." [660-23-404(5)(c)] For example, development may be prohibited within a highly valuable riparian corridor with intact vegetation. Some development, however, may be allowed if all economic use of a property is lost through full protection. This could occur when a parcel of otherwise developable land is located fully within a riparian corridor.

Impact of ESEE decision on the UGB

A decision to limit or prohibit conflicting uses in fish and wildlife habitat areas could impact the amount of buildable land available to meet the jobs and housing needs of the Metro region within the UGB. If land for employment and housing were protected, then the Metro Council is required to consider either increasing densities or changing design type designations in other parts of the region. If the 20-year demand for growth still cannot be met, the Metro Council has the authority to expand the UGB to meet regional needs. At the regional level, expanding the UGB has the potential to mitigate the negative consequences on jobs and housing of limiting or prohibiting development. However, not all uses are "substitutable" or able to be relocated from one part of the region to another. For example, it is easier to relocate housing than water-dependent industrial uses. Expanding the UGB to allow for protection of fish and wildlife habitat may be one method to minimize clashes with conflicting uses. However, such a decision may increase expenditures associated with extending infrastructure, vehicle miles traveled, and other development related expenses.

Organization of this report

This ESEE analysis describes the tradeoffs associated with allowing, limiting, or prohibiting conflicting uses in fish and wildlife habitat areas. The goals are to follow the steps outlined in the Goal 5 rule and to provide sufficient information for the Metro Council to evaluate program options for the protection of fish and wildlife habitat.

The second chapter, *Impact Areas*, identifies the area within which conflicting uses adversely affect the fish and wildlife habitat. Chapter three, *Conflicting Uses,* describes the land uses and activities that negatively impact fish and wildlife habitat, including a substantial amount of data related to the inventory, fish and wildlife habitat classification, and acreage figures for types of conflicting uses.

Chapters four through seven *(Economic Consequences, Social Consequences, Environmental Consequences,* and *Energy Consequences)* contain Metro's analysis of the ESEE consequences for the region.

Chapter eight, *Summary and Conclusions,* highlights the main ESEE tradeoffs and the implications for the next step of Metro's planning process in the development of a fish and wildlife habitat protection plan.

CHAPTER 2: IMPACT AREAS

Introduction

One step of the economic, social, environmental, and energy (ESEE) analysis is to identify "impact areas." The ESEE analysis is conducted for both the resource area (in this case, regionally significant riparian corridors and wildlife habitat) and the impact area. Under the Goal 5 rule, Metro may develop a program that applies to both the regionally significant fish and wildlife habitat and the impact area.

Definition of the impact area

Under the Goal 5 rule, Metro must identify an impact area for all regionally significant fish and wildlife habitat:

> *Local governments shall determine an impact area for each significant resource site. The impact area shall be drawn to include only the area in which allowed uses could adversely affect the identified resource. The impact area defines the geographic limits within which to conduct an ESEE analysis for the identified significant resource. (OAR 660-23-040(3))*

Simply put, the impact area defines an area where allowed land uses or activities could harm the fish and wildlife habitat. The impact area may be larger than the identified significant fish and wildlife habitat or it may be as small as the fish and wildlife habitat itself. For example, impact areas for riparian corridors could encompass lands outside the corridor that contribute to riparian function. Development near streams and wetlands removes vegetation that would otherwise contribute to riparian function by providing shade, sedimentation control, and water storage. Developed areas near streams and wetlands can be included within impact areas because they are sources of run-off from impervious surfaces, human disturbance, noise, lighting, toxins, fertilizers and pesticides. Each of these influences may adversely affect riparian areas and wildlife habitat.

The Goal 5 rule allows substantial discretion in determining the impact area for fish and wildlife habitats. Recent court decisions dictate that the size and extent of the impact area can be quite large, so long as there are reasons to support the impact area decision.[12] For example, the extent of an impact area could include the entire watershed.

As documented in Metro's science paper, the effects of urbanization on the functions and values of fish and wildlife habitat are pervasive.[13] A compelling case can be made for identifying the entire watershed as an impact area based on the cumulative effects of urbanization, such as road density, impervious surfaces and altered hydrology, vegetation loss and alteration, and species depletion. However, doing so may necessitate an ESEE analysis for the entire watershed, which significantly encumbers the Goal 5 planning process. Stormwater management through watershed planning may be more realistic for addressing these larger, more pervasive effects of

[12] Sanders v. Yamhill County, 34 Or LUBA 782 (1998).
[13] Metro's Technical Report for Goal 5, August, 2002, pages 33-50.

urbanization on the function of fish and wildlife habitats.[14] Metro's current work plan calls for addressing regional stormwater issues following completion of the fish and wildlife program.

Local examples[15]

Local jurisdictions complying with the Goal 5 rule have used a variety of means to determine impact areas, with approaches ranging from simple to complex. In the simplest approach the impact area and the fish and wildlife habitat area can be the same, and some local jurisdictions have selected that option. For example, the city of Fairview, city of St. Helens, and Deschutes County consider the impact area to be the same as the habitat area. Note that Fairview, under the old Goal 5 rule, stated, "the Fairview impact area could reasonably be the entire City." However, Fairview did not identify a specific impact area outside of the habitat area, as it would serve "no useful purpose."

Some jurisdictions utilize setbacks to define impact areas. For example, the city of Wilsonville chose to implement a 25-foot impact area in addition to the habitat area "because it was protective of the resource, provided a reasonable review of development, and allowed a buffer area for the storm sewer system."

Other jurisdictions assign impact areas that vary based on fish and wildlife habitat. For example, Lake Oswego uses the impact area to refer to "the area where development siting standards are recommended to mitigate identified adverse impacts." The City's definition of the impact area varies based on the habitat type (e.g., 30-foot impact area on each side of a Class 1 stream, with different impact areas for other types of stream). The impact area width ranges from 25-30 feet (in which no new structures may be built), but there is an additional 10-foot construction setback. However, upon development and drawing of the final plat, the 30-foot setback outer line then becomes the hard-and-fast line and everything within becomes the protection area. For upland tree groves there are no impact areas.

In Tualatin, the impact area also varies based on the habitat type. The impact area for wetlands includes the wetland plus a 25-foot setback surrounding the wetland. Some upland wildlife habitat within 50 feet of certain wetlands plus any adjacent steeply sloped areas are also included in the impact area. Open space areas do not include any additional land as an impact area, and for forested habitat sites the impact area extends to the edge of the canopy. These examples are a sampling of the broad range of choices available for designating impact areas.

Metro's approach

Metro's riparian corridor inventory covers a substantial portion of the landscape and describes the features that provide function to the riparian corridor. Areas that received a score of one to 30 are identified as regionally significant habitat. The wildlife habitat inventory excludes substantial low-structure vegetation, most forested habitat patches less than two acres, and habitat patches scoring less than two in the model (approximately 2,070 acres in the 2-20 acre size range). The potential impacts of adjacent land use on wildlife habitat are important.

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[14] Stormwater management and watershed planning are identified in Metro's Regional Growth Goals and Objectives, the Regional Framework Plan, and Title 3 as issues of regional concern.
[15] See Metro's *Local Plan Analysis* (Metro 2002) for more information.

However, the advantages of additional impact areas may be higher for vulnerable riparian areas (within 150 feet of a water feature) than for upland wildlife habitat. Therefore, a larger impact area for riparian areas close to water features has been identified than for wildlife habitat and riparian resources further than 150 feet from water.

Riparian impact areas beyond the existing inventory include the areas adjacent to the most vulnerable resources such as streams, wetlands and lakes with little or no riparian vegetation. All land uses in a watershed impact the streams within it, but Metro's scientific literature review indicates that the area providing the most important ecological functions to the stream generally falls within 150 feet. Therefore the ***riparian impact area*** has been defined as the area within 150 feet of a stream, wetland or lake that otherwise is not included in the inventory. Developed floodplains that are included in the inventory do not have an additional impact area. The ***vegetation impact area*** is defined as 25 feet around all remaining resources to protect the tree root zone area and low-structure vegetation. Using this method to identify the impact area adds 16,323 acres to the inventory of regionally significant fish and wildlife habitat to be analyzed for ESEE consequences.

There are many ways to determine impact areas under the Goal 5 rule. Metro's impact area focuses primarily on two aspects of the Goal 5 fish and wildlife habitat inventories: primary functional criteria for streams and waterbodies, and tree root-zone protection. This impact area protects the vulnerability of the fish and wildlife habitat. An ecologically appropriate impact area designation also helps Metro and its partners identify key restoration areas.

Riparian corridor impact area

Aquatic resources such as streams, wetlands and lakes may be strongly influenced by adjacent land use, and their degradation may cause cascading negative effects downstream. For example, an eroding streambank has negative consequences for instream habitat both onsite and downstream. This is particularly true when there is little or no existing vegetation nearby. When these conditions exist, streams, rivers, and wetlands are unlikely to receive the benefits of any Goal 5 program without additional impact areas. These water resources are likely to be in close proximity to developed areas where runoff, sediments, excess nutrients and pollutants can make their way directly to the water without the moderating influences provided by vegetation. These resources may be the areas most adversely impacted by adjacent land uses and practices.

While all land uses in a watershed impact the water bodies within it, the scientific literature review shows that the area providing primary function to the stream generally falls within 150 feet[16]. Adjacent land use has the strongest influence on waterways within the 150-foot zone, where the majority of primary ecological functions are either being provided, or would be if the area were not developed. Areas with secondary ecological functions may extend substantially further than 150 feet from the stream. These resources likely play lesser, but cumulatively important, roles in regional stream health and an argument can be made for impact areas on existing secondary resources. However, basing impact areas on secondary functions *that should*

[16] To review the literature on recommended widths, see Table 7 in *Metro's Technical Report for Goal 5*, July 2002; for GIS mapping descriptions for the two inventories, see Tables 4 and 5 in *Metro's Riparian Corridor and Wildlife Habitat Inventories*, August 2002.

exist but don't would be difficult to model and would necessitate inclusion of the entire watershed as the impact area. These data support Metro's impact area for riparian areas of 150 feet from the water body.

Tree root zone protection

In the case of wildlife habitat, adverse edge effects are an important driver of ecological value and are incorporated into Metro's wildlife habitat model via habitat patch size and habitat interior. Edge effects are a function of human influences occurring at or near a forest or wetland edge; therefore it could be argued that impact areas are already accounted for in wildlife habitat patches. For example, a habitat patch narrower than 400 feet contains virtually no interior habitat. Therefore, human influences such as disturbance and nonnative species may be relatively pervasive; impact areas may serve no purpose in such cases. However, tree root zone compaction could theoretically result in a gradual shrinking of forested habitat over time due to tree damage around the edges of the habitat.

Tree root protection is important because root damage affects the entire tree. Soil compaction above the roots is a key culprit. The drip-line is the full area beneath the tree canopy. Certified arborists state that the root zone of a tree typically extends at least one-and-a-half to two times the distance of the drip-line; some experts indicate root spread may extend as far as two to three times the distance of the drip-line (Appleton et al. 2000; Ryan et al. 2002). A Metro GIS survey of trees in our region indicates that the drip-line for relatively mature trees is about 65 feet. Therefore, Metro's impact area for root zone protection is 25 feet.[17]

A 25-foot impact area is also appropriate for addressing non-forested habitat areas. Low structure vegetation can be quite fragile and vulnerable to disturbances such as trampling, motorized and non-motorized traffic, grazing, etc. Physical disturbance in herbaceous habitats often leads to nonnative or invasive species proliferation (Alberta Riparian Habitat Management Program). This is an issue in for both native herbaceous habitats and agricultural lands, where noxious weeds may rapidly spread and can cause severe crop losses resulting in economic hardship.

Summary

A 150-foot riparian impact area and 25-foot vegetation impact area will:

- Provide all fish and wildlife habitat with an impact area (except developed floodplains).
- Provide the most sensitive fish and wildlife habitat with wider impact areas.
- Provide impact areas to address tree root zones.
- Allow the potential to address areas that are already degraded, but where negative inputs may strongly influence onsite and downstream water quality and key wildlife habitat (such as wetlands).
- Meet the requirements of the Goal 5 rule.

[17] Take the drip line times the recommended distance: 65 x 1.75 = 113.75. Subtract out the drip line: 113.75 – 65 ft = 48.75. Divide by two to get the radius for a 1-sided impact area: 48.75 / 2 = 24.4 ft.

CHAPTER 3: CONFLICTING USES

Introduction

A key step in the economic, social, environmental, and energy (ESEE) analysis is to identify conflicting uses that "exist, or could occur" within regionally significant fish and wildlife habitat and identified impact areas. A conflicting use is a "land use, or other activity reasonably and customarily subject to land use regulations, that could adversely affect a significant Goal 5 resource" (OAR 660-23-010(1)). Identifying conflicting uses is important in order to focus the ESEE consequences analysis on various land uses and related disturbance activities that may negatively impact fish and wildlife habitat.

The following sections describe:

- Metro's method for identifying conflicting uses from a regional perspective,
- the relationship of generalized regional zones to Metro's fish and wildlife habitat inventory,
- the relationship of the 2040 design type hierarchy to Metro's fish and wildlife habitat inventory,
- the relationship of impact areas to generalized regional zones, and
- conflicting uses by Metro's generalized regional zones.

The consequences of allowing, limiting or prohibiting the conflicting use are covered in each of the ESEE analyses, discussed in the following chapters.

Identifying Conflicting Uses

The Goal 5 rule directs local governments to identify conflicting uses in their ESEE analysis by examining "land uses allowed outright or conditionally within the zones applied to the resource site and impact area" (OAR 660-23-040(2)). The Goal 5 rule does not, however, address how conflicting uses should be identified for a regional ESEE analysis.

Metro has taken a regional approach in identifying conflicting uses. Metro is responsible for developing regional policies for managing growth, protecting natural resources, directing regional investment in a mix of transportation options, as well as other policies. Metro does not, however, have zoning authority. Instead, local governments are responsible for implementing regional policy using their comprehensive planning and zoning authority. Consequently, Metro is relying on its compilation of local jurisdictions' zoning codes to provide the framework for identifying conflicting uses (Metro's regional zones and generalized regional zones), as described in the next section. In addition, Metro's 2040 Growth Concept is also described to address conflicting uses that "could occur" over time.

Regional zones and generalized regional zones

Metro's Data Resource Center (DRC) developed "regional zones" and "generalized regional zones" as a GIS data layer to perform regionwide analyses. These regional zones are based on a compilation of local government zoning designations. Each local jurisdiction has a unique array of zoning categories, with literally hundreds of zoning codes that regulate land use in the 24 cities and three counties within Metro's jurisdiction. Although zoning categories are similar among jurisdictions, the actual permitted uses and density requirements often vary. Metro compiled local city and county zoning codes and assigned them to one of 26 regional zones as shown in Table 3-1 below. Table 3-1 also shows the generalized regional zones into which the 26 regional zones are further aggregated. Local jurisdictions had an opportunity to review the compilation and assignments, and corrections were made based on their comments.

Table 3-1. Regional zones & generalized regional zones.

Regional zones	Generalized regional zones
SFR1 Single Family 1 – detached housing with minimum lot sizes from 20,000 square feet and over.	***SFR Single-family Residential***
SFR2 Single Family 2 – detached housing with minimum lot sizes ranging from 12,000 to 20,000 square feet.	
SFR3 Single Family 3 – detached housing with minimum lot sizes ranging from 8,500 to 12,000 square feet.	
SFR4 Single Family 4 – detached housing with minimum lot sizes from 6,500 to 8,500 square feet.	
SFR5 Single Family 5 – detached housing with minimum lot sizes ranging from 5,500 to 6,500 square feet.	
SFR6 Single Family 6 – detached housing with minimum lot sizes from 4,000 to 5,500 square feet.	
SFR7 Single Family 7 – detached housing with minimum lot sizes up to 4,000 square feet.	
MFR1 Multi-family 1 – housing and/or duplex, townhouse and attached single-family structures allowed outright. Maximum net allowable densities range from 2 to 25 units per acre, with height limits usually set at 2 1/2 to 3 stories.	***MFR Multi-family Residential***
MFR2 Multi-family 2 – housing accommodating densities ranging from 25 to 50 units per acre. Buildings may exceed three stories in height.	
MFR3 Multi-family 3 – housing accommodating densities ranging from 50 to 100 units per acre.	
MFR4 Multi-family 4 – housing accommodating densities greater than 100 units per acre. This is the densest of the multi-family zones and would require greater use of vertical space and buildings with multiple stories.	

Note: Local jurisdictions are the ultimate source for actual zoning of any given property.

Table 3-1 (cont.). Regional Zones & Generalized Regional Zones

Regional Zones (cont.)	Generalized Regional Zones (cont.)
MUC1 Mixed Used Center 1 – combines residential and employment uses in town centers, main streets and corridors.	***MUC Mixed Use Centers***
MUC2 Mixed Use Center 2 – combines residential and employment uses in light rail station areas and regional centers.	
MUC3 Mixed Use Center 3 – combines residential and employment uses in central city locations. Mixed use is weighted toward residential development.	
CN Neighborhood Commercial – small scale commercial districts permitting retail and service activities such as grocery stores and laundromats supporting the local residential community. Floor space and/or lot size is usually limited from 5,000 to 10,000 square feet.	***COM Commercial***
CG General Commercial – larger scale commercial districts, often with a more regional orientation for providing services. Businesses offering a wide variety of goods and services are permitted and include highway and strip commercial zones.	
CC Central Commercial – allows a full range of commercial activities typically associated with central business districts. More restrictive than general commercial in the case of large lot and highway oriented uses, but usually allows multi-story development.	
CO Office Commercial – districts accommodating a range of business, professional and medical office facilities, typically as a buffer between residential areas and more intensive uses.	
PF Public Facilities – generally provides for community services such as schools, churches, government offices, hospitals, libraries, correctional facilities, public parks, public recreation facilities and public utilities.	
IL Light Industrial – districts permitting warehousing and light processing and fabrication activities. May allow some commercial activities.	***IND Industrial***
IH Heavy Industrial – districts permitting light industrial and more intensive industrial activities such as bottling, limited chemical processing, heavy manufacturing and similar uses.	
IMU Mixed Use Industrial – districts accommodating a mix of light manufacturing, office and retail uses.	
IA Industrial Area – districts designated exclusively for manufacturing, industrial, warehouse and distribution related operations.	
FF Agriculture or Forestry – activities suited to commercial scale agricultural production, typically with lot sizes of 30 acres or more.	***RUR Rural***
RRFU Rural or Future Urban – residential uses permitted on rural lands or areas designated for future urban development with minimum lot sizes of one acre or more.	
POS Parks and Open Space – preservation of public and private open and natural areas.	***POS Parks and Open Space***

Note: Local jurisdictions are the ultimate source for actual zoning of any given property.

Metro's 26 regional zones provide a clear representation of general land uses allowed outright over the regional landscape. The general zones do not, however, represent land uses allowed conditionally within zones because these vary among local jurisdictions and are not explicitly captured in the regional zones. Disturbance activities associated with conditional uses will be considered in the *Conflicting Uses by Generalized Regional Zones* section.

According to the Goal 5 rule, the ESEE analysis "may address each of the identified conflicting uses, or it may address a group of similar conflicting uses" (OAR 660-23-040(5)). The 26 regional zones are further aggregated into seven major land use categories (generalized regional zones, see Table 3-1): single-family residential, multi-family residential, mixed use, commercial, industrial, rural, and parks and open space. These seven generalized regional zones represent a group of similar conflicting uses and are used in the ESEE analysis for identifying the consequences of allowing, limiting, or prohibiting conflicting uses within fish and wildlife habitat.

Metro's 2040 Growth Concept

Metro's 2040 Growth Concept helps to identify where conflicting uses are likely to occur over time. The 2040 Growth Concept map[18] shows the general location of the 2040 design types inside the urban growth boundary (UGB), as well as several outside the UGB, but inside Metro's jurisdiction. Areas outside the UGB are primarily designated as rural reserves. In December 2002, the Metro Council approved a major expansion of the UGB. The decision brings approximately 18,880 acres into the boundary. These areas have been held at a rural level of development and do not yet have urban zoning. These areas will be the focus of detailed concept planning based on the 2040 Growth Concept principles and land uses will intensify in these areas over time.

Metro's 2040 Growth Concept (adopted in 1995) defines the form of regional growth and development for the Metro region. The concept encourages land use and transportation policies that will allow the Metro area cities and counties to manage growth, protect natural resources, and make improvements to facilities and infrastructure while maintaining the region's quality of life. The concept reflects important values identified by the people who live in this region: access to nature, protection of farmland and natural areas, safe and stable neighborhoods, a diversity of housing types, transportation choices, and a healthy economy.

The concept provides an expression of the region's goals through land use and identifies various design types as the "building blocks" of the regional strategy for managing growth. The centerpiece of the 2040 Growth Concept is the development of centers – compact, mixed-used areas inside the UGB with employment, housing, retail, and cultural and recreational activities, and a pedestrian-friendly environment with access to a variety of transportation choices.

The success of the 2040 Growth Concept depends in large part on the implementation of regional transportation priorities. The Regional Transportation Plan (RTP) groups the 2040 design types into a hierarchy based on transportation investment priority. This hierarchical scheme also helps

[18] To view the 2040 Growth Concept map online: http://www.metro-region.org/library_docs/land_use/concept.pdf

to focus economic development priorities (see *Economic Consequences* chapter) in areas that are most important to achieving the goals of the 2040 Growth Concept. For the purposes of Metro's Goal 5 ESEE analysis, a modified grouping of the 2040 design types is proposed as follows:

Primary land use components

The central city, regional centers, industrial areas, and intermodal facilities are centerpieces of the 2040 Growth Concept. Implementation of the Growth Concept is largely dependent on the success of these primary components:

- *Central City.* Downtown Portland serves as the region's major regional center and also functions as a hub for cultural activities and employment for the entire metropolitan area.

- *Regional Centers.* Regional centers are located throughout the region and serve large market areas outside the central city (e.g., Hillsboro, Gresham). They are intended to become the focus of compact development, redevelopment, and high-quality transit service.

- *Industrial Areas (non-water dependent).* The region's economy depends on a strong base of industry. The Growth Concept identifies areas to be devoted to this use. For purposes of Goal 5, industrial areas have been further divided into non-water dependent and water dependent. Industrial areas that are not water dependent typically demand proximity to high quality transportation and access to an employee base.

- *Industrial Areas (water dependent).* The metropolitan area developed as a city based on a prime location at the confluence of the Columbia and Willamette Rivers. The Portland Harbor consists of several marine terminals that provide access to cities throughout the Pacific Rim, as well as access to the rest of the United States with rail and highway service. Several industrial properties are located on the harbor adjacent to this transportation network.

- *Intermodal transportation facilities.* The region's continued strength as a national and international distribution center is dependent on the provision of adequate intermodal facilities. These facilities include marine terminals, freight facilities for trucking, airports and railroads.

Secondary land use components

- *Town Centers.* Town centers include compact development and a relatively high level of transit service, but they are meant to be smaller and less dense than regional centers. Town centers provide local shopping, employment, and cultural and recreational opportunities within a local market area (e.g., Forest Grove, Milwaukie).

- *Main Streets.* Main streets are similar to town centers but on a smaller scale. Main streets typically serve the immediate neighborhood and sometimes have a traditional commercial identity that may draw visitors from other parts of the region.

- *Station Communities.* Station communities are areas of development centered around light rail or high-capacity transit stations. These areas include mixed-use, compact development and provide a mix of transportation options such as light rail, bus, bicycling, walking and auto.

Tertiary design type components

- *Inner Neighborhoods.* These areas include primarily residential development and are accessible to employment. Inner neighborhoods generally have better access to jobs and shopping than outer neighborhoods and lot sizes are typically smaller.

- *Outer Neighborhoods.* These areas are farther away from large employment centers and have larger lot sizes and thus lower densities than inner neighborhoods.

- *Employment centers.* Employment centers are designated to receive various types of employment and may include residential development that serves the needs of employees.

- *Corridors.* Corridors are major streets that serve as key transportation routes for people and goods. Corridors are not intended to be as dense as centers, but provide a mix of uses such as higher density residential, office, commercial, and retail.

Other

- *Parks and Open Spaces.* Parks and open space include recreational parks, streams and trail corridors, wetlands, floodplains and other natural areas. These areas play a key role in maintaining the quality of life citizens of the region enjoy. Access to both recreational parks and natural areas has been identified as a high priority by residents. These areas are unlikely to provide opportunities for residential, commercial, or industrial development.

- *Rural.* Rural lands outside the urban growth boundary.

The 26 regional zones and seven generalized regional zones, together with the 2040 Growth Concept described in this section, allow for a regional picture of both existing and potential future conflicting uses. The next section describes the relationship of the seven generalized regional zones with Metro's Goal 5 fish and wildlife habitat inventory.

Relationship of generalized regional zones and 2040 design types to Metro's Goal 5 inventory of regionally significant fish and wildlife habitat

This section takes a closer look at where conflicting uses and Goal 5 fish and wildlife habitat overlap. Metro's Goal 5 inventory of regionally significant fish and wildlife habitat is analyzed in the following ways: geographical boundaries (i.e., UGB, Metro's jurisdiction); development status (i.e., developed and vacant); generalized regional zones and development status; generalized regional zones, fish and wildlife habitat classification and development status; and 2040 design types hierarchy and fish and wildlife classification. In addition, impact areas are summarized by generalized regional zones and development status. This information provides context in the ESEE analysis by quantifying the extent (i.e., acreage) to which fish and wildlife habitat may be impacted by allowing, limiting, or prohibiting the conflicting uses.

Distribution of land within the UGB and Metro's jurisdictional boundary

Figure 3-1 below shows the urban growth boundary and Metro's jurisdictional boundary (before December 2002). The land area within Metro's jurisdiction is comprised of approximately 227,540 acres within the UGB and 53,120 outside the UGB for a total of over 280,660 acres (not including water features), or about 438 square miles. The 2002 UGB expansion areas (hatched areas on map) include approximately 18,800 acres, most of which are inside Metro's jurisdiction (over 3,100 acres are currently outside Metro's jurisdiction). The gray area on the map represents regionally significant fish and wildlife habitat.

Figure 3-1. Metro's fish and wildlife habitat inventory, UGB, jurisdictional boundary & expansion areas.

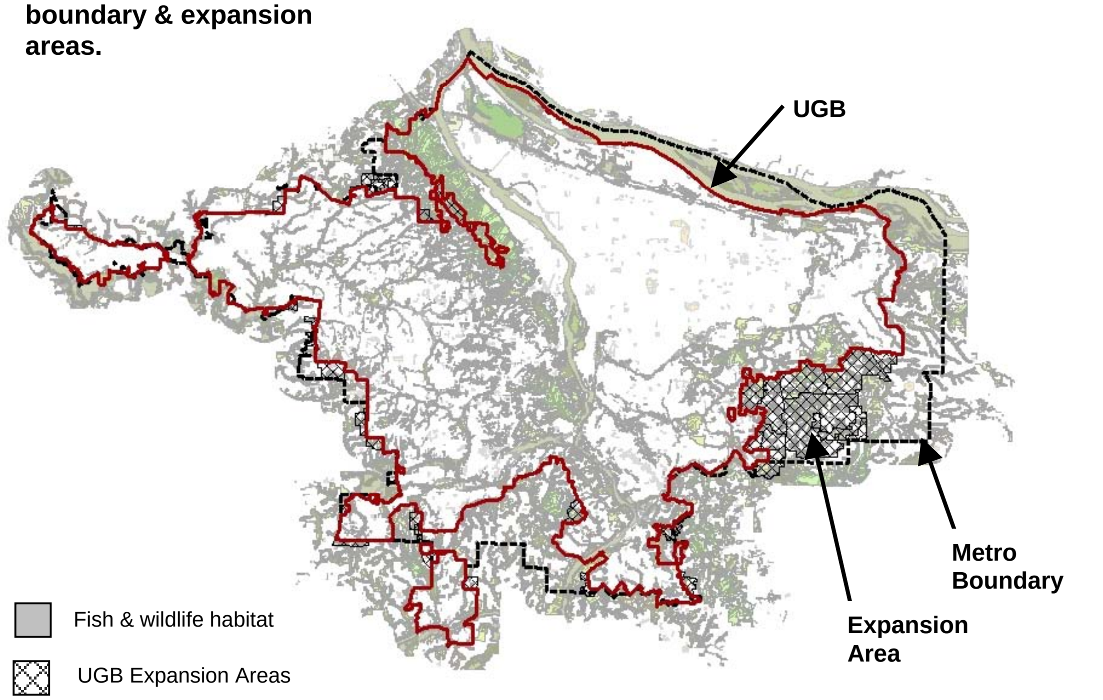


Table 3-2 disaggregates non-habitat and habitat lands into three geographical areas: inside the UGB, UGB expansion areas, and the remaining areas in Metro's jurisdiction outside of the UGB. The total acreage shown in the table includes approximately 3,100 acres in the expansion areas that are currently outside Metro's jurisdiction. Approximately 81,700 acres of fish and wildlife habitat are within, or will be within, Metro's jurisdictional boundary (almost 29 percent of the total land area). Within the UGB, 24 percent of the total land area is fish and wildlife habitat (53,671 acres). UGB expansion areas include over 8,200 acres of fish and wildlife habitat (44 percent of the expansion area). Fifty-three percent of the remaining areas in Metro's jurisdiction outside the UGB (19,794 acres) are fish and wildlife habitat.

Two-thirds (66 percent) of the total fish and wildlife acres are within the UGB. The other third (28,026 acres) is located in the expansion areas and the remaining areas in Metro's jurisdiction outside the UGB.

Table 3-2. Fish and wildlife habitat by Metro's jurisdictional status.

Geographical Area	**Total Acres*** (Non-habitat and habitat)	**Fish and wildlife habitat**		
		Habitat Acres	*% of Geog. Area*	*% of Total Habitat*
Inside UGB (before Dec. 2002)	227,539	53,671	24%	66%
UGB Expansion Areas (Dec. 2002)**	18,799	8,232	44%	10%
Remaining areas in Metro's jurisdiction outside UGB	37,404	19,794	53%	24%
Total Acreage	283,742	81,697	29%	100%

Source: Metro's Regional Land Information System (RLIS) data base
*Water areas removed (~8,000 acres of habitat)
**UGB expansion areas include approximately 3,100 acres that are currently outside Metro's jurisdiction

Distribution of land by development status

In this section, both non-habitat and habitat lands are broken out by development status (developed and vacant) within the three geographical areas (see Table 3-3). A description of each development status follows to provide a better understanding of Table 3-3.

Developed refers to land that has improvements and specific land uses. There are two subsets within the developed category: urban and parks. *Urban*, as used in this report, refers to land developed in accordance with the specific zoning (e.g., single-family residential, commercial, industrial, etc.).

Parks refer to Metro's inventory of public and private parks and open space, golf courses, cemeteries, trails, and other uses. Parks are categorized as developed land because they are generally not available for urban development in Metro's analysis of buildable lands within the UGB.

Vacant refers to land that has no buildings, improvements or identifiable land use. Metro's vacant lands inventory also includes vacant portions of developed tax lots that are 1/2 acre

(20,000 square feet) or greater. The vacant category also has two subsets: constrained and buildable.

Constrained land consists of environmentally sensitive land – Title 3 Water Quality and Flood Management Areas (i.e., river and stream corridors, wetlands, floodplains, steep slopes 25 percent or greater adjacent to water features); land in public ownership (that otherwise would be buildable); already platted single-family lots; and buffers on major utility lines (50-75 feet). Title 3 areas alone are used to calculate constrained land outside the UGB. Constrained land is not necessarily unbuildable. For example, from 1998 to 2000, 363 acres (seven percent) of undeveloped Title 3 vegetated corridors were developed and 568 acres (9 percent) of floodplains were developed (Metro 2003).

Buildable land is what remains after subtracting out vacant constrained land from total vacant acres. Vacant, buildable land provides the basis for estimating the region's 20-year land supply for dwelling units and employment inside the UGB.

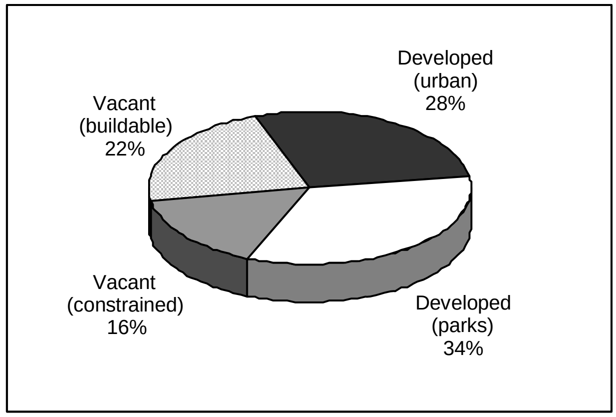
Forty-four percent of the total vacant, buildable acres (both non-habitat and habitat land) in Table 3-3 are classified as fish and wildlife habitat (28,355 acres/64,178 acres). Approximately 41 percent of the total vacant buildable acres within the UGB is fish and wildlife habitat (11,923 acres/29,146 acres). Outside the UGB, 47 percent of the total vacant buildable acres (16,431 acres/35,031 acres) is fish and wildlife habitat.

Table 3-3. Non-habitat and habitat lands by development status.

Geographical Area	Non-habitat acres				Fish and wildlife habitat acres				Total Acres
	Developed		Vacant		Developed		Vacant		
	Urban	*Parks*	*Constr.*	*Buildable*	*Urban*	*Parks*	*Constr.*	*Buildable*	
Inside UGB (before 12/02)	143,263	9,216	4,166	17,223	15,041	18,258	8,449	11,923	227,539
UGB Expansion Areas (12/02)	3,791	377	0	6,399	1,262	716	552	5,703	18,799
Remaining areas in Metro's jurisdiction	4,701	708	0	12,201	2,161	5,028	1,877	10,728	37,404
Total Acreage	151,754	10,301	4,166	35,823	18,464	24,001	10,878	28,355	283,742

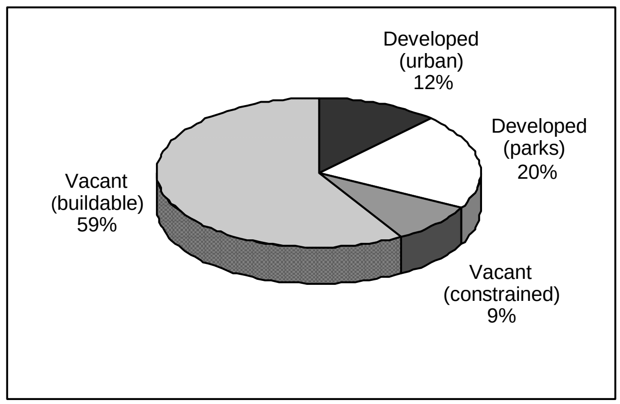
Figures 3-2 and 3-3 show the proportion of fish and wildlife habitat by development status inside the UGB and outside the UGB in expansion areas and Metro's jurisdiction (based on Table 3-3). Thirty-eight percent of the fish and wildlife habitat inside the UGB is vacant (buildable plus constrained); 62 percent is considered developed (urban plus parks). Within the expansion areas and remaining areas in Metro's jurisdiction, 32 percent of the land is developed and 68 percent is vacant.

Figure 3-2. Fish and wildlife habitat by development status inside UGB.



Developed land is included in the Goal 5 fish and wildlife habitat inventory for several reasons. First, developed areas along streams that lack significant vegetation are mapped with a 50-foot default area to recognize essential riparian function. Second, vegetated portions of developed lots are included in the Goal 5 inventory where they contribute riparian function and/or wildlife habitat value. For example, dense forest canopies over developed subdivisions are included in the inventory where the canopy meets the applicable mapping criteria (Metro 2002d).

Figure 3-3. Fish and wildlife habitat by development status in expansion areas & remaining areas in Metro's jurisdiction.



The development status of fish and wildlife habitat provides some insight into the vulnerability of the habitat to potential adverse impacts from conflicting uses. The least vulnerable fish and wildlife habitat is that in park status; however, protection is not guaranteed. For example, a park may be developed for recreational uses (e.g., ball fields) rather than left in a natural state. Fish and wildlife habitat classified as developed (urban) is less vulnerable than those that are vacant. Changes often occur, however, on developed land. For example, a lot may be subdivided, expansion of existing facilities may occur, or management practices may change (e.g., tree cutting). Vacant, constrained fish and wildlife habitat, as pointed out above, may also be developed but less intensively in many cases. Vacant, buildable fish and wildlife habitat is the most vulnerable to adverse impacts.

Distribution of fish and wildlife habitat by generalized regional zones and development status

This section presents regionally significant fish and wildlife habitat by generalized regional zones and development status (Tables 3-4 and 3-5) within the UGB (before December 2002), and in UGB expansion areas and the remaining areas in Metro's jurisdiction.

The largest proportion of fish and wildlife habitat is zoned for single-family residential development (46 percent). Nearly 27 percent of single-family zoned habitat land (6,687 acres) is considered buildable, which also represents the largest proportion of total buildable habitat land (56 percent).

The parks and open spaces (POS) category contains the next highest proportion of fish and wildlife habitat (20 percent). However, the POS category significantly under-represents the amount of land actually used as parks in the region because many local jurisdictions do not have a separate zone for parks and open space. Instead, parks are allowed outright or conditionally in all or most zones. In such cases, parks and open space generally retain the underlying zoning. To address this issue, parks are identified separately under the "developed" land category in the tables below. For example, there are over 5,500 acres of parks (based on Metro's parks and open space inventory) that are zoned single-family residential.

Fourteen percent of fish and wildlife habitat is zoned for industrial use (7,721 acres); of that, 23 percent is considered buildable (1,761 acres). Although only seven percent of fish and wildlife habitat is zoned for rural uses inside the UGB, over half of it is buildable and represents the second highest proportion (17 percent) of total buildable habitat land.

Table 3-4. Total fish and wildlife habitat by generalized regional zones inside UGB.*

Generalized Regional Zones	Fish and wildlife habitat acres					
	Developed		Vacant		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	9,300	5,557	3,277	6,687	24,821	46%
MFR	975	704	462	470	2,610	5%
MUC	406	100	266	512	1,284	2%
COMM	649	1,144	451	429	2,672	5%
IND	2,620	972	2,368	1,761	7,721	14%
RUR	380	193	1,261	2,015	3,923	7%
POS	483	9,577	359	48	10,468	20%
NO ZONE**	155	11	5	1	172	0%
TOTAL	*14,968*	*18,258*	*8,449*	*11,923*	*53,671*	*100%*

*****Before December 2002
******Some habitat areas within the UGB (0.3%) have no zoning designation.

Most of the fish and wildlife habitat in UGB expansion areas and the remaining areas in Metro's jurisdiction has rural zoning (89 percent; Table 3-5). Sixty-three percent of rural habitat land is considered buildable (15,772 acres).

Table 3-5. Total fish and wildlife habitat acres by generalized regional zones in expansion areas and remaining areas in Metro's jurisdiction.

Generalized Regional Zones	Fish and wildlife habitat acres					
	Developed		Vacant		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	163	231	16	460	871	3%
RUR	2,860	3,982	2,356	15,772	24,969	89%
POS	324	1,521	43	109	1,997	7%
MFR, MUC, COM, IND	77	9	13	90	189	1%
TOTAL	*3,423*	*5,743*	*2,429*	*16,431*	*28,026*	*100%*

Distribution of fish and wildlife habitat by classification and generalized regional zones

In this section, Metro's fish and wildlife habitat inventory is divided into six classifications, each representing discreet areas on the landscape: Class I, II and III riparian/wildlife corridors, and Class A, B, and C upland wildlife habitat. Metro has created these classifications as a tool to distinguish higher value habitat from lower value habitat. This information can then be used for analyzing conflicting uses and ESEE consequences, and for developing a Goal 5 program. Figures 3-4 and 3-5 show the breakdown of regionally significant fish and wildlife habitat by classification (53,671 habitat acres in UGB; 28,026 habitat acres outside UGB). The following sections describe these classifications and present tables that show each fish and wildlife habitat classification by generalized regional zone.

Figure 3-4. Fish and wildlife habitat by classification within the UGB.

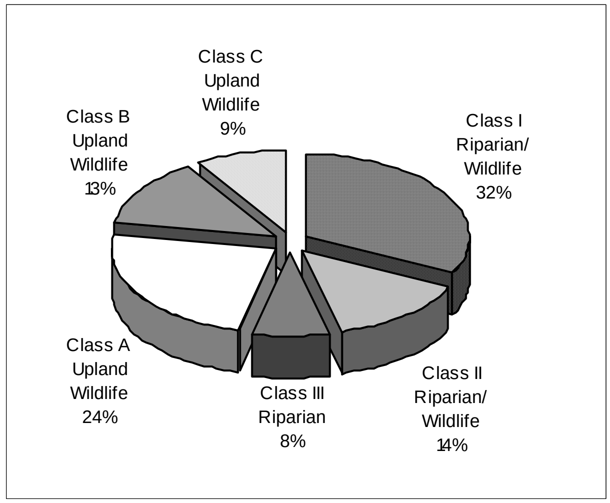
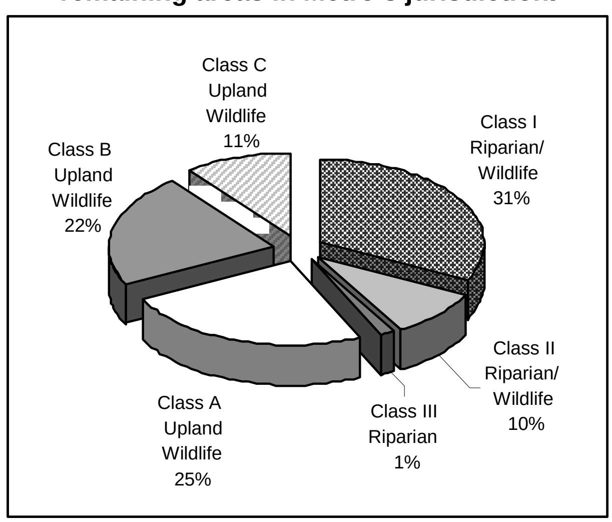


Figure 3-5. Fish and wildlife habitat by classification in UGB expansion areas & remaining areas in Metro's jurisdiction.



Class I riparian/wildlife corridors

Class I riparian/wildlife corridors is the largest classification, representing 32 percent of total fish and wildlife habitat inside the UGB and 31 percent outside the UGB. These areas are predominantly high value riparian corridors that provide three to five primary functions (scoring 18-30 points in the riparian model). The primary functions include: 1) microclimate and shade; 2) streamflow moderation and water storage; 3) bank stabilization, sediment and pollution control; 4) large wood and channel dynamics; and 5) organic material sources. Class I riparian corridors include rivers, streams, stream-associated wetlands, undeveloped floodplains, forest canopy within 100 feet of a stream, and forest canopy within 200 feet of streams with adjacent steep slopes.

Wildlife habitat is also included in high value riparian/wildlife corridors. For example, an area providing riparian function may also have habitat value in the wildlife model. Habitats of Concern are unique or unusually important wildlife habitat areas and are considered high value habitat. Where Habitats of Concern coincide with any riparian/wildlife corridor, the area of overlap is elevated to a Class I riparian/wildlife corridor.

Table 3-6 shows that single-family residential, rural, and industrial development contain the largest concentration of Class I riparian/wildlife corridors (40 percent, 18 percent, and 17 percent, respectively) and the largest portion of buildable land (42 percent, 33 percent, and 14 percent, respectively) inside the UGB. Outside the UGB (Table 3-7), 80 percent of Class I riparian/wildlife corridors is zoned rural and 18 percent is in parks and open space. Forty percent of rural zoned Class I riparian/wildlife corridors inside the UGB is considered buildable. Overall (i.e., inside and outside the UGB), only seven percent of all buildable land (non-habitat and habitat) is Class I riparian/wildlife corridors.[19]

Table 3-6. Class I riparian/wildlife corridors by generalized regional zones inside UGB.

Generalized Regional Zones	Class I Riparian/Wildlife Corridors					
	Developed		Vacant		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	1,661	2,414	1,868	942	6,886	40%
MFR	206	377	296	71	949	6%
MUC	74	57	194	97	423	2%
COMM	104	607	242	84	1,036	6%
IND	427	713	1,441	326	2,907	17%
RUR	113	85	922	739	1,858	18%
POS	111	2,812	246	9	3,176	11%
NO ZONE*	38	8	3	0	50	0%
TOTAL	*2,734*	*7,073*	*5,212*	*2,267*	*17,285*	*100%*

***Some habitat areas within the UGB (0.3%) have no zoning designation.

Table 3-7. Class I riparian/wildlife corridors by generalized regional zones in expansion areas and remaining areas in Metro's jurisdiction.

Generalized Regional Zones	Class I Riparian/Wildlife Corridors					
	Developed Acres		Vacant Acres		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	24	41	16	74	155	2%
RUR	571	2,635	1,867	2,098	7,172	80%
POS	288	1,288	37	18	1,631	18%
MFR, MUC, COM, IND	15	7	11	17	50	1%
TOTAL	*898*	*3,971*	*1,931*	*2,207*	*9,008*	*100%*

Class II riparian/wildlife corridors

Class II riparian/wildlife corridors comprise 14 percent of total fish and wildlife habitat inside the UGB and ten percent outside the UGB (see Figures 3-4 and 3-5). These areas are medium value riparian/wildlife corridors that provide one to two primary functional values (scoring six to

[19] (2,267 acres + 2,207 acres)/64,178 total buildable acres = 6.97%

17 points in the riparian model) or a combination of one primary function and one or more secondary functions. Wildlife habitat is included in these areas where it coincides with the medium value riparian habitat. Class II riparian/wildlife corridors include rivers, streams, 50-foot area along developed stream segments, forest canopy or low structure vegetation within 200 feet of streams, and portions of undeveloped floodplains extending beyond 300 feet of streams. Class II riparian/wildlife corridors are elevated to Class I when they contain Habitats of Concern.

Forty-four percent of fish and wildlife habitat inside the UGB is zoned single-family residential; 22 percent is industrial (Table 3-8). Outside the UGB (Table 3-9), 95 percent of the habitat is zoned rural. Only about five percent[20] of the total vacant buildable land (non-habitat and habitat land) is classified as Class II riparian/wildlife corridors.

Table 3-8. Class II riparian/wildlife corridors by generalized regional zones inside UGB.

Generalized Regional Zones	Class II Riparian/Wildlife Corridor					
	Developed Acres		Vacant Acres		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	1,385	666	527	708	3,285	44%
MFR	207	78	75	62	422	6%
MUC	64	17	45	100	226	3%
COMM	134	250	137	75	596	8%
IND	448	114	684	378	1,623	22%
RUR	88	23	269	186	566	8%
POS	64	571	41	13	689	9%
NO ZONE*	42	2	2	0	47	1%
TOTAL	*2,432*	*1,721*	*1,780*	*1,521*	*7,454*	*100%*

*****Some habitat areas within the UGB (0.3%) have no zoning designation.

Table 3-9. Class II riparian/wildlife corridors by generalized regional zones in expansion areas and remaining areas in Metro's jurisdiction.

Generalized Regional Zones	Class II Riparian/Wildlife Corridors					
	Developed Acres		Vacant Acres		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	15	14	1	42	71	3%
RUR	348	214	438	1,568	2,569	95%
POS	14	8	1	6	29	1%
MFR, MUC, COM, IND	21	1	1	9	32	1%
TOTAL	*398*	*237*	*442*	*1,625*	*2,702*	*100%*

Class III riparian/wildlife corridors

Class III riparian corridors comprise eight percent of total fish and wildlife habitat inside the UGB and one percent outside the UGB (see Figures 3-4 and 3-5). These are low value areas that have riparian value only (located outside of wildlife habitat areas) such as developed floodplains and smaller forest canopies that are disassociated from streams (less than 20 acres). Thirty-seven percent of Class III riparian/wildlife corridors inside the UGB are single-family residential; another 37 percent is industrial (Table 3-10). Overall, most of Class III areas are developed (84 percent), typically in floodplains. Class III riparian corridors outside the UGB are predominantly rural land (90 percent) and mostly buildable (58 percent; Table 3-11). These are probably undeveloped forest canopies of less than 20 acres.

[20] (1,521 acres + 1,625 acres)/64,178 acres = 4.9%

Table 3-10. Class III riparian/wildlife corridors by generalized regional zones inside UGB.

Generalized Regional Zones	Class III Riparian Corridors					
	Developed Acres		Vacant Acres		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	1,186	84	55	174	1,499	37%
MFR	245	5	7	35	293	7%
MUC	183	0	2	23	209	5%
COMM	272	16	4	25	318	8%
IND	1,389	16	31	59	1,496	37%
RUR	45	5	2	46	98	2%
POS	115	33	3	2	153	4%
NO ZONE *	29	0	0	0	29	0%
TOTAL	*3,464*	*161*	*104*	*364*	*4,094*	*100%*

*****Some habitat areas within the UGB (0.3%) have no zoning designation.

Table 3-11. Class III riparian/wildlife corridors by generalized regional zones in expansion areas and remaining areas in Metro's jurisdiction.

Generalized Regional Zones	Class III Riparian Corridors					
	Developed		Vacant		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	13	1	0	7	21	6%
RUR	116	10	1	203	330	90%
POS	8	0	0	0	8	2%
MFR, MUC, COM, IND	6	0	1	2	9	2%
TOTAL	*142*	*11*	*2*	*212*	*368*	*100%*

Class A upland wildlife habitat

Class A upland wildlife habitat comprises 24 percent of the fish and wildlife habitat inside the UGB and 25 percent outside the UGB (see Figures 3-4 and 3-5). These are high value wildlife habitat areas scoring seven to nine points in the wildlife model. Examples include upland portions of large forest patches and large contiguous patches such as Forest Park. This category may also contain areas providing secondary functions for riparian corridors and Habitats of Concern located outside of riparian/wildlife corridors.

Within the UGB, forty-five percent of Class A upland wildlife habitat is zoned as single-family residential and 44 percent is parks and open space (Table 3-12). Seventy-seven percent of buildable land located within Class A upland wildlife habitat is zoned single-family zoning. Ninety percent of Class A wildlife habitat in UGB expansion areas and the remaining areas in Metro's jurisdiction is zoned for rural uses (Table 3-13), and most of this acreage is buildable (72 percent).

Table 3-12. Class A upland wildlife habitat by generalized regional zones inside UGB.

Generalized Regional Zones	Class A Upland Wildlife Habitat					
	Developed Acres		Vacant Acres		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	1,677	1,285	286	2,486	5,734	45%
MFR	85	129	42	94	350	3%
MUC	17	23	9	112	161	1%
COMM	29	53	21	49	152	1%
IND	80	98	47	238	462	4%
RUR	45	27	10	234	316	2%
POS	94	5,557	43	7	5,700	44%
NO ZONE*	4	0	0	0	4	0%
TOTAL	*2,031*	*7,171*	*457*	*3,219*	*12,879*	*100%*

*****Some habitat areas within the UGB (0.3%) have no zoning designation.

Table 3-13. Class A upland wildlife habitat by generalized regional zones in expansion areas and remaining areas in Metro's jurisdiction.

Generalized Regional Zones	Class A Upland Wildlife Habitat					
	Developed Acres		Vacant Acres		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	34	175	0	191	400	6%
RUR	615	862	34	4,682	6,193	90%
POS	10	209	2	35	256	4%
MFR, MUC, COM, IND	7	0	0	23	30	0%
TOTAL	*666*	*1,246*	*36*	*4,931*	*6,879*	*100%*

Class B upland wildlife habitat

Class B upland wildlife habitat makes up 13 percent of the fish and wildlife habitat inside the UGB and 22 percent outside the UGB (see Figures 3-4 and 3-5). These are medium value upland wildlife habitat areas scoring four to six points in the wildlife model. These areas include upland portions of medium sized forest patches with low structure connector patches along streams and rivers. This habitat category may also contain areas providing secondary functions for riparian corridors. Within the UGB, seventy-two percent of Class B upland wildlife habitat is zoned single-family residential; a large portion (68 percent) is developed, parks, and constrained land (Table 3-14). Outside the UGB, 96 percent of the habitat is zoned for rural uses. Eighty-three percent of these rural zoned lands are buildable (Table 3-15).

Table 3-14. Class B upland wildlife habitat by generalized regional zones inside UGB.

Generalized Regional Zones	Class B Upland Wildlife Habitat					
	Developed		Vacant		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	2,339	794	409	1,657	5,199	72%
MFR	119	47	23	95	284	4%
MUC	23	0	9	111	143	2%
COMM	50	128	15	76	269	4%
IND	58	5	25	262	350	5%
RUR	89	28	29	419	565	8%
POS	52	298	27	2	378	5%
NO ZONE*	17	0	0	0	17	0%
TOTAL	*2,747*	*1,299*	*537*	*2,622*	*7,205*	*100%*

*****Some habitat areas within the UGB (0.3%) have no zoning designation.

Table 3-15. Class B upland wildlife habitat by generalized regional zones in expansion areas and remaining areas in Metro's jurisdiction.

Generalized Regional Zones	Class B Upland Wildlife Habitat					
	Developed		Vacant		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	54	0	0	93	147	2%
RUR	805	171	12	4,869	5,856	96%
POS	5	16	3	47	71	1%
MFR, MUC, COM, IND	12	0	0	28	41	1%
TOTAL	*876*	*187*	*15*	*5,037*	*6,115*	*100%*

Class C upland wildlife habitat

Class C upland wildlife habitat represents nine percent of the fish and wildlife habitat inside the UGB and 11 percent outside the UGB (see Figures 3-4 and 3-5). These are less valuable upland wildlife habitat areas scoring two to three points in the wildlife habitat model. They include forest patches and smaller connector patches along streams and rivers. This category may also contain areas providing secondary functions for riparian corridors.

Within the UGB, single-family zoning is applied to 47 percent of Class C wildlife habitat. Industrial and rural zoning are applied to 19 percent and 11 percent, respectively (Table 3-16). Over 40 percent of the total land in this habitat category is buildable inside the UGB. Almost all of the land outside the UGB (96 percent; Table 3-17) is zoned rural, 82 percent of which is buildable.

Table 3-16. Class C upland wildlife habitat by generalized regional zones inside UGB.

Generalized Regional Zones	Class C Upland Wildlife Habitat					
	Developed		Vacant		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	1,052	314	132	721	2,219	47%
MFR	113	69	18	113	313	7%
MUC	44	2	6	70	122	3%
COMM	59	90	32	120	301	6%
IND	218	26	142	498	884	19%
RUR	73	25	29	393	520	11%
POS	48	308	1	16	372	8%
NO ZONE*	26	0	0	0	26	
TOTAL	*1,633*	*834*	*360*	*1,929*	*4,756*	*100%*

*****Some habitat areas within the UGB (0.3%) have no zoning designation.

Table 3-17. Class C upland wildlife habitat by generalized regional zones in expansion areas and remaining areas in Metro's jurisdiction.

Generalized Regional Zones	Class C Upland Wildlife Habitat					
	Developed		Vacant		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	21	1	0	54	76	3%
RUR	406	89	4	2,350	2,849	96%
POS	0	0	0	2	2	0%
MFR, MUC, COM, IND	15	1	0	12	28	1%
TOTAL	442	91	4	2,418	2,955	*100%*

Relationship of Metro's fish and wildlife habitat inventory to the 2040 Design Type Hierarchy

This section examines the relationship of Metro's fish and wildlife habitat inventory to the 2040 design type hierarchy described in the first section. Table 3-18 shows that over half of the fish and wildlife habitat (55 percent) falls into the tertiary design type category (i.e., inner and outer neighborhoods, employment centers, corridors); 28 percent is other design types (i.e., parks and open space, rural); and 11 percent is primary design types (city center, regional centers, industrial centers, intermodal transportation facilities). Only 14 percent of buildable fish and wildlife habitat coincides with primary design types, whereas 79 percent is in the tertiary design type category. This information is not included for the area outside the UGB because design types are not applied for the most part. Where they are applied, the location of the design types is very general.

Table 3-18. Fish and wildlife habitat acreage by 2040 design type hierarchy and development status inside the UGB.

2040 Design Type Hierarchy	Development Status					
	Developed		Vacant		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
Primary design types	2,205	66	2,082	1,712	6,064	11%
Secondary design types	1,070	212	525	762	2,570	5%
Tertiary design types	11,460	3,038	5,685	9,384	29,568	55%
Other design types	271	14,818	92	6	15,187	28%
No design types	34	123	65	59	282	1%
Total	*15,041*	*18,258*	*8,449*	*11,923*	*53,671*	*100%*

Figure 3-6. Distribution of fish and wildlife habitat classes by 2040 design type priority inside UGB.

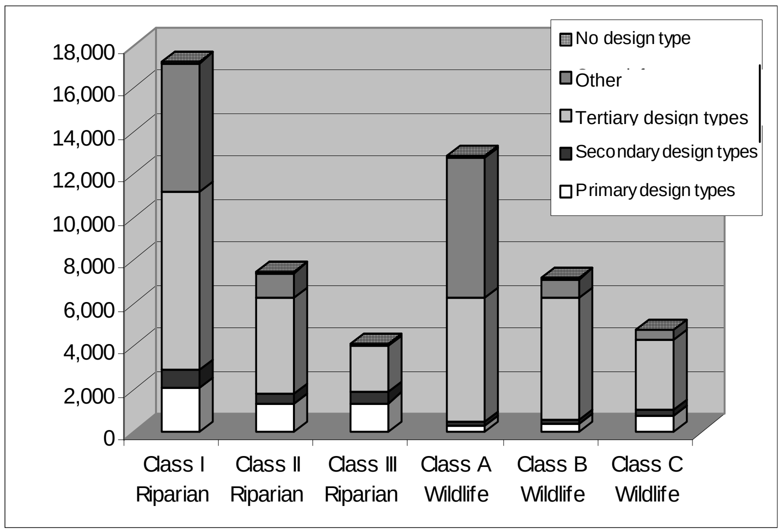


Figure 3-6 shows the distribution of fish and wildlife habitat classes by 2040 design type hierarchy.[21] For example, most of Class I riparian/ wildlife corridors (14,350 acres; 83 percent) falls within the tertiary design type and other design type categories; almost all of Class A upland wildlife (12,305 acres; 96 percent) coincides with these two categories.

Impact Areas

Impact areas, as described in the previous section, define an area where allowed land uses or activities could harm the fish and wildlife habitat. Development activities near streams and wetlands often remove vegetation that would otherwise contribute to riparian function by providing shade, sedimentation control, and water storage. Developed areas also contribute runoff from impervious surfaces, human disturbance, noise, lighting, toxins, fertilizers and pesticides; each of these influences may adversely affect riparian areas and wildlife habitat. Tables 3-19 and 3-20 break out impact area acreage by generalized regional zones and development status. Over 13,300 acres are included as impact areas inside the UGB and 82 percent are developed. Over half of the impact area inside the UGB is zoned for single-family use; 19 percent is industrial zoned land. Impact areas outside the UGB (3,000 acres) are primarily zoned for rural uses (92 percent). Fifty-nine percent of the impact area outside the UGB is considered buildable.

[21] Figure 3-6 does not reflect design types adopted through the Pleasant Valley Concept Plan.

Table 3-19. Impact areas by generalized regional zones inside UGB.

Generalized Regional Zones	Impact Areas					
	Developed		Vacant		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	5,833	400	254	634	7,121	53%
MFR	903	67	39	92	1,101	8%
MUC	309	15	32	103	459	3%
COMM	645	159	33	89	926	7%
IND	1,625	86	251	585	2,547	19%
RUR	205	20	53	263	541	4%
POS	139	397	8	8	552	4%
NO ZONE*	70	0	0	0	70	1%
TOTAL	*9,729*	*1,144*	*670*	*1,774*	*13,317*	*100%*

*****Some habitat areas within the UGB (.3%) have no zoning designation.

Table 3-20. Impact areas by generalized regional zones in expansion areas and remaining areas in Metro's jurisdiction.

Generalized Regional Zones	Impact Areas					
	Developed		Vacant		Total	
	Urban	*Park*	*Constrained*	*Buildable*	*Dev. & Vac*	*% of Total*
SFR	59	1	0	43	103	3%
RUR	932	105	0	1,722	2,759	92%
POS	53	4	0	4	61	2%
MFR, MUC, COM, IND	65	0	0	18	83	3%
TOTAL	1,109	110	0	1,787	3,006	100%

The next section describes the activities that occur within each zone that may conflict with regionally significant fish and wildlife habitat.

Conflicting Uses by Metro's Generalized Regional Zones

The seven generalized regional zones provide the framework for identifying conflicting uses at a regional scale and the potential consequences, or impacts, to regionally significant fish and wildlife habitat. These generalized regional zones, by themselves, are not conflicting uses. It is the development activities and other disturbances (e.g., clearing land, adding impervious surfaces, replacing natural vegetation with non-native vegetation, etc.) permitted by the local zoning that potentially conflict with fish and wildlife habitat. These activities can generate negative impacts on natural vegetation and soil, the hydrologic and erosional processes in a watershed, and the physical characteristics of fish and wildlife habitat.

This section describes some of the common disturbance activities associated with land uses that are allowed outright or conditionally within Metro's generalized regional zones and that conflict with fish and wildlife habitat. The consequences, or impacts, to regionally significant fish and wildlife habitat are described in each of the ESEE analyses that follow this section.

According to the Goal 5 rule, a local government, following the standard ESEE process, complies with the rule if it identifies "at least the following activities as conflicting uses in riparian corridors:

(a) The permanent alteration of the riparian corridor by placement of structures or impervious surfaces, except for:
   (A) Water-dependent or water-related uses; and
   (B) Replacement of existing structures with structures in the same location that do not disturb additional riparian surface area; and

(b) Removal of vegetation in the riparian area, except:
   (A) As necessary for restoration activities, such as replacement of vegetation with native riparian species;
   (B) As necessary for the development of water-related or water-dependent uses; and
   (C) On lands designated for agricultural or forest use outside UGBs." (OAR 660-23-090(7))

Past land use practices, and perhaps to a lesser degree current land use practices, can negatively impact fish and wildlife habitat. Some of the common disturbance activities are listed in Table 3-21. Among the most obvious disturbances are the removal of vegetation and the placement of structures and impervious surfaces. Removal of vegetation from streambanks, floodplains, and upland wildlife areas fundamentally alters the stream hydrology resulting in many adverse effects (e.g., increased erosion, sedimentation, increased flooding, loss of habitat, etc.). Increased levels of impervious surfaces reduce groundwater infiltration, increase stormwater runoff, and degrade water quality (see *Environmental Consequences* chapter).

Disturbance activities occur in all regional zones; however, the degree to which these disturbances occur depends on the intensity of the land use (e.g., single-family residential vs. mixed use center), and the form and layout of the development (cluster development vs. evenly distributed development). The remainder of this section describes the disturbance activities in each of following generalized regional zones.

- Single family residential
- Multi-family residential
- Mixed Use Centers
- Commercial
- Industrial
- Rural
- Parks and Open Space

Table 3-21. Common disturbance activities.

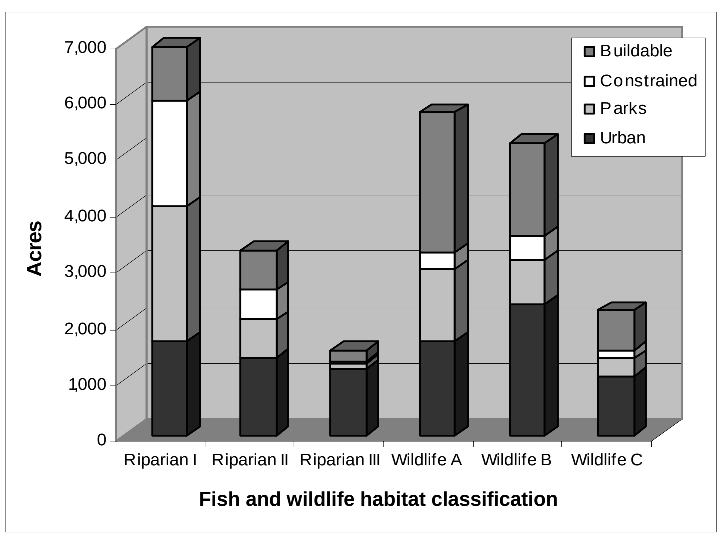
- Clearing vegetation and removing native soils
- Grading, excavation, filling, hauling, and soil compaction
- Adding impervious surfaces by constructing buildings, sidewalks, driveways, parking areas and roads
- Modifying streams such as channelizing, piping, widening, deepening, straightening and armoring streambanks to confine flows, increase capacity for flood control, and stabilize streambanks
- Installing utility connections such as sewers and stormwater pipes; septic tanks (in rural areas); building sewer pump stations and water towers
- Building stormwater control structures
- Constructing roads, stream crossings (e.g., bridges), installing culverts
- Landscaping with non-native vegetation (e.g., establishment of lawns, addition of non-native landscape features – trees, shrubs, groundcover, etc.)
- Introducing non-native fish and wildlife species
- Using fertilizers, pesticides and herbicides
- Building fences and other wildlife barriers
- Using toxins in households and businesses
- Generating runoff from household and business activities
- Other (pets, lights, noise, litter, garbage, etc.)

Single family residential (SFR 1-7)

Single-family residential (SFR 1-7) generally allows detached and attached housing on lot sizes up to 20,000 square feet. Conditional uses that often occur in single-family residential zones include: residential recreational centers, churches, schools, daycare facilities, nursing homes, retail sales and service, basic utilities, parks and open areas, etc.

The largest portion of Metro's Goal 5 fish and wildlife habitat inventory– 46 percent – is zoned for single-family residential uses (24,821 acres; see Table 3). Figure 3-7 shows the distribution of SFR fish and wildlife habitat by classification and development status. Over 50 percent of SFR habitat land is classified as high value riparian/wildlife corridors and upland wildlife habitat (12,620 acres); 44 percent of it is vacant (17 percent constrained; 27 percent buildable). Twenty-one percent of SFR habitat land is classified as Class B upland wildlife habitat; 13 percent is

Figure 3-7. Distribution of SFR zoned habitat land by classification and development status in UGB.



riparian/wildlife II. Overall, the developed/vacant status of SFR habitat land is 60/40 percent (respectively). Twenty-seven percent of the vacant land is buildable. Outside the UGB in expansion areas and remaining areas in Metro's jurisdiction, only three percent of fish and wildlife habitat is currently zoned for single-family residential. UGB expansion areas, which are predominantly zoned for rural uses, will eventually be upzoned to accommodate single-family residential development as well as a mix of other uses (e.g., multi-family, commercial, industrial, etc.).

Common development activities that occur in areas zoned for single-family residential include: preparing the site by clearing vegetation and grading; installing utility connections (e.g., stormwater pipes; sewer pipes); building roads and sidewalks; creating stormwater detention facilities; and constructing dwelling units, garages, accessory buildings, driveways, and parking areas. Past development practices included piping or modifying streams (e.g., channelizing, deepening, widening) and filling wetlands. These activities are now widely regulated and are less likely to occur.

Other disturbance activities occurring in SFR land that potentially impact fish and wildlife habitat include: landscaping with non-native vegetation (e.g., lawn, ornamental plants, etc.); applying pesticides, herbicides, and fungicides; building fences and other wildlife barriers; generating runoff; using household toxins; allowing pets to roam freely; generating noise, and using outdoor lighting.

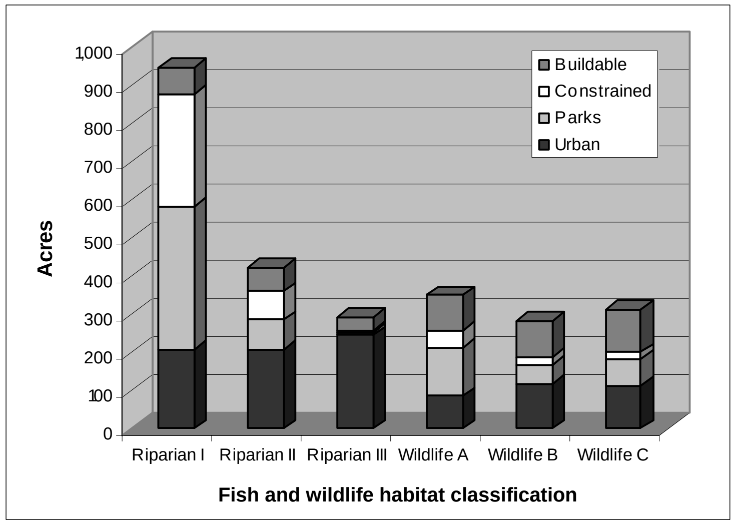
As described earlier, the removal of natural vegetation and the placement of structures and impervious surfaces are the most prevalent disturbances in nearly all zones. Some land uses may require more site preparation (e.g., vegetation removal, grading, etc.) and more impervious surface coverage (e.g., buildings, parking, etc.) than others. For example, a two-acre parcel developed as a single-family subdivision may add less impervious surfaces than an industrial development that requires a large percentage of total land area to accommodate manufacturing, warehousing and transportation facilities. Within SFR zones, however, vegetation removal and impervious surface coverage are highly variable, depending on development practices. For example, some communities may not require that trees and native vegetation be conserved during the development process. Residential streets may be designed to be wider than necessary for serving small volumes of traffic. Development practices that incorporate natural resources into the design (e.g., cluster design) and reduce overall imperviousness (e.g., narrow street design, shared parking) are likely to have less impact on fish and wildlife habitat.

Multi-family residential (MFR 1-4)

Multi-family residential (MFR1-4) includes land for apartment complexes, duplexes, garden apartments, rowhouses, townhouses, condominiums, and other attached single-family structures. These range in densities from two to 25 units per acre with height limits usually set at 2-1/2 to 3 stories (MFR1) to densities greater than 100 units and multiple stories (MFR4). Some mixed-use and neighborhood-scale commercial uses may be allowed under certain circumstances. Conditional uses may include churches, governmental facilities, utility structures, schools, residential recreational centers, group living facilities, etc.

Five percent of the Goal 5 fish and wildlife habitat inventory is zoned as MFR (2,610 acres; see Table 3-4). Figure 3-8 shows the distribution of MFR land by habitat classification and development status. Half of the MFR zoned habitat is classified as high value riparian/wildlife corridors and upland wildlife habitat (1,299 acres). Overall, the total developed/vacant status of MFR habitat is 64/36 percent respectively. Most of the buildable land is found in the three upland wildlife categories.

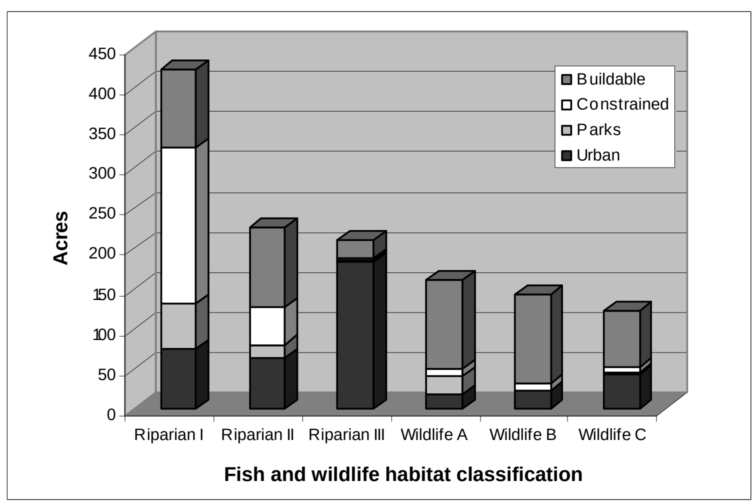
Figure 3-8. Distribution of MFR zoned habitat land by classification and development status in UGB.



Development activities that occur in areas zoned for multi-family residential are similar to those found in single-family residential areas. Vegetation is removed, impervious surfaces are added, household activities are similar. Multi-family development may add more impervious surface than single-family residential to accommodate for parking. However, in many cases multi-family residential construction can clear less land area to construct the dwelling units than a typical single-family subdivision. Certain disturbance activities may be more common in single-family than in multi-family residential uses. For example, pesticide, herbicide and fertilizer use may be greater in single-family developments with landscaped yards.

Mixed use centers (MUC)

Figure 3-9. Distribution of MUC zoned habitat land by classification and development status in UGB.



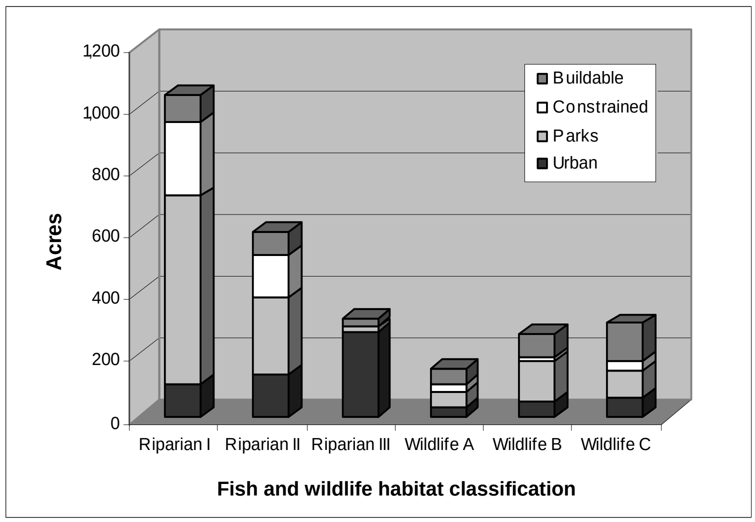
Mixed use centers (MUC) include residential along with commercial uses in town centers, main streets, corridors, light rail station areas, regional centers and the central city. Development types generally permitted include moderate-density to high-density multi-family residential uses, attached single-family dwellings, locally-oriented commercial, retail, services, office uses, community service, and daycare. Mixed-use centers have a strong pedestrian and transit orientation.

Only two percent of fish and wildlife habitat is zoned for mixed use (1,284 acres; see Table 3-4). Figure 3-9 shows the distribution of MUC land by habitat classification and development status. Fifty-one percent of habitat zoned for mixed use is Class I and II riparian/wildlife corridors (649 acres); 33 percent is upland wildlife habitat (426 acres); and 16 percent is Class III riparian (210 acres). About 40 percent of MUC zoned habitat is buildable.

Similar development activities to those described in the SFR and MFR sections occur in mixed-use centers: vegetation is cleared, impervious surfaces are added. A higher level of imperviousness may occur in these areas as a result of parking requirements and road networks. Other disturbance activities may be different from residential uses. For example, the use of pesticides and herbicides is likely to be less significant in mixed-use centers. The design of mixed-use centers determines the severity of impacts on the fish and wildlife habitat.

Commercial (COM)

Figure 3-10. Distribution of COM zoned habitat land by classification and development status in UGB.



Commercial (COM) districts are similar to mixed use zoning in that they tend to be closer to central urban areas or related corridors of commercial activity. Commercial uses include a wide range and scale of retail and service businesses, office, and civic uses in a concentrated area. Public facilities (PF) such as schools, churches, government offices, hospitals, libraries, correctional facilities, public recreation facilities, and public utilities are also included in this category. Conditional uses typically allowed in commercial areas include group living facilities (e.g., nursing homes, boarding houses), churches, schools, jails and related facilities, basic utilities, radio transmission facilities, transit park and rides, rail lines and utility corridors, etc.

Five percent of fish and wildlife habitat is zoned for commercial development (2,672 acres; see Table 3-4). Figure 3-10 shows the distribution of commercial land by habitat classification and development status. Thirty-nine percent of the land is classified as high value riparian/wildlife corridors; only eight percent of that is buildable. Upland wildlife habitat comprises only a small potion (nine percent) of commercial land. The developed/vacant status of COM habitat land is 67/33 percent (respectively).

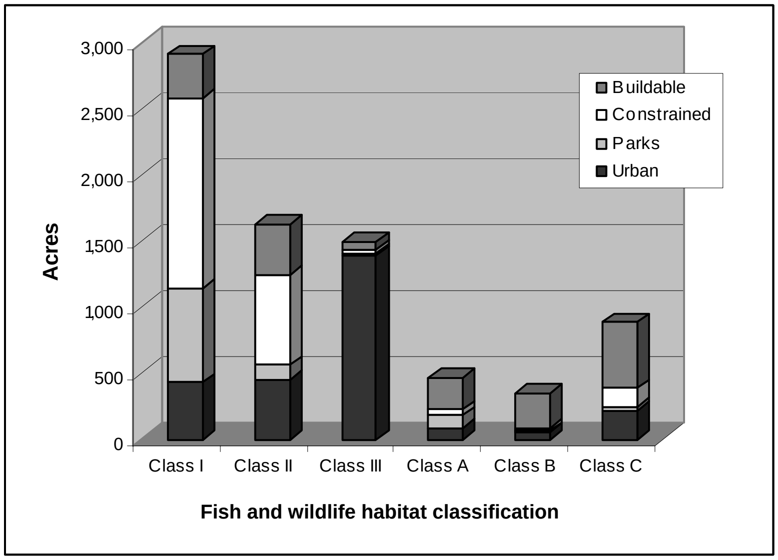
The disturbance activities related to commercial uses are similar to those described for SFR and MFR uses; however, in many cases these activities are more intense. Clearing and grading are usually more extensive for commercial development. Roads and parking lots are important features of commercial development to allow for customer access and visitation. Additional traffic around commercial areas creates more pollutants on roadways, which are eventually washed into streams and rivers. In addition, increased traffic creates hazards to wildlife when moving from one habitat area to another. Large parking lots result in more impervious surfaces than are typically required for residential uses and mixed use areas.

Some of the disturbance activities are less of an issue in commercial development than in residential areas. For example, application of fertilizers, pesticides and herbicides may be reduced, unless the commercial development incorporates extensive landscaping. Impacts to the fish and wildlife habitat from domestic pets are also less relevant in commercial development.

Industrial (IND)

Industrial zones allow a variety of industrial uses from light manufacturing (e.g., fabrication) to heavy manufacturing (e.g., chemical processing) to mixed use industrial (e.g., a mix of light manufacturing, office and retail uses). Supporting commercial services such as restaurants and banks may be allowed outright, depending on the zone, or permitted with limitations. Conditional uses may include junkyards and wrecking yards, basic utilities, commercial recreation facilities, and waste related services.

Figure 3-11. Distribution of IND zoned habitat land by classification and development status in UGB.



Industrial zoned land represents a fairly significant portion of the Goal 5 fish and wildlife habitat inventory – 14 percent (7,721 acres; see Table 3-4). Industrial land tends to be large, flat parcels that may intersect with fish and wildlife habitat in lower density areas of the region, often bordering rivers, streams or wetlands. This fact is apparent from Figure 3-11; over 2,900 acres, or 38 percent of industrially zoned habitat, is high value riparian/wildlife corridors. Over sixty percent of Class I is considered vacant, most of which is constrained land. The developed/vacant status of total IND habitat land is 47/53 percent (respectively).

Disturbance activities in industrial development are similar to those found in residential and commercial areas, but to a greater degree depending on the intensity of the industrial activity (e.g., light industrial vs. heavy industrial). Industrial development is typically land intensive, meaning it requires a large percentage of total land area to accommodate manufacturing, warehousing, transportation facilities, etc. Site preparation for industrial development frequently requires complete site clearing and grading. Past development practices retained few, if any, natural resources on the site and the entire site was covered with impervious surfaces. Current regulations require that impervious surfaces be set back from water features, and that riparian areas be planted with native vegetation.

Some industrial uses require a substantial amount of water for use in manufacturing processes (e.g., cooling equipment) that is later released to the rivers at an increased temperature. This process impacts instream habitat for fish and other aquatic species. Industrial areas may contribute high quantities of heavy metals and other toxic materials. In addition, the use, storage, and transport of hazardous materials often occurs in industrial uses.

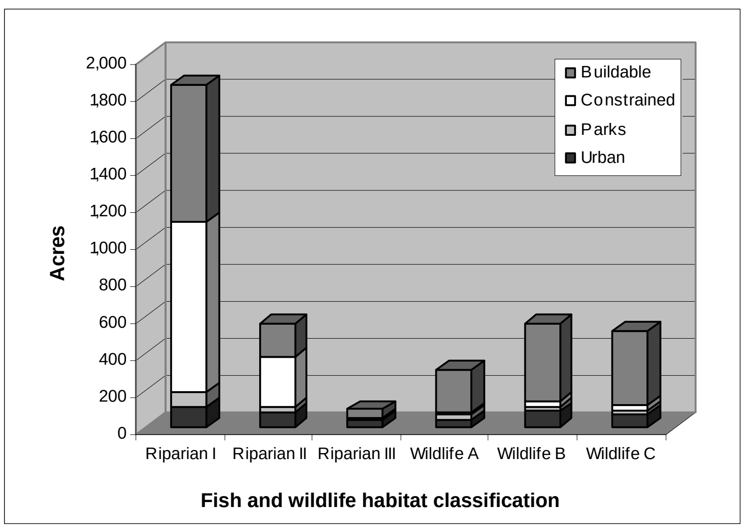
Mining typically occurs on industrially-zoned land. In the Metro region, mining is focused on aggregate resources (naturally occurring concentrations of stone, rock, sand and other materials used for urban development and road building). Aggregate resources are regulated as Goal 5 resources. Instream and off-channel mining of aggregate resources has direct and significant negative impacts on the aquatic ecosystem. Extraction of sand and gravel from within a stream channel may change the way in which water and sediment move through a stream system and altering stream characteristics (e.g., channel morphology and substrate, channel stability, etc.). Off-channel mining practices often include construction of berms and dikes to prevent flood flows from spilling into excavation areas. These structures can prevent the natural lateral migration of the stream.

Marine terminals, freight facilities for trucking, airports and railroad mostly occur in industrial zoned areas. These land uses have similar disturbance activities as land intensive industrial uses. Airports have the additional impact of noise and light. The Goal 5 rule exempts water-dependent or water-related uses, which are generally located in industrially zoned areas, from being identified as conflicting uses. (OAR 660-23-090(7)) However, activities related to these uses have detrimental impacts on instream aquatic habitat.

Rural (RUR)

The rural generalized zoning category includes RRFU (Rural Residential and Future Urban) and FF (Agricultural and Forestry). Rural residential lands provide the opportunity for single-family housing on lots of one acre or more in a rural or semi-rural environment. This designation also includes areas set aside for future urban development. Some of the local zones that fall into the RRFU category also allow agriculture, horticulture, greenhouses, nurseries, timber growing, and raising of livestock and animals.

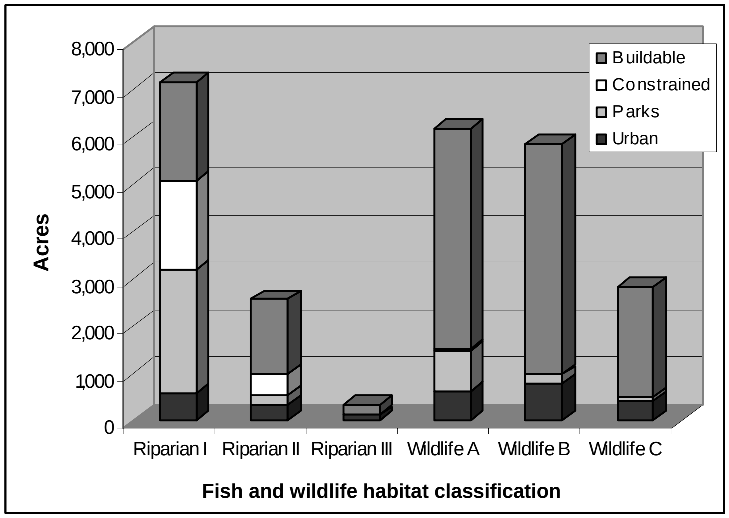
Figure 3-12. Distribution of RUR habitat land by classification and development status in UGB.



Fourteen percent of the fish and wildlife habitat inside the UGB (before December 2002) is zoned for rural use (7,721 acres; see Table 3-4). Not surprisingly, fish and wildlife habitat zoned for rural uses is a much higher proportion (89 percent) in UGB expansion areas and the remaining areas within Metro's jurisdiction (24,969 acres; see Table 3-5). Figure 3-12 shows that most of the rural zoned habitat land within the UGB is Class I and Class II riparian/wildlife corridors (62 percent). Over half (51 percent) the total habitat land zoned for rural uses inside the UGB is considered buildable.

Figure 3-13 shows the distribution of rural fish and wildlife habitat in UGB expansion areas and the remaining areas in Metro's jurisdiction. Fifty-four percent of habitat zoned for rural uses is high value Class I riparian/wildlife corridors and Class A upland wildlife habitat; more than half of that is buildable. Over 8,200 acres of the 18,800 acres in UGB expansion areas (44 percent) are significant fish and wildlife habitat. These areas will eventually be upzoned from rural zoning to accommodate urban development.

Figure 3-13. Distribution of RUR habitat land by classification and development status outside UGB.



Rural disturbance activities are similar to single-family and multi-family residential, except that there is typically less impervious surface. The larger lots generally spread out the impact of development and produce less stormwater runoff. However, the use of pesticides, herbicides and fertilizers may be greater in rural developments where agricultural uses are allowed. In addition, grazing of livestock can cause soil erosion, soil compaction, deterioration of water quality, and simplification of native vegetation diversity.

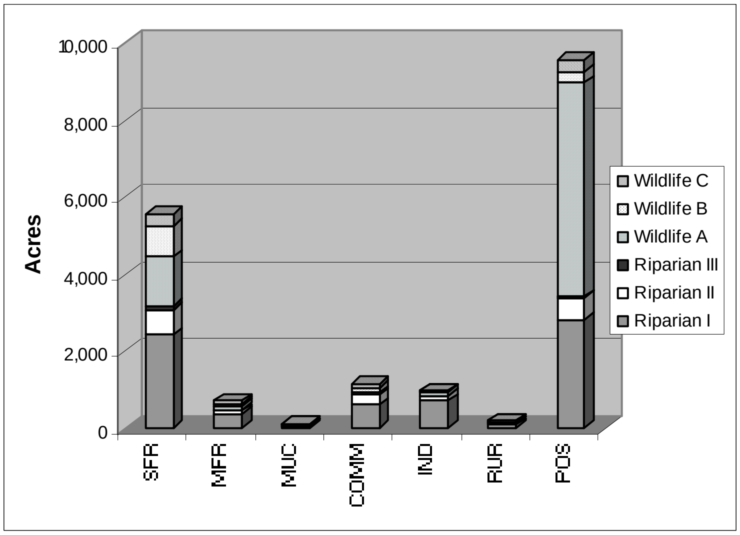
Agricultural uses and forestry, suitable to commercial scale production (typically with lot sizes of 30 acres or more), are allowed in the FF (Agriculture or Forestry) regional zone. Commercial farm and forest uses can involve extensive removal of native vegetation and habitat and are considered a conflicting use within the UGB. However, the Goal 5 rule exempts identifying agricultural and forest use outside the UGB as conflicting uses. (OAR 660-23-090(7)) Clearing vegetation, plowing fields, exposing bare soils and other farming and forestry practices (e.g., use of harvesting equipment) can heavily impact fish and wildlife habitat (e.g., soil erosion, soil compaction, etc.).

Parks and open space (POS)

Twenty percent of the Goal 5 fish and wildlife habitat inventory (10,470 acres; see Table 3-4) is actually zoned as parks and open space. An additional 8,680 acres are included in Metro's parks and open spaces inventory, but are zoned something other than POS. Parks and open space are allowed outright or conditionally in all of the generalized regional zones, although to varying degrees, and often retain the underlying zoning. Metro excludes parks and open space from the buildable land supply for estimating the region's 20-year land supply for dwelling units and employment inside the UGB.

Figure 3-14 shows park acreage by generalized zones and habitat classification. The largest number of park acres occurs in POS and SFR zoning.

Figure 3-14. Parks and open space by generalized regional zones and habitat classification.



The disturbance activities associated with parks and open space vary depending on the intensity of use. Many developed parks provide ball fields, tennis courts, picnic areas, recreational trails, maintenance facilities, parking lots, and other amenities. Disturbance activities in parks create impacts that are similar to those described for residential uses; however, generally a smaller percentage of land is covered by impervious surfaces. Maintenance practices used in many parks are similar to residential landscaping practices and can negatively impact habitat. Off-leash dog use in some of these parks impacts water quality.

Undeveloped open space, on the other hand, has the least amount of disturbance activities. These areas provide important wildlife habitat. Publicly owned open space provides recreational opportunities for people and a connection to nature and exposure to wildlife. Human activities such as hiking and biking, however, can negatively impact the fish and wildlife habitat.

Summary

Metro identified conflicting uses from a regional perspective by examining generalized regional zones (Metro's compilation of local jurisdictions' zones) and by considering Metro's 2040 Growth Concept. The conflicting use chapter analyzed Metro's Goal 5 fish and wildlife habitat inventory (e.g., habitat class, development status) and its distribution among generalized regional zones, 2040 design type priorities, and impact areas. Disturbance activities that are likely to occur within the generalized regional zones are also described. Some key points from this chapter include:

Figure 3-15. Total acreage in Metro's jurisdiction.

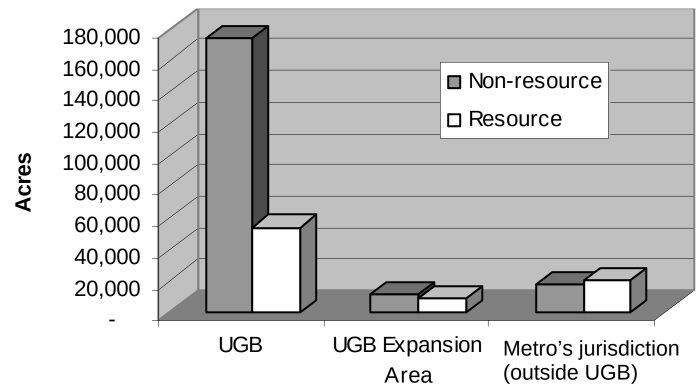
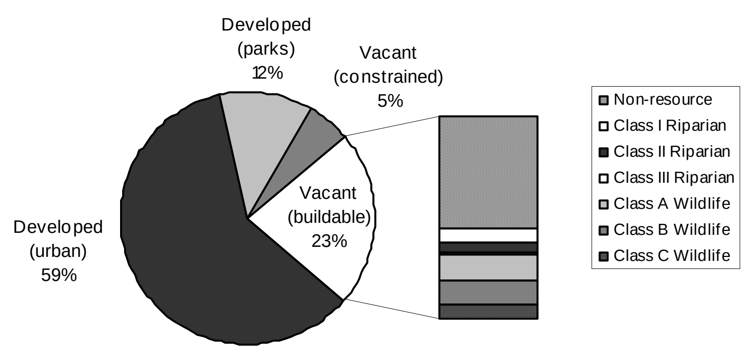


Figure 3-16. Percentage of total acreage in Metro's jurisdiction by development status.



- Metro's jurisdiction is comprised of approximately 280,660 acres, or about 438 square miles (not including water features). Figure 3-15 shows a comparison of non-habitat land with habitat land in three geographical areas: the UGB (pre-December 2002), UGB expansion areas (December 2002), and the remaining areas in Metro's jurisdiction outside the UGB (see Figure 3-1 map).
- About 29 percent of the total acreage in the three geographical areas represented in Figure 3-15 is regionally significant fish and wildlife habitat (81,700 acres).
- Approximately two-thirds of fish and wildlife habitat are within the UGB.
- Twenty-three percent of the total land area (both non-habitat and habitat) is vacant buildable land (64,175 acres). Almost half of the vacant buildable land in Metro's jurisdiction is fish and wildlife habitat (see Figure 3-16).
- Twenty-eight percent of vacant fish and wildlife habitat is already constrained by existing environmental regulations.
- The highest quality riparian/wildlife corridors (Class I) comprise about seven percent of the total supply of buildable land, while the highest quality upland wildlife (Class A) is 13 percent of the total supply of buildable land.

- The generalized regional zones, by themselves, are not conflicting uses. It is the development activities and other disturbances (e.g., clearing vegetation; adding impervious surfaces such roads, sidewalks, buildings and parking lots; landscaping with non-native vegetation; use of chemicals and contaminants) that generate negative impacts to fish and wildlife habitat.
- Forty-seven percent of fish and wildlife habitat is zoned single-family residential; over half is classified as high value riparian/wildlife and upland wildlife.
- Twenty percent of the fish and wildlife habitat is zoned for parks and open space. However, 34 percent of the fish and wildlife habitat is used as a park or open space.
- Fourteen percent of fish and wildlife habitat is zoned for industrial use. Of this amount, 44 percent overlaps with high value habitat, and over half is vacant.
- Metro has identified approximately 16, 300 acres as impact areas; over half are zoned single-family residential; 19 percent are zoned industrial; 82 percent is developed.
- 2040 design types are prioritized into four categories: primary land use components, secondary land use components, tertiary land use components, and other. Over half of the fish and wildlife habitat overlap with tertiary land use components (i.e., inner and outer neighborhoods, employment centers, corridors); 28 percent of the habitat is other design types (i.e., parks and open space, rural), 11 percent is in a primary category (i.e., central city, regional centers, industrial areas, intermodal transportation facilities); and five percent is secondary land uses (i.e., town centers, main streets, and station communities).

Figure 3-17. Distribution of habitat classification by generalized regional zones inside the UGB.

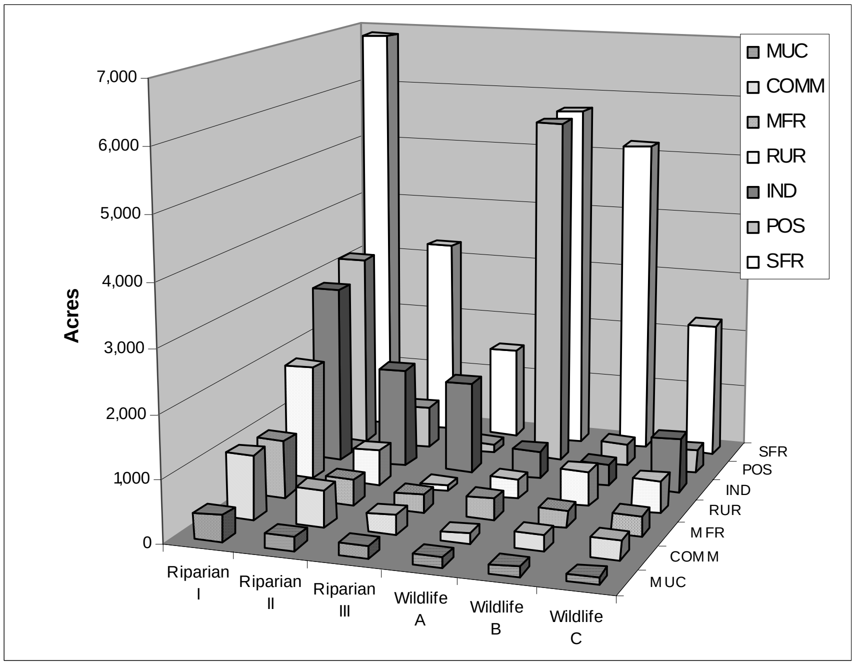
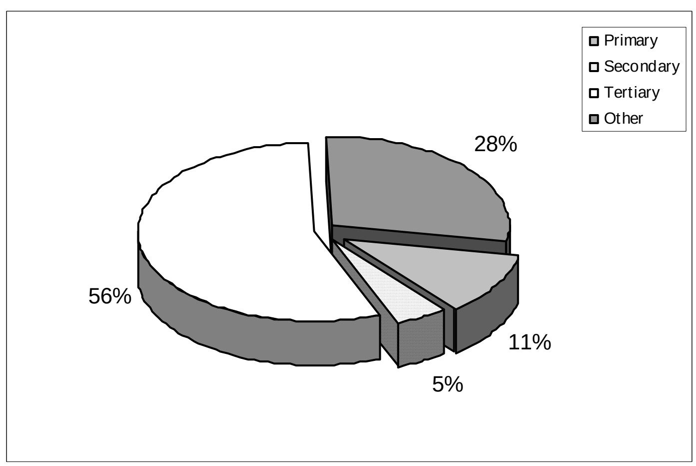


Figure 3-18. Percentage of fish and wildlife habitat by 2040 design type hierarchy.



The next four chapters consider the ESEE consequences of allowing, limiting, or prohibiting conflicting uses in fish and wildlife habitat areas.

CHAPTER 4: ECONOMIC CONSEQUENCES

Introduction

This chapter focuses on the economic consequences of protecting or not protecting fish and wildlife habitat. The competition between developing fish and wildlife habitat and protecting the ecosystem services provided by these areas lies at the heart of economic analysis. Metro contracted with ECONorthwest, a well-respected economic consulting firm, to provide insights into this competition and identify supporting information for the economic analysis. ECONorthwest conducted a review of the relevant literature[22] that focused on the factors that influence the market value for developable land and the economic value of ecosystem services provided by fish and wildlife habitat.

This chapter begins by providing an overview of the region's economy and the economic principles guiding the analysis. It then briefly outlines the major analytical tasks involved. The remainder of the chapter summarizes ECONorthwest's analysis[23] and describes the tradeoffs of protecting or not protecting fish and wildlife habitat by addressing the following questions:

- How is land ranked based on the economic importance for development?
- How is land ranked based on the economic importance for ecosystem services?
- What are the interactions between development value and ecosystem services value of fish and wildlife habitat?
- What are the potential economic consequences of allowing, limiting or prohibiting conflicting uses?

<u>Background and context</u>

Metro region's economy

The economic structure of the region's economy has shifted over time from one driven by resource industries (timber, agriculture, and metals) to more knowledge-based and service-oriented industries. This restructuring has occurred as productivity, labor trends and capital investments have re-shaped the national economy over the last half century and forced regional economies like the Portland area to adapt in order to prosper. And indeed the Portland area has prospered – witnessed by its above-average population and job growth over the last several decades.

Early on, cities on the West Coast emerged because of proximity to trade routes and abundant natural resources of which residents could take advantage. This region was blessed with plentiful rainfall and rich soil for agriculture in the Willamette Valley and plentiful trees for harvesting logs for homes and industry. Portland's proximity at the confluence of two great rivers provided cheap and convenient access/connections for farm goods and supplies to and

[22] See Appendix C: *Final Draft Literature Review for the Economic Portion of Metro's Goal 5 ESEE Analysis* (ECONorthwest 2003)
[23] See Appendix C: *Final Report for the Economic Portion of Metro's Goal 5 ESEE Analysis* (ECONorthwest 2004).

from various sea and inland trade routes. Portland became a major seaport and transportation hub for West Coast trade.

Agriculture in the northern Willamette Valley has changed over time as farm production has become more competitive nationwide. Farms that once produced foodstuffs for the Portland area no longer are the dominant agricultural industry. Today instead, the major agricultural producers are nursery growers and grass seed farming.

With the onset of World War II, the region's economy shifted to producing goods for the war effort. Ship building and ancillary manufacturing arose to briefly become a key industry during the 1940's. Since then, ship building has declined. However, the transportation equipment industry remains a significant industry in the region, but the components of this industry have shifted away from ship building to the production of rail cars (Gunderson), aircraft parts manufacturing (Boeing) and heavy diesel truck production (Freightliner).

After construction of the Bonneville Dam and other dams along the Columbia River, metals manufacturing and fabrication (particularly aluminum) became an important component of the regional economy. The dams provided an opportunity to create jobs and generate cheap and plentiful electricity for residents in the region. The enormous surplus of electricity attracted Reynolds Aluminum and others to locate aluminum smelting plants in and around the region. As the aluminum industry matured, the Northwest aluminum industry's competitive advantage steadily waned. A combination of higher electricity prices, diminished electrical supplies, and global competition has forced most of the region's aluminum smelters out of business. The metal industry in the region has evolved into a secondary industry that mostly handles recycling of scrap metals.

Before the 1980's regional recession, timber products (logging and paper) were engines of growth for the State and metropolitan area economies. This is no longer the situation. Continued concerns over logging of old growth forests and associated decline of species have led to restricted harvest levels on federal forest lands. In addition, competition from Canadian sources and southeast U.S. producers has increased over time. Continued productivity enhancements in the industry also add to the long-term employment declines in this industry. As a result, the forest products industry is a smaller part of the regional economy.

As the region's traditional resource industries came under increased competitive pressures, the metropolitan area experienced the emergence of a new industry – the so-called high-tech industry. High-tech had its nascent beginning in 1946 with Techtronix and 30 years later with Intel. The high-tech industry really came into prominence in the 1990's as Intel and other multi-national firms from Asia invested over $10 billion in the area alone. The high-tech sector, popularly known as Silicon Forest, which is largely concentrated in Hillsboro, with smaller "clusters" in Tualatin and Gresham, is not monolithic but is comprised of different companies specializing in various fields of expertise. The region's specialties in the high-tech field include semi-conductors, electro-scientific instruments, printer and parts manufacturing, and visual projection devices.

The transport of goods and services has always been an important component of the metropolitan economy. The Port of Portland continues to be a key economic component to this region's economic health. The factors that made Portland a key location for commerce are still here today and may be even stronger today than before. International travel and the trading of goods and services overseas is much greater today. The regional economy is much more globally bound, so the infrastructure and technology to move goods and people overseas and around the country are very important to the growth and prosperity of the region.

As the region's basic or traded sectors grow and attract new businesses and the people who work for these companies, the region has experienced a multi-fold increase in services and retail. Every city has needs and these needs are provided by the numerous entrepreneurs who everyday provide the goods and services residents living in the city demand. As the region's population grows, so have the number of shopkeepers. Like all metropolitan areas in the U.S., there has been an evolution in how goods and services are supplied to consumers. One example is the rapid growth of Mega-stores and regional malls that did not exist half a century ago.

As described above, the region's economy has shifted over time from resource-based industries to more knowledge-based and service-oriented industries. This transition has added complexity to the region's economy and competition for natural resources. The following section briefly describes the economic principles upon which this analysis is based.

Economic principles

The following six economic principles help define the approach to the analysis of economic tradeoffs of developing lands that contain significant riparian and/or wildlife habitat or protecting this habitat and the associated ecosystem services that benefit society.

1. *Market prices for land can be used as a measure of development value.* Property markets for developable land meet most of the criteria for a well-functioning market. Many sellers and buyers participate in the market, there is free entry to and exit from the market, and buyers and sellers have access to information on the attributes of land that provide development value. For these reasons, market prices for land provide a good measure of development value. Participants in a market can measure or rank the development potential or importance of properties based on property value.
2. *Ecosystem services have economic value.* Ecosystem services are the benefits to society of well-functioning ecosystems such as riparian areas that mitigate flooding, help filter toxins and sediment from surface runoff and provide recreational and other amenity values. Society also benefits from wildlife habitat that helps support populations of species with commercial, recreational, and cultural value.
3. *Property markets may capture some, but not all, of the values of ecosystem services.* Property markets can provide information on the value of some ecosystem services, such as the value associated with proximity or access to recreational resources or scenic vistas. Property values typically do not reflect the value of other ecosystem services, such as water quality or wildlife habitat services.
4. *Property markets may not capture public policy or planning goals.* Just as property markets fail to reflect the full value to society of ecosystem services, these markets may also fail to capture the value of public policy or planning goals that affect land use. For example, properties with the highest market value may not necessarily be the most

important lands from a public policy perspective. Specific to this project, the hierarchy of design types as described by the 2040 Growth Concept emphasizes certain land use types in certain locations. Public policy consideration drives the design of the hierarchy, not market prices. As a result, the 2040 Growth Concept may emphasize the importance of a relatively low valued land use, such as industrial development, in an area that, if left to property markets, would develop into a higher valued use, such as a residential development.

5. *There is competition for the fish and wildlife habitat resources at issue in this study.* In the past, discussions of the competition for natural resources focused on the tradeoffs of developing or using a resource and the associated jobs created or supported versus protecting the resource for its intrinsic or non-use value. This is the 'jobs vs. the environment' argument. Such an approach assumed two competing demands for a resource: 1) that protecting the environment would not generate or support jobs, and 2) that development use would not generate negative impacts beyond affecting non-use values.

   Today, the competition for resources is more complex with more demands on a finite amount of natural resources. The dynamics of the competition extend far beyond a choice of jobs or the environment. A distinction can be made between demands on the resource that have use and non-use values. The range of demands with use values include commercial use of the resource, the ecosystem services provided by the resources, the impacts of the resources and development values on location decisions of retirees, workers and businesses and other quality-of-life impacts and options to use the resources in the future.[24] Demands with non-use values include the intrinsic value of the resources.

6. *A static analysis likely will fail to inform stakeholders or decision makers adequately of the economic tradeoffs*. A static analysis is similar to taking a snapshot of analytical conditions. This approach assumes no changes in factors that could influence the outcome of a decision to develop or to protect resources. An alternative approach that considers how changes or adjustments affect the economic analysis will likely provide a more complete description of the economic tradeoffs than ignoring these adjustments. In this case, dynamic adjustments may include expanding the urban growth boundary (UGB) and the substitutability of land within the UGB. Such a dynamic approach also considers the likely restoration efforts that can help mitigate the negative impacts of development on regionally significant fish and wildlife habitat. A dynamic approach that considers likely changes, adjustments, or possible mitigation efforts will provide decision makers with a more complete view of the likely economic impacts than will a static approach.

Framework for the economic analysis

The framework for the economic analysis consists of four major analytical tasks, briefly described below.

[24] See Appendix C, *Final Draft Literature Review for the Economic Portion of Metro's Goal 5 ESEE Analysis* (ECONorthwest, 2003), for more information on the competing demands for natural resources.

- *Rank fish and wildlife habitat based on the economic importance for development (development value).* In this analytical task, a method was developed to rank the relative importance of land for development using three criteria: land value, employment and 2040 design types.

- *Describe economic value of ecosystem services provided by fish and wildlife habitat.* In this task, the economic value of ecosystem services is described based on ECONorthwest's economic literature review. Metro's ranking of fish and wildlife habitat for ecological function serves as a proxy for the economic value of ecosystem services.

- *Compare the ranking of economic importance for development (development value) with Metro's ranking of ecological value for fish and wildlife habitat.* This comparison provides information on the amount and distribution of significant interactions between development use and habitat protection.

- *Describe the economic consequences of allowing, limiting, or prohibiting development of regionally significant fish and wildlife habitat.* In this task, reference is made back to the previous tasks that describe the context for the analysis of economic tradeoffs. Economic factors (e.g., land value, employment, 2040 design types and value of ecosystem services) are described that may be affected by a Goal 5 decision.

How is land ranked based on the economic importance for development?

Not all land has the same economic importance for development, just as not all fish and wildlife habitat have the same ecological value. For example, land zoned for parks has less economic importance compared to land zoned for industrial uses. This analysis ranks land based on economic importance for development, or "development value." This approach helps weigh the economic consequences of protecting or not protecting fish and wildlife habitat.

Development value of land can be ranked in many ways. Methods include ranking land based on property value, distance from city center, the amount of vehicle and pedestrian traffic that passes by, or local economic development priorities that target specific economic sectors or land uses. Developing an exhaustive list of methods and applying them to the lands that contain fish and wildlife habitat goes beyond the scope of this analysis. Instead, this analysis focuses on a three measures that provide a general understanding of the development values: land value, employment potential associated with development (employment density) and 2040 Growth Concept planning goals.

Property markets provide a good measure of a property's development value because factors that affect a parcel's development potential (i.e., location and use) are typically widely known and easily measured.[25] The location factors that influence property values include availability of

[25] See Appendix C, *Final Draft Literature Review for the Economic Portion of Metro's Goal 5 ESEE Analysis* (ECONorthwest, 2003), for more information.

urban infrastructure services, transportation access, and zoning and other regulations. Use factors include a property's amenities, physical terrain and lot size and shape.

The second measure for describing the importance of land for development is the employment potential associated with development. Land values and employment potential describe current conditions. For insights into relative importance for development in the future, a third measure is used that ranks land using Metro's 2040 Growth Concept planning goals described by the 2040 design types.[26] The following sections describe these three measures.

Rank lands based on land value

Market prices reflect a parcel's location and use factors. Distribution of land value was modeled based on local tax assessor data and mapped using GIS. County assessors' data on value (compiled by Metro) is a reasonable proxy for market value for purposes of identifying a range of property values from high to low. "Reasonable proxy" means that there is a relatively high correlation between values in the assessor's data and market values. That is, a high value in the assessor's database will also have a high market value. Given the limitations on assessed value from Measures 5 and 50, it is expected that assessed values will be less than market values. However, this data is used to describe a range of property values from high to low, not as a measure of market value for any one property.

The data on land value was used for ranking lands, not the value of land plus improvements. Land value reflects the expected value of land in the best uses supported by the market and allowed by public policy. Including the value of improvements would bias the analysis against undeveloped land. Property without improvements would likely be constrained to the lower end of the range of values if the range included the value of improvements.

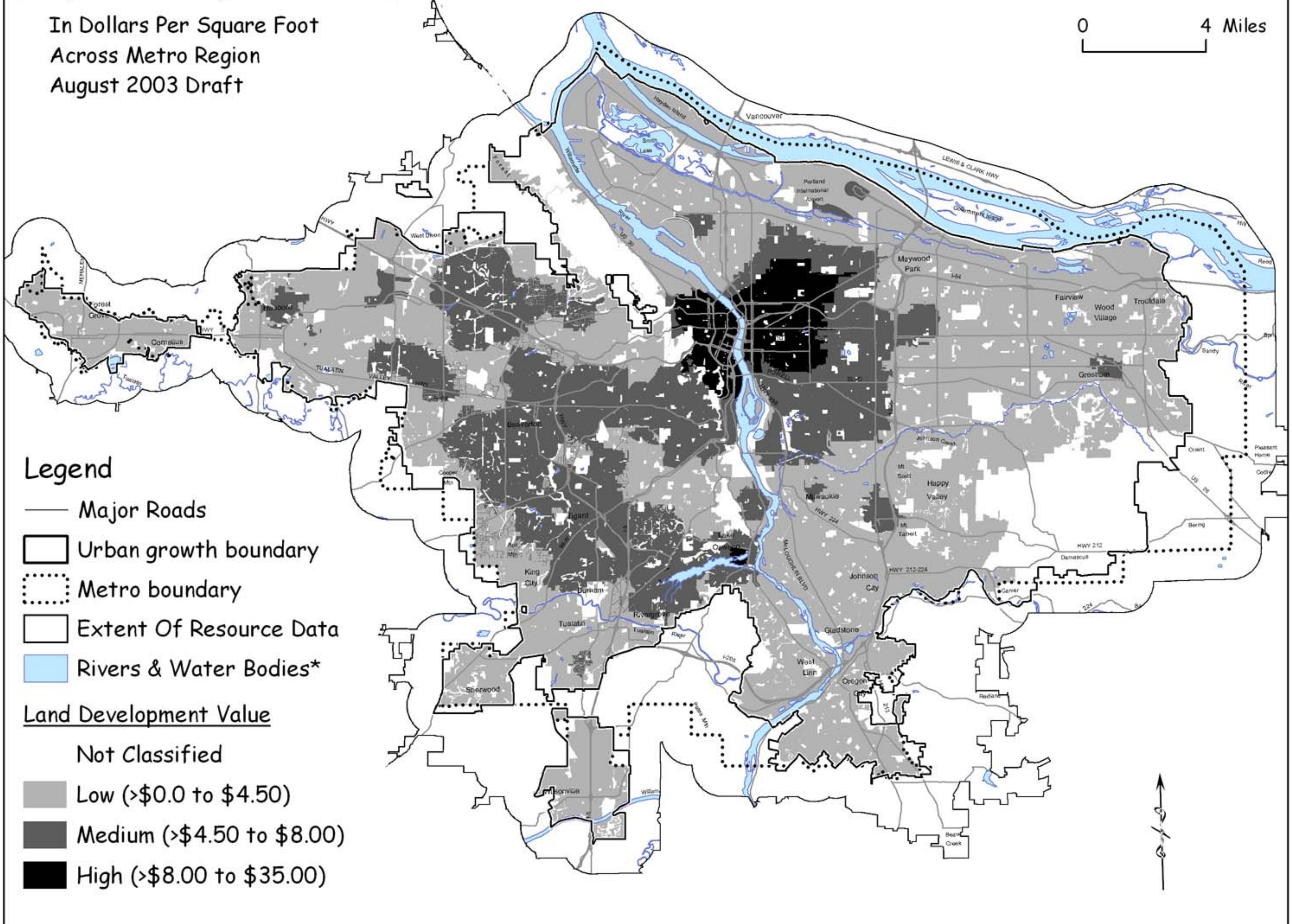
The database of assessed values excludes land uses that do not pay property taxes, such as public schools and some hospitals, and underestimates the value of other land uses that pay limited property taxes, such as low-income housing. Land value reflects the amenity values associated with fish and wildlife habitat, but likely does not capture the value of other ecosystem services such as those associated with water quality and flood management.

Map 1 shows the distribution of land value across the Metro region. Land value is divided into "low," "medium" and "high" values. Habitat lands with assessed values equal to or greater than $8.00 per square foot have high development value. Habitat lands with assessed values greater than $4.50 and less than $8.00 have medium development value. Habitat lands with assessed value below $4.50 per square foot have low development value.[27] Values are expressed as mean dollars per square foot. Map 1 shows that the highest values are centered on the city of Portland and surrounding concentrations of population and commercial activity. Areas of medium value surround the high valued areas and include areas of suburban population and commercial concentrations. Low values are found in the remaining outlying areas.

[26] See Conflicting Use chapter for description of 2040 design types.
[27] See Appendix C, *Final Report for the Economic Portion of Metro's Goal 5 ESEE Analysis* (ECONorthwest 2004), for more information

Map 1a depicts the distribution of land values for the subset of lands in Metro's jurisdiction that contain fish and wildlife habitat. The large majority of these acres fall in the outlying or low category. Map 1b shows only those habitat lands that are ranked high for the quality of fish and wildlife habitat characteristics. Another way of describing the lands shown in Map 1b is that they represent the development value of lands that contain the most significant fish and wildlife habitat

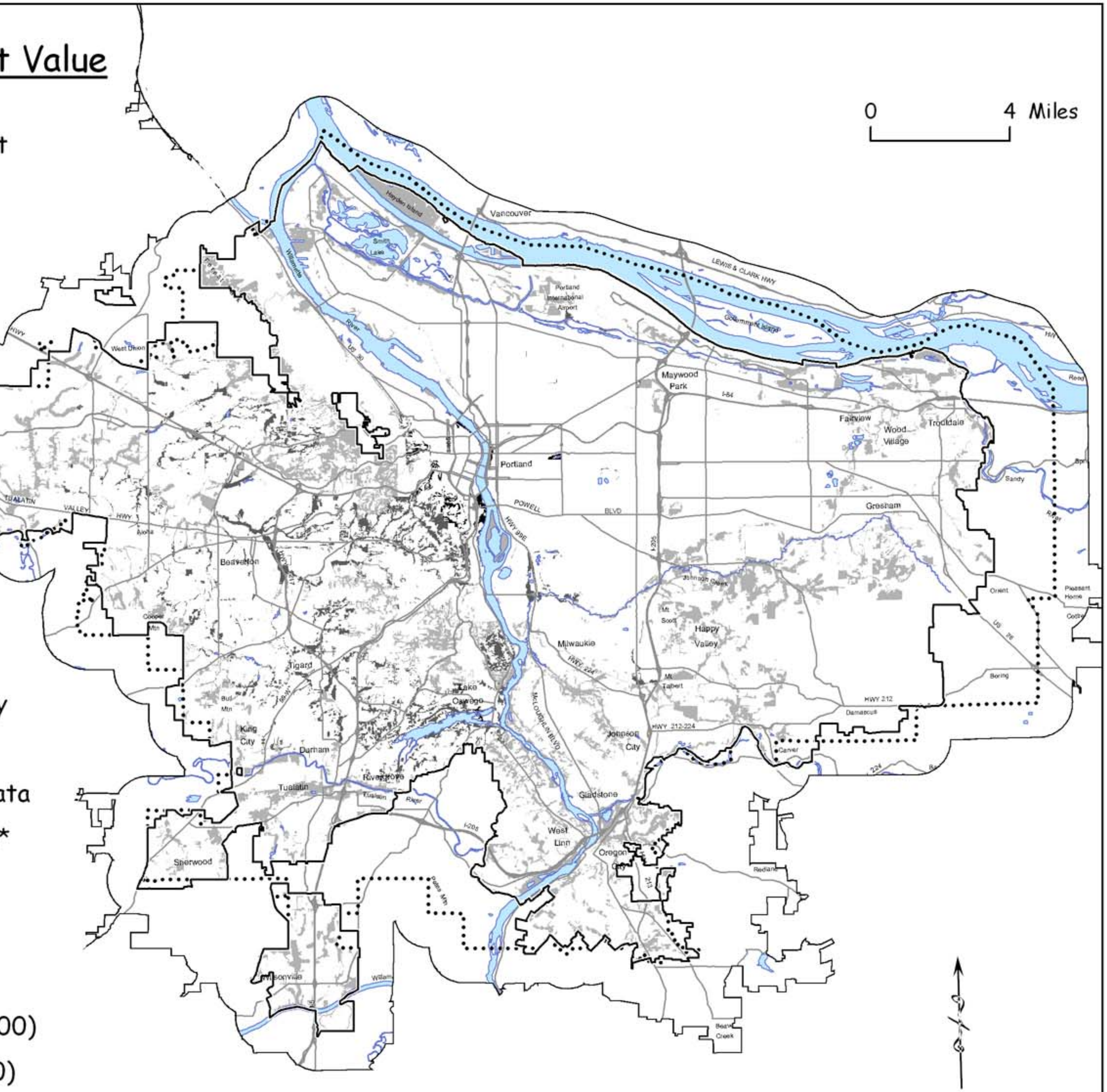
Map 1: Development Value



*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps091103\Map 1 Development Value.mxd

Map 1a: Development Value

Within Resources
In Dollars Per Square Foot
Across Metro Region
August 2003 Draft



Legend

Major Roads

Urban growth boundary

Metro boundary

Extent Of Resource Data

Rivers & Water Bodies*

Land Development Value

Not Classified

Low (>$0.0 to $4.50)

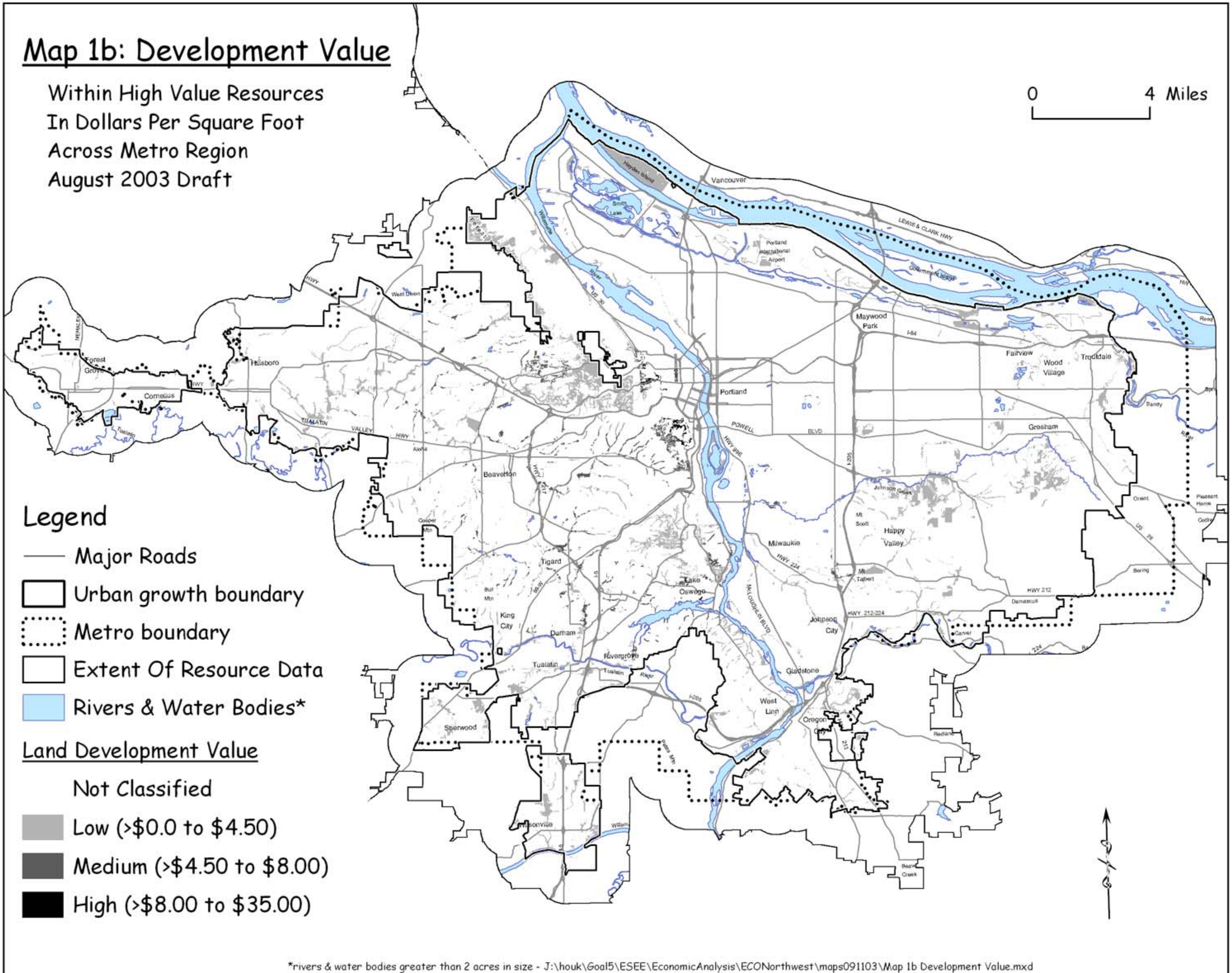
Medium (>$4.50 to $8.00)

High (>$8.00 to $35.00)

*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps091103\Map 1 Development Value.mxd

Map 1b: Development Value

Within High Value Resources
In Dollars Per Square Foot
Across Metro Region
August 2003 Draft



Legend

Major Roads

Urban growth boundary

Metro boundary

Extent Of Resource Data

Rivers & Water Bodies*

Land Development Value

Not Classified

Low (>$0.0 to $4.50)

Medium (>$4.50 to $8.00)

High (>$8.00 to $35.00)

*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps091103\Map 1b Development Value.mxd

Rank lands based on employment potential

Employment potential associated with development is a way of ranking economic importance of land. The more employees that land can support, the more valuable it is for development. Employment density was modeled as employees per gross acre across the Metro region (using State 202 employment data[28]) and mapped using GIS. Jobs were assigned to vacant or undeveloped land based on jobs in surrounding areas with similar zoning.

Employment density was divided into "low," "medium" and "high" employment. Habitat lands with employment density equal to or greater than 16 jobs per acre have high development value. Habitat lands with employment density greater than four and less than 16 jobs per acre have medium development value. Habitat lands with employment density of four jobs per acre or less have low development value.[29]

The methodology for assigning jobs to vacant land and for defining three categories of employment density assumes that jobs are tied to a specific location and cannot move to other locations in the Metro region. This assumption is certainly not strictly correct; in some instances it may not be even approximately correct. To the extent that land uses that support these jobs can move elsewhere in the UGB, or be directed elsewhere in the future, these alternatives will help mitigate potential negative employment impacts of limit and prohibit decisions.

The measure of employment density does not capture the relative importance of residential development; however, ranking land based on land value, as described in the previous section, provides a measure of the relative development value of residential areas. Another limitation of this analysis is that it does not distinguish among jobs that are more "important" and those that are less "important" to the region's economy.

Map 2 shows the distribution of lands ranked by employment density. The low, medium and high categories in Map 2 correspond to the break points described above. Compared with the distribution of development values as described by land value (see Map 1), lands that support employment occupy a smaller subset of Metro's jurisdiction. That is because Map 2 excludes lands that do not support employment, primarily residential and park lands. Map 2 shows that lands that support employment predominate in the Portland city center and along transportation routes.

Map 2a depicts the distribution of employment density for the subset of lands in Metro's jurisdiction that contains significant fish and wildlife habitat. The large majority of these lands fall in the outlying or low category.

Map 2b shows the subset of lands from Map 2a that are ranked high for the quality of fish and upland wildlife habitat characteristics. Map 2b shows the employment density for lands that contain the most significant fish and wildlife habitat. Policy decisions that protect the most significant habitat would have the greatest impact on these lands.

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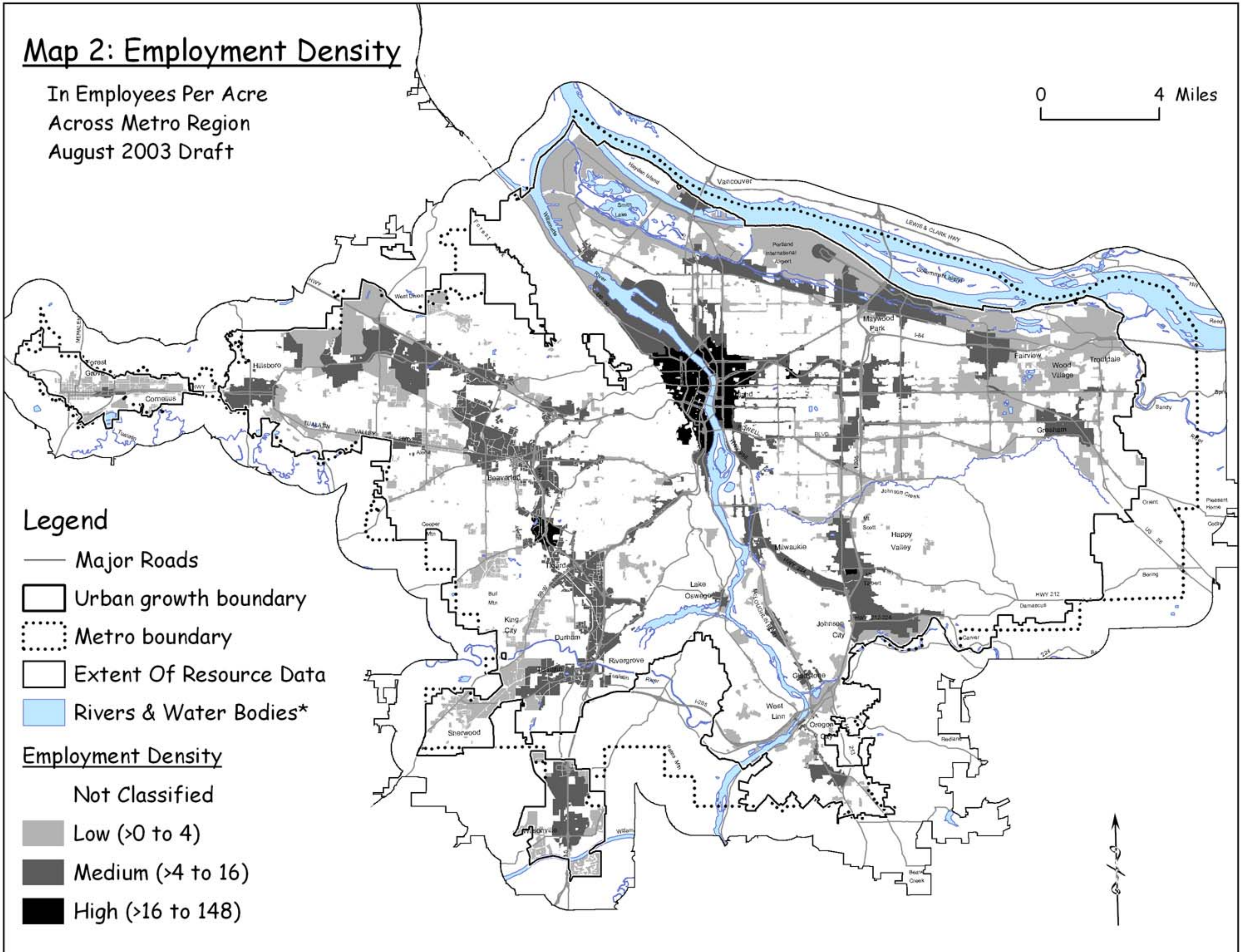
[28] 2002 employment data for the metropolitan region are from the Oregon Department of Revenue (referred to as the Employment Security, 202 tapes).
[29] See Appendix C: *Final Report for the Economic Portion of Metro's Goal 5 ESEE Analysis* (ECONorthwest 2004).

Map 2: Employment Density

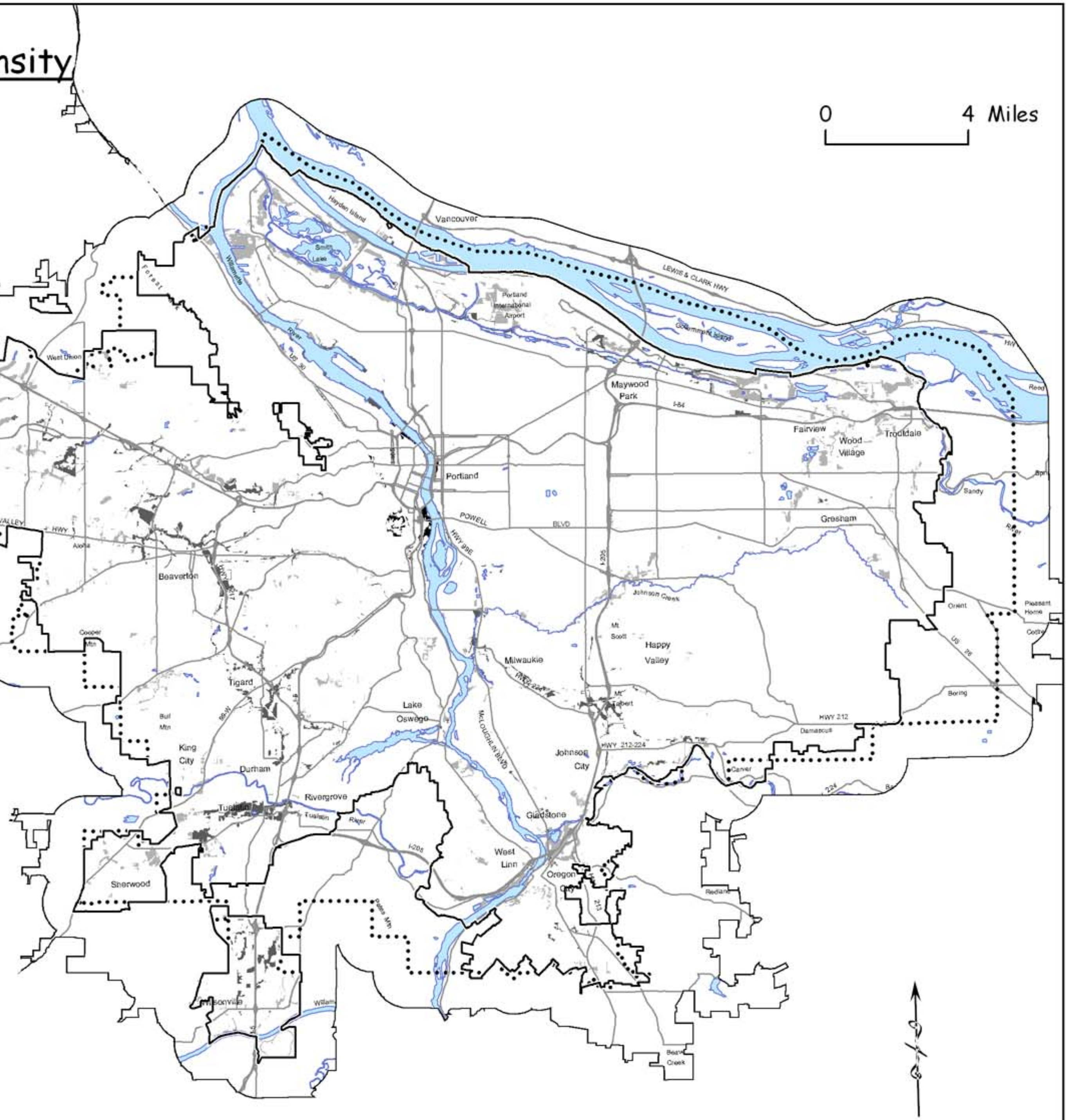
In Employees Per Acre
Across Metro Region
August 2003 Draft



*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps091103\Map 2 Employment Density.mxd

Map 2a: Employment Density

Within Resources
In Employees Per Acre
Across Metro Region
August 2003 Draft



Legend

Major Roads
Urban growth boundary
Metro boundary
Extent Of Resource Data
Rivers & Water Bodies*

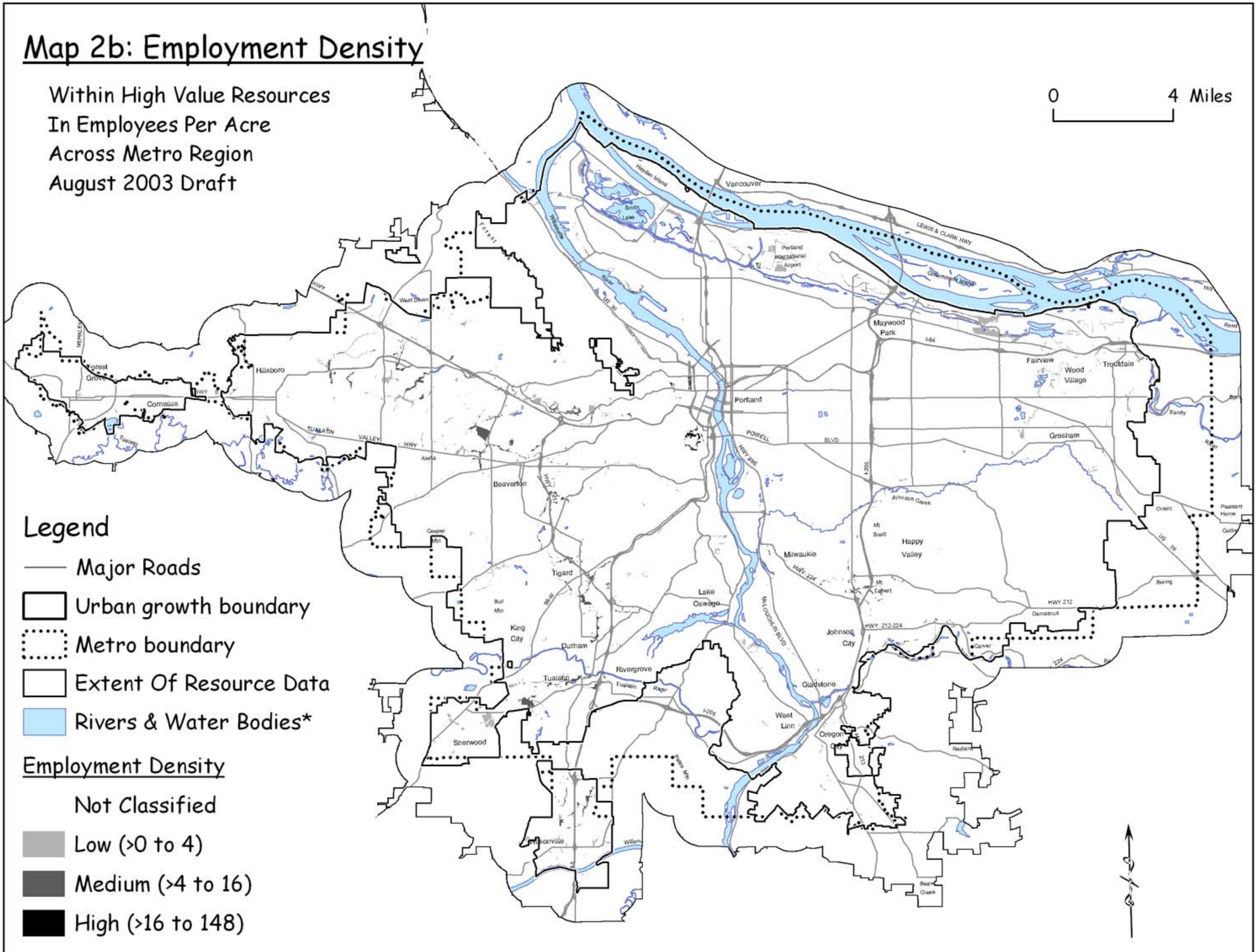
Employment Density

Not Classified
Low (>0 to 4)
Medium (>4 to 16)
High (>16 to 148)

*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps091103\Map 2a Employment Density.mxd

Map 2b: Employment Density

Within High Value Resources
In Employees Per Acre
Across Metro Region
August 2003 Draft



Legend

Major Roads

Urban growth boundary

Metro boundary

Extent Of Resource Data

Rivers & Water Bodies*

Employment Density

Not Classified

Low (>0 to 4)

Medium (>4 to 16)

High (>16 to 148)

*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps091103\Map 2b Employment Density.mxd

Rank lands based on 2040 design types

Land value and employment density provide snapshot views of current conditions. For insights into future development patterns and associated economic importance of land, the 2040 design type hierarchy was used. As described in the *Conflicting Use* chapter, the success of the 2040 Growth Concept depends in large part on the implementation of regional transportation priorities. The Regional Transportation Plan (RTP) groups the 2040 design types into a hierarchy based on transportation investment priority. This hierarchy also helps to focus economic development priorities in areas that are most important to achieving the goals of the 2040 Growth Concept. For the purposes of this economic analysis, a modified grouping of the 2040 design types was used as follows:

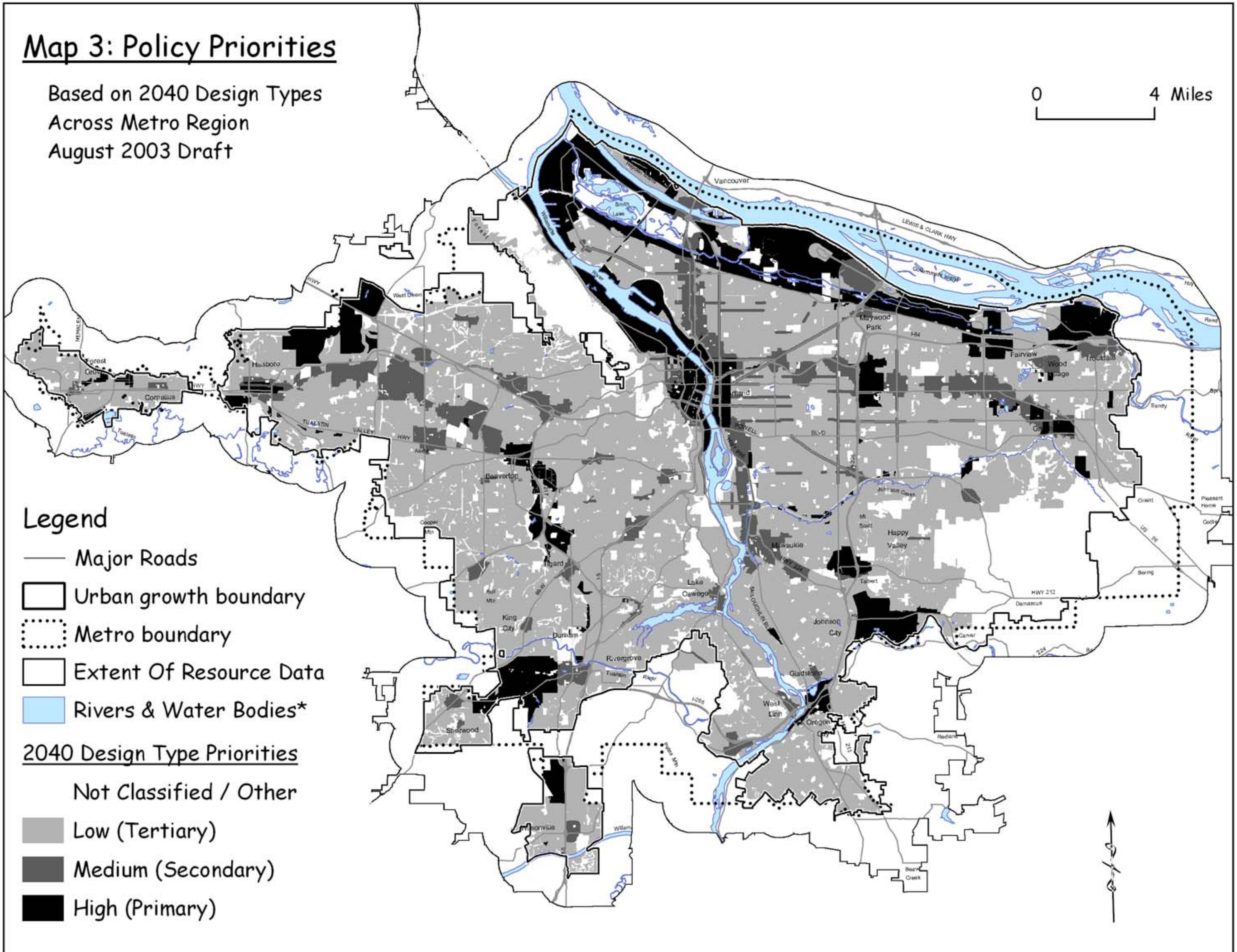
- *Primary land use components* – central city, regional centers, industrial areas, and intermodal facilities
- *Secondary land use components* – town centers, main streets, station communities
- *Tertiary land use components* – inner and outer neighborhoods, employment centers, corridors, future urban lands
- *Other land use components* – parks and open space, rural lands

In general, land values and employment densities are expected to be higher for primary components and decrease moving from primary to secondary to tertiary and finally to other land use components.

Maps 3, 3a, and 3b show the distribution of the four categories of 2040 design types. Map 3a shows the subset of lands in Map 3 that contain significant Goal 5 fish and wildlife habitat. Metro's Goal 5 decision will affect these lands. Map 3b shows the subset of lands in Map 3a that support the most significant Goal 5 fish and wildlife habitat.

Comparing Maps 1, 2, and 3 show that primary design types are distributed across more of Metro's jurisdiction than are areas of high land value or employment density, which are concentrated mostly in the downtown Portland area. This is especially true along the Columbia River and the Willamette River outside of downtown Portland. These industrial areas have low land values and employment densities for the most part, but have a primary design type designation. One interpretation of this difference is that the design types reflect public policies to support or enhance the industrial areas along the rivers for future development. Even though these areas have low land values and employment densities relative to the Portland city center, public policy considerations dictate that these industrial lands should be emphasized or enhanced for reasons other than land value or employment density.

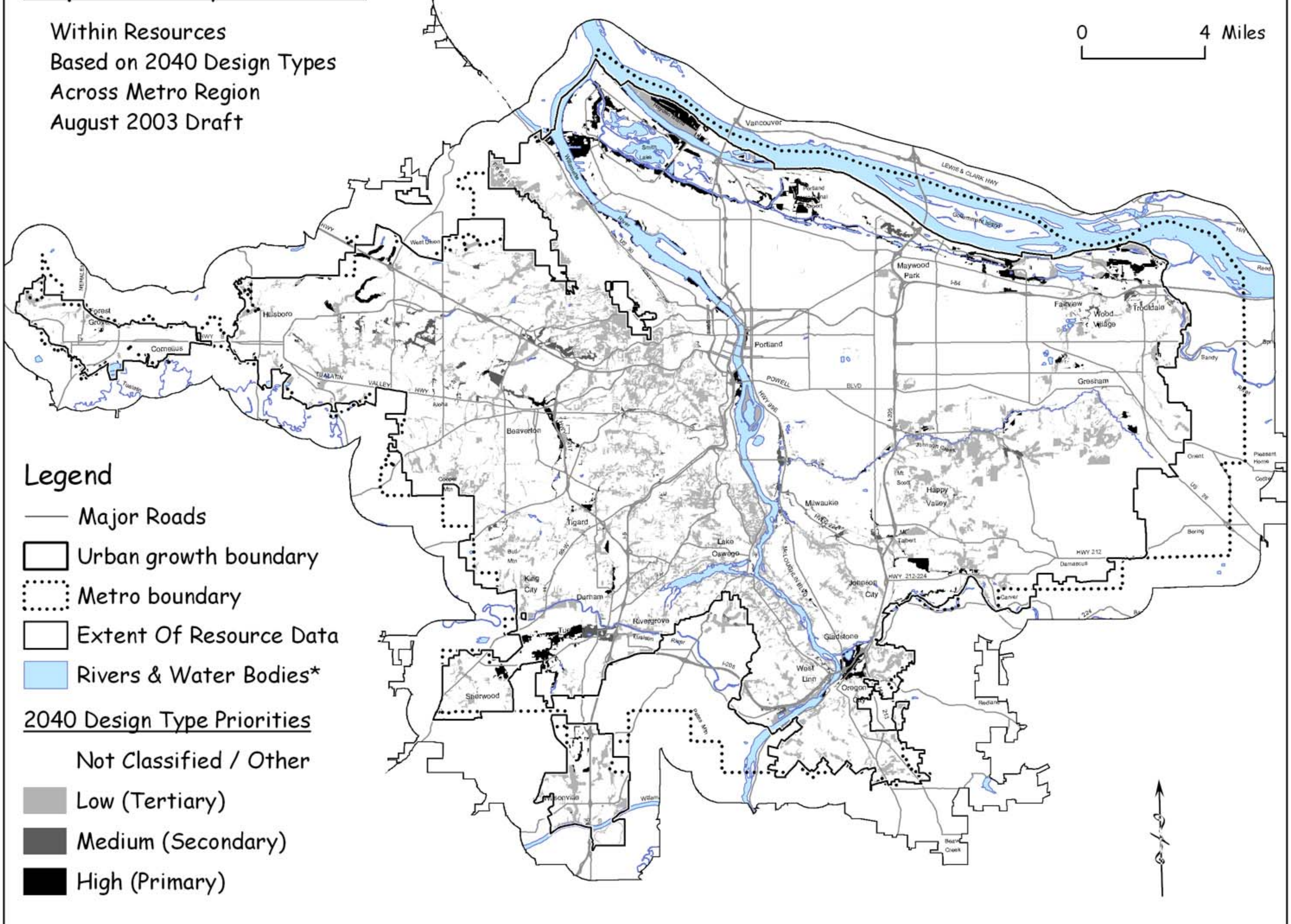
The preceding paragraph describes differences in distribution among the three measures of development value. There are also similarities. For example, just as most lands in Metro's jurisdiction rank low for land value and employment density, most lands also rank in the tertiary or other design type. Another similarity is that, with the exception of lands along the rivers, the distribution of lands with high and medium employment density has a pattern similar to the distribution of lands ranked primary and secondary design types.



*rivers & water bodies greater than 2 acres in size - **These names could change in the future - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps\Map 3 Policy Priorities.mxd

Map 3a: Policy Priorities

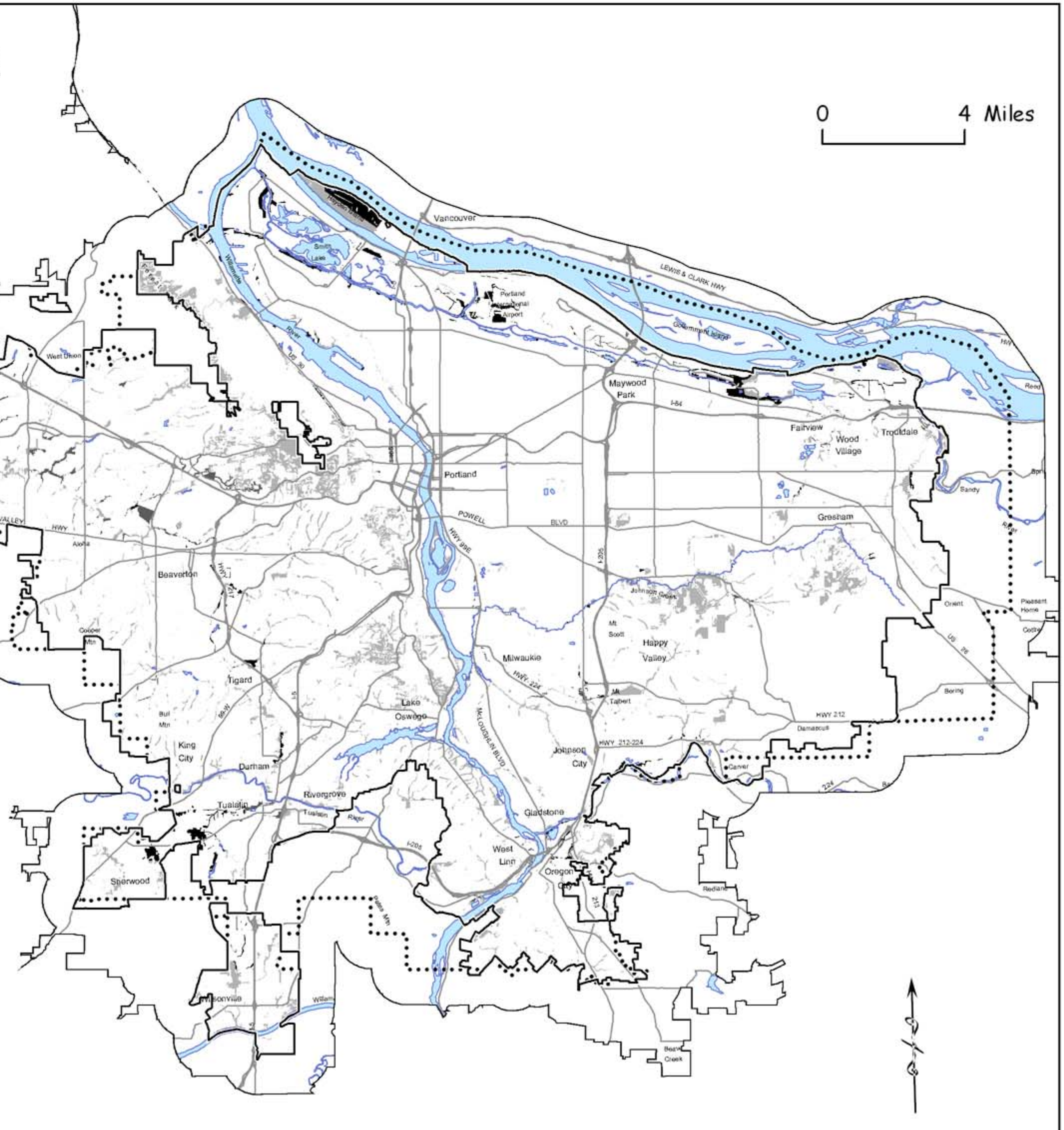
Within Resources
Based on 2040 Design Types
Across Metro Region
August 2003 Draft



*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps091103\Map 3a Employment Density.mxd

Map 3b: Policy Priorities

Within High Value Resources
Based on 2040 Design Types
Across Metro Region
August 2003 Draft



Legend
- Major Roads
- Urban growth boundary
- Metro boundary
- Extent Of Resource Data
- Rivers & Water Bodies*

2040 Design Type Priorities
- Not Classified / Other
- Low (Tertiary)
- Medium (Secondary)
- High (Primary)

*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps091103\Map 3b Policy Priorities.mxd

Limitations of the ranking methods

Land value

This method excludes land uses exempt from property taxes or underestimates the economic importance of lands that pay taxes at a diminished rate. Lands exempt from tax assessments—for example, schools, universities, and some hospitals—do not appear in the data base or analysis for this measure of economic importance. This method also underestimates the economic importance of lands with restricted or diminished tax assessments—for example, low-income housing, urban-renewal areas, and other land uses that benefit from public policies that subsidize tax payments. The analysis includes these lands in the ranking, but the rankings may not reflect these parcels' full value.

Employment density

This analysis calculates the average employment density across all land uses in a given GIS map unit. This method may underestimate or overestimate the employment density for some individual parcels. For example, the employment density for a GIS map unit that includes residential areas surrounding a university or hospital may underestimate the employment ranking for these facilities because of the relatively low employment densities found in the residential areas. The opposite is also true. Because the method calculates the average employment density per map unit, properties with lower-than-average densities will be represented by an average measure for the entire map unit that overestimates the employment density for these parcels.

Employment density does not distinguish between "more" important or "less" important jobs as described by employment income or employment multipliers. Employment density provides stakeholders and decisionmakers with employment information that exceeds the requirements for a Goal 5 ESEE analysis. Also, Metro uses employment density when addressing other land use issues that have employment consequences.[30] Finally, the 2040 design types capture to some degree the economic importance of land as described by employment multipliers.

2040 design types

The 2040 design types exclude certain land uses or underestimate the relative importance of a given land use. For example, several educational institutions are not located in designated design type areas. In other cases, what some consider a regionally significant land use, such as a regional medical center, is included in a lower level design type.

The land uses of concern—those for which the three methods used in the economic analysis either exclude or underestimate their economic importance—fall predominantly into four general categories: 1) transportation, 2) utilities, 3) education, and 4) health care. The following subsection briefly describes the relative economic importance of these land uses.

Transportation facilities and utilities: To stay competitive, cities must have modern and efficient physical infrastructure, including roads, bridges, water and sewer systems, airport and cargo facilities, energy systems and telecommunications. The economic literature shows a correlation between economic growth and transportation facilities and utility services. Well-functioning and efficient physical infrastructure helps promote improvements in productivity.

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[30] See the Metro report, *Technical Report: 1999 Employment Density Study*, April 6, 1999, revised May 5, 1999.

The quality of, and access to, transportation facilities and utilities can also directly influence production costs.

Education: The economic literature distinguishes between the economic importance of primary and secondary education, from college, university and post-graduate studies. Many high-skilled or knowledge-based workers can choose where they want to live, they can apply their skills to a variety of industries or have the ability to telecommute. Because they can pick and choose their locations, they choose those with quality amenities, including good elementary and secondary schools.

Given the current high demand for skilled labor, economic growth and development depends in part on access to a critical mass of employable persons with the necessary training and education. An educated workforce has become the primary location factor for growing companies.
The most competitive cities recognize that businesses must locate near or have access to knowledge centers. Among the most important knowledge-based organizations are colleges and universities that provide trained personnel and research capacities. Companies also depend on training and continuing education facilities that help them become and remain learning organizations.

Increasing evidence suggests that promoting innovation, creativity, flexibility and adaptability will be essential to keeping U.S. cities economically vital and internationally competitive. Innovation is particularly important in industries that require an educated workforce. High-tech companies need to have access to new ideas typically associated with a university or research institute.

Medical services: Medical services contribute to a region's economic growth and development in a number of ways. In many municipalities, hospitals and medical clinics are among the largest employers. For example, in the Portland area, OHSU is the region's top employer. Medical schools and research facilities provide important education related services that help support the growth and development of knowledge-based businesses. The availability of high quality and diverse medical services also contributes to a region's quality of life, which helps attract and retain high skilled, and highly educated workers.

How is land ranked based on the economic importance for ecosystem services?

Ecosystem services are the beneficial outcomes, for the natural environment or people, that result from ecosystem functions. Overlap exists between the ecological functions of riparian corridors and upland wildlife habitat and the ecosystem services that benefit society and have economic value (see Table 4-1). For example, the ecosystem function of tree canopy and foliage shading streams helps reduce air and water temperatures, which may benefit society by reducing cooling demands in summer and by protecting species such as salmon that have recreational, commercial and intrinsic value. The ecosystem functions of streamflow moderation and water storage help moderate flooding, which benefits society by reducing flood damage and flood management costs. The ecosystem functions of bank stabilization and sediment and pollution control may help reduce landslides and maintain water quality, which benefits society through avoided costs to filter and treat water. Wildlife habitat may benefit society by supporting species with commercial and recreational value. Riparian corridors and wildlife habitat provide amenity benefits such as scenic views and open space.

Table 4-1: Ecological functions, wildlife characteristics and related ecosystem services that benefit society.

Ecological Functions (Riparian)	Ecosystem Services
Microclimate shade and cooling	Moderating summer temperatures, which reduces energy demand for cooling.
Stream flow moderation and improved water storage	Reduced flood damage and flood-management costs.
Bank stabilization and sediment and pollution control	Improved water quality. Reduced demand for water filtration and treatment. Reduced landslides and related damage and clean-up costs.
Large woody debris and channel dynamics	Reduced flood damage and flood-management costs.
Well-functioning riparian areas in general	Amenity and intrinsic values associated with riparian areas.
Ecological Functions (Wildlife Characteristics)	
Habitats of concern and habitats for unique and sensitive species	Increased population of salmon and associated increase in commercial, recreational, spiritual and intrinsic value.
Well-functioning wildlife habitats in general	Amenity and intrinsic values associated with wildlife habitat.

Source: ECONorthwest 2003.

Describing the value of ecosystem services is more challenging than describing the value of development related attributes. No single measure of the economic value of ecosystem services captures the complete value of all services provided by riparian corridors and upland wildlife habitat. ECONorthwest's literature review[31] describes various studies (e.g., hedonic analysis, replacement cost, avoided cost, travel cost, contingent valuation, benefit-transfer) that provide information and perspectives on the value of ecosystem services. The review also reports values for a range of ecosystem services (e.g., flood management, water quality, habitat that supports salmon, amenity and intrinsic values) as described in academic literature and other sources.

During the inventory process, regionally significant riparian corridors and upland wildlife habitat were determined based primary and/or secondary ecological services they provide. ECONorthwest concluded in their literature review that Metro's inventory and ranking of riparian corridors and upland wildlife habitat provide a basis from which to identify the ecosystem services provided by this habitat that have value to society. Even though the inventory ranking did not focus on the economic value of these habitats, it provides insights into the relative economic importance. That is, resources that ranked high (for ecological functions) provide more of the type of ecosystem services that society values than do areas that ranked low.

For the ESEE analysis, riparian corridors and upland wildlife habitat were divided into six classifications (three riparian, three wildlife), each representing discreet areas on the landscape

[31] Appendix C: *Final Draft Literature Review for the Economic Portion of Metro's Goal 5 ESEE Analysis* (October 2004).

(see description in the *Conflicting Use* chapter). This was done to distinguish higher value habitat from lower value habitat for consideration of allow, limit and prohibit consequences. This analysis assumes that areas that provide more of the ecological functions and wildlife characteristics provide more ecosystem services and value to society than do areas that provide fewer functions and characteristics. It also assumes that actions that enhance or protect ecosystem services will have positive economic consequences, and actions that degrade these services will have negative economic consequences, specific to these services. For purposes of this analysis, the six classifications have been grouped into three categories: high value, medium value and low value (see Table 4-2).

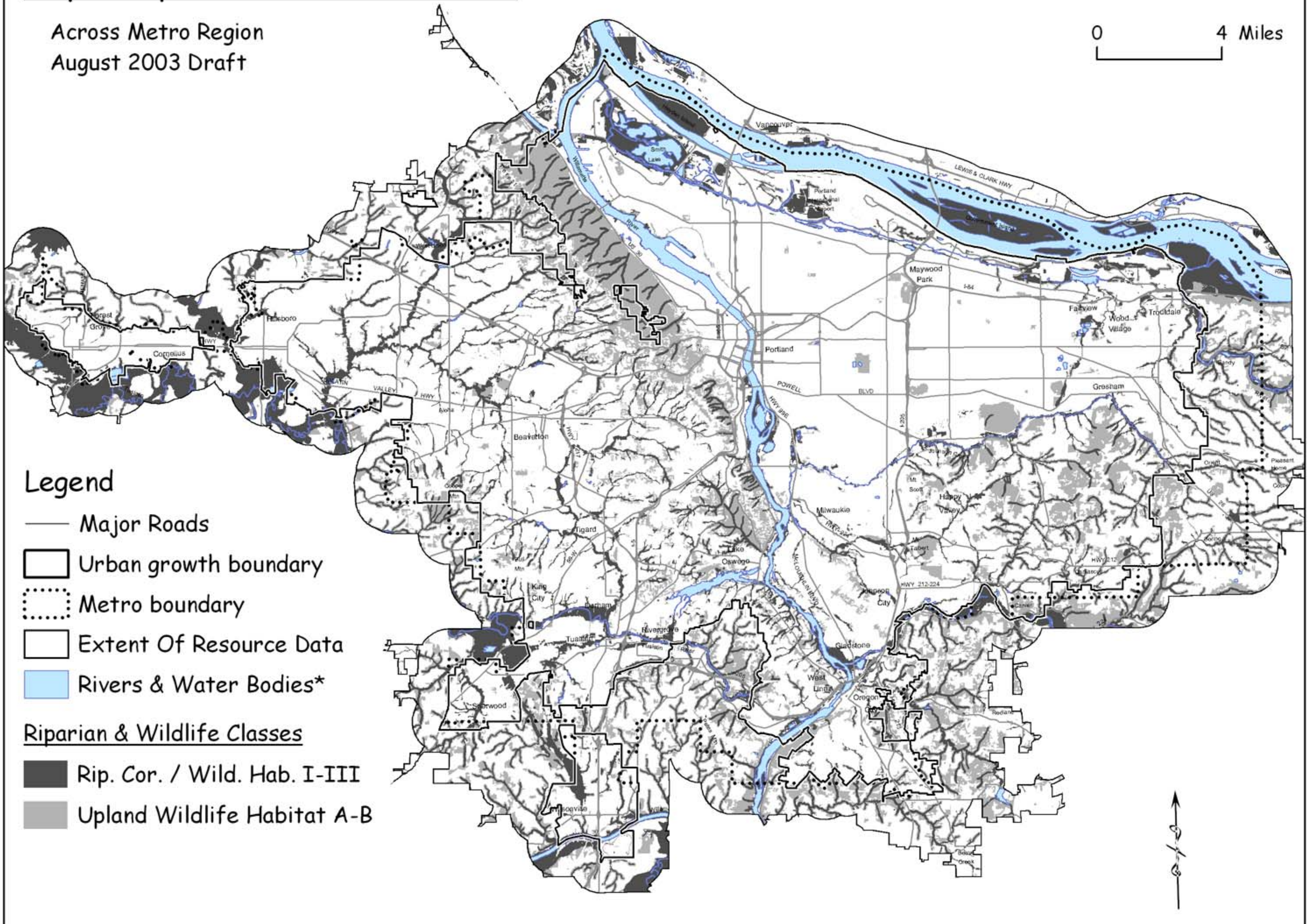
Table 4-2. Ranking for economic importance for ecosystem services.

High Value Habitat	Medium Value Habitat	Low Value Habitat
Class I riparian/wildlife corridors	Class II riparian/wildlife corridors	Class III riparian corridors
Class A upland wildlife habitat	Class B upland wildlife habitat	Class C upland wildlife

Map 4 shows the distribution of the riparian and wildlife habitat classes across Metro's jurisdiction. The map shows that with one notable exception, the area between the Willamette and Columbia rivers, fish and wildlife areas cover much of Metro's jurisdiction. The areas with little or no fish or wildlife habitat are historically the most intensely developed areas. Map 4a shows the distribution of the highest valued habitat lands: Class I riparian/wildlife corridors and Class A upland wildlife habitat.

Map 4: Riparian & Wildlife Classes

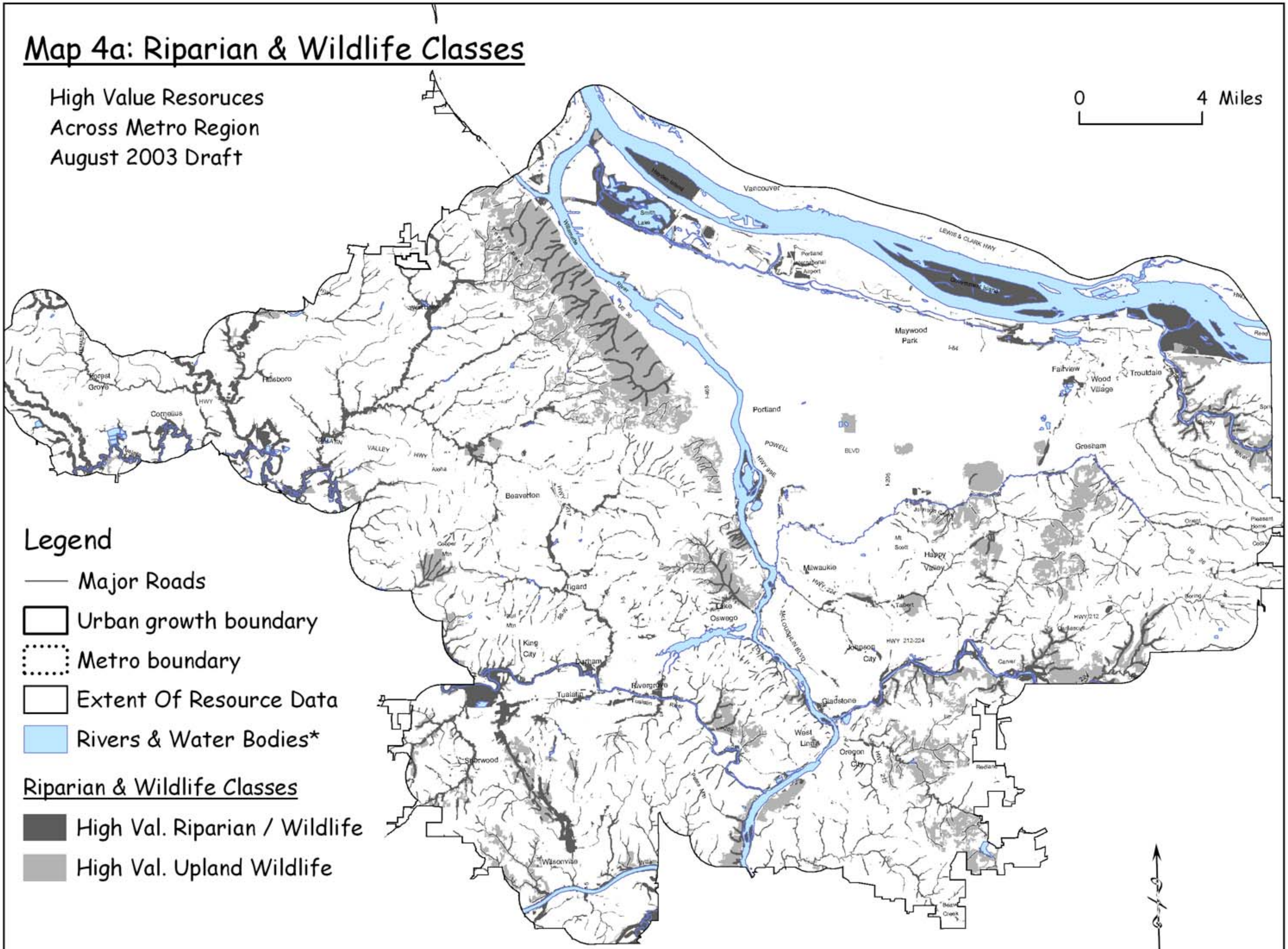
Across Metro Region
August 2003 Draft



*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps091103\Map 4 Riparian & Wildlife Classes.mxd

Map 4a: Riparian & Wildlife Classes

High Value Resoruces
Across Metro Region
August 2003 Draft



Legend

Major Roads

Urban growth boundary

Metro boundary

Extent Of Resource Data

Rivers & Water Bodies*

Riparian & Wildlife Classes

High Val. Riparian / Wildlife

High Val. Upland Wildlife

*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps091103\Map 4a Riparian and Wildlife.mxd

What are the interactions between development value and ecosystem services value of fish and wildlife habitat?

The *Conflicting Use* chapter described lands within the UGB, in UGB expansion areas and the remaining areas within Metro's jurisdiction (outside the UGB) in various ways. This section relies on that data and other data generated from this economic analysis to provide insight on the amount and distribution of significant interactions between development use and habitat protection. This information is relevant because the economic consequences of allowing, limiting, or prohibiting development differs by development value and ecosystem services value.

To provide background for this analysis, this section begins by recapping information from the *Conflicting Use* chapter on the development status of fish and wildlife habitat, and the potential conflicts based on generalized regional zones. It then presents data and analysis on the economic interactions between development value (land value, employment density, 2040 design types) and habitat type (Class I-III riparian corridors, Class A-C upland wildlife).

Development status of fish and wildlife habitat and impact areas

The development status is relevant to the economic analysis because it can influence the type, amount and timing of the economic consequences of allow, limit and prohibit decisions. Of the four development categories shown in Table 4-3 below, lands in the developed/park status would be least affected by Metro's Goal 5 decisions. To the extent that lands in this development status includes private lands such as golf courses, these uses may be affected in some way by Goal 5 decisions, but any impact will be more limited compared with potential impacts to land in developed urban uses.

Table 4-3: Fish and wildlife habitat by development status and as a percentage of total lands in the development status in the UGB (2002).

Development Status	% of Fish & Wildlife Habitat	% of Total in Development Status
Developed (parks)	34%	66%
Developed (urban)	28%	10%
Vacant (constrained)	16%	67%
Vacant (buildable)	22%	41%
Total	100%	(not applicable)

Development on lands in the vacant constrained status is already affected more by Title 3 (Water Quality and Flood Management) and other regulations. Goal 5 decisions may have impacts on these lands; however, it will be to a lesser degree than on vacant land unconstrained by Title 3 or other regulations. Goal 5 decisions may affect lands in the developed/urban status in the future if the properties are redeveloped or existing uses expand to cover more of the property. Lands in the vacant buildable status may be most immediately affected by Goal 5 decisions.

Table 4-3 also shows habitat lands as a percentage of total lands (both fish and wildlife habitat and non-fish and wildlife habitat) in development categories in the UGB. For example, 34 percent of fish and wildlife habitat are in the developed/parks category and they account for approximately 66 percent of the total developed/parks in the UGB. Developed/urban lands account for 28 percent of fish and wildlife habitat, but these lands represent just 10 percent of total developed/urban acres in the UGB. Vacant constrained lands contain 16 percent of the fish and wildlife habitat, representing 67 percent of total vacant constrained acres in the UGB. Twenty-two percent of fish and wildlife habitat is vacant buildable, and these lands account for a significant percentage (41 percent) of the total vacant buildable acres in the UGB.

Figure 4-1: Development status of impact areas.

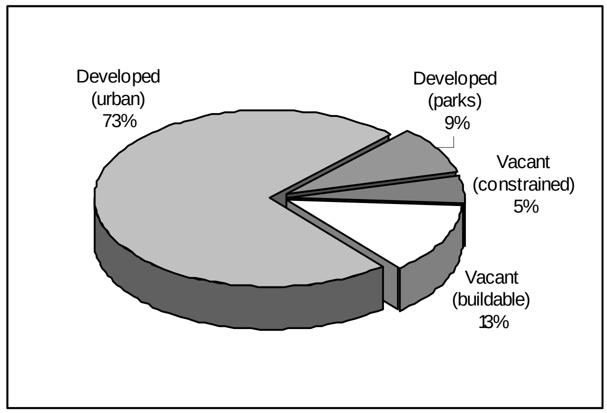
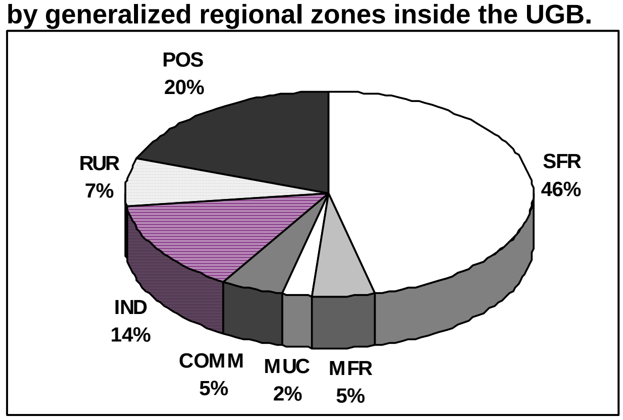


Figure 4-1 shows that most impact areas (see Chapter 2: *Impact Areas* for definition) are developed as urban. The distribution of development values for impact areas follow the distributions of land value, employment density and 2040 design types described earlier for lands containing fish and wildlife habitat. Most impact areas are characterized by low land value or employment density, or design types that have low land value and employment.

Fish and wildlife habitat by generalized regional zones

As Figure 4-2 shows, approximately 46 percent of the fish and wildlife habitat occur on lands zoned as single-family residential. Other zones with a significant percentage of fish and wildlife habitat are parks and open space (20 percent) and industrial (14 percent). Together, these three zones account for 80 percent of the fish and wildlife habitat.

Figure 4-2: Percentage of fish & wildlife habitat by generalized regional zones inside the UGB.



Lands outside the UGB and within Metro's jurisdiction are primarily zoned rural residential, and agricultural and forestry lands. Relative to the Portland City center, these lands have low land value and employment density. These lands have not yet been categorized by 2040 design types.

Fish and wildlife habitat classifications

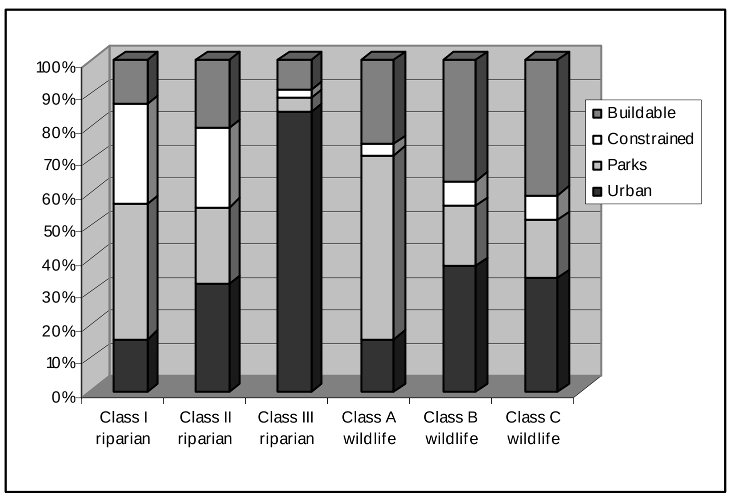
Fish and wildlife habitat classifications are defined in the *Conflicting Use* chapter. Table 4-4 shows the percentage of fish and wildlife habitat in each classification. Notice that the percentage declines from Class I to Class III and from Class A to Class C. Fifty-six percent of the inventory lands is in high value riparian/wildlife corridors (Class I) and upland wildlife habitat (Class A). Twenty-seven percent of the inventory land is medium value (Class II/B) and the remainder (17 percent) is low value fish and wildlife habitat.

Table 4-4: Percentage of fish and wildlife habitat by habitat classifications.

Fish and wildlife habitat classification	Percent of total fish & wildlife habitat
Riparian/wildlife Class I	32%
Riparian/wildlife Class II	14%
Riparian Class III	8%
Upland Wildlife Class A	24%
Upland Wildlife Class B	13%
Upland Wildlife Class C	9%
Total	100%

Figure 4-3 shows that, in general, the percentage of land in a given habitat type (i.e., riparian/wildlife corridors, upland wildlife habitat) that is developed as urban increases moving from high value (Class I/A) habitat to low value habitat (Class III/C). For example, 16 percent of Class I riparian/ wildlife corridors is developed as urban, whereas 85 percent of Class III is developed as urban. These results are consistent with the map of significant fish and wildlife habitat (Map 4), which shows very few significant resources in areas with the longest history of more intensive urban development.

Figure 4-3: Fish and wildlife habitat classification by development status.



Much of the Class I/A land is in parks and opens space: 41 percent of Class I lands and 56 percent of Class A lands. This percentage drops significantly when moving to Class II/B, 23 percent and 18 percent, respectively.

The greatest percentage of vacant constrained land falls in Class I and II riparian/wildlife corridors (30 percent and 24 percent, respectively). This makes sense because many of these areas are located in floodplains. In the vacant buildable status, a higher percentage of habitat lands is upland wildlife habitat compared to riparian/wildlife corridors.

Development value

Development value, or the economic importance of land for development, is measured by land value, employment value, and 2040 design type hierarchy. The following analysis describes the interaction between individual measures of development value and fish and wildlife habitat.

Land value

Table 4-5 below demonstrates that the percentage of fish and wildlife habitat classifications with no land value (as determined by tax assessors)[32] declines from Class I riparian/wildlife and Class A upland wildlife habitat to Class III riparian and Class C upland wildlife. The percentage of lands with low and medium land value increases across these same classes of riparian and upland wildlife habitat. None of the lands in Class I and only three percent of lands in Class III have high land value. One percent of land in the remaining classes are categorized as having high land value.

Map 1a shows the overlap of the three classes of land value on fish and wildlife habitat. Map 1b shows the overlap on high valued habitat lands (Class I/A) only. These maps illustrate the distribution of land value described in Table 4-5. Comparing Map 1a with Map 4 (Riparian and Wildlife Classes) shows that a significant portion of the lands that contains fish and wildlife habitat does not support development value as measured using land value. Map 1b shows that a relatively small percentage of the fish and wildlife habitat that support land value are ranked high valued habitat (Class I/A).

Table 4-5: Percentage of fish and wildlife habitat by land value.

Land Value	Riparian/ Wildlife I	Riparian/ Wildlife II	Riparian III	Upland Wildlife A	Upland Wildlife B	Upland Wildlife C
% of habitat with no land value (as determined by tax assessor)	43%	25%	7%	57%	19%	19%
% of habitat with **low** land value	48%	61%	69%	38%	59%	62%
% of habitat with **medium** land value	9%	14%	22%	4%	22%	18%
% of habitat with **high** land value	0%	1%	3%	1%	1%	1%
Total	100%	100%	100%	100%	100%	100%

Employment Value

Table 4-6 lists the percentage of fish and wildlife habitat classifications that does not support employment and, the percentage categorized as having low, medium, and high employment density, relative to the Portland city center.[33] The table shows that much of the fish and wildlife habitat is zoned for uses that does not support significant amounts of employment. For example,

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[32] Excludes a measure of the land value of public institutions, such as parks and schools, and public infrastructure such as roads, sewer and water services.

[33] See the full table of interactions in the Appendix for the number of acres by zoning type ranked low, medium and high employment density.

83 percent of Class I riparian/wildlife corridors and 95 percent of Class A upland wildlife habitat are zoned for single-family residential, multi-family residential, rural, and parks and open space. Of the acres in zonings that support employment, such as industrial, commercial and mixed use, 11 percent of Class I lands and three percent of Class A lands are categorized as having low employment density relative to the Portland city center.

In general, the percentage of lands that does not support employment declines from Class I/A to Class III/C. However, the percentage of lands with low employment value increases from Class I/A to Class III/C. Two out of the six classes of significant fish and wildlife habitat, Class II and III, have lands designated as high employment value. However, these lands represent a very small percentage, one and two percent respectively, of the total lands in these classes.

Table 4-6: Percentage of fish and wildlife habitat by employment density value.

Employment Density	Riparian/ Wildlife I	Riparian/ Wildlife II	Riparian III	Upland Wildlife A	Upland Wildlife B	Upland Wildlife C
% of habitat that does not support employment	83%	72%	51%	95%	91%	75%
% of habitat supporting **low** employment	11%	18%	30%	3%	5%	18%
% of habitat supporting **medium** employment	6%	9%	17%	2%	4%	7%
% of habitat supporting **high** employment	0%	1%	2%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%

Map 2a shows the overlap of the three classes of employment density on all classes of fish and wildlife habitat. Map 2b shows the overlap of the three classes of employment density on high valued habitat (Class I/A) only. These maps illustrate the distributions shown in Table 4-6. Maps 2a, employment density, and Map 4, fish and wildlife habitat inventory, illustrate that much of the inventory is zoned parks and open space or residential, which are not considered employment generating uses. Also, of the habitat lands that do support employment, very little of these lands support high employment densities. Map 2b shows the same trends but for high valued habitat lands (Class I/A) only. Comparing Map 1a with Map 2a shows that more of the fish and wildlife habitat lands support development value as measured by land value compared with development value measured by employment density.

2040 design types

Table 4-7 shows the distribution of fish and wildlife habitat classifications by the 2040 design type hierarchy. This distribution differs from the trends described for land value and employment density. In general, more of the fish and wildlife habitat have high economic value from a policy perspective than from a land value or employment generation perspective. Map 3a shows the overlap of the three design type priorities on all classes of fish and wildlife habitat. Map 3b shows the same overlap but for high valued habitat lands (Class I/A) only. As with land value and employment, much of the fish and wildlife habitat does not support development values as measured by 2040 design types (see Map 3a compared with Map 4). Map 3b and Map 4 show that, relative to the total distribution of fish and wildlife habitat, the overlap of high valued habitat with primary 2040 design types covers a small area.

Table 4-7: Percentage of fish and wildlife habitat by 2040 design type hierarchy.

2040 Design Type Hierarchy	Riparian/ Wildlife I	Riparian/ Wildlife II	Riparian III	Upland Wildlife A	Upland Wildlife B	Upland Wildlife C
% Other design types that do not support development value	35%	15%	2%	52%	13%	10%
% Tertiary **(low)**	48%	60%	52%	44%	79%	68%
% Secondary **(medium)**	5%	6%	13%	2%	3%	7%
% Primary **(high)**	12%	18%	33%	2%	5%	15%
Total	100%	100%	100%	100%	100%	100%

Comparing Table 4-7 with Tables 4-5 and 4-6 illustrates that more fish and wildlife habitat have development value when ranking these lands using design types than rankings based on land value or employment. However, a significant percentage of lands still falls in the low valued development category (tertiary). Except for Classes A and B (upland wildlife habitat), which have a relatively small percentage of land in the high category (primary), the other classes have a significantly larger percentage of land in the high category, relative to land value and employment measures. As illustrated in the next table (Table 4-8), much of this high valued land is zoned for industrial use.

Single-family residential, parks and open space, and industrial generalized regional zones account for 80 percent of significant fish and wildlife acres (see Figure 4-4). Cross referencing the number of habitat acres for these zoning types with primary, secondary, tertiary and other 2040 design types illustrates interactions between habitat land and future land use as described by the design types. Table 4-8 shows the major interactions.

Table 4-8: Interactions between fish and wildlife habitat by zoning and 2040 design types hierarchy in the UGB (2002).

Generalized Regional Zones	% of Fish & Wildlife Habitat Classified as Tertiary & Other	% of Fish & Wildlife Habitat Classified as Primary
Single-family residential	98%	1%
Parks and open space	98%	0.3%
Industrial	33%	60%

Source: Data analysis by Metro staff and ECONorthwest.

Ninety-eight percent of fish and wildlife habitat acres zoned as single-family residential and parks and open space is classified as tertiary or other design types, but only 33 percent of industrial acres is classified by these design types. In contrast, sixty percent of fish and wildlife habitat acres in industrial zoning is classified as a primary 2040 design type, with one percent or less of single-family and parks and open space acres in the primary design type.

As illustrated in Tables 4-5 and 4-6, estimating development value using land value or employment found that the large majority of fish and wildlife habitat acres either do not support development value or have a low value, relative to acres in the Portland city center. Estimating development value using 2040 design types has similar results for land in single-family or parks and open space zoning but not for acres in industrial zoning, as noted above. To the extent that 2040 design types describe future development patterns in the UGB, it appears that the future interactions between high development values and significant fish and wildlife habitat will occur mostly on land zoned for industrial use.

Combined measures

The analysis above describes the interaction between *individual* measures of development value, for example, land value, employment, 2040 design types, and fish and wildlife habitat. The following analysis describes the interactions between the *combined* measures of development values and significant fish and wildlife habitat.

As described above, the development value of acres containing significant habitat was ranked based on high, medium, and low land values and employment density. For these same acres development value is also described using primary, secondary, tertiary and other 2040 design types. The "other" design type includes parks, open space, and rural lands, which are expected to have a low development value.

Table 4-9 describes the interactions between the combined measures of development value and fish and wildlife habitat for the three zoning types, single-family residential, parks and open space and industrial, which account for 80 percent of the acres of significant habitat. The second column in Table 4-9 lists the percentage of habitat acres that fall into the "other" design type. The percent of habitat acres that score low on all three measures of development value is listed in the third column. The fourth column lists the percentage of habitat acres that score at least one medium value and no high values. The percentage of habitat acres that scored high on at least one measure of development value is shown in the fifth column.

Table 4-9: Interactions fish and wildlife habitat by zoning and combined measures of development value in the UGB (2002).

Generalized Regional Zones	% of Habitat Acres Classified as "Other" Design Type	% of Habitat Acres with All Low Measures	% Habitat Acres with at Least One Medium Measure, No High Measures	% of Habitat Acres with at Least One High Measure
Single-family Residential	17%	61%	21%	2%
Parks and Open Space	81%	17%	2%	0.3%
Industrial	10%	14%	15%	61%

Source: Data analysis by Metro staff and ECONorthwest.

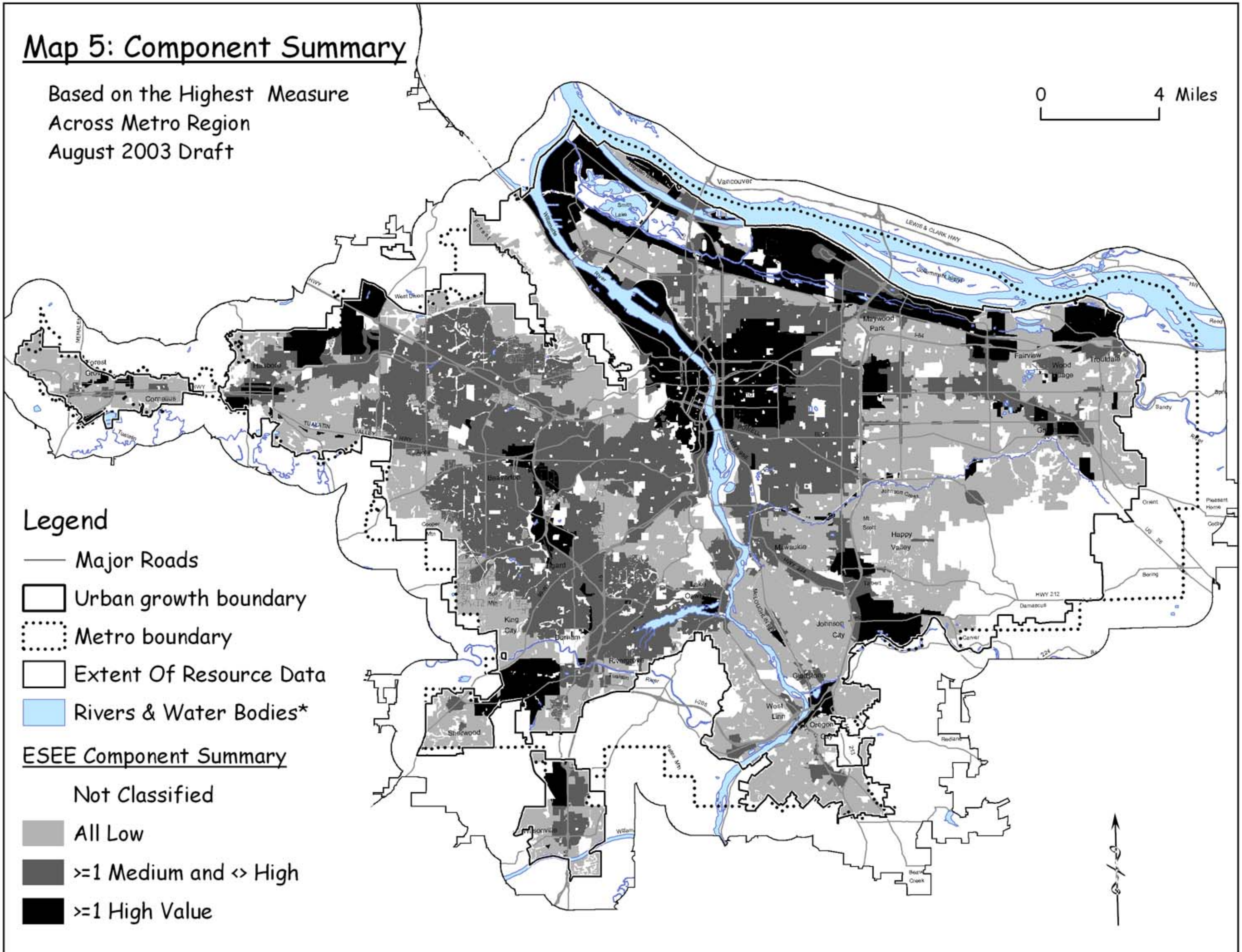
Similar to the results illustrated in Table 4-8, Table 4-9 shows how interactions for industrial lands differ from interactions for single-family or parks and open space. For example, approximately 17 percent of fish and wildlife habitat in single-family zoning is in the "other" design type; 61 percent scored low on all three measures of development value. For parks and open space the percentage of habitat acres in these two categories is even higher, approximately 98 percent. In contrast, for habitat acres in industrial zoning, approximately 24 percent is in these two low categories, with approximately 61 percent of the industrial acres scoring high on at least one measure of development value. As noted in Table 4-7, most of these acres scored high on the 2040 design type measure of development value. A very small percentage of habitat acres in single-family or parks and open space scored high on any of the measures of development value.

Maps 5, 5a and 5b show the distribution of the three combined measures: areas that scored low on all three measures of development value, areas that scored medium on at least one measure without scoring high on any measures, and areas that scored high on at least one measure. Map 5a shows the overlap of the combined measures on all habitat lands and Map 5b shows the overlap of combined measures on high valued habitat lands (Class I/A) only.

Comparing Map 5 with Maps 1 (Land Value), 2 (Employment Density) and 3 (2040 Design Type Hierarchy) illustrates that areas outside the Portland city center that ranked high on at least one measure ranked high on the 2040 design types. Map 5a shows this same distribution for lands that overlap with significant fish and wildlife habitat. As shown on Map 5b much of the high value fish and wildlife habitat lands overlap with lands that scored low on all three measures of development value. However, for a significant portion of this map there is an overlap of high valued habitat with areas that scored high on at least one measure of development value. In most cases these lands scored high on 2040 design types and are zoned industrial.

Map 5: Component Summary

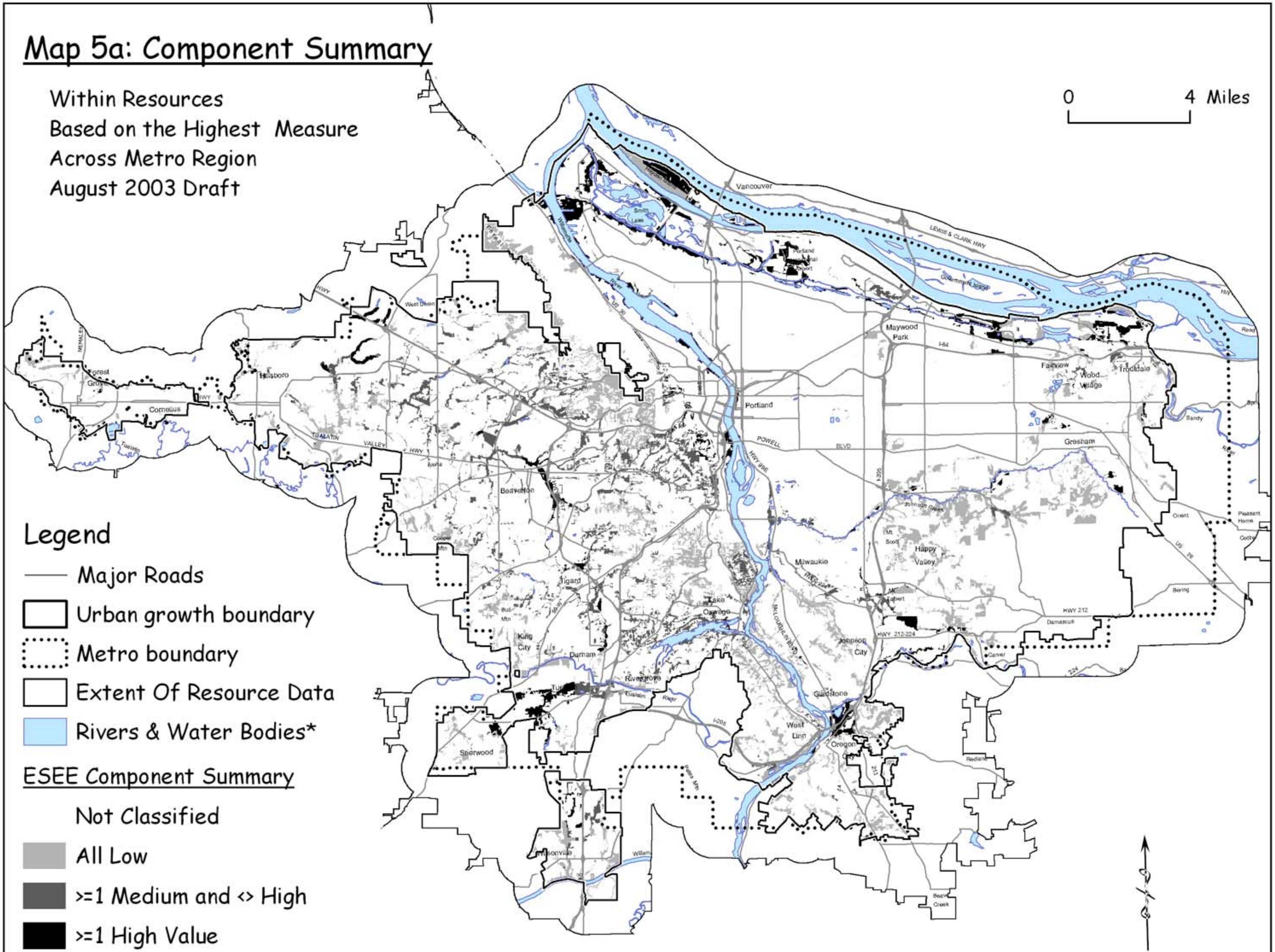
Based on the Highest Measure
Across Metro Region
August 2003 Draft



*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps\Map 5 Component Summary.mxd

Map 5a: Component Summary

Within Resources
Based on the Highest Measure
Across Metro Region
August 2003 Draft



Legend

Major Roads

Urban growth boundary

Metro boundary

Extent Of Resource Data

Rivers & Water Bodies*

ESEE Component Summary

Not Classified

All Low

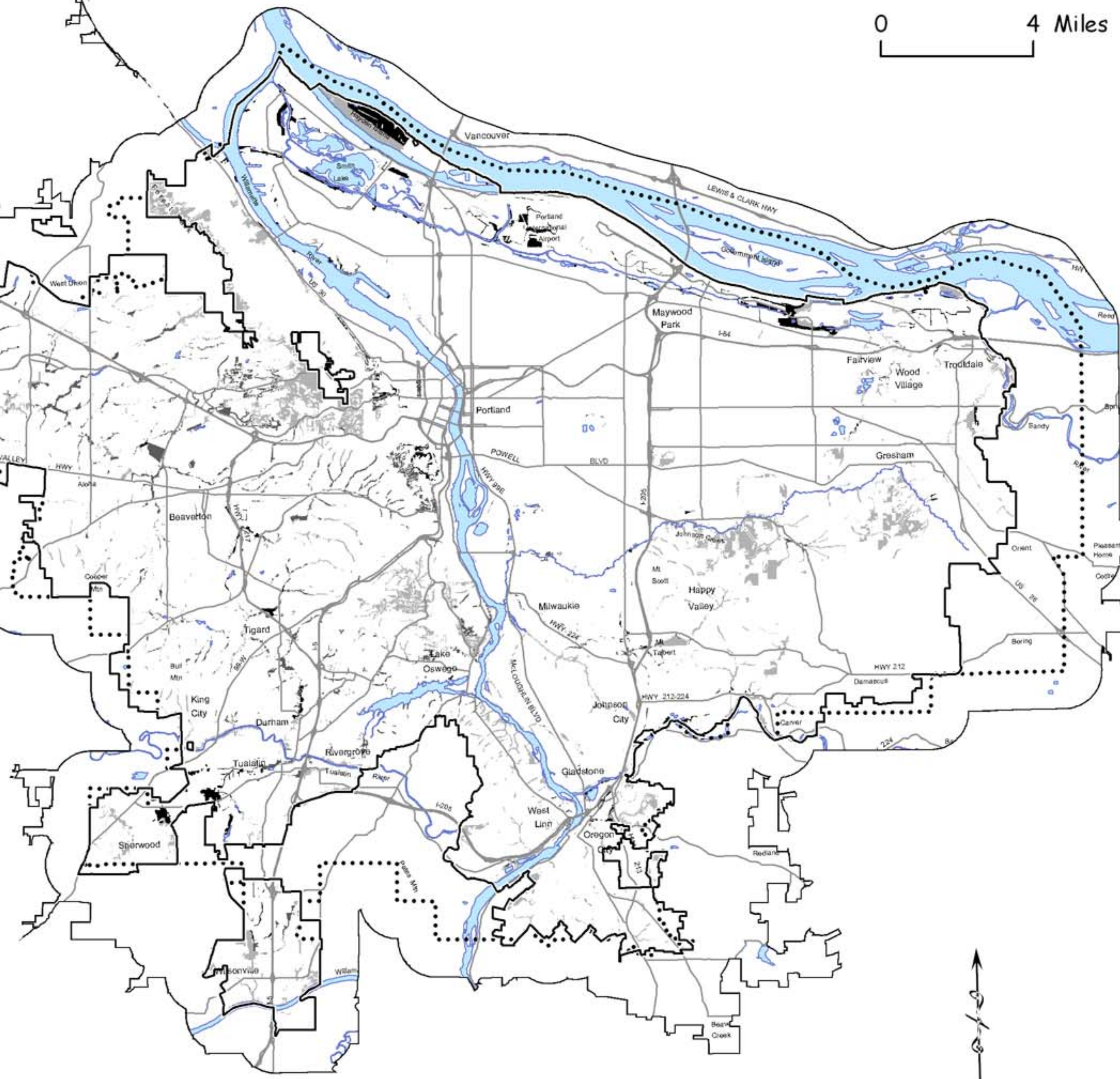
>=1 Medium and <> High

>=1 High Value

*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps091103\Map 5a Employment Density.mxd

Map 5b: Component Summary

Within High Value Resources
Based on the Highest Measure
Across Metro Region
August 2003 Draft



Legend

Major Roads

Urban growth boundary

Metro boundary

Extent Of Resource Data

Rivers & Water Bodies*

ESEE Component Summary

Not Classified

All Low

>=1 Medium and <> High

>=1 High Value

*rivers & water bodies greater than 2 acres in size - J:\houk\Goal5\ESEE\EconomicAnalysis\ECONorthwest\maps\Map 5b Component Summary.mxd

Summary of interactions

- *Land value, zoning and habitat:* The zoning for a majority of fish and wildlife habitat lands, approximately 64 percent, support development value. The remainder fall into POS zoning or contain water bodies. Of the lands with development value, most fall into the low land value category.
- *Employment, zoning and habitat:* Approximately 78 percent of the fish and wildlife lands do not support employment. These lands are zoned SFR, MFR, RUR and POS. Of the lands that do support employment, most fall into the low employment category.
- *2040 design type and habitat:* The distribution of fish and wildlife habitat lands by 2040 design types differs from the distributions described above for land value and employment. In general, categorizing lands using 2040 design types yields a distribution with a greater percentage of the lands having development value, and for the lands that have development value, more of the lands rank in the higher-valued design types.
- *2040 design type, zoning, and habitat:* Three generalized regional zones, SFR, POS and IND, account for 80 percent of the habitat acres. Ninety-eight percent of the fish and wildlife habitat lands zoned SFR and POS fall into the lowest design type[34]. In contrast, 33 percent of the lands zoned IND fall in the lowest design type and 60 percent is ranked in the primary, or highest, design type.
- *Land value, employment, 2040 design type, zoning and habitat:* Focusing on fish and wildlife habitat lands zoned SFR, POS and IND, approximately 98 percent of POS lands, and approximately 78 percent of SFR lands ranked in the lowest category for all three measures of development value (land value, employment and 2040 design type). In contrast, 25 percent of lands zoned IND ranked in the lowest categories for all three measures of development value. Over 60 percent of IND lands ranked in the highest category for at least one measure.
- *Goal 5 allow, limit, prohibit impacts:* The large majority of Goal 5 allow, limit and prohibit decisions will impact lands zoned SFR, POS and IND. Impacts on lands zoned SFR and POS will have little or no employment impacts and will affect lands ranked low on the land-value scale. The majority of impacts on lands zoned IND will affect lands ranked high on at least one measure of development value.

The fact that Goal 5 decisions would primarily affect acres with lower land values and employment densities does not mean that limit or prohibit decisions on these acres would generate trivial economic consequences. The low category for these development values are relative to land values and employment densities found in the Portland city center and do not represent an absolute measure of land value or employment. The actual impacts of limit or prohibit decisions on property values or employment will depend on the specifics of the decision, the details of the Goal 5 program that implements the decision, actions that may mitigate any negative impacts, and specifics of the individual parcels affected.

[34] This includes lands in the tertiary design type, and lands in the "other" design type that includes parks, open space and rural reserves.

What are the potential economic consequences of allowing, limiting or prohibiting conflicting uses?

This section describes the economic consequences of decisions to allow, limit, or prohibit land uses that conflict with significant fish and wildlife habitat. Four categories of economic consequences of Goal 5 decisions are considered in this analysis:

- The changes in the values of the goods and services citizens receive are referred to as *economic values*. The economic values at issue in this analysis include the impact of Goal 5 decisions on property values (location and site factors) and the values of ecosystem goods and services provided by riparian and wildlife areas (e.g., flood management, water quality, habitat that supports salmon, amenity and intrinsic values).
- The changes in the level of economic activities within the local economy such as the impact on the level of local employment and income, changes in tax payments and transportation impacts are referred to as *economic impacts*.
- The changes in the development patterns over the coming decades are outlined by the *2040 design types.*
- The changes in the distributions of costs and benefits within the economy, especially changes affecting groups of special concern, such as property owners that shoulder a disproportionate amount of the negative consequences of a policy decision, are referred to as *economic equity*. Equity tradeoffs in this analysis include tradeoffs by type of land use, as described by zoning type, and the geographic distribution of economic tradeoffs.

The sections that follow describe: 1) the baseline for the analysis of economic tradeoffs, 2) the potential economic consequences based on the four categories listed above, 3) the summary of economic consequences of allow, limit or prohibit decisions and 4) the factors that influence economic consequences.

Baseline for the analysis of economic tradeoffs

The existing, non-Goal 5, regulatory protection of fish and wildlife habitat provides the baseline for the analysis of economic tradeoffs of Goal 5 allow, limit and prohibit decisions. An allow decision will permit developing significant habitat to the limits allowed by existing, non-Goal 5 protection measures. Goal 5 limit or prohibit decisions provide a marginal *increase* in protection above and beyond existing protection measures.

For lands in Metro's jurisdiction, Title 3 of the Urban Growth Management Function Plan (Title 3) describes existing protection measures and is the baseline against which the Goal 5 management decisions will be measured. Title 3 regulates development that affects water quality, flood management and fish and wildlife conservation.

Because Title 3 implements statewide land-use goals, it affects lands in all the local jurisdictions within Metro's jurisdiction. Local jurisdictions, however, may adopt protection measures that exceed Title 3 regulations. The economic tradeoffs of Goal 5 allow, limit and prohibit decisions in these jurisdictions will differ from the tradeoffs in jurisdictions where Title 3 represents the baseline protection in the following ways:

- Allow decisions will overestimate the negative impacts of development on Goal 5 fish and wildlife habitat and associated ecosystem services. An allow decision will also overestimate the benefits on development values.
- Limit and prohibit decisions will overestimate the benefits of habitat protection and will overestimate the negative impacts on development values.

Potential economic consequences

This section describes potential economic consequences by the four economic factors – economic values, economic impacts, 2040 design types and economic equity – and how Goal 5 decisions may impact these factors.

Economic Values

Property values in development – the factors that affect the development value for land fall into two general categories: location factors and use factors.
Location factors include:

- Availability and quality of public infrastructure, for example, roads, sewer, water and electric. Land-use decisions that hinder or make more difficult the provision of infrastructure services may negatively impact the values of the affected properties.
- Access to the site. Actions that limit or impede access to a site may negatively impact the site's property value.
- Agglomerative economies associated with the location. Decisions that promote or allow the development of agglomerative economies, such as clustering of commercial or industrial developments, will help maintain or enhance development values of these activities. Decisions that inhibit the development of such agglomerative economies may have the opposite effect.
- Existing zoning or other land-use regulations. Zoning and other regulations can have positive and negative impacts on a property's value. For example, waterfront properties zoned for industrial use might have higher property values if they were zoned residential. In another example, a residential zoning may protect property values by excluding incompatible land uses (e.g., a gas station).

Use factors include:

- Amenities of the site, for example, views, access to parks, water and other open spaces. Actions that protect or enhance a location's amenities, may also protect or enhance the impact that amenities have on property values.
- Physical terrain, for example, hilly or flat. Grading hills and other changes to a parcel's physical terrain may increase the parcel's usability and development value. Actions that limit grading hills or other changes to a parcel's physical terrain may negatively impact the parcel's property value.
- Lot size, shape and buildable area. Actions that limit a parcel's usable area may negatively impact the parcel's development value. Impacts from limiting a parcel's usable area will likely be the most common way that limit or prohibit decisions could influence development values.

Values of ecosystem services – Chapter 6 of the report describes the environmental consequences of allow, limit and prohibit decisions on fish and wildlife habitat and on the associated ecological functions and wildlife characteristics. As described in literature review (see Appendix C), the ecological functions of fish and wildlife provide ecosystem services that benefit society. Actions that protect or enhance these services will also protect and enhance their value. Actions that degrade ecosystem services will have the opposite effect. As services degrade, society either does without the service, restores the degraded habitat or replaces some lost or degraded services by building engineered projects (e.g., upgrading a water-treatment plant that provides clean water).

Ecosystem services include:

- Flood management. Fish and wildlife habitat help mitigate flooding by moderating flow intensities and absorbing runoff. Actions that reduce flood management services may increase flooding of area homes and businesses, and increase flood related damages and government expenditures for flood clean up and mitigation.
- Water quality. Fish and wildlife habitat help control soil erosion and landslides that cause sedimentation. Habitat areas also help filter toxins and sediment from surface runoff before they enter streams and other water bodies. Degrading these services may increase the flow of sediment and contaminants into area waters. Degraded water quality may increase filtration costs for businesses and municipalities. Increased concentrations of toxins and sedimentation may also increase the costs of projects mandated by regulatory agencies to bring water quality into compliance with federal and state water-quality laws (e.g., the Clean Water Act).
- Moderating water and air temperatures. Vegetation in fish and wildlife habitats provides shade that helps reduce air temperatures and the “heat island effect” in summer. Moderating air temperatures in summer helps reduce electricity costs associated with air conditioning. Actions that remove this vegetation may increase summer air temperatures and cooling costs.
- Stormwater services. Fish and wildlife habitats absorb rainfall that otherwise would flow into stormwater systems. Replacing these habitats with impervious surfaces will increase stormwater flows and management costs. These costs can be substantial.
- Salmon habitat. Fish and wildlife habitat support salmon populations and related commercial, recreational and cultural values. Actions that protect salmon habitats also help protect these values. Actions that degrade habitats may have the opposite effect.
- Amenities. Fish and wildlife habitat provide view, open space, and water-related amenities and associated amenity values for properties in proximity to habitat. Actions that protect these amenities also protect the contribution this habitat make toward property values. Actions that degrade the habitat have the opposite effect.
- Recreation. Fish and wildlife habitat support recreation activities including wildlife viewing, fishing and activities associated with parks and open space. Degrading these habitats may also degrade recreation related ecosystem services.
- Intrinsic and option values. Intrinsic values are the values people find inherent in a habitat or species for itself, rather from the use or consumption of the habitat. These values represent the amounts residents or society would pay to protect a habitat, or expect in payment to degrade the habitat. Option values represent the value of protecting a habitat or species for future use or enjoyment. Actions that degrade fish and wildlife habitat also degrade the intrinsic and option values associated with the habitat. Such decisions also increase the risks of an irreversible outcome, for example, extinction of a salmon species, which may have negative economic consequences in the future.

- Carbon sequestration. Chapter 7 describes the energy consequences of allow, limit and prohibit decisions on fish and wildlife habitat, including the carbon-sequestration benefits of trees and other vegetation. Removing the vegetation negatively impacts the sequestration benefits and associated economic value.

To the extent that fish and wildlife habitat provide multiple ecosystem service, the true or full values of services at risk from actions that degrade habitat are the cumulative values of the affected services.

Economic Impacts

Employment – for lands that support employment, e.g., commercial, industrial and mixed use, the factors that influence land value also influence employment. For example, actions that affect access to a site or a property's developable area will also likely affect the employment potential of the site. In general, however, Goal 5 decisions will impact land values more than employment (or income) for the following reasons:

- A large percentage of the fish and wildlife habitat are zoned for land uses that do not support employment. Of the remaining lands, many have low employment densities relative to densities in the Portland city center.
- A portion of the lands containing habitat zoned commercial or industrial have previously been developed and currently support employment. Goal 5 decisions will not affect this employment. A Goal 5 decision on these lands may affect future employment through redevelopment of properties.

Actions that protect or degrade fish and wildlife habitat may impact jobs that depend on these habitats. For example, protecting salmon habitat may help support jobs that depend on commercial and recreational salmon harvests. In this example, many of the jobs associated with salmon harvests may be located outside Metro's service area.

Income – income tradeoffs of protecting or degrading fish and wildlife habitat will follow employment tradeoffs

Property taxes **–** impacts of protecting or degrading fish and wildlife habitat will follow impacts on property values. This is especially true for lands zoned commercial and industrial that have not yet been developed. Limiting development on these lands may negatively impact property values and associated property taxes. Limiting development may have the opposite effect on property values and associated tax payments for residential property surrounding or adjacent to properties currently undeveloped. Protecting fish and wildlife habitat on these lands may have a beneficial impact in property taxes, especially over the long term.

Payroll taxes – the payroll tax tradeoffs of protecting or degrading fish and wildlife habitat will follow employment and income tradeoffs.

Business taxes – the business tax tradeoffs of protecting or degrading fish and wildlife habitat will follow the tradeoffs for property value, employment and income for lands zoned commercial, industrial and mixed use.

Transportation costs – transportation costs increase with the number of vehicle miles traveled (VMT). Planning guidelines that address transportation costs, such as the 2040 design types, promote more compact development that limits VMT and transportation costs. Actions that push development out towards the UGB or beyond will increase VMT and transportation costs relative to actions that promote more compact development.

2040 Design Types
The 2040 Growth Concept outlines the Portland metropolitan region's plan to accommodate expected population growth over the coming decades, while addressing housing, transportation, open space and employment needs. The 2040 design types represent land-use categories (e.g., central city, main streets, neighborhoods, rural reserves/open space) that embody the Growth Concept's transportation, housing and other land-use goals. The 2040 Growth Concept anticipates expected population growth while:

- Maintaining access to nature.
- Protecting wildlife habitat.
- Promoting efficient use of land.
- Supporting a vibrant economy.
- Providing transportation options.
- Promoting development along transportation corridors.
- Minimizing sprawl and VMT.

Activities that protect or degrade fish and wildlife habitat may have mixed impacts on the 2040 Growth Concept's goals and associated design types. Protecting and maintaining access to these habitats supports the growth concept and design types' emphasis on habitat protection. However, if protecting habitat displaces development to the extent that it promotes sprawl, expanding the UGB and the number of VMT, protection actions may inhibit or limit the design types. Alternatively, developing habitat may limit UGB expansion and associated consequences, but may also conflict with the growth concept's goals that address habitat protection and access to natural areas.

The growth concept's goals regarding development density and transportation considerations may mitigate the impacts of habitat protection on sprawl. Increasing the efficiency of land use by promoting higher development densities along transportation corridors complements the habitat protection goals by accommodating, to some extent, land uses that might otherwise be displaced to outside the UGB.

Economic Equity
Geographic distribution of impacts – in general, locations within Metro's jurisdiction that have been developed more intensely over longer periods of time have the least amount of fish and wildlife habitat. As a result, Goal 5 protection measures will have limited or no negative impacts on development in these locations.

Distribution of impacts by land use – approximately 80 percent of the lands containing fish and wildlife habitat fall into three generalized regional zones: single-family residential (SFR), parks and open space (POS), and industrial (IND). Potential economic tradeoffs associated with Goal 5 protection will fall primarily on lands in these zoning categories. As a group, lands in other zoning categories will experience limited Goal 5 economic tradeoffs.

Distribution of impacts by Goal 5 treatment **–** Goal 5 treatments will affect the distribution of positive and negative economic tradeoffs. Allow treatments do not increase habitat protection beyond Title 3 or local regulatory measures and place no additional restrictions on land use and development. Developers and property owners will enjoy most, if not all, of the benefits. Habitat-associated ecosystem services and those that benefit from the habitat and services will suffer most, if not all, of the negative economic tradeoffs. Results for prohibit treatments will have the opposite effect. Development interests will suffer most, if not all, of the restrictions. Habitat, ecosystem services, and those who benefits from the habitat and services will experience most, if not all, of the benefits. Limit treatments offer the most equitable distribution of tradeoffs because they generate positive and negative tradeoffs for development and resource interests.

Summary of economic consequences

Summarized below are some of the economic consequences of allowing, limiting or prohibiting conflicting uses.

Allow conflicting uses

Allowing conflicting uses means no additional protection of Goal 5 fish and wildlife beyond the baseline protection provided by Title 3, or by local protection measures that exceed Title 3 guidelines.

- No impediments to development or negative impacts on the development value of land.
- Development-related employment, income and taxes will be unaffected by Goal 5.
- No Goal-5 related increase in VMT, transportation costs or UGB expansion.
- Amenity-related property values and associated property taxes for undeveloped lands zoned SFR and RUR that are adjacent to Goal 5 habitat lands may be less for this scenario relative to limit and prohibit scenarios.
- Flood mitigation services will decline, flood damage and clean-up costs may increase.
- Erosion and sedimentation will increase, as will concentration of toxins in streams and other water bodies. Water-quality expenditures (e.g., for filtration and treatment) by businesses and municipalities may increase. Municipal expenditures that address water-quality regulations (e.g., the federal Clean Water Act) may increase.
- Summer temperatures and the urban "heat island effect" may increase with an associated increase in cooling costs.
- Developing fish and wildlife habitat will increase the amount of impervious surfaces, which will increase stormwater flows and treatment costs.
- Development that negatively impacts salmon habitat may affect commercial, recreational and cultural harvests. Municipal expenditures that address habitat regulations (e.g., Endangered Species Act) may increase.

- Degrading fish and wildlife habitat may negatively affect recreational opportunities and values that depend on these habitats.
- Negative impacts on intrinsic values for fish and wildlife habitat.
- Developing fish and wildlife habitat now or in the near-term precludes developing them in the future or protecting them for future generations. This reduces the option values associated with the habitats.
- Carbon sequestration and air-pollution removal will decline with an associated decline in air quality and related values of air-quality services.
- Businesses that rely on fish and wildlife habitat and associated ecosystem services may experience a decline in sales, employment and income relative to the limit or prohibit scenarios. Employment and business-related tax payments may also decline.
- Allowing conflicting uses will negatively affect the 2040 Growth Concept and design types that emphasize protecting habitat and maintaining access to habitat.
- The large majority, if not all, of the negative economic tradeoffs of this option affect fish and wildlife habitat, associated ecosystem services and economic factors (e.g., jobs, incomes and values, that depend on these habitats). Development interests suffer little or no negative economic tradeoffs.

Limit conflicting uses

Limiting conflicting uses strikes a balance between completely developing the Goal 5 fish and wildlife habitat and protecting them. This alternative provides opportunities including: developing lands in ways that minimize negative environmental and economic tradeoffs; supporting the development goals embodied by the 2040 design types; and protecting the most important habitats.

- Will generate a mix of positive and negative economic tradeoffs for development interests and for the habitats and associated ecosystem services. Developing habitat will generate positive impacts on development values, employment, income and tax payments. However, these impacts will be less than for the allow scenario. The habitat will likely suffer some degradation, but not to the extent generated under the allow scenario.
- The consequences for the 2040 design types will be mixed. Protecting fish and wildlife habitat to a greater extent, compared with the allow scenario, may increase VMT if protecting habitat displaces development and pushes it out toward the UGB or beyond. This may also increase the next UGB expansion and transportation costs. However, protecting habitat is consistent with the planning goals reflected in the design types.
- Will generate a more equitable distribution of positive and negative economic tradeoffs, compared with either the allow or prohibit scenarios. Development interests and habitat will both experience positive and negative economic tradeoffs.

Prohibit conflicting uses

Prohibiting conflicting uses will prevent development actions that conflict with, or degrade, fish and wildlife habitat. This scenario emphasizes habitat protection. Protection measures will exceed the baseline protection provided by Title 3, or by local protection measures that exceed Title 3 guidelines.

- Amenity-related property values and associated property taxes for lands zoned SFR and RUR that are adjacent to fish and wildlife habitat may be greater for this scenario relative to limit and allow scenarios.
- This alternative will provide the greatest amount of flood mitigation services and value.
- Erosion and sedimentation will be less than limit or allow alternatives, as will concentration of toxins in streams and other water bodies. Water quality expenditures (e.g., for filtration and treatment) by businesses and municipalities may be the least under this alternative. Municipal expenditures that address water quality regulations (e.g., the federal Clean Water Act) may decline, especially over the long term.
- This alternative will have the greatest mitigating effect on summer temperatures, the urban "heat island effect," and associated cooling costs.
- Prohibiting development in fish and wildlife habitat will generate the least amount of impervious surfaces, and will generate the least amount of stormwater flows and treatment costs.
- This scenario will protect the greatest amount of salmon habitat and may positively affect commercial, recreational and cultural harvests. Municipal expenditures that address habitat regulations (e.g., Endangered Species Act) may decline, especially over the long term.
- This alternative will preserve the greatest amount of recreational opportunities and the associated recreational values.
- The intrinsic and options values for the fish and wildlife habitat will be preserved.
- Maintaining the greatest amount of vegetation will maximize carbon sequestration, air pollutant removal and the related values of air quality services.
- This alternative will provide the greatest support to businesses that rely on fish and wildlife habitat and associated ecosystem services.
- Prohibiting conflicting uses will support the aspects of the 2040 Growth Concept and design types that emphasize protecting habitat and maintaining access to habitat.
- This alternative will have the greatest negative impact on the development value of land.
- Development related employment, income and tax payments will also suffer the greatest under this alternative.
- Aspects of the 2040 design types that minimize VMT and sprawl will be negatively impacted if protection measures displace development within the UGB.
- The large majority, if not all, of the negative economic tradeoffs of this alternative affect development interests. The economic values and activities supported by fish and wildlife habitat suffer little or no negative economic tradeoffs, relative to allow and limit alternatives.

Factors that influence economic consequences

The description of economic tradeoffs in the previous section assumes no reaction by stakeholders and decision makers that would impact the economic tradeoffs. This static approach ignores, for example, the possibility that restoring fish and wildlife habitat may mitigate some of the negative economic tradeoffs of development on these habitats. A more dynamic view of economic tradeoffs considers alternatives that could help mitigate negative tradeoffs and enhance positive tradeoffs. This section describes a number of these dynamic factors.

Substitutability of land uses

Moving proposed land uses that conflict with fish and wildlife habitat to alternative locations may mitigate negative economic tradeoffs for both the land use and habitat. The previously conflicting land use can take place without impacting habitat. Substituting a non-conflicting or less conflicting land use in the habitat area will protect, to some extent, the property's development value. Such a move will also protect, to some extent, the quality and quantity of the property's fish and wildlife habitat.

The feasibility of substituting land uses depends on the types of land uses at issue and the availability of suitable sites outside habitat areas. The more specific or unique the development requirements, the less likely the development can take place elsewhere. For example, water-dependent industrial development must take place in specific locations—relatively large lots with water access. This limits the extent to which the land use can avoid conflicting with habitat by moving elsewhere. By comparison, residential land uses have relatively few development specific requirements and take place throughout Metro's jurisdiction.

Expanding the Urban Growth Boundary

Protecting fish and wildlife habitat may reduce the amount of developable land within the UGB. If this is the case, expanding the UGB could mitigate this loss while protecting fish and wildlife habitat within the existing UGB. However, expanding the UGB may promote sprawl and negative sprawl-related impacts including increased VMT and transportation costs, and possibly minimizing the effectiveness of the 2040 design types.

Encourage development practices that minimize conflicts with fish and wildlife habitat

Encouraging development practices that minimize conflicts with resources may help mitigate negative economic tradeoffs for both development and the resources. These practices include low-impact development projects that minimize impervious surfaces and manage stormwater in ways that more closely mimic natural systems. Cluster developments for residential lands is another example. This type of development localizes housing sites and associated land-use activities (e.g., roads) while avoiding developing fish and wildlife habitat. In another example property owners may sell future development rights while retaining ownership without restrictions on existing land uses.

Restoring degraded fish and wildlife habitat

Restoring already-degraded fish and wildlife habitat could offset a portion of the negative impact of new development on habitat elsewhere. In some cases, restoration opportunities may lie outside the existing UGB or Metro's jurisdiction.

Economic consequences by generalized regional zone

Below is a brief description of the economic consequences by the seven generalized regional zones (matrices describing the consequences may be found in (See Appendix D):

- **Single-family residential (SFR):** Lands zoned SFR account for almost half, 46 percent, of Goal 5 fish and wildlife habitat. Protection actions on these lands will primarily affect property values and related tax payments with little or no direct impacts on employment and income. Since SFR developments typically retain more vegetation and tree cover than other types of development, this land use will conflict less with habitat and retain more ecosystem services and associated economic values than other development uses. Encouraging low impact developments and cluster development patterns may help mitigate negative economic tradeoffs for development and resources.

- **Multi-family residential (MFR):** MFR lands account for approximately five percent of Goal 5 fish and wildlife habitat. Economic tradeoffs will be similar to SFR lands except that MFR development typically retains less vegetation cover and fewer ecosystem services and associated values.
- **Commercial (COM):** Approximately five percent of Goal 5 fish and wildlife habitat are on lands zoned COM. Habitat protection actions may negatively affect property values, employment, income and related tax payments. COM developments involve extensive landscape modifications that negatively affect ecosystem services and the economic values of services. These negative impacts are comparable to, or greater than, the degradation of ecosystem services and values associated with MFR developments.
- **Industrial (IND):** IND lands account for approximately 15 percent of lands containing Goal 5 fish and wildlife. Economic tradeoffs will be similar in type and extent to tradeoffs for COM lands.
- **Mixed-use centers (MUC):** Approximately three percent of Goal 5 fish and wildlife habitat are on lands zoned MUC. Economic tradeoffs will be similar to developments on lands zoned MFR and COM. Limiting MUC developments will have mixed impacts on 2040 design types and the underlying 2040 Growth Concept. Protecting fish and wildlife habitat supports the Growth Concept's goals of maintaining access to nature and protecting habitat. Limiting MUC developments, however, may negatively impact the design type's emphasis on promoting more efficient land use and minimizing sprawl and VMT.
- **Rural residential (RUR):** RUR lands account for approximately seven percent of Goal 5 fish and wildlife habitat. Economic tradeoffs of developing RUR lands will be similar to SFR except less intensive given the more dispersed nature of RUR developments.
- **Parks and Open Space (POS):** Approximately 20 percent of the Goal 5 fish and wildlife habitat are on lands zoned POS. Protection measures may limit recreation activities that require facilities (e.g., ball fields and golf courses, and related infrastructure such as parking lots). This limitation may negatively impact property values for private parklands more than parks on public lands. Park and open space land uses may be the least intrusive on habitats and associated ecosystem services and economic values.

Summary Points

This section lists the summary points from the analysis of economic consequences.

- Fish and wildlife habitat lands were ranked for their economic importance for development or development value using three measures: land value, employment density and 2040 design type hierarchy.
- Fish and wildlife habitat lands provide ecological functions (e.g., bank stabilization, streamflow moderation, shade, etc.) that also provide ecosystem services (e.g., reduce flood damage, improve water quality). Ecosystem services have economic value. The analysis assumes that habitat that ranked high (for ecological functions) provide more of the type of ecosystem services that society values than do areas that ranked low.
- The Goal 5 programs may protect services such as flood management, water quality, amenity, and salmon-habitat values across a broad area that may affect residents throughout

the UGB and downstream from the UGB. Protecting these ecosystem services may also reduce municipal expenditures to provide these same services, especially over the long term.

- Prohibiting development protects habitat and associated values, but will limit development related economic benefits.
- Limiting development preserves some level of development and habitat values.
- Protecting fish and wildlife habitat within the existing UGB preserves habitat in close proximity to current population distributions but increases the probability of expanding the UGB sooner or to a greater extent than otherwise would be the case if protection measures displace developable land.
- Protecting habitat on the urban fringe protects development interests close in, but reduces access to habitat and associated ecosystem services for the majority of the population within the existing UGB.
- The details of the program options applied at the parcel level will dictate the type and extent of positive and negative economic tradeoffs for Goal 5 habitat protection measures.
- The fact that Goal 5 decisions would primarily affect land with lower property values and employment density does not mean economic consequences of limit or prohibit decisions would be trivial. The low category of land value and employment is relative to values and employment in the Portland city center. The cumulative property value or number of employees affected may be significant depending on the type of decision, the details of the Goal 5 program that implements the decision, actions that may mitigate the negative impact (e.g., expanding the UGB), and specifics of the individual parcels affected.
- Goal 5 programs that include fish and wildlife habitat restoration activities may mitigate the need to implement more severe limit decisions. That is, a program that includes habitat restoration may result in more allow or limit decisions, compared with a program that excludes habitat restoration. However, restoration plans should be developed in the context that restoring degraded habitat may be more expensive, and in the end provide fewer or lower quality ecosystem services, compared with protecting high quality habitat.

CHAPTER 5: SOCIAL CONSEQUENCES

Introduction

This chapter focuses on the social consequences of protecting or not protecting fish and wildlife habitat. Areas providing fish and wildlife habitat provide many important social benefits. However, protecting these areas places a burden on property owners. In this chapter the social benefits and burdens of protecting or not protecting fish and wildlife habitat are described by addressing the following questions:

- What do fish and wildlife habitat contribute to our cultural heritage and sense of place?
- How does protecting fish and wildlife habitat affect our health?
- What educational values are provided by fish and wildlife habitat?
- How does protecting fish and wildlife habitat affect public safety?
- What are the social impacts of protecting fish and wildlife habitat on the land supply?
- How does protecting fish and wildlife habitat affect property rights (private and public)?
- What fish and wildlife habitat will we leave for future generations to enjoy?
- What are the potential social consequences of allowing, limiting, or prohibiting conflicting uses as they relate to Metro's generalized zones?

Metro's fish and wildlife habitat protection efforts are being conducted under State Land Use Planning Goal 5. Land use planning is largely a negotiated social and political process that involves people, their communities, and their governments in decision making. Thus, the social issues include not only those related to land use plans specifically but also those of democracy, participation, and community process. Planning is a public social process representing multiple needs and values. The overall planning context and the importance of social participation are discussed in the section below.

Framework for the social analysis

Citizens have indicated the importance of protecting the air and water, endangered species and natural areas. Federal,[35] state, regional, and local policies reflect these choices. Publicly supported programs (e.g., Metro's Parks and Greenspaces program) exemplify the value placed on natural resources. Over 40 local groups (largely volunteers) focus their work on preserving and restoring streams and rivers, including watershed councils and conservation groups, land trusts, friends groups, specific stream groups, and the Willamette restoration initiative.[36] The public interest and outreach programs sponsored by parks and recreation programs and non-profit organizations provide opportunities for social gatherings, education, recreation, and conservation activities.

The value placed on ecosystem health by citizens in the region highlights the importance of conserving fish and wildlife habitat. The long-term, less tangible benefit of ecosystem health (intrinsic value of habitat) exists along with short-term amenity benefits to property owners and

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[35] Endangered Species Act, Clean Water Act, etc. See *Introduction* chapter and *Appendix A* of ESEE report for more detail on policies that protect fish and wildlife habitat.
[36] See Metro's *Riparian Corridor and Wildlife Habitat Inventories* (Metro 2002d) for more information.

others. Some of the social benefits that arise from a healthy ecosystem are clean water, improved salmon and other wildlife habitat, biodiversity of plant and animal species, relief from urban stress, flood mitigation, educational and recreational opportunities, and neighborhood amenities.

In this analysis we consider the possible impacts of protecting or not protecting fish and wildlife habitat on human needs and social values. This analysis does not undertake a survey of people's values; however, it does point to a range of relevant and acknowledged values that bear on the protection of fish and wildlife habitat. Some of the relevant values considered in the analysis are ecological, economic, health, educational, aesthetic, and sense of place or regional identity. A range of values is associated with these issues, and sometimes they conflict with each other.

Linking human needs and comprehensive planning

The existing and planned functions[37] of the Metro region serve the needs of individuals, organizations and communities. These functions cover a range of security and welfare needs as well as the need for freedom and identity. Oregon's comprehensive planning goals parallel the diversity of social organization that supports human development. The planning goals address an array of concerns such as farms, industry, water quality, historic preservation, citizen involvement and urbanization. Land use policies specifically address such social functions as land for housing and employment, location of public facilities, and provision of recreation and natural areas.

Metro's 2040 Growth Concept was designed to help the Metro region continue to grow in a way that maintains a high quality of life. This includes livable neighborhoods, good transportation options, a strong economy, a vibrant culture, and access to nature while retaining aspects of the local character that provide continuity with the past and make this region unique.

Natural resources are one touchstone of this region's uniqueness. Without the proximity of forests, rivers, scenic mountain views, and farmland valleys, the region's natural and cultural identity would be diminished. Oregon's planning goals recognize that the land use planning program needs to preserve significant fish and wildlife habitat. This recognition of natural resource protection is a form of valuation that society places on nature to meet a variety of general needs and desires related to resource dependency, urbanization, and enjoyment of life.

Social participation and public legitimacy

This analysis focuses on the tradeoffs of protecting or not protecting fish and wildlife habitat from a social point of view. However, a key social consideration of any protection program is a well-designed and transparent public outreach and involvement process. Without plentiful opportunities for meaningful public comment, a program (regulatory or voluntary) is unlikely to succeed, and with good public involvement the success of implementation is more likely. It is important to identify the range of opinions of those who have a stake in the development of potential policies to protect fish and wildlife habitat.

Natural resource protection engenders strong stakeholder claims. The value placed on natural resources differs among individuals and stakeholder groups, and the natural resources in question

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[37] For example, housing, schools, roads and transportation, industrial zones, and parks.

are not always equally distributed. Some people view natural resources as public or common goods, while others view them as private property. Citizens have given the government the responsibility for overseeing the management and allocation of public resources while also protecting private property rights.

Regulations to protect natural resources require a degree of social agreement for acceptance and cooperation to be effective. According to Uphoff and Langholz (1998), three key elements must be in place for natural resource protection to be effective: (1) a legal/coercive element, (2) an economic/profit motive element, and (3) a cultural/social acceptance element. Without social approval it may be impossible to prevent motivations of monetary self-interest or to counter illegal activity intended to circumvent laws protecting common goods. Social processes that uphold legitimacy and participation in decision making are thus essential for long-term public policy support and successful implementation.

It is important to respect the right of citizens to participate in identifying key issues of interest and concern. Without an adequate level of citizen involvement and direction, a program may be less likely to be accepted and runs the risk of being viewed as too technical or bureaucratic (Lane 2001, Brechin et al. 2002). The disproportionate influence of "powerful interests" can be ameliorated with open planning processes. Public resource management and allocation is political and involves the values of a broad range of people. Broad citizen involvement allows for a transparent process, develops trust, and leads to negotiated agreements that build locally acceptable commitments (Creighton 1983).

Citizen involvement is formalized in Oregon's land use planning system as Statewide Planning Goal 1. When stakeholders are provided with an opportunity to participate, programs are more likely to be successful. People and communities may see their interests in protecting the region's fish and wildlife habitats differently and may thus express different priorities in terms of their immediate needs and values. But, from a social perspective, this process of participation and opportunity for citizen involvement in the planning process is central. It is important that citizen involvement be a key aspect of program development and that the issues raised in the analysis below be considered.

What do fish and wildlife habitat contribute to our cultural heritage and sense of place?

Fish and wildlife habitat once covered the entire Metro region. "Historical evidence indicates that at the time of the Oregon Trail migration, the majority of the Portland region was in a continuous canopy" (Poracsky 2000). People have been drawn to the Willamette Valley and the confluence with the Columbia River for centuries because of the abundant natural resources available to provide a good quality of life. Lewis and Clark missed the mouth of the Willamette River twice as they explored the Columbia River, due to the forested islands screening it from view. After they were told by Native Americans of the river's existence they went back to explore and were duly impressed (Riddle 2000). Wildlife were abundant: "[Lewis and Clark] camped across the river from the island and in their journals bemoaned being kept awake by the 'horid' noise of the geese, ducks, and swans" (Matrazzo 2000). Just a few decades later the rivers were completely changed:

> River traffic was crowded with ferries carrying passengers back and forth to the east and west banks, and river steamers taking sightseers on excursions up the Willamette to the "Niagara of the West," up the Columbia to the Gorge, or downriver to the ocean. (Riddle 2000)

Today the remnants of habitat provide residents with a sense of regional identity and preserve some of the fish and wildlife species that have so shaped the development of this region.

Cultural heritage

Nature and wildlife are part of our region's unique identity. Residents of this region consistently say that contact with nature is important, and they value the natural biological diversity that is part of the Willamette Valley.[38] Robin Cody (2000), co-author of the book *Wild in the City: A guide to Portland's natural areas* (Houck and Cody 2000), states: "Although Portlanders are now a fully urbanized people, the rivers still make us who we are. Never too deeply buried in the urban ethos is an imaginative truth, that not so long ago we emerged to a riverside clearing, the sons and daughters of pioneers, self-selected for rugged individuality."

As Oregonians, state symbols are part of the cultural identity of residents in the Portland metropolitan region. The Western Meadowlark was selected as Oregon's state bird by schoolchildren in 1927 (Marshall et al. 2003). It is currently a state-listed Species of Concern, and has been nearly extirpated from the Portland metropolitan region due to loss of native grasslands (a Habitat of Concern here) and development encroachment. However, some birds still winter over in the region, and bird-watchers often seek them out in areas such as the agricultural lands around the Tualatin River. The state fish, Chinook salmon, has five runs in or near this region, and all five are federally listed as Threatened or Endangered. Loss of these species and their habitats implies an irreplaceable cultural loss.

Fish and wildlife play key roles, currently and historically, in Native American religion and culture. Levi Holt, former commissioner of the Columbia River Inter-Tribal Fish Commission (CRITFC), comments:

> The tribes always treated water as a medicine because it nourished the life of the earth, flushing poisons out of humans, other creatures and the land. We knew that to be productive, water must be kept pure. When water is kept cold and clean, it takes care of salmon. (Hollenbach and Ory 1999)

The CRITFC (2002) states that "without salmon returning to our rivers and streams, we would cease to be Indian people." CRITFC holds fundraisers each year, and so far the Spirit of the Salmon Fund has raised over $1.5 million for the commission and its member tribes to spend on salmon recovery activities. The federal government also has treaty obligations that ensure the availability of Chinook salmon and steelhead trout for tribal fishing (*U.S. v. Washington* 1974).

This identification with nature and wildlife by the majority of the region's residents is reflected in many ways. For example, the 100-year-old Audubon Society of Portland is older than the

[38] May 2001 Davis and Hibbits phone survey commissioned by Metro, an October 2001 Moore Information survey sponsored by KGW-TV and the Portland Tribune, and an informal "SurveyPoint" poll available by phone and on Metro's website in 2001.

national Audubon Society and is the largest chapter in the country, with over 10,000 members and 1,000 volunteers. Each year thousands of residents flock to the Wild Arts Festival to buy wildlife art and meet the authors of wildlife-related books; salmon and birds are probably the most common art themes in this area. Metro's annual Salmon Festival takes place at Oxbow Regional Park, located in the scenic Sandy River Gorge eight miles east of Gresham. Native Chinook salmon have migrated for thousands of years from the Pacific Ocean to the Sandy River and may be viewed spawning at the park during the festival and throughout October. Nature and wildlife are prominent subjects in the Portland Art Museum and in art galleries throughout the region.

Residents of the region also care specifically about at-risk wildlife and habitats. For example, in a 1997 poll conducted by the *Oregonian*, the decline of the region's salmon topped the list of residents' environmental worries (Brinckman 1997). The underlying reason was that salmon represent the Northwest's heritage and serve as a gauge of water quality and environmental health. Residents frequent rare habitats such as the oak woodland/wetlands complex in Oaks Bottom and river islands such as Sauvie Island. Such places harbor unique plant and wildlife communities and represent native habitats that were once common here, which makes them especially valuable to the region.

In 1999, Metro surveyed a diverse group of stakeholders, whose consensus on the most appropriate criteria for defining regionally significant fish and wildlife habitat included the presence of threatened, endangered, state sensitive, or state-listed species (Metro 1999a). Declining species most often depend on sensitive or declining habitats, such as riparian, Oregon white oak, undeveloped hilltops and river islands, or native grasslands. Loss of these species and the habitats they depend on is irreversible. In 2002, Metro conducted a public outreach effort in which over 2,400 residents participated (Metro 2002b). Environmental protection was identified as one of the three key issues deserving greater emphasis.

Contact with nature and the rich diversity of species and habitats native to this region are important parts of the region's cultural heritage; to the extent that these habitats are lost, so is a part of our culture, heritage, and natural history.

Sense of place and neighborhood character

The relation of people to place and land is an essential experience. Humans have been sensitized over millions of years by their co-evolution with the landscapes and species on the planet. The experience people have growing up is influenced by the climate, seasons, terrain, vegetation, and local animals. Home or neighborhood terrain, playgrounds, backyards, local parks, and scenic views, as well as the urban experiences of work, leisure, and travel in the region all influence the sense of place people feel, including their level of attachment to particular places.

The Metro region is well defined by its landscape: major rivers, hills, trees, the rainy season and summer heat. It includes views of Mt. Hood and Mt. St. Helens. The region is defined by the many streams and rivers, including the Willamette River running through the urban core, the Tualatin in the west and the Clackamas in the east, and the Columbia River leading to the Pacific Ocean. Forest Park provides opportunities for hiking in the city as well as defining our views of downtown Portland – skyscrapers framed against the forest and hills. This region is unique:

"Few cities in the nation can boast putting oceans, mountains, fresh strawberries, spawning salmon, and spectacular waterfalls in the same sentence, much less in the same day" (Seltzer 2000).

Bioregionalism is a landscape term expressing a reciprocal interaction of people and place, nature and society. Respect for place becomes a key feedback response for promoting the quality of life that people seek (Bethold-Bond 2000). Our regional identity includes the urban landscape that spans the river harbors, downtown Portland, and the cities and towns with a mix of new and old structures, known neighborhood features, gathering places, workplaces, city parks, museums, restaurants and stores. People are socially connected to the entirety of the built and natural environment, through street trees, gardens, walks, bicycle rides, and automobile trips. People have a regional identity in addition to other place-based identities (e.g., a neighborhood or watershed).

Historical perspectives on the changing Oregon landscape, the people who settled here, and the treatment of the environment, explain some of the region's uniqueness as well as common responses to life and development issues. In Terence O'Donnell's (1988) history of the 10,000 years of settlement since the "land came to rest and humans arrived to live from it," the people that chose to come to Oregon are described as being of modest ambition, respectable folks, self-sufficient and independent, seeking some measure of retreat and quiet.

> To delineate with any exactitude the character of either a person or a place is a futile exercise. Nonetheless, and perhaps as this and impressionistic history of Portland suggests, certain traits have appeared again and again in the town's expression of itself. There is the value placed on nature, a rather curious value for a city to embrace. One observer has commented that Portlanders are 'reluctant to face the facts of urban life, only its amenities'." (O'Donnell & Vaughn 1984)

A counter-perspective to immigrant sensibilities or attachment to place is reflected in an account of the utility of the land and the realities of capital and markets. Many people moved to Oregon to profit from the abundant natural resources. For many years it seemed there was no end to the board feet to be logged from the forests and the number of salmon caught from the rivers.

> Nearly a century and a half of American settlement has produced a regional landscape which has grown increasingly less distinctive and progressively less stable…. Northwesterners have frequently acted as if the natural world exists largely as something to buy and sell and as if the regional ecology were infinitely malleable. (White 1983)

These perspectives on the value of natural resources represent the conflicting values placed on natural resources and the changing views over time.

Scenic values

Trees, open space, and streams define the visual appeal of the Portland metropolitan region. Tree-covered hills blanket the cities and towns; removal of large sections of the canopy would change the visual appeal residents of the region enjoy. Fish and wildlife habitat can provide scenic value regardless of the degree of physical accessibility. People can enjoy a view of a stream, open space, or forest even if they are not able to explore it. However, people's perceptions of what makes up a "scenic" view may differ. Some consider densely vegetated hillsides to be attractive, while others are attracted to open, park-like land. Most fish and wildlife habitat value is derived from the more densely vegetated areas. There are also economic values placed on scenic views, as described in the *Economic Consequences* chapter of this report.

Natural resources buffer land uses from each other

Fish and wildlife habitat can help to buffer incompatible land uses from each other. Open space, tree canopy, and streams provide physical, noise, and visual buffering that can separate land uses and reduce off-site impacts. Trees not only help to control noise pollution but add the soothing sounds of wind rustling through leaves and branches. A U.S. Department of Agriculture publication reports that a 100-foot wide and 45-foot tall patch of trees can reduce noise levels by 50 percent (U.S. Department of Agriculture 1998). For example, a residential area buffered from industrial uses by a forest or stream will be more desirable than a residential area without the buffer.

How does protecting fish and wildlife habitat affect our health?

Health is a social issue. It encompasses both physical and mental well being. Fish and wildlife habitat provide benefits that affect both our physical and mental health. According to the Academy of Leisure Sciences (2002), recreation and leisure activities may be one of the best methods of curbing rising medical costs. Recreation contributes to healthy living, and healthy people need less medical care. People have long recognized the value of nature in contributing to our mental and physical well being. In fact, the ancient Egyptians created gardens to restore the spirit.

Recreational opportunities

Land use planning is tied to environmental quality and to recreational and leisure activity, both of which have a direct effect on people's health. Air and water quality is one aspect of this, along with opportunities for physical exercise through recreation and mental health benefits derived from proximity to nature. Recreation helps to fuel the human spirit, strengthen the physical self, and create a series of connections to others, community, and the environment that are as necessary to life as air and water.

Psychologists Sachs and Segal (1994) found that activities such as a walk in the woods gives a boost to the immune system that lasts two or three days. Exercise helps people live longer. Several studies have shown that middle-aged adults who exercise live on average about two years longer (Nieman 1998). Aside from improved cardiopulmonary benefits and quality of life, researchers have found that exercise had a beneficial effect on the happiness of cancer survivors: those exercising reported 19 additional hours of happiness per week than those not exercising (Courneya et al. 2003).

Natural areas provide tangible value in urban environments for people and communities. Natural resources, open space, parks, greenways, and trail systems are described generally as amenities in an urban area. The region's natural resource amenities include a mix of local parks and natural scenery, plus access to wilderness destinations within a two-hour drive. Hiking in Portland's Washington Park, driving to the scenic Columbia Gorge, weekend camping visits to the Cascades or the Oregon Coast, and boating on the Willamette River are some examples of recreation opportunities in the region. People enjoy walking and spending time in their neighborhoods and backyards in livable communities. Many people move to the Metro region specifically for the abundance of recreational opportunities located in and near the urban area.

The Metropolitan Greenspaces Master Plan, adopted by the Metro Council in 1992, describes a vision for a unique regional system of parks, natural areas, greenways, and trails for fish, wildlife and people. The plan identifies 57 urban natural areas and 34 trail and greenway corridors that define green infrastructure for the Metro region. In 1995 voters approved a bond measure ($135 million) to purchase sites identified in the plan. Local park providers, schools, businesses, and citizen groups are implementing the plan through a combination of open space acquisition, land-use standards, incentives, and stewardship.

Residents and local governments are working with Metro to ensure that people have access to nature close to home as well as efficient ways to get to work, school, or shopping. When originally conceived 100 years ago, the regional trail system was going to be 40 miles long, circling the city of Portland. The Metro area has grown substantially since then. The Metropolitan Greenspaces Master Plan expanded the concept to 25 cities and four counties within the Portland/Vancouver metropolitan region. Today, plans call for an 800-mile network of land trails, water trails, and greenways. Nearly 30 percent of the land-based trails are complete. Recreation and access to nature are important values to citizens of this region.

Recreational activities help to keep people well. While protecting fish and wildlife habitat on private land does not provide most residents of the region with direct recreational opportunities, it does contribute to overall ecosystem health. A healthy ecosystem means continued presence of fish in streams and birds and other wildlife in natural areas. Many citizens have moved to this region for the opportunity to engage in fishing, canoeing, sea kayaking, and other activities on the region's streams and rivers. Birdwatching is a popular pastime, especially visits to Smith and Bybee Lakes and Sauvie Island.

Impact of sprawl

A healthy urban environment is typified by neighborhood amenities such as access to nature (in the form of parks or openspace views) and pedestrian-scale development that provides both aesthetic and functional value. The modern predominance of door-to-door automobile trips, congestion, stresses, and pollution detracts from our health and enjoyment of city living. An article on integrative medicine identifies the "biopsychosocial interface" of the built environment, implicating urban planning and public policy in the process:

> While the trend toward increasing urban sprawl has impacts on land use, transportation, and economic and social development, less attention has been paid, until recently, to the fact that the way that our communities are designed can also have serious health consequences. (Horowitz 2002)

Horowitz describes the common health threats of auto-dependent urban sprawl as respiratory problems from air pollution, toxicity in air and water supplies, various stress factors, lack of physical exercise or activity, obesity, and impaired access to nature. Urban and suburban sprawl can isolate people socially. Urban stress also arises from noise, crime, litter, or blight in neighborhood settings. However, increased density does not always have a positive impact on health. For instance, densely settled areas may allow for faster transmittal of communicable diseases. Not all neighborhoods face these issues, and social inequities between income groups and neighborhoods are well known and linked to health and environmental justice issues.

Environmental quality

Having intact natural systems helps keep the air and water clean in urban areas. Urbanization contributes to poor air quality and higher levels of industrial pollutants and results in other adverse effects such as high summer "heat island" temperatures.[39] Polluted air and water can cause many physical ailments such as asthma and bronchitis, allergies, and gastrointestinal problems. Poor air quality can prevent children from playing outside on summer days and can prevent adults from exercising outdoors or commuting by foot or bicycle. Retaining natural areas in the region helps to mitigate the negative impacts of development on human health.

Fish and wildlife depend on clean air and water to thrive. Fish are especially sensitive to poor water quality, such as that caused by the presence of toxins and other chemicals. Some people depend on fishing as a supplementary food source, and eating contaminated fish can negatively affect their health. Negative impacts include increased cancer risk and other health effects such as immunological, reproductive, developmental or nervous system disorders (U.S. Environmental Protection Agency 2002). Native Americans in the Columbia Basin eat fish at rates six to 11 times the national average and thus may be at a higher risk for negative impacts (U.S. Environmental Protection Agency 2002). Toxic fish are of particular concern for pregnant women and young children. Therefore, protecting fish and wildlife habitat may help keep those who eat fish from the region's rivers healthy.

Mental health and stress

The sight of natural areas enhances our mental health. Edward O. Wilson (1986) described this in his "biophilia hypothesis," which posits that human beings are attracted to nature because they are inextricably linked to the natural world and emotionally dependent on it. In discussing related research, the Trust for Public Lands (1994) points to information in over 100 studies describing the benefits of stress reduction from "experiences in wilderness and urban nature areas." Dr. Roger Ulrich of Texas A&M's Center for Health Systems and Design supports this research. He is cited in popular health literature regarding his studies on the positive response patients exhibit when exposed to natural environments:

> "…[J]ust looking at certain types of everyday nature is quickly effective in producing a mild, open-eyed relaxation response… Anger and fear also both diminish to the point of measurable improvement." (Ulrich quoted in British United Provident Association [BUPA] 2002)

Ulrich has found that passive scenic values reduce stress, lower blood pressure, and enhance medical recovery (Ulrich et al. 1991). Anytime people have a chance to look out a window at greenspace, or to be outdoors, they experience some benefit associated with a connection to nature, all other factors being equal (BUPA 2002, Baker 2002). Even pictures of nature can positively affect hospital patients. A study in a Swedish hospital found that heart surgery

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[39] See *Energy Consequences* chapter for more discussion on Urban Heat Island effects.

patients viewing a landscape with trees and water "experienced less anxiety, and required fewer strong pain doses, than control groups assigned no pictures" (Ulrich et al. 1993).

Nature and spiritual values

Spiritual values are associated with a deeper reverence for nature and the outdoors. Beyond the benefits of exercise or stress relief, spirituality binds human beings and nature in a larger whole. Some people feel their closest connection with religion or the spiritual world when in the woods or by a river. Over the past few centuries the rise of science and rationalism provided humankind the opportunity to exert more control over nature and distanced people from their spiritual connections to nature (Rockefeller 1992). Most people today live in urban environments, with many children growing up not learning how the natural environment functions and supports our well being.

Many religions reflect beliefs of a larger mutual arising of knowing, meaning, and sense between people, nature and cosmos. Respect for the land, a morality of caring that extends to the type of utility we place on nature, is evident in Western spiritual traditions. On the other hand, another school of thought focuses on the "man over nature" model that focuses on the utilitarian value of animals and ecosystems (Rockefeller 1992). Lately many of the major religious organizations, such as the World Council of Churches, the U.S. Conference of Catholic Bishops, and the National Religious Partnership for the Environment have actively supported environmental protection policies and describe the connection between faith and the ecological health of the planet (Schueller 2001). For example, the Catholic Bishops of the Northwest issued a letter on caring for the Columbia River watershed, spurred by the economic and ecological conflicts evident in the region (Columbia River Pastoral Letter Project 2000). The letter described "…a vision that promotes justice for people and stewardship of creation."

Native American culture and spirituality is based on an appreciation of the natural world, as described by Margaret Saluskin of the Yakama Tribe below.

> Salmon was presented to me and my family through our religion as our brother. The same with the deer. And our sisters are the roots and berries. And you would treat them as such. Their life to you is just as valuable as another person would be. (Hollenbach and Ory 1999).

Spiritual awareness of the importance of nature has led to the philosophy and teaching of ethics, as expressed by such inspirational leaders as John Muir, Aldo Leopold, and Henry David Thoreau (Rockefeller 1992). It has also given rise to new philosophies, such as deep ecology, and to religions that view nature as sacred, such as paganism and Gaia (goddess)-based religions. Deep ecology is a philosophy based on the sacred relationship with Earth and all beings, an international movement for a viable future, a path for self-realization, and a compass for daily action (Drengson 1999). Nature provides inspiration and the chance for people from many religions and viewpoints to explore and enjoy their spirituality.

What educational values are provided by fish and wildlife habitat?

The existence of healthy ecosystems and fish and wildlife species enhances educational values and promotes recreation opportunities such as wildlife viewing, nature painting, and photography. Healthy ecosystems also provide "living laboratories" for active educational programs from volunteer monitoring to formal scientific research. While these values and opportunities are realized mostly on public lands, private open space and natural resources also contribute substantially to maintaining healthy ecosystems and habitat for fish and wildlife species. These activities are not limited to public lands, as some private lands are dedicated to wildlife sanctuaries and environmental education facilities. In addition, roads and adjacent public parks afford viewing opportunities on adjacent private lands.

Nearby natural areas provide important educational opportunities

The importance of a variety of accessible natural areas for educational programs is evidenced by the wide array of non-formal education providers[40] and formal education providers[41] in the region. These entities provide programs for children and adults to learn about the environment, natural and cultural history, fish and wildlife species and their habitats, social studies, and civics.

Natural areas can provide a focal point for teaching people about how government works and how they can be involved in improving their neighborhood, city, or region. This public participation improves community understanding of environmental, social, and political issues.

Park districts such as Metro Parks and Greenspaces, Portland Public Parks, Tualatin Hills Parks and Recreation District, and North Clackamas County Parks District host hundreds of outdoor activities and environmental education programs, involving thousands of youth and adults on an annual basis. Metro's Parks and Greenspaces department developed a map depicting the locations of all the nature centers and environmental learning centers in the region. Non-profit groups such as the Audubon Society of Portland, Friends of Trees, and SOLV have extensive education and volunteer programs aimed at restoring fish and wildlife habitats and increasing people's awareness of the habitats and species within the region.

Natural areas provide opportunities for interdisciplinary education

More and more schools are recognizing the value of natural areas and the environment as an effective focus for integrated, interdisciplinary studies in all areas – social studies, arts, science, and mathematics. This model, *using the environment as an integrated context for learning* (EIC), has been shown to improve critical thinking skills, achievement in standardized tests and improved student attitudes about learning and civility toward others (Leiberman and Hoody 1998).

Public school districts, such as Portland Public Schools and North Clackamas School District, provide magnet schools focused on environmental learning. These schools fully incorporate public open spaces in their curriculum, providing an integrated context for all subject areas. Public and private schools also have "adopted" natural areas adjacent to or near the school grounds as a project-based approach to the overall curriculum. Happy Valley Environmental School, for example, uses the city-owned wetlands in this way and has helped build walkways

[40] For example, Tualatin Hills Nature Park, Jackson Bottom Wetlands Preserve, Tryon Creek State Park.
[41] For example, public and private schools, community colleges, universities, professional training institutes.

and restore native vegetation. Three Rivers Charter School in the Wilsonville-West Linn School District uses its grounds and adjacent lands to integrate all subjects.

Publicly owned open space and natural areas provide the bulk of recreation and educational opportunities within the region. However, private lands and wildlife sanctuaries, such as the 112-acre Audubon Society of Portland campus and the OES March/Montclair wetlands complex, also make a substantial contribution to the region's environmental education and recreation opportunities. Corporate parks, with associated natural areas, provide passive and active recreational opportunities for workers while enhancing the overall workplace environment.

How does protecting fish and wildlife habitat affect public safety?

Land that provides functional fish and wildlife habitat is often located on steep slopes and on floodplains in the urban area, since those lands pose more difficulties to develop. Protecting vegetative cover in these areas may reduce public safety hazards like landslides and floods. However, negative impacts of protecting or increasing trees and vegetative cover include possible increased risk of wildfires and increased numbers of undesirable species. Fish and wildlife habitat may also have an impact on reducing crime and violence.

Flooding and landslides

Trees and vegetative cover provide slope stability, prevent stream bank erosion, and allow for permeable soils to absorb and hold floodwaters, while conserving fish and wildlife habitat. Any conservation and restoration of habitat lands would likewise help with the prevention of natural and environmental hazards such as landslides, flooding, stormwater runoff, and erosion. The costs to property owners and insurance companies from landslides, flooding, and erosion can be significant if development is not carefully engineered; even then downstream properties may be affected by vegetative clearance or surface runoff. Thus, habitat conservation provides social benefits to property owners and communities that are located in higher risk locations.

Goal 7 of the Statewide Planning Goals requires local governments to reduce risk from natural hazards. The rule states that "local governments shall adopt comprehensive plans (inventories, policies and implementing measures) to reduce risk to people and property from natural hazards." Approximately 28 percent of the vacant, buildable land in Metro's inventory is environmentally constrained. The fish and wildlife inventory represents ecosystem functions and biodiversity in the region, and environmental constraints represent hazards and safety protection (e.g., floods, landslides, and water quality). This convergence of functions illustrates multiple benefits from habitat protection – preventing natural hazards and protecting fish and wildlife habitat. It also demonstrates that much of the remaining fish and wildlife habitat is located in the more difficult to develop areas.

Wildfires and windstorms

Besides flooding and landslides, wildfires are another type of natural hazard. Urban wildfires are risks for property owners associated with dry trees, brush, and vegetation in close proximity to built structures that in drought conditions or hot summer weather. Managing fish and wildlife habitat to encourage native vegetative cover while also managing for any fire hazard is a balancing act. The risks would be less in cool, moist riparian areas than the drier upland habitats. Spatial buffering could minimize risks to people and structures. Trees intermingled with houses, businesses, roads, and utility lines can pose hazards in windstorms as well.

Nuisance species

Preserving fish and wildlife habitat could allow nuisance species to continue to live in proximity to people. However, several species have adapted to live in the most urban environments and are likely to stay, such as raccoons and opossums. Wetlands and areas of standing water allow mosquitoes to breed and may contribute to diseases such as the West Nile virus. However, if wetlands are healthy the natural ecosystem controls mosquito populations (Scheirer 1994, Ladd and Frankenberger 2003).

Crime and violent behavior

The presence of trees and grass can lower the incidence of aggression and violent behavior, as was found by Bill Sullivan and Francis Kuo in a study of residents of public housing in Chicago (Kuo and Sullivan 2001a). Greenery reduces mental fatigue, which allows for more positive interactions between people. Neighborhood green areas can also increase community ties and support networks (Kuo et al. 1998). Additionally, tree canopy (as opposed to dense shrubs) in urban areas may actually reduce crime (Kuo and Sullivan 2001b). The study found that, compared with apartment buildings that had little or no vegetation, buildings with high levels of greenery had 52 percent fewer total crimes, including 48 percent fewer property crimes and 56 percent fewer violent crimes.

What are the social impacts of protecting fish and wildlife habitat on the land supply?

The urban land supply is a representative social issue because it relates to people's basic needs for housing, jobs and urban services. A constriction of the existing land supply could negatively affect the social needs these lands serve (e.g., housing and employment). An urban growth boundary (UGB) expansion could offset the impacts, but the urbanizing rural land spreads the development pattern further towards the periphery of the region. This could increase travel times[42] and congestion and could encroach further on fish and wildlife habitat in rural areas.

Metro's fish and wildlife habitat inventory covers developed, vacant, and buildable land. (See *Conflicting Use* chapter for more information.) If there are changes to the regional land supply, the Goal 5 rule allows governments to meet competing needs by compensating for reductions in the buildable land inventory. The rule states that a government shall:

> (a) Amend its urban growth boundary to provide additional buildable lands sufficient to compensate for the loss of buildable lands caused by application of Goal 5;
> (b) Redesignate other land [inside the UGB] to replace identified land needs… (OAR 660-23-070(1)).

[42] Please see this report's *Energy Consequences Analysis* chapter for more description of the impacts of urbanizing rural land.

One of Metro's key tasks is the identification of buildable land, which defines where new development can occur. The buildable land supply influences housing availability and affordability, employment, and manufacturing locations. It also influences transportation system planning and general accessibility, along with public facility siting (e.g., cultural centers, schools, utility, and maintenance facilities). Land supply also affects public capital expenditures as urban services are spread out over larger areas.

Vacant land, redevelopable land, and infill sites provide the basis for housing and employment growth in the region. All vacant land is not considered *buildable*. Some of it is environmentally constrained (Title 3 lands in floodplains and adjacent steep slopes), and some is in public ownership and serves other needs (e.g., schools, parks, utility easements). The buildable land inventory is reviewed periodically to ensure that there is an adequate 20-year supply to meet forecasted housing and employment demand.[43]

Whether protection of fish and wildlife habitat will constrain buildable lands will not be determined until a program option is chosen. The Goal 5 rule allows for a range of approaches to conflicting uses: development may continue, be limited in some manner, or be prohibited in certain areas. Consistent with Metro's existing policies to protect water quality and floodplains, the assumption is that habitat protection may restrict design and management on some lands but will not prevent all development in order to prevent regulatory takings. Potential social impacts of constraining the land supply are described below.

Housing opportunities and affordability

Residential zones make up the largest component of buildable land in the fish and wildlife habitat inventory. Approximately 60 percent of the vacant, buildable habitat within the urban growth boundary is zoned residential,[44] and of that 66 percent is not environmentally constrained. Thus, the residential buildable land supply appears to be the most sensitive to possible impacts of fish and wildlife habitat protection.

The types of housing opportunities available may change depending on habitat protection. Rather than reduce the number of housing units allowed on a lot, regulations may allow for the same units in a denser configuration, such as rowhouses, condominiums, or apartments. Clustering units on smaller lots in a subdivision may allow fish and wildlife habitat to be preserved. These potential changes have social impacts. Many people who might choose to purchase or rent a single-family home with a large yard will not view these other housing options as equivalent. The location of the housing is important as well. Housing opportunities closer to existing employment, shopping, and entertainment will not be replaced by residentially zoned land in areas on the urban fringe.

Housing affordability may be affected if protecting fish and wildlife habitat results in changes to the land supply. Some studies have shown that maintaining an urban growth boundary and limiting the supply of buildable land increase the cost of housing (Staley and Mildner 1999). Further limits to the land supply may cause a commensurate increase in housing costs. However,

[43] Buildable lands are described in December 1999 Update to the Technical Appendix to the Urban Growth Report.
[44] SFR: 56%, MFR: 4%

another recent study found that market demand, not land constraints or growth management policies, is the primary determinant of housing prices (Nelson et. al 2002). In some instances denser housing is more affordable than large-lot single-family homes, so that policies supporting increased density may result in lower housing costs. Housing developed on the periphery of the region may or may not be affordable, depending on the costs involved in bringing urban services to new areas. Limiting or prohibiting conflicting uses could have a negative impact on housing affordability but may not, depending on the type of development allowed and other market forces.

Impacts on quantity and nature of employment opportunities

Employment opportunities typically occur on land that is zoned for commercial, industrial, or institutional uses. Vacant land zoned for commercial, industrial, or mixed-use development makes up 28 percent of the land within the fish and wildlife habitat inventory, and almost half is not environmentally constrained. Development of these uses on land containing fish and wildlife habitat can sometimes occur in such a way that some or most of the habitat functional value is retained.

The location of these lands is an important factor in determining the social impact of allowing, limiting, or prohibiting use in these areas. Metro is able to add land to the UGB if employment capacities are reduced due to habitat protection. However, it is important to consider the social impacts of adding employment land on the urban fringe. Will job opportunities located in newly developed areas be equivalent to lost opportunities located near existing concentrations of housing? Residents choosing to work in locations further from their homes will incur additional travel expenses as well as a reduction in quality of life due to more time spent commuting and away from home. Additionally, the types of jobs may be different, as a company that might choose to locate in an existing commercial or industrial area may not choose to move to a new location.

How does protecting fish and wildlife habitat affect property rights (private and public)?

Metro's Goal 5 fish and wildlife habitat inventory covers both public and private land. Habitat coincides with residential, commercial, and industrial property as well as with public land such as parks, greenspaces, schools, and public facilities. Property ownership and land use regulations are sensitive issues that are central to habitat protection. Property is subject to law and review by people and social institutions concerned with the use of land. Changes to property use are negotiated in this public-private dynamic.

Natural resource stewardship exacerbates the question of government oversight because ecosystems cross property lines and jurisdictional boundaries. Ecosystem continuity is one criterion for successful environmental stewardship, and this larger view tends to reside with public sector planning and oversight. Government has a responsibility to uphold the public trust, including the protection of valued public resources, once identified and agreed upon.

Property owners have many concerns about regulations limiting development on their land. People purchase a property with the expectation of a certain use; thus regulatory certainty is an important factor. A change in regulations affecting land development and use could have an economic impact, but there is also a social aspect relating to individuals' perceptions of their rights and roles in our society. Restrictions on the use of property can also contribute to feelings of political alienation and may cause people to invest in property or businesses elsewhere.

Americans have a history of strong individual property rights

Property is considered by many to be one of the basic institutions of human society, similar to family and religion. In America the rights that come along with owning a piece of property have been especially revered. Many people believe that individual property owners should determine the most appropriate and beneficial use of their property. These beliefs date back to frontier times in America, when land was conquered and tamed.

The legal concept of property consists of a number of rights that are guaranteed by the government (Sargent et. al 1991). A common idiomatic description of property rights is the reference to a "bundle of sticks," where each stick represents rights the owner has in regard to the land. Some sticks are reserved by the government, such as the right to tax and the right to control the type of private use on the land (Meyer 2001). Conferred rights depend on public oversight and responsibilities associated with land ownership. The benefits, agreements, and responsibilities tied to property are varied and are negotiated over time by law and public policy. There are also informal cultural aspects of property such as status conferred by property, how property is kept, and related social conduct by property owners.

Land ownership issues are complex because individuals have expectations of what they can do with their land while society at large has expectations of how land should be managed.[45] Environmental conservation and natural resource scarcity are two examples of how common issues affect both public and private property interests. Natural resource protection, for the sake of the public good, has become a factor in the debate about land use and resource management, which involves multiple types of property and uses. However, many residents of the region consider unregulated ownership of property (or as few regulations as possible) to be important. Thus, if Metro were to implement regulations to limit or prohibit conflicting uses in identified fish and wildlife habitat, such limitations on the activities of a private property owner would have a social impact on those property owners and other citizens who feel strongly about the rights of private property owners to use their property as they see fit, unfettered by government regulation.

Takings

The "Takings Clause" of the Fifth Amendment to the U.S. Constitution provides that private property shall not be taken for public use without just compensation. This clause was part of the U.S. Constitution as initially ratified, and it represents a bedrock principle of American law. Article I, section 18 of the Oregon Constitution contains a similar requirement. Not many people

[45] Property rights are a function of what others are willing to acknowledge. A property owner's actions are limited by the expectations and rights of other people, as formally sanctioned and sustained in law (Meyer 2001).

would disagree that if the government physically takes private property and puts it to public use, to build a road, for example, the landowner should be justly compensated for the value of the property that was taken. This is normally done through a condemnation procedure. A more difficult question arises, however, when the government does not physically confiscate property but rather regulates how private citizens may use their property. The U.S. Supreme Court has issued numerous decisions interpreting and refining the meaning of the federal Takings Clause in the context of such alleged "regulatory takings."[46] Such jurisprudence makes it clear that the meaning of the Takings Clause in the context of regulatory takings is still vigorously and passionately debated.

In 2000, this issue was put before the people of Oregon in the form of Ballot Measure 7. Measure 7 asked if property owners should be compensated for any decrease in the market value of their property caused by the imposition of new governmental regulations. The measure passed, but the Oregon Supreme Court later overturned the measure on procedural grounds (it had not been adopted as required by the Oregon Constitution). A recent report by the City Club of Portland on ballot Measure 7 (from the 2000 election) addressed regulatory takings. The report suggests that compensation to property owners is reasonable at a certain agreed-upon threshold of regulatory appropriation, as it relates to existing allowed uses (not anticipated or speculative uses). The report suggests government is accountable for its regulatory impacts and should estimate these impacts and make exceptions when unfair burdens exist (City Club of Portland 2002).

Thus, in summary, it is clear that people have strong feelings about the takings issue; feelings that go beyond concern about a loss in the economic value of property. There are people who believe, for example, that the *Dolan v. City of Tigard* decision should be interpreted to require the government to compensate any landowner whose ability to develop their property is at all limited by a government regulation. Others legally dispute that interpretation, and a legal recitation of the interpretation of Supreme Court cases is inappropriate in this analysis. The point of raising this issue is that it goes to the question of individual rights in our society and the relationship between individuals and government. Some who believe that more compensation should be provided when the government regulates the use of private property might feel alienated from government when courts have ruled that certain regulations do not constitute compensable takings. Put another way, if regulations are imposed that may decrease property owners' freedom to use their property as they wish, some will believe that the government has "taken" their property, regardless of whether a court would find that such an action was a constitutional "taking" for which they should be compensated.

If the Metro Council chooses to limit or prohibit conflicting uses on some fish and wildlife habitat, a program to protect these areas will be developed in such a way that a legal taking does not occur, similar to current regulations to protect water quality and prevent flooding (Title 3). However, many landowners believe that additional regulations require compensation, and that a regulatory program should also include incentives.

[46] See, e.g., *Agins v. Tiburon*, *Nollan v. California Coastal Commission*, *Dolan v. City of Tigard*, *Penn Central Transp. Co. v. New York City*, *Lucas v. South Carolina Coastal Council*, and *Palazzolo v. Rhode Island*; see also *Dodd v. Hood River County* (9th Circuit decision).

Personal financial security

Real property is one of the largest economic investments many people make and is an important and sensitive social issue. Property represents issues of security, income, housing, and employment opportunity. The ability to use land as it is zoned implies a social and economic purpose or right – perhaps described as certainty or security. Private investment in property is tied to a potential income stream or return on investment, which usually results from a combination of local plans and development conditions, general market conditions, upkeep, and improvements. Investors in property seek clarity about the regulatory framework. Regulations that result in reductions to property value may affect people's ability to draw on the equity in their homes to fund retirement, education, and other activities. Thus, limiting or prohibiting conflicting uses, if it results in reduced property values, can have a negative social impact.

At the same time, because property overlaps with and can affect natural resource systems – land, water, air, ecosystems – property is also tied to common goods which are needed and valued by society at large as well as by individuals. The impact of natural areas on quality of life, property values, and regional attractiveness is an economic consideration as well. For example, local studies (Lutzenhiser and Netusil 2001, Bolitzer and Netusil 2000) have shown that proximity to some types of natural areas actually increase property values, thus preservation of these habitats could positively impact nearby property owners. Private individuals and firms can capture the value of location, such as nearby parks, open space or schools, or good accessibility to services or transportation infrastructure. This results in higher demand and higher dollar valuation of these properties. On the other hand, public parks, schools, highways, and other perceived amenities capture individual or commercial value by the usage, time, and willingness of people to pay for them. Negative impacts such as congestion, noise, nuisance, crime, pollution, or diminished natural features can affect adjacent property values as well as the community.

Distribution of benefits and burdens

When a community makes habitat allocation decisions, social equity issues and questions of policy fairness may arise. There are several social equity considerations. Who may be affected if fish and wildlife habitat identified in the inventory is protected? Who benefits, and who is burdened by a habitat protection program? If some property owners are burdened, is the benefit gained commensurate with the burdens on property owners? The affected parties could include individual property owners, families, and businesses as well as other entities such as public agencies, non-profits, and community organizations.

Fish and wildlife habitat is fixed in location at a given point in time; therefore, the distribution of the assets and liabilities resulting from the habitat is inherently uneven. Uneven distribution of the habitat is not in itself an inequity, since these natural assets were not publicly allocated in the past and cannot be reallocated at present. The habitat exists in nature, is partially attributable to historic development trends, and is a feature of the landscape today. If Metro were to develop a plan to restore or acquire fish and wildlife habitat and thus invest publicly in conserving these areas, then social equity concerns might arise. Currently, distributive concerns are minimized because of the fixed character of the habitat and the lack of funds to develop restoration or acquisition programs targeted to the fish and wildlife habitat inventory.

Public access to many of the fish and wildlife habitat inventory sites identified by Metro is limited, and public benefits are more indirect than direct. Indirect public benefits are derived from the value of maintaining biodiversity in the region and from general environmental health and water quality improvements. The more direct benefits of being located near fish and wildlife habitat accrue to those nearby. While streams and rivers are a public resource, streamside property owners benefit more from actions taken to protect and enhance stream health. Those same property owners may "pay" for their location with the increased risk of flooding and sometimes additional regulations to maintain the public values of the habitat. Amenity values[47] that benefit property owners may be considered as offsets against burdens these same owners may face in shouldering the responsibility of conserving these resources.

Fish and wildlife habitat can add value to property (Bolitzer and Netusil 2000) and is related to the demand for these locations. On the other hand, if the fish and wildlife habitat substantially hinders development of the property or acts as a nuisance, then there are inequities to consider. If the benefits and burdens are relatively equal, then some of the equity issues may be neutral.

The property owners most affected by a decision to limit or prohibit conflicting uses are single-family residential (46 percent), followed by industrial land (14 percent). However, developed land is likely to be less affected than vacant land.[48] All residents of the region will benefit from the retention of fish and wildlife habitat, even though public access may be unavailable on all but publicly owned land. The benefits arising from protecting fish and wildlife habitat have been described throughout this social analysis. Thus, the burden may fall disproportionately on one group of property owners to provide the benefit for the common good. A protection program that includes incentives and carefully considers the impact of regulations may reduce the burden on the selected property owners.

Public property rights

Ownership of property is defined as an aggregate of rights that are guaranteed and protected by the government. However, the government retains some rights in trust for the people. For example, environmental quality and fish and wildlife habitat are not owned by anyone. They are public resources that the government can act to preserve, which is the concept of the public trust doctrine.

For example, the public has a right to clean air and water. Landowner actions on private land affect the quality of both air and water. Therefore, government regulations at the federal level have been developed to protect public rights through the Clean Air Act and the Clean Water Act. Similarly, fish and wildlife are important natural resources that typically cross legal boundaries, moving from one property to another. An individual does not own the wildlife that inhabits or crosses his or her land (*Geer v. Connecticut* 1896). If society has identified specific species of fish or wildlife as important to protect, through the Endangered Species Act or other means, then a government has the responsibility to act to maintain the species in trust for the people.

[47] See *Economic Consequences Analysis* for more description of amenity values.
[48] Developed land: single family, 37 percent; industrial, 34 percent. See *Conflicting Uses* chapter for more data.

In law, the public trust doctrine serves as a foundation of the public's right for common use and access of public resources (although this doctrine has traditionally been restricted to the interpretation of navigable waterways and tidelands). The public trust doctrine can theoretically be applied to all public trust resources. Private individuals do not own public trust resources. The Oregon beaches are one example of a public trust resource. The Oregon legislature affirmed the public's right to access or use of a common area (the beach) on Oregon's coast (between low tide and the line of vegetation defined in ORS 390.770) even if privately owned. This is not so much about a right of public access as about the responsibility to preserve the associated public value (availability of that experience) inherent to this unique coastal environment (Oregon Department of Land Conservation and Development 2003a, "Beach Bill"). Access is not required to protect a public trust resource. Protecting air and water quality or wildlife, while affecting private property rights, does not require providing public access to private land.

Controversy and legal conflicts are likely regarding the differences in public trust assertions and private right claims when these concepts overlap in policy making, such as with developing a program to protect regionally significant fish and wildlife habitat. Establishing the value of these habitats from both a public and private perspective is important in identifying the social concerns of protecting fish and wildlife habitat.

What fish and wildlife habitat will we leave for future generations to enjoy in the Metro region?

Sustainable development and other social movements by local, national and international groups have fostered a new urgency in planning and development. Interdisciplinary thinking seeks to reconcile natural resources, human needs, social responsibility, and ethics. Preserving biodiversity has an intrinsic value as well as a potential future value with regard to science, health, cultural heritage, and the economy. The overarching message of social-environmental policy is human interdependence with the natural world. Resource scarcity and environmental degradation temper production and consumption patterns around the world. This new social awareness leads to shifts in how growth and development occur, from the workplace to people's backyards.

Social values that support society's interdependence with nature, as opposed to control over nature, indicate an awareness of the biophysical limits of the environment. While everyone does not adhere to sustainable development's goal of a moral obligation to preserve the natural world, some see this as recognition of deeper social values that extend to future generations. The U.S. Conference of Catholic Bishops (USCCB) states that

> …[W]e simply cannot leave this problem for the children of tomorrow. As stewards of their heritage, we have an obligation to respect their dignity and to pass on their natural inheritance, so that their lives are protected and, if possible, made better than our own. (USCCB 2001)

Resource dependency is a defining characteristic of living systems. An essential challenge for modern development is how to design and manage for humanity's interdependence with nature. This is not just an ecological, engineering, or market question; it is also increasingly a social and policy issue. Attention to human-induced environmental problems has emerged as a result of our increased population, resource scarcity, waste generation and the combined effects on health and long-term survival.   In urban metropolitan areas these effects can be seen with growth: more people, more pollution, and a scarcity of open space (Donnelley 1998, Lange 2003, Lazaroff 2003, McClure 2003).

Intergenerational equity

How do people manage for environmental stability, health, and the integrity of the planet's ecosystem for future generations? The interdependency of people and nature is a reciprocal relationship. Feedback or awareness is key to the stability of the ecosystem. Sustainable development embraces this idea. It has captured the common sense notion of moderation, of realizing that biophysical limits exist and exercising caution with resources that may not be easily replenished. This current awareness extends to monitoring the most basic ecosystem attributes, such as climate conditions, air, water and soil quality, and species diversity.

Originally written 30 years ago, the Oregon Statewide Planning goals repeatedly cite "carrying capacity"[49] when assessing development and impacts on the environment. The following two phrases are repeated as considerations in nine planning guidelines (for natural resources, air and water quality, natural hazards, recreation, economic development, housing, public facilities, transportation, and urbanization):

> Plans … should consider as a major determinant the carrying capacity of the air, land and water resources of the planning area. The land conservation and development actions provided by such plans should not exceed the carrying capacity of such resources. (Oregon Department of Land Conservation and Development 2003b)

These are general parameters of evaluation and specific application of this principle is often hard to estimate. As more attention is paid to sustainability, renewed attention to what carrying capacity means becomes relevant. A decision to limit or prohibit conflicting uses in fish and wildlife habitat areas meets the social goal of retaining natural resources for future generations to enjoy.

What are the potential social consequences of allowing, limiting, or prohibiting conflicting uses?

The Goal 5 process requires local governments to make a decision to allow, limit, or prohibit conflicting uses to protect fish and wildlife habitat based on balancing the consequences of the four ESEE factors. A description of what it might mean to allow, limit, or prohibit conflicting uses is described in the Chapter 3, *Conflicting Uses*. The social consequences analysis is limited by the hypothetical context of policy changes. In general, the social considerations as they relate to specific property development are focused on people's rights and interests in effecting policy and on the value people place on the long-term existence of fish and wildlife habitat. Below is a general description of the social impacts of allowing, limiting or prohibiting conflicting uses, a

[49] *Carrying capacity* as defined by DLCD: Level of use which can be accommodated and continued without irreversible impairment of natural resources productivity, the ecosystem and the quality of air, land and water resources.

summary of the differences of the consequences by regional zone, and the key points learned from the social analysis. Several matrices relating the social impacts to Metro's generalized regional zones may be found in Appendix D.

Potential social consequences

Allow conflicting uses

A decision to allow conflicting uses in fish and wildlife habitat areas would have positive and negative social consequences. Property owners would not be concerned about impacts to property rights, there would be no takings issues, and the burden of protecting fish and wildlife habitat would be equally distributed. For residential land in particular, there might not be a change in personal financial security or the right to maintain and develop land within the existing regulatory framework. There would be no change in the number or type of housing options, and housing affordability might not be affected. Industrial landowners could continue to develop using land intensive practices. Employment opportunities under current zoning might not change. Additionally, less fish and wildlife habitat might mean a decreased risk of urban wildfires and nuisance species.

However, a decision to allow conflicting uses would have several negative impacts. The fish and wildlife habitat that forms a major portion of our cultural heritage, sense of place, and regional identity might be eroded and possibly lost. The salmon that are so important to Native American culture and the heritage of the Pacific Northwest would stand less of a chance of surviving. Some property owners might be concerned that property values would diminish due to potential loss of nearby natural areas. Public health could suffer due to poor air and water quality, fewer recreational opportunities, reduction in opportunities for mentally restorative nature visits, and possibly higher levels of aggression and violence. Opportunities for children and adults to learn about the environment specifically and to integrate environmental learning with traditional subjects to form a cohesive approach would be lost. Loss of tree canopy and vegetation could increase the risk of floods and landslides. Fewer companies might locate to this region if the quality of life and outdoor recreation are negatively affected. An allow decision would not provide for intergenerational equity, since people today would not be saving fish and wildlife habitat for future generations to enjoy.

Limit conflicting uses

A decision to limit conflicting uses in fish and wildlife habitat areas would be a compromise, attempting to minimize the negative social impacts of either allowing or prohibiting conflicting uses. If development occurred with minimal impact to the fish and wildlife habitat, social values could be maintained while reducing the effect on property owners. This type of approach could maintain housing and employment options while preserving as much habitat as possible. Some or most of our cultural heritage, neighborhood character, sense of place, and scenic values would be preserved. Negative impacts on public health could be reduced, and most educational opportunities could be retained. Benefits such as stress reduction, decrease in aggression and violent behavior, and positive impacts on mental health might not be lost. Salmon would be provided with more of a chance to recover and impacts on Native American culture and regional identity would be lessened. Risk of floods and landslides would be reduced, and there would be more intergenerational equity. However, an increase in habitat could result in more urban wildfires and nuisance species. Regulations limiting conflicting uses might not be equitably distributed among property owners, and there may be impacts on property rights as well as takings concerns.

Prohibit conflicting uses

A decision to prohibit conflicting uses in fish and wildlife habitat areas would preserve all of the important social values and public benefits provided by habitat described above. However, such regulations would result in an unequal distribution of burden among property owners, with a negative impact on property rights. Takings concerns would likely become an issue. While property owners with existing homes might not be affected, vacant land might not be allowed to develop in the same way as currently allowed. Housing and employment options might be reduced, with a resulting need to increase densities or expand the urban growth boundary. More land would be needed to meet housing and employment demand if conflicting uses were prohibited on additional land within the urban growth boundary.

Social consequences by generalized regional zone

Most of the social consequences are similar across zones (matrices describing the consequences may be found in Appendix D); the differences are identified below.

- **Single-family residential (SFR):** For single-family uses, a decision to allow could maintain personal financial security (equity) if property values are not affected. A limit or prohibit decision might reduce options for large lot homes if they are allowed under current zoning. However, in some instances larger lots could reduce the impact on fish and wildlife habitat and could be allowed under a limit decision, depending on the type of program.
- **Multi-family residential (MFR):** A limit or prohibit decision may reduce opportunities to develop at high densities in fish and wildlife habitat areas. This could affect property owners by reducing the number of units that could be built on a specific property, reducing development potential. However, a program could be designed to minimize the impact by allowing clustered development or transferring density.
- **Mixed-use centers (MUC):** An allow decision would have no impact on current 2040 densities or development in centers, supporting the achievement of the 2040 Growth Concept. A limit or prohibit decision may impact achievement of the 2040 Growth Concept by curtailing growth in centers, depending on the type of program implemented.
- **Commercial (COM) & Industrial (IND):** For commercial and industrial land the most important social consequence of a limit or prohibit decision is the potential to impact job creation and the location of future jobs.
- **Rural (RUR):** In rural areas the focus is on the future opportunities for housing and employment that could be minimized when the land is urbanized.
- **Parks and open space (POS):** An allow decision would maintain or increase opportunities for active recreation, while a decision to limit or prohibit could reduce opportunities for active recreation, depending on the program.

Summary points

- Protection of fish and wildlife habitat preserves many important social values. These include our cultural heritage, regional identity, sense of place, and neighborhood character. Property owners may also benefit from the retention of fish and wildlife habitat through increased property values. Opportunities for education abound in areas with healthy fish and wildlife habitat.

- The distribution of the regulatory burden on property owners to protect fish and wildlife habitat for the general public benefit is a critical social concern. Private property rights are a fundamental cornerstone of American life, and additional regulations reducing development rights may be seen as an attack on personal financial security as well as a possible taking. However, there are public rights to clean air and water, as well as healthy fish and wildlife, which serve as a counterbalance to this view.
- Fish and wildlife habitat provide positive benefits to public health and safety, but there are some negative effects. There are many obvious benefits of recreation, as well as the mental health and stress relief found in nature. Additionally, minimizing the incidence of flooding and erosion contributes to public safety. However, increased forest canopy and vegetation could lead to wildfire risks and potential damage from windstorms.
- People today have a responsibility to provide future generations with some of the same benefits that current residents enjoy. Sustainable development practices allow for development to occur today while maintaining a certain amount of intergenerational equity.

CHAPTER 6: ENVIRONMENTAL CONSEQUENCES

Introduction

Urban areas are, by their nature, heavily impacted by human activities. In turn, humans are part of the ecosystem in which they live, and human welfare ultimately depends in part on the vital services, such as shade, fresh air and clean water, provided by natural resources. The urban growth boundary (UGB) designates a limit to physical expansion of the urban area; to contain the negative ecological effects associated with urban sprawl and to protect valuable forest and agricultural lands. The UGB is effective at this: current aerial photographs clearly show that more natural resources and farmland remain outside the UGB than within it.

What are the consequences to regionally significant fish and wildlife habitat of allowing, limiting, or prohibiting land uses that conflict with habitat functions? Full protection of remaining fish and wildlife habitat will preserve existing habitat functions. Fully allowing conflicting uses in fish and wildlife habitat will reduce or remove existing ecological functions, with associated negative impacts on fish, wildlife and people. However, consequences for the broadest category – limiting conflicting uses within fish and wildlife habitat – depend on the definition of limit. Limiting conflicting uses implies that some limited amount of development or other conflicting use(s) will occur in conflict with fish and wildlife habitat areas. The consequences depend on the extent and type of land use and the habitat's ecological importance in the regional system, influenced by the program selected in the next phase of the Goal 5 process. Figure 6-1 provides a general illustration of the potential environmental consequences of this decision process; actual consequences depend on the program selected and its implementation effectiveness.

Figure 6-1. Range of potential consequences of prohibiting, limiting, and allowing conflicting uses within fish and wildlife habitat.

Prohibit	***Limit***	***Allow***
• Preserve existing ecological functions	• Existing ecological functions impaired	• Existing ecological functions greatly impaired
• More native plants and animals	• Some increase in non-native species invasions	• Greatly increased non-native species invasions
• More biodiversity	• Some biodiversity loss	• Substantial biodiversity loss
• Retain existing stream network	• Some streams will be lost, but less than allow	• Substantial stream loss continues
• Good restoration potential	• Good restoration potential	• Poor restoration potential
• Flood frequency, magnitude maintained as is possible	• Flooding increased compared to prohibit	• Flooding substantially increased
• Soil loss continues at current level	• Increased soil loss, sedimentation	• Very damaging soil loss, sedimentation
• Possibly retain salmon	• Salmon decline further	• Probable salmon loss
• Possible environmental threat due to greater UGB expansions	• Possible environmental threat due to greater UGB expansions, but to a lesser degree than Prohibit	• Decreased need for future UGB expansions, reducing environmental threats to areas outside the UGB

This chapter addresses the following questions:

- What are the functions and values of the region's fish and wildlife habitat?
- What impacts do conflicting uses have on the region's fish, wildlife, and their habitats?
- What are the potential environmental consequences to fish and wildlife habitat of allowing, limiting, or prohibiting uses that conflict with habitat function?

What are the functions and values of the region's fish and wildlife habitat?

To assess the consequences of allowing, limiting or prohibiting conflicting uses on fish and wildlife habitat, it is important to first identify the ecological characteristics of healthy ecosystems. Metro's science paper characterized the attributes of healthy watersheds and functional values of fish and wildlife habitat (Metro 2002c), as summarized below:

Key ecological attributes that characterize a healthy watershed

- Vegetated uplands dominated by native plant cover.
- Continuous stream corridors, including headwater areas, with healthy, fully functioning riparian corridors. The fewer the disruptions within the riparian corridor, the better.
- Floodplains connected with stream and river channels.
- Relatively unaltered hydrologic regimes.[50]
- Intact hyporheic zones.[51]
- Clean water at temperatures suitable to support native wildlife.
- Natural (or ecologically sustainable) input rates of solar radiation, sediments, organic matter, and nutrients that support healthy, productive and diverse fish and wildlife populations.
- Lateral, longitudinal and vertical connections between ecosystem components.
- Natural (or ecologically sustainable) rates of landscape disturbances.
- Good air quality.[52]
- Healthy, uncompacted soils.
- Diverse biological communities.

Key functions and values of fish and wildlife habitat

- Key habitat functions in riparian corridors can be assigned to five main categories: microclimate and shade; streamflow moderation and water storage; bank stabilization and pollution control; large wood and channel dynamics; and organic material sources.
- Native vegetation plays a critical role in the longitudinal and lateral connectivity of the riparian corridor for fish and wildlife.
- Native vegetation supports more species of native wildlife than non-native vegetation.
- Downed wood and snags (or large woody debris), frequently found in natural ecosystems but often lacking in disturbed environments, are crucial to providing high quality habitat in both

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[50] That is, natural drainage systems that route and deliver water in quantities and at rates similar to natural conditions.
[51] Retention of the natural intermixing of ground- and stream water.
[52] See Chapter 7, *Energy Consequences* for further discussion of air quality.

aquatic and terrestrial ecosystems. Large wood also influences natural channel dynamics.
- Conservation of the majority of water areas – wetlands, streams, groundwater, and near surface water areas (hyporheic zone) – is essential to ecosystem health.
- Appropriate buffers to retain key riparian corridor functions should be based on site-specific conditions.
- Upland habitat is important for many wildlife species. The guidelines in developing a conservation plan for upland habitat are: large habitat patches are better than small patches; small patches of unique habitat are worth saving; connectivity to other patches is important; and connectivity or proximity to water resources is valuable.
- Declining and unique habitats are vital to regional biodiversity, and should receive high conservation priority status.
- Habitat fragmentation is detrimental to both wildlife and habitat; buffers and surrounding land use play an important role in maintaining the functions of remaining habitat.
- Tree canopy provides important wildlife habitat and helps maintain air and water quality.

Metro's science paper (Metro 2002c) identifies the fish and wildlife species regularly supported by the region's existing wildlife habitat.

What impacts do conflicting uses have on the region's fish, wildlife, and their habitats?

In water and on land, urban environments share similar ecological problems worldwide, including habitat loss, habitat damage and alteration, modified hydrology, non-native species, and human disturbance. Impacts with negative consequences to fish and wildlife habitat are both site-specific and ultimately, cumulative. For example, stream problems due to pollution may come from either point-source[53] or non-point source polluters.[54] Cumulative impacts provide a way to consider the combined influence of one type of action by many individuals.

Metro's role is to assess and address the cumulative impacts of development and other uses that conflict with fish and wildlife habitat at the regional level. The scientific literature and Metro's fieldwork (Frady et al. 2003) state that certain types of site-specific impacts tend to be associated with certain development types.[55]

In urban areas, cumulative impacts are pervasive and cause great environmental harm. It is often difficult to separate one cumulative impact category from another because they overlap and combine for harmful effects. For example, vegetation loss and increased impervious surfaces combine to alter natural hydrologic regimes. During rainstorms, these impacts cause too much water to enter the streams, too quickly. The result is damaged streambanks and streambeds with increased erosion; erosion adds sediments to the stream, and so forth. Problems such as these quickly become widespread in all urban areas. For the purposes of this analysis it is useful to cluster the primary consequences into eight general categories. Table 6-1 below lists each environmental consequence category and cross-references it with the conflicting uses identified

[53] Industrial or municipal wastewater discharge into a stream or river.
[54] All landowners using pesticides or all non-natural stormwater discharges within a watershed.
[55] This is discussed in more detail in the *Conflicting Use* chapter.

in the *Conflicting Uses* chapter. Following Table 6-1, each environmental consequence category is described more fully and the types of impacts associated with that category identified.[56]

Table 6-1. Cross-reference of the major environmental consequences categories and the conflicting uses associated with each category.

Potential consequences to fish and wildlife habitat	Disturbance Activities (conflicting uses)																
	Vegetative clearing	Grading, filling, soil compaction	Installation of impervious surfaces; runoff	Stream modification	Installation and maintenance of utilities	Stormwater piping, water control structures	Road construction, bridges, culverts	Landscaping, introduction of exotic plant species	Introduction of non-native fish and wildlife species	Herbicides, pesticides, fertilizer use	Installation of fences and other wildlife barriers	Introduction of toxics, heavy metals, pollutants	Water useage	Livestock grazing	Trail construction, maintenance and use	Allowing pets, livestock in natural resource areas	Human disturbance (e.g. light, noise)
Altered hydrology, physical stream damage, increased flooding	■	■	■	■	■	■	■	□	□	□		□	■	■	□	□	
Degraded water quality	■	■	■	■	■	■	■	■	□	■		■	■	■	■	■	
Loss/degradation of riparian or upland habitat	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Habitat fragmentation	■	■	■	■	■	■	■	■	□	□	■		□	■	□	□	■
Altered microclimate	■	■	■	■	■	■	■	□		□			■	■	□		■
Reduced woody debris and organic materials	■	□	■	■	■	■	■	■		□			□	■	□		
Erosion, sedimentation and soil loss	■	■	■	■	■	■	■	□		□			□	■	■	□	
Reduced biodiversity; non-native species invasions	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

■ Conflicting use has potential for direct impact.
□ Conflicting use has potential for impacts, but at a reduced level or through indirect means.

Altered hydrology, physical stream damage, increased flooding

This category is listed first because it is an overarching issue in urban ecology. Activities typically associated with urbanization, especially vegetation removal, installation of impervious surfaces, and stormwater control (Table 6-1), fundamentally alter the patterns of rainwater delivery to streams and other waterbodies: too much water hits the stream too quickly. The result is physical damage to streams and an increase in flooding. Many adverse effects are documented due to hydrologic alterations, and some of these are listed in Table 6-2. Impaired

[56] For more in-depth discussions of these issues and relevant literature citations, see *Metro's Technical Report for Goal 5* (Metro 2002c).

water quality, addressed as a separate environmental consequence category, is also associated with altered hydrology, as are many other urban effects (see Table 6-1 above).

In the Metro region, much of the rainfall naturally seeps into the soil and makes its way to the stream only after much slowing and interception by soils, rocks, plants, and roots. Streams and the animals living there are adapted to these patterns; when the patterns change substantially, streams can no longer support some of these species, such as salmon and certain insects critical to instream food webs (McCarron et al. 1997; May and Horner 2000).

Development activities remove vegetation, add impervious surfaces, and often include intentional widening, deepening, straightening, and sometimes armoring streambanks to confine flows and increase a stream's capacity for localized flood control (although in fact, this practice increases flooding by altering the hydrology). These activities result in moving water more quickly downstream, disconnecting the stream from its floodplain and groundwater sources, degrading riparian habitat, and creating bigger floods and more problems downstream. To illustrate this concept, Figure 6-2 compares two hydrographs, a type of graph that charts the timing of runoff and peak flood stage. The "Q after" line shows a taller flood peak that occurs sooner, with more water being discharged via the stream than under natural conditions (Q before).

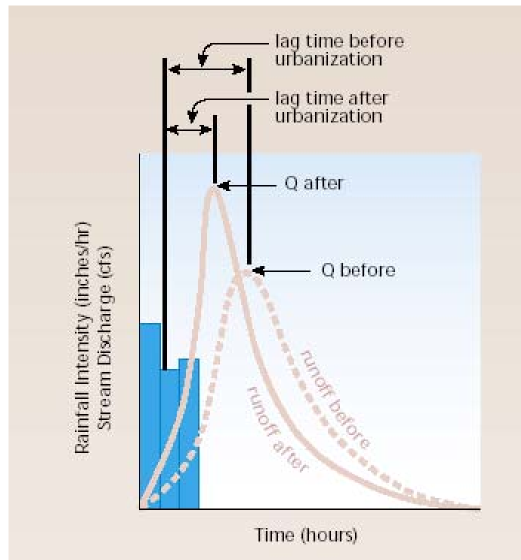

Figure 6-2. A comparison of hydrographs before and after urbanization.
(Source: FIRSWG 1988)

Altered hydrology damages stream channels and streambanks. Fast-moving, high-volume water quickly erodes away streambanks, incises (downcuts) stream channels, and increases sediment loads in the water and streambed. Stream channels widen and straighten, and are often intentionally modified in these ways, to accommodate increased stormwater velocity and volume due to altered hydrology. Large woody debris, ponds, pools, riffles, streambanks, and sandbars are simplified or washed away. The stream's substrate – that is, the particles making up the bottom of the streambed – tend to change from larger rocks to finer particles such as clay and silt; fine substrates are tightly packed, with little room for oxygen pockets or macroinvertebrates. Salmon need larger substrates for spawning, and they also need macroinvertebrates for food. These changes result in a loss of stream complexity and fish and wildlife habitat and degraded water quality downstream due to increased fine sediments in the channel and in the water column.

Altered hydrology causes increased flooding by affecting the frequency, duration and magnitude of flood events, and reducing water infiltration and storage (Booth and Jackson 1997). The frequency is altered in that more floods occur per year. Flood duration and severity tend to be increased. These flood characteristics are typically measured using a hydrograph; Figure 6-2 shows an example of the changes in flood patterns that occur with urbanization. The hydrograph's peak is taller and occurs sooner (a bigger flood that quickly overwhelms water storage) and the shape of the peak is narrower (the water is not retained on the land to replenish groundwater and keep summer streams running).

Altered hydrology complicates restoration efforts in an urban setting. Restoration has some limited ability to counteract these negative effects, but may be rendered ineffective if larger-scale issues such as stormwater, canopy cover, and imperviousness are not addressed. For example, placing large wood in a stream usually helps under more natural conditions, but if the stream is too flashy from altered hydrology it may wash away the wood and continue to widen, deepen, and damage the stream.

Table 6-2. Environmental consequences of altered hydrology, physical stream damage and increased flooding.

- Degraded riparian habitat, ecological function loss
- Decreased channel sinuosity (results in higher water velocity, increased discharge, increased flooding)
- Stream channel scouring, armoring, and changes in channel width and depth
- Streambank erosion and destabilization
- Downstream sedimentation and erosion
- Loss of riparian vegetation due to erosion, downcutting, disconnection with groundwater
- Loss of stream shading; higher water temperatures
- Altered microclimate
- Loss of riparian buffer filtration capacity
- Loss of hyporheic zone, groundwater
- Loss of large woody debris, instream complexity
- Loss of pool/riffle complexes and decreased streambed substrate size harms native fish and invertebrates
- Loss of ecosystem services provided by healthy watersheds: clean water, nutrient cycling, human food (salmon), water storage, flood abatement, summertime inflow/recharge of cool, clean water to streams, etc.
- Loss of critical food web components (macroinvertebrates, salmon, organic materials)
- Loss of sand bars, shorebird, and waterfowl habitat
- Loss of habitat heterogeneity; reduced instream and riparian structural and functional diversity
- Loss of native soil and native soil invertebrates
- Native aquatic and land-dwelling wildlife decline due to cumulative instream and terrestrial habitat degradation
- Reduced biodiversity

Degraded water quality

Urban areas are where human population densities are highest. Humans are the primary source of pollutants and excess nutrients, thus urbanized watersheds typically have elevated pollution levels and impaired water quality. However, many factors contribute to pollution, and some of these factors can be controlled or mitigated. Table 6-3 highlights some of the environmental consequences of degraded water quality.

Excess pollutants, increased temperatures, or excess sediments may degrade water quality. Sediments are addressed in a separate consequences category below (Erosion, sedimentation and soil loss). Pollution can destroy food webs within stream systems. Pollution includes excess fertilizers, pesticides and herbicides, heavy metals, and other toxins. Impervious surfaces collect and concentrate pollutants from different land use activities and deliver these materials to streams during storms, preventing percolation and natural filtering by soil and vegetation. Data collected in the Pacific Northwest suggest that pollution from urban areas is harming salmon, birds and some mammals such as river otters (Lower Columbia River Estuary Program [LCREP] 1999; McCarthy and Gale 1999). Human health is also an issue; eating fish and crayfish from polluted waters can cause serious illness.[57] For example, fish in the Columbia Slough contain PCBs and pesticides; these chemicals may effect human development, reproduction, and immune systems, and may increase the probability of contracting cancer (City of Portland 2003).

[57] See *Social Consequences* chapter for further discussion of public health issues.

Development type influences the pollutants entering stream systems. For example, *E. coli* derives primarily from residential areas (pets, leaking septic tanks, etc.), entering through runoff, stormwater and groundwater; this bacterium is an indicator of fecal pollution from warm-blooded animals (Oregon Department of Environmental Quality 1998). Sediments derive most frequently from industrial and residential streets; construction and agriculture are other major sediment sources.

Phosphorus derives from fertilizer applied to residential lawns, industrial streets, and residential streets, in that order, but also sometimes from natural geological sources and from air deposition (Don Yon, Oregon DEQ, personal communication 2003); elevated phosphorus levels are a common problem in our area. Excess nitrogen is typically associated with agricultural lands, but residential fertilizers are another source. Some of these nutrients are needed in waterways, but excess amounts cause unnaturally increased nutrients, leading to low-oxygen water conditions and other water quality problems.

Heavy metals in excess amounts are toxic to humans, fish and other wildlife. Heavy metals are often contributed by cars and trucks; brake pads, oil and tire wear are major sources (Engberg 1995; Baldwin et al. 2003). Copper is emerging as a major problem for salmon, and in urban areas derives primarily from brake pads (Baldwin et al. 2003). Industrial lands are also a source of heavy metals through both point- and nonpoint-sources, but residential roofs also contribute substantial amounts of copper and zinc.

Pesticides, from both the present and the past (e.g., DDT), are present in many of the region’s streams. More pounds of pesticides per acre are applied in urban areas than agricultural areas (Stinson and Bromley 1991). Recent research suggests that pesticides at low levels have an additive harmful effect on stream-dwelling wildlife (Munn and Gilliom 2001). Pesticides harm fish and wildlife through a variety of means, including direct mortality, decreased reproductive capacity, loss of salmon navigation and defense abilities, and loss of macroinvertebrates, a key salmon food source.

Table 6-3. Environmental consequences of degraded water quality.

- Hazardous materials, toxics in waterways and on land
- Groundwater and well water contamination
- Toxic pesticide residuals may remain in soils, plants, groundwater, and surface water for decades
- Human toxicity, direct and indirect (drinking contaminated water, eating contaminated fish)
- Heavy metal contamination harms salmon
- Pesticides entering waterways kill or harm aquatic organisms; unintended kills to non-target organisms
- Loss of pollution-intolerant species; increase in tolerant generalist species, which out-compete sensitive species
- Toxin bioaccumulation; decrease in reproductive success (e.g., Bald Eagles, Osprey, salmon, otters)
- Pollution-associated chemical changes, growth impediments
- Decreased stream and wetland water quality; feeds into larger streams, rivers and degrades downstream quality
- Increased nutrients in streams and wetlands; excess algal growth, low oxygen conditions harm aquatic organisms
- Decrease in life-sustaining capacity of air, water, and land
- Impaired salmon olfactory responses and homing behavior
- E. coli, other bacterial contamination; human health risk
- Water temperature increases result in lower dissolved oxygen; harms temperature-sensitive aquatic organisms (e.g., salmon, macroinvertebrates)
- Reduced biodiversity

Other chemicals found in streams, soil and groundwater create a variety of health problems for humans, fish and wildlife. Oil and other hydrocarbons, PAHs (polycyclic aromatic hydrocarbons), PCBs, dioxins and furans, pesticides, and metals are the most toxic to fish and wildlife, based on both Lower Columbia River and Willamette River studies by DEQ, and these are also most prevalent in the region's waterways (Don Yon, personal communication 2003). These chemicals typically derive from vehicular use and industrial and residential uses, through both point- and nonpoint-sources.

Physical and chemical pollution is not the only important water quality issue; temperature is a key water quality issue in the Metro region (see *Appendix B*). Water temperature is an important indicator of a watershed's vitality because of its controlling influence on the metabolism, development and activity of aquatic organisms (Naiman et al. 1992). Cold water holds more oxygen; cold, well-oxygenated water is needed by many aquatic species. Increased water temperatures may have profound effects on aquatic species, such as salmon, that can tolerate only a limited temperature range natural to Pacific Northwest streams. Air temperature and riparian vegetation play key roles in maintaining lower water temperatures.[58]

Riparian vegetation helps keep stream and river water cool (Budd et al. 1987). Riparian vegetation is more effective in providing shade and moderating stream temperature in smaller streams. Shade also cools shallow groundwater that feeds the stream during dry summer periods. Although shading on larger rivers may have little influence on water temperature, overhanging riparian vegetation along the banks creates cooler microhabitat for fish and aquatic organisms, and shade from smaller tributaries supply cooler water to large rivers (Palone and Todd 1997). Removing vegetation, especially trees and shrubs, results in warmer stream and river water.

As described in Chapter 1, the Oregon DEQ is required by the federal Clean Water Act to maintain a list of steam segments that do not meet water quality standards, called the 303(d) list. Many of the region's stream reaches are 303(d) listed as water-quality impaired due to elevated temperatures (Appendix B). Elevated temperatures are typically due to a combination of riparian forest removal and an increase in pavement and other impervious surfaces, where water flowing across these heat-gathering surfaces is warmed. Fish and other aquatic wildlife are adapted to the naturally cool water conditions in the Metro region, and warmer water harms these animals.

Loss/degradation of fish and wildlife habitat

Vegetation loss through a variety of means harms fish and wildlife and their habitats. Habitat loss has been identified a key factor in the decline of biodiversity worldwide (Kerr and Currie 1995). Within this category, many actions contribute to cumulative impacts. The Metro region, once composed of vast forested expanses, now has only about 12 percent forest canopy cover remaining according to one recent report (American Forests 2001). Substantial losses (25 percent or more) of surface streams reduces riparian habitat, a vitally important habitat type to the region's wildlife (Metro 1999b). Table 6-4 highlights some of the environmental consequences of habitat loss and degradation.

However, substantially more forest canopy cover exists outside the UGB than within it, attesting

[58] See Chapter 7 *Energy Consequences* for more information.

to the success of the UGB in controlling some negative impacts due to urbanization at the macro scale. In addition, many areas within the Metro region are currently undergoing restoration and tree-planting activities that provide widespread benefits to fish, wildlife, and people through improvements to the environment. If this environmentally promising trend continues and accelerates, the region could potentially see ecological improvement over time, perhaps even with increased human population and development.

Table 6-4. Environmental consequences of fish and wildlife habitat loss and degradation.

- Altered watershed hydrology
- Increased flooding
- Erosion and soil loss throughout the watershed
- Increased downstream sedimentation and erosion
- Increased water velocity: stream incision, bank damage, loss of pool/riffle complexes, decreased substrate size
- Soil compaction; reduced water infiltration and storage
- Loss of fish and wildlife habitat
- Loss of habitat connectivity; fragmentation
- Reduction of structural and functional habitat diversity
- Shift in vegetation types or dominant plant species
- Shift to deciduous tree cover, with changes in wildlife, nutrient cycles, and reduced water storage capacity
- Increased adverse edge effects such as predation
- Increased edge-associated non-native species
- Loss of native vegetation in herbaceous, shrub, tree layers
- Loss of large woody debris and its sources
- Loss of native soil and native invertebrates
- Native aquatic wildlife declines due to cumulative instream and terrestrial habitat degradation
- Loss of stream shading
- Increased air temperatures (see Energy section, Urban Heat Island effect)
- Increased water temperatures
- Altered microclimate (warmer, drier air and soils)
- Loss of ecosystem services provided by plants (toxin and CO_2 uptake; O_2 release; water and carbon storage)
- Loss of riparian buffer pollution, sediment filtration capacity
- Loss of at-risk habitats
- Reduced biodiversity

Wildlife habitat is directly lost through development and other land use activities that remove trees and other vegetation. Habitat is degraded through a variety of activities, from site-specific to regional spatial scales. For example, at the site level, construction of a single-family residential home typically involves clearing vegetation, resulting in habitat loss. Lawns and other non-native vegetation replace native forests, resulting in a shift in plant species, leading to a shift in wildlife species. This is often to the detriment of native species and those species that rely on specific native habitat types such as grasslands, coniferous forests, or Oregon white oak habitat. During site preparation, soils are moved and compacted, altering soil profiles, fungus and microorganisms important to the success of native plant communities.

At a larger spatial scale, the effects of changes in vegetative cover can be observed through long-term species trends. For example, at-risk habitats in this region include riparian forests and grasslands, with substantial regional losses documented. Trends over the past three decades for many bird species that specialize in these habitats show precipitous declines.[59]

All other consequence categories interact with this consequence category. For example, altered hydrology results in the loss and degradation of aquatic/riparian areas; so do degraded water quality, habitat fragmentation, altered microclimate, loss of large wood, and erosion and soil

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[59] For some examples of species declining in the Metro region, see Table 6 in *Metro's Technical Report for Goal 5* (Metro 2002c).

loss. This is because wildlife depends on natural resources to live, and natural resources rely to some degree on wildlife as well. For example, plants need insects for fertilization; plants provide insects with food and a place to live, hide, and reproduce. Nearly all bird species feed their young insects. Birds disperse the plant seeds pollinated by the insects, and also do some pollinating themselves (for example, hummingbirds).

Habitat fragmentation

As discussed above, large-scale vegetation loss impacts wildlife. What habitat remains typically becomes fragmented, with increased consequences to wildlife and habitat due to negative edge effects and loss of connectivity between habitats. Habitat fragmentation has been identified as a key factor in the decline of biodiversity worldwide (Kerr and Currie 1995). Table 6-5 highlights some of the environmental consequences of habitat fragmentation.

Fragmentation reduces or eliminates the structural and functional diversity of fish and wildlife habitat; it also alters microclimate, discussed below. The predominance of non-native species is a key problem accompanying habitat fragmentation, primarily due to adverse edge effects.[60]

Edge effects are the negative consequences to plant and wildlife communities due to positioning near the edge of a habitat patch. Edge effects include increased predation of birds and bird nests by native and non-native predators; increased non-native plant and animal species; simplified forest structure; and increased human disturbances (physical, light and noise) associated with activities near the edge of the patch (Soulé 1991; Lidicker and Koenig 1996; Bolger et al. 1997; Hennings and Edge 2003). Habitat fragmentation increases edge habitat, and edge effects.

Table 6-5. Environmental consequences of wildlife habitat fragmentation.

- Small remnant patches of habitat not connected to other natural vegetation
- Adverse edge effects due to non-native or invasive plants and animals
- Increased wildlife disturbance and mortality due to pets, humans and predators moving along patch edges
- Increased nest predation
- Degraded habitat quality due to reduction in invertebrate abundance and quality
- Loss of connectivity between habitat patches
- Gradual loss of species richness over time in disconnected habitat patches
- Loss of population gene flow and genetic diversity
- “Edge” species benefit, while forest-interior or area-sensitive species decline or are lost
- Impassable barriers and mortality to wildlife (e.g., roads)
- Increases in roads and pathways (major disturbance and invasive species vectors)
- Vegetation trampling, soil compaction and tree root zone disturbance; increased tree wind-throw and death
- Loss of/harm to those species relying on a specific habitat type to meet their life-history needs
- Loss of/harm to disturbance-sensitive wildlife species (e.g., Neotropical migratory songbirds, bats, shorebirds)
- Noise/light pollution require fish and wildlife habitat quality
- Reduced biodiversity

Fragmentation and habitat isolation is also a problem because some wildlife species, such as amphibians, have small home ranges and cannot travel as freely as birds and mammals (Corn and Bury 1989; Richter and Azous 1995). Once a species disappears from a habitat patch, there may

[60] Non-native species are discussed further under the section below entitled “Reduced biodiversity and non-native species invasions.”

be no way for more individuals of that species to move back in and repopulate the patch, causing regional species losses over time. All types of development can cause habitat loss and fragmentation, and fragmentation occurs in all types of habitat – streams, wetlands, riparian, and upland wildlife habitats. When large-scale habitat loss occurs, an ecosystem can no longer support as much wildlife as it once did (Wilcox and Murphy 1985; Bolger et al. 1997).

It is possible to reduce the adverse effects of fragmentation by planning the size, shape, and connectivity of remaining natural areas (Soulé 1991) and Metro built these important characteristics into the wildlife habitat model.[61]

In areas with extensive habitat loss typical of urban areas, it is important to plan for larger habitat patches and connectivity among patches wherever possible. Narrow habitat patches such as those along developed streams are critical to migratory wildlife such as Neotropical migratory birds, known to be at risk in the Metro area (Hennings and Edge 2003). Neotropical migrants are bird species that breed in the Metro region, but migrate south of the U.S./Mexico border to overwinter.[62] A system that contains large and medium sized habitat patches, connected by narrower corridors and nearby smaller patches is desirable.

The amount of human disturbance to wildlife is related to habitat fragmentation. Human disturbance can occur anywhere in urban areas, but within wildlife habitat patches these disturbances are typically concentrated in or near edge habitats. Road, noise, lights, and human activity[63] can all have detrimental effects on fish and wildlife and their habitats.

Noise can disrupt wildlife movement by distracting animals or by causing them to move away from the noise source, which can affect migration, breeding and nesting habits, as well as effectively reducing available habitat. Road noise is an emerging issue for birds, who rely on song to communicate and defend their breeding territories (Reijnen et al. 1995). Road noise may be a key to Neotropical migratory songbird loss in our urban area, where the number of species and individuals is reduced with increasing road density (Hennings and Edge 2003).

Night lighting, which frequently occurs near habitat edges, can alter the life cycles of plants and animals. For example, Moore et al. (2000) found that night lighting caused some wetland algae-grazing invertebrate species to forage deeper in the water; this could cause algal blooms at the water's surface, which can degrade water quality through low dissolved oxygen levels and toxicity. While lighting effects on fish of our area have not been studied, river-dwelling seatrout in Scotland are exposed to greater predation under night lighting (Contor and Griffith 1995). Terrestrial invertebrates (Frank 1988), amphibians (Buchanan 1993), birds (Frey 1993) and mammals (Rydell and Baagoe 1996) are also affected by night lighting.

Large buildings that remain lit overnight are known to attract migrating birds, which are injured or killed when they hit the buildings (Trapp 1998; Manville 2000). The magnitude of kills may

[61] See *Introduction* chapter for a brief description of Metro's wildlife habitat model. Metro's *Riparian corridor and Wildlife Habitat Inventories* contain a complete description (Metro 2002c).
[62] Typical examples include some of the more colorful species such as most warblers, Rufous Hummingbirds and Western Tanagers.
[63] For example, hiking on trails, children playing in streams.

depend on siting, height, lighting, and cross-sectional area of the obstacle, as well as weather conditions (Weir 1976). Night lighting also affects wildlife habitat itself. Many plant species depend on light and dark cycle lengths to direct their growth and reproduction, thus changing light duration may interfere with germination, flowering, and growth (Campbell 1990; Edwards and El-Kassaby 1996; Environmental Building News 1998).

The mere presence of humans has been shown to be detrimental to some wildlife species. Repeated human disturbance such as approaching large mammals can cause loss of unborn young (Phillips and Alldredge 2000). Bird biologists recognize that repeatedly approaching a bird's nest may cause the parents to abandon eggs or young (Bowman and Stehn 2003). Human disturbance causes energetically costly defensive behavior in animals; for example, bats are particularly sensitive to human disturbance, especially during breeding or hibernation (LaRoe et al. 1995; Tuttle 1997; Montana Chapter, The Wildlife Society 1999). Other negative effects from humans disturbing natural environments include vegetation trampling, tree root zone disturbance, and soil compaction, which reduces water infiltration and capacity for soil to support plants and invertebrates) (Cole and Trull 1992; Cole 1995; Whitecotton et al. 2000).

Altered microclimate

Riparian areas have a unique microclimate differentiated from upland habitat by a diversity of vegetation, leading to complex structure in the forest canopy, which impacts the amount of light, heat, and wind that penetrates the area. Moist soils help to keep temperatures lower than in surrounding areas as well. Stream channel width and riparian area topography influence microclimate extent (Brosofske et al. 1997; Pollock and Kennard 1998). Table 6-6 highlights some of the environmental consequences of altered microclimate.

Table 6-6. Environmental consequences of altered microclimate.

- Decrease in soil and air moisture
- Increase in soil, air, and water temperatures, with particularly harmful effects to amphibians
- Wider temperature variability in soils and air
- Decrease in soil's carrying capacity for microorganisms (macroinvertebrates, beneficial bacteria and fungi)
- Decrease in soil's ability to support plants, with corresponding habitat loss/degradation and reduction in ecosystem's ability to support wildlife
- Reduction in organic materials and large wood; altered food web, degraded fish and wildlife habitat (especially invertebrates, fish, amphibians, small mammals and snag-dependent species)
- Decrease in terrestrial food sources: leaves and other organic matter, macroinvertebrates
- Decreased stream shading, increased water temperatures
- Shallow groundwater temperature increases due to shading loss and soil warming
- Increased wind causes wind-throw, damaging or killing trees, especially near edges
- Wind-throw causes reduction in patch size and increased edge effects and fragmentation
- Wind-throw exposes soils to erosion
- Altered plant, fish and wildlife communities
- Reduced biodiversity

The microclimate of riparian areas is generally more moist and mild (cooler in summer and warmer in winter) than the surrounding area (Knutson and Naef 1997). This creates diverse habitat characteristics that are desirable to many species, particularly for amphibians year-round and for large mammals during hot, dry summers and severe winters (Knutson and Naef 1997). Widespread microclimate alterations change plant and animal communities, due in part to the edge effects engendered by habitat fragmentation (Saunders et al. 1999; Gehlhausen et al. 2000; Laurance et al. 2000). Forest edges tend to have elevated air temperatures, reduced humidity, and are exposed to more wind than forest interior habitats (Saunders et al. 1999; Gehlhausen et al. 2000; Laurance et al. 2000). In urban areas, this effect is compounded by the urban heat island effect.[64]

Amphibians may be the group most sensitive to microclimate changes and have suffered worldwide declines over the past 20 years, with particularly significant declines in the Pacific Northwest (LaRoe et al. 1995; Richter and Ostergaard 1999; Semlitsch 2000). Unlike other species groups, amphibian skin and eggs are not wind- or waterproof, and exposure to temperature and wind increases may be lethal.

Microclimate includes wind effects. An important consideration with forested riparian buffers is the ability of the forest to withstand the force of high winds (Broderson 1973; Steimblums et al. 1984). For example, in northwest Washington, windthrow (uprooting of trees or tree trunk breakage from wind) averaged 33 percent in riparian forest buffers within one to three years after clearcut harvest of adjacent timber (Grizzel and Wolff 1998). In a review of several studies, Pollock and Kennard (1998) determined that wider forest buffers protected trees from windthrow much more effectively than narrow forests. Thus, microclimate effects also relate to habitat loss and degradation, as well as several other consequence categories.

Shade is an important microclimatic function of riparian vegetation that influences water temperature (discussed in the Degraded Water Quality section above). Riparian vegetation creates an instream microclimate that maintains relatively constant water temperatures; when a riparian forest is removed, the monthly mean maximum temperature along smaller streams may increase 7-8° C (Budd et al. 1987). Water temperature is one of the most crucial environmental factors influencing salmon and other aquatic species.

Reduced woody debris and organic materials

Large woody debris (LWD), such as branches, logs, snags, uprooted trees, and root wads, is an important component of aquatic habitats in the Pacific Northwest, both as a structural element and as cover from predators or protection from high streamflows (Adams 1994; Prichard et al. 1998). Organic matter, such as leaves, twigs, and pine needles, help form the foundation of food webs both in aquatic habitats and on land. When riparian vegetation is removed, the source of large wood and organic matter is removed, with resulting harm to fish and wildlife habitat. Table 6-7

Table 6-7. Environmental consequences of reduced woody debris and organic material.

- Loss of stream and channel complexity (pool-riffle sequences, river island formation)
- Changes in channel bottom topography and substrate
- Increased water velocity in streams and rivers
- Changes in sediment and nutrient storage, transport, and cycling; decreased nutrient retention time
- Increased erosion rates and sedimentation
- Loss of important base components of food web
- Reduced carrying capacity of environment (fewer individuals can be supported when food is reduced)
- Loss of important macroinvertebrate, fish, amphibian, bat and small mammal, and bird refugia and habitat
- Potential loss of wildlife species depending on large wood and snags
- Decreased carbon storage (see Energy section)
- Loss of organic components that make up healthy soil; decreased beneficial bacteria, fungi and soil invertebrates
- Decreased rate of new soil production
- Decreased ability for soil to support plants and animals
- Reduced biodiversity

[64] See *Energy Consequences* chapter.

highlights some of the environmental consequences of reduced woody debris and organic materials.

Large woody debris is a key aquatic habitat structure. As sediment, large woody debris and other organic materials are transported and deposited throughout a watershed, channel characteristics and aquatic and terrestrial habitats are formed. Large woody debris is important because it influences the routing and storage of water and sediments, as well as the development of channel bottom topography, including the formation and distribution of pools (Beschta 1979; Booth et al. 1997).

In addition, LWD helps dissipate energy generated from streamflow, slowing erosion and sediment transport rate and retaining organic debris, making it available to organisms living there (Naiman et al. 1992). Large woody debris is also an important source of aquatic cover and acts as a surface for biological activity by aquatic organisms (Gregory et al. 1991; Naiman et al. 1992).

Large woody debris is often intentionally removed from waterways; for example, between 1867 and 1912, 55 miles of the Willamette River above Albany, Oregon were improved for navigation by removing an average 61 snags per kilometer (Sedell et al. 1990). Large wood may also be removed from streams in an attempt to reduce flooding. In urban streams of the Pacific Northwest, large wood is significantly depleted through washout, downcutting, and direct removal (Booth et al. 1997). In the Puget Sound region, the amount of large woody debris in the channel decreases with increased development (May et al. 1997).

The removal of riparian vegetation also results in loss of terrestrial LWD critical to soil health and wildlife habitat (Maser and Trappe 1984). Large woody debris, both standing (snags) and fallen, is an important source of foraging, cover and nest sites for birds, mammals, reptiles, and amphibians. LWD provides nesting habitat for cavity-nesting birds such as woodpeckers, chickadees, nuthatches and wrens. Woody debris has also been shown to be a key habitat element for amphibians (Bury et al. 1991; Welsh and Lind 1991; Butts and McComb 2000) and small mammals (McComb et al. 1993; Butts and McComb 2000; Wilson and Carey 2000).

Beyond the structural importance of LWD, other, smaller organic debris provides carbon, the basic fuel for aquatic and terrestrial food webs (Allan 1995). Smaller pieces of organic litter (e.g., leaves, needles and twigs) and terrestrial insects, important food sources for aquatic species, enter the stream primarily by direct leaf or debris fall (Spence et al. 1996). Benthic, or stream-bottom, invertebrates rely on a supply of organic litter to maintain healthy communities. Removing riparian vegetation also removes the primary source of these materials, reducing the stream’s habitat value to fish and wildlife (Brown and Krygier 1970). In addition, when flow rates increase and channels are simplified, the retention time of organic debris in the system is decreased because it quickly washes downstream (Webster and Meyer 1997). Thus urbanized streams tend to contain less food than undisturbed watersheds.

Erosion, sedimentation and soil loss

Increased erosion and sedimentation results from:

- vegetation removal,
- hydrologic alterations (increased water velocity increases erosion),
- roads and other impervious surfaces, and
- construction.

Upon delivery to streams, these sediments are either suspended in water (creating increased turbidity) or deposited on the streambed (creating sediment build-up and embeddedness), where they can alter sediment transport processes, initiate channel instability and lead to in- and near-stream habitat degradation. Erosion removes topsoil; it takes many years for nature to build only a few inches of good topsoil. Healthy soils are vital in the establishment and nourishment of plants and provide habitat for countless organisms. Construction activities also compact soil, reducing the overall watershed infiltration rate and storage capacity. Table 6-8 highlights some of the environmental consequences of erosion, sedimentation and soil loss.

Table 6-8. Environmental consequences of erosion, sedimentation and soil loss.

- Soil loss; it takes centuries to build a few inches of good soil. Hydric (water-retaining) soil is especially detrimental.
- Stream banks damaged
- Stream bed substrates altered, size reduced (salmon and many macroinvertebrates need larger substrate; fish, amphibians, birds, other animals need macroinvertebrates)
- Sediment buildup in stream channels and subsequent loss of channel topography (infilling of pools and loss of biodiversity in aquatic habitats)
- Water quality impairments; increased sedimentation in downstream streams and wetlands
- Increased sedimentation in estaries due to feeder stream sediment loads
- Loss of soil's ability to support vegetation, with accompanying habitat loss and degradation
- Vegetation is damaged or washed away when soils are eroded; fish and wildlife habitat loss and degradation
- Vegetation loss leads to increased runoff, leading to further erosion
- Loss of organic matter critical to fish and wildlife food webs and habitat
- Toxics bind to sediments, enter streams and wetlands
- Salmon reduction and loss
- Large amounts of land with recently disturbed soils suitable for weedy, invasive species
- Increased water turbidity and/or changes in water chemistry, with negative fish and wildlife consequences
- Reduced biodiversity

Vegetation holds soils in place and captures excess sediments as they wash through during rainstorms (Gregory et al. 1991; Knutson and Naef 1997; Naiman and Decamps 1997). Riparian vegetation removal is especially harmful because it disturbs existing soils, allows sediments from the disturbed area to wash into stream, and removes the last remaining filter between the stream and the land. However, removal of vegetation in upland areas, especially in steeply sloped terrain, also contributes to a higher rate of soil erosion and can result in significant consequences such as landslides, flooding, channel erosion and destruction of aquatic habitat.

Landslides are downslope movement, under gravity, of masses of soil and rock material.[65] In an urban setting, improper drainage most often induces disastrous sliding (Oregon DOGAMI 2003). Landslides and debris flows (rapidly moving landslides that typically move long distances) are natural processes, triggered or accelerated by these factors:

- Intense or prolonged rainfall, or rapid snow melt, causing sharp changes in groundwater levels
- Undercutting of a slope or cliff by erosion or evacuation
- Shocks or vibrations from earthquakes or construction.
- Vegetation removal by fires, timber harvesting, or land clearing.
- Placing fill (weight) on steep slopes
- A combination of these factors

Salmon and other aquatic species need clear water with low concentrations of suspended sediments in the water column (turbidity) and cool water. High turbidity clogs fish gills and can hamper migration. However, deposited sediments generally have a greater impact on aquatic species than suspended sediments because they alter macroinvertebrate communities (salmon food supply) and ruins spawning habitat. Salmon, salamanders and many aquatic insects need relatively sediment-free gravel beds with suitable gravel in which to reproduce.

Roads and other impervious surfaces contribute substantially to erosion and soil loss. Road networks contribute more sediments to streams than any other land management activity, from both surface erosion and landslides (Jones et al. 2000; Gucinski et al. 2001). Not only do these features substantially increase sedimentation in their own right, but they also reduce the capacity of soil to support vegetation and store water. In addition, many toxic substances bind to soil particles and enter waterways via eroded soil; for example, DDT, banned decades ago but still present in soils, washes into streams and wetlands in this manner.

Activities such as grading, filling, hauling and agriculture cause significant erosion and transport of fine sediments to the stream (Trimble 1997; Wood and Armitage 1997). Each year in the U.S. an estimated 80 million tons of sediment are washed from construction sites into water bodies (Goldman et al. 1986). Soil quality is typically degraded along urban stream corridors where development activities include removal of natural riparian vegetation, grading, compaction of soil, and placement of fill that is dissimilar from native topsoil.

Reduced biodiversity, non-native species introductions, and landscaping

As described in the *Introduction* chapter, our area's natural resources have changed dramatically in terms of quantity and quality with human encroachment. Altered plant and animal communities are a hallmark of urban ecosystems. Non-native plant and animal invasions, proliferation of generalist species and loss of specialists (those relying on a specific habitat type or feature) are prevalent. Non-native species are associated with the majority of at-risk species declines worldwide due to competition for resources and outright predation (Wilcove et al. 1998;

[65] As defined by the Oregon Department of Geology and Mineral Industries (DOGAMI; Oregon DOGAMI 2003). Landslide hazard areas have been mapped by DOGAMI and are available on their website www.oregongeology.com/landslide/landslidehome.htm.

Pimentel et al. 2000). Table 6-9 highlights some of the environmental consequences of reduced biodiversity and non-native species invasions.

Manicured lawns and landscaping often replace natural vegetation along stream corridors in developed areas throughout watersheds, and this impacts wildlife communities. By replacing the naturally complex mix of vegetation with lawns, structural complexity is reduced. Structurally complex vegetation supports more native species than simple vegetation (Hennings and Edge 2003). In addition, simplified, non-native habitats favor non-native wildlife species because the non-native species that have established populations are habitat generalists, or species that can survive in a wide variety of circumstances. Native generalists also benefit from habitat simplification, to the detriment of native species with more specific habitat requirements.

Table 6-9. Environmental consequences of reduced biodiversity, non-native species introductions, and landscaping.

- Restricted pool of pollinators and seed dispersers
- Reduced native wildlife gene pools can lead to decreased survival rates
- Human-enhanced dispersal of some species (weeds, rodent pests, starlings, English Sparrows, pigeons)
- Potential reduction, loss of species that control pest species (e.g., woodpeckers control carpenter ants)
- Increased competition for food and habitat resources
- Non-native species invasions; reductions in native fish and wildlife populations; extirpations; species extinctions
- Urbanization often benefits species with small home ranges and high reproductive rates
- Generalists that can thrive in a variety of habitats and situations displace more sensitive habitat specialists
- Loss of balance between predator-prey populations
- Increase in small mammal abundance for certain species; small mammals eat bird eggs
- Simplification and large-scale alteration of plant and animal communities
- Non-native plant invasions reduce functional and structural diversity of wildlife habitat
- Loss of food resources for native wildlife species (native insects and birds prefer native plants)
- Local native species extinctions due to increased competition and predation
- Numerous sources for continuous non-native re-invasions
- Introduction of diseases and parasites to which native organisms are not adapted
- Financial harm to crops and agriculture due to pests
- Wildlife predation by cats, dogs, and other human-introduced predators
- Reduced biodiversity

In the Metro region, non-native birds such as European Starlings, non-native amphibians such as bullfrogs, and non-native fish tend to out-compete or directly kill native species.[66] Non-native plants are an issue because they favor non-native wildlife species. In the Metro region, non-native birds and plants are linked to edge effects.[67]

Domestic animals can have strong impacts on wildlife communities. Domestic animals include livestock, but in urban areas the primary species impacting wildlife are domestic cats and dogs, which kill wildlife and disrupt native wildlife behavior. For example, barking dogs scare wildlife, increasing stress levels and reducing

[66] For example, starlings made up 17 percent of riparian birds surveyed along 54 riparian study sites in the greater Metro region (Hennings 2001); the narrower the forest, the more starlings – sometimes more than half of all breeding birds present.
[67] Discussed in the Fragmentation section above; non-native plants, shrubs, and birds decline with distance to the edge of a forest patch.

their ability to forage and nest.[68] As most pet owners realize, cats kill animals even when they have ample food provided. In addition, dogs and cats can contribute to stream degradation by contributing fecal coliform and disturbing streambanks and vegetation.

Wildlife barriers (including habitat fragmentation) also reduce biological diversity. Development practices such as installing stream crossings[69] and piping and culverting streams destroy habitat and create impassable fish barriers that block entire stream reaches to migratory fish species and isolate remaining species, putting these populations at risk of reduced genetic diversity and/or extinction. Habitat fragmentation creates wildlife barriers by creating space between habitat patches across which some species cannot travel.

What are the potential environmental consequences to fish and wildlife habitat of allowing, limiting, or prohibiting uses that conflict with natural resource function?

All major consequences occur in each zoning type, but the severity depends on prevalent conflicting uses. For example, more imperviousness results in more severe hydrologic alterations; more pesticide use results in increased water quality impairment. More traffic translates to increased human disturbance to wildlife. The consequences also depend on the percent of fish and wildlife habitat falling within each zoning type. For example, single-family residential contains about half of all habitat; consequences may be strong due to amount of land cover. On the other hand, commercial contains only five percent of all habitat; thus potential consequences are reduced because commercial uses do not cover much land. This section includes a summary of the potential environmental tradeoffs of allowing, limiting, or prohibiting conflicting uses. Most of the environmental consequences are similar in all regional zones, the differences are described below. Appendix D contains several matrices that summarize the environmental consequences of a decision to allow, limit, or prohibit by generalized regional zones. Finally, the key points learned from the environmental consequences analysis are highlighted at the end of the chapter.

Summary of potential environmental tradeoffs

The analysis of environmental consequences is general in nature to account for variability within zoning types, and also because consequences depend on the program selected. Environmental consequences can also vary depending on the scale through which they are viewed; for example, at the site level, high-density housing is associated with fairly high levels of imperviousness, but on a larger scale this zoning type reduces the amount of roads and land needed to accommodate housing. Below are some general consequences associated with allow, limit, and prohibit decisions.

Allow conflicting uses

- Extensive loss of ecological functions in riparian areas, especially for Class I riparian corridors

[68] About a third of U.S. households have cats; each year in the U.S. cats kill an unknown, but undeniably large number of wild animals (The Wildlife Society 2002).
[69] For example, roads, sewers, and pipelines.

- Likely to harm salmon
- Degraded water quality
- Extensive loss of valuable wildlife habitat and functional values (size, interior habitat, connectivity, proximity to water)
- Loss of Habitats of Concern
- Continued loss of native species and at-risk species; reduction in migratory songbirds
- Education opportunities
- Reduced need for UGB expansion; protects habitat outside UGB from urban encroachment

Limit conflicting uses

- Depends on type of program: results may range from minimal protection to near-full protection of ecological functions
- Strong potential for restoration, mitigation, and education activities to offset negative impacts
- Implementation of BMPs (best management practices) and low impact development standards could reduce negative impacts
- Less harm to native species and fewer nonnative species invasions than Allow
- Intrusion in some habitat areas will reduce the quality of other habitats, especially if connector habitat is fragmented and interior habitat reduced
- May require UGB expansion, depending on program

Prohibit conflicting uses

- Retention of some of the region’s most critical ecological functions and best remaining wildlife habitats
- Most likely to support salmon conservation, retains important aquatic habitat
- Prevents further habitat fragmentation; preserves restoration opportunities
- Minimizes hydrologic alterations, reduces flooding, and preserves water quality
- Provides key breeding habitat for migratory songbirds, aquatic species, habitat interior species, and other native species
- Preserves Habitats of Concern
- May require substantial expansion of the UGB

Environmental consequences by generalized regional zone

The disturbance activities, or conflicting uses, associated with each of Metro’s generalized regional zones were described in Chapter 3, *Conflicting Uses.* Disturbance activities (conflicting uses) were cross-referenced with potential consequences to regionally significant fish and wildlife habitat in Table 6-1 at the beginning of this chapter. Many of the negative environmental impacts due to conflicting uses relate to the levels of imperviousness and the amounts of natural land cover associated with those conflicting uses. There are trends in imperviousness and natural land cover associated with Metro’s generalized regional zones. These trends are useful in fostering discussion about land use impacts. Table 6-10 lists these general trends, providing a foundation for the consequences discussion.

Table 6-10. Relative levels of imperviousness and natural landcover typically associated with generalized zoning land-use types.*

Generalized regional zone	Typical onsite imperviousness[1]	Typical infrastructure requirements[2]	Typical natural landcover[1]
Commercial	High	Moderate to high	Low
Industrial	High	Variable	Low
Mixed use	Moderate to high	Lower per person	Low
High-density multi-family	Moderate to high	Lower per person	Low to moderate
Medium/low density multi-family	Moderate onsite	Moderate per person	Low to moderate
High density single family	Moderate onsite	Moderate per person	Low to moderate
Medium/low density single family	Low to moderate	Higher per person	Moderate to high
Rural	Low	Higher per person	High
Agricultural	Low	Variable	High
Open space	Low	Low	High

*These general estimates are provided to facilitate discussion.
[1]Relative to other land use types; per unit area.
[2]Infrastructure refers to roads and parking, sewers and stormwater piping, power transmission, etc. needed to support the land use.

Most of the environmental consequences are similar across zones (matrices describing the consequences may be found in Appendix D); the differences are identified below.

- **Single-family residential (SFR):** tends to retain more trees and vegetation, reducing negative impacts. Stormwater piping and imperviousness is a strong factor due to the extent of single family zoning; altered hydrology is a primary consequence. Landscaping, pesticide and fertilizer use, and pets tend to degrade habitat and water quality. Potential to retain existing vegetation and add new vegetation, as well as stormwater solutions such as Low Impact Development, could have positive implications for stormwater runoff and hydrology.
- **Multi-family residential (MFR):** density decreases overall infrastructure and road requirements, but increases onsite imperviousness and vegetation loss. Multi-family residential tends to create more human disturbance because human densities are higher. In general, negative environmental consequences are stronger at the site level compared to less dense forms of housing, but reduced at a larger scale due to compactness and efficiency of form.
- **Commercial (COM):** high onsite imperviousness; increased traffic and human disturbance. Consequences similar to industrial development, but commercial development is more consistently associated with certain disturbances, including installation and maintenance of utilities, stormwater-related modifications, and road construction. Not as strongly associated with toxics, heavy metals and other pollutants as industrial development, although transportation-related toxics are an issue due to heavy traffic and parking requirements.
- **Industrial (IND):** high onsite imperviousness; tends to have low amounts of vegetation; use of toxic chemicals may increase negative impacts to fish and wildlife. Consequences weighted toward altered hydrology, degraded water quality, habitat loss, and alterations to biological communities, including reduced biodiversity. Institutional uses are similar to industrial, except that they are not strongly associated with toxics and can sometimes have more natural land cover.
- **Mixed-use centers (MUC):** may decrease VMT which reduces water quality impacts at the regional scale, but onsite imperviousness and noise and light disturbances may be high. May

include a variety of land uses, therefore conflicting uses and consequences vary. Can offer efficient land use and reduce the amount of land needed, because development types can meet specific local needs. Can provide shared parking and greater efficiency in parking lot layout, thereby reducing imperviousness and the stormwater runoff associated with paved areas.

- **Rural residential (RUR):** Less severe hydrologic alterations compared to areas with more pavement and less vegetation. More roads and other infrastructure required per dwelling unit. Agriculture (not regulated by Metro) may increase pesticides, nutrient inputs, and seasonal disturbances, but also can provide grassland and connector habitat. Leaky septic systems can degrade water quality. Livestock grazing harms riparian areas, compacts soil, and degrades water quality. Human disturbance reduced compared to higher density housing types.
- **Parks and open space (POS):** active parks increase human disturbance and tend to remove natural landcover; landscaping in such parks may degrade water quality and wildlife habitat. In more natural areas parks provide important habitat, connectivity, and improved water qualityIn some jurisdictions (e.g., Portland), other uses such as rail lines, utility corridors, broadcast facilities, mining, agriculture, and institutional uses are allowed, with corresponding consequences.

Summary points

- Tree canopy is invaluable to the functionality of both fish and wildlife habitat habitat. It is important both near streams and throughout the watershed, as affirmed by local studies (Frady et al. 2003). Tree canopy provides habitat, absorbs pollution and excess nutrients, and slows and retains stormwater, reducing hydrologic alterations.
- Hydrologic changes have far-reaching negative consequences. Reducing or mitigating imperviousness and stormwater impacts will be important to address these consequences.
- Consequences to fish habitat depend on habitat value. For example, loss of high-value (Class I) riparian corridors, which retain three to five primary functions, would have a stronger ecological impact than Class II or Class III riparian corridors, which contain two or no primary ecological functions, respectively. Loss of high-value riparian corridors would also result in loss of high-value wildlife habitat, because Class I riparian corridors include some high-value wildlife habitat (including Habitats of Concern) where high value inventory areas overlap. For example, many Class I riparian corridors include bottomland hardwood forest and wetlands in a floodplain setting; this type of area is critical to riparian function and also provides a unique and declining habitat type.
- Consequences to wildlife habitat also depend on habitat value, but with different implications than fish habitat. Because connectivity is important to wildlife, the loss of any component in the system may reduce the value of nearby wildlife habitat patches. For example, preserving two Class A wildlife habitat patches – the largest patches with good water resources and connectivity to other patches, or Habitats of Concern – will be most valuable to wildlife if between-patch connectivity is retained; the connecting patches are typically Class B or C wildlife habitat. If only Class A wildlife habitat is preserved, its value will be reduced due to loss of nearby Class B and C patches. On the other hand, smaller habitat patches tend to have lower quality habitat due to edge effects and reduced interior habitat.
- Homes surrounded by trees can provide very important wildlife habitat. For example, local

studies indicate that resident native birds are most diverse in developed areas with plenty of forest canopy (Hennings and Edge 2003). Single-family residential accounts for a large proportion of fish and wildlife lands, therefore retaining tree canopy within this zoning type is desirable. This would allow some conflicting uses to occur while retaining important natural resources, with important implications for limiting future UGB expansions. Clustered housing is one way to reduce forest canopy loss.

CHAPTER 7: ENERGY CONSEQUENCES

Introduction

Urbanization leads to concentrated areas of energy use, with important implications for fish and wildlife habitat. In turn, fish and wildlife habitat influence energy use. Within the UGB the issue is not whether, but *how* to urbanize, and the extent to which fish and wildlife habitat should be protected. The nature of these relationships can affect energy use and efficiency within the UGB, as well as the boundary's size and shape.

The energy consequences analysis of allowing, limiting or prohibiting conflicting uses in fish and wildlife habitat areas addresses the following questions, from a regional perspective:

- What is energy, and how is it used?
- What are the environmental consequences of energy use?
- How does regional planning relate to energy use?
- What are the energy consequences of allowing, limiting, or prohibiting conflicting uses in or near fish and wildlife habitat?

What is energy, and how is it used?

Energy can be broadly defined as the capability of a system to do work. In the electric power industry, energy is more narrowly defined as the mathematical product of real power and time (Public Power Council 2003). For the purposes of this document, energy is the fossil fuel, hydroelectric, or other resource providing the energy to do work, such as driving, creating roads and buildings, and heating and cooling.

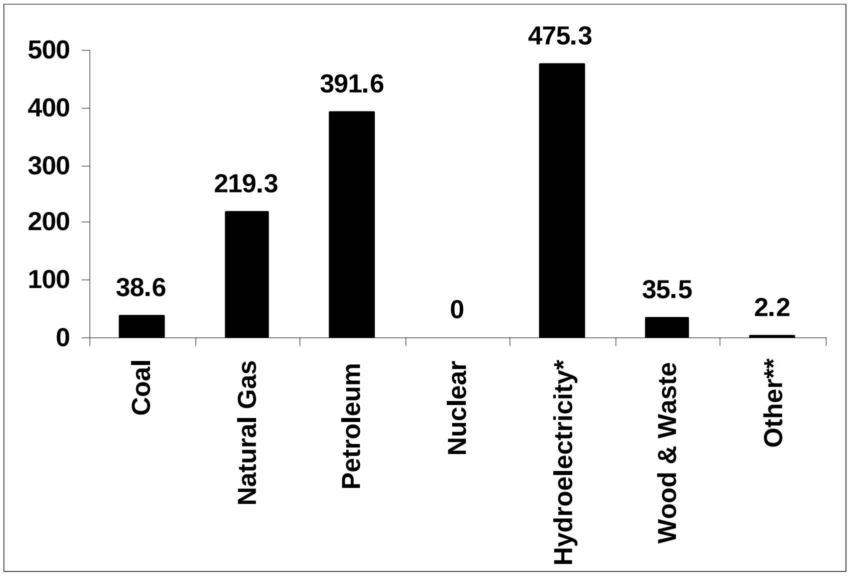
According to the U.S. Department of Energy, Oregonians' primary energy sources are fossil fuels (petroleum products and natural gas) and electricity (Figure 7-1). The proportion of Oregon's energy derived from fossil fuels has risen substantially, whereas the proportion of electricity has held steady since 1980, at about 20 percent (Oregon Office of Energy 2002). Regional planning influences fossil fuel use more than electricity use, because the spatial arrangement of urban infrastructure systems strongly influence fossil fuel use. The factors influencing electricity use tend to be more site-specific.

Fossil fuels

Oregon's fossil fuel use has nearly tripled in the past 40 years. This is due primarily to motor vehicle use, which relies chiefly on petroleum products although interest in alternative fuels is growing. By 1999, petroleum products accounted for nearly half of the energy used in the state (Oregon Office of Energy 2002).

Natural gas is another important fossil fuel resource for industry, electricity generation, residential, and commercial uses, in that order. Natural gas use per capita increased 63 percent between 1990 and 1999, rising to 24 percent of total energy use in the state.

Figure 7-1. Types of energy consumed by Oregonians, 1999 (in trillions of BTUs).



* May include pumped storage and net imports of electricity generated from this resource.
** Geothermal, wind, photovoltaic, and solar.
Source: U.S. Department of Energy, http://www.eia.doe.gov/emeu/sep/or/frame.html

Electricity

Electricity is another important energy source in the region. Portland General Electric (PGE) is the state's largest utility, providing electricity to more than 730,000 customers in Portland, Salem and nearby communities (Hemmingway et al. 2002). The energy sources for PGE's electricity include PGE's hydropower (10 percent), coal (25 percent), gas/oil (26 percent) and purchases on the market which include Mid-Columbia hydropower, wind and other renewable energy sources (39 percent) (PGE 2002). Pacific Power serves another 68,000 customers in the Metro region. Eighty percent of Pacific Power's generation is from thermal plants (Pacificorp 2003).

It takes energy to produce and deliver energy to gas stations, homes, businesses and industry. Of the major energy sources, electricity takes the most energy, on average, for production and delivery to the site (U.S. Department of Energy 1999). However, that depends on how electricity is produced (e.g., via hydropower or fossil fuels). For example, for every unit of fossil fuel-generated electricity produced, it costs three fossil fuel energy units to produce and deliver it to the site, whereas hydropower takes substantially less production and delivery energy (U.S. Department of Energy 1999). Coal is the most energy-intensive source of electricity. Hydropower is a renewable resource, as discussed next, but the region's capacity for generating hydropower is limited.

Renewable energy sources

The Oregon Office of Energy defines renewable energy as energy from any source that can be maintained in a constant supply over time (Oregon Office of Energy 2003). Renewable energy sources represent the most promising future energy supplies because they may be sustainable over the long term; the supply of fossil fuels is limited and therefore non-renewable and non-sustainable. Hydropower (flowing water) is the prevalent renewable energy source used in the Metro region, but alternative sources such as wind and sun power could be further developed. Table 7-1 shows the five predominant renewable energy sources: hydropower, biomass, wind, the sun (solar), and heat from inside the earth (geothermal).

Table 7-1. Types of and uses for renewable sources of energy.

Source of energy	Description	Used for heat?	Used for Electricity?	Used for Vehicle fuel?
Water (hydro-electric)	Like the wind, flowing water is a product of the earth's climate and geography. Snowmelt and runoff from precipitation at higher elevations flow toward sea level in streams and rivers. In an earlier era, water wheels used the power of flowing water to turn grinding stones and to run mechanical equipment. Modern hydro-turbines use water power to generate electricity.		Yes	(electric cars are used, but not on a widespread basis)
Biomass	"Biomass" describes all plants, trees and organic matter on the earth. Biomass is a source of renewable energy because the natural process of photosynthesis constantly produces new organic matter in the growth of trees and plants. Photosynthesis stores the sun's energy in organic matter. That energy is released when biomass is used to make heat, electricity or liquid fuels.	Yes	Yes	Yes
Wind	The wind blows because of natural conditions of climate and geography. Historically, wind power was used to supply mechanical energy, for example to pump water, grind grain or sail a boat. Today, wind power is primarily a source of electricity.		Yes	
Solar	The sun is a constant natural source of heat and light. Sunlight can be converted to electricity. Solar energy is energy that comes directly from the sun.	Yes	Yes	
Geothermal	Heat from deep within the earth is called "geothermal energy." In some locations, geothermal energy is close enough to the surface that, by drilling a well to reach the heat source, the energy can be extracted and used for heating buildings and other purposes. Where the temperatures are hot enough, geothermal energy can be used to generate electricity.	Yes	Yes	

Source: Oregon Department of Energy 2003.

All renewable energy sources can be used to produce electricity. Solar energy and geothermal energy can supply both electricity and heat. Biomass can supply all three forms of useful energy.

Energy cost and availability

Energy cost and availability are important factors influencing the prevailing types of energy used. The Oregon Office of Energy calculated source-specific potential electricity generation and estimated wholesale costs for a variety of renewable energy types (Table 7-2, in order of least to most expensive).

Table 7-2. Potential generation and estimated wholesale costs for renewable energy resources available in the Pacific Northwest.

Renewable energy resource	**Cost** (cents per kilowatt-hour)	**Region-Wide Potential for Generation** (average megawatts)
Hydroelectric	1.1 to 7.0	170
Chemical recovery boilers (used to recycle chemicals, reduce wastewater discharges, and recover energy from pulp wood industry)	2.6	195
Natural gas (can be manufactured rather than extracted; for example, methane from livestock manure)	2.7	7,400
Industrial cogeneration (consumes fuel, usually natural gas, to produce both heat and electricity; captures and uses energy that otherwise would be wasted)	2.7 to 6.4	4,600
Landfill gas	3.1	94
Wood residue	4.3 to 5.4	300
Geothermal	5.2 to 6.5	390 to 1,070
Wind	5.3 to 8.1	700+
Forest biomass	5.5 to 6.6	300 to 1,000
Solar thermal	8.6	------
Solar photovoltaic (large-scale)	19.4	------
Solar photovoltaic (small-scale)	21.5 to 23.6	------

Source: Oregon Office of Energy 2003.

As Table 7-2 shows, hydroelectric power is the cheapest renewable source of electricity in the region, but not necessarily the source with the most energy potential nor the most environmentally sound option. As with any source of energy, there are environmental costs associated with hydroelectric power, including harm to salmon habitat. Some sources such as wind and solar power may be less environmentally harmful, and prices may drop as the technology develops. The environmental consequences of energy use are discussed next.

What are the environmental consequences of energy use?

Energy use can impact the environment in some major and specific ways, and natural resources mitigate these consequences and influence energy use. Therefore, energy consequences are often environmental, but environmental consequences lead to changes in energy use. Some environmental consequences relating directly to energy use include:

- Increased air temperatures
- Increased water temperatures
- Reduced air quality
- Habitat loss and degradation due to infrastructure (transportation and energy)
- Negative effects from hydropower and dams

Increased air temperatures

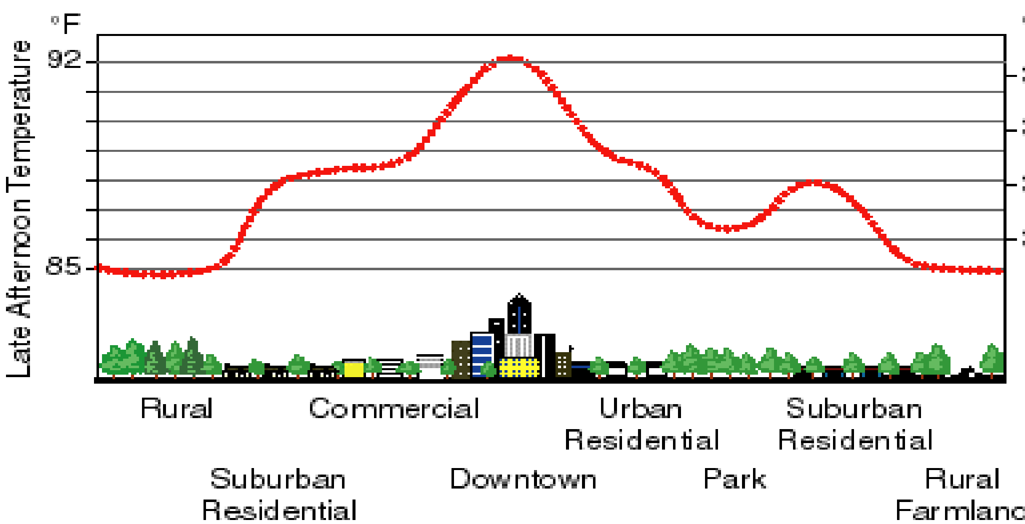
Vegetation helps cool the air, whereas pavement, buildings, and combustion processes such as motor vehicle engines tend to warm the air. This warming may occur both locally (the urban heat island effect) and globally (global warming). Air temperature also influences water temperature and quality, as discussed in the next category.

Air temperature influences energy use; for example, in cities with populations of more than 100,000, peak utility cooling demand increases 1.5 percent to 2 percent for every degree Fahrenheit the temperature rises (U.S. Department of Energy 1999). This increases energy demand and alters forest microclimates by increasing water, soil and air temperature and reducing soil and air humidity.[70]

Urban heat island effect

Cities are warmer than other areas, a phenomenon called the "Urban Heat Island effect" (Figure 7-2; U.S. Department of Energy 1993). The urban heat island effect is not limited to downtown areas, but is also influenced by suburban developments; it is a temperature gradient, increasingly warm from rural to urban areas. The average temperature difference along this gradient varies regionally, with differences in temperature from rural to urban areas ranging from 2º to 8º F (U.S. Department of Energy 1993).

Figure 7-2. Sketch of a typical Urban Heat Island profile (reproduced with permission from Morris 2003).



Plants help reduce the urban heat island effect by cooling the air through several mechanisms. In well-vegetated areas, a substantial portion of solar energy that hits plants is used for plant metabolism (U.S. Department of Energy 1993). Plants provide shade, which keeps other surfaces from storing the sun's heat energy. Plants also use moisture for temperature control; as temperatures rise, excess water is released from leaves it cools the surrounding air.

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70 See *Environmental Consequences* chapter for further discussion on microclimate.

Impervious surfaces, especially dark surfaces with low reflectivity, collect and efficiently store the sun's energy as heat, as well as displacing vegetation. The heat energy is released at night, creating areas of warm air. Several hot days in a row can compound this effect, because as the urban or suburban area fails to cool at night, temperatures rise on each successive hot day; ambient air temperature can differ between an urban heat island and a vegetated area by 2-10° F. On a hot day, the air above a paved area may be 25° F hotter than the air in a nearby forest. The U.S. Department of Energy (1993) states that one of the simplest and cheapest strategies for countering the urban heat island effect is to increase the number of trees and other plants.

Global warming

Carbon dioxide in the air is a key contributor to global warming, or the "greenhouse effect" (Rubin et al. 1992). Carbon is stored in trees and other plants, but is released through combustion processes and vegetation removal (Northwest Environment Watch 2003). Although debate continues, most scientists now agree that increasing greenhouse gas emissions from human activities are altering the world's atmosphere, primarily due to the burning of fossil fuels and land use changes such as deforestation (Oregon Progress Board 2000; Price and Root 2001).

In Oregon, electricity production generates 44 percent of the carbon dioxide (CO_2) emissions, and transportation fuels contribute another 35 percent; natural gas contributes 14 percent (Oregon Progress Board 2000). Trees absorb and trap atmospheric CO_2, storing the carbon in solid form for long periods of time (Krieger 2001; Price and Glick 2002). Trees also reduce atmospheric CO_2 by reducing demand for heating and air conditioning (McPherson et al. 2002).

Global warming is expected to change the planet's climate by altering the exchange of water among the oceans, atmosphere, and land; this is expected to shift regional temperatures and patterns of rainfall (Price and Glick 2002). To illustrate, the annual average global temperature has increased by one degree Fahrenheit over the past century; increases have been slightly higher in the Pacific Northwest, at 1.5º F (Price and Root 2001; Northwest Environment Watch 2003). Scientists anticipate that the Pacific Northwest will experience warmer, wetter winters and warmer, drier summers, with an average increase of 4.5˚F by 2050 (Snover et al. 1998).

Global climate change is also likely to influence terrestrial wildlife, such as bird communities (Price 2000; Price and Root 2001). Species' distribution ranges are likely to move northward, and for many species that are already vulnerable, the risk of extinction will increase with global warming (Gitay et al. 2002). For example, Neotropical migratory birds, known to be at-risk in the urban Metro area (Hennings and Edge 2003), are predicted to change in species composition by 32 percent, with a 16 percent net decrease in species richness over the next 75-100 years (Price and Root 2001).

Increased water temperatures

Air temperature strongly influences water temperature. Water temperature is an important indicator of a watershed's vitality because of its controlling influence on the metabolism, development and activity of aquatic organisms (Naiman et al. 1992). Temperature and precipitation are the primary variables that determine the annual water cycle in the Pacific Northwest (Climate Impacts Group, University of Washington 2003). Increased water temperature is a common reason for Metro-area streams appearing on DEQ's 303(d) list of water quality impaired streams, as discussed in the *Environmental Consequences* chapter.

Increased water temperatures reduce the amount of oxygen the water can hold and change the water's chemistry (Pauley et al. 1989). As a result, energy impacts that cause an upward shift in air temperatures result in impaired water quality. This has negative impacts on wildlife living in and near the stream, such as macroinvertebrates, fish and amphibians (Tevis 1966; Pearson and Kramer 1972; Merritt et al. 1982).

Eaton and Scheller (1996) estimated that temperature increases from a doubling of atmospheric carbon dioxide is likely to reduce habitat for cold and cool water fish by approximately 50 percent. Rathert et al. (1999) identified annual air temperature range as a key environmental variable predicting the number of native fish species present in Oregon streams. According to Tyedmers and Ward (2001), the direct impacts to fisheries of water temperature increases due to predicted global warming include the following:

- Rising water temperatures (streams fed by deep groundwater or with riparian shading will be less affected)
- Altered hydrologic regimes (more winter flooding; dryer summers; decreased water supply due to loss of snow pack; shift in some streams from perennial to ephemeral)
- Changes in aquatic productivity (loss of cold-water fish and the macroinvertebrates on which they depend for food; increase in nonnative warm-water species)

Reduced air quality

Although an environmental issue, air pollution is directly related to urban energy use. Vehicular traffic, industry, and heating and cooling are energy-consuming activities that produce air pollutants as products of combustion. Air pollution is also directly related to vegetation; trees and plants clean the air (McPherson et al. 2002).

Air quality is measured and reported in a variety of ways, but Oregon DEQ collects and houses most state and local air quality data. Oregon DEQ uses an Air Pollution Index (API) to integrate carbon monoxide, particulates, ozone, nitrogen oxides, sulfur dioxide, and other pollutants into a single air quality index value (Oregon Department of Environmental Quality 2003b).[71] Figure 7-3 (on page XX) shows the Metro region's major sources of air pollution.

Air temperature is a major factor relating to air pollution. Higher air temperatures accelerate the chemical reactions leading to high ozone concentrations and other pollutants. While ozone high in the earth's atmosphere protects humans from the harmful effect of ultraviolet radiation, it is a pollutant near the earth's surface. Unacceptable levels of smog-forming ozone and other pollutants are frequently reached at 94° F and above, compounding the heat island problem by creating a heat-trapping cloud of pollution over urban areas (McPherson et al. 2002).

Most air pollution is caused by individual actions such as driving cars; using woodstoves, gas-powered lawn mowers and motorboats, paints and aerosol products like hairspray and air

[71] Air quality indices are reported daily via DEQ's website (http://www.deq.state.or.us).

fresheners; and outdoor burning. The Oregon DEQ estimates that industry contributes less than 10 percent of air pollution problems in the state; by far, the largest single source of air pollution is gas-powered vehicles (Oregon Department of Environmental Quality 2001), and this is what can be influenced most at the regional scale.

Habitat loss and degradation due to infrastructure (transportation and energy)

Motor vehicle transportation is the single biggest outlay of energy in the region, and also creates the largest proportion of infrastructure needed to support urban areas. Transportation infrastructure such as road networks requires substantial energy outlays, removes habitat, and negatively impacts wildlife and the environment.[72] Wildlife mortality due to roads is well known. Infrastructure relating directly to the transmission of energy, such as power line corridors and pipelines, may also remove or fragment fish and wildlife habitat, as well as providing corridors for the transmission of undesirable seed sources.[73]

Negative effects from hydropower and dams

Hydropower is associated with both positive and negative environmental impacts: on the one hand, hydropower is one of the cleanest sources of electricity available on a large scale because it harnesses the movement of water for energy rather than burning fossil fuels. On the other hand, dams affect fish and wildlife and their habitats. Although dams provide many societal benefits including power generation, water storage, flood control, agricultural irrigation, and recreation, they influence watershed functions in fundamental ways (FISRWG 1998). Ecological problems associated with dams include erratic water volume and velocity (altered hydrology), increased streambank erosion, loss and fragmentation of riparian habitat, altered water chemistry, altered instream habitat, and blocked fish and instream wildlife passage.

All salmon and steelhead in the Columbia Basin are affected to some degree by damming activities (Federal Caucus 2000). Fish bypass systems and mitigation strategies are now required as part of Federal Energy Regulatory Commission licensing (Portland General Electric 2003).[74] Recognizing the impacts of energy production on wildlife, regional energy providers such as PGE now offer voluntary “salmon power” or “green power” energy sources, designed to provide more wildlife- and environment-friendly energy at slightly higher short-term costs.

More than 85 percent of the inland waterways within the continental United States are now artificially controlled through dams (National Research Council [NRC] 1992), including all major Metro area rivers. The Columbia and Snake River systems are protected areas, closed to further hydropower development (Oregon Office of Energy 2003). Some of the Metro region’s electricity derives from these sources. Reducing the risk to salmon populations in these river systems may require changes in the management of existing hydroelectric plants. These measures may reduce overall generating capacity, although further development of alternative renewable energy sources could help offset the capacity loss.

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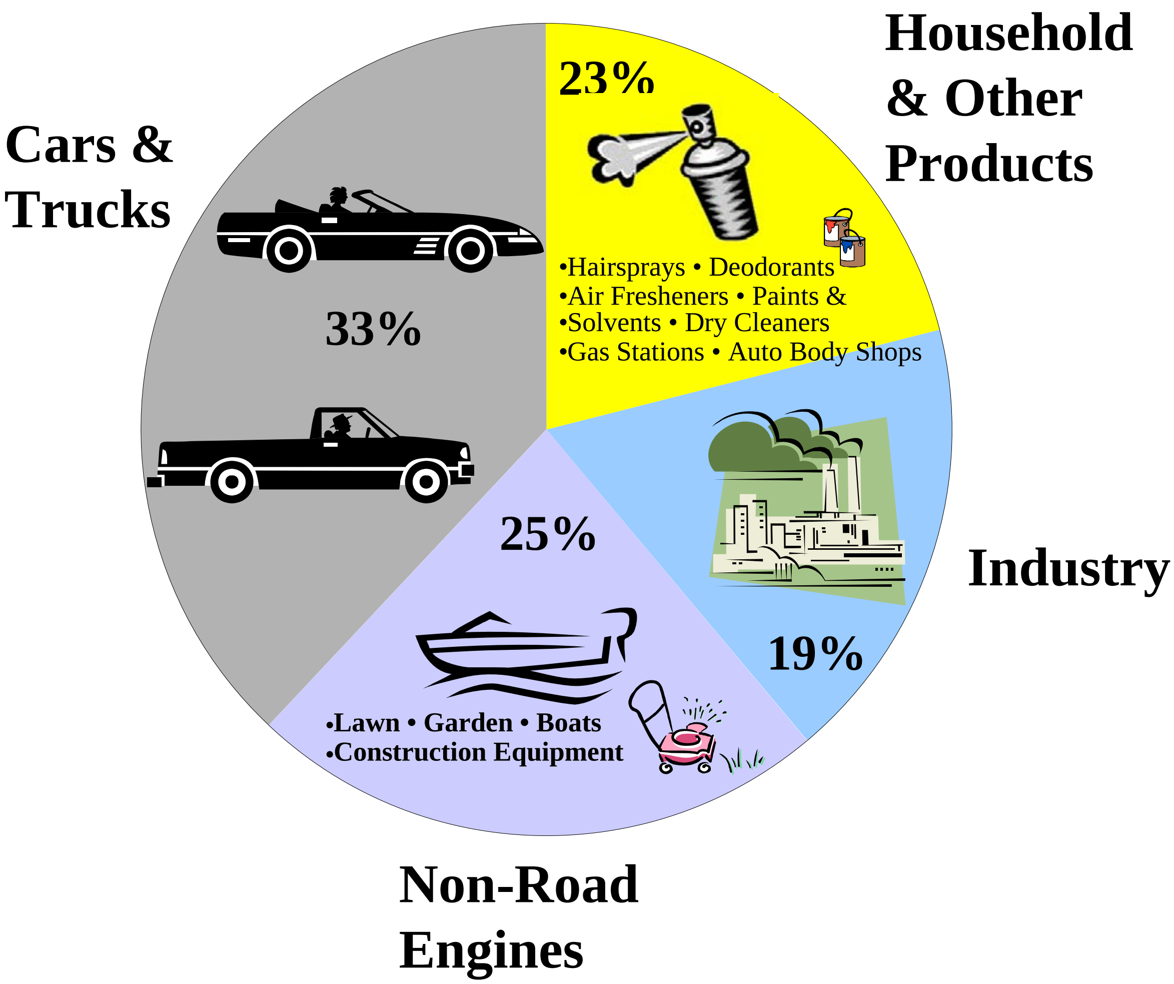
[72] See *Environmental Consequences* chapter for further discussion.
[73] Infrastructure is discussed further in the Regional Planning section of this chapter.
[74] The Idaho National Engineering Laboratory administers a federally funded program to develop hydroelectric turbines that will cause less harm to fish (Oregon Office of Energy 2003).

Figure 7-3. Portland/Vancouver metropolitan area airshed ozone* sources, 2001.



* Volatile Organic Compounds and Nitrogen Oxides

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How does regional planning relate to energy use?

At the regional scale, energy use is most strongly influenced by the extent and physical arrangement of transportation networks, the built environment, and green infrastructure. These factors are related, and changes in one affect the others and overall energy use patterns. All three factors influence air and water temperature and quality, thus influencing fish and wildlife habitat.

The 2040 Growth Concept and the UGB are important tools for reducing energy use because they define the extent of the urban region and guide the physical arrangement of the built environment and corresponding transportation network. Keeping development inside the UGB protects farm and forest lands from sprawl and reduces vehicle miles traveled (VMT). The 2040 Growth Concept sets forth and implements policies that encourage efficient land use and a balanced transportation system, and guides the physical arrangement of urban centers and the transportation network.

The region's 2040 Growth Concept calls for:

- A compact urban form, including efficient land use that can accommodate a variety of needed zoning types;
- A well-planned transportation system that includes vehicular travel, mass transit, and alternative transportation modes such as bicycling and walking; and
- Protection of natural areas.

The importance of these factors to the region's energy use is discussed below.

Importance of a compact urban form and zoning types

A compact urban form conserves energy by reducing transportation-related energy output and infrastructure needs, and also reduces the spatial extent of vegetation loss and the urban heat island effect.

As the population of an area increases transportation needs increase, and sometimes the number of miles a citizen needs to travel (VMT) also increases. At present, most vehicles are powered by fossil fuels; therefore increased VMT results in increased fossil fuel use. The amount of VMT increase depends on where and how far citizens must drive to meet their daily needs, as well as whether alternative modes of transportation are available.

In the Metro region from 1989 through 1999, about 46 square miles of land were developed, with most construction resulting from development within existing urban and suburban areas in keeping with the region's goals to contain urban sprawl (Northwest Environment Watch 2002a, 2002b). The Metro region's rate of high-density growth (more than 12 people per acre) nearly doubled that of Seattle over the past decade; the region's population increased by about 470,000 during that period.

These statistics indicate two things about the Metro region: first, with more people moving into the area, more city or suburban areas and related infrastructure must be built or expanded, which takes energy and materials.[75] Second, because population density is increasing within the UGB, the infrastructure requirements are reduced compared to the much larger infrastructure investments needed to support development in rural areas. Compact urban forms are more energy and resource efficient than "sprawled" cities.

Transportation and other infrastructure relates to energy because it:

- requires energy to install and maintain;
- can cause loss of trees and natural areas, with resulting energy implications including air temperature and quality and the need to repair damaged stream systems; and
- creates impervious surfaces, with resulting transportation, energy-related air and water quality, and maintenance and repair issues.

Compact urban forms reduce infrastructure requirements. During the 2040 Growth Concept development process Metro modeled water, sewer and stormwater infrastructure requirements under three regional development scenarios (Metro 1994a, b). The option with the most compact urban form incurred the lowest costs for water and sanitary sewer service, although stormwater costs were indistinguishable among the concepts.

There are hidden energy and ecological expenses involved with installing and maintaining infrastructure systems. Stream equilibrium is disturbed when roads, sewer or stormwater pipes are located in stream corridors and under streams, resulting in disturbances that require energy and materials to restore. For example, energy is required to address sediments generated through construction that clog wetlands and stormwater systems; exotic plant invasions; stream channel damage; flood protection and repair, etc.

Substantial dollars in the region are already being invested in restoration. For example, the Metropolitan Greenspaces Program, funded by the U.S. Fish and Wildlife Service and administered in partnership with Metro Regional Parks and Greenspaces, funded 279 restoration and environmental education products totaling more nearly $2.4 million from 1991-2002. With total local matching funds of nearly $7.4 million, the Portland/Vancouver region has spent nearly $9.8 million on restoration through this program alone.

Zoning type influences energy use. Table 7-3 shows the results of a survey Metro conducted to examine the VMT issue. The results indicate that areas combining good transit options (trains and buses) and mixed-use zoning tend to have the lowest VMT, as well as the fewest cars or trucks per household. Mixed-use urban centers are higher density centers of employment and housing that are well served by transit to form compact areas of retail, cultural, and recreational activities in a pedestrian-friendly environment. Mixed-use centers are energy-efficient because they provide efficient access to goods and services and enhance multi-modal transportation. Higher density residential housing is more energy-efficient than low densities due to increased VMT and infrastructure requirements. All zoning types are needed, but a compact urban form can help reduce energy requirements for each.

[75] Materials also require energy for manufacture and transport.

Table 7-3. Metro Travel Behavior Survey Results for Multnomah County (all trip purposes, all income groups).

	Mode Share					Vehicle Miles per Capita	Auto Ownership per Household
Land Use Type	**% Auto**	**% Walk**	**% Transit**	**% Bike**	**% Other**		
Good Transit/Mixed Use	58.1%	27.0%	11.5%	1.9%	1.5%	9.8	0.9
Good Transit Only	74.4%	15.2%	7.9%	1.4%	1.1%	13.3	1.5
Remainder of Multnomah County	81.5%	9.7%	3.5%	1.6%	3.7%	17.3	1.7
Remainder of Region	87.3%	6.1%	1.2%	0.8%	4.6%	21.8	1.9

Source: Metro 1994 Travel Behavior Survey

Importance of a balanced transportation system

Fossil fuel use is second only to hydroelectric power in regional energy consumption. A large proportion of the region's infrastructure, including roads, parking areas and driveways, supports transportation. Transportation infrastructure creation and maintenance require energy, and so do the vehicles using that infrastructure. However, mass transit and the availability of alternative transportation modes reduce energy consumption and related environmental consequences by reducing VMT, fossil fuel use, and infrastructure needs.

Gasoline use is the principal cause of urban air pollution in the Pacific Northwest, creates the region's largest source of greenhouse gas emissions, and is one of the region's most expensive imports (Northwest Environment Watch 2002a). Overall gas consumption in the Pacific Northwest grew 21 percent from 1993-2002, about in step with the rate of population growth. Oregon consumes 17 percent more gas than it did a decade ago.

Although overall gas consumption also grew in Oregon recent decades, per capita gas consumption in the state actually dropped by about one percent over the last decade; the average Oregonian used 8.5 gallons of gas per week in 2002 (Northwest Environment Watch 2002b). Per capita consumption was expected to drop more substantially with the significant trends in fuel efficiency seen during the 1980s, but Oregonians bought more trucks and sport utility vehicles (SUVs) in the 1990s. SUVs and minivans typically consume about one-fourth more gasoline per mile than cars. Therefore, the expected improvements in per capita fuel use and air quality failed to materialize (Northwest Environment Watch 2002a).

VMT, the number of trips made, driving speed, and driving patterns impact fossil fuel use (Girling et al. 2000). These variables are influenced by the accessibility of uses, and the attractiveness of routes to pedestrian, bicycle, and transit modes of travel. In general, research agrees that higher densities, appropriate mixes of land uses, well designed circulation networks, transit options, and attractive pedestrian and bicycle routes can be associated with less motor vehicle travel.

Importance of "green infrastructure"

As discussed above, trees and other vegetation reduce energy demand and help moderate the air temperature increases and air pollution associated with energy use. Fish and wildlife habitat that provides ecosystem services and that are considered important or necessary to support cities and suburbs, can be considered a type of infrastructure: "green infrastructure." Recognition and protection of green infrastructure, both inside and outside the urban growth boundary, are reflected in Metro's 2040 Growth Concept.

Aside from positive environmental and aesthetic effects, green infrastructure can provide access to alternative transportation modes such as walking and bicycling – for example, the Fanno Creek Greenway and Springwater Corridor trail systems provide non-motorized transportation access to many of the region's citizens.

However, protection of fish and wildlife habitat can also increase energy use by increasing VMT. For example, too many avoided stream crossings may result in the need to drive further around fish and wildlife habitat, increasing VMT. Similarly, utilities such as sewer and water lines may need to be rerouted, requiring energy and materials. Extensive natural areas protection could result in larger UGB expansions.

Those policies that allow the region to maintain a compact urban form and reduce VMT, while at the same time interspersing green infrastructure into and around the built environment, will reduce regional energy demands and the environmental impacts associated with energy use.

What are the energy consequences of allowing, limiting, or prohibiting conflicting uses in or near fish and wildlife habitat?

The analysis of energy consequences is general in nature and deals primarily with the implications of tree and vegetation loss and extent of the urban area. Metro avoided focusing on site-specific energy issues such as household appliance use, because other issues are more relevant to energy use at the regional scale. Below is a general description of the energy impacts of allowing, limiting or prohibiting conflicting uses, a summary of the differences of the consequences by regional zone, and the key points learned from the energy analysis. Several matrices relating the energy impacts to Metro's generalized regional zones may be found in Appendix D.

Potential energy consequences

Below are some general consequences associated with allow, limit, and prohibit decisions:

Allow conflicting uses

- Compact urban form reduces transportation energy use
- Less vegetation available to conserve energy and mitigate air quality, air and water temperatures

Limit conflicting uses

- Potential to find middle ground, maximizing vegetation and compact urban form
- Most likely to support Region 2040 Growth Concept***Prohibit conflicting uses***

- Potential need for UGB expansions, increased transportation infrastructure, more energy used
- Maximizes retention of forest canopy and vegetation, maximizing vegetation energy benefits

Energy consequences by generalized regional zone

Most of the energy consequences are similar across zones (matrices describing the consequences may be found in Appendix D); the differences are identified below.

- **Single-family residential (SFR):** tends to retain more trees and vegetation than other zoning types, reducing negative air quality and temperature impacts. However, tends to require more infrastructure and creates the need for greater travel distances. In this regard, low-density housing is the most energy inefficient use of all housing types. Clustered housing can reduce this negative consequence.
- **Multi-family residential (MFR):** density decreases overall infrastructure and road requirements, reducing energy use due to reduced transportation and infrastructure needs.
- **Commercial (COM):** high onsite imperviousness, including parking needs, and relatively low tree and vegetation cover can increase temperatures and air pollution consequences.
- **Industrial (IND):** high onsite imperviousness and relatively low amounts of vegetation can increase temperatures and air pollution. Tends to have fewer parking needs than COM.
- **Mixed-use centers (MUC):** this land use is energy efficient because it decreases VMT and overall infrastructure requirements. Can offer efficient land use and reduce the amount of land needed, because development types can meet specific local needs. Can provide shared parking and greater efficiency in parking lot layout, thereby reducing imperviousness and negative energy consequences associated with temperature regulation.
- **Rural residential (RUR):** more roads and other infrastructure required per dwelling unit. Higher VMT due to distances residents need to travel to meet their daily needs. However, tends to retain forest canopy and other vegetation, helping to regulate air and water temperatures and improve air quality.
- **Parks and open space (POS):** varies by the intensity of development within the park. Some parks are very natural, contributing to positive temperature regulation and air quality effects. Other parks, such as those with buildings, parking areas and paved boat landings, may increase negative energy effects related to temperature regulation and air quality.

Summary points

- A compact urban form conserves energy by reducing infrastructure and Vehicle Miles Traveled (VMT), and also conserves fish and wildlife habitat outside UGB.
- Trees and other vegetation are a key variable mitigating negative energy impacts. Plants clean and cool air and water, and also reduce air conditioning demand.
- Transportation infrastructure creation and maintenance require energy, whereas transit and alternative transportation modes reduce energy consumption. Program solutions that reduce infrastructure needs and support alternative modes of transportation are likely to reduce overall energy use.
- At the regional scale, fossil fuel use for transportation constitutes a key use of energy and contributes to warming of air and water, as well as air pollution. Reducing vehicle miles traveled, and the infrastructure required to support such travel, is an important variable in reducing energy use. Clustered housing and MUC and MFR zoning types provide three potential ways to reduce VMT and infrastructure needs.

- Protection of fish and wildlife habitat can increase energy use by increasing VMT, because drivers must travel around the protected areas. However, trees and other vegetation also help mitigate negative energy effects. A strong energy solution would include a balance between compact urban form and retention of green infrastructure within the urban area.

CHAPTER 8: SUMMARY AND CONCLUSIONS

Introduction

Integrating the needs of people with the needs of fish and wildlife in an urban environment is not an easy task. There is debate on the value of protecting habitat in urban and developing areas, considering the difficulty many species have cohabiting with humans and the economic value of developable land in urban areas. However, a large body of evidence, both local and nationwide, indicates that people living in urban areas value fish and wildlife habitat. In addition, properties located adjacent to fish and wildlife habitat can have higher economic and social value.

In keeping with these values, Metro's policies have consistently placed a high level of importance on the protection of the natural environment as a means of maintaining the high quality of life citizens of this region expect. The general economic, social, environmental, and energy tradeoffs of allowing, limiting, and prohibiting conflicting uses are summarized in this chapter. The next step of Metro's planning process is to identify the specific ESEE tradeoffs of several program options, after which the Metro Council will make a decision to allow, limit, or prohibit conflicting uses in fish and wildlife habitat areas.

Tradeoffs of allowing, limiting or prohibiting conflicting uses

The Goal 5 rule describes a process in which the economic, social, environmental, and energy consequences of allowing, limiting, and prohibiting conflicting uses are balanced with the need to preserve fish and wildlife habitat. These tradeoffs are described below by fish and wildlife habitat classification and then the differences by general regional zone are highlighted. Metro considers the tradeoffs from a regional perspective. Some of the tradeoffs are different when considering local priorities and concerns, for example from a regional perspective conflicting uses could be relocated or intensified in one area to account for fish and wildlife habitat protection in another. This solution may not address the needs of a city to provide jobs or housing within its jurisdiction, or to protect locally significant fish and wildlife habitat.

Fish and wildlife habitat class

The consequences of allowing conflicting uses vary by habitat class, with negative impacts greater when conflicting uses are allowed in high value fish and wildlife habitat areas. Impacts on undeveloped land would likely be greater than on developed land, depending on the type of program implemented. However, developed land may be impacted when redevelopment activities occur. Here we focus on the impacts to undeveloped land.

Class I riparian/wildlife corridors and Class A upland wildlife

Allow

The tradeoffs of an allow decision would be substantially greater in Class I riparian/wildlife corridors and Class A upland wildlife habitats than in habitat areas with less functional value. There would not be many positive consequences of allowing conflicting uses in these high quality habitat areas. Only seven percent of the unconstrained, buildable land[76] within the

[76] Unconstrained land has no current environmental regulations; buildable land includes vacant lots and portions of developed lots over a certain size. See *Conflicting Uses* chapter for more detailed definitions.

UGB[77] falls within Class I riparian/wildlife, if more vacant land fell within these areas the tradeoffs would be higher. Less than one-fifth of Class I land is zoned for uses which support employment[78] and none is of high employment value,[79] limiting economic benefits of an allow decision. The largest portion (42 percent) of buildable land in Class I riparian/wildlife is zoned for single family use, so a decision to allow would minimize additional property owner concerns about further regulations on their land. Class A wildlife contains about eight percent of unconstrained, buildable land within the UGB, and of that land 77 percent is zoned for single family use. Single family is likely to retain more natural land cover than other zoning types, providing some wildlife habitat and connectivity within the UGB. Only five percent of Class A wildlife is zoned for uses which support employment, and none is ranked as high employment value.

The negative impacts of an allow decision are particularly striking when considering the environmental consequences. Many primary ecological functions and habitat characteristics would be lost, key habitat for sensitive and endangered species would be fragmented and degraded, and nonnative species would likely be introduced. The loss of trees and vegetation would also lead to higher air temperatures and increased energy demand for temperature regulation. The negative economic impacts of an allow decision in these healthy habitat areas would include the loss of ecosystem services, potential increase in municipal expenditures on water quality and flood control, and a high risk of foregoing future ecosystem benefits. The social impact of losing these high value habitat would be greater than lower value areas, since these places are critical to preserving cultural heritage and protecting public health. A decision to allow would negatively impact the salmon that are so important to Native American culture; and the heritage and economy of the Pacific Northwest may face an irreversible loss through habitat loss and degradation.

Prohibit

A decision to prohibit conflicting uses in Class I riparian/wildlife corridors and Class A upland wildlife would result in the most positive environmental consequences. The amount of buildable land impacted would be fifteen percent of the total buildable land in the UGB, which would reduce competition between habitat conservation and development of these high value habitats (Class I and Class A habitat). Preserving the high value habitats would minimize negative environmental consequences but would focus protection efforts on owners of buildable single family land, especially in upland habitat areas. A decision to prohibit would reduce air temperatures but may increase infrastructure needs and commute distances by preventing road development in high value habitats. Some of the negative economic development impacts of a prohibit decision may be mitigated by the value of ecosystem services provided by high quality habitat. The key social tradeoff is between preserving the public social values of habitat while impacting private property rights. A decision to prohibit conflicting uses in these areas would likely require additional density elsewhere in the UGB or an expansion of the UGB to provide sufficient buildable land.

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[77] The UGB prior to December 2002.
[78] Land zoned for employment includes mixed-use, commercial, and industrial zones, and does not include parks.
[79] Employment density is based on employees per acre. See Appendix C.

Limit

A decision to limit conflicting uses in Class I riparian/wildlife corridors and Class A upland wildlife habitat would allow some habitat preservation while mitigating the negative economic, social and energy consequences. The impact of limiting development would depend on the type of program implemented, and the results may range from minimal to almost complete protection of ecological functions. Using best management practices and low impact development standards to mitigate the impacts of development could reduce negative environmental, social, energy and economic consequences. Retention of existing habitat would be much cheaper than restoring it later, and also would require less energy.

Class II riparian/wildlife corridors and Class B upland wildlife

Allow

The tradeoffs of allowing conflicting uses in Class II riparian/wildlife would not be as great as in Class I riparian/wildlife corridors but still have a substantial negative impact on ecological function. However, the potential for losing existing ecological functions is reduced because fewer functions are present. A decision to allow may also result in the loss of restoration opportunities to regain ecological functions. The loss of Class II riparian/wildlife corridors would remove existing water quality filtration capacity and other ecological functions, with resulting negative impacts on ecosystem services, social values, and energy use. It also would have a negative environmental impact on Class I riparian/wildlife corridors by removing areas that contribute both primary and secondary function to the streams and water bodies. Class II riparian/wildlife corridors contains about four percent of the unconstrained buildable land within the UGB; thus allowing development in these areas does not have a significant economic benefit. Most of that buildable land is zoned for single family (47 percent), followed by industrial land (25 percent). The positive social and economic benefits of development would accrue to private landowners with an allow decision, while the public benefits would be diminished. Approximately 28 percent of land in Class II riparian/wildlife corridors supports employment, but only one percent is classified as high employment value.

A decision to allow development in Class B upland wildlife would result in the loss of connectivity between habitat patches as well as extensive loss of migratory stopover habitats and movement corridors. This would impact the value of the Class A upland wildlife areas by reducing connectivity among them, with consequent negative social and economic impacts. Class B upland wildlife contains a little over six percent of the buildable land in the UGB. Over 63 percent of that land is zoned for single family use, followed by rural (16 percent) and industrial (10 percent). Single family uses often retain more habitat value if trees and vegetation are preserved, which would reduce the negative environmental, social and energy consequences of a decision to allow development. Only nine percent of Class B upland wildlife land supports employment, and none is classified as of high employment value.

Prohibit

Prohibiting conflicting uses in Class II riparian/wildlife corridors and Class B upland wildlife would result in a number of positive environmental consequences but at the expense of affecting a large number of residential property owners. Preservation of Class II riparian/wildlife corridors and Class B upland wildlife would increase the quality of Class I riparian/wildlife corridors and Class A upland wildlife, maintaining riparian ecological functions and habitat connectivity. A decision to prohibit may result in the need to increase density within the UGB or to expand the boundary. It also would retain restoration opportunities where ecological functions could be regained by increasing tree canopy or removing nonnative plants.

Limit

The tradeoffs of preserving Class II riparian/wildlife corridors and Class B upland wildlife may be addressed by mitigating the negative consequences with a limit decision. The impact of limiting development would depend on the type of program implemented. Using best management practices and low impact development standards to mitigate the impacts of development could reduce negative environmental, social, energy and economic consequences. Retention of existing habitat would be much cheaper than restoring it later, and also would require less energy. These habitat types that are not currently high quality may benefit from limited development if tied to restoration and mitigation.

Class III riparian/wildlife corridors; Class C upland wildlife

Allow

The tradeoffs of allowing conflicting uses in Class III riparian/wildlife corridors and Class C upland wildlife would not be as great as in the higher value habitat areas. Class III riparian/wildlife corridors include smaller forest patches and developed floodplains. The developed floodplains currently provide little ecological value but may provide opportunities for restoration in the future. Isolated smaller forest patches provide some environmental and energy benefits. These areas make up less than one percent of the buildable land in the UGB. Forty-eight percent of that land is zoned for single family, development of which could retain some of the forest canopy. Forty-nine percent of Class III riparian/wildlife corridors is zoned for uses which support employment, but only two percent is classified as high employment value.

Class C upland wildlife patches are of reduced quality compared to A and B upland wildlife and these isolated patches may be associated with increased wildlife mortality on roads. However, Class C upland wildlife patches may provide important habitat for specific wildlife species as well as connectivity along riparian corridors. Class C upland wildlife comprises only about five percent of the buildable land within the UGB, most of which is zoned for single family (37 percent) and industrial (26 percent). Only 25 percent of Class C upland wildlife land is zoned for uses which support employment, and none is classified as high employment value.

Prohibit

The ecological benefits of prohibiting development in Class III riparian/wildlife corridors and Class C upland wildlife would not be commensurate with the negative economic, social and energy consequences for the property owners in these areas. However, the impact on buildable land would be minimal, reducing the regional impact of preserving these areas.

Limit

A decision to limit conflicting uses in Class III riparian/wildlife corridors and Class C upland wildlife could preserve some habitat value while mitigating the negative consequences of protection. Class III riparian/wildlife corridors and Class C upland wildlife could provide important sites for restoration, improving the overall habitat quality for all habitat classes.

Impact areas

Allow, Limit, Prohibit

The negative consequences of allowing conflicting uses in impact areas would be substantially less for all four ESEE factors than in higher value fish and wildlife habitat categories. Impact areas provide little existing ecological function, so the environmental benefit of limiting or prohibiting conflicting uses is low. However, these areas provide important opportunities for landowner education, stewardship and restoration. With redevelopment a limit decision that directs the use of low impact development standards and best management practices could help the overall ecosystem to regain ecological function over time.

Regional zones

Most of the impacts of allowing conflicting uses would be the same across regional zones and are described in Table 8-1; the differences are described below.

Single family residential (SFR)

For single-family uses, the tradeoffs include many of the most sensitive social issues. Single-family zoning comprises the largest portion (46 percent) of the fish and wildlife habitat inventory, and includes 23 percent of the total unconstrained buildable land within the UGB. A decision to allow conflicting uses minimizes additional restrictions on the development potential of land, reducing possible impacts on personal financial security and regulatory or perceptual takings. Allowing conflicting uses on vacant land may impact established neighborhoods, changing neighborhood character and impacting property owners. With a limit decision, single family uses provide opportunities to balance the competing needs of habitat protection and property development rights. These lands often retain trees and vegetation and also provide opportunities for stewardship and landowner education. However, residential uses may increase offsite roads and infrastructure. Prohibiting conflicting uses completely would adversely affect a large number of residential property owners, but would retain habitat and neighborhood character.

Multi-family residential (MFR)

The most important tradeoff to consider in a decision to allow, limit, or prohibit development on land zoned for multi-family is the impact on capacity within the UGB. However, land zoned for multi-family accounts for only five percent of the total fish and wildlife habitat inventory and only one and a half percent of the total unconstrained buildable land within the UGB. Thus, limiting or prohibiting conflicting uses on multi-family land would have a minimal impact on housing capacity. Multi-family development tends to have fewer infrastructure requirements per dwelling unit as compared to single family, reducing the cost of development (economic and energy) but increasing vegetation loss and impervious surfaces. With a limit decision, this zoning type allows for substantial preservation of the habitat along with development if low impact development standards are applied in conjunction with best management practices.

Mixed-use centers (MUC)

A key tradeoff to consider for mixed-use centers is their importance in supporting the 2040 Growth Concept and providing housing and employment capacity within the UGB. Mixed-use centers comprise only two percent of the fish and wildlife habitat inventory, and almost two percent of the total unconstrained buildable land in the UGB. Mixed-use centers allow residents the opportunity to live near their work, which tends to reduce vehicle miles traveled and the related negative water quality impacts and energy use. Less time spent commuting also allows people time to spend with family, on hobbies or recreational activities. However, the increased levels of impervious surfaces and tree loss add to the urban heat island effect and contribute to global warming. Mixed-use centers may provide some opportunity for habitat preservation along with development, depending on the type of program implemented.

Commercial (COM)

For commercial uses the most important tradeoff to consider is the impact on employment and shopping opportunities. Commercially zoned land accounts for five percent of the fish and wildlife habitat inventory, and only one and a half percent of the total unconstrained buildable land in the UGB. Allowing conflicting uses in commercially zoned areas reduces employment impacts specific to development use and does not affect related income and income tax revenue to municipalities. However, similar to mixed-use centers, the increased levels of on-site impervious surfaces have negative environmental and energy impacts. Commercial land uses tend to be more land extensive than single family or multi-family uses, thus reducing the ability to preserve ecological function while allowing development. However, some ecological functions could be retained with a limit decision by requiring low impact development and best management practices.

Industrial (IND)

Industrial uses provide employment and an income base for the region, a critical tradeoff to consider when protecting fish and wildlife habitat. Land zoned for industrial use comprises 14 percent of the fish and wildlife habitat inventory, but only six percent of the total unconstrained buildable land in the UGB. Additionally, most of the habitat land zoned for industrial use is classified as having a low employment density, minimizing the economic development impacts of a limit or prohibit decision. Industrial development tends to be very land extensive, maximizing vegetation loss; increased toxins may be present. Instituting low impact development standards and best management practices with a limit decision may preserve some of the ecological functions while reducing negative economic impacts.

Rural (RUR)

An important tradeoff to consider in rural areas is the impact of allowing conflicting uses on the regional identity and preservation of land for development in the future. Rural areas serve as visual greenbelts and also maintain land in agricultural uses near the UGB. Rural zoning comprises seven percent of the fish and wildlife habitat inventory and seven percent of the total unconstrained buildable land in the UGB. Outside of the UGB but within Metro's jurisdiction, rural residential is the predominate use. Rural uses provide important connector habitat, but allowing conflicting uses in rural areas can have negative environmental effects such as livestock degradation of riparian areas and water quality impacts of leaky septic tanks. A limit decision would provide opportunities to preserve habitat while allowing some development to occur.

Parks and open space (POS)

A key consideration for parks and open space uses is the need for active recreation facilities versus using public land to preserve habitat for the public benefit. Land in use as parks and open space makes up 20 percent of the fish and wildlife habitat inventory, but provides a negligible amount of unconstrained buildable land. Publicly owned lands offer the main opportunity to preserve habitat for the public benefit without negatively impacting private property owners.

Key points

Following completion of the ESEE analysis, Metro staff will develop alternatives for implementing programs to protect regionally significant fish and wildlife habitat. These alternatives will be analyzed based on the ESEE tradeoffs identified above, and will be evaluated using criteria developed from the key points described below. This section identifies some of the implications from the analysis that may be relevant to developing and evaluating Goal 5 alternatives.

Economic

1. **Fish and wildlife habitat and the ecosystem services they provide have economic value.** Decisions that protect or enhance ecosystem services have a positive effect on the economy. In some cases it is more cost effective to protect fish and wildlife habitat than it is to undertake restoration or build engineered structures to provide for flood control, water quality, and other ecosystem services.
2. **Development status of fish and wildlife habitat moderates the types, intensity, and distribution of economic consequences.**
    - Most fish and wildlife habitat is in park status, developed with existing uses, or constrained by existing regulatory programs protecting streams, wetlands, floodplains, and steep slopes near streams (34 percent of the habitat is in park status, 22 percent is developed, and 16 percent is vacant constrained). The majority of high value fish and wildlife habitat (71 percent of Class I riparian/wildlife and 59 percent of Class A upland wildlife areas) is already in parks/open space or constrained.
    - While fish and wildlife habitat comprises 41 percent of the unconstrained buildable land supply within the 2002 UGB, the highest value habitat comprises 20 percent of the region's buildable land supply. This reduces the competition between conservation and development of high value fish and wildlife habitat.
    - The degree to which development is limited within fish and wildlife habitat, especially vacant buildable lands, will directly affect the need for compensatory actions such as increasing densities within the UGB and expanding the UGB.
    - Single-family lands deserve special attention given that they account for a large proportion of fish and wildlife habitat (46 percent). How these lands are treated in protection programs will influence the development value and habitat value of these lands.
    - Conflicts are highest on the 14 percent of fish and wildlife habitat lands in industrial zoning. About 61 percent of these lands scored high for at least one measure of development value. How conflicts are resolved in these areas have implications on employment and potentially the need to expand the UGB.
3. **A majority of fish and wildlife habitat occurs outside areas of intensive urban development.** Economic consequences of decisions to limit or prohibit conflicting uses on these lands will affect economic activities with low land value and employment density, relative to the Portland city center. However, these decisions will have a more significant impact on land values than on employment.

- A majority of high value fish and wildlife habitat (83 percent of Class I riparian/wildlife and 95 percent of Class A upland wildlife) is not zoned to support employment, and land that does support employment is mostly of low employment value (no land in these categories is of high employment value).
- Moderate and low value fish and wildlife habitat supports more employment compared to high value habitat, but most employment values remain low.
- A significant proportion of fish and wildlife habitat occurs in areas that have some development value, but compared to the Portland city center, the development values are low.

4. **Limit and prohibit decisions would affect primarily 2040 design types with lower expected levels of urbanization (i.e., inner and outer neighborhoods)**. However, these areas cover a majority of the urban landscape, so the decisions would impact a large number of property owners.
5. **The fact that limit or prohibit decisions would affect land with lower property values and employment density does not mean that the regional consequences of such decisions would be trivial.** The cumulative property value or employment affected could be significant depending on the details of the regional program and the nature of mitigating actions (such as increasing densities within centers or expanding the UGB)
6. **Decisions that result in protection of fish and wildlife habitat may reduce the future costs to municipalities of complying with environmental regulations such as the federal Endangered Species Act and the federal Clean Water Act.** Likewise, degrading fish and wildlife habitat increases the likelihood that future municipal expenditure to comply with environmental laws will increase.
7. **Relocation of conflicting uses within the current UGB, or expanding the UGB, has the potential to mitigate the adverse effects of limit and prohibit decisions on land value and employment.** However, expanding the UGB may increase expenditures associated with vehicle miles traveled, extending or expanding infrastructure, and other urban growth expenditures. At the local scale, relocating conflicting uses to another jurisdiction or expansion of the UGB may not mitigate adverse effects unless the expansion occurs nearby.

Social

1. **Protection of fish and wildlife habitat preserves many important social values.** These include our cultural heritage, regional identity, sense of place, and neighborhood character. Property owners may also benefit from the retention of fish and wildlife habitat through increased property values. Opportunities for education abound in areas with healthy fish and wildlife habitat.
2. **The distribution of the regulatory burden on property owners to protect fish and wildlife habitat for the general public benefit is a critical social concern.** Private property rights are a fundamental cornerstone of American life, and additional regulations reducing development rights may be seen as an attack on personal financial security as well as a possible taking. However, there are public rights to clean air and water, as well as healthy fish and wildlife, which serve as a counterbalance to this view.
3. **Fish and wildlife habitat provide positive benefits to public health and safety, but there are some negative effects.** There are many obvious benefits of recreation, as well as the mental health and stress relief found in nature. Additionally, minimizing the incidence of

flooding and erosion contributes to public safety. However, increased forest canopy and vegetation could lead to wildfire risks and potential damage from windstorms.

4. **People today have a responsibility to provide future generations with some of the same benefits that current residents enjoy.** Sustainable development practices allow for development to occur today while maintaining a certain amount of intergenerational equity.

Environmental

1. **Trees are invaluable to the health of fish and wildlife habitat.** It is important both near streams and throughout the watershed, as affirmed by local studies. Trees provide habitat, absorb pollution and excess nutrients, and slow and retain stormwater, reducing hydrologic alterations.
2. **Hydrologic changes have far-reaching negative consequences.** Reducing or mitigating impervious surfaces and stormwater impacts is necessary to mimic natural water flow patterns.
3. **Consequences to fish habitat depend on habitat value.** For example, loss of high-value Class I riparian/wildlife habitat would have a stronger ecological impact than Class II or Class III habitat. Loss of high-value riparian habitat would also result in loss of high-value wildlife habitat, because Class I riparian/wildlife habitat include some high-value wildlife habitat (including Habitats of Concern).
4. **Consequences to wildlife habitat also depend on habitat value, but with different implications than fish habitat.** Because connectivity is important to wildlife, the loss of any component in the system may reduce the value of nearby wildlife habitat patches. For example, preserving two Class A upland wildlife habitat patches will be most valuable to wildlife if connectivity is retained, and the connecting patches are typically Class B or C upland wildlife. If only Class A upland wildlife is preserved, its value will be reduced due to the loss of nearby Class B and C upland wildlife.
5. **Homes surrounded by trees can provide important wildlife habitat.** Resident native birds are most diverse in developed areas with plenty of forest canopy. A limit decision provides opportunities to preserve important fish and wildlife habitat while allowing for some conflicting uses, especially in residential zones.

Energy

1. **Trees and other vegetation are a key variable mitigating negative energy impacts.** Plants clean and cool air and water, and also reduce air conditioning demand.
2. **Transportation infrastructure creation and maintenance require energy, whereas transit and alternative transportation modes reduce energy consumption.** Program solutions that reduce infrastructure needs and support alternative modes of transportation can reduce overall energy use.
3. **At the regional scale, fossil fuel use for transportation constitutes a key use of energy and contributes to warming of air and water, as well as air pollution.** Reducing vehicle miles traveled, and the infrastructure required to support such travel, is an important variable in reducing energy use. Clustered housing in single family zones, as well as mixed-use centers and multi-family zoning types provide three potential ways to reduce VMT and infrastructure needs.

4. **Protection of fish and wildlife habitat can increase energy use by increasing VMT, because drivers must travel around the protected areas.** However, trees and other vegetation also help mitigate negative energy effects. A limit decision could provide a balance between compact urban form and retention of green infrastructure within the urban area.

Next steps

The right balance between preserving and developing fish and wildlife habitat is not obvious. Allowing 100 percent of the desired development activities or protecting 100 percent of the habitat areas from development will not satisfy the many competing interests, as described above. The ESEE tradeoffs and key points identified in this report create a base of facts as a foundation for the public debate and decision making process. Metro's ESEE analysis shows the difficulty inherent in balancing the goals of protecting fish and wildlife habitat and providing for the development needs of the region.

The next step in Metro's planning process involves defining several program options for protecting fish and wildlife habitat. The tradeoffs associated with each option will be evaluated and compared, providing valuable information to the Metro Council as it considers a final decision to allow, limit, or prohibit conflicting uses in regionally significant fish and wildlife habitat areas.

Table 8-1. ESEE consequences of allowing, limiting and prohibiting conflicting uses by habitat class

<table>
<tr><th colspan="5">ESEE Consequences of <u>ALLOWING</u> conflicting uses</th></tr>
<tr><th>Habitat type</th><th>Economic</th><th>Social</th><th>Environment</th><th>Energy</th></tr>
<tr>
<td>CLASS I RIPARIAN
Score: 18-30
3-5 primary functions, plus secondary functions</td>
<td>+ Property owners realize full development potential
+ Supports intrinsic value of built environment
+ No affect on employment and income related to development activities
+ Buildable land with habitat accounts for almost half of the total buildable land in UGB, reduces need to expand UGB by allowing development
+ SFR: No impact on development value on large portion of habitat land
+ IF a restoration component is included impacts on ecosystem services could be mitigated but at higher cost
− Negative impacts on employment and income that depend on quality of riparian and wildlife habitat
− Increased municipal spending on flood and water quality management
− Cumulative negative impacts on all ecosystem services (e.g., flood management, water-quality)
− Increases risk of foregoing future uses and benefits associated with habitat
− Increases risk of irreversible outcome (e.g., extinction of salmon) that may have future negative economic consequences
− May increase cost of municipal compliance with federal regulations (ESA)
− Majority of habitat occurs on land with low development value and employment density, protection of ecosystem values could occur with less economic impact</td>
<td>+ Maintain housing and employment options
+ No change in property rights
+ No takings concerns
+ Equitable impact on property owners
+ SFR: Maintain personal financial security (equity)
+ MUC: Does not impact 2040 densities and development in centers
+ MUC: Allows residents opportunity to live near where they work
+ POS: Maintain or increase opportunities for active recreation
− May lose cultural heritage
− May not protect salmon and thus impact Native American culture and regional identity
− May change neighborhood character and sense of place
− Scenic values may be lost
− Incompatible land uses may lose buffers
− May degrade environmental quality and impact health
− May lose recreational and educational opportunities
− Loss of tree canopy and vegetation may increase stress levels and impact mental health
− Aggression and violent behavior could increase
− May increase risk of landslides and floods if tree canopy and vegetation is removed
− Loss of intergenerational equity</td>
<td>+ Functional consequences: no positive consequences beyond that provided by existing protection
+ Reduced need for UGB expansion
+ SFR: may retain more trees/ vegetation
+ MFR: Increased density within UGB reduces need for UGB expansions
+ MFR: Decreased infrastructure requirements per dwelling unit decreases overall infrastructure/roads
+ MUC: tends to reduce VMT, reducing water quality impacts
− Functional consequences: loss of 3-5 primary ecological functions
− Likely harm to salmon and wildlife through habitat loss and degradation
− Increased pesticide and fertilizer use degrades water quality
− Landscaping uses water
− Continued development in flood areas
− Continued wetland conversion
− Nonnative species introductions
− MFR: tends to retain less vegetation and add more imperviousness
− IND: Increased imperviousness and decreased canopy cover increase negative ecological effects
− IND: Increased toxins may be associated with this land use
− IND: Can be particularly detrimental to water quality
− RUR: Livestock degrade riparian area
− RUR: Septic tanks are common and may leak, reducing water quality</td>
<td>+ Contributes to efficiencies in provision of services
+ More compact development may reduce VMT (Vehicle Miles Traveled per person) and fossil fuel use
+ Reducing VMT and fossil fuel use reduces air pollutants and heat
+ MUC: High density centers reduce VMT, infrastructure, energy use
+ RUR: Imperviousness is typically lower and vegetation cover higher, reducing Urban Heat Island effect
− Loss of trees and increased imperviousness lead to Urban Heat Island effect and global warming; higher air conditioning (AC) demand
− Warmer air warms water; harms salmon
− Increased energy consumption to provide engineered solutions to manage stormwater flow, reduce soil erosion, keep water cool, etc.
− SFR: associated with increased offsite roads and infrastructure
− MFR, COM, IND: Increased onsite imperviousness and tree loss add to Urban Heat Island effect and global warming on a per-acre basis
− IND: Placement within the floodplain is common, increasing energy-requiring flood mitigation</td>
</tr>
</table>

ESEE Consequences of ***ALLOWING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
CLASS II RIPARIAN *Score: 6-17* *1-2 primary functions and some secondary functions*	**+** *Same as Class I riparian* **-** *Same as Class I Riparian, except less risk*	**+** *Same as Class I riparian* **-** *Same as Class I Riparian, except less risk*	**+** *Similar to Class I riparian habitat* **-** *Similar to Class I riparian habitat, except:* **-** Loss of restoration opportunities to regain ecological functions **-** Loss of functionality would be less because fewer ecological functions are present; however, loss of Class 2 Riparian removes existing water quality filtration capacity and other ecological services	**+** *Same as Class I Riparian* **-** *Same as Class I Riparian, except less risk*
CLASS III RIPARIAN *Score: 1-5* *No primary functions, no wildlife value: includes small forest patches and developed floodplain*	**+** *Same as Class I Riparian* **-** *Same as Class I Riparian, except less risk*	**+** *Same as Class I Riparian* **-** *Same as Class I Riparian, except less risk*	**+** *Similar to Class I riparian habitat, except:* **+** Class 3 Riparian ecological functions are already reduced, thus allowing conflicting uses does not have a significant impact on overall ecological function **-** *Similar to Class II riparian habitat, except:* **-** The potential for losing existing ecological functions is reduced	**+** *Same as Class I Riparian* **-** *Same as Class I Riparian, except less risk*

ESEE Consequences of ***ALLOWING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
CLASS A WILDLIFE *Score 7-9* *no primary riparian function but may contain secondary riparian functions*	+ *Same as Class I riparian* − *Same as Class I riparian*	+ *Same as Class I riparian* + Less vegetation may reduce risk of wildfires + Less habitat may reduce number of undesirable species − *Same as Class I Riparian*	+ *Similar to Class I riparian habitat* + **Functional consequences:** no positive consequences noted + SFR: may retain more natural land cover than other zoning, providing wildlife habitat and connectivity + MFR, MUC: Increased density in UGB may limit expansion to new areas + RUR: Less habitat fragmentation; tends to retain more connectivity + RUR: agricultural areas can provide important grassland habitat − **Functional consequences:** Loss of key habitat characteristics − Extensive loss of valuable wildlife habitat − Nonnative plant and animal species invasions − Increased adverse edge effects − Pesticides may harm wildlife − Noise and light disturbances − Continued native species loss over time, reduction in migratory songbirds − Decline of at-risk wildlife species; more species imperiled − Continued loss of Habitats of Concern and associated species − Mortality from roadway crossings − MFR: higher onsite imperviousness, increased negative effects on wildlife and migratory songbirds − COM, IND: Increased imperviousness and decreased canopy cover − COM, MUC: Increased human disturbance	+ *Same as Class I Riparian* − *Same as Class I Riparian*

ESEE Consequences of ***ALLOWING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
CLASS B WILDLIFE *Score 4-6* *no primary riparian function but may contain secondary riparian functions*	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*	+ *Same as Class A Wildlife* − *Same as Class A Wildlife, except less risk*	+ *Similar to Class I Riparian* + *Similar to Class A Wildlife* − *Similar to Class A Wildlife, except:* − Habitat interior loss less extensive than Class A − Loss of connectivity especially pronounced; extensive loss of migratory stopover habitat and movement corridors. Reduces value of Class A patches. − Loss of grassland and low-structure vegetation within 300 ft of streams − Loss of locally rare migratory stopover habitat and locally rare habitat patches with water resources	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*
CLASS C WILDLIFE *Score 2-3* *no primary riparian function but may contain secondary riparian functions*	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*	+ *Same as Class A Wildlife* − *Same as Class A Wildlife, except less risk*	+ *Similar to Class I Riparian and Class A Wildlife* + These patches tend to be relatively small, isolated, and lacking substantial water resources, and are therefore reduced in quality compared to Class A and B + Isolated patches may be associated with increased wildlife mortality on roadways − *Similar to Class B, except:* − Only limited loss of habitat interior − Some loss of connectivity between patches − Important loss of migratory stopover habitat, these patches tend to occur in areas lacking substantial wildlife habitat − Loss of upland patches lacking water resources but providing important habitat to specific wildlife species	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*

ESEE Consequences of ***ALLOWING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
Riparian impact area	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone	+ Opportunities for landowner education may reduce effects of existing and future environmentally harmful practices near waterways − Potential for increased adverse impacts (e.g., pollution, altered hydrology, pesticide use, bacterial contamination, human disturbance…) to waterways due to existing and new conflicting uses in areas adjacent to waterways − These impacts are greater than in other areas because they are near water and because non-habitat areas tend to lack natural filtration provided by riparian vegetation	
Vegetation impact area	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone	+ Opportunities for landowner education may reduce effects of existing and future environmentally harmful practices − Potential for increased adverse effects adjacent to habitat areas, primarily forested but also low-structure vegetation	

ESEE Consequences of ***LIMITING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
CLASS I RIPARIAN *Score: 18-30* *3-5 primary functions, plus secondary functions*	+ *Extent of impact depends on program:* + IF a restoration component is included impacts on ecosystem services could be mitigated but at higher cost + Intrinsic value of built environment can be retained if balanced with habitat needs + Positive to neutral impact on employment and income that depend on quality of riparian and wildlife habitat + Reduces municipal spending on flood and water quality management + Reduces risk of foregoing future uses and benefits associated with habitat + Reduces risk of irreversible outcome (e.g., extinction of salmon) that may have future negative economic consequences + May decrease cost of municipal compliance with federal regulations (ESA) + Majority of habitat occurs on land with low development value and employment density, protection of ecosystem values could occur with less economic impact + Primarily affects 2040 design types with lower expected levels of urbanization + Reduces cumulative negative impacts on all ecosystem services (e.g., flood management, water-quality) + SFR: Large portion of habitat, decisions on access/layout influences development and habitat value - Development potential of property is limited - Some effect on employment and income related to development activities - Buildable land with habitat accounts for almost half of the total buildable land in UGB, may impact need to expand UGB by limiting development - SFR: May substantially impact development value	+ Preserve some buffers between uses + Retain some or most cultural heritage + Provide salmon chance for recovery, lessen impacts on Native American culture and regional identity + Retain most neighborhood character and sense of place + Preserve most scenic values + Maintain environmental quality and reduce negative health impacts + Retain most educational and recreational opportunities + Retention of tree canopy/vegetation may reduce stress levels and positively impact mental health + Reduce risk of landslides and floods + Provide some intergenerational equity + SFR, MFR, MUC: Maintain housing options/affordability if development minimally impacts the habitat + COM, MUC, IND: Maintain employment opportunities + POS: Increase active recreation opportunities if habitat minimally impacted - Property rights: owners may not be able to develop land to same extent - Takings concerns - Inequitable to property owners - SFR: May reduce option for large lot single family homes - SFR: May impact property values, decreasing personal financial security - SFR, MFR, MUC: May reduce housing options/affordability if development minimally impacts the habitat - COM, MUC, IND: May reduce employment opportunities - POS: May reduce opportunities for active recreation	+ **Functional consequences:** May conserve some of 3-5 existing primary ecological functions, depending on program, as well as Class A or B wildlife habitat falling within Class I riparian; extent depends on program + Reduced need for UGB expansion + Strong potential for BMP implementation and low impact development and innovative design standards + Hydrology less altered than "allow" + MFR: Increased density within UGB reduces need for expansions + MFR: Decreased infrastructure requirements per dwelling unit reduces negative ecological effects + MUC: reduced VMT, fewer water quality impacts from transportation runoff - **Functional consequences:** Potential for substantial loss of 3-5 primary ecological functions, as described in ALLOW. Class A or B wildlife habitat falling within Class I riparian would also be compromised. Extent of loss depends on program. *See comments under "allow," except:* - Hydrology less altered, less stream damage - Greater flood area/wetland protection - Greater protection of steep slopes - Fish and other aquatic wildlife habitat impaired, but extent of loss reduced - Water quality impacts likely, but degree depends on program - MFR, MUC, COM, IND: Loss of ecological functions greater than SFR due to increased imperviousness and tree loss - IND: Increased toxins may be associated with this land use type - RUR: Septic tanks may leak bacteria into waterways, reducing water quality	+ **May reduce new infrastructure requirements** + **Reducing VMT and fossil fuel use reduces air pollutants and heat** + **Increased forest cover helps remove air pollutants and reduce smog** + **Increased forest cover cools air by shade, evapotranspiration, carbon storage; reduced Urban Heat Island effect, global warming, and AC demand** + **May result in decreased energy consumption to manage stormwater runoff, reduce sedimentation and erosion and keep water cool** + **Tree retention is cheaper, easier, and less energy-consumptive than planting new** + **MFR: Requires less land per unit than SFR, reducing extent of tree loss, infrastructure, UGB expansions** + **MUC: Higher density centers create compact urban form, reducing VMT, infrastructure**, energy use **Negative consequences similar to "ALLOW", but to a lesser degree** - Avoiding sensitive natural areas may increase infrastructure requirements - May lead to increased VMT - May result in need for UGB expansion - Loss of trees increases Urban Heat Island effect, global warming, AC demand - Warmer air warms water; harms salmon and other species - MFR, COM, IND: Increased onsite tree loss and imperviousness add to Urban Heat Island effect and global warming - COM, IND: May increase energy consumption to replace natural systems - IND: Placement within the floodplain is common, increasing energy-requiring flood mitigation

ESEE Consequences of ***LIMITING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
CLASS II RIPARIAN *Score: 6-17* *1-2 primary functions and some secondary functions*	+ *Same as Class I riparian* − *Same as Class I riparian, except less risk*	+ *Same as Class I riparian* − *Same as Class I riparian, except less risk*	+ *Similar to Class I riparian habitat* + Retains restoration opportunities where ecological functions could be regained through tree canopy increases or other measures − *Similar to Class I riparian resources, except:* − Some loss of features providing ecological functions (scores 6-17), unless offset by mitigation and restoration activities	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*
CLASS III RIPARIAN *Score: 1-5* *No primary functions, no wildlife value: includes small forest patches and developed floodplain*	+ *Same as Class I riparian* − *Same as Class I riparian, except less risk*	+ *Same as Class I riparian* − *Same as Class I riparian, except less risk*	+ *Similar to Class II riparian habitat* − *Similar to Class II riparian habitat, except:* − Loss of opportunities to add forest canopy along streams where low structure currently exists	: *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*

ESEE Consequences of ***LIMITING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
CLASS A WILDLIFE *Score 7-9* *no primary riparian function but may contain secondary riparian functions*	+ *Same as Class I riparian* − *Same as Class I riparian*	+ *Same as Class I riparian* − *Same as Class I riparian* − More vegetation could increase risk of wildfires − Less habitat could increase nuisance species	+ **Functional consequences:** Some retention of key habitat attributes (patch size, habitat interior, connectivity and water resources) for habitat outside Class I riparian + More habitat retained than Allow + Reduced edge effects + Fewer nonnative species invasions + More connectivity retained + Less harm to native species + Reduced need for UGB expansion + Landscaping can provide diverse habitats + Low to moderate levels of development provide good habitat for some species + MFR: Increased density in UGB may limit expansion to new areas, protecting important outlying habitats + RUR: Less habitat fragmentation; tends to retain more connectivity + RUR: agricultural areas can provide important grassland habitat *Similar to "allow," but to a lesser degree depending on program options* − **Functional consequences:** Potential for *reduction* in habitat patch size, connectivity, and amount of interior habitat, reducing ecological function − Wildlife crossings across roadways cause mortality − MFR, COM, MUC, IND: More onsite imperviousness and less forest/vegetation increase negative effects on wildlife and migratory songbirds − MFR, COM, MUC, IND: Higher level of development is less valuable to wildlife − MFR, COM, MUC, IND: Increased human disturbance may negatively impact wildlife, but to a lesser degree than allow − RUR: Increased toxins may be associated with agriculture	+ *Same as Class I riparian* − *Same as Class I riparian, except less risk*

ESEE Consequences of ***LIMITING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
CLASS B WILDLIFE *Score 4-6 no primary riparian function but may contain secondary riparian functions*	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*	+ *Same as Class A Wildlife* − *Same as Class A Wildlife, except less risk*	*Similar to Class A, except:* + More habitat connectivity between large habitat patches retained + Grassland and low structure habitat within 300 ft of stream may be retained + Low to moderate levels of development provide good habitat for some species, most pronounced in Class A patches *Similar to "ALLOW," but to a lesser degree depending on program options* − To the extent the resource removed, habitat and connectivity will be lost − MFR: More onsite imperviousness and less forest and vegetation increases negative effects on wildlife and migratory songbirds − MFR, COM, IND, MUC: Higher density development less valuable to wildlife − MFR, COM, IND, MUC: Increased human disturbance may negatively impact wildlife	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*
CLASS C WILDLIFE *Score 2-3 no primary riparian function but may contain secondary riparian functions*	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*	+ *Same as Class A Wildlife* − *Same as Class A Wildlife, except less risk*	*Similar to Class B, except:* + Most are small forested patches + Less likely to provide good habitat for some species, because these patches tend to be narrow, disconnected, and surrounded by development + Isolated patches may be associated with increased wildlife crossing mortality on roadways *Similar to "allow," but to a lesser degree depending on program options* − To the extent that conflicting uses remove the resource, habitat and connectivity will be lost	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*

ESEE Consequences of ***LIMITING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
Riparian impact area	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone	+ Retains restoration opportunities where riparian functions could be regained through planting tree canopy or other measures + May help protect existing water resources from current or future adverse effects due to conflicting uses + Provides mitigation opportunities + Incentives and landowner education could enhance ecological health over time − Similar to "allow," but to a lesser degree	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone
Vegetation impact area	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone	+ Retains restoration opportunities where habitat patch functions could be regained through planting tree canopy or other measures; for example, potential for decreased edge effects, increased interior habitat and increased connectivity to other patches and to water resources + Provides mitigation opportunities + Incentives and landowner education could enhance ecological health over time − *Similar to "allow," but to a lesser degree*	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone

ESEE Consequences of ***PROHIBITING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
CLASS I RIPARIAN *Score: 18-30* *3-5 primary functions, plus secondary functions*	+ Positive impact on employment and income that depend on quality of riparian and wildlife habitat + Minimizes municipal spending on flood and water quality management (as long as takings issues are avoided) + Minimizes risk of foregoing future uses and benefits associated with habitat + Minimizes risk of irreversible outcome (e.g., extinction of salmon) that may have future negative economic consequences + May decrease cost of municipal compliance with federal regulations (ESA) + Majority of habitat occurs on land with low development value and employment density, protection of ecosystem values could occur with less economic impact + Most habitat is on land with 2040 design types with lower expected levels of urbanization + Minimizes cumulative negative impacts on all ecosystem services (e.g., flood management, water-quality) − Does not support intrinsic value of built environment − Development potential of property is impacted substantially − Major affect on employment and income related to development activities if buildable land decreased − Buildable land with habitat accounts for almost half of the total buildable land in UGB, likely to impact need to expand UGB by prohibiting development − SFR: Likely to have substantial impact on development value on large portion of habitat	+ Preserve cultural heritage + Provide salmon a chance to recover and lessen impacts on Native American culture and regional identity + Preserve or increase buffers between incompatible land uses + Retain neighborhood character/sense of place + Preserve scenic values + Maintain and possibly improve environmental quality and reduce negative health impacts + Retain educational and recreational opportunities + Retention of tree canopy and vegetation may reduce stress levels and positively impact mental health + Reduce risk of landslides and floods + Provide intergenerational equity − Inequitable impact on property owners − Property rights: owners may not be able to develop land to same extent − Likely to result in takings concerns − SFR: Possible negative impact on property values, decrease in equity − SFR, MFR, MUC: Reduce housing options and opportunities − SFR, MFR, MUC: May impact housing affordability − MUC: Negative impact to 2040 if development in centers is curtailed − COM, IND, MUC: Reduce employment options and opportunities − POS: Reduce opportunities for active recreation	+ Functional consequences: Preservation of the most ecologically functional riparian areas, as well as some of the most important wildlife habitat remaining in the region, including Habitats of Concern + Helps maintain hydrologic connectivity + Minimizes hydrologic alterations, reduces flooding + Retention of important salmon habitat + IND: Minimize water quality degradation + RUR: Fewer water quality problems associated with leaky septic tanks, livestock + POS: Could help prevent human/pet disturbance to wildlife − **Functional consequences**: no adverse consequences for Class I habitat − Increased need for UGB expansion − Potential for increased infrastructure intrusion into other habitat areas if Class I riparian areas are avoided − MFR, MUC: Opportunity for increased density reduced, thereby increasing need for UGB expansion − RUR: Rural lands are low density and therefore tend to require more infrastructure per dwelling unit, increasing VMT and decreasing water quality	+ **Retention of tree canopy and other vegetation may provide strong protection from warmer air and water from Urban Heat Island effect and global warming** + **Opportunity for pleasant, accessible alternative means of transportation such as walking and bicycling through natural areas, if permitted under program** + **Likely to result in decreased need for future** restoration and flood mitigation − Limits transportation planning options − Limits infrastructure placement options − Increases extent of urban area and VMT − Potential for increased total imperviousness due to increased roads; energy is required to build and maintain roadways and other infrastructure − If utilities are prohibited from being installed along streams, may require pumping or other activities to take non-gravity driven pathways − Increased VMT, fossil fuel use, air pollution, related warming of air and water − Extent of Urban Heat Island effect may increase, potentially increasing AC demand − MUC: Most energy-efficient land use; prohibit decision would reduce energy saving opportunities

ESEE Consequences of ***PROHIBITING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
CLASS II RIPARIAN *Score: 6-17* *1-2 primary functions and some secondary functions*	+ *Same as Class I riparian* − *Same as Class I riparian, except less risk*	+ *Same as Class I riparian* − *Same as Class I riparian, except less risk*	+ Similar to Class I riparian habitat + Retention of some critical ecological functions and ecosystem services provided by existing natural resources + Retains restoration opportunities where ecological functions could be regained through tree canopy increases or other measures + Provides mitigation opportunities − *Similar to Class I riparian habitat, except:* − Increased need for UGB expansion, but less so than prohibit decision in Class I (scores of 6-18 – at least 1 primary function) −	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*
CLASS III RIPARIAN *Score: 1-5* *No primary functions, no wildlife value: includes small forest patches and developed floodplain*	+ *Same as Class I riparian* − *Same as Class I riparian, except less risk*	+ *Same as Class I riparian* − *Same as Class I riparian, except less risk*	+ Similar to Class I riparian habita, except: + Retention of some ecological functions and ecosystem services provided by existing natural resources + Retains restoration opportunities where ecological functions could be regained through tree canopy increases or other measures + Provides mitigation opportunities − *Similar to Class I riparian habitat, except:* − Increased need for UGB expansion, but less so than Class II	+ **Same** *as Class I Riparian* − *Same as Class I Riparian, except less risk*

ESEE Consequences of ***PROHIBITING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
CLASS A WILDLIFE *Score 7-9* *no primary riparian function but may contain secondary riparian functions*	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*	+ *Same as Class I Riparian* − *Same as Class I Riparian* − More vegetation increase risk of wildfires − More habitat may increase nuisance species	+ Functional consequences: Retention of key attributes for habitat outside Class I riparian + Retention of some of the best remaining wildlife habitats in the region + Provides key breeding habitat for migratory songbirds, aquatic species and habitat interior specialists + Retains Habitats of Concern + Provides important source habitats for native wildlife and plant species + Reduced wildlife road crossing mortality + RUR: Decrease in agricultural toxins + RUR: Reduced livestock damage − **Functional consequences:** Continuing functionality of Class A habitat patches may depend on connectivity with other, less valuable habitat patches − If conflicting uses are prohibited in all Class A wildlife other habitat may be disproportionately removed or altered, reducing the quality of Class A habitat − Class A patches are typically very large, may result in need for UGB expansions − RUR: Agricultural areas can provide important habitat for grassland and low structure-associated species	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*

ESEE Consequences of ***PROHIBITING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
CLASS B WILDLIFE *Score 4-6* *no primary riparian function but may contain secondary riparian functions*	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*	+ *Same as Class A Wildlife* − *Same as Class A Wildlife, except less risk*	+ Similar to Class A, except: + Retention of some of the most important connectivity elements in the region + Retention of large upland habitat patches important to specific wildlife species + Important for migratory songbirds + May provide important source habitats for native wildlife and plant species + Grassland and low-structure vegetation within 300 ft of streams would be retained − *Similar to Class A Wildlife, except:* − If conflicting uses are prohibited in all Class B wildlife habitat, Class A and C may be disproportionately removed or altered, thereby reducing the quality of Class B habitat through connectivity loss and increasing isolation	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*
CLASS C WILDLIFE *Score 2-3* *no primary riparian function but may contain secondary riparian functions*	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*	+ *Same as Class A Wildlife* − *Same as Class A Wildlife, except less risk*	+ Similar to Class B, except: + Not as important to regional connectivity, may provide important local connectivity + Small, isolated patches provide important and locally rare stopover habitat to migratory birds + RUR: Prohibiting conflicting uses may decrease agricultural toxins + RUR: Reduced livestock damage − *Similar to Class B, except:* − Small isolated habitat patches may limit reproductive success due to edge effects and reduced habitat quality − Isolated patches may be associated with increased roadway mortality − RUR: Agricultural areas can provide important habitat for grassland and low structure-associated species	+ *Same as Class I Riparian* − *Same as Class I Riparian, except less risk*
Riparian impact area	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone	+ *Similar to “limit,” but to a greater degree* − Primary negative consequences relate to social, economic and energy	+ Positive consequences depend on the general zone − Negative consequences depend on the general zone

ESEE Consequences of ***PROHIBITING*** conflicting uses				
Habitat type	**Economic**	**Social**	**Environment**	**Energy**
Vegetation impact area	**+** Positive consequences depend on the general zone **−** Negative consequences depend on the general zone	**+** Positive consequences depend on the general zone **−** Negative consequences depend on the general zone	**+** *Similar to "limit," but to a greater degree* **−** Primary negative consequences relate to social, economic and energy	**+** Positive consequences depend on the general zone **−** Negative consequences depend on the general zone

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APPENDICES

Copies of Appendices A, B, C and D are available for review in the Metro Council's files. In addition, copies may be requested from the Metro Planning Department, 600 N.E. Grand Ave., Portland, OR 97232, or by calling 503-797-1555. Copies may also be available via the Metro website: www.metro-region.org/nature.

APPENDIX A

Federal, State, Regional, and Local Policies

APPENDIX A
FEDERAL, STATE, REGIONAL, AND LOCAL POLICIES

Federal, State, Regional, and Local Policies

When the Metro Council adopted the Urban Growth Management Functional Plan in 1996, one of the purposes was to address regional fish and wildlife habitat as a matter that has a "significant impact upon the orderly and responsible development of the metropolitan area." ORS 268.390(1). Regional conservation of identified fish and wildlife habitat is consistent with many other state and federal policies and laws. The Metro Policy Advisory Committee recognized this connection in October 2000, when it adopted the "Purpose, Vision, Goal, Principles and Context" (Vision Statement) for the development of Metro's fish and wildlife program.

The Vision Statement recommended that the Metro Council address these state and federal policies, in particular the Endangered Species Act (ESA). MPAC recommended that Metro develop a program that could satisfy federal agency standards, and comply with the ESA "so that local governments could use it if they choose." Metro's fish and wildlife program will have important connections with many other state and federal programs, and will aid in local compliance with those programs. The discussion below describes relevant federal and state requirements and how Metro's program may be coordinated with those requirements.

Federal Policy

Endangered Species Act (ESA)

The purpose of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." 16 USC 1531(b). The act requires federal agencies to identify critical habitat for endangered and threatened species, create a recovery plan for those species and in some circumstances issue regulations that provide for the conservation of such species. Above all, the act prohibits any individual, group of individuals, states, cities and counties from "taking" a listed species.[1]

Twelve species of salmon and steelhead are listed as either threatened or endangered in the Columbia River and Willamette River Basins. (See Table A-1). The federal agency responsible for these species is the National Oceanic and Atmospheric Administration Fisheries unit (NOAA Fisheries). All of these species are present in the Portland metropolitan area at some point in their life cycle. They either migrate through the metropolitan area as adults or juveniles, or may spawn and rear in metropolitan area streams. Most of these salmonids were listed in 1997, 1998 and 1999. NOAA Fisheries is currently undertaking a review of those listed species to determine whether their status should be revised. This review could result in species being reclassified from endangered to threatened or visa versa, or candidate species (those proposed for listing in the past) being listed as endangered or threatened. One such species that exists in the metropolitan area is the lower Columbia River Coho Salmon.

[1] The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. 16 USC 1532(19).

Numerous other fish and wildlife species and species of concern may also be found in the Metro region. These include as listed species: Aleutian Canada goose and Peregrine falcon; species of concern: Pacific western big-eared bat, Northwestern pond turtle, Tricolored blackbird, Olive-sided flycatcher, Little willow flycatcher, Northern red-legged frog, Long-eared myotis (bat), Fringed myotis (bat), Long-legged myotis (bat), Yuma myotis (bat), Green sturgeon and Pacific lamprey.

Table A-1: Endangered Species Act status of West Coast salmon & steelhead

Species	ESU (Date)	Status
Coho Salmon	Lower Columbia River/Southwest WA ESU (7/95)	Proposed
Chinook Salmon	Snake River Fall-run (4/92)	Threatened
	Snake River Spring/Summer-run (4/92)	Threatened
	Lower Columbia River (3/99)	Threatened
	Upper Willamette River (3/99)	Threatened
	Upper Columbia River Spring-run (3/99)	Endangered
Chum Salmon	Columbia River (3/99)	Threatened
Sockeye	Snake River (11/91)	Endangered
Steelhead	Upper Columbia River (8/97)	Endangered
	Snake River Basin (8/97)	Threatened
	Lower Columbia River (3/98)	Threatened
	Upper Willamette (3/99)	Threatened
	Middle Columbia River (3/99)	Threatened

The listing of species as threatened or endangered triggers a requirement for the responsible federal agency to create a recovery plan for that species or their habitat. NOAA Fisheries lists threatened and endangered species by Evolutionarily Significant Units (ESU) which encompass geographic areas that may include multiple river basins. For recovery planning purposes, NOAA Fisheries has combined five ESUs into the Columbia Basin “recovery domain” for listed salmonids. The Willamette River Basin is part of that recovery domain. Recovery planning must address problems at both the ESU scale and the smaller scale of independent populations of fish. For example, NOAA Fisheries has identified independent populations of threatened steelhead in the McKenzie, Calapooia, Santiam and Clackamas river basins.

NOAA Fisheries is currently developing recovery plans for listed salmonid species. As explained in more detail below, much of that work will be accomplished through the Northwest Power Planning Council’s subbasin planning process. While it is anticipated that the recovery plans will be detailed and comprehensive, the measures identified by the plans will apply only to federal actions, or actions that have a federal nexus (i.e., federally funded). Strictly speaking, individuals and state and local governments are not bound by these recovery plans. However, the recovery plans are likely to represent the best guidance for conducting local actions that may have an adverse impact on the listed species. It may also be several years before the recovery plans are fully implemented. Until that time, local governments must implement their own measures to avoid taking listed species. These measures can take the form of a section 4(d) limit, a section 10 habitat conservation plan, or modifying regulation of local land development to minimize the risk of take.

Metro's inventory of regionally significant fish and wildlife habitat has identified habitat upon which listed salmonids depend for some part of their life histories. Coordinating Metro's program with NOAA Fisheries recovery plan as it is developed will not only assist in long-term recovery of the species, but also with local compliance with the ESA.

Clean Water Act (CWA)

The Clean Water Act (CWA) sets a national goal to "restore and maintain the chemical, physical and biological integrity of the Nations waters." 33 U.S.C.A. 1251. In Oregon, the CWA is implemented by the Department of Environmental Quality (DEQ) with review and approval by the U.S. Environmental Protection Agency (EPA). The DEQ has the responsibility for protecting the beneficial uses of rivers, streams and lakes of the state. Beneficial uses include drinking water, cold water fisheries, industrial water supply, recreation and agricultural uses. The DEQ carries out this responsibility in part by identifying those water bodies which are not meeting current water quality standards. This inventory is commonly referred to as the section 303(d) list. The 1998 303(d) list included over two hundred miles of rivers and streams in the Metro region which did not meet water quality parameters for one or more pollutants. For the entire state, about 5,000 miles of water quality limited rivers and streams have been added to the 303(d) list since 1998.

For waters identified on the 303(d) list, DEQ must develop total maximum daily loads (TMDL) for those pollutants that exceed water quality standards. These TMDLs apply to both point sources (end of pipe) and nonpoint sources (no specific origin). The daily load allocations become part of plans at the watershed scale intended to meet water quality standards. Depending upon where the watershed is located, different state agencies, local governments and land owners will be responsible for developing the water quality plans. In urban areas, local governments, watershed councils, landowners and stakeholders will likely be the parties responsible for such plans.

In addition to developing water quality plans in connection with TMDLs, some cities and counties are also responsible for stormwater management. Generally, large cities, smaller cities within urbanized areas, and cities outside urbanized areas with populations over 10,000 are required to have permits to operate municipal separate storm sewer systems that discharge into surface waters of the state. These permits require cities to implement water quality protections for their municipal operations and for construction and post construction run-off control from urban development.

Beginning in December 2002, individual projects that disturb one or more acres of land need National Pollutant Discharge Elimination System (NPDES) 1200-C general permit coverage. These permits govern stormwater discharges. One of the requirements of these permits is an erosion and sediment control plan that applies before during and after construction. The plan must demonstrate how erosion will be controlled and limited so that sediment does not have an adverse impact on receiving water bodies.

While Metro does not have responsibility or authority to regulate water quality, the Title 3 water quality land use requirements are already consistent with many DEQ rules. Metro's fish and wildlife program will further assist the region with improving water quality for the beneficial use of supporting cold water fisheries.

Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act)

The 1980 Northwest Power Act requires the Bonneville Power Administration ("BPA") to implement a Fish and Wildlife Program that mitigates for the degradation to both fish and wildlife habitat caused by the Columbia Hydropower System. Complying with the Fish and Wildlife Program is achieved primarily through subbasin plans developed with oversight from the Northwest Power Planning Council. The subbasin plans consist of three parts: (1) a subbasin assessment describing existing and historic resource conditions, (2) an inventory if existing activities, and (3) a management plan that addresses the key limiting factors in the subbasin. A "lead entity" is contracted to coordinate the subbasin planning. The BPA provides funding for producing the subbasin plan, technical assistance related to the plan, and ultimately for on-the-ground projects that implement the plan.

The connection between NPPC subbasin planning and NOAA Fisheries recovery planning for listed salmonids has recently been strengthened. The Regional Administrator for NOAA Fisheries envisions that subbasin plans will become components of federal recovery plans. NOAA Fisheries and NPPC collaborated on developing a Technical Guide for Subbasin Planners with the intent of enabling those planners to produce a subbasin plan that would satisfy local recovery plan requirements under the ESA.

The NPPC has contracted with the Willamette Restoration Initiative (WRI) to coordinate the creation of the Willamette Subbasin Plan. The subbasin planning process accommodates and encourages participation by watershed councils, stakeholders, and local governments. The information generated by Metro's Fish and Wildlife Habitat Conservation program will be valuable to that planning process and contribute as a building block of NOAA Fisheries recovery plan. Coordination between Metro and WRI on the subbasin planning will be extremely important because the subbasin plan will prioritize needs and projects in the Lower Willamette and Clackamas River basins that will potentially qualify for federal funding support, and will constitute local components of NOAA Fisheries recovery plan for listed salmonids.

The Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act was originally passed in 1976 and amended by the Sustainable Fisheries Act of 1996. These statutes require federal agencies to consult with NOAA Fisheries on activities that may adversely affect "essential fish habitat" ("EFH"). The Magnuson – Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity."

The Pacific Fishery Management Council has identified EFH for the pacific coast salmon fishery. Those areas generally include "those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem."[2] To meet that goal, EFH must include all streams, lakes, ponds, wetlands and the habitat historically accessible to salmon in Washington, Oregon, Idaho and California. The Sandy River, Clackamas River, Tualatin River, and Lower Willamette River basins have all been identified as EFH for chinook and coho salmon. These basins include streams and habitat in urban areas.

The Magnuson – Stevens Act does not contain requirements for state, local or private entities. NOAA Fisheries typically considers EFH at the same time it conducts ESA Section 7 consultations. However, the Pacific Fishery Management Council considers EFH to be a common interest among all parties, and a tool to promote healthy and sustainable coastal fisheries.

State Policy

Oregon Plan for Salmon and Watersheds

The mission of the Oregon Plan for Salmon and Watersheds is "to restore our native fish populations – and the aquatic systems that support them – to productive and sustainable levels that will provide substantial environmental, cultural and economic benefits." It was initiated in 1995 to address restoration of coastal coho salmon. In April 1997, the Oregon Legislature incorporated other related efforts into one overarching framework: "The Oregon Plan for Salmon and Watersheds." It is designed to restore the healthy function of Oregon's natural aquatic systems. It represents commitments on behalf of government, interest groups and private citizens from all sectors of the State.

The local watershed councils are the bedrock of the Oregon Plan. The councils are composed of citizens who are concerned about their rivers and watersheds. They are formed and operate according to two principles adopted by the Legislature: 1) that the watershed council be a voluntary, local group, and 2) the council represents a balance of interested and affected persons within the watershed. The primary tasks of a watershed council are to conduct an assessment of the watershed and create an action plan for improving the watershed.

Six watershed councils are currently operating in the Metro region: Columbia Slough Watershed Council, Sandy River Basin Watershed Council, Clackamas Basin Watershed Council, Tualatin River Watershed Council, Tryon Creek Watershed Council, and Johnson Creek Watershed Council. Each of these groups is funded to some degree by the Oregon Watershed Enhancement Board (OWEB). In addition to doing their assessment and action plans, these watershed councils do a heroic amount of community outreach and education. Close cooperation between Metro and the watershed councils will fulfill the purpose of the Oregon Plan and help identify key restoration opportunities that are important to those communities in the region.

There is a Willamette Chapter to the Oregon Plan for Salmon and Watersheds. In 1998 former Governor John Kitzhaber founded Willamette Restoration Initiative (WRI) by appointing a diverse group of business, government, farming, conservation and community representatives to serve on a board. The group was charged with identifying the means to address the Willamette River's many problems from water quality to lost habitat. In February 2001, the Willamette

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[2] Identification and Description of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon, Pacific Fishery Management Council, 1999.

Restoration Initiative published its “Willamette Restoration Strategy” which is the Willamette Chapter of the Oregon Plan. The Strategy identifies 27 critical actions that are necessary in the Willamette River Basin to improve the river and its ecosystems. The recommendations from the Strategy will strongly influence local plans that seek to protect natural resources in and along the Willamette River.

Native Fish Conservation Policy

In November 2002, the Oregon Fish and Wildlife Commission adopted the Native Fish Conservation Policy. The purpose of the policy is: “to ensure the conservation and recovery of native fish in Oregon.” OAR 635-007-0502. The policy focuses on “naturally produced native fish” which are those fish species that “reproduce and complete their full life cycle in natural habitats.” OAR 635-007-0501(33). The reason for this focus on naturally produced fish is that those “native fish are the primary basis for Endangered Species Act delisting decisions and the foundation for long-term sustainability of native species and hatchery programs.”

The Oregon Department of Fish and Wildlife is responsible for developing conservation plans for native fish species with priority on those species listed under the state ESA or as state “sensitive species.” OAR 635-007-0505(3). The conservation plans will use the Oregon Plan for Salmon and Watersheds and input from “local and regional forums” as the context for the development, implementation, and coordination of the plans. Although Metro’s fish and wildlife program is not restricted to protecting native fish species, the program will offer some protection to the habitats upon which native fish depend and provide an opportunity to coordinate with ODFW on applicable conservation plans.

Oregon Endangered Species Rules

The Oregon Endangered Species Act is intended to manage the listed “species and their habitats so that the status of the species improves to a point where listing is no longer necessary.” Species are listed under the state act when: (1) they are native, and (2) they are in danger of extinction throughout any significant portion of its range within this state (endangered) or (3) likely to become an endangered species within the foreseeable future throughout any significant portion of its range within this state (threatened). OAR 635-100-0105(3). The state act also lists a species as “sensitive” when the “wildlife species, subspecies, or populations that are subject to a decline in number of sufficient magnitude to qualify their listing as Threatened due to loss in quantity or quality of habitat or other factors.” OAR 635-100-0001(4).

The Oregon Department of Fish and Wildlife (ODFW) is required to develop survival guidelines for certain threatened or endangered species. The survival guidelines include water quality, water quantity and habitat requirements that apply on state property. The state act requires any agency in charge of state owned property to consult with ODFW to ensure that all actions on such property are consistent with the survival guidelines developed for affected species. OAR 635-100-1030. Lower Columbia River Coho salmon are listed as endangered under the state act and ODFW has adopted survival guidelines for the coho. At the time of listing, the species was only found in the Clackamas and Sandy River basins. Lower Columbia River Coho are candidate species for listing under the federal ESA.

Oregon Wetland Regulatory Program

The Oregon Division of State Lands (DSL) administers Oregon's removal/fill law (ORS 196.800-196.990). Using similar definitions as the federal government, DSL determines wetland boundaries and water bodies that meet the definition of "waters of the state." A permit is required for fill equal to or exceeding 50 cubic yards or more of material in any waters of the State at one location. Likewise, a permit is required for removal of more than 50 cubic yards of material in any waters of the state in any calendar year. Waters of the state means natural waterways including all tidal and nontidal bays, intermittent and constantly flowing streams, lakes, wetlands, and other bodies of navigable and non-navigable water.

Oregon Division of State Lands Essential Indigenous Anadromous Salmonid Habitat

In an effort to identify and protect essential habitat for salmon and trout, the Oregon Legislature in 1993 required the DSL to identify essential indigenous anadromous salmon habitat. DSL has defined such habitat as: "habitat that is necessary to prevent the depletion of indigenous anadromous salmonid species during their life history stages of spawning and rearing." OAR 141-102-0020(1). The agency has mapped essential habitat throughout the state. The essential habitat designation carries with it a requirement for a "permit for activities involving the fill or removal of <u>any</u> amount of material in essential habitat, unless the activity is exempt" by state law. OAR 141-102-0000(3).

Regional Policy

Several policies adopted by the Metro Council with the direction of citizens in the region influence the ESEE consequences analysis. These policies provide the framework for protecting natural resources while managing urban growth in the region. Natural resources, including riparian corridors and water quality, play a key role in the livability of the Metro region. Key policies are described below.

Metro Charter

Metro's 1992 Charter requires Metro to address issues of regional significance such as land use and transportation planning as well as regional parks and open spaces. Through its Charter-mandated responsibilities, the Metro Council has provided leadership in addressing growth management issues by working with citizens, elected officials and diverse interest groups to craft a vision of how the region will grow and to adopt policies to achieve that vision. In the course of debating how growth will be managed, the Metro Council identified the protection of natural systems – floodplains, rivers, streams and wetlands – as a cornerstone for these regional policies. Metro has determined in the *Region 2040 Growth Concept* that protecting these systems is essential to maintaining the region's livability and economic well being as well as providing habitat, water quality and flood management benefits.

Metro's role in identifying natural resource protection measures and incentives within its boundary has been established with adoption of the *Regional Urban Growth Goals and Objectives (RUGGOs), Region 2040 Growth Concept* and the *Urban Growth Management Functional Plan*. Natural resources by their very nature cross jurisdictional boundaries and are best managed with regional, watershed-wide protection strategies. Metro has a role in working with local jurisdictions to determine the protection of these important resources, just as it determines parking standards, transportation networks and land use densities for the region. Through extensive public involvement, the Metro Council has identified the need to balance natural resource protection with urban development while the region grows. If coordination with citizens and elected officials outside of the Metro area can be achieved, natural resource protection can be ensured for entire watershed systems.

Future Vision Report

The 1992 Metro Charter required Metro to develop and consider a vision for the region's future development. Metro's 1995 *Future Vision Report* recognizes the region's unique ecosystem and the value of improved air and water quality. It states that the region should manage watersheds to protect, restore and maintain the integrity of streams, wetlands and floodplains, and their multiple biological, physical and social values. It also states that "…We value natural systems for their intrinsic value, and recognize our responsibility to be stewards of the region's natural resources." It identifies the need for "…restored ecosystems protected from future degradation and decline." While not a regulatory document, the *Future Vision Report* has greatly influenced the content of Metro's regional plans.

Regional Urban Growth Goals and Objectives

Metro's Regional Urban Growth Goals and Objectives (RUGGO), amended in 1995, identify goals and planning activities for the Metro region. Several RUGGO chapters relate to watersheds and riparian corridors. Two chapters relate to water resources: Objective 12: Watershed Management and Regional Water Quality and Objective 13: Urban Water Supply. Objective 12.1 states: "Metro will develop a long-term regional strategy for comprehensive water resources management, created in partnership with the jurisdictions and agencies charged with planning and managing water resources and aquatic habitats. The regional strategy shall meet federal and state water quality standards and complement, but not duplicate, local integrated watershed plans."

Objective 15: Natural Areas, Parks, Fish and Wildlife Habitat calls for an open space system capable of sustaining or enhancing native wildlife and plant populations. It recognizes the need for a regionwide system of linked significant wildlife habitats and states that this system should be preserved, restored where appropriate, and managed to maintain the region's biodiversity. The *Region 2040 Growth Concept* included a 200-foot environmental greenway along all streams in the region to ensure connectivity throughout the natural landscape. The Land Conservation and Development Commission (LCDC) acknowledged the RUGGOs for compliance with the statewide planning goals in 1996.

The Stream and Floodplain Protection Plan (Title 3)

Title 3, the *Stream and Floodplain Protection Plan,* (1996 *Urban Growth Management Functional Plan*) establishes regional performance standards to address water quality and floodplain management and recommends actions for the protection of fish and wildlife habitat. In June 1998, the Metro Council adopted revisions to Title 3, including water quality and floodplain maps that show where Title 3 applies. Section 5 of Title 3 (which was essentially unchanged by the 1998 amendments) directed Metro staff to address fish and wildlife habitat. The purpose of Section 5 is to: "conserve, protect and enhance fish and wildlife habitat within the fish and wildlife habitat conservation areas to be identified on the water quality and flood management area map by establishing performance standards and promoting coordination by Metro of regional urban watersheds." The completed sections of Title 3 meet the requirements for Statewide Planning Goal 6 (water quality) and Goal 7 (flood management), while Section 5 relates to Goal 5. LCDC acknowledged the water quality and floodplain protection components of Title 3 for compliance with Goals 5, 6 and 7 in 2000.

Greenspaces Master Plan

The Metro Greenspaces Master Plan, adopted by Metro Council in 1992, articulated the vision for a cooperative, interconnected system of parks, natural areas, trails and greenways for fish, wildlife and people. The Master Plan recommended tools to protect greenspaces such as acquisition, education and restoration. In 1995, voters passed Bond Measure 26-26 directing Metro to purchase regionally significant natural areas. Since then over 9,000 acres of natural areas have been acquired for permanent protection. Metro's Parks and Greenspaces Department also provides education programs and works to restore its properties.

Local Goal 5 programs

Most of the local jurisdictions in the Metro region have adopted Goal 5 programs that have been acknowledged by the Department of Land Conservation and Development as being in compliance with the state rule. Some of these programs were developed prior to Goal 5 rule revisions in 1996, while a few have been done more recently. The rule requires local jurisdictions to balance the need to protect natural resources against other state goals such as housing (Goal 10) and transportation (Goal 12) while providing ample opportunity for citizen involvement (Goal 1). Thus, the state rule allows local jurisdictions' Goal 5 programs to be in compliance with state law while being inconsistent with each other. However, Metro's code required an analysis of the consistency of local natural resource protection prior to conducting a regional ESEE analysis and a regional protection program.

Metro staff conducted an analysis of local Goal 5 programs beginning in 1999 and culminating in a report (*Local Plan Analysis: A Review of Goal 5 Protection in the Metro Region)* to the Metro Council in August 2002. The local plan analysis demonstrated that there are many inconsistencies and inadequacies in natural resource protection in the Metro region. An important reason for the inconsistency in local protection is that the Goal 5 rule does not set a specific standard, rather it lays out a process for jurisdictions to follow. The process described by state law allows jurisdictions to choose which resources to protect and the level of protection received after balancing the consequences of protection with the economic, social, and energy needs within the jurisdiction. Most jurisdictions choose to "limit" conflicting uses in resource areas, the Goal 5 Rule defines this choice as "conflicting uses should be allowed in a limited way that protects the resource to the desired extent." This language gives local governments wide discretion in designing protection programs.

If protecting natural resources is an important piece of maintaining livability within the region, as stated in Metro's Regional Urban Growth Goals and Objectives (RUGGOs), then it is critical to provide a more consistent level of protection throughout the region. This ESEE analysis identifies the tradeoffs of allowing, limiting, or prohibiting development consistently across the region.

Appendix B

Portland Metro Area – DEQ’s 303 (d) Listed Pollutants of TMDLs

APPENDIX B
Portland Metro Area – DEQ's 303 (d) Listed Pollutants of TMDLs as per the 1998 Listing of Water Quality Limited Waterbodies.

TMDL	303 (D) LISTED POLLUTANTS
Lower Columbia River – Tenasillahe Island to Willamette River	Bacteria, Dissolved Oxygen, pH, Temperature, Total Dissolved Gas (from Dams), Arsenic, PCB, DDE, DDT
Lower Columbia River –Willamette River to Bonneville Dam	pH, Temperature, Total Dissolved Gas (from Dams), Arsenic, PCB, DDE, DDT
Lower Columbia – Sandy River	Temperature
Clackamas River -- Mainstem	Temperature
Clackamas River – Fish Creek	Habitat Modification
Lower Willamette -- Blue Lake	Aquatic Weeds or Algae, pH
Lower Willamette -- Bybee Lake	Aquatic Weeds or Algae, Biological Criteria, Flow Modification, Habitat Modification, pH
Lower Willamette -- Columbia Slough	Bacteria, Chlorophyll a, Dissolved Oxygen, Nutrients, pH, Temperature, DDE, DDT, PCBs, 2,3,7,8 TCDD (Dioxin), Lead
Lower Willamette -- Fairview Creek	Bacteria, Nutrients, pH
Lower Willamette -- Fairview Lake	Nutrients
Lower Willamette -- Johnson Creek	Bacteria, Temperature, DDT, Dieldrin
Lower Willamette -- Smith Lake	Aquatic Weeds or Algae, Biological Criteria, Flow Modification, Habitat Modification, pH
Lower Willamette -- Spring Brook Creek	Bacteria
Lower Willamette -- Tryon Creek	Temperature
Willamette River Mainstem – Mouth to Willamette Falls	Bacteria, Biological Criteria, Temperature, Mercury, Pentachlorophenol, Arsenic
Tualatin Basin – Ash Creek	Bacteria, Biological Criteria, Dissolved Oxygen, Temperature
Tualatin Basin – Beaverton Creek	Bacteria, Biological Criteria, Dissolved Oxygen, Temperature
Tualatin Basin – Bronson Creek	Bacteria, Biological Criteria, Chlorophyll a, Dissolved Oxygen, Temperature
Tualatin Basin – Burris Creek	Bacteria, Chlorophyll a, Dissolved Oxygen
Tualatin Basin – Butternut Creek	Bacteria, Biological Criteria, Dissolved Oxygen, Temperature
Tualatin Basin – Carpenter Creek	Bacteria, Dissolved Oxygen
Tualatin Basin – Cedar Creek	Bacteria, Chlorophyll a, Dissolved Oxygen
Tualatin Basin – Cedar Mill Creek	Bacteria, Biological Criteria, Temperature
Tualatin Basin – Chicken Creek	Bacteria, Dissolved Oxygen
Tualatin Basin – Christenson Creek	Bacteria, Dissolved Oxygen
Tualatin Basin – Council Creek	Dissolved Oxygen
Tualatin Basin – Dairy Creek	Bacteria, Dissolved Oxygen, Temperature, pH
Tualatin Basin – Fanno Creek	Bacteria, Chlorophyll a, Dissolved Oxygen, Temperature, Arsenic, Manganese, Iron
Tualatin Basin – Gales Creek	Bacteria, Dissolved Oxygen, Temperature, pH
Tualatin Basin – Hall Creek	Bacteria, Dissolved Oxygen
Tualatin Basin – Heaton Creek	Bacteria
Tualatin Basin – Hedges Creek	Bacteria, Biological Criteria, Dissolved Oxygen, Temperature
Tualatin Basin – Johnson Creek	Bacteria, Biological Criteria, Dissolved Oxygen, Temperature
Tualatin Basin – McFee Creek	Bacteria, Dissolved Oxygen
Tualatin Basin – McKay Creek	Bacteria, Temperature
Tualatin Basin – Nyberg Creek	Bacteria, Chlorophyll a, Dissolved Oxygen, Temperature
Tualatin Basin – Rock Creek	Bacteria, Biological Criteria, Chlorophyll a, Dissolved Oxygen, Temperature
Tualatin Basin – Scoggins Creek	Dissolved Oxygen
Tualatin Basin – Summer Creek	Bacteria, Biological Criteria, Dissolved Oxygen, Temperature
Tualatin Basin – Willow Creek	Bacteria, Dissolved Oxygen, Temperature
Tualatin River – Mainstem	Bacteria, Temperature

Courtesy Don Yon, Oregon DEQ, 2003.

APPENDIX B

Portland Metro Area – DEQ's 303 (d) Listed Pollutants of TMDLs as per the 2002 Listing of Water Quality Limited Waterbodies.

TMDL	**303 (D) LISTED POLLUTANTS**
Clackamas River -- Mainstem	*E. coli*, Temperature
Willamette River -- Mainstem	Aldrin, Biological Criteria, DDT, DDE, Dieldrin, Fecal Coliform, Iron, Manganese, Mercury, PCB, Pentachlorophenol, Polynuclear Aromatic Hydrocarbons (PAHs), Temperature
Lower Columbia – Sandy River	Dissolved Oxygen, *E. coli*, Temperature
Willamette River -- Smith Lake	Aquatic Weeds or Algae, pH
Willamette River -- Blue Lake/Arata Creek and Bybee Lake	Aquatic Weeds or Algae, pH
Willamette River -- Columbia Slough	Iron, Manganese, Temperature
Willamette River -- Fairview Lake/ Osburn Creek	PH
Willamette River -- Johnson Creek	DDT, Dieldrin, Fecal Coliform, PCB, Polynuclear Aromatic Hydrocarbons (PAHs), Temperature
Willamette River -- Spring Brook Creek	Temperature
Willamette River – Kellogg, Mt. Scott, and Phillips Creeks	*E. coli*
Willamette River – Tryon Creek	Temperature
Tualatin Basin – Knoll Wetland	Chromium, Copper, Lead, Silver, Zinc

Courtesy Don Yon, Oregon DEQ, 2003.

Note: This list is shorter than the 1998 list not because water quality has improved, but because TMDLs were developed for many 303(d)-listed reaches.

APPENDIX C

Economic Report and Literature Review

Final Report for the Economic Portion of Metro's Goal 5 ESEE Analysis

October 2004

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SUMMARY

This report is part of Metro's Goal 5 analysis of the economic, social, environmental and energy (ESEE) consequences of developing or protecting riparian and upland-wildlife resources. This final report describes the economic tradeoffs of allowing, limiting or prohibiting development of resources in Metro's service area. Following the conclusion of the ESEE analysis Metro will develop and evaluate the details of Goal 5 program options to protect resources. The appropriate context for considering this report, therefore, is as an interim report about possible methods, *not* as a final report that evaluates proposed policy options. This is not a report on the costs and benefits of protection measures at the local or parcel level. The report describes the economic tradeoffs of allow, limit and prohibit decisions qualitatively and on a regional scale.

Our analysis included the following analytical tasks:

- Rank the lands that contain riparian and upland-wildlife resource using the land's development value. In consultation with Metro staff and Metro's Economic Technical Advisory Council ("ETAC") we develop three methods of ranking the relative importance of land for development: land value, employment, and the 2040 Design Types.
- Compare development importance with Metro's rankings based on the amount and types of ecological functions or wildlife characteristics the lands provide. Comparing the rankings of development importance with rankings for riparian and wildlife importance provides information on the amount and distribution of significant conflicts between development use and resource protection.
- Describe the current land-use status of lands that contain riparian and upland-wildlife resources. Some of these lands have already been developed. Other lands are vacant, but development will be constrained by existing protection measures (e.g., Title 3) or characteristics of the land (e.g., steep slopes). Development status affects the economic analysis because it can influence the type, amount and timing of economic tradeoffs of protection decisions.
- Describe the economic tradeoffs of allow, limit, and prohibit decisions as they relate to the development use of lands and protecting the riparian and wildlife resources.
- Our analysis includes a review of the professional literature on the economic value of land in development and preservation.

The economic principles most relevant to our analysis:

- Market prices for land reflect potential development values. Participants in a market can measure or rank the development importance of land using property values.
- Ecosystem services benefit society and have economic value. Actions that enhance or protect these services also enhance or protect the associated societal benefits and values. Actions that degrade ecosystem services will have the opposite effect.
- Property markets capture some but not all of the value of ecosystem services. Markets typically do not reflect the value of ecosystem services provided by natural resource, such as flood-mitigation or filtering sediment from stormwater runoff.
- Property markets may not capture public-policy or planning goals. For example, public policy may proscribe specific land uses in a specific area (e.g., water-dependent industrial use), that, if left to property markets, would develop into higher-valued land uses (e.g., water-front, large-lot residential developments).
- There's competition for the riparian and upland-wildlife resources at issue in this study. Resources, especially in urban areas, cannot satisfy the complex and competing demands that society places on them. Allocating resources to one use means that competing uses go without, with the associated economic benefits and costs of the allocation decision.
- A static analysis likely will fail to inform decisionmakers adequately of the economic tradeoffs. This approach assumes no changes in factors that could mitigate negative outcomes and encourage positive outcomes. An alternative approach that considers how changes or adjustments—examples in this case include expanding the Urban Growth Boundary (UGB) or restoring degraded riparian areas—affect the economic outcomes will likely provide a more complete descriptions of tradeoffs.

Comparing the different methods of ranking lands and current land uses yields the following interactions:

- Less than 25 percent of the lands that contain Goal 5 resources are vacant and available for development. Goal 5 decisions will have the most immediate impacts on these lands because development is unconstrained by other factors.

- Over 60 percent of resource acres are on lands already maintained as parks or already developed with urban uses. Goal 5 decisions may affect these lands in the future through redevelopment, though impacts on parks lands are expected to be minimal compared to impacts on land in urban development.

- In the short-term, Goal 5 decisions will have the greatest impact on the 22 percent of resource lands that are undeveloped and unconstrained by Title 3 or other rules. These lands also contain a significant amount, 41 percent, of the total vacant-buildable lands in the UGB.

- Over 80 percent of the land uses that potentially conflict with Goal 5 riparian and upland-wildlife resources occur in three regional zones: single-family residential (SFR), parks and open space (POS), and industrial (IND).

- SFR contains the largest percentage of Goal 5-resource lands, over 46 percent. Goal 5 allow, limit and prohibit decisions likely will fall most heavily on lands in this zoning.

- Lands zoned POS account for approximately 20 percent of Goal 5 natural resources.

- Over 14 percent of the lands with Goal 5 natural resources are zoned IND.

- The majority of lands with Goal 5 resources do not support employment. Less than 22 percent of the lands are zoned for commercial, industrial or mixed-use.

- The zoning for a majority of resource lands, approximately 64 percent, supports development value. The remainder fall into POS zoning or contain water bodies. Of the lands with development value, most fall into the "low" land-value category.

- Approximately 78 percent of the resources lands do not support employment. These lands are zoned SFR, MFR, RUR, and POS. Of the lands that do support employment, most fall into the "low" employment category.

- The distribution of resource lands by 2040 Design Type differs from the distributions described above for land value and employment. In general, categorizing lands using 2040 Design Types yields a distribution with a greater percentage of the lands having development value, and for the lands that have development value, more of the lands rank in the higher-valued design types.

- The large majority of Goal 5 allow, limit and prohibit decisions will impact lands zoned SFR, POS and IND. Impacts on lands zoned SFR and POS will have little or no employment impacts and will affect lands ranked "low" on the land-value scale. The majority of impacts on lands zoned IND will affect lands ranked "high" on at least one measure of development value.

- The fact that Goal 5 decisions would primarily affect acres with lower land values and employment densities does not mean that economic consequences of limit or prohibit decisions would be trivial. The "low" category of land value and employment is relative to values and employment in the Portland city center. The cumulative property value or number of employees affected may be significant depending on the type of decision, the details of the Goal 5 plan that implements the decision, actions that may mitigate the negative impact (e.g., expanding the UGB), and specifics of the individual parcels affected.

- Given the volume or amount of riparian and upland-wildlife resources at issue, and the quality of the resources, the Goal 5 programs that protect these resources may have significantly positive impacts on the values of ecosystem services provided by these resources. These programs may protect services such as flood management, water quality, amenity, and salmon-habitat values across a broad area that may affect residents through out the UGB and downstream from the UGB. Protecting these ecosystem services may also reduce municipal expenditures to provide these same services, especially over the long term.

We describe three categories of economic consequences of Goal 5 decisions:

1. The changes in the values of the goods and services citizens receive. We label these consequences *economic values*. The economic values at issue in this analysis include the impact of Goal 5 decisions on property values and the values of ecosystem goods and services provided by riparian and wildlife areas.

2. The changes in the levels of economic activities within the local economy, in particular, the impact on the level of local employment and income. We label these consequences *economic impacts*.

3. The changes in the distributions of costs and benefits within the economy, especially changes affecting groups of special concern such as property owners that shoulder a disproportionate amount of the negative consequences of a policy decision. We label these consequences *economic equity.*

Allowing conflicting uses means no additional protection of Goal 5 riparian or upland-wildlife resources beyond the baseline protection provided by Title 3, or by local protection measures that exceed Title 3 guidelines. This alternative emphasizes developing lands containing Goal 5 resources. Positive economic tradeoffs of this alternative include:

- No impediments to development or impacts on the development value of land.
- Development-related employment, income and taxes will be unaffected by Goal 5.

- No Goal-5 related increase in Vehicle Miles Traveled (VMT), transportation costs or UGB expansion because Goal 5 protection does not displace development within the UGB.

Negative economic tradeoffs include:

- Amenity-related property values and associated property taxes for undeveloped lands zoned SFR and RUR that are adjacent to Goal 5 resource lands may be less for this scenario relative to limit and prohibit scenarios.
- Flood-mitigation services will decline, flood damage and clean-up costs may increase.
- Erosion and sedimentation will increase, as will concentration of toxins in streams and other water bodies. Water-quality expenditures (e.g., for filtration and treatment) by businesses and municipalities may increase. Municipal expenditures that address water-quality regulations (e.g., the federal Clean Water Act) may increase.
- Summer temperatures and the urban "heat island effect" may increase with an associated increase in cooling costs.
- Developing riparian and upland-wildlife resources will increase the amount of impervious surfaces, which will increase stormwater flows and treatment costs.
- Development that negatively impacts salmon habitat may affect commercial, recreational and cultural harvests. Municipal expenditures that address habitat regulations (e.g., Endangered Species Act) may increase.
- Degrading riparian and upland-wildlife resources may negatively affect recreational opportunities and values that depend on these resources.
- Developing the resources may negatively impact their intrinsic values.
- Developing Goal 5 resources now or in the near-term precludes developing them in the future or protecting them for future generations. This reduces the option values associated with the resources.
- Carbon sequestration and air pollutant removal will decline with an associated decline in air quality and the related values of air-quality services.
- Businesses that rely on riparian and upland-wildlife resources and associated ecosystem services may experience a decline in employment and income. Employment and business-related tax payments may also decline.
- Allowing conflicting uses will negatively affect the 2040 Growth Concept and Design Types that emphasize protecting resources and maintain access to resources.

- The large majority, if not all, of the negative economic tradeoffs of this option affect riparian and upland-wildlife areas, associated ecosystem services and economic factors, e.g., jobs, incomes and values, that depend on these resources. Development interests suffer little or no negative economic tradeoffs.

Limiting conflicting uses strikes a balance between completely developing the Goal 5 riparian and upland-wildlife resources and protecting them. This alternative provides opportunities including: developing lands in ways that minimize negative environmental and economic tradeoffs; supporting the development goals embodied by the 2040 Design Types; and protecting the most important habitats.

The economic tradeoffs for this alternative depend on the degree of limitation on development actions: lightly limit, moderately limit, or strictly limit. Lightly-limit treatments will have more in common with allow treatments than with prohibit treatments. The opposite will be the case for strictly-limit treatments. As the name implies, tradeoffs for the moderately-limit treatment will fall somewhere in between.

This scenario will generate a mix of positive and negative economic tradeoffs for development interests and for the resources and associated ecosystem services. Development will occur, with the associated positive impacts on property values, employment, income, and tax payments. However, these impacts will be less than for the allow scenario. The resources will likely suffer some degradation, but not to the extent generated under the allow scenario. The resource-related economic values and impacts will also increase.

The consequences for the 2040 Design Types will be mixed. Protecting resources to a greater extent, compared with the allow scenario, may increase VMT if protecting resources displaces development and pushes it out toward the UGB or beyond. This may also increase the next UGB expansion and transportation costs. However, protecting riparian and upland-wildlife resources is consistent with the planning goals reflected in the Design Types.

The limit scenario will generate a more equitable distribution of positive and negative economic tradeoffs, compared with either the allow or prohibit scenarios. Development interests and the resources will both experience positive and negative economic tradeoffs.

Prohibiting conflicting uses will prevent development actions that conflict with, or degrade, Goal 5 riparian and upland-wildlife resources. This scenario emphasizes resource protection. Protection measures will exceed the baseline protection provided by Title 3, or by local protection measures that exceed Title 3 guidelines.

Positive economic tradeoffs of this alternative include:

- Amenity-related property values and associated property taxes for lands zoned SFR and RUR that are adjacent to Goal 5 resource lands may be greater for this scenario relative to limit and allow scenarios.
- This alternative will provide the greatest amount of flood-mitigation services and value.
- Erosion and sedimentation will be less than limit or allow alternatives, as will concentration of toxins in streams and other water bodies. Water-quality expenditures (e.g., for filtration and treatment) by businesses and municipalities may be the least under this alternative. Municipal expenditures that address water-quality regulations (e.g., the federal Clean Water Act) may decline, especially over the long term.
- This alternative will have the greatest mitigating effect on summer temperatures, the urban "heat island effect," and associated cooling costs.
- Prohibiting development in Goal 5 riparian and upland-wildlife resources will generate the least amount of impervious surfaces, and will generate the least amount of stormwater flows and treatment costs.
- This scenario will protect the greatest amount of salmon habitat and may positively affect commercial, recreational and cultural harvests. Municipal expenditures that address habitat regulations (e.g., Endangered Species Act) may decline, especially over the long term.
- This alternative will preserve the greatest amount of recreational opportunities, and the associated recreational values.
- The intrinsic and options values for the riparian and upland-wildlife resources will be preserved.
- Maintaining the greatest amount of vegetation will maximize carbon sequestration, air pollutant removal and the related values of air-quality services.
- This alternative will provide the greatest support to businesses that rely on riparian and upland-wildlife resources and associated ecosystem services.
- Prohibiting conflicting uses will support the aspects of the 2040 Growth Concept and Design Types that emphasize protecting resources and maintain access to resources.

Negative economic tradeoffs include:

- This alternative will have the greatest negative impact on the development value of land.
- Development-related employment, income and tax payments will also suffer the greatest under this alternative.

- The large majority, if not all, of the negative economic tradeoffs of this alternative affect development interests. The economic values and activities supported by riparian and upland-wildlife resources suffer little or no negative economic tradeoffs, relative to allow and limit alternatives.

A static description of economic consequences assumes, for the most part, that the consequences are fixed without possibility of mitigating negative impacts or enhancing positive impacts. This view ignores alternatives that may influence the economic tradeoffs of Goal 5 decisions. A more dynamic view of likely consequences accounts for these factors.

These dynamic factors include:

- The substitutability of land use within the UGB. Moving proposed land uses that conflict with riparian and upland-wildlife resources to alternative locations may mitigate negative economic tradeoffs for both the land use and resources.
- Expanding the UGB. Protecting riparian and upland-wildlife resources may reduce the amount of developable land within the UGB. If this is the case, expanding the UGB could mitigate this loss while protecting riparian and upland-resources within the existing UGB.
- Encouraging development practices that minimize conflicts with resources may help mitigate negative economic tradeoffs for both development and resources. These practices include low-impact development projects that minimize impervious surfaces and manage stormwater in ways that more closely mimic natural systems.
- The extent of restoration efforts. Restoring already-degraded riparian and upland-wildlife habitat could offset a portion of the negative impact of new development on habitat elsewhere.

Implications of the economic analysis for developing Goal 5 program options include:

- The economic analysis identifies the major factors and impacts that decisionmakers can use to screen lands at a regional level to get a subset of lands to consider for some level of protection.

- The extreme ends of likely program options include: (1) Adopt no new policy to preserve riparian or upland-wildlife resources inside the UGB, and perhaps even eliminate some existing policies that restrict economic development in specific areas, e.g., water-dependent industrial development; and (2) Allow no new development on any identified resource lands. For political and economic reasons, neither of those options is likely to be the preferred option. Final program options will likely fall somewhere between the extremes.

- A program option that would generate the minimum negative economic impacts on local businesses would continue with and enforce existing regulations. No new Goal 5-related regulations or incentives for preservation would be implemented, but none of the existing ones would be eliminated. With this option, may of the riparian and upland-wildlife resources would eventually get some level of development, though the amount or configuration of the development may be restricted to the benefit of ecosystem services by existing policies, e.g., Title 3.

- A program option that provides some additional protection of significant resources beyond existing regulations would target restrictions on some types development on some types of properties. There's a large number of possible variations of these program options. One option starts with slightly limiting development on lands that ranked low on all three measures of development value that contain the highest quality riparian or wildlife resources. Or, slightly limiting development on these lands in combination with restoring degraded riparian and wildlife resources elsewhere.

- Another example is developing a program option that combines resource protection, as described above, with options that protect specific development values. For example, program options that protect development on lands that ranked high on all three measures of development value, or that protect development that can't be relocated in the UGB to avoid conflicts with significant resources, e.g., water-dependent industrial use.

1. INTRODUCTION

1.1 PURPOSE OF THIS REPORT

State land-use policies, as described by Goal 5: Open Spaces, Scenic and Historic Areas, and Natural Resources, requires that local governments protect important natural resources. Elements of the Goal 5 program include identifying resources, describing their biophysical significance, and evaluating the positive and negative tradeoffs of protecting the resources. Goal 5 lists four categories of potential tradeoffs: economic, social, environmental, and energy (ESEE).

In the Portland region, Metro's responsibilities include identifying significant natural resources and evaluating ESEE consequences of allowing, limiting, or prohibiting development on lands that contain resources. Metro hired ECO to help evaluate the economic consequences. This final report is ECO's product responding to this charge.

1.2 SCOPE OF THIS REPORT

The findings in this report must be interpreted in context. Most importantly, this report is *an interim report about possible methods, <u>not</u> a final report that evaluates proposed policy options.* The rest of this section explains that point.

The analysis described in this report addresses the economic tradeoffs of allowing, limiting, or prohibiting lands uses and other actions that conflict with riparian areas and upland-wildlife habitat[1]. The analysis of tradeoffs addressed how protection actions may impact values and other economic measures including:

- The development value of land.
- The values of ecosystem services provided by riparian and upland-wildlife resources.
- Related economic measures including employment and economic equity.

The format of the Goal 5 process dictates that the ESEE analyses be conducted without the benefit of detailed information on the policies that will protect significant resource. Thus Metro must conduct the analyses:

- Without knowing the *extent* of allow, limit or prohibit decisions. Neither Metro, nor the local jurisdictions with Goal 5-responsibilities have identified the lands on which conflicting uses

[1] See Metro's report on its inventory of significant Goal 5 resources for more information.

will be *allowed*, and the lands on which development activity will be *limited* or *prohibited*.

- Without knowing *how* these decisions will be implemented. Metro's responsibility includes developing management decisions at the *regional* level. As we understand it, *local* jurisdictions have the responsibility of implementing the protection measures at the local level. Local decisions will influence the economic consequences.

- Without a precise *definition* of what limit means for both development value and value of ecosystem services.

Given these constraints and uncertainties, this economic analysis describes the consequences or tradeoffs of allow, limit, and prohibit decisions *qualitatively* and on a *regional scale*. This is *not* a cost-benefit study that:

- Quantifies or measures the complete range of economic costs and benefits of allow, limit and prohibit decisions.
- Describes the economic consequences, tradeoffs or costs and benefits of Goal 5 decisions at the local or parcel level.

- Evaluates the range of management options and identifies, from an economic perspective, the "best" Goal 5 protection policy.

A description of the past and future tasks in Metro's ESEE evaluation helps show where and how this report fits in. Figure 1 summarizes the main parts of Metro's Goal 5 process.[2]

Figure 1: Summary of Metro's Goal 5 Process

Identify and Rank Regionally Significant Riparian and Wildlife Areas. → Identify Conflicting Uses → Analyze ESEE Consequences → Develop Goal 5 Programs

The process began in 2001 with Metro identifying significant riparian and upland wildlife areas and creating an inventory of these natural resources. Based on this information, Metro ranked riparian areas and upland-wildlife habitats. Metro Council adopted these areas as regionally-significant resources in August 2002.

Next Metro identified land uses that conflict with or would adversely affect riparian and upland-wildlife resources. Any development potentially conflicts at some level with the preservation of land in its natural state, but some development types may conflict less than others. Metro described conflicting uses based on the following land-use zonings: single-family

[2] See Metro's Goal 5 report for more information.

residential, multi-family residential, commercial, mixed-use, industrial, rural, and parks-and-open-space.

ECO and Metro completed a preliminary scope of work in March of 2003. In May of 2003, ECO and Metro finalized the scope and ECO completed a preliminary review of the relevant literature. In late May 2003, ECO began work on the economic analysis, while Metro staff evaluated the social, energy, and environmental tradeoffs. ECO completed a draft report in September 2003. ECO reviewed comments on the draft report submitted by Metro's Economic Technical Advisory Committee ("ETAC"), the Independent Economic Analysis Board ("IEAB"), Dr. Art O'Sullivan, stakeholders, and Metro staff and Council. This is ECO's final report.

Based on the results of the analyses of ESEE tradeoffs and on other information, Metro staff will develop and evaluate program options that protect riparian areas and upland-wildlife habitats. Metro Council will make the final determination on protection measures.

1.3 OVERVIEW OF THE ANALYSIS

We started by reviewing Oregon State Land Use Goal 5 and previous Metro work regarding the Goal 5 ESEE analysis. We then searched the professional literature on the economic value of land in development and preservation. In consultation with Metro staff and ETAC we examined the available data that describes the development value of land at issue in the study. We also studied reports on Metro's inventory and ranking of significant riparian and wildlife resources. Working with Metro staff we ranked the relative importance of land in development and preservation and generated maps that depict development value and ecological importance across Metro's jurisdiction. Based on these maps and on the underlying data we examined the interactions between development value and ecological importance of Goal 5 resources. We then described the economic tradeoffs of decisions to allow, limit, or prohibit development of the resource lands.

The analytical constraints and focus of the Goal 5 process require that we depict economic consequences qualitatively rather than quantitatively. We describe the economic factors that can be influenced by an allow, limit, or prohibit decision and the likely direction of change. We do not, however, calculate a quantitative change in development or resource values associated with a Goal 5 decision for the region or for a specific property.

We reviewed the draft reports by Metro staff that describe the energy, social and environmental tradeoffs of allow, limit, and prohibit decisions. To the extent that these studies described energy, social or environmental changes that have economic tradeoffs, we considered this information in our analysis.

1.4 ORGANIZATION OF THIS REPORT

The remainder of this report is divided into two sections:

Economic Principles provides the underlying economic concepts that guide our analysis.

Analysis applies the economic principles to come to conclusions about the economic tradeoffs of allow, limit and prohibit protection measures.

2. ECONOMIC PRINCIPLES

We begin by introducing the economic principles that guide this study. These principles help define our approach to the analysis of economic tradeoffs of developing lands that contain significant riparian or wildlife resources or protecting these resources and the associated ecosystem services that benefit society.

The following are the six economic principles most relevant to our analysis:

1. *Market prices for land can be used as a measure of development value.* Property markets for developable land meet most of the criteria for a well functioning market. Many sellers and buyers participate in the market, there's free entry to and exit from the market, and buyers and sellers have access to information on the attributes of land that provide development value. For these reasons, market prices for land provide a good measure of development value. Participants in a market can measure or rank the development potential or importance of properties based on property value.

2. *Ecosystem services have economic value.* By ecosystem services we mean the benefits to society of well-functioning ecosystems such as riparian areas that mitigate flooding, help filter toxins and sediment from surface runoff and provide recreational and other amenity values. Society also benefits from wildlife habitat that helps support populations of species with commercial, recreational, and cultural value.

3. *Property markets may capture some, but not all, of the values of ecosystem services.* Property markets can provide information on the value of some ecosystem services, such as the value associated with proximity or access to recreational resources or scenic vistas. Property values typically do not reflect the value of other ecosystem services, such as water-quality or wildlife-habitat services.

4. *Property markets may not capture public-policy or planning goals*. Just as property markets fail to reflect the full value to society of ecosystem services, these markets may also fail to capture the value of public-policy or planning goals that affect land use. For example, properties with the highest market value may not necessarily be the most important lands from a public-policy perspective. Specific to this project, the hierarchy of design types as described by the 2040 Growth Concept emphasizes certain development types in certain locations. Public policy consideration drive the design of the hierarchy, not market prices. As a result, a 2040 Growth Concept may emphasize the importance of a relatively low valued land use, such as industrial development, in an area that, if left to property markets, would develop into a higher-valued use, such as a residential development.

5. *There's competition for the riparian and wildlife resources at issue in this study*. In the past, discussions of the competition for natural resources focused on the tradeoffs of developing or using a resource and the associated jobs created or supported versus protecting the resource for its intrinsic or non-use value. This is the 'jobs vs. the environment' argument. Such an approach assumed two competing demands for a resource, that protecting the environment would not generate or support jobs and that development use would not generate negative impacts beyond affecting non-use values.

   Today, the competition for resources is more complex with more demands on a finite amount of natural resources. The dynamics of the competition extend far beyond a choice of jobs or the environment. We distinguish between demands on the resource that have use and non-use values. The range of demands with use values include commercial use of the resource, the ecosystem services provided by the resources, the impacts of the resources and development values on location decisions of retirees, workers and businesses and other quality-of-life impacts and options to use the resources in the future.[3] Demands with non-use values include the intrinsic value of the resources.

6. *A static analysis likely will fail to inform stakeholders or decisionmakers adequately of the economic tradeoffs.* A static analysis is similar to taking a snapshot of analytical conditions. This approach assumes no changes in factors that could influence the outcome of a decision to develop or protect resources. An alternative approach that considers how changes or adjustments affect the economic analysis will likely provide a more complete

[3] See the literature review in the appendix of this report for more information on the competing demands for natural resources.

description of the economic tradeoffs than ignoring these adjustments. In this case, dynamic adjustments may include expanding the Urban Growth Boundary ("UGB") and the substitutability of land within the UGB. Such a dynamic approach also considers the likely restoration efforts that can help mitigate the negative impacts of development on significant resources. A dynamic approach that considers likely changes, adjustments, or possible mitigation efforts will provide decisionmakers with a more complete view of the likely economic impacts than will a static approach.

3. ANALYSIS

The major analytical tasks for our study include:

- *Rank the relative importance of lands that contain significant riparian and wildlife resource for development.* The tradeoffs of protecting riparian and wildlife areas or developing these lands for residential, commercial, industrial, etc. use lies at the heart of Metro's Goal 5 decisions. In this task we worked with Metro staff and ETAC to develop three methods of ranking the relative importance of land for development use: land value, employment, and the 2040 Design Types.

- *Overlay or compare the ranking of development importance with Metro's ranking of significant riparian and wildlife resources.* Metro ranked lands that contain riparian and wildlife resources into six categories depending on the amount and type of ecological functions or wildlife characteristics.[4] In this task we compare the rankings of development importance with rankings for riparian and wildlife importance. This comparison provides decisionmakers with information on the amount and distribution of significant interactions between development use and resource protection.

- *Describe the current land-use status of lands that contain significant riparian and wildlife resources.* We can describe the lands at issue in Metro's Goal 5 process many ways. Metro described and ranked the lands according to the ecological functions they provide. We worked with Metro staff to rank these same lands based on their development value. Current land-use status provides additional information relevant to Goal 5 deliberations. Some of these lands have already been developed. Other lands are vacant, but developing some of these lands will be constrained by existing rules or regulations or characteristics of the land, e.g., too steep. The development status of property relates to the economic analysis because it can influence the

[4] See Metro's report on Riparian Corridor and Wildlife Habitat Inventories and Metro's Conflicting Use report for more information on Metro's ranking of lands.

type, amount and timing of economic tradeoffs of allow, limit and prohibit decisions.

- *Describe the economic tradeoffs of allow, limit, and prohibit decisions as they relate to the development use of lands and protecting the riparian and upland-wildlife resources.* In this task we'll refer back to the previous tasks that describe the context for the analysis of economic tradeoffs. We describe the economic factors, e.g., development value, employment and value of ecosystem services, that may be affected by a Goal 5 decision and the factors that may influence the economic tradeoffs, e.g., expanding the UGB. We summarize our description of economic tradeoffs in a matrix.

3.1. RANK LAND BASED ON THE ECONOMIC IMPORTANCE FOR DEVELOPMENT

We can rank the economic-development importance of land many ways. Methods include ranking land based on property value, distance from city center, the amount of vehicle and pedestrian traffic that passes by, or local economic-development priorities that target specific economic sectors or land uses. Developing an exhaustive list of methods and applying them to the lands that contain Goal 5 riparian and upland-wildlife resources goes beyond the scope of this analysis. We focused instead on a few measures that give stakeholders and decisionmakers a general understanding of the development values at issue in the Goal 5 process and apply to a broad rang of zonings and land uses. In consultation with Metro staff and Metro's ETAC, we selected three measures that describe the current and future development importance of land from different perspectives.

The first measure is property value. Real-estate markets provide a good measure of a property's development value because factors that affect a parcel's development potential are typically widely known and easily measured. The professional literature describes these factors as location and use factors.[5] The location factors that influence property values include availability of urban-infrastructure services, transportation access, and zoning and other regulations. Use factors include a property's amenities, physical terrain and lot size and shape.

Another way of describing the importance of land for development is the employment potential associated with development, which is our second method. We ranked the lands in Metro's inventory of significant riparian and upland-wildlife areas based on the employment associated with zoning and land uses.

[5] See the literature review in the Appendix for more information on these factors.

Property values and employment numbers describe current conditions. For insights into the relative importance of land for development in the future we ranked lands using the planning goals described by the 2040 Design Types[6].

These three measures provide information on development values for the large majority of lands in Metro's Goal 5 analysis. However, these methods have limitations for certain land uses. In subsection 3.1.4 we describe these limitations and provide additional information on the economic importance of the development value for these land uses.

3.1.1. RANK LANDS BASED ON MARKET PRICES FOR LAND

Method and Data

To define categories of development value based on market prices for land we took the following steps:[7]

- Choose the data base. The best (most consistent, broad, and available) data on land price for the Portland metropolitan region are from the county assessors (data compiled by Metro). The reported assessed values probably systematically underestimate at a consistent rate the market value, but the errors should be less than 10%. Also, our ranking of lands among categories of value depends more on the *distribution* of values, and less on a precise measure of value for any one property. This is especially true in our case where we've ranked land value into three categories. The fewer the categories, the less likely that the assessor's data misrepresents a given property's value and that we have assigned the property to the wrong category. Our analysis uses tax-assessor data for year 2003 for lands inside the UGB as of 2002.

- Choose the units of measurement. The two obvious choices for reporting measures of land value that are standardized by land area are dollars per acre and dollars per square foot. The latter is more common in real estate evaluations so we used that.[8]

- Consider natural breaks in the data, market conditions, and study objectives to define categories of land value.

[6] See Metro's Conflicting Use report for more information on the 2040 Design Types.

[7] See the methodology in the Appendix that describes the details of Metro's ranking of lands that contain significant riparian and wildlife resources.

[8] Conder, S and K. Larson. 1998. *Residential Lot Values and the Capital-Land Substitution Parameter: Some Recent Results from the Portland Metro Area*. Metro. May.

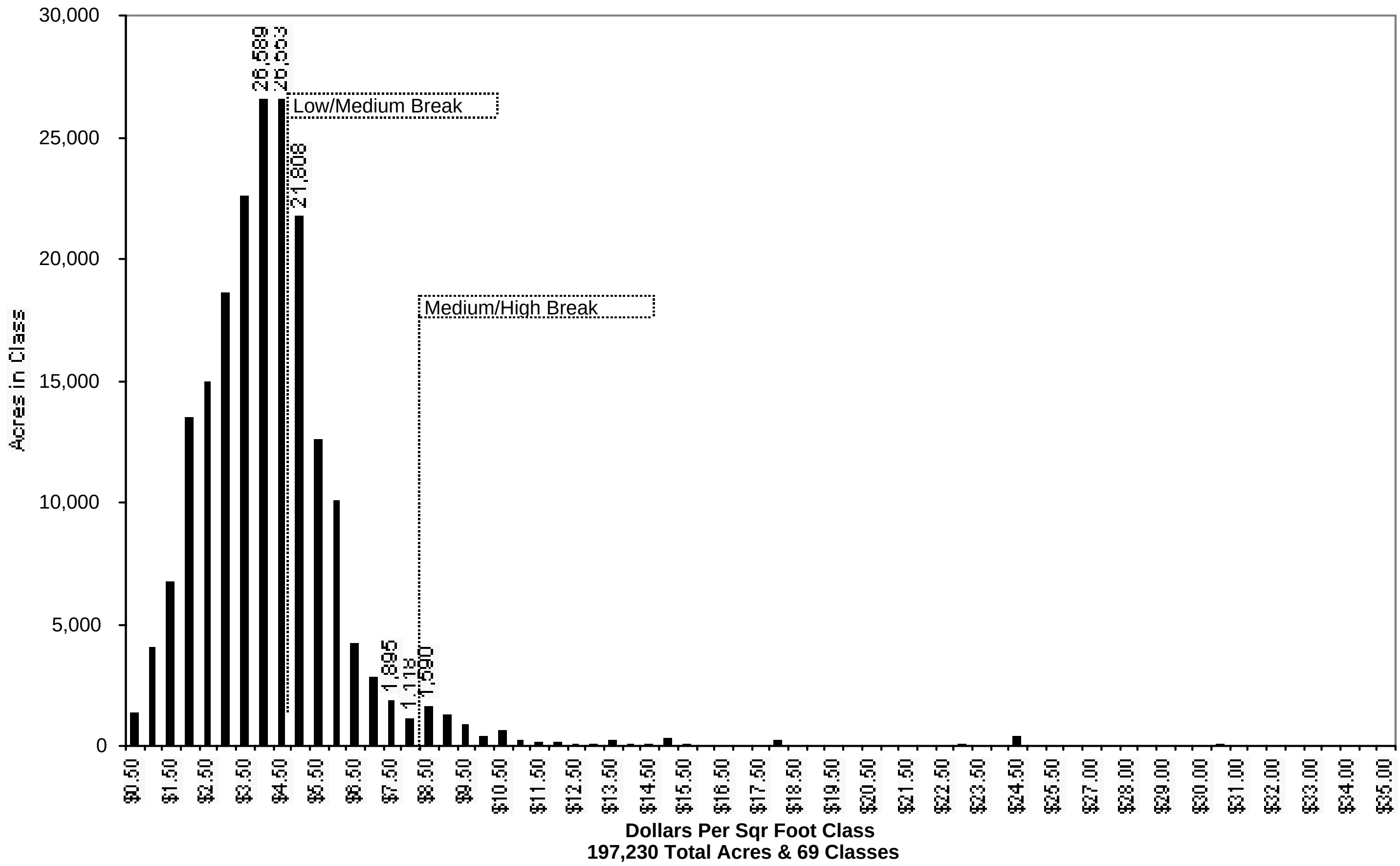
- Regarding market conditions, most unplatted but developable single-family residential parcels in the metropolitan area will be at $4 or $5 a square foot or more. Industrial land is, at the low end, around $5/sqft. Commercial and residential land is higher. Multi-family land, at the lower end (suburban) may be as low as $5/sqft. Land in downtowns outside of Portland will be in the range of $10 to $20 sq. ft. (higher in a few specific locations). Land close-in in Portland can be very much higher than $20/sqft., and can exceed $100/sqft. in the downtown.

- Regarding study objectives, it is more important to discriminate more at the low end of the scale than at the high end. Above $10/sqft., land is clearly "high" value and there is not much of it: showing land in $10- or $20-increments would not provide much value for decisionmaking. At the lower end, below $10/sqft., however, there is a lot of land, and where the line gets drawn between "low" and "medium" value could affect a large number of properties.

Given these considerations we divided "low," "medium," and "high" land values as shown in Figure 2. The acres in Figure 2 represent only those lands in Metro's jurisdiction that contain Goal 5 significant riparian and wildlife resources. Resource lands with assessed values equal to or greater than $8.00 per square foot have "high" development value. Resource lands with values greater than $4.50 and less than $8.00 have "medium" development value. Lands with value below $4.50 per square foot have "low" development value.

Near the breaks between low-medium and medium-high values we list the number of acres for each unit of land value. This information shows how the number of acres in each category increases or decreases by changing the breaks between the categories of land value. For example, *reducing the lower bound of the medium category* by $0.50 per square foot of land value, increases the number of acres with "medium" value and adds 26,553 acres to this category. *Increasing the lower bound of the medium category* by $0.50 per square foot, reduces the number of acres in that category by 21,808 acres.

Figure 2: Distribution of Land Value and Class Breaks



Source: Data analysis by Metro staff and ECONorthwest.

Assumptions and Limitations

Ranking the development value of resource lands as measured by assessed value per square foot reflects the following assumptions and limitations.

- Market prices reflect a parcel's location and use factors.

- The assessor's data on value is a reasonable proxy for market value for purposes of identifying a range of property values from "high" to "low." By reasonable proxy we mean that there's a relatively high correlation between values in the assessor's data and market values. That is, a "high" value in the assessor's database will also have a "high" market value. Given the limitations on assessed value from Measures 5 and 50, we expect assessed values will be less than market values. However, we're using this data to describe a range of property values from “high” to “low,” not as an absolute measure of market value for any one property.

- We used data on land value, not the value of land plus improvements. Land value reflects the expected value of land in the best uses supported by the market and allowed by public policy. Including the value of improvements would bias the analysis against undeveloped land. Property without improvements would likely be constrained to the lower end of the range of values if the range included the value of improvements.

- The database of assessed values excludes land uses that do not pay property taxes, such as public schools and some hospitals, and underestimates the value of other land uses that pay limited property taxes, such as low-income housing. We discuss this issue in subsection 3.1.4 below.

- Land values may reflect the amenity values associated with riparian areas and upland-wildlife habitat, but likely do not capture the value of other ecosystem services such as those associated with water quality and flood management.

Maps

Map 1[9] shows the distribution of land values for all lands in Metro’s service area, including lands that do not support riparian and upland-wildlife resources. The “low,” “medium,” and “high” categories in Map 1 correspond to the break points illustrated in Figure 2. The distribution of land values from “low” to “high” follows the pattern of land-use intensity across Metro’s jurisdiction. The highest values occur in the central parts of the city of Portland. Areas of medium value surround the high-valued areas and include urban and suburban population and commercial concentrations. Land with “low” values cover the remaining outlying areas.

Map 1a depicts the distribution of land values for the subset of lands in Metro’s jurisdiction that contain riparian and upland-wildlife resources. This map shows the acres at issue in Metro’s Goal 5 deliberations. The large majority of these acres fall in the outlying or “low” category.

Map 1b shows only those resource lands that are ranked “high” for the quality of riparian and upland-wildlife habitat characteristics. Another way of describing the lands shown in Map 1b is that they represent the development value of lands that contain the most significant Goal 5 resources.

[9] See the Appendix for the maps discussed throughout the report.

3.1.2. RANK LANDS BASED ON JOBS

Method and Data

To define categories of employment density, we took the following steps:[10]

- Choose the data base. The best data on employment (most consistent, broad, and available, current, disaggregated, and location-specific) for the Portland metropolitan region are from the Oregon Department of Revenue (refereed to as the Employment Security, 202 tapes). These data are available to Metro. Our analysis is based on employment data for year 2002.

- Choose the units of measurement. The two obvious choices for reporting measures of employment that are standardized by land area are employees per acre or per square feet of lot size. The former is more common in Oregon planning practice, and what we chose.[11] Yee and Bradford, 1999. These data represent employees per *gross* acre, which includes land dedicated to roads, sidewalks, and other areas that do not directly support employment.

- Estimate employment density for vacant lands based on the density in surrounding lands with similar zonings.

- Consider natural breaks in the data, market conditions, and study objectives to define categories of the employment value (measured in employees per acre—i.e., the more employees that the land can support, the more valuable it is for development).

- Regarding market conditions, typical density for industrial employment is 5 to 10 employees per acre. Commercial (office and retail) activities typically employ approximately 20 to 25 employees per acre in suburban city centers, shopping centers, and business parks. To get over 25 employees per acre for a large area would probably require a concentration of multi-story buildings.

- Regarding study objectives, it is more important to discriminate more at the low end of the scale than at the high end. Above 20 employees, land is clearly "high value" for employment and there is not much of it. At the lower end, below 20 employees per acre, however, there is a lot of land, and where the line gets drawn between low and medium value may affect many properties.

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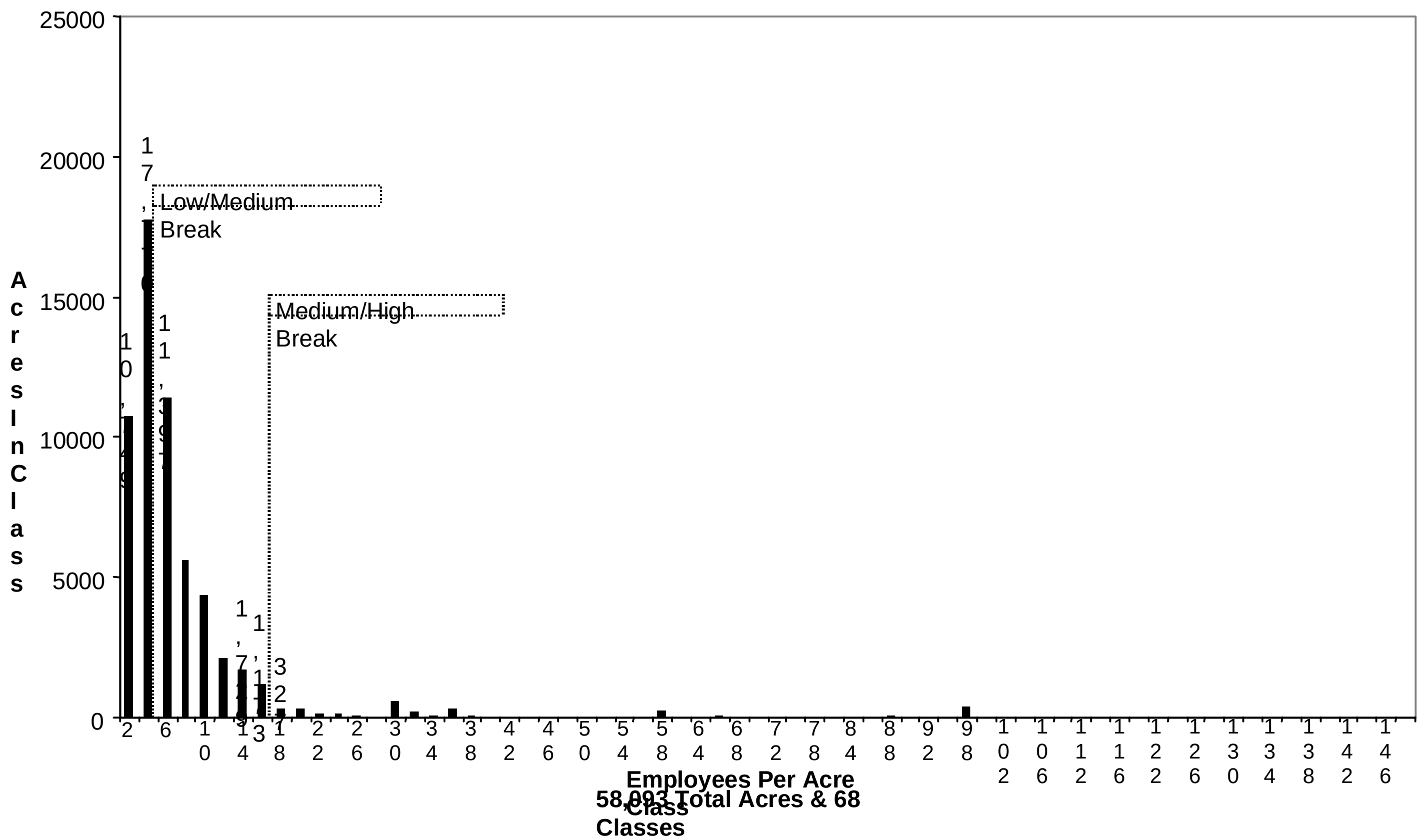
[10] See the methodology in the Appendix that describes the details of Metro's ranking of lands that contain significant riparian and wildlife resources.

[11] Yee, D. and J. Bradford, 1999. *1999 Employment Density Study: Technical Report.* Metro's Growth Management Services Department. Revised May 5.

Given these considerations, we divided “low,” “medium,” and “high” employment as shown in Figure 3. This figure shows the distribution of employment density for lands that contain significant riparian and wildlife resources. Resource lands with employment density equal to or greater than 16 jobs per acre have “high” development value. Resource lands with values greater than 4 and less than 16 jobs per acre have “medium” development value. Lands with employment density of 4 jobs per acre or less have “low” development value.

Near the breaks between low-medium and medium-high values we list the number of acres in each degree of employment density. For example, if we reduce the lower bound of the medium category by one degree of employment density, or 2 jobs per acre, we would add 17,770 acres into the medium category. If we were to increase the lower bound of the medium category by one degree we would reduce the number of total acres in that category by 11,397. This information will help decisionmakers and others conduct sensitivity analyses of the impacts of changing the break points on the number of acres per category.

Figure 3: Distribution of Employment Density and Class Breaks



Source: Data analysis by Metro staff and ECONorthwest.

Assumptions and Limitations

The ranking method described above reflects the following assumptions and limitations:

- This method assumes that jobs are tied to a specific location and cannot move to other locations in the Metro area. This assumption is certainly not strictly correct; in some instances it may not be even approximately correct.

- The measures of employment density do not capture the relative importance of residential developments. However, we expect that ranking land based on land value (as described above) provides a measure of the relative development value of residential areas.

- Employment density for vacant land will be equivalent to employment densities of surrounding lands with similar zonings and land use.

- One of the limitations of our analysis is that we have not distinguished among jobs that are more "important" and those that are less "important," as described by employment income or employment multipliers. The analysis assumes all jobs are equally important. The ranking for an individual parcel using employment income or employment multipliers may differ from the ranking based on employment density. The land uses most affected are smaller parcels that employ large numbers of works at low wages and large parcels that employ few workers at high wages. The former would rank higher on the employment-density scale and lower on the employment-income scale. The latter would rank lower on employment density and higher on employment income. It's not clear from a regional perspective the net effect of this limitation on the overall results. We note also that the 2040 Design Types described in the next subsection account, to some extent, for differences in employment types.

Maps

Map 2 shows the distribution of lands ranked by employment density. The "low," "medium," and "high" categories in Map 2 correspond to the break points illustrated in Figure 3. Compared with the distribution of development values as described by land value (see Map 1), lands that support employment occupy a smaller subset of Metro's service area. That's because Map 2 excludes lands that do not support employment, primarily residential and park lands. Map 2 shows that lands that support employment predominate in the Portland city-center and along transportation routes.

Map 2a depicts the distribution of employment density for the subset of lands in Metro's jurisdiction that contain significant riparian and upland-wildlife resources. This map shows the employment density for the lands at issue in Metro's Goal 5 deliberations. The large majority of these lands fall in the outlying or "low" category.

Map 2b shows the subset of lands from Map 2a that are ranked "high" for the quality of riparian and upland-wildlife habitat characteristics. Map 2b shows the employment density for lands that contain the most significant Goal 5 riparian and wildlife resources. Policy decisions that protect the most significant Goal 5 resources would have the greatest impact on these lands.

3.1.3. Rank Lands According to 2040 Design Types

Method and Data

Land value and employment density measure development importance today under current conditions. For insights into future development patterns and the associated importance of land uses we look to the planning goals as described by the 2040 Design Types. As we understand it, the 2040 Design Types represent a blueprint that helps guide future development and reflect deliberations on what stakeholders and decisionmakers want future development to look like.[12]

For the purposes of Metro's Goal 5 ESEE analysis, Metro developed a hierarchical scheme for the design types as follows.

1. Primary Land Use Components

- *Central City*. Downtown Portland.
- *Regional Centers*. Areas outside the central city that are the focus of compact development, redevelopment, and high-quality transit service, e.g., Hillsboro and Gresham.
- *Industrial Areas, non-water dependent*.
- *Industrial Areas, water dependent*.
- *Intermodal Transportation Facilities*. These facilities include marine terminals, freight facilities for trucking, airports and railroads.

2. Secondary Land Use Components

- *Town Centers*. These areas are smaller and less dense than regional centers, e.g., Forest Grove and Milwaukie.
- *Main Streets*. Main streets are similar to town centers but on a smaller scale.
- *Station Communities*. These developments are centered around light rail or high-capacity transit stations.

[12] For more information on the 2040 Design Types see the Conflicting Uses section of Metro's ESEE report.

3. Tertiary Land Use Components

- *Inner Neighborhoods*. Primarily residential developments with access to employment and shopping.

- *Outer Neighborhoods*. Farther away from employment centers than inner neighborhoods with smaller lot sizes.

- *Employment Centers*. Areas designated to receive various types of employment and may include residential developments that serve the needs of employees.

- *Corridors*. Major streets that serve as key transportation routes for people and goods. Corridors provide a mix of land uses such as higher density residential, office, commercial, and retail.

- *Future Urban Lands*. Areas that have recently been brought into the urban growth boundary ("UGB") and lands that may be brought into the UGB.

4. Other

- *Parks and Open Space*. Not included in other design types.
- *Rural Reserves*. Lands outside the UGB that provide a visual and physical separation between urban areas and farm and forest lands.

Assumptions and Limitations

The ranking method described above reflects the following assumptions and limitations:

- The 2040 Design Types describe future development patterns in Metro's service area.

- The 2040 Design Types consider regional land-use goals and policies in addition to economic factors. For example, non-water dependent industrial areas rank as a primary component, even though some secondary components, e.g., Town Centers, may have higher land values or employment. Industrial areas, however, are more important or valuable from a policy perspective regarding the content and pattern of future development and so rank ahead of Town Centers.

Maps

Metro staff categorized lands in the UGB based on the 2040 Design Types and mapped lands using GIS.[13] Map 3 shows the distribution of the four

[13] See the methodology in the Appendix that describes the details of Metro's ranking of lands that contain significant riparian and wildlife resources.

categories of 2040 Design Types described above for all lands in Metro's service area. Map 3a shows the subset of lands in Map 3 that contain significant Goal 5 riparian or wildlife resources. Metro's Goal 5 decision will affect these lands. Map 3b shows the subset of lands in Map 3a that support the most significant Goal 5 riparian or wildlife resources.

Comparing Maps 1, 2 and 3 we see that the Primary Design Types cover more of Metro's jurisdiction than are areas of "high" land value or employment density, which are concentrated mostly in the downtown Portland area. This is especially true along the Columbia River and the Willamette River outside of downtown Portland. This area has "low" land values and employment densities for the most part, but has a Primary Design-Type designation. For these lands the Design Types reflect public policies that support or enhance the industrial areas along the rivers for future development. Even though these areas have "low" land values and employment densities relative to the Portland city center, public-policy considerations dictate that these industrial lands should be emphasized or enhanced for reasons other than the value of land or employment density.

The preceding paragraph describes differences in distribution among the three measures of development value. There are also similarities. For example, just as most lands in Metro's service area rank "low" for land value and employment density, most lands also rank in the "tertiary" or "other" design type. Another similarity is that, with the exception of lands along the rivers, the distribution of lands with "high" and "medium" employment density has a pattern similar to the distribution of lands ranked "primary" and "secondary" design types.

3.1.4. LIMITATIONS OF THE THREE MEASURES OF THE ECONOMIC IMPORTANCE OF LAND FOR DEVELOPMENT

Some reviewers of the draft economic report felt that the three methods of ranking lands using economic-development values—land value, employment density, and 2040 Design Types—create special concerns for certain land uses. These concerns arise because the three methods either exclude some land uses from the analysis or underestimate their economic importance.

In response to these comments we've added this subsection that describes the limitations of the ranking methods, the affected land uses and their regional significance, and factors to consider regarding the potential impacts of allow, limit, and prohibit decisions for these land uses.

We note that the economic portion of the ESEE analysis describes the relative economic importance of lands that contain significant natural resources from a *regional* perspective. The analysis does not focus on the relative economic importance of *individual parcels*. Such an analysis is beyond the scope of a Goal 5 ESEE analysis. The reviewers' concerns, however, apply to the economic importance of individual parcels. These comments highlight the importance of implementing a Goal 5 program that considers unique or important characteristics at the parcel level when implementing protection guidelines developed at the regional level.

Limitations of the Ranking Methods

Land Value

This method excludes land uses exempt from property taxes or underestimates the economic importance of lands that pay taxes at a diminished rate. Lands exempt from tax assessments—e.g., schools, universities, and some hospitals—do not appear in the data base or analysis for this measure of economic importance.

This method underestimates the economic importance of lands with restricted or diminished tax assessments—e.g., low-income housing, urban-renewal areas, and other land uses that benefit from public policies that subsidize tax payments. The analysis includes these lands in the ranking, but the rankings may not reflect these parcels' full value.

Employment Density

Our analysis calculates the average employment density across all land uses in a given GIS map unit. This method may underestimate or overestimate the employment density for some individual parcels. For example, the employment density for a GIS map unit that includes residential areas surrounding a university or hospital may underestimate the employment ranking for these facilities because of the relatively low employment densities found in the residential areas. We note that the opposite is also true. Because the method calculates the average employment density per map unit, properties with lower-than-average densities will be represented by an average measure for the entire map unit that overestimates the employment density for these parcels.

Employment density does not distinguish between "more" important or "less" important jobs as described by employment income or employment multipliers. In consultation with Metro's ETAC we discussed this issue and considered adding these measures to the analysis or substituting them for employment density. Ultimately we concluded that employment density provides stakeholders and decisionmakers with employment information that exceeds the requirements for a Goal 5 ESEE analysis. Also, we note that Metro uses employment density when addressing other land use issues that have employment consequences[14]. Finally, the 2040 Design Types capture to some degree the economic importance of land as described by employment multipliers.

[14] See the Metro report, *Technical Report: 1999 Employment Density Study*, April 6, 1999, revised May 5, 1999.

2040 Design Type

Some reviewers commented that the 2040 Design Types exclude certain land uses or underestimate the relative importance of a given land use. For example, several educational institutions are not located in designated design-type areas. In other cases, what some consider a regionally-significant land use, such as a regional medical center, are included in a lower-level design type.

Relative Economic Importance of Land Uses

The lands uses of concern—those for which the three methods used in the economic analysis either exclude or underestimate their economic importance—fall predominantly into four general categories: 1) transportation; 2) utilities; 3) education; and, 4) health care. In this subsection we describe the relative economic importance of these land uses.

Transportation Facilities and Utilities: To stay competitive, cities must have modern and efficient physical infrastructure, including roads, bridges, water and sewer systems, airport and cargo facilities, energy systems and telecommunications. The economic literature shows a correlation between economic growth and transportation facilities and utility services. Well-functioning and efficient physical infrastructure helps promote improvements in productivity. The quality of, and access to, transportation facilities and utilities can also directly influence production costs.[15]

Education: The economic literature distinguishes between the economic importance of primary and secondary education, from college, university and post-graduate studies.

Primary and Secondary Education

Many high-skilled or knowledge-based workers can choose where they want to live, they can apply their skills to a variety of industries or have the

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[15]Atkinson, Robert D. and Paul D. Gottlieb. 2001. *The Metropolitan New Economy Index: Benchmarking Economic Transformation in the Nation's Metropolitan Areas*. Progressive Policy Institute and the Center for Regional Economic Issues, Case Western Reserve University. April.

Cohen, Natalie. 2000. *Business Location Decision-Making and the Cities: Bringing Companies Back*. Washington, D.C.: The Brookings Institution. April.

Rondinelli, Dennis A. 1998. "The Changing Forces of Urban Economic Development: Globalization and City Competitiveness in the 21st Century." *Cityscape*, 3 (3).

Fisher, R.C. 1997. "The Effects of State and Local Public Services on Economic Development." *New England Economic Review*. March/April, p. 53-82.

Collaborative Economics. 1999. *Innovative Regions: The Importance of Place and Networks in the Innovative Economy*. The Heinz Endowments, Innovation Works, Inc., and The Pittsburg Regional Alliance. October. Collaborative Economics 1999.

ability to telecommute. Because they can pick and choose their locations, they choose those with quality amenities, including good elementary and secondary schools.[16]

College, University, and Post-Graduate Studies

Given the current high demand for skilled labor, economic growth and development depends in part on access to a critical mass of employable persons with the necessary training and education. An educated workforce has become the primary location factor for growing companies.[17]

The most competitive cities recognize that businesses must locate near or have access to knowledge centers. Among the most important knowledge-based organizations are colleges and universities that provide trained personnel and research capacities. Companies also depend on training and continuing education facilities that help them become and remain learning organizations.[18]

Increasing evidence suggests that promoting innovation, creativity, flexibility, and adaptability will be essential to keeping US cities economically vital and internationally competitive. Innovation is particularly important in industries that require an educated workforce. High-tech companies need to have access to new ideas typically associated with a university or research institute.[19]

Medical Services: Medical services contribute to a region's economic growth and development in a number of ways. In many municipalities, hospitals and medical clinics are among the largest employers. For example, in the Portland area, OHSU is the region's top employer. Medical schools and research facilities provided important education-related services that help

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[16] Cohen 2000

Florida, R. 2000. *Competing in the Age of Talent: Environment, Amenities, and the New Economy*. Prepared for the R.K. Mellon Foundation, Heinz Endowments, and Sustainable Pittsburgh.

[17] Cohen 2000

Ady, Robert M. 1997. "Discussion." *New England Economic Review*. March/April, p. 77-82.

Glaeser, E. and J.M. Shapiro. 2001. *Job Sprawl: Employment Location in the U.S. Metropolitan Areas*. The Brookings Institution. May.

[18] Rondinelli 1998

Audretsch, D.B. and M.P. Feldman. 1996. "R&D Spillovers and the Geography of Innovation and Production." *The American Economic Review*. 86 (3), p. 630-640.

Collaborative Economics 1999.

[19]Fulton, William and Paul Shigley. 2001. "Little Chips, Big Dreams." *Governing* (no information on volume number).

support the growth and development of knowledge-based businesses. The availability of high-quality and diverse medical services also contributes to a region's quality of life, which helps attract and retain high skilled, and highly-educated workers.

Factors To Consider Regarding Allow, Limit and Prohibit Decisions

The reviewers' comments highlight the importance of considering unique or important characteristics at the *parcel* level when implementing protection guidelines developed at the *regional* level. The economic factors that may affect deliberations of these issues at the local level include:

Land Value. The fact that municipalities or regional governments grant certain land uses a waiver or reduction of property taxes offers insights into the relative importance of the services provided by these land uses to local or regional residents and businesses. Using this approach for lands excluded from or undervalued in the land-value database, facilities with complete and permanent exemption from property taxes would rank higher than facilities with limited or temporary exemptions.

Employment Density. Some regionally-significant facilities rank low on the employment scale because they're surrounded by land uses with low employment densities. Others because they occupy relatively large parcels, which diminishes the number of employees per gross acre. This condition is analogous to industrial lands, which occupy relatively large parcels and have relatively low employment densities. Metro recognized that employment density and the other measures of economic importance did not adequately reflect the economic contribution of some industrial lands to the regional economy. As a result of this limitation, it made a policy decision to identify these lands as "regionally-significant" industrial lands and to rank these lands higher on the scale of economic importance than other industrial lands. Metro or local decisionmakers could apply this same policy consideration and decision to the lands that rank lower on the employment measure of development value.

Flexibility of Land Use. The potential economic consequences of Goal 5 protection for the land uses at issue in this part of our analysis depends in part on the details of a given land use including the physical space the use occupies. For example, the economic impacts of limiting the development of a runway extension at Portland airport will be different from the potential impacts of reconfiguring an access road on the airport grounds so that it avoids significant riparian areas.

In another example, a utility right-of-way that extends for miles along a narrow strip of land may pass through riparian or wildlife habitats that vary in importance and value. This land use has limited flexibility in that it would be difficult and expensive to move or reconfigure the right-of-way. The utility services provided via the right-of-way may have regional significance if they affect residences and businesses through out Metro's service area. In a contrasting example, a college or university with ample vacant land on its campus may have multiple options for the site of a new dormitory if the proposed location conflicts with important and valuable riparian or upland-wildlife habitat.

3.2. Rank Land Based on the Economic Importance for Ecosystem Services

Method and Data

Metro conducted an inventory of the significant riparian-wildlife and upland-wildlife resources in its service area and ranked these resources based on the amount and type of ecological functions and wildlife characteristics.[20]

The ecological functions specific to riparian wildlife areas that Metro considered include:

- Microclimate and shade provided by forest or woody vegetation in and along riparian areas.
- Stream flow moderation and water storage capabilities.
- Bank stabilization and sediment and pollution control.
- Channel dynamics.
- Organic inputs.

Metro ranked riparian-wildlife areas into three categories, Class I, II, and III. As we understand it, areas with more ecological functions and/or areas with functions near a stream, wetland or floodplain received a higher ranking than areas with fewer functions or with functions that were further away from water features.

The characteristics that Metro considered for upland-wildlife areas included:

- Habitats of concern and habitats for unique and sensitive species.
- Habitat patch size and interior habitat.
- Connectivity and proximity to water resources and other habitat areas.

Similar to the ranking of riparian areas, Metro staff ranked land with upland-wildlife habitat into three categories, Class A, B, and C, depending on the type and amount of wildlife characteristics.

[20] See Metro's report, *Metro's Riparian Corridor and Wildlife Habitat Inventories* for more information on Metro's inventory and ranking of riparian and wildlife resources.

In Table 1 below, we list the riparian and wildlife classes and the percent of total resources by class.

Table 1: Resource Categories, as a Percentage of Total Resource Lands.

Resource Category	Percent of Total Resource Lands
Riparian & Wildlife Class I	32%
Riparian & Wildlife Class II	14%
Riparian Class III	8%
Upland Wildlife Class A	24%
Upland Wildlife Class B	13%
Upland Wildlife Class C	9%
Total	100%

Source: Conflicting Uses section of Metro's Goal 5 report.

Fifty-six percent of the resource lands are in Riparian & Wildlife Class I and Upland Wildlife Class A, categories with the most important ecological functions and wildlife characteristics. The percentage of total resource lands in a resource category declines from Class I to Class III and from Class A to Class C.

Metro's inventory and ranking focused on the ecological functions and wildlife characteristics that affect the biophysical health and wellbeing of these areas, without concern for how these attributes benefit society. Hueting, et al. (1998), King and Mazzotta (2003) and others,[21] describe the relationship between the biophysical attributes of natural areas and the related benefits to society. These researchers and others use the term "ecosystem services" to describe the services provided by natural areas that benefit society.

Table 2 below lists the ecological functions and wildlife characteristics that Metro considered in its ranking of riparian and wildlife areas and the related ecosystem services that benefit society.[22]

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[21] Balmford, A., et al. 2002. "Economic Reasons for Conserving Wild Nature." *Science* 297: 950-953.

Costanza, R., et al. 1997. "The Value of the World's Ecosystem Services and Natural Capital." *Nature* 387 (May 15): 253-260.

Daily, G. and K. Ellison. 2002. *The New Economy of Nature*. Washington, D.C.: Island Press.

[22] See also Metro's analysis of environmental consequences for information on the relationship between ecological functions, wildlife characteristics and benefits to society.

Table 2: Ecological Functions, Wildlife Characteristics and Related Ecosystem Services that Benefit Society

Ecological Function	Ecosystem Service
Microclimate shade and cooling	Moderating summer temperatures, which helps reduces energy demand for cooling.
Stream flow moderation and improved water storage	Reduced flood damage and flood-management costs.
Bank stabilization and sediment and pollution control	Improved water quality. Reduced demand for water filtration and treatment. Reduced landslides and related damage and clean-up costs.
Large woody debris and channel dynamics	Reduced flood damage and flood-management costs.
Well-functioning riparian areas in general	Recreation, amenity and intrinsic values associated with riparian areas.
Wildlife Characteristic	
Habitats of concern and habitats for unique and sensitive species	Increased populations of salmon and other species and associated increases in commercial, recreational, cultural and intrinsic values.
Well-functioning wildlife habitats in general	Recreation, amenity and intrinsic values associated with wildlife habitat.

Source: ECONorthwest and Metro's inventory and ranking of riparian and wildlife resources.

As described in the references noted above, and in the literature review that accompanies this report, the ecological functions and wildlife characteristics in Table 2 provide ecosystem services that benefit society. For example, riparian areas that mitigate flooding help reduce flood-related damages to homes and businesses. In another example, protecting or improving habitat that benefits salmon helps protect the fish's commercial, recreational, and cultural values. See the literature review for more information on ecosystem services and their economic values.

Assumptions and Limitations

The ranking of riparian-wildlife and upland-wildlife resources depends on the following assumptions and characteristics:

- Areas that provide more of the ecological functions and wildlife characteristics illustrated in Table 1 provide more ecosystem services and value to society than do areas that provide fewer functions and characteristics.

- Actions that enhance or protect ecosystem services also enhance or protect the economic values associated with those services. Actions that degrade these services will have the opposite effect.

Maps

Map 4 shows the distribution of the classes of riparian-wildlife and upland-wildlife resources across Metro's service area. With one notable exception—the area between the Willamette and Columbia Rivers—Goal 5 significant natural resources cover much of Metro's service area. The map shows that the most intensively-developed areas of the Portland city center and extending east from the Willamette River retain little or no riparian or wildlife resources.

Map 4a shows the distribution of the highest-valued resource lands, Riparian & Wildlife Class I and Upland Wildlife Class A.

3.3. CURRENT LAND-USE STATUS OF RESOURCE LANDS

The previous subsections describe the lands at issue in Metro's Goal 5 analysis based on their economic importance for development and on the quality of riparian and wildlife habitat. This section describes the current land-use characteristics of the land. These characteristics include development status (vacant or developed, and the type of development) and zoning type (e.g., single-family residential, commercial, etc).

Development status and zoning type influence the type, amount, and timing of the economic consequences of Goal 5 allow, limit and prohibit decisions. For example, the employment impacts of limiting future activities in an already-developed residential area will differ from the impacts of limiting development of vacant area zoned for commercial or industrial use.

3.3.1. DEVELOPMENT STATUS

Metro classified the lands containing significant riparian and wildlife resources using four development categories:

- *Developed Parks*[23]: Park and openspace lands that Metro considers already developed and generally not available for urban development.

- *Developed Urban:* Lands that have been developed in accordance with specific zoning, such as single-family residential or commercial use.

- *Vacant Constrained:* Lands that have not yet been developed but development is constrained by Title 3[24].

[23] This category includes all areas covered by parks or open space and includes park land zoned as single-family residential, commercial, or other zoning.

[24] For information on Title 3, see, "Title 3: Water Quality, Flood Management, and Fish and Wildlife Conservation" described in the Metro Urban Growth Management Functional Plan. Title 3 describes development guidelines that protect water quality, floodplain areas, and fish and wildlife habitat.

- *Vacant Buildable*: Vacant, buildable land that's unconstrained by non-Goal 5 regulations.

Table 3 describes the development status of the Goal 5 resources lands and describes these lands as a percentage of the *total* lands by development category in the UGB. For example, 34 percent of Goal 5 resources lands are in parks and these parklands account for approximately 66 percent of the total parklands in the Portland Metro UGB.

Table 3: Goal 5 Resource Lands by Development Status and As A Percentage of Total Lands in the Development Status in the UGB in 2002

Development Status	% of Total Goal 5 Resource Lands	Goal 5 Resources as a % of Total Lands in the Development Status in the UGB
Developed Parks	34%	66%
Developed Urban	28%	10%
Vacant Constrained	16%	67%
Vacant Buildable	22%	41%
Total	100%	(not applicable)

Source: Data analysis by Metro staff.

Table 3 illustrates that:

- Less than 25 percent of the lands that contain Goal 5 resources are vacant and available for development. Goal 5 decisions will have the most immediate impacts here because development is unconstrained by other factors. Limit and prohibit decisions will affect vacant-buildable lands throughout the Portland metro area because these lands account for over 40 percent of the total inventory of vacant-buildable lands within the UGB.

- Seventy-eight percent of the lands with Goal 5 resources have already been developed or development is constrained on these lands by non-Goal 5 regulations.

- Over 60 percent of Goal 5-resource lands have already been developed as parks/open space or as urban residential, commercial, industrial, etc. developments.

- We expect that future developments on park and open-space lands will have limited negative impacts on the significant riparian and wildlife resources on these lands. As a result, it's unlikely that Goal 5 limit or prohibit decisions will significantly affect future developments on these lands.

- Goal 5 decisions may impact lands in the developed-urban category in the future as these lands are redeveloped.

- Title 3 restricts development on 16 percent of the lands with Goal 5 resources. This percentage underestimates the total amount of land on which development is restricted because Title 3 is a state-wide regulation and does not reflect lands on which development is restricted by local regulations that exceed Title 3 guidelines.

Metro must conduct the Goal 5 ESEE analysis for lands that contain significant natural resources *and* impact areas[25]. Impact areas lie outside, but adjacent to, the lands that contain significant resources. Land-use activities that occur on lands within the impact areas may negatively impact significant resources. Metro identified two types of impact areas. Riparian-impact areas occur within 150 feet of a stream, wetland, or lake that otherwise receives no resource protection. Supplementary impact areas occur in a band 25-feet wide around all resources to protect the tree root-zone areas.

Table 4 describes the development status of impact areas.

Table 4: The Development Status of Impact Areas

	Developed Parks	Developed Urban	Vacant Constrained	Vacant Buildable
Percentage of Impact Areas	9%	73%	5%	13%

Source: Data analysis by Metro staff.

As Table 4 indicates, most impact areas have already been developed.

An analysis of the development value of impact areas, as described by land value, employment density and 2040 Design Types, found that the distribution of development values follows the distributions of land value, employment density and 2040 Design Types described above for the lands containing significant riparian and wildlife resources. That is, most impact areas have "low" land value, employment density, and design types, relative to the values measured for lands in the Portland city center.

3.3.2. GENERALIZED REGIONAL ZONES

As described in the Conflicting Uses section of Metro's Goal 5 report, Metro identified land uses that could potential conflicting with significant riparian-wildlife and upland-wildlife habitat. Metro described these land uses using "generalized regional zones." The generalized regional zones reflect a compilation of zoning designations as implemented by local governments

[25] See the Impact Areas section of Metro's Goal 5 report for more information on impact areas.

within Metro's service area.[26] In this subsection we describe the lands containing significant Goal 5 natural resource by generalized regional zones.

Table 5 below lists the lands with Goal 5 natural resources by the generalized regional zones[27].

Table 5: Significant Riparian Areas and Wildlife Habitat by Generalized Regional Zone, in Acres and Percentage, in the UGB in 2002

Generalized Regional Zone	Acres	Percentage of Total Acres of Significant Resources
Single-Family Residential	24,821	46.2%
Multi-Family Residential	2,610	4.9%
Commercial	2,672	5.0%
Industrial	7,721	14.4%
Mixed Use Centers	1,284	2.4%
Rural	3,923	7.3%
Parks and Open Space	10,468	19.5%
No Zoning	172	0.3%
Total	53,671	100%

Source: Conflicting Uses section of Metro's Goal 5 report.

Table 5 illustrates that:

- Over 80 percent of the land uses that potentially conflict with Goal 5 riparian-wildlife and upland-wildlife resources occur in three regional zones: single-family residential (SFR), parks and open space (POS), and industrial (IND).

- SFR contains the largest percentage of Goal 5-resource lands, over 46 percent. Goal 5 allow, limit and prohibit decisions likely will fall most heavily on lands in this zoning.

- Lands zoned POS account for approximately 20 percent of Goal 5 natural resources.

- Over 14 percent of the lands with Goal 5 natural resource are zoned IND.

[26] See Metro's Goal 5 report for more information on designating conflicting uses.

[27] Table 3 describes the potential conflicting lands uses *within the UGB* in 2000. Lands *outside the UGB* but within Metro's service area are primarily zoned rural residential, agricultural, and forestry lands. Relative to the Portland city center we expect these lands have low employment density and land value. These lands have not yet been categorized by 2040 Design Type.

- The majority of lands with Goal 5 resource do not support employment. Less than 22 percent of the lands are zoned for commercial, industrial or mixed-use.

3.4. INTERACTIONS AMONG MEASURES

Previous subsections describe the lands containing Goal 5 natural resources using measures of development value[28], resource categories[29], and generalized regional zones[30]. In this subsection we describe the overlap and interactions among the measures. Given the number of measures and the large size of the table of interactions, we've appended the table in the Appendix to this report. The Appendix also contains tables that describe interactions between various subsets of measures.

Summary points illustrated in the tables of interactions include:

- *Land Value, Zoning and Resources:* The zoning for a majority of resource lands, approximately 64 percent, support development value. The remainder fall into POS zoning or contain water bodies. Of the lands with development value, most fall into the "low" land-value category. See Table 4 in the Appendix

- *Employment, Zoning and Resources:* Approximately 78 percent of the resources lands do not support employment. These lands are zoned SFR, MFR, RUR, and POS. Of the lands that do support employment, most fall into the "low" employment category. See Table 5 in the Appendix.

- *2040 Design Type and Resources:* The distribution of resource lands by 2040 Design Type differs from the distributions described above for land value and employment. In general, categorizing lands using 2040 Design Types yields a distribution with a greater percentage of the lands having development value, and for the lands that have development value, more of the lands rank in the higher-valued design types. See Table 6 in the Appendix.

- *2040 Design Type, Zoning, and Resources:* Three generalized regional zones, SFR, POS, and IND, account for 80 percent of the resource acres. Ninety-eight percent of the resource lands zoned SFR and POS fall into the lowest design type[31]. In contrast, 33 percent of the lands

[28] Land value, employment density, and 2040 Design Type.

[29] Riparian-wildlife classes I, II, and III, upland-wildlife classes A, B, and C.

[30] Single-family residential, multi-family residential, commercial, industrial, mixed use centers, rural, parks and open space, and no zoning.

[31] This includes lands in the tertiary design type, and lands in the "other" design type that includes parks, open space and rural reserves.

zoned IND fall in the lowest design type and 60 percent is ranked in the primary, or highest, design type. See Table 7 in the Appendix.

- *Land Value, Employment, 2040 Design Type, Zoning and Resources*: Focusing on resource lands zoned SFR, POS, and IND, approximately 98 percent of POS lands, and approximately 78 percent of SFR lands ranked in the lowest category for all three measures of development value (land value, employment and 2040 Design Type). In contrast, 25 percent of lands zoned IND ranked in the lowest categories for all three measures of development value. Over 60 percent of IND lands ranked in the highest category for at least one measure. See Table 8 in the Appendix.

- *Goal 5 Allow, Limit, Prohibit Impacts*: The large majority of Goal 5 allow, limit and prohibit decisions will impact lands zoned SFR, POS and IND. Impacts on lands zoned SFR and POS will have little or no employment impacts and will affect lands ranked "low" on the land-value scale. The majority of impacts on lands zoned IND will affect lands ranked "high" on at least one measure of development value.

The fact that Goal 5 decisions would primarily affect acres with lower land values and employment densities does not mean that limit or prohibit decisions on these acres would generate trivial economic consequences. The "low" category for these development values are relative to land values and employment densities found in the Portland city center and do not represent an absolute measure of land value or employment. The actual impacts of limit or prohibit decisions on property values or employment will depend on the specifics of the decision (e.g., lightly limit, moderately limit, etc.), the details of the Goal 5 plan that implements the decision, actions that may mitigate any negative impacts, and specifics of the individual parcels affected.

Maps

For mapping purposes, Metro summarized the interaction among the measures of development value into three categories, which they refer to as Component Summaries. The lowest category shows lands that ranked "low" on all three measures of development value: property value, employment density and 2040 Design Types. The next category shows lands that ranked "medium" on at least one category, with no "high" rankings. The final category shows lands that ranked "high" on at least one category.

Map 5 shows the Component Summaries for *all* lands in Metro's service area, including lands that do not contain Goal 5 natural resources. Map 5a shows the Component Summaries for the subset of lands within Metro's service area that contain significant Goal 5 natural resources. Goal 5 decisions will affect these lands. Map 5b is similar to Map 5a except that it illustrates the Component Summaries for the subset of resource lands that ranked highest for type and amount of ecological functions and wildlife characteristics (Class I and Class A lands).

Focusing on Maps 5a and b that depict resource lands, the maps show that the majority of resource lands ranked "low" on all three measures of development value.

3.5. POTENTIAL ECONOMIC TRADEOFFS OF GOAL 5 ALLOW, LIMIT, AND PROHIBIT DECISIONS

3.5.1. INTRODUCTION

The economic portion of the Goal 5 ESEE analysis addresses the tradeoffs of developing lands that contain Goal 5 riparian and wildlife resources, or maintaining the resources and their associated ecosystem services that benefit society. Any development potentially conflicts at some level with preserving land in its natural state. Developing the lands with Goal 5 resources will generate a set of economic tradeoffs distinct from the tradeoffs of protecting the resources. We describe these tradeoffs in this subsection.

It's not clear at this time the details of Metro's Goal 5 programs or how they'll be implemented. Both will influence the economic tradeoffs. Economic tradeoffs will also depend on the specifics of the significant resources affected, the conflicting land uses, and parcel size, configuration, and location. As a result of these analytical uncertainties, we depict economic tradeoffs qualitatively rather than quantitatively. We describe—at the regional level—the economic factors that allow, limit, or prohibit decision can influence and the likely directions of change. We do not, however, calculate a quantitative change in the development or resource values associated with a Goal 5 decision on a specific property.

We considered the results from the analyses of energy, social, and environmental tradeoffs in our analysis of economic tradeoffs.

We describe the following categories of economic tradeoffs:

Economic Values. The changes in the values of goods and services.

- Property values.
- The values of ecosystem goods and services provided by riparian and wildlife areas.

Economic Impacts. The changes in the levels of economic activities within the local economy.

- Employment and income tradeoffs.
- Changes in tax payments.
- Transportation impacts.

2040 Design Types. The 2040 Design Types outline development patterns over the coming decades. The analysis considered the economic tradeoffs of how allow, limit and prohibit decisions may impact future development.

Economic Equity. The changes in the distributions of costs and benefits within the economy, especially changes affecting groups of special concern such as property owners that shoulder a disproportionate amount of the negative consequences of a policy decision. Equity tradeoffs in this analysis include:

- Tradeoffs by type of land use, as described by zoning type.
- The geographic distribution of economic tradeoffs.

As an introduction to our discussion of economic tradeoffs we describe the baseline conditions against which the economic tradeoffs of Goal 5 decisions will be compared. We then describe the static economic tradeoffs or the tradeoffs as if the economy or policy makers cannot react to mitigate or avoid negative economic outcomes, or to enhance or promote positive economic outcomes. Following our description of economic tradeoffs we list the major factors that can influence the distribution and magnitude of tradeoffs. These factors provide a somewhat dynamic view of the tradeoffs. In matrices that follow our narrative description we summarize the economic tradeoffs of allow, limit, and prohibit decisions by generalized regional zones.

3.5.2. BASELINE FOR THE ANALYSIS OF ECONOMIC TRADEOFFS

The existing, non-Goal 5, regulatory protection of riparian and wildlife resources provides the baseline for the analysis of economic tradeoffs of Goal 5 allow, limit and prohibit decisions. An allow decision will permit developing significant natural resource to the limits allowed by existing, non-Goal 5 protection measures. Goal 5 limit or prohibit decisions provide a marginal *increase* in protection above and beyond existing protection measures.

For lands in Metro's service area, Title 3 of the Urban Growth Management Function Plan (Title 3) describes existing protection measures and is the baseline against which the Goal 5 management decisions will be measured. Title 3 regulates development that affects water quality, flood management and fish and wildlife conservation. As described by Metro, the goal of Title 3 is to

> "[P]rotect the region's health and public safety by reducing flood and landslide hazards, controlling soil erosion and reducing pollution of the region's waterways. Title 3 specifically implements the Oregon Statewide Land Use Goals 6 and 7 by protecting streams, rivers, wetlands and floodplains by avoiding,

limiting or mitigating the impact on these areas from development." [32]

Because Title 3 implements statewide land-use goals it affects lands in all the local jurisdictions within Metro's service area. Local jurisdictions, however, may adopt protection measures that *exceed* Title 3 regulations. The economic tradeoffs of Goal 5 allow, limit and prohibit decisions in these jurisdictions will differ from the tradeoffs in jurisdictions where Title 3 represents the baseline protection in the following ways.

- Allow decisions will overestimate the negative impacts of development on Goal 5 riparian and wildlife resource and associated ecosystem services. An allow decision will also overestimate the benefits on development values.
- Limit and prohibit decisions will overestimate the benefits of habitat protection and will overestimate the negative impacts on development values.

3.5.3. POTENTIAL ECONOMIC TRADEOFFS OF GOAL 5 ALLOW, LIMIT, AND PROHIBIT DECISIONS

We begin by describing economic values, economic impacts, 2040 Design Types and equity issues and how Goal 5 decisions may impact these factors. Next we summarize the economic tradeoffs for allow, limit and prohibit decisions. Finally, we describe economic tradeoffs by generalized regional zones.

Economic Values

Property Values in Development

The factors that affect the development value for land fall into two general categories: location factors and use factors[33].

Location factors include:

- Availability and quality of public infrastructure, e.g., roads, sewer, water, electric. Land-use decisions that hinder or make more difficult the provision of infrastructure services may negatively impact the values of the affected properties.
- Access to the site. Actions that limit or impede access to a site may negatively impact the site's property value.

[32] www.metro-region.org/article.cfm?ArticleID=274 accessed August 5, 2004.

[33] See the accompanying literature review for more information on location and use factors.

- Agglomerative economies associated with the location. Decisions that promote or allow the development of agglomerative economies, e.g., clustering of commercial or industrial developments, will help maintain or enhance development values of these activities. Decisions that inhibit the development of such agglomerative economies may have the opposite effect.

- Existing zoning or other land-use regulations. Zoning and other regulations can have positive and negative impacts on a property's value. For example, water-front properties zoned for industrial use might have higher property values if they were zoned residential. In another example, a residential zoning may protect property values by excluding incompatible land uses, e.g., a gas station.

Use factors include:

- Amenities of the site, e.g., views, access to parks, water, and other open spaces. Actions that protect or enhance a location's amenities, may also protect or enhance the impact that amenities have on property values.

- Physical terrain, e.g., hilly or flat. Grading hills and other changes to a parcel's physical terrain may increase the parcel's usability and development value. Actions that limit grading hills or other changes to a parcel's physical terrain may negatively impact the parcel's property value.

- Lot size, shape and buildable area. Actions that limit a parcel's usable area may negatively impact the parcel's development value. We expect that the impacts from limiting a parcel's usable area will likely be the most common way that limit or prohibit decisions could influence development values.

Values of Ecosystem Services

Metro's report on Goal 5 environmental tradeoffs describes the consequences of allow, limit and prohibit decisions on riparian and wildlife resources and on the associated ecological functions and wildlife characteristics. As described in Metro's environmental report, and above in Section 3.2 and in the literature review that accompanies this report, the ecological functions and wildlife characteristics at issue in Metro's study provide ecosystem services that benefit society. Actions that protect or enhance these services will also protect and enhance their value. Actions that degrade ecosystem services will have the opposite effect. As services degrade, society either does without the service, restores the degraded habitat, or replaces some lost or degraded services by building engineered projects, e.g., upgrading a water-treatment plant that provide clean water.

Metro's Goal 5 decisions will impact the following ecosystem services:

- *Flood Management*. Riparian and upland-wildlife habitat help mitigate flooding by moderating flow intensities and absorbing runoff. Actions that reduce flood-management services may increase flooding of area homes and businesses, and increase flood-related damages and government expenditures for flood clean up and mitigation.

- *Water Quality*. The habitats at issue in this study help control soil erosion and landslides that cause sedimentation. Riparian and wildlife areas also help filter toxins and sediment from surface runoff before they enter streams and other water bodies. Degrading these services may increase the flow of sediment and contaminants into areas waters. Degraded water quality may increase filtration costs for businesses and municipalities. Increased concentrations of toxins and sedimentation may also increase the costs of projects mandated by regulatory agencies to bring water quality into compliance with federal and state water-quality laws, e.g., the Clean Water Act.

- *Moderating Water and Air Temperatures*. Vegetation in riparian and wildlife habitats provides shade that helps reduce air temperatures and the "heat island effect" in summer. Moderating air temperatures in summer helps reduce electricity costs associated with air conditioning. Actions that remove this vegetation may increase summer air temperatures and cooling costs.

- *Stormwater Services*. Riparian and upland wildlife habitats absorb rainfall that otherwise would flow into stormwater systems. Replacing these habitats with impervious surfaces will increase stormwater flows and management costs. These costs can be substantial. For example, Portland is currently spending approximately $1.4 billion retrofitting its stormwater system[34].

- *Salmon Habitat*. The habitats at issue in this study help support salmon populations and related commercial, recreational and cultural values. Actions that protect salmon habitats also help protect these values. Actions that degrade habitats may have the opposite effect.

- *Amenities*. Riparian and upland-wildlife habitats provide view, open-space, and water-related amenities and associated amenity values for properties in proximity to the resources. Actions that protect these amenities also protect the contribution these resources make toward property values. Actions that degrade the resources have the opposite effect.

- *Recreation*. Riparian and upland-wildlife habitats support recreation activities including wildlife viewing, fishing, and activities associated

[34] Portland Utility Review Board, Issue Paper Recommendation, August 25, 2004. <www.portlandonline.com>

with parks and open space. Degrading these resources may also degrade recreation-related ecosystem services.

- *Intrinsic and Option Values*. Intrinsic values are the values people find inherent in a resource or species for itself, rather from the use or consumption of the resource. These values represent the amounts residents or society would pay to protect a resources, or expect in payment to degrade the resource. Option values represent the value of protecting a resource or species for future use or enjoyment[35]. Actions that degrade riparian and upland-wildlife resources also degrade the intrinsic and option values associated with the resources. Such decisions also increase the risks of an irreversible outcome, e.g., extinction of a salmon species, which may have negative economic consequences in the future.

- *Carbon Sequestration*. Metro's Goal 5 report on energy tradeoffs describes the carbon-sequestration benefits of trees and other vegetation. Removing the vegetation negatively impacts the sequestration benefits and associated economic value[36].

To the extent that riparian and upland-wildlife resources provide multiple ecosystem service, the true or full values of services at risk from actions that degrade resources are the cumulative values of the affected services.

Economic Impacts

Employment

We expect that for lands that support employment, e.g., commercial, industrial and mixed use, the factors that influence land value also influence employment. For example, actions that affect access to a site or a property's developable area will also likely affect the employment potential of the site. In general, however, we expect that Goal 5 decisions will impact land values more than employment (or income) for the following reasons.

- A large percentage of Goal 5 riparian and upland-wildlife resources are zoned for land uses that do not support employment. Of the remaining lands, many have "low" employment densities, relative to densities in the Portland city center.

- A portion of the lands containing resources zoned commercial or industrial have previously been developed and currently support employment. Goal 5 decisions will not affect this employment. A Goal

[35] See the literature review that accompanies this report for more information on intrinsic and option values.

[36] See the literature review for more information on the value of carbon sequestration.

5 decision on these lands may affect future employment through re-development of properties.

Actions that protect or degrade riparian and upland-wildlife resources may impact jobs that depend on these resources. For example, protecting salmon habitat may help support jobs that depend on commercial and recreational salmon harvests. In this example, many of the jobs associated with salmon harvests may be located outside Metro's service area.

Income

We expect the income tradeoffs of protecting or degrading riparian and upland-wildlife resources will follow employment tradeoffs.

Taxes

Property Taxes

We expect impacts of protecting or degrading riparian and upland-wildlife resources will follow impacts on property values. This is especially true for lands zoned commercial and industrial that have not yet been developed. Limiting development on these lands may negatively impact property values and associated property taxes. Limiting development may have the opposite effect on property values and associated tax payments for residential property surrounding or adjacent to properties currently undeveloped. Protecting riparian and upland-wildlife resources on these lands may have a beneficial impact in property taxes, especially over the long term.

Payroll Taxes

We expect that the payroll-tax tradeoffs of protecting or degrading riparian and upland-wildlife resources will follow employment and income tradeoffs.

Business Taxes

We expect that the business-tax tradeoffs of protecting or degrading riparian and upland-wildlife resources will follow the tradeoffs for property value, employment and income for lands zoned commercial, industrial and mixed-use.

Transportation Costs

Transportation costs increase with the number of vehicle miles traveled (VMT). Planning guidelines that address transportation costs, such as the 2040 Design Types, promote more compact development that limits VMT and transportation costs. Actions that push development out towards the UGB boundary or beyond will increase VMT and transportation costs relative to actions that promote more compact development.

2040 Design Types

The 2040 Growth Concept outlines the Portland metropolitan region's plan to accommodate expected population growth over the coming decades, while addressing housing, transportation, open space and employment needs. The 2040 Design Types represent the land-use categories, e.g., central city, main streets, neighborhoods, rural reserves/open space, that embody the Growth Concept's transportation, housing and other land-use goals[37]. The 2040 Growth Concept anticipates expected population growth while:

- Maintaining access to nature.
- Protecting wildlife habitat.
- Promoting efficient use of land.
- Supporting a vibrant economy.
- Providing transportation options.
- Promoting development along transportation corridors.
- Minimizing sprawl and VMT.

Activities that protect or degrade riparian and upland-wildlife resources may have mixed impacts on the 2040 Growth Concept's goals and associated Design Types. Protecting and maintaining access to these resources supports the Growth Concepts and Design Types' emphasis on resource protection. However, if protecting resources displaces development to the extent that it promotes sprawl, expanding the UGB and the number of VMT, protection actions may inhibit or limit the Design Types. Alternatively, developing resource lands may limit UGB expansion and associated consequences, but may also conflict with the Growth Concept's goals that address resource protection and access to natural areas.

The Growth Concept's goals regarding development density and transportation considerations may mitigate the impacts of resource protection on sprawl. Increasing the efficiency of land use by promoting higher development densities along transportation corridors complements the resource-protection goals by accommodating, to some extent, land uses that might otherwise be displaced to outside the UGB.

Economic Equity

Geographic Distribution of Impacts

In general, locations within Metro's service area that have been developed more intensely over longer periods of time have the least amount of riparian

[37] For more information on the 2040 Growth Concept and Design Types see Metro's publication, "The Nature of 2040: The Region's 50-Year Plan for Managing Growth," "2040 Growth Concept and the RTP," and other information on Metro's web site, www.metro-region.org.

and upland-wildlife resources. As a result, Goal 5 protection measures will have limited or no negative impacts on development in these locations. Map 4 shows the distribution of riparian and upland-wildlife resources at issue in Metro's Goal 5 analysis.

As illustrated in Map 4, a triangularly-shaped area that extends southwest from the confluence of the Willamette and Columbia Rivers down to Gladstone, then northeast up to Troutdale, and northwest along the Columbia River to the confluence with the Willamette River has little riparian or upland-wildlife resources, excluding river-front areas. We expect that negative tradeoffs of Goal 5 protection measures on development will predominantly affect properties outside this area.

To the extent that Goal 5 decisions limit development outside this triangular area, properties within the triangle may become more desirable to developers and increase in value relative to conditions that would exist without Goal 5 protection.

Distribution of Impacts by Land Use

Approximately 80 percent of the lands containing riparian and upland-wildlife resources fall into three generalized regional zones: single-family residential (SFR), parks and open space (POS), and industrial (IND). See Table 5. We expect the economic tradeoffs associated with Goal 5 protection will fall primarily on lands in these zoning categories. As a group, lands in other zoning categories will experience limited Goal 5 economic tradeoffs.

SFR lands accounts for approximately 46 percent of Goal 5-resource lands and will experience the large majority of economic tradeoffs. This percentage is disproportionately large, relative to other zonings, and means Goal 5 tradeoffs will impact these lands the most and to a greater extent than lands in other zonings. POS lands account for approximately 20 percent of resource lands, and IND lands 14 percent. Lands in the remaining four zoning categories, multi-family residential, commercial, mixed use centers, and rural, combined account for approximately 20 percent of Goal 5 riparian and upland-wildlife lands. Tradeoffs associated with Goal 5 protection measures will be disproportionately less for these lands.

The current development status of lands that contain Goal 5 riparian and upland wildlife resources shows another aspect of the distribution of Goal 5 economic tradeoffs. As described above in section 3.3, vacant-buildable lands that contain Goal 5 riparian and upland-wildlife resources will likely experience the most immediate effects of Goal 5 protection measures. These lands account for approximately 22 percent of Goal 5 resource lands. See Table 3. However, these lands also represent over 40 percent of the available vacant-buildable land in the UGB. The economic tradeoffs of Goal 5 protection measures will affect a significant portion of vacant-buildable land throughout the UGB.

Distribution of Impacts By Goal 5 Treatment

Of course, the Goal 5 treatments will affect the distribution of positive and negative economic tradeoffs. Allow treatments do not increase resource protection beyond Title 3 or local regulatory measures and place no additional restrictions on land use and development. Developers and property owners will enjoy most, if not all, of the benefits. Riparian and upland-wildlife resources, associated ecosystem services and those that benefit from the resources and services will suffer most, if not all, of the negative economic tradeoffs. Results for prohibit treatments will have the opposite effect. Development interests will suffer most, if not all, of the restrictions. The natural resources, ecosystem services, and those who benefits from the resources and services will experience most, if not all, of the benefits. Limit treatments offer the most equitable distribution of tradeoffs because they generate positive and negative tradeoffs for development and resource interests.

SUMMARY OF ECONOMIC TRADEOFFS

Allow Conflicting Uses

Allowing conflicting uses means no additional protection of Goal 5 riparian or upland-wildlife resources beyond the baseline protection provided by Title 3, or by local protection measures that exceed Title 3 guidelines. This alternative emphasizes developing lands containing Goal 5 resources. Positive economic tradeoffs of this alternative include:

- No impediments to development or negative impacts on the development value of land.
- Development-related employment, income and taxes will be unaffected by Goal 5.
- No Goal-5 related increase in VMT, transportation costs or UGB expansion.

Negative economic tradeoffs include:

- Amenity-related property values and associated property taxes for undeveloped lands zoned SFR and RUR that are adjacent to Goal 5 resource lands may be less for this scenario relative to limit and prohibit scenarios.
- Flood-mitigation services will decline, flood damage and clean-up costs may increase.
- Erosion and sedimentation will increase, as will concentration of toxins in streams and other water bodies. Water-quality expenditures (e.g., for filtration and treatment) by businesses and municipalities may increase. Municipal expenditures that address water-quality regulations (e.g., the federal Clean Water Act) may increase.

- Summer temperatures and the urban "heat island effect" may increase with an associated increase in cooling costs.
- Developing riparian and upland-wildlife resources will increase the amount of impervious surfaces, which will increase stormwater flows and treatment costs.
- Development that negatively impacts salmon habitat may affect commercial, recreational and cultural harvests. Municipal expenditures that address habitat regulations (e.g., Endangered Species Act) may increase.
- Degrading riparian and upland-wildlife resources may negatively affect recreational opportunities and values that depend on these resources.
- Negative impacts on intrinsic values for riparian and upland-wildlife resources.
- Developing Goal 5 resources now or in the near-term precludes developing them in the future or protecting them for future generations. This reduces the option values associated with the resources.
- Carbon sequestration and air-pollution removal will decline with an associated decline in air quality and related values of air-quality services.
- Businesses that rely on riparian and upland-wildlife resources and associated ecosystem services may experience a decline in sales, employment and income relative to the limit or prohibit scenarios. Employment and business-related tax payments may also decline.
- Allowing conflicting uses will negatively affect the 2040 Growth Concept and Design Types that emphasize protecting resources and maintain access to resources.
- The large majority, if not all, of the negative economic tradeoffs of this option affect riparian and upland-wildlife areas, associated ecosystem services and economic factors, e.g., jobs, incomes and values, that depend on these resources. Development interests suffer little or no negative economic tradeoffs.

Limit Conflicting Uses

Limiting conflicting uses strikes a balance between completely developing the Goal 5 riparian and upland-wildlife resources and protecting them. This alternative provides opportunities including: developing lands in ways that minimize negative environmental and economic tradeoffs; supporting the development goals embodied by the 2040 Design Types; and protecting the most important habitats.

The economic tradeoffs for this alternative depend on the degree of limitation on development actions: lightly limit, moderately limit, or strictly limit. Lightly-limit treatments will have more in common with allow treatments than with prohibit treatments. The opposite will be the case for strictly-limit treatments. As the name implies, tradeoffs for the moderately-limit treatment will fall somewhere in between.

This scenario will generate a mix of positive and negative economic tradeoffs for development interests and for the resources and associated ecosystem services. Developing resources will generate positive impacts on development values, employment, income, and tax payments. However, these impacts will be less than for the allow scenario. The resources will likely suffer some degradation, but not to the extent generated under the allow scenario.

The consequences for the 2040 Design Types will be mixed. Protecting resources to a greater extent, compared with the allow scenario, may increase VMT if protecting resources displaces development and pushes it out toward the UGB or beyond. This may also increase the next UGB expansion and transportation costs. However, protecting riparian and upland-wildlife resources is consistent with the planning goals reflected in the Design Types.

The limit scenario will generate a more equitable distribution of positive and negative economic tradeoffs, compared with either the allow or prohibit scenarios. Development interests and the resources will both experience positive and negative economic tradeoffs.

Prohibit Conflicting Uses

Prohibiting conflicting uses will prevent development actions that conflict with, or degrade, Goal 5 riparian and upland-wildlife resources. This scenario emphasizes resource protection. Protection measures will exceed the baseline protection provided by Title 3, or by local protection measures that exceed Title 3 guidelines.

Positive economic tradeoffs of this alternative include:

- Amenity-related property values and associated property taxes for lands zoned SFR and RUR that are adjacent to Goal 5 resource lands may be greater for this scenario relative to limit and allow scenarios.
- This alternative will provide the greatest amount of flood-mitigation services and value.
- Erosion and sedimentation will be less than limit or allow alternatives, as will concentration of toxins in streams and other water bodies. Water-quality expenditures (e.g., for filtration and treatment) by businesses and municipalities may be the least under this alternative. Municipal expenditures that address water-quality regulations (e.g., the federal Clean Water Act) may decline, especially over the long term.

- This alternative will have the greatest mitigating effect on summer temperatures, the urban "heat island effect," and associated cooling costs.
- Prohibiting development in Goal 5 riparian and upland-wildlife resources will generate the least amount of impervious surfaces, and will generate the least amount of stormwater flows and treatment costs.
- This scenario will protect the greatest amount of salmon habitat and may positively affect commercial, recreational and cultural harvests. Municipal expenditures that address habitat regulations (e.g., Endangered Species Act) may decline, especially over the long term.
- This alternative will preserve the greatest amount of recreational opportunities, and the associated recreational values.
- The intrinsic and options values for the riparian and upland-wildlife resources will be preserved.
- Maintaining the greatest amount of vegetation will maximize carbon sequestration, air pollutant removal and the related values of air-quality services.
- This alternative will provide the greatest support to businesses that rely on riparian and upland-wildlife resources and associated ecosystem services.
- Prohibiting conflicting uses will support the aspects of the 2040 Growth Concept and Design Types that emphasize protecting resources and maintain access to resources.

Negative economic tradeoffs include:

- This alternative will have the greatest negative impact on the development value of land.
- Development-related employment, income and tax payments will also suffer the greatest under this alternative.
- Aspects of the 2040 Design Types that minimize VMT and sprawl will be negatively impacted if protection measures displace development within the UGB.
- The large majority, if not all, of the negative economic tradeoffs of this alternative affect development interests. The economic values and activities supported by riparian and upland-wildlife resources suffer little or no negative economic tradeoffs, relative to allow and limit alternatives.

3.5.4. The Dynamic Aspects Of Economic Tradeoffs

The description of economic tradeoffs in the previous section assumes no reaction by stakeholders and decisionmakers that would impact the economic tradeoffs. This static approach ignores, for example, the possibility that restoring riparian and upland-wildlife habitats may mitigate some of the negative economic tradeoffs of development on these resources. A more dynamic view of economic tradeoffs considers alternatives that could help mitigate negative tradeoffs and enhance positive tradeoffs. In this section we describe a number of these dynamic factors.

Substitutability of Land Uses

Moving proposed land uses that conflict with riparian and upland-wildlife resources to alternative locations may mitigate negative economic tradeoffs for both the land use and resources. The previously-conflicting land use can take place without impacting Goal 5 resources. Substituting a non-conflicting or less-conflicting land use in the resource area will protect, to some extent, the property's development value. Such a move will also protect, to some extent, the quality and quantity of the property's riparian and upland-wildlife resources.

The feasibility of substituting land uses depends on the types of land uses at issue and the availability of suitable sites outside the resource areas. The more specific or unique the development requirements, the less likely the development can take place elsewhere. For example, water-dependent industrial development must take place in specific locations—relatively large lots with water access. This limits the extent to which the land use can avoid conflicting with riparian resources by moving elsewhere. By comparison, residential land uses have relatively few development-specific requirements and take place throughout Metro's service area.

Expanding the Urban Growth Boundary

Protecting riparian and upland-wildlife resources may reduce the amount of developable land within the UGB. If this is the case, expanding the UGB could mitigate this loss while protecting riparian and upland-resources within the existing UGB. However, expanding the UGB may promote sprawl and negative sprawl-related impacts including increased VMT and transportation costs, and possibly minimizing the effectiveness of the 2040 Design Types.

As we understand it, Metro Council and staff consider expanding the UGB as an option of last resort. Goal 5 protection options will be developed in ways that emphasize other mitigation options.

Encourage Development Practices That Minimize Conflicts With Resources

Encouraging development practices that minimize conflicts with resources may help mitigate negative economic tradeoffs for both development and the resources. These practices include low-impact development projects that minimize impervious surfaces and manage stormwater in ways that more closely mimic natural systems. Cluster developments for residential lands is another example. This type of development localizes housing sites and associated land-use activities, e.g., roads, while avoiding developing riparian and upland-forest resources. In another example property owners may sell future development rights while retaining ownership without restrictions on existing land uses.

Restoring Degraded Riparian and Upland-Wildlife Resources

Restoring already-degraded riparian and upland-wildlife habitat could offset a portion of the negative impact of new development on habitat elsewhere. In some cases, restoration opportunities may lie outside the existing UGB or Metro's service area.

3.5.5. ECONOMIC TRADEOFFS BY GENERALIZED REGIONAL ZONE

Single Family Residential (SFR)

Lands zoned SFR account for almost half, 46 percent, of Goal 5 riparian and upland-wildlife resources. Protection actions on these lands will primarily affect property values and related tax payments with little or no direct impacts on employment and income. Since SFR developments typically retain more vegetation and tree cover than other types of development, this land use will conflict less with resources and retain more ecosystem services and associated economic values than other development uses. Encouraging low-impact developments and cluster development patterns may help mitigate negative economic tradeoffs for development and resources.

Multi-family Residential (MFR)

MFR lands account for approximately 5 percent of Goal 5 riparian and upland-wildlife resources. Economic tradeoffs will be similar to SFR lands except that MFR development typically retains less vegetation cover and fewer ecosystem services and associated values.

Commercial (COM)

Approximately 5 percent of Goal 5 riparian and upland-wildlife resources are on lands zoned COM. Resource-protection actions may negative affect property values, employment, income and related tax payments. COM developments involve extensive landscape modifications that negatively affect ecosystem services and the economic values of services. These negative impacts are comparable to, or greater than, the degradation of ecosystem services and values associated with MFR developments.

Industrial (IND)

IND lands account for approximately 15 percent of lands containing Goal 5 riparian and upland-wildlife resources. Economic tradeoffs will be similar in type and extent to tradeoffs for COM lands.

Mixed-Use Centers (MUC)

Approximately three percent of Goal 5 riparian and upland-wildlife resources are on lands zoned MUC. Economic tradeoffs will be similar to developments on lands zoned MFR and COM. Limiting MUC developments will have mixed impacts on 2040 Design Types and the underlying 2040 Growth Concept. Protecting riparian and upland-wildlife resources supports the Growth Concept's goals of maintaining access to nature and protecting habitat. Limiting MUC developments, however, may negatively impact the Design Type's emphasis on promoting more efficient use of land and minimizing sprawl and VMT.

Rural Residential (RUR)

RUR lands account for approximately 7 percent of Goal 5 riparian and upland-wildlife resources. Economic tradeoffs of developing RUR lands will be similar to SFR except less intensive given the more dispersed nature of RUR developments.

Parks and Open Space (POS)

Approximately 20 percent of the Goal 5 riparian and upland-wildlife resources are on lands zoned POS. Protection measures may limit recreation activities that require facilities, e.g., ball fields and golf courses, and related infrastructure, e.g., parking lots. This limitation may negatively impact property values for private parklands more than parks on public lands. Park and open-space land uses may be the least intrusive on habitats and associated ecosystem services and economic values.

The matrices at the end of this report depict the proceeding descriptions of economic tradeoffs by generalized regional zone in table format.

3.5.6. SUMMARY POINTS

- Allowing development of Goal 5 riparian and upland-wildlife resources protects development values but will degrade riparian and upland wildlife resources and the associated ecosystem services that society values.

- Prohibiting development protects resources and associated values, but will limit development-related economic benefits.

- Limiting development preserves some level of development and resource values.

- Protecting resources within the existing UGB preserves resources in close proximity to current population distributions but increases the probability of expanding the UGB sooner or to a greater extent than otherwise would be the case if protection measures displace developable land.

- Protecting resources on the urban fringe protects development interests close in, but reduces access to resources and associated ecosystem services for the majority of the population within the existing UGB.

- The details of the program options applied at the parcel level will dictate the type and extent of positive and negative economic tradeoffs for Goal 5 resource-protection measures.

- Avoid double-counting environmental consequences when developing Goal 5 programs. For example, environmental consequences were estimated by Metro staff as part of their ESEE analysis. ECONorthwest's analysis of economic consequences considered the impacts on ecosystem services, which are based in large part on Metro's analysis of environmental consequences.

4. MATRICIES OF ECONOMIC CONSEQUENCES

Single Family Residential

	Riparian & Wildlife Classes I, II, III		Upland Wildlife Classes A, B, C	
	Positive	**Negative**	**Positive**	**Negative**
Allow	• Property owners realize full development potential. • Protection of amenity/quality of life values associated with the build environment in urban areas. • Expanding UGB to offset development land lost to resource protection not required.	• Degradation of ecosystem services and values. • Higher loss of ecosystem services and values for resources in Class I compared with Classes II and III. • Municipal expenditures may increase in the future re environmental laws, flood management and water-quality control. • Damages and costs associated with flooding and landslides may increase. • Cooling costs in summer may increase. • Increased risk of foregoing future uses of resources. • Increased risk of irreversible outcome with possible negative economic results. • May increase restoration costs. • May negatively impact jobs and income that depend on quality of ecosystem services.	Similar to Riparian.	Similar to Riparian except: • Degradation of ecosystem services associated with habitat that supports salmon. Negative consequences on related commercial, recreational, spiritual and intrinsic values. • Higher loss of ecosystem services and values for resources in Class A compared with Classes B and C. • Negative impacts on employment that depends on quality of salmon habitat.

Single Family Residential

	Riparian & Wildlife Classes I, II, III		Upland Wildlife Classes A, B, C	
	Positive	**Negative**	**Positive**	**Negative**
Limit	• The economic tradeoffs associated with a limit decision will fall between the tradeoffs of allow and prohibit. Limit tradeoffs will depend on the specifics of the limit decision (severely limit, moderately limit, or slightly limit), the land use and property in question, and the mitigation possibilities. The limit option offers the most equitable distribution of positive and negative economic tradeoffs of Goal 5 protection.			
Prohibit	• Protection of riparian resource and associated ecosystem services and values. • Greater protection of services and values for Class I resource compared with Class II and III. • May reduce future costs re environmental regulations, flood management and water quality controls. • May reduce future damage and costs re flooding and landslides. • May reduce "heat-island" effect and cooling costs in summer. • Lower restoration costs compared with allow or limit. • Reduced risk of foregoing future uses of resources. • Reduced risk of irreversible outcome with possible negative economic results. • May protect jobs and income that depend on quality of ecosystem services.	• Negative consequences on development value of property and associated taxes. • Expanding the UGB to mitigate negative impacts on amount of developable land may increase costs associated with expanding or extending infrastructure and other sprawl-related costs. • SFR accounts for 46% of total resource lands and will experience more negative impacts than other land uses.	Similar to Riparian except: • Protecting wildlife habitat that supports salmon and related commercial, recreational, spiritual, and intrinsic values. • May protect jobs and income that depend on quality of salmon habitat.	Similar to Riparian.

Multi Family Residential

	Riparian & Wildlife Classes I, II, III		Upland Wildlife Classes A, B, C	
	Positive	**Negative**	**Positive**	**Negative**
Allow	Similar to SFR.	Similar to SFR except: • More habitat disturbance will generate greater negative impacts on resources, ecosystem services and associated economic values.	Similar to SFR.	Similar to SFR.
Limit	Similar to SFR.			
Prohibit	Similar to SFR.	Similar to SFR. except: • Pressure to expand UGB will be less than for SFR because of the increased density of MFR developments.	Similar to SFR.	Similar to SFR.

Commercial

	Riparian & Wildlife Classes I, II, III		Upland Wildlife Classes A, B, C	
	Positive	**Negative**	**Positive**	**Negative**
Allow	Similar to MFR except: • No employment impacts specific to development use. • No impacts on related income and income-tax revenue to municipalities.	Similar to MFR.	Similar to MFR.	Similar to MFR.
Limit	Similar to MFR.			
Prohibit	Similar to MFR.	Similar to MFR except: • COM contains 5% of significant resources. • Negative impacts on employment specific to development use. Substitutability or reconfiguration of land use may mitigate this impact. • Negative impacts on related income and income-tax revenue.	Similar to MFR.	Similar to MFR.

Industrial

	Riparian & Wildlife Classes I, II, III		Upland Wildlife Classes A, B, C	
	Positive	**Negative**	**Positive**	**Negative**
Allow	Similar to COM except: • More intensive positive development-related impacts.	Similar to COM except: • Greater negative impacts on ecosystem services.	Similar to COM.	• Similar to COM.
Limit	Similar to COM.			
Prohibit	Similar to COM except: • Greater beneficial impacts on ecosystem services.	Similar to COM except: • More intensive negative development-related impacts.	Similar to COM.	Similar to COM.

Mixed Use Centers

	Riparian & Wildlife Classes I, II, III		Upland Wildlife Classes A, B, C	
	Positive	**Negative**	**Positive**	**Negative**
Allow	Similar to MFR and COM, depending on land use.	Similar to MFR and COM, depending on land use.	Similar to MFR and COM, depending on land use.	Similar to MFR and COM, depending on land use.
Limit	Similar to MFR and COM, depending on land use.			
Prohibit	Similar to MFR and COM, depending on land use.	Similar to MFR and COM, depending on land use.	Similar to MFR and COM, depending on land use.	Similar to MFR and COM, depending on land use.

Rural

	Riparian & Wildlife Classes I, II, III		Upland Wildlife Classes A, B, C	
	Positive	**Negative**	**Positive**	**Negative**
Allow	Similar to SFR except: • Impacts will be more dispersed.	Similar to SFR except: • Impacts will be more dispersed.	Similar to SFR except: • Impacts will be more dispersed.	Similar to SFR except: • Impacts will be more dispersed.
Limit	Similar to SFR except: • Impacts will be more dispersed.			
Prohibit	Similar to SFR except: • Impacts will be more dispersed.	Similar to SFR except: • Impacts will be more dispersed.	Similar to SFR except: • Impacts will be more dispersed.	Similar to SFR except: • Impacts will be more dispersed.

Parks and Open Space

	Riparian & Wildlife Classes I, II, III		Upland Wildlife Classes A, B, C	
	Positive	**Negative**	**Positive**	**Negative**
Allow	Similar to RUR except: • Employment, income and related taxes specific to public and private parklands, e.g., golf courses, will be unaffected.	Similar to RUR.	Similar to RUR.	Similar to RUR.
Limit	Similar to RUR.			
Prohibit	Similar to RUR.	Similar to RUR except: • Negative impacts on development values specific to public and private park lands.	Similar to RUR.	Similar to RUR.

Impact Areas

	Riparian & Wildlife Classes I, II, III		Upland Wildlife Classes A, B, C	
	Positive	**Negative**	**Positive**	**Negative**
Allow	Similar to SFR, COM, IND, POS, depending on land use.	Similar to SFR, COM, IND, POS, depending on land use.	Similar to SFR, COM, IND, POS, depending on land use.	Similar to SFR, COM, IND, POS, depending on land use.
Limit	Similar to SFR, COM, IND, POS, depending on land use.			
Prohibit	Similar to SFR, COM, IND, POS, depending on land use.	Similar to SFR, COM, IND, POS, depending on land use.	Similar to SFR, COM, IND, POS, depending on land use.	Similar to SFR, COM, IND, POS, depending on land use.

5. APPENDIX TABLES

Table 1: Percentage of Goal 5 Resource Lands in Urban Development, in the UGB in 2002

	Riparian & Wildlife Resources			Upland Wildlife Resources		
	Class I	**Class II**	**Class III**	**Class A**	**Class B**	**Class C**
% of Goal 5 Lands in Urban Development	16%	33%	85%	16%	38%	34%

Source: Data analysis by Metro staff and ECONorthwest.

Table 2: Percentage of Goal 5 Resource Lands in Parks and Open Space, in the UGB in 2002

	Riparian & Wildlife Resources			Upland Wildlife Resources		
	Class I	**Class II**	**Class III**	**Class A**	**Class B**	**Class C**
% of Goal 5 Lands in Parks	41%	23%	4%	56%	18%	18%

Source: Data analysis by Metro staff and ECONorthwest.

Table 3: Percentage of Goal 5 Resource Lands Categorized as Vacant Buildable, in the UGB in 2002

	Riparian & Wildlife Resources			Upland Wildlife Resources		
	Class I	**Class II**	**Class III**	**Class A**	**Class B**	**Class C**
% of Goal 5 Lands Vacant Buildable	13%	20%	9%	25%	36%	41%

Source: Data analysis by Metro staff and ECONorthwest.

Table 4: Percentage of Goal 5 Lands In Zonings That Do Not Support Development Values, and for Zonings That Do Support Development Value, the Percentage of Lands Categorized As Low, Medium, and High Land Value, in the UGB in 2002

	Riparian Resources			Wildlife Resources		
	Class I	**Class II**	**Class III**	**Class A**	**Class B**	**Class C**
% of Goal 5 Lands in Zonings that Do Not Support Development Value	43%	25%	7%	57%	19%	19%
% Low Land Value	48%	60%	68%	38%	58%	62%
% Medium Land Value	9%	14%	22%	4%	22%	18%
% High Land Value	0%	1%	3%	1%	1%	1%
Total	100%	100%	100%	100%	100%	100%

Source: Data analysis by Metro staff and ECONorthwest.

Table 5: Percentage of Goal 5 Lands In Zonings That Do Not Support Employment, and for Zonings That Do Support Employment, the Percentage of Lands Categorized Low, Medium, and High Employment Density, in the UGB in 2002

	Riparian & Wildlife Resources			Upland Wildlife Resources		
	Class I	**Class II**	**Class III**	**Class A**	**Class B**	**Class C**
% of Goal 5 Lands in Zonings that Do Not Support Employment	83%	72%	51%	95%	91%	75%
% Low Employment Value	11%	18%	30%	3%	5%	18%
% Medium Employment Value	6%	9%	17%	2%	4%	7%
% High Employment Value	0%	1%	2%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%

Source: Data analysis by Metro staff and ECONorthwest.

Table 6: Percentage of Goal 5 Lands by 2040 Design Type That Do Not Support Development Values, and for Lands That Do Support Development Value, the Percentage of Lands Categorized as Tertiary, Secondary, and Primary Design Types, in the UGB in 2002

	Riparian Resources			Wildlife Resources		
	Class I	**Class II**	**Class III**	**Class A**	**Class B**	**Class C**
% of Goal 5 Lands By Design Types that Do Not Support Development Value	35%	15%	2%	52%	12%	10%
% Tertiary Design Type	48%	61%	52%	44%	80%	68%
% Secondary Design Type	5%	6%	13%	2%	3%	7%
% Primary Design Type	12%	18%	33%	2%	5%	15%
Total:	100%	100%	100%	100%	100%	100%

Source: Data analysis by Metro staff and ECONorthwest.

Table 7: Interactions Between Resource Acres By Zoning and 2040 Design Types, in the UGB in 2002

Zoning Type Containing Acres of Significant Riparian and Wildlife Resources	Percentage of Acres in Zoning Type Classified as Tertiary + Other 2040 Design Types	Percentage of Acres in Zoning Type Classified as Primary 2040 Design Type
Single Family Residential	98%	1%
Parks and Open Space	98%	0.3%
Industrial	33%	60%

Source: Data analysis by Metro staff and ECONorthwest.

Table 8: Interactions Between Resource Acres By Zoning and Combined Measures of Development Value, in the UGB in 2002

Zoning Type Containing Acres of Significant Riparian and Wildlife Resources	% of Acres In Zoning Type Classified as "Other" Design Type	% of Acres in Zoning Type with All Low Measures	% of Acres in Zoning Type with At Least One Medium Measure, No High Measures	% of Acres in Zoning Type with At Least One High Measure
Single Family Residential	16.7%	60.9%	20.7%	1.7%
Parks and Open Space	81.0%	16.9%	1.7%	0.3%
Industrial	10.3%	14.1%	15.1%	60.5%

Source: Data analysis by Metro staff and ECONorthwest.

APPENDIX D

ESEE Consequences by Generalized Regional Zones

<table>
<tr><td rowspan="3">Development scenario</td><td colspan="4">Economic consequences:
SINGLE FAMILY RESIDENTIAL (SFR)</td></tr>
<tr><td colspan="2">Class I, II and III Riparian/wildlife</td><td colspan="2">Class A, B, and C Upland wildlife habitat</td></tr>
<tr><td>Positive</td><td>Negative</td><td>Positive</td><td>Negative</td></tr>
<tr><td>ALLOW</td><td>• Property owners realize full development potential.
• Protection of amenity/quality of life values associated with the build environment in urban areas.
• Expanding UGB not required.</td><td>• Degradation of ecosystem services and values.
• Higher loss of ecosystem services and values for resources in Class I compared with Classes II and III.
• See full table of interactions for tradeoffs of low-, medium, and high-valued SFR with Class I, II, III resources.
• Municipal expenditures in the future re environmental laws may increase.
• Municipal expenditures in the future re flood management and water quality may increase.
• Damages and costs associated with flooding and landslides may increase.
• Cooling costs in summer may increase.
• Increased risk of foregoing future uses of resources.
• Increased risk of irreversible outcome with possible negative economic results.
• May include restoration costs.
• May negatively impact jobs and income that depend on quality of ecosystem services.</td><td>Similar to Riparian</td><td>Similar to Riparian except:
• Degradation of ecosystem services associated with habitat that supports salmon. Negative consequences on related commercial, recreational, spiritual and intrinsic values.
• Higher loss of ecosystem services and values for resources in Class A compared with Classes B and C.
• See full table of interactions for tradeoffs of low-, medium, and high-valued SFR with Class A, B, and C resources.
• Negative impacts on employment that depends on quality of salmon habitat.</td></tr>
<tr><td>LIMIT</td><td colspan="4">The economic tradeoffs associated with a limit decision will fall between the tradeoffs of allow and prohibit. Limit tradeoffs will depend on the specifics of the limit decision (severely limit, moderately limit, or slightly limit), the land use and property in question, and the mitigation possibilities.</td></tr>
</table>

Development scenario	Economic consequences: SINGLE FAMILY RESIDENTIAL (SFR)			
	Class I, II and III Riparian/wildlife		**Class A, B, and C Upland wildlife habitat**	
	Positive	***Negative***	***Positive***	***Negative***
PROHIBIT	• Protection of riparian resource and associated ecosystem services and values. • Greater protection of services and values for Class I resource compared with Class II and III. • May reduce future costs re environmental regulations. • May reduce future costs re flood management and water quality. • May reduce future damage and costs re flooding and landslides. • May reduce "heat-island" effect and cooling costs in summer. • No restoration costs. • Reduced risk of foregoing future uses of resources. • Reduced risk of irreversible outcome with possible negative economic results. • May protect jobs and income that depend on quality of ecosystem services.	• Negative consequences on development value of property. Substitutability or reconfiguration of land use may mitigate this consequence. • 1% of SFR has "High" land value. • 98% of SFR ranked "Low" on 2040 Design Types. • 78% of SFR ranked "Low" on all measures of development value. • See full table of interactions for tradeoffs of low-, medium, and high-valued SFR with Class I, II, III resources. • Expanding the UGB to mitigate negative impacts on amount of developable land may increase costs associated with expanding or extending infrastructure and other sprawl-related costs. • SFR accounts for 46% of total resource lands and will experience more negative impacts than other land uses.	*Similar to Riparian except:* • Protection of wildlife habitat that supports salmon and related commercial, recreational, spiritual, and intrinsic values. • May protect jobs and income that depend on quality of salmon habitat. • See full table of interactions for tradeoffs of low-, medium, and high-valued SFR with Class A, B, and C resources.	*Similar to Riparian*

Development scenario	Economic consequences: MULTI-FAMILY RESIDENTIAL (MFR)			
	Class I, II and III Riparian/wildlife		Class A, B, and C Upland wildlife habitat	
	Positive	***Negative***	***Positive***	***Negative***
ALLOW	*Similar to SFR except:* • Reduced need for UGB expansion and associated costs.	*Similar to SFR. except:* • Increased negative impacts on economic costs and damage associated with stormwater (flooding) and water quality. • See full table of interactions for tradeoffs of low-, medium, and high-valued MFR with Class I, II, III resources.	*Similar to SFR.*	*Similar to SFR except:* • See full table of interactions for tradeoffs of low-, medium, and high-valued MFR with Class A, B, C resources.
LIMIT	*Similar to SFR.*	*Similar to SFR.*	*Similar to SFR.*	*Similar to SFR.*
PROHIBIT	*Similar to SFR.*	*Similar to SFR. except:* • MFR accounts for 5% of significant resources. • 66% of MFR lands ranked low on land value and 4% ranked high. • 86% of MFR ranked “Low” on 2040 Design Types. • 68% ranked “Low” on all measures of development value. • See full table of interactions for tradeoffs of low-, medium, and high-valued MFR with Class I, II, III resources. • Increased concentration of development means that the marginal demand to expand UGB will be less than for SFR.	*Similar to SFR.*	*Similar to SFR except:* • See full table of interactions for tradeoffs of low-, medium, and high-valued MFR with Class A, B, C resources.

Development scenario	Economic consequences: COMMERCIAL (COM)			
	Class I, II and III Riparian/wildlife		**Class A, B, and C Upland wildlife habitat**	
	Positive	***Negative***	***Positive***	***Negative***
ALLOW	*Similar to MFR except:* • No employment impacts specific to development use. • No impacts on related income and income-tax revenue to municipalities.	*Similar to MFR except:* • Increased costs and damage associated with stormwater (flooding) and water quality. • See full table of interactions for tradeoffs of low-, medium, and high-valued COM with Class I, II, III resources.	*Similar to MFR.*	*Similar to MFR except:* • See full table of interactions for tradeoffs of low-, medium, and high-valued COM with Class A, B, C resources.
LIMIT	*Similar to MFR.*	*Similar to MFR.*	*Similar to MFR.*	*Similar to MFR.*
PROHIBIT	*Similar to MFR.*	*Similar to MFR except:* • COM contains 5% of significant resources. • Negative impacts on employment specific to development use. Substitutability or reconfiguration of land use may mitigate this impact. • Negative impacts on related income and income-tax revenue to municipalities. • 81% COM ranked "Low" land value. • 57% COM ranked "Low" employment and 0.2% ranked "High" employment. • 77% COM ranked "Low" on 2040 Design Type • 63% COM ranked "Low" on all measures of development value. 9% COM ranked high on one measure. • See full table of interactions for tradeoffs of low-, medium, and high-valued COM with Class I, II, III resources.	*Similar to MFR.*	*Similar to MFR except:* • See full table of interactions for tradeoffs of low-, medium, and high-valued COM with Class A, B, and C resources.

<table>
<tr><th rowspan="3">Development scenario</th><th colspan="4">Economic consequences:
INDUSTRIAL (IND)</th></tr>
<tr><th colspan="2">Class I, II and III Riparian/wildlife</th><th colspan="2">Class A, B, and C Upland wildlife habitat</th></tr>
<tr><th>Positive</th><th>Negative</th><th>Positive</th><th>Negative</th></tr>
<tr><td>ALLOW</td><td>Similar to MFR except:
• No employment impacts specific to development use.
• No impacts on related income and income-tax revenue to municipalities.</td><td>Similar to MFR except:
• Increased costs and damage associated with negative impacts on ecosystem services.
• IND accounts for 14% of significant resources.
• See full table of interactions for tradeoffs of low-, medium, and high-valued IND with Class I, II, III resources.</td><td>Similar to MFR.</td><td>Similar to MFR except:
• See full table of interactions for tradeoffs of low-, medium, and high-valued IND with Class A, B, and C resources.</td></tr>
<tr><td>LIMIT</td><td>Similar to MFR.</td><td>Similar to MFR.</td><td>Similar to MFR.</td><td>Similar to MFR.</td></tr>
<tr><td>PROHIBIT</td><td>Similar to MFR.</td><td>Similar to MFR except:
• Negative impacts on employment specific to development use. Substitutability or reconfiguration of land use may mitigate this impact.
• Negative impacts on related income and income-tax revenue to municipalities.
• 93% ranked “Low” land value.
• 70% ranked “Low” employment.
• 32% ranked “Low” 2040 Design Type and 60% ranked “High.”
• 24% ranked “Low” on all measures of development value. 61% ranked “High” on at least one measure.</td><td>Similar to MFR.</td><td>Similar to MFR.</td></tr>
</table>

Development scenario	Economic consequences: MIXED-USE CENTERS (MUC)			
	Class I, II and III Riparian/wildlife		**Class A, B, and C Upland wildlife habitat**	
	Positive	***Negative***	***Positive***	***Negative***
ALLOW	*Similar to MFR and COM, depending on land use.*	*Similar to MFR and COM, depending on land use except:* • MUC accounts for 2% of significant resources. • See full table of interactions for tradeoffs of low-, medium, and high-valued MUC with Class I, II, III resources.	*Similar to MFR and COM, depending on land use.*	*Similar to MFR and COM, depending on land use except:* • See full table of interactions for tradeoffs of low-, medium, and high-valued MUC with Class A, B, and C resources.
LIMIT	*Similar to MFR and COM, depending on land use.*	*Similar to MFR and COM, depending on land use.*	*Similar to MFR and COM, depending on land use.*	*Similar to MFR and COM, depending on land use.*
PROHIBIT	*Similar to MFR and COM, depending on land use.*	*Similar to MFR except:* • Negative impacts on employment specific to development use. Substitutability or reconfiguration of land use may mitigate this impact. • Negative impacts on related income and income-tax revenue to municipalities. • 74% ranked "Low" land value. • 41% ranked "Low", 49% ranked "Medium," and 10% ranked "High" employment. • 24% ranked "Low," and 19% ranked "High" on 2040 Design Types. • 17% ranked "Low" on all measures of development value, 64% ranked "Medium" on at least one measure, and 19% ranked "High" on at least one measure.	*Similar to MFR and COM, depending on land use.*	*Similar to MFR and COM, depending on land use.*

Development scenario	Economic consequences: RURAL (RUR)			
	Class I, II and III Riparian/wildlife		**Class A, B, and C Upland wildlife habitat**	
	Positive	***Negative***	***Positive***	***Negative***
ALLOW	*Similar to SFR.*	*Similar to SFR except:* • RUR accounts for 7% of significant resources. • See full table of interactions for tradeoffs of low-, medium, and high-valued RUR with Class I, II, III resources.	*Similar to SFR.*	*Similar to SFR except:* • See full table of interactions for tradeoffs of low-, medium, and high-valued RUR with Class A, B, and C resources.
LIMIT	*Similar to SFR.*	*Similar to SFR.*	*Similar to SFR.*	*Similar to SFR.*
PROHIBIT	*Similar to SFR.*	*Similar to SFR except:* • 100% of RUR ranked “Low” on land value. • 84% ranked “Low” and 15% ranked “High” on 2040 Design Types. • 83% ranked “Low” on all measures of development value, 15% ranked “High” on at least one measure.	*Similar to SFR.*	*Similar to SFR.*

Development scenario	Economic consequences: PARKS AND OPEN SPACE (POS)			
	Class I, II and III Riparian/wildlife		**Class A, B, and C Upland wildlife habitat**	
	Positive	***Negative***	***Positive***	***Negative***
ALLOW	*Similar to RUR.*	*Similar to RUR except:* • POS contain approximately 20% of the Goal 5 significant resources. • See full table of interactions for tradeoffs of low-, medium, and high-valued POS with Class I, II, III resources.	*Similar to RUR.*	*Similar to RUR except:* • See full table of interactions for tradeoffs of low-, medium, and high-valued POS with Class A, B, and C resources.
LIMIT	*Similar to RUR.*	*Similar to RUR.*	*Similar to RUR.*	*Similar to RUR.*
PROHIBIT	*Similar to RUR.*	*Similar to RUR except:* • In general, this category has no development value.	*Similar to RUR.*	*Similar to RUR.*

Development scenario	Economic consequences: IMPACT AREAS			
	Class I, II and III Riparian/wildlife		**Class A, B, and C Upland wildlife habitat**	
	Positive	***Negative***	***Positive***	***Negative***
ALLOW	*Depends on land use. May be similar to SFR, COM, IND, POS.*	*Depends on land use. May be similar to SFR, COM, IND, POS.* • See full table of interactions for tradeoffs of low-, medium, and high-valued Impact Areas with Class I, II, III resources.	*Depends on land use. May be similar to SFR, COM, IND, POS.*	*Depends on land use. May be similar to SFR, COM, IND, POS.* • See full table of interactions for tradeoffs of low-, medium, and high-valued Impact Areas with Class A, B, C resources.
LIMIT	*Depends on land use. May be similar to SFR, COM, IND, POS.*	*Depends on land use. May be similar to SFR, COM, IND, POS.*	*Depends on land use. May be similar to SFR, COM, IND, POS.*	*Depends on land use. May be similar to SFR, COM, IND, POS.*
PROHIBIT	*Depends on land use. May be similar to SFR, COM, IND, POS.*	*Depends on land use. May be similar to SFR, COM, IND, POS.*	*Depends on land use. May be similar to SFR, COM, IND, POS.*	*Depends on land use. May be similar to SFR, COM, IND, POS.*

<table>
<tr><td rowspan="3">Development scenario</td><td colspan="2">Social consequences:
SINGLE-FAMILY RESIDENTIAL</td></tr>
<tr><td colspan="2">Riparian and wildlife habitat resources</td></tr>
<tr><td>Positive</td><td>Negative</td></tr>
<tr><td>ALLOW</td><td>• Maintain housing options
• No change in property rights
• No takings concern
• Maintain personal financial security (equity)
• Equitable impact on property owners
Wildlife habitat same as riparian, except:
• Less vegetation may reduce risk of wildfires
• Less habitat may reduce number of undesirable species</td><td>• May lose cultural heritage
• May not protect salmon and may impact Native American culture and regional identity
• May change neighborhood character and sense of place
• Scenic values may be lost
• Incompatible land uses may lose buffers
• May degrade environmental quality and affect health
• May lose recreational and educational opportunities
• Loss of tree canopy and vegetation may increase stress levels and impact mental health
• May increase risk of landslides and floods if tree canopy and vegetation are removed
• Loss of intergenerational equity</td></tr>
<tr><td>LIMIT</td><td>• Maintain housing options when development can occur with minimal impact to the resource
• Preserve some buffering of incompatible uses
• Retain some or most of our cultural heritage
• Provide salmon more of a chance to recover and lessen impacts on Native American culture and regional identity
• Retain most neighborhood character and sense of place
• Preserve most scenic values
• Maintain environmental quality and reduce negative health impacts
• Retain most educational and recreational opportunities
• Retention of tree canopy and vegetation may reduce stress levels and positively impact mental health
• Reduce risk of landslides and floods
• Provide some amount of intergenerational equity</td><td>• May reduce option for large-lot single-family homes
• Regulations may affect property rights – owners may not be able to develop land to same extent
• May result in takings concerns
• Could have a negative impact on property values and thus decrease personal financial security
• Impact on property owners is not equitable – only those with significant resources are impacted
Wildlife habitat same as riparian, except:
• More vegetation could increase risk of wildfires
• More habitat could increase number of undesirable species</td></tr>
<tr><td>PROHIBIT
•</td><td>• Preserve cultural heritage
• Provide salmon a chance to recover and lessen impacts on Native American culture and regional identity
• Preserve or increase buffers between incompatible land uses
• Retain neighborhood character and sense of place
• Preserve scenic values
• Maintain and possibly improve environmental quality and reduce negative health impacts
• Retain educational and recreational opportunities
• Retention of tree canopy and vegetation may reduce stress levels and positively impact mental health
• Reduce risk of landslides and floods
• Provide intergenerational equity</td><td>• Reduce housing options and opportunities (Even if residential land is provided outside the UGB it is not equivalent to land in existing neighborhoods)
• May impact housing affordability
• Regulations would impact property rights – owners may not be able to develop land to same extent
• Likely to result in takings concerns
• Could have a negative impact on property values and thus decrease personal financial security
• Impact on property owners is not equitable – only those with significant resources are impacted
Wildlife habitat same as riparian, except:
• More vegetation could increase risk of wildfires
• More habitat could increase number of undesirable species</td></tr>
</table>

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<table>
<tr><th rowspan="3">Development scenario</th><th colspan="2">Social consequences:
MULTI-FAMILY RESIDENTIAL</th></tr>
<tr><th colspan="2">Riparian and wildlife habitat resources</th></tr>
<tr><th>Positive</th><th>Negative</th></tr>
<tr><td>ALLOW</td><td>• Maintain housing options
• No change in property rights
• No takings concern
• Equitable impact on property owners
Wildlife habitat same as riparian, except:
• Less vegetation may reduce risk of wildfires
• Less habitat may reduce number of undesirable species</td><td>• May lose cultural heritage
• May not protect salmon and thus impact Native American culture and regional identity
• May change neighborhood character and sense of place
• Scenic values may be lost
• Incompatible land uses may lose buffers
• May degrade environmental quality and impact health
• May lose recreational and educational opportunities
• Loss of tree canopy and vegetation may increase stress levels and impact mental health
• May increase risk of landslides and floods if tree canopy and vegetation are removed
• Loss of intergenerational equity</td></tr>
<tr><td>LIMIT</td><td>• Maintain housing options when development can occur with minimal impact to the resource
• Preserve some buffering of incompatible uses
• Retain some or most of our cultural heritage
• Provide salmon more of a chance to recover and lessen impacts on Native American culture and regional identity
• Retain most neighborhood character and sense of place
• Preserve most scenic values
• Maintain environmental quality and reduce negative health impacts
• Retain most educational and recreational opportunities
• Retention of tree canopy and vegetation may reduce stress levels and positively impact mental health
• Reduce risk of landslides and floods
• Provide some amount of intergenerational equity</td><td>• May reduce opportunities to develop at high density
• May impact housing affordability
• Regulations may impact property rights – owners may not be able to develop land to same extent
• Limit decision may result in takings concerns
• Impact on property owners is not equitable – only those with significant resources are impacted
Wildlife habitat same as riparian, except:
• More vegetation could increase risk of wildfires
• More habitat could increase number of undesirable species</td></tr>
<tr><td>PROHIBIT</td><td>• Preserve cultural heritage
• Provide salmon a chance to recover and lessen impacts on Native American culture and regional identity
• Preserve or increase buffers between incompatible land uses
• Retain neighborhood character and sense of place
• Preserve scenic values
• Maintain and possibly improve environmental quality and reduce negative health impacts
• Retain educational and recreational opportunities
• Retention of tree canopy and vegetation may reduce stress levels and positively impact mental health
• Reduce risk of landslides and floods
• Provide intergenerational equity</td><td>• Reduce housing options and opportunities (even if residential land is provided outside the UGB, it is not equivalent to land in existing neighborhoods)
• May impact housing affordability
• Regulations would impact property rights – owners may not be able to develop land to same extent
• Likely to result in takings concerns
• Impact on property owners is not equitable – only those with significant resources are impacted
Wildlife habitat same as riparian, except:
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Development scenario	Social consequences: MIXED-USE CENTERS	
	Riparian and wildlife habitat resources	
	Positive	***Negative***
ALLOW	• Maintain housing options • Maintain employment opportunities • Does not impact 2040 densities and development in centers • Allows residents opportunity to live near where they work • No change in property rights • No takings concern • Equitable impact on property owners *Wildlife habitat same as riparian, except:* • Less vegetation may reduce risk of wildfires • Less habitat may reduce number of undesirable species	• 2040 growth concept emphasizes importance of green corridors, a healthy ecosystem • May lose cultural heritage • May not protect salmon and thus impact Native American culture and regional identity • May change neighborhood character and sense of place • Scenic values may be lost • Incompatible land uses may lose buffers • May degrade environmental quality and impact health • May lose recreational and educational opportunities • Loss of tree canopy and vegetation may increase stress levels and impact mental health • May increase risk of landslides and floods if tree canopy and vegetation are removed • Loss of intergenerational equity
LIMIT	• Maintain housing options when development can occur with minimal impact to the resource • Maintain employment opportunities if development can occur with minimal impact to the resource • Preserve some buffering of incompatible uses • Retain some or most of our cultural heritage • Provide salmon more of a chance to recover and lessen impacts on Native American culture and regional identity • Retain most neighborhood character and sense of place • Preserve most scenic values • Maintain environmental quality and reduce negative health impacts • Retain most educational and recreational opportunities • Retention of tree canopy and vegetation may reduce stress levels and positively impact mental health • Reduce risk of landslides and floods • Provide some amount of intergenerational equity	• May impact 2040 growth concept if development in centers is curtailed • May reduce opportunities to develop at high density • May reduce employment and housing opportunities • May impact housing affordability • Regulations may impact property rights – owners may not be able to develop land to same extent • Limit decision may result in takings concerns • Impact on property owners is not equitable – only those with significant resources are impacted *Wildlife habitat same as riparian, except:* • More vegetation could increase risk of wildfires • More habitat could increase number of undesirable species

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MIXED-USE CENTERS</td></tr>
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<tr><td>Positive</td><td>Negative</td></tr>
<tr><td>PROHIBIT</td><td>• Preserve cultural heritage
• Provide salmon a chance to recover and lessen impacts on Native American culture and regional identity
• Preserve or increase buffers between incompatible land uses
• Retain neighborhood character and sense of place
• Preserve scenic values
• Maintain and possibly improve environmental quality and reduce negative health impacts
• Retain educational and recreational opportunities
• Retention of tree canopy and vegetation may reduce stress levels and positively impact mental health
• Reduce risk of landslides and floods
• Provide intergenerational equity</td><td>• Negative impact to 2040 growth concept if development in centers is curtailed
• Reduce housing and employment options and opportunities. Even if residential and employment land is provided outside the UGB, it is not equivalent to land in existing neighborhoods and centers.
• May impact housing affordability
• Regulations would impact property rights – owners may not be able to develop land to same extent
• Likely to result in takings concerns
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Wildlife habitat same as riparian, except:
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<tr><th rowspan="3">Development scenario</th><th colspan="2">Social consequences:
COMMERCIAL</th></tr>
<tr><th colspan="2">Riparian and wildlife habitat resources</th></tr>
<tr><th>Positive</th><th>Negative</th></tr>
<tr><td>ALLOW</td><td>• Maintain employment opportunities
• No change in property rights
• No takings concern
• Equitable impact on property owners
Wildlife habitat same as riparian, except:
• Less vegetation may reduce risk of wildfires
• Less habitat may reduce number of undesirable species</td><td>• 2040 growth concept emphasizes the importance of green corridors and a healthy ecosystem
• May lose cultural heritage
• May not protect salmon and thus impact Native American culture and regional identity
• Scenic values may be lost
• Incompatible land uses may lose buffers
• May degrade environmental quality and impact health
• May lose recreational and educational opportunities
• Loss of tree canopy and vegetation may increase stress levels and impact mental health
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<tr><td>LIMIT</td><td>• Maintain employment opportunities if development can occur with minimal impact to the resource
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• Provide some amount of intergenerational equity</td><td>• May reduce employment opportunities
• Regulations may impact property rights – owners may not be able to develop land to same extent
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• Reduce risk of landslides and floods
• Provide intergenerational equity</td><td>• Reduce employment options and opportunities. Even if employment land is provided outside the UGB, it is not equivalent to land in existing neighborhoods and centers.
• Regulations would impact property rights – owners may not be able to develop land to same extent
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<tr><th rowspan="3">Development scenario</th><th colspan="2">Social consequences:
INDUSTRIAL</th></tr>
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<tr><th>Positive</th><th>Negative</th></tr>
<tr><td>ALLOW</td><td>• Maintain employment opportunities
• No change in property rights
• No takings concern
• Equitable impact on property owners
Wildlife habitat same as riparian, except:
• Less vegetation may reduce risk of wildfires
• Less habitat may reduce number of undesirable species</td><td>• May lose cultural heritage
• May not protect salmon and thus impact Native American culture and regional identity
• Scenic values may be lost
• Incompatible land uses may lose buffers
• May degrade environmental quality and impact health
• May lose recreational and educational opportunities
• Loss of tree canopy and vegetation may increase stress levels and impact mental health
• May increase risk of landslides and floods if tree canopy and vegetation are removed
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<tr><td>LIMIT</td><td>• Maintain employment opportunities if development can occur with minimal impact to the resource
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• Provide some amount of intergenerational equity</td><td>• May reduce employment opportunities
• Regulations may impact property rights – owners may not be able to develop land to same extent
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• Preserve or increase buffers between incompatible land uses
• Preserve scenic values
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• Retain educational and recreational opportunities
• Retention of tree canopy and vegetation may reduce stress levels and positively impact mental health
• Reduce risk of landslides and floods
• Provide intergenerational equity</td><td>• Reduce employment options and opportunities. Even if employment land is provided outside the UGB, it is not equivalent to land in existing neighborhoods and centers.
• Regulations would impact property rights – owners may not be able to develop land to same extent
• Likely to result in takings concerns
• Impact on property owners is not equitable – only those with significant resources are impacted
Wildlife habitat same as riparian, except:
• More vegetation could increase risk of wildfires
• More habitat could increase number of undesirable species</td></tr>
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Development scenario	Social consequences: RURAL — Riparian and wildlife habitat resources — Positive	Negative
ALLOW	• *Metro does not regulate agricultural activities, thus the impacts of allowing, limiting or prohibiting agricultural disturbances to the resource are not described here* • Maintain housing and employment opportunities in the future if land is to be urbanized • No change in property rights • No takings concern • Equitable impact on property owners *Wildlife habitat same as riparian, except:* • Less vegetation may reduce risk of wildfires • Less habitat may reduce number of undesirable species	• May lose cultural heritage • May not protect salmon and thus impact Native American culture and regional identity • Scenic values may be lost • Incompatible land uses may lose buffers • May degrade environmental quality and impact health • May lose recreational and educational opportunities • Loss of tree canopy and vegetation may increase stress levels and impact mental health • May increase risk of landslides and floods if tree canopy and vegetation are removed • Loss of intergenerational equity
LIMIT	• Maintain housing and employment opportunities in future if urbanized and development occurs with minimal impact to the resource • Preserve some buffering of incompatible uses • Retain some or most of our cultural heritage • Provide salmon more of a chance to recover and lessen impacts on Native American culture and regional identity • Preserve most scenic values • Maintain environmental quality and reduce negative health impacts • Retain most educational and recreational opportunities • Retention of tree canopy and vegetation may reduce stress levels and positively impact mental health • Reduce risk of landslides and floods • Provide some amount of intergenerational equity	• May reduce housing and employment opportunities in future if land is to be urbanized • Regulations may impact property rights – owners may not be able to develop land to same extent • Limit decision may result in takings concerns • Impact on property owners is not equitable – only those with significant resources are impacted *Wildlife habitat same as riparian, except:* • More vegetation could increase risk of wildfires • More habitat could increase number of undesirable species
PROHIBIT	• Preserve cultural heritage • Provide salmon a chance to recover and lessen impacts on Native American culture and regional identity • Preserve or increase buffers between incompatible land uses • Preserve scenic values • Maintain and possibly improve environmental quality and reduce negative health impacts • Retain educational and recreational opportunities • Retention of tree canopy and vegetation may reduce stress levels and positively impact mental health • Reduce risk of landslides and floods • Provide intergenerational equity	• Reduce housing and employment options and opportunities – if area is to be urbanized in the future will impact land available for housing and employment • Regulations would impact property rights – owners may not be able to develop land to same extent • Likely to result in takings concerns • Impact on property owners is not equitable – only those with significant resources are impacted *Wildlife habitat same as riparian, except:* • More vegetation could increase risk of wildfires • More habitat could increase number of undesirable species

Development scenario	Social consequences: PARKS AND OPENSPACE	
	Riparian and wildlife habitat resources	
	Positive	***Negative***
ALLOW	• Maintain or increase opportunities for active recreation if parks are converted to ball fields, boat ramps, or other community structures *Wildlife habitat same as riparian, except:* • Less vegetation may reduce risk of wildfires • Less habitat may reduce number of undesirable species	• May lose cultural heritage • May not protect salmon and thus impact Native American culture and regional identity • Scenic values may be lost • May degrade environmental quality and impact health • May lose recreational and educational opportunities • Loss of tree canopy and vegetation may increase stress levels and impact mental health • May increase risk of landslides and floods if tree canopy and vegetation are removed • Loss of intergenerational equity
LIMIT	• Maintain existing active park use and provide new opportunities if development occurs with minimal impact to the resource • Retain some or most of our cultural heritage • Provide salmon more of a chance to recover and lessen impacts on Native American culture and regional identity • Preserve most scenic values • Maintain environmental quality and reduce negative health impacts • Retain most educational and recreational opportunities • Retention of tree canopy and vegetation may reduce stress levels and positively impact mental health • Reduce risk of landslides and floods • Provide some amount of intergenerational equity	• May reduce opportunities for active recreation *Wildlife habitat same as riparian, except:* • More vegetation could increase risk of wildfires • More habitat could increase number of undesirable species
PROHIBIT	• Preserve cultural heritage • Provide salmon a chance to recover and lessen impacts on Native American culture and regional identity • Preserve scenic values • Maintain and possibly improve environmental quality and reduce negative health impacts • Retain educational and recreational opportunities • Retention of tree canopy and vegetation may reduce stress levels and positively impact mental health • Reduce risk of landslides and floods • Provide intergenerational equity	• Reduce opportunities for active recreation *Wildlife habitat same as riparian, except:* • More vegetation could increase risk of wildfires • More habitat could increase number of undesirable species

Development scenario	Social consequences: IMPACT AREA	
	Riparian and wildlife habitat resources	
	Positive	***Negative***
ALLOW	Same as described above depending on the regional zoning category	Same as described above depending on the regional zoning category
LIMIT	Same as described above depending on the regional zoning category	Same as described above depending on the regional zoning category
PROHIBIT	Same as described above depending on the regional zoning category	Same as described above depending on the regional zoning category

<table>
<tr><td rowspan="3">Development scenario</td><td colspan="4">Environmental consequences:
SINGLE FAMILY RESIDENTIAL</td></tr>
<tr><td colspan="2">Class I Riparian resources</td><td colspan="2">Class A Wildlife Habitat resources</td></tr>
<tr><td>Positive</td><td>Negative</td><td>Positive</td><td>Negative</td></tr>
<tr><td>ALLOW</td>
<td>• Functional consequences: no positive consequences noted beyond that provided by existing protection (e.g., Title 3)
• Reduced need for UGB expansion (protects land outside UGB)
• Low to medium density SFR may retain more trees/vegetation than most other zoning types; local studies show that increased forest canopy near streams and throughout the watershed is associated with healthier streams
• This zoning type contains the largest amount of Class I Riparian Resources, therefore incentives and education could improve land stewardship, but would require substantial financial investment</td>
<td>• Functional consequences: Widespread loss of 3-5 primary ecological functions, including: microclimate and shade; streamflow moderation/water storage; bank stabilization, sediment and pollution control; large wood and channel dynamics; and organic material sources. Class I Riparian resources also contain a substantial portion of high-value wildlife habitat (not included in Class A or B wildlife habitat if falls in Class I riparian), which would also be compromised or removed
• Medium to high density housing tends to retain less vegetation and add more imperviousness; these factors are known to harm streams and wetlands
• Likely harm to salmon and wildlife through habitat loss and degradation
• Increased pesticide and fertilizer use degrades water quality
• Landscaping uses water
• Continued development in flood areas
• Continued wetland conversion
• Non-native species introductions
• Severity of consequences relates to:
o housing density
o proximity to water resources
o amount of vegetation retained onsite
o amount of effective imperviousness
o stormwater management practices
o landowner/land user outreach and education</td>
<td>Similar to Class I Riparian Resources
• Functional consequences: no positive consequences noted
• Low to medium density SFR may retain more natural land cover than most other zoning types, providing wildlife habitat and connectivity</td>
<td>• Functional consequences: Loss of key habitat characteristics including large patch size, shape (habitat interior), water resources, connectivity
• High density housing may not retain trees and other vegetation; partial or complete loss of largest, most well-connected and water-rich patches
• Extensive loss of valuable wildlife habitat
• Non-native plant and animal species invasions
• Increased adverse edge effects
• Reduced wildlife food and cover
• Reduced woody debris and snags
• Pesticides may harm wildlife
• Noise and light disturbances
• Continued native species loss over time
• Reduction in Neotropical migratory songbirds
• Most extensive loss of habitat interior and associated species outside Class I riparian
• Further decline of at-risk wildlife species; more species likely to become imperiled
• Continued loss of Habitats of Concern and associated species
• Wildlife crossings across roadways cause mortality</td></tr>
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<tr><th>Positive</th><th>Negative</th><th>Positive</th><th>Negative</th></tr>
<tr><td>LIMIT</td><td>• Functional consequences: May conserve some level of 3-5 existing primary ecological functions, depending on program, as well as Class A or B wildlife habitat falling within Class I riparian; extent depends on program
• Reduced need for UGB expansion compared to “prohibit”
• Strong potential for restoration and mitigation activities to offset negative ecological effects
• Strong potential for BMP implementation and low impact development and innovative design standards
• Hydrology less altered than “allow”
• The large extent of Class I Riparian Resources in SFR represents substantial mitigation, restoration and land stewardship opportunities, but would require investment</td><td>• Functional consequences: Potential for substantial loss of 3-5 primary ecological functions, as described in Allow. Class A or B wildlife habitat falling within Class I riparian would also be compromised. Extent of loss depends on program.
• See comments under “allow,” except:
• Hydrology less altered, less stream damage
• Greater protection of flood areas and wetlands
• Greater protection of steep slope areas
• Fish and other aquatic wildlife habitat impaired, but extent of loss reduced
• Water quality impacts likely, but degree depends on program effectiveness</td><td>• Functional consequences: Some retention of key habitat attributes (patch size, habitat interior, connectivity and water resources) for habitat outside Class I riparian
• More habitat retained than Allow
• Reduced edge effects
• Fewer non-native species invasions
• More connectivity retained
• Less harm to native species
• Reduced need for UGB expansion
• Landscaping can provide diverse habitats
• Low to moderate levels of development provide good habitat for some species
• This zoning type contains the largest amount of Class A Wildlife Habitat resources outside of Riparian Class I, therefore represents mitigation, restoration and land stewardship opportunities</td><td>Similar to “allow,” but to a lesser degree depending on program options
• Functional consequences: Potential for reduction in habitat patch size, connectivity, and amount of interior habitat, reducing ecological function of habitat</td></tr>
<tr><td>PROHIBIT</td><td>• Functional consequences: Preservation of the most ecologically functional riparian areas, as well as some of the most important wildlife habitat remaining in the region, including Habitats of Concern (especially wetlands, bottomland hardwood)
• Helps maintain hydrologic connectivity
• Minimizes hydrologic alterations, reduces flooding
• Retention of important salmon habitat</td><td>• Functional consequences: no adverse consequences noted to Class I resources
• Increased need for UGB expansion
• Potential for increased infrastructure intrusion into other resource areas due to avoiding Class I riparian areas</td><td>• Functional consequences: Retention of key habitat attributes (patch size, habitat interior, connectivity and water resources) for habitat outside Class I riparian
• Retention of some of the best remaining wildlife habitats in the region
• This option will provide key breeding habitat for Neotropical migrants, aquatic species and habitat interior specialists (but see next column)
• Retains Habitats of Concern
• Provides important source habitats for native wildlife and plant species
• Reduced wildlife road crossing mortality</td><td>• Functional consequences: Continuing functionality of Class A habitat patches may depend on connectivity with other, less valuable habitat patches
• If conflicting uses are prohibited in all Class A wildlife habitat patches, other habitat patches may be disproportionately removed or altered, thereby reducing the functionality of Class A habitat patches through connectivity loss
• Class A patches are typically very large, therefore may result in a need for UGB expansions</td></tr>
</table>

Environmental consequences: SINGLE FAMILY RESIDENTIAL (SFR)

Development scenario	Class II Riparian resources		Class B Wildlife Habitat resources	
	Positive	**_Negative_**	**_Positive_**	**_Negative_**
ALLOW	*Similar to Class I riparian resources* • This zoning type contains the largest amount of Class II Riparian Resources, therefore represents substantial mitigation, restoration and land stewardship opportunities	*Similar to Class I riparian resources, except:* • Loss of restoration opportunities where ecological functions could be regained through tree canopy increases or other measures • Loss of functionality would be less because less ecological function exists; however, loss of this resource type would remove existing water quality filtration capacity or other ecological services, leaving waterways with little or no protection from conflicting uses	*Similar to Class I Riparian Resources* • SFR contains majority of Class B Wildlife Habitat Resources, therefore represents substantial mitigation, restoration and land stewardship opportunities	*Similar to Class A, except:* • Habitat interior loss less extensive than Class A • Loss of connectivity especially pronounced; extensive loss of migratory stopover habitat and movement corridors. Reduces value of Class A patches. • Loss of grassland and low-structure vegetation within 300 ft of streams; important to specific wildlife groups (e.g., grassland birds) • Loss of locally rare migratory stopover habitat and locally rare habitat patches with water resources
LIMIT	*Similar to Class I riparian resources, except:* • Retains restoration opportunities where ecological functions could be regained through tree canopy increases or other measures • Provides mitigation opportunities	*Similar to Class I riparian resources, except:* • Some loss of the features providing important ecological functions (scores 6-17), unless offset by mitigation and restoration activities	*Similar to Class A, except:* • More habitat connectivity between large habitat patches retained • Grassland and low structure habitat within 300 ft of stream may be retained • Low to moderate levels of development provide good habitat for some species, but this is most pronounced in Class A patches due to forest width	*Similar to "allow," but to a lesser degree depending on program options* • To the extent that conflicting uses remove the resource, habitat and connectivity will be lost
PROHIBIT	*Similar to Class I riparian resources, except:* • Retention of some critical ecological functions and ecosystem services provided by existing natural resources • Retains restoration opportunities where ecological functions could be regained through tree canopy increases or other measures • Provides mitigation opportunities	*Similar to Class I riparian resources, except:* • Increased need for UGB expansion, but less so than prohibit decision in Class I (scores of 6-18 – at least 1 primary function)	*Similar to Class A, except:* • Retention of some of the most important connectivity elements in the region • Retention of large upland habitat patches important to specific wildlife species • This option important for Neotropical migratory birds during migration • May provide important source habitats for native wildlife and plant species • Grassland and low-structure vegetation within 300 ft of streams would be retained	*Similar to Class A*

Development scenario	Environmental consequences: SINGLE FAMILY RESIDENTIAL (SFR)			
	Class III Riparian		Class C Wildlife Habitat resources	
	Positive	**Negative**	**Positive**	**Negative**
ALLOW	*Similar to Class I riparian resources, except:* • Low Value Riparian tends to have less forest or other vegetation than other classes, and includes developed floodplains, where functionality is already reduced • SFR and IND contain the majority of Low Value Riparian Resources, therefore SFR represents opportunities for improved ecological function through mitigation or restoration	*Similar to Class II riparian resources, except:* • The potential for losing existing ecological functions is reduced	*Similar to Class I, except:* • These patches tend to be relatively small, isolated, and lacking substantial water resources, and are therefore reduced in quality and functionality compared to Class A and B • Isolated patches may be associated with increased wildlife crossing mortality on roadways	*Similar to Class B, except:* • Only limited loss of habitat interior • Some loss of connectivity between patches • Important loss of migratory stopover habitat, because these patches tend to occur in areas lacking substantial wildlife habitat • Loss of upland patches lacking water resources but providing important habitat to specific wildlife species
LIMIT	*Similar to Class I riparian resources, except:* • Retains restoration opportunities where ecological functions could be regained through tree canopy increases or other measures • Provides mitigation opportunities	*Similar to Class I riparian resources, except:* • Loss of opportunities to add forest canopy along streams where low structure currently exists	*Similar to Class B, except:* • Most are small forested patches • Less likely to provide good habitat for some species, because these patches tend to be narrow, disconnected, and surrounded by development • Isolated patches may be associated with increased wildlife crossing mortality on roadways	*Similar to "allow," but to a lesser degree depending on program options* • To the extent that conflicting uses remove the resource, habitat and connectivity will be lost
PROHIBIT	*Similar to Class I riparian resources, except:* • Retention of some ecological functions and ecosystem services provided by existing natural resources (scores 1-5) • Retains restoration opportunities where ecological functions could be regained through tree canopy increases or other measures • Provides mitigation opportunities	*Similar to Class I riparian resources, except:* • Increased need for UGB expansion, but less so than Class II	*Similar to Class B, except:* • Not as important to regional connectivity, but may provide important local connectivity • Small, isolated patches provide important and locally rare stopover habitat to migratory birds	*Similar to Class B, except:* • Small isolated habitat patches may limit reproductive success due to edge effects and reduced habitat quality • Isolated patches may be associated with increased wildlife crossing mortality on roadways

Development scenario	Environmental consequences: SINGLE FAMILY RESIDENTIAL (SFR)			
	Impact areas around waterways (50-150 feet from resource)		Impact areas around habitat (25 feet)	
	Positive	***Negative***	***Positive***	***Negative***
ALLOW	• Opportunities for landowner education may reduce effects of existing and future environmentally harmful practices near waterways	• Potential for increased adverse impacts (e.g., pollution, altered hydrology, pesticide use, bacterial contamination, human disturbance…) to waterways due to existing and new conflicting uses in areas adjacent to waterways • These impacts are greater than in other areas because they are near water and because non-resource areas tend to lack natural filtration provided by riparian vegetation	• Opportunities for landowner education may reduce effects of existing and future environmentally harmful practices	• Potential for increased adverse effects adjacent to habitat areas, primarily forested but also low-structure vegetation, including: o Soil compaction, causing tree and other vegetation damage and increasing risk of tree falls o Increased vegetation trampling at edges of habitat patches o Introduction of trash and pollutants to wildlife habitat o Increased adverse edge effects o Increased light and noise disturbance o Increased potential for non-native plant and animal species invasions
LIMIT	• Retains restoration opportunities where riparian functions could be regained through planting tree canopy or other measures • May help protect existing water resources from current or future adverse effects due to conflicting uses • Provides mitigation opportunities • Incentives and landowner education could enhance ecological health over time	*Similar to "allow," but to a lesser degree*	• Retains restoration opportunities where habitat patch functions could be regained through planting tree canopy or other measures; for example, potential for decreased edge effects, increased interior habitat and increased connectivity to other patches and to water resources • Provides mitigation opportunities • Incentives and landowner education could enhance ecological health over time	• Similar to "allow," but to a lesser degree
PROHIBIT	*Similar to "limit," but to a greater degree*	• Primary negative consequences relate to social, economic and energy	*Similar to "limit," but to a greater degree*	• Primary negative consequences relate to social, economic and energy

Environmental consequences: MULTIFAMILY RESIDENTIAL (MFR)

Development scenario	Class I Riparian resources		Class A Wildlife Habitat resources	
	Positive	**_Negative_**	**_Positive_**	**_Negative_**
ALLOW	*Similar to Single Family Residential, except:* • Increased density within UGB reduces need for UGB expansions • Decreased infrastructure requirements per dwelling unit decreases overall infrastructure and roads needed, thereby reducing negative ecological effects	*Similar to Single Family Residential, except:* • Associated with higher levels of onsite imperviousness and lower levels of forest and vegetation, with increased negative stormwater and water quality impacts	*Similar to Single Family Residential, except:* • Increased density within UGB may limit expansion to new areas, protecting important outlying habitats	*Similar to Single Family Residential, except:* • Associated with higher levels of onsite imperviousness and lower levels of forest and vegetation, with increased negative effects on riparian wildlife and Neotropical migrants
LIMIT	*Similar to Single Family Residential, except:* • Increased density within UGB reduces need for UGB expansions • Decreased infrastructure requirements per dwelling unit decreases overall infrastructure and roads needed, thereby reducing negative ecological effects	*Similar to Single Family Residential, except:* • Onsite loss of ecological functions and ecosystem services likely to be more severe due to increased imperviousness and tree canopy loss, unless offset by mitigation and restoration activities	*Similar to Single Family Residential, except:* • Increased density within UGB may limit expansion to new areas, protecting important outlying habitats	*Similar to Single Family Residential, except:* • Associated with higher levels of onsite imperviousness and lower levels of forest and vegetation, with increased negative effects on riparian wildlife and Neotropical migrants • Higher level of development less valuable to wildlife
PROHIBIT	*Similar to Single Family Residential*	*Similar to Single Family Residential, except:* • Opportunity for increased density reduced, thereby increasing need for UGB expansion	*Similar to Single Family Residential*	*Similar to Single Family Residential*

Environmental consequences: MULTIFAMILY RESIDENTIAL (MFR)

<table>
<tr><th rowspan="2">Development scenario</th><th colspan="2">Class II Riparian resources</th><th colspan="2">Class B Wildlife Habitat resources</th></tr>
<tr><th>Positive</th><th>Negative</th><th>Positive</th><th>Negative</th></tr>
<tr><td>ALLOW</td><td>Similar to Class I riparian resources</td><td>Similar to Class I riparian resources, except:
Loss of restoration opportunities where ecological functions could be regained through tree canopy increases or other measures
Loss of functionality would be less because less ecological function exists; however, loss of this resource type would remove any remaining water quality filtration capacity or other ecological services, leaving waterways with little protection or buffering from conflicting uses</td><td>Similar to Class I Riparian Resources</td><td>Similar to Class A, except:
Habitat interior loss, but less extensive than Class A
Loss of connectivity especially pronounced; extensive loss of migratory stopover habitat and movement corridors. Reduces value of Class A patches.
In Type 2 habitat patches, loss of grassland and low-structure vegetation important to specific wildlife groups (e.g., grassland birds, meadow voles)
Loss of locally rare migratory stopover habitat and locally rare habitat patches with water resources
Associated with higher levels of onsite imperviousness and lower levels of forest and vegetation, with increased negative effects on riparian wildlife and Neotropical migrants
Higher density development less valuable to wildlife</td></tr>
<tr><td>LIMIT</td><td>Similar to Class I riparian resources, except:
Retains restoration opportunities where ecological functions could be regained through tree canopy increases or other measures
Provides mitigation opportunities</td><td>Similar to Class I riparian resources, except:
Loss of opportunities to add forest canopy along streams where low structure currently exists</td><td>Similar to Class A, except:
More habitat connectivity between large habitat patches retained
More grassland and low structure habitat retained (larger, better connected low structure patches fall in Class B)</td><td>Similar to “allow,” but to a lesser degree depending on program options
To the extent that conflicting uses remove the resource, habitat and connectivity will be lost
Associated with higher levels of onsite imperviousness and lower levels of forest and vegetation, with increased negative effects on riparian wildlife and Neotropical migrants
Higher density development less valuable to wildlife</td></tr>
<tr><td>PROHIBIT</td><td>Similar to Class I riparian resources, except:
Retention of some critical ecological functions and ecosystem services provided by existing natural resources
Retains restoration opportunities where ecological functions could be regained through tree canopy increases or other measures
Provides mitigation opportunities</td><td>Similar to Class I riparian resources, except:
Increased need for UGB expansion, but less so than Class II</td><td>Similar to Class A, except:
Retention of some of the most important connectivity elements in the region
Retention of large upland habitat patches important to specific wildlife species
Preserves areas important for Neotropical migratory birds during migration
May provide important source habitats for native wildlife and plant</td><td>Similar to Class A, except:
If conflicting uses are prohibited in all Class B wildlife habitat patches, Class A and C may be disproportionately removed or altered, thereby reducing the functionality of Class B habitat patches through connectivity loss and increasing isolation</td></tr>
</table>

			species	

Development scenario	**Environmental consequences: MULTIFAMILY RESIDENTIAL (MFR)**			
	Low Value Riparian		**Class C Wildlife Habitat resources**	
	Positive	***Negative***	***Positive***	***Negative***
ALLOW	*Similar to Class I riparian resources, except:* • This class tends to have less forest or other vegetation than other classes, and includes developed floodplains; functionality already reduced here	*Similar to Class II riparian resources, except:* • The potential for losing existing ecological functions is reduced	*Similar to Class B, except:* • These patches tend to be relatively small, isolated, and lacking substantial water resources, and are therefore reduced in quality and functionality compared to Class A and B	*Similar to Class B, except:* • Only limited loss of habitat interior • Some loss of connectivity between patches • Important loss of migratory stopover habitat, because these patches tend to occur in areas lacking substantial wildlife habitat • Loss of upland patches lacking water resources but providing important habitat to specific wildlife species
LIMIT	*Similar to Class I riparian resources, except:* • Retains restoration opportunities where ecological functions could be regained through tree canopy increases or other measures • Provides mitigation opportunities	*Similar to Class I riparian resources, except:* • Loss of opportunities to add forest canopy along streams where low structure currently exists	*Similar to Class B, except:* • Most are small forested patches • Less likely to provide good habitat for some species, because these patches tend to be narrow, disconnected, and surrounded by development	*Similar to "allow," but to a lesser degree depending on program options* • To the extent that conflicting uses remove the resource, habitat and connectivity will be lost
PROHIBIT	*Similar to Class I riparian resources, except:* • Retention of some ecological functions and ecosystem services provided by existing natural resources • Retains restoration opportunities where ecological functions could be regained through tree canopy increases or other measures • Provides mitigation opportunities	*Similar to Class I riparian resources, except:* • Increased need for UGB expansion, but less so than Class II	*Similar to Class B, except:* • Not as important to regional connectivity, but may provide important local connectivity • Small, isolated patches provide important and locally rare stopover habitat to migratory birds	*Similar to Class B, except:* • Small isolated habitat patches may limit reproductive success due to edge effects and reduced habitat quality

Development scenario	Environmental consequences: COMMERCIAL (COM)			
	Class I, II and III Riparian resources		**Class A, B, and C Wildlife Habitat resources**	
	Positive	***Negative***	***Positive***	***Negative***
ALLOW	*Similar to MFR*	*Similar to MFR, except:* • Increased imperviousness and decreased canopy cover increase negative ecological effects	*Similar to MFR*	*Similar to MFR, except:* • Increased imperviousness and decreased canopy cover increase negative ecological effects • Increased human disturbance may negatively impact wildlife
LIMIT	*Similar to MFR*	*Similar to MFR, except:* • Increased imperviousness and decreased canopy cover increase negative ecological effects, to a lesser extent than allow	*Similar to MFR*	*Similar to MFR, except:* • Increased imperviousness and decreased canopy cover increase negative ecological effects to a lesser degree than allow • Increased human disturbance may negatively impact wildlife, but to a lesser degree than allow
PROHIBIT	*Similar to MFR*	• *Similar to MFR*	*Similar to MFR*	*Similar to MFR*

Development scenario	Environmental consequences: INDUSTRIAL (IND)			
	Class I, II and III Riparian resources		**Class A, B, and C Wildlife Habitat resources**	
	Positive	***Negative***	***Positive***	***Negative***
ALLOW	*Similar to MFR, except:* • SFR and IND contain the majority of Low Value Riparian Resources, therefore SFR represents opportunities for improved ecological function through mitigation or restoration	*Similar to MFR, except:* • Increased imperviousness and decreased canopy cover increase negative ecological effects • Increased toxics may be associated with this land use type • IND contains a substantial portion of Class I Riparian Resources and can be particularly detrimental to water quality	*Similar to MFR*	*Similar to MFR, except:* • Increased imperviousness and decreased canopy cover increase negative ecological effects
LIMIT	*Similar to MFR, except:* • IND contains a substantial portion of Class I Riparian Resources, representing opportunities for improved ecological function through mitigation, restoration, or programmatic protection • SFR and IND contain the majority of Low Value Riparian Resources, therefore SFR represents opportunities for improved ecological function through mitigation or restoration	*Similar to MFR, except:* • Increased imperviousness and decreased canopy cover increase negative ecological effects • Increased toxins may be associated with this land use type	*Similar to MFR*	*Similar to MFR, except:* • Increased imperviousness and decreased canopy cover increase negative ecological effects, but to a lesser extent than allow
PROHIBIT	*Similar to MFR* • Prohibiting conflicting uses would minimize water quality degradation • IND contains a substantial portion of Class I Riparian Resources, representing opportunities for improved ecological function through preservation and restoration	*Similar to MFR*	*Similar to MFR*	*Similar to MFR*

Development scenario	Environmental consequences: MIXED USE CENTERS (MUC)			
	Class I, II and III Riparian resources		Class A, B, and C Wildlife Habitat resources	
	Positive	***Negative***	***Positive***	***Negative***
ALLOW	• Because MUC zoning allows for a variety of land uses in the same area, it has potential for reducing the amount of land needed; UGB expansions less necessary • MUC tends to reduce VMT, thereby reducing water quality impacts due to transportation runoff • Less use of fertilizers, pesticides and herbicides than residential because less landscaping and vegetation present	• Mixed use development generates similar disturbance activities and consequences as residential and commercial, but to varying degrees depending on uses • MUC typically have high imperviousness and little tree canopy cover • Extensive loss of ecological functions and ecosystem services, with particular concerns regarding altered hydrology, stormwater and water quality • More parking areas and roads add pollutants to water resources	• Because mixed use zoning allows for a variety of land uses, it has potential for reducing the amount of land needed; UGB expansions less necessary • Incentives and education could improve land stewardship, but requires financial investment	*Similar to MFR and COM, depending on mix of land uses, except:* • Noise and light disturbances may be higher • Extent of vegetation loss may be higher
LIMIT	*Similar to MFR and COM, depending on mix of land uses, except:* • MUC tends to reduce VMT, thereby reducing water quality impacts due to transportation runoff	*Similar to MFR and COM, depending on mix of land uses*	*Similar to MFR and COM, depending on mix of land uses*	*Similar to MFR and COM, depending on mix of land uses*
PROHIBIT	*Similar to MFR and COM, depending on mix of land uses*	*Similar to MFR and COM, depending on mix of land uses*	*Similar to MFR and COM, depending on mix of land uses*	*Similar to MFR and COM, depending on mix of land uses*

<table>
<tr><th rowspan="3">Development scenario</th><th colspan="4">Environmental consequences:
RURAL (RUR)</th></tr>
<tr><th colspan="2">Class I, II and III Riparian resources</th><th colspan="2">Class A, B, and C Wildlife Habitat resources</th></tr>
<tr><th>Positive</th><th>Negative</th><th>Positive</th><th>Negative</th></tr>
<tr><td>ALLOW</td><td>Similar to SFR, except:
• Lower imperviousness; more tree canopy and vegetation reduce harm to streams</td><td>Similar to SFR, except:
• Increased pesticide use may be associated with this land use due to agriculture
• Livestock degrade riparian area and water quality
• Septic tanks are common and sometimes leak bacteria into waterways, reducing water quality</td><td>Similar to SFR, except:
• Lower imperviousness; often more tree canopy and vegetation reduce extent of habitat loss and adverse edge effects
• Less habitat fragmentation; tends to retain more connectivity between patches and to water
• RUR lands with agricultural areas can provide important habitat for grassland and low structure-associated species</td><td>Similar to SFR, except:
• Increased toxics may be associated with this land use type due to agriculture
• Livestock degrade riparian area and reduce habitat quality
• Wildlife crossings across roadways cause mortality</td></tr>
<tr><td>LIMIT</td><td>See comments under "allow," except:
• Programmatic options may reduce loss of ecological functions
• Impervious surface mitigation opportunities
• Hydrology often less altered than other zoning types
• Strong potential for BMPs, restoration and mitigation activities to offset negative ecological effects, but requires financial investment</td><td>Similar to SFR, except:
• Increased pesticide use may be associated with this land use due to agriculture
• Septic tanks are common and sometimes leak bacteria into waterways, reducing water quality</td><td>Similar to SFR, except:
• Lower imperviousness; often more tree canopy and vegetation reduce extent of habitat loss and adverse edge effects
• Less habitat fragmentation; tends to retain more connectivity between patches and to water
• RUR lands with agricultural areas can provide important habitat for grassland and low structure-associated species</td><td>Similar to SFR, except:
• Increased toxics may be associated with this land use type due to agriculture
• Livestock grazing can damage riparian areas and reduce habitat quality
• Wildlife crossings across roadways cause mortality</td></tr>
<tr><td>PROHIBIT</td><td>Similar to SFR, except:
• Fewer water quality problems associated with leaky septic tanks, livestock
• Less need to expand UGB</td><td>Similar to SFR, except:
• Rural lands are low density and therefore tend to require more infrastructure per dwelling unit, increasing VMT and decreasing water quality</td><td>• Similar to SFR, except:
• Prohibiting conflicting uses may decrease toxics associated with agriculture
• Reduced livestock damage to habitat
• Reduced wildlife road kill mortality
•</td><td>Similar to SFR, except:
• RUR lands with agricultural areas can provide important habitat for grassland and low structure-associated species</td></tr>
</table>

Development scenario	Environmental consequences: PARKS AND OPEN SPACE (POS)			
	Class I, II and III Riparian resources		Class A, B, and C Wildlife Habitat resources	
	Positive	*Negative*	*Positive*	*Negative*
ALLOW	*Similar to RUR, except:* • May be highly variable in natural land cover and management	*Similar to RUR, except:* • May be highly variable in natural land cover and management • Human disturbance may be higher	*Similar to SFR, except:* • May be highly variable in natural land cover and management	*Similar to RUR, except:* • May be highly variable in natural land cover and management
LIMIT	*Similar to RUR, except:* • May be highly variable in natural land cover and management	*Similar to SFR, except:* • May be highly variable in natural land cover and management • Human disturbance may be higher	*Similar to SFR, except:* • May be highly variable in natural land cover and management	*Similar to RUR, except:* • May be highly variable in natural land cover and management
PROHIBIT	*Similar to RUR, except:* • May be highly variable in natural land cover and management • Could help prevent human / pet disturbance to wildlife	*Similar to RUR, except:* • May be highly variable in natural land cover and management	*Similar to RUR, except:* • May be highly variable in natural land cover and management	*Similar to RUR, except:* • May be highly variable in natural land cover and management

<table>
<tr><th rowspan="3">Development scenario</th><th colspan="2">Energy consequences:
SINGLE FAMILY RESIDENTIAL</th></tr>
<tr><th colspan="2">Fish and wildlife habitat</th></tr>
<tr><th>Positive</th><th>Negative</th></tr>
<tr><td>ALLOW</td><td>• More compact form contributes to efficiencies in provision of services and reduction of travel distances
• More compact development form may reduce VMT (Vehicle Miles Traveled per person) and fossil fuel use
• Reducing VMT and fossil fuel use reduces air pollutants and heat
• Represents the majority of buildable resource lands; opportunities for education and incentives</td><td>• Loss of trees and increased imperviousness lead to increased Urban Heat Island effect and global warming; increased air conditioning (AC) demand
• Extensive loss of ecosystem services related to trees, plants; reduced air quality
• Warmer air warms water; harms salmonids and other temperature-sensitive animals
• Increased energy consumption to provide engineered solutions to replace natural systems to manage stormwater flow, reduce soil erosion, keep water cool, etc.
• This land use type associated with increased offsite roads and infrastructure; large amount of buildable resource acres suggests high energy output for infrastructure creation, maintenance, and increased AC demand due to additional imperviousness
• Decreased energy efficiency if housing is not required to use cluster design
• Education and incentives, if implemented, would require substantial financial investment</td></tr>
<tr><td>LIMIT</td><td>• May reduce infrastructure requirements and enable use of existing infrastructure, thereby saving energy needed to create, install, and maintain all types of infrastructure
• May allow energy-saving infrastructure development (e.g., gravity flow sewer or water lines)
• Reducing VMT and fossil fuel use reduces air pollutants and heat
• Increased forest cover can help remove energy-related air pollutants and reduce smog
• Increased forest cover can cool air by shade, evapotranspiration, carbon storage; reduced Urban Heat Island effect, reduced global warming, reduced AC demand
• May result in decreased energy consumption to manage stormwater runoff, reduce sedimentation and erosion and keep water cool
• Tree retention is cheaper, easier, and less energy-consumptive than planting new trees
• Limiting conflicting uses has the greatest potential for mitigation and restoration activities; may result in increased ecological function over time
• Represents the majority of buildable resource lands; opportunities for education and incentives</td><td>Negative consequences similar to “allow” option, but to a lesser degree
• Avoiding sensitive natural areas may increase energy-using infrastructure requirements
• Increased miles of infrastructure and increased transportation systems lead to increased VMT
• Avoiding sensitive natural areas may result in future need for UGB expansion
• Loss of trees increases Urban Heat Island effect and global warming; increased air conditioning demand, impacts air quality
• Allows greater transportation planning options compared to prohibit, while still retaining green infrastructure
• Warmer air warms water; harms salmonids and other temperature-sensitive animals
• Possible reduction in access to transportation modes such as bicycling, walking because extensive pathways often run along natural areas (program-dependent)
• Education and incentives, if implemented, would require substantial financial investment</td></tr>
<tr><td>PROHIBIT</td><td>• Retention of substantial tree canopy and other vegetation may provide the strongest protection against warmer air and water due to Urban Heat Island effect and global warming (CO_2 storage) (although physical extent of Urban Heat Island effect likely to be expanded)
• Opportunity for pleasant, accessible alternative means of transportation such as walking and bicycling through natural areas, if permitted under programmatic options
• Likely to result in decreased need for future energy-requiring restoration and flood mitigation activities due to retention of tree and vegetation cover</td><td>• Limits transportation planning options
• Limits infrastructure placement options
• Increases extent of urban area and VMT
• Potential for increased total imperviousness due to increased roads; energy is required to build and maintain roadways and other infrastructure
• If utilities are prohibited from being installed along streams, may require pumping or other energy-requiring activities to take non-gravity driven pathways
• Increased travel distance, fossil fuel use, air pollution, related warming of air and water
• Extent of Urban Heat Island effect may increase, potentially increasing AC demand</td></tr>
</table>

<table>
<tr><th rowspan="3">Development scenario</th><th colspan="2">Energy consequences:
MULTIFAMILY RESIDENTIAL</th></tr>
<tr><th colspan="2">Fish and wildlife habitat</th></tr>
<tr><th>Positive</th><th>Negative</th></tr>
<tr><td>ALLOW</td><td>Similar to Single Family Residential, except:
• Buildable resource lands are less extensive
• Can clear less land per unit to construct dwelling units than SFR, reducing overall extent of tree loss, infrastructure requirements, and need for UGB expansion</td><td>Similar to Single Family Residential, except:
• Buildable resource lands are less extensive
• Increased onsite imperviousness and tree loss add to Urban Heat Island effect and global warming on a per-acre basis</td></tr>
<tr><td>LIMIT</td><td>Similar to Single Family Residential, except:
• Buildable resource lands are less extensive
• Can clear less land per unit to construct dwelling units than SFR, reducing overall extent of tree loss, infrastructure requirements, and need for UGB expansion</td><td>Similar to Single Family Residential, except:
• Buildable resource lands are less extensive
• Increased onsite imperviousness and tree loss add to Urban Heat Island effect and global warming on a per-acre basis</td></tr>
<tr><td>PROHIBIT</td><td>Similar to Single Family Residential</td><td>Similar to Single Family Residential</td></tr>
</table>

Development scenario	Energy consequences: COMMERCIAL	
	Fish and wildlife habitat	
	Positive	***Negative***
ALLOW	*Similar to Single Family Residential, except:* • Buildable resource lands are less extensive	*Similar to Single Family Residential, except:* • Buildable resource lands are less extensive • High onsite imperviousness and tree loss add to Urban Heat Island effect and global warming on a per-acre basis • Further increases in energy consumption to provide engineered solutions to replace natural systems to manage stormwater flow, reduce soil erosion, keep water cool, etc.
LIMIT	*Similar to Single Family Residential* • Buildable resource lands are less extensive	*Similar to Single Family Residential, except*: • Buildable resource lands are less extensive • High onsite imperviousness and tree loss add to Urban Heat Island effect and global warming on a per-acre basis • Further increases in energy consumption to provide engineered solutions to replace natural systems to manage stormwater flow, reduce soil erosion, keep water cool, etc.
PROHIBIT	*Similar to Single Family Residential*	*Similar to Single Family Residential*

<table>
<tr><th rowspan="3">Development scenario</th><th colspan="2">Energy consequences:
INDUSTRIAL</th></tr>
<tr><th colspan="2">Fish and wildlife habitat</th></tr>
<tr><th>Positive</th><th>Negative</th></tr>
<tr><td>ALLOW</td><td>Similar to Single Family Residential, except:
• Buildable resource lands are less extensive, although still substantial</td><td>Similar to Single Family Residential, except:
• Buildable resource lands are less extensive, although still substantial
• High onsite imperviousness and tree loss add to Urban Heat Island effect and global warming
• Further increases in energy consumption to provide engineered solutions to replace natural systems to manage stormwater flow, reduce soil erosion, keep water cool, etc.
• Placement within the floodplain is common, increasing energy-requiring flood mitigation</td></tr>
<tr><td>LIMIT</td><td>Similar to Single Family Residential, except:
• Buildable resource lands are less extensive, although still substantial</td><td>Similar to Single Family Residential, except:
• Buildable resource lands are less extensive, although still substantial
• High onsite imperviousness and tree loss add to Urban Heat Island effect and global warming
• Further increases in energy consumption to provide engineered solutions to replace natural systems to manage stormwater flow, reduce soil erosion, keep water cool, etc.
• Placement within the floodplain is common, increasing energy-requiring flood mitigation</td></tr>
<tr><td>PROHIBIT</td><td>Similar to Single Family Residential, except:</td><td>Similar to Single Family Residential</td></tr>
</table>

Development scenario	Energy consequences: MIXED USE CENTERS	
	Fish and wildlife habitat	
	Positive	***Negative***
ALLOW	*Similar to Single Family Residential, except:* • Buildable resource lands are less extensive • Higher density centers of employment and housing create compact urban form, reducing VMT, infrastructure, energy use • Provide efficient access to goods and services, enhance multi-modal transportation	*Similar to Single Family Residential, except:* • Buildable resource lands are less extensive
LIMIT	*Similar to Single Family Residential, except:* • Buildable resource lands are less extensive • Higher density centers of employment and housing create compact urban form, reducing VMT, infrastructure, energy use • Provide efficient access to goods and services, enhance multi-modal transportation	*Similar to Single Family Residential, except:* • Buildable resource lands are less extensive
PROHIBIT	*Similar to Single Family Residential* •	*Similar to Single Family Residential, except:* • This zoning type is the most energy-efficient land use; prohibit decision would reduce energy saving opportunities provided by land use and transportation efficiencies

<table>
<tr><td rowspan="3">Development scenario</td><td colspan="2">Energy consequences:
RURAL</td></tr>
<tr><td colspan="2">Fish and wildlife habitat</td></tr>
<tr><td>Positive</td><td>Negative</td></tr>
<tr><td>ALLOW</td><td>Similar to Single Family Residential, except:
• Buildable resource lands are less extensive
• Imperviousness is typically lower and vegetation cover higher, reducing Urban Heat Island effect</td><td>Similar to Single Family Residential, except:
• More infrastructure required per dwelling unit</td></tr>
<tr><td>LIMIT</td><td>Similar toSingle Family Residential, except:
• Buildable resource lands are less extensive
• Imperviousness is typically lower and vegetation cover higher, reducing Urban Heat Island effect</td><td>Similar to Single Family Residential
• More infrastructure required per dwelling unit</td></tr>
<tr><td>PROHIBIT</td><td>Similar to Single Family Residential</td><td>Similar to Single Family Residential
• More infrastructure required per dwelling unit</td></tr>
</table>

Development scenario	Energy consequences: PARKS AND OPEN SPACE	
	Fish and wildlife habitat	
	Positive	***Negative***
ALLOW	*Similar to Single Family Residential, except:* • Buildable resource lands are less extensive • Imperviousness is typically lower and vegetation cover higher, reducing Urban Heat Island effect • Less infrastructure required compared to other zoning types	*Similar to Single Family Residential*
LIMIT	*Similar toSingle Family Residential, except:* • Buildable resource lands are less extensive • Imperviousness is typically lower and vegetation cover higher, reducing Urban Heat Island effect • Less infrastructure required compared to other zoning types	*Similar to Single Family Residential*
PROHIBIT	*Similar toSingle Family Residential, except:* • Buildable resource lands are less extensive	*Similar to Single Family Residential*

Assumptions:

- At the regional scale, energy use is most strongly influenced by the extent and physical arrangement of transportation networks, the built environment, and green infrastructure. Options consistent with Region 2040 Growth Concept support energy conservation, especially fossil fuel use.
- Because options consistent with Region 2040 are a primary consideration, energy consequences differ little between:
  - riparian and wildlife habitat resources - tree retention and stream crossing considerations are most important
  - low-value and high value resources
  - types of land use (based on residential because that is most extensive land use; comments on differences among land uses included at end of table)

EXHIBIT F—ORDINANCE NO. 05-1077C

ATTACHMENT 4.

METRO'S PHASE II ECONOMIC, SOCIAL, ENVIRONMENTAL, AND ENERGY (ESEE) ANALYSIS

This report is available for review in the Metro Council's files or on Metro's website: **http://www.metro-region.org/nature**. In addition, copies may be requested from the Metro Planning Department, 600 N.E. Grand Ave., Portland, OR 97232, or by calling 503-797-1555.

Metro's Phase II ESEE Analysis

Table of Contents

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METRO
People places • open spaces
Clean air and clean water do not stop at city limits or county lines. Neither does the need for jobs, a thriving economy, and good transportation choices for people and businesses in our region. Voters have asked Metro to help with the challenges that cross those lines and affect the 24 cities and three counties in the Portland metropolitan area.

A regional approach simply makes sense when it comes to protecting open space, caring for parks, planning for the best use of land, managing garbage disposal, and increasing recycling. Metro oversees world-class facilities such as the Oregon Zoo, which contributes to conservation and education, and the Oregon Convention Center, which benefits the region's economy.

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Figure 4-13. Park lands by habitat class and ownership.

CHAPTER ONE: INTRODUCTION

The natural environment is an important aspect of the uniqueness of the Metro region. Metro's policies have consistently placed a high level of importance on the protection of the natural environment as a means of maintaining the high quality of life citizens of this region expect. Healthy streams and upland areas provide habitat for many animals, fish such as salmon, and clean water for people, fish, and wildlife.

Residents of this region consistently say that contact with nature is important, and they value the natural biological diversity that is part of the Willamette Valley.[1] As Oregonians, state symbols are part of the cultural identity of residents in the Metro region. The Western Meadowlark was selected as Oregon's state bird by schoolchildren in 1927 (Marshall et al. 2003). It is currently a state-listed Species of Concern, and has been nearly lost from the Metro region due to loss of native grasslands and urban development. However, some birds still winter over in the region, and bird-watchers often seek them out in areas such as the agricultural lands around the Tualatin River. The state fish, Chinook salmon, has five evolutionary significant units (ESUs) in or near this region, and all five are listed as Threatened or Endangered under the federal Endangered Species Act. Contact with nature and the rich diversity of species and habitats native to this region are important parts of the region's cultural heritage. To the extent that these habitat is lost, so is a part of our culture, heritage, and natural history.

Much work has already been accomplished to protect and restore fish and wildlife habitat in the region. Metro and other organizations have purchased close to 11,000 habitat acres, thousands of volunteers work to restore habitat and remove invasive species, and most cities and counties have existing habitat protection programs. Metro's efforts are not isolated and build on the tremendous work that is going on in the region. However, Metro's habitat inventories and science review, as well as compliance with federal regulations such as the Endangered Species Act and Clean Water Act, demonstrate that additional habitat protection is needed. Metro's goal is to provide more consistent, effective protection to fish and wildlife habitat across the region.

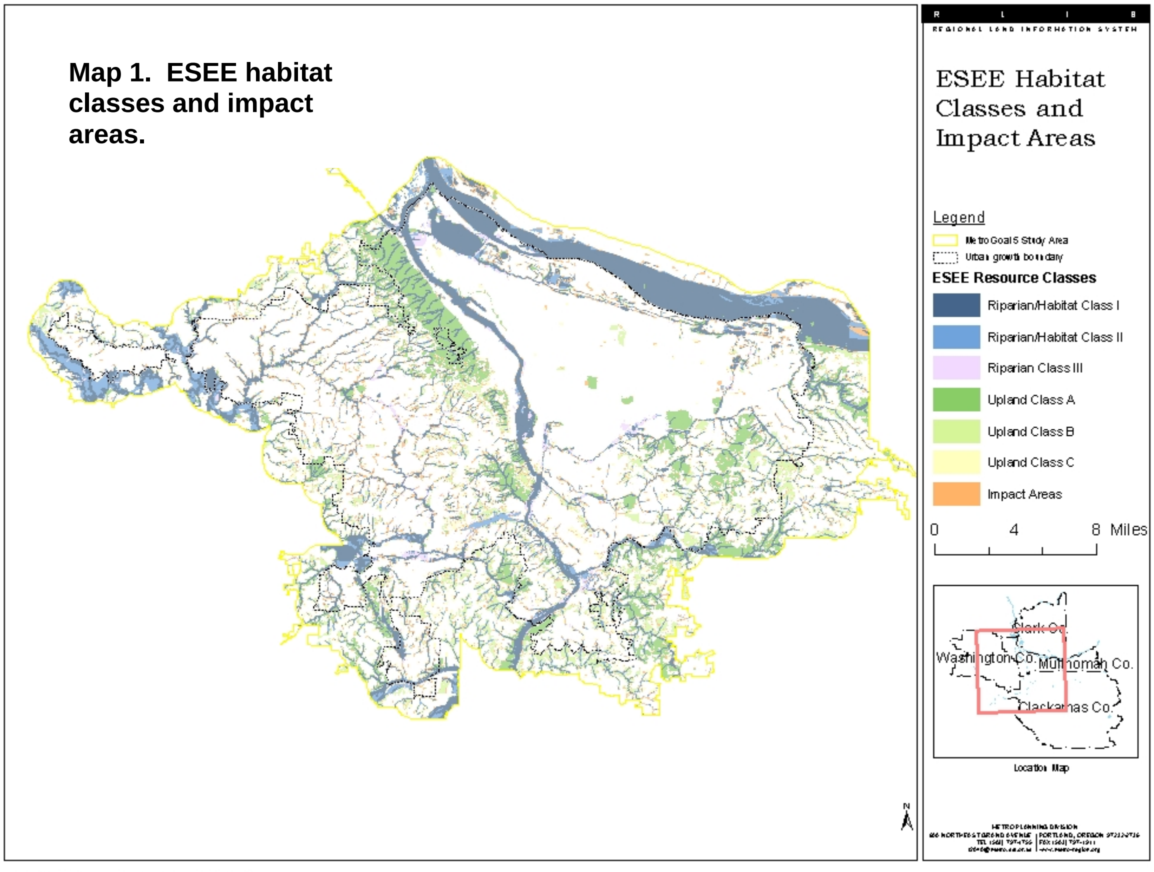
Metro's approach to fish and wildlife habitat protection

The Metro Council and its local partners are conducting a three-step planning process to conserve, protect, and restore urban streams, waterways, and upland areas that provide important fish and wildlife habitat. State land-use planning laws and broad citizen concern about the need to protect and restore habitat guide this work.

The Metro Council identified regionally significant fish and wildlife habitat in August 2002, based on a scientific assessment of functional habitat values, completing the first step of the planning process. Metro is currently completing the second step of the planning process: assessing the Economic, Environmental, Social, and Energy (ESEE) tradeoffs of protecting or not protecting regionally significant fish and wildlife habitat.

[1] May 2001 Davis and Hibbits phone survey commissioned by Metro, an October 2001 Moore Information survey sponsored by KGW-TV and the Portland Tribune, and an informal "SurveyPoint" poll available by phone and on Metro's website in 2001.

Metro's ESEE analysis is divided into two phases. The first phase was completed in fall 2003 with the release of the discussion draft ESEE Phase I report, which describes the general regional tradeoffs of allowing, limiting, or prohibiting conflicting uses in fish and wildlife habitat areas.[2] Map 1 shows the habitat and impact areas under consideration in the ESEE analysis.



Map 1. ESEE habitat classes and impact areas.

Key points from ESEE Phase I

Metro's approach for conducting a region-wide ESEE consequences analysis focused on achieving the goals of the 2040 Growth Concept. The goals in the Growth Concept, the Future Vision, the Regional Framework Plan (implemented through the Urban Growth Management Functional Plan), and Metro's Vision Statement for Protecting Fish and Wildlife Habitat all specify that the region should manage growth while protecting the natural environment, maintaining a high quality of life, and providing affordable housing options.

A key step in the ESEE analysis is to identify conflicting uses that "exist, or could occur" within regionally significant fish and wildlife habitat sites and identified impact areas. According to the Goal 5 rule, a conflicting use is a "land use, or other activity reasonably and customarily subject to land use regulations that could adversely affect a significant Goal 5 resource." Identifying conflicting uses is important to focus the ESEE analysis on various land uses and related

[2] Metro's Phase I Economic, Social, Environmental, and Energy Analysis (ESEE) April 2005.

disturbance activities that may negatively impact fish and wildlife habitat. In Metro's Phase I ESEE analysis, conflicting uses were identified from a regional perspective by examining generalized regional zones and by considering Metro's 2040 Growth Concept. Metro analyzed the distribution of its fish and wildlife habitat inventory among generalized regional zones, 2040 design type priorities, and impact areas.

The Goal 5 rule describes a process in which the ESEE consequences of allowing, limiting, and prohibiting conflicting uses are weighed with the need to preserve natural resources. These tradeoffs are described below. Metro considered the tradeoffs from a regional perspective. Some of the tradeoffs are different when considering local priorities and concerns; for example, from a regional perspective conflicting uses could be relocated or intensified in one area to account for habitat protection in another. This solution may not address the needs of a city to provide jobs or housing within its jurisdiction, to collect tax revenue, or to protect locally significant resources.

Economic tradeoffs

The key economic tradeoffs identified in the ESEE analysis include:

- Habitat lands have economic value for their urban development potential, which is measured using land value, employment density and 2040 design type designation. Generally, habitat land that is located in a primary 2040 design type designation (i.e., city center, regional center, industrial areas) has the highest value for urban development. Residential, lower density retail, and employment areas have lower value for urban development. Urban development value is not assigned to rural areas and parks.
- Habitat lands also have economic value for the ecosystem services they provide, such as flood control and water quality protection. Lands with the highest fish and wildlife values provide the highest level of ecosystem services.
- Competition between the use of habitat land for ecosystem services and urban development is minimal because the overlap between the highest value habitat and the highest value urban development land is relatively small.
- Much of the vacant, buildable land throughout the region is not part of the highest class of regionally significant fish and wildlife habitat.
- The majority of the highly valued habitat land is outside intensely developed urban areas and, thus, has lower urban development value.
- Lower-value habitat and urban development value areas are important for their cumulative contribution to the region's economy and habitat health.
- Habitat identified as having a low urban development value at the regional level may have high urban development value from a local perspective.
- By concentrating development in defined urban centers, some of the region's development needs can be met. However, accommodating demand for industrial land and single-family residential property will need special attention because these needs cannot be met fully in centers.
- Restricting the development of vacant habitat lands increases the likelihood of expanding the urban growth boundary (UGB).

Social tradeoffs
The key social tradeoffs identified in the ESEE analysis include:
- The social benefits of preserving fish and wildlife habitat areas are diverse and cross-cultural. Habitat areas are an integral part of the area's cultural heritage, regional identity, education, recreation, and public health.
- Public values must be balanced with personal and financial private property interests.
- The needs of future generations must be considered when determining how the land is used today.
- Consideration must be given to the additional time and resources needed for compliance and enforcement of new requirements.
- Preservation of land for habitat use within the urban area may result in the shifting of jobs and housing away from locations where people prefer to live and work.

Environmental tradeoffs
The key environmental tradeoffs identified in the ESEE analysis include:
- Development on highly valued fish and wildlife habitat land has a greater ecological impact than development on less valuable habitat land.
- Protection of both streamside and upland habitat is important to watershed health. Lower-valued upland wildlife areas can play a critical role in connecting habitat areas and supporting biodiversity.
- Trees are very important because they provide habitat, absorb pollution, and reduce water-related impacts by slowing and holding runoff.
- When development activity disturbs streams, the environmental impacts affect the immediate property and also are felt downstream.
- Protection of higher and lower-valued habitat supports healthy watersheds and creates restoration opportunities that, over time, can further improve the watershed.
- Some of the highest value habitat areas are located outside the UGB. If development needs cannot be accommodated within the existing UGB, conflict between habitat protection and urban development will increase as the UGB expands.

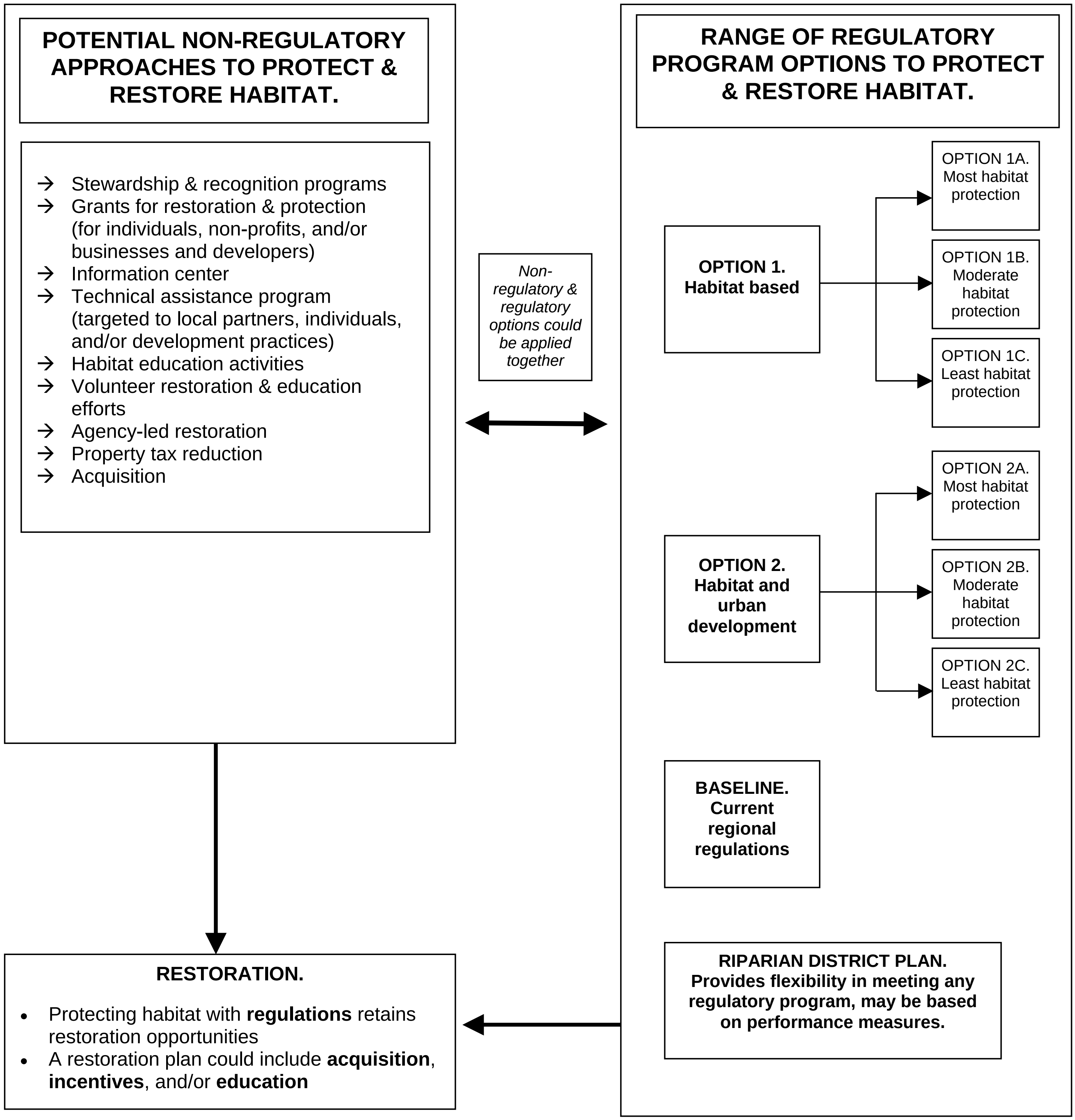
Energy tradeoffs
The key energy tradeoffs identified in the ESEE analysis include:
- Trees and other vegetation can reduce energy use because they cool and clean the air and water naturally.
- If protection results in additional expansion of the urban growth boundary to accommodate development needs, increased auto use could result in increased fuel (energy) use.
- Building in urban centers can reduce auto and energy use.

The results of the Phase I analysis showed that neither allowing all habitat land to be developed nor prohibiting development on all habitat land will satisfy the competing land use interests. Metro Council accepted the findings of the Phase I report and directed staff to evaluate six regulatory options that varied habitat protection levels.

Phase II ESEE analysis

This ESEE Phase II report describes several potential non-regulatory approaches to habitat protection and includes Metro's evaluation of the performance of the six program options identified by the Metro Council in October 2003. The Program Option Chart (Figure 1-1) illustrates the six regulatory and various non-regulatory program approaches studied in the Phase II ESEE analysis. Program options are defined by applying a range of hypothetical allow, limit, and prohibit regulatory treatments to regionally significant fish and wildlife habitat and impact areas within Metro's jurisdiction. Non-regulatory approaches are described as possible components to program options. The results identified in this report will provide information to the Metro Council, local partners, and citizens in the region as the Council chooses a direction for program development in May 2004. The Metro Council is scheduled to consider a fish and wildlife program by December 2004 designed to protect the nature of the region for generations to come.

FIGURE 1-1: PROGRAM OPTION CHART



Format of report

This Phase II ESEE analysis includes four major chapters.

Chapter 2 focuses on non-regulatory approaches for protecting and restoring fish and wildlife habitat. A brief summary of existing efforts in the Metro region is included, followed by several potential approaches, most of which could build on existing programs. A cursory estimate of cost and effectiveness of the non-regulatory approaches is included.

Chapter 3 focuses on existing and potential regulations to protect fish and wildlife habitat. A summary of Metro's *Local Plan Analysis* (August 2002) describes the existing local Goal 5 protection plans. Due to inconsistencies of local plans, Metro uses Title 3 Stream and Floodplain Protection as a baseline for comparing the six regulatory program options. The baseline regulations are described, followed by a description of the regulatory options.

Chapter 4 includes the analysis of tradeoffs for the ESEE factors as well as other criteria including meeting federal guidelines and the increment of additional protection.

Chapter 5 summarizes Metro's analysis of the six regulatory program options, describes how the non-regulatory and regulatory tools could complement each other, and identifies the next steps in program development.

CHAPTER TWO: NON-REGULATORY TOOL OPTIONS

Introduction

A program to protect and restore fish and wildlife habitat can protect more habitat if it includes both regulatory and non-regulatory components. These approaches complement each other, as shown in the table below: non-regulatory tools can address habitat issues that are not covered under land use regulations (e.g., pesticide use) as well as decrease the social/economic impact of regulations (e.g., funds for restoration activities, technical assistance for habitat friendly development). An effective regional protection program could use regulations to establish baseline levels of protection and non-regulatory tools to support and in some cases exceed the baseline. Further, regulations could provide jurisdictions flexibility to meet protection standards under a variety of different circumstances. Regulatory and non-regulatory habitat protection tools can offer varying levels of protection, and can be applied to different habitat in the urban area. Choosing the right tool for the right habitat, location and situation is important, and will require additional analysis and the input and recommendations of the public and the Metro Council.

Table 2-1. Comparison of regulatory and non-regulatory approaches to protect and restore habitat.

Non-regulatory approaches	Regulatory approaches
1. Uncertain protection (acquisition provides certainty but requires funding and depends on willing sellers)	1. Certainty of protection (with adequate enforcement capability)
2. Restoration can be achieved with a variety of approaches (incentives are necessary)	2. Preserves restoration opportunities but does not achieve restoration (mitigation may be required but unlikely to increase overall ecological function)
3. Depends on willing landowners and good stewardship	3. Property rights concerns (takings, real or perceived)
4. Can apply to non-land use activities (e.g., gardening, landscaping, remodeling, etc.)	4. Triggered by development (e.g., building permit application)
5. Application is limited by dollars and the number of willing landowners	5. Consistent treatment of similar situations

Metro's Parks and Greenspaces Department, along with other local partners, commissioned a study of incentives for natural area protection in 2002 (*Incentives Report*).[3] The Metro Council has considered the *Incentives Report*, and the information that relates to fish and wildlife habitat protection has been incorporated into the Phase II ESEE analysis. The study included three parts: a study of 18 candidate incentives, landowner interviews, and implementation strategies for three promising programs. Potential non-regulatory approaches for protection and tools for restoration are described and evaluated based on cost and effectiveness. A summary of non-regulatory tools currently being used in the Metro region is also included. Any new or expanded non-regulatory tool would require funding at some level; potential funding sources will be considered when Metro develops a program to protect fish and wildlife habitat.

[3] Local partners include: City of Portland, City of Oregon City, and the Tualatin Hills Parks and Recreation District. *Tools for natural area protection*, February 2002.

Existing non-regulatory tools for habitat protection and restoration

Numerous non-regulatory programs focused on protecting fish and wildlife habitat exist in the Metro region. In 2003, Metro compiled and summarized the efforts of 31 groups[4] that focus habitat protection and restoration efforts within the UGB, providing a snapshot of current efforts.[5] Funding levels fluctuate and organizations come and go, but Metro's survey provides a picture of how much has been accomplished in the current environment with non-regulatory tools. Table 2-2, below, describes a few of the non-regulatory programs in the region.

Since there are so many different types of programs in the region, Metro's study of non-regulatory tools categorized habitat protection and restoration programs in the following ways:

- **Restoration and enhancement.** The watershed councils operating in the Metro area have identified many restoration and enhancement priorities, which have been implemented and funded by several types of government agencies and private organizations. Much of the grant money that flows into the region is used for restoration and enhancement, but the grants are highly competitive and are inadequate to meet the demand. For example, Metro's grant program with the US Fish and Wildlife Service funded only about 35 percent of the grant proposals over the past three years, leaving about $1.7 million of unfunded requests. These grant sources are also volatile and may change due to economic and political forces.
- **Education and outreach.** Some programs are focused on assisting private citizens and businesses in "green" consumer choices.[6] Other education efforts focus on living with wildlife, acquiring skills in watershed protection, and monitoring of fish and wildlife habitat. Outreach tools include articles in newsletters and on websites as well as brochures and books that inform the public and landowners about stewardship issues. In addition to informing the public about fish and wildlife habitat issues, education and outreach are often used to promote restoration and other habitat protection programs.
- **Land acquisition programs.** These programs are very effective in habitat protection and restoration and are usually applied to privately owned lands. Land may be purchased outright or with a conservation easement from willing landowners.

A summary of the known accomplishments from the organizations surveyed is described below.

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[4] The 31 groups investigated included: city governments, environmental services districts, park districts, soil and water conservation districts, watershed councils, federal programs, Metro, and non-profit organizations.
[5] *Accomplishment Report: Non-regulatory fish and wildlife stewardship in the Metro region* (Metro 2003).
[6] Including programs such as: alternatives methods of pest control, "Naturescaping," and "Green Building" construction methods.

Table 2-2. Examples of existing non-regulatory programs in the Metro region.

Focus	Programs
Restoration and enhancement	• *Oregon Watershed Enhancement Board (OWEB) General Grant Program.* Grants to carry out on the ground watershed restoration projects to restore aquatic habitat, improve water quality, and improve biodiversity. Projects include planting, culvert replacement, habitat improvements, wetland restoration, and others. (2002 total of $3,028,000 for Clackamas, Multnomah, and Washington counties; 31 projects). • *Metro/USFWS Greenspaces Grant Program.* Provides funding for urban projects that emphasize environmental education, habitat enhancement and watershed health. • *East Multnomah Soil & Water Conservation District grants*. Provides awards for conservation and restoration projects, ranging from $200-2,500, mostly on rural lands (funding is sponsored by the Fish and Wildlife Foundation). • *Wildlife Habitat Incentives Program (WHIP)*. Implemented through Natural Resources Conservation Service (NRCS) to help landowners develop and improve wildlife habitat on their land. In Oregon approximately $350,000 (for the entire state) is targeted for salmon habitat, riparian habitat, and promotion of biodiversity. • *Environmental Quality Incentives Program (EQIP).* Provides payments through the NRCS to farmers and ranchers for assistance implementing conservation practices on their lands (including filter strips, manure management practices and others). Authorized by the 2002 Farm Bill, pays up to 74% of the costs of the implemented practice.
Education and outreach	• *Metro's Natural Gardening and Landscaping Program.* Metro offers free natural gardening seminars and workshops in spring and fall. Also includes a demonstration garden, summer garden tour, and educational materials. • *Downspout Disconnect Program.* City of Portland program that provides property owners with funds and technical expertise to disconnect downspouts to reduce flow into the stormsewer system. • *Eco Biz Program.* City of Portland program, started to recognize auto repair and service facilities that minimize their environmental impacts. Currently being extended to landscaping business. • *Metro's Green Streets Handbook.* A resource for designing environmentally sound streets that can help protect streams and wildlife habitat. • *Eco-roof Program.* Portland provides sewer rate discounts to developers that build greenroofs minimizing stormwater runoff. Also provides an eco-roof floor area bonus, in which each square foot of eco-roof equals an additional three square feet of building area in the downtown. • *G-Rated Incentive Program.* Portland program that encourages innovations in residential and commercial development and redevelopment for green building design practices. Provides up to $20,000 for commercial projects and $3,000 for residential projects.
Land acquisition programs	• *Metro Openspaces Acquisition Program.* Funded through $135 million bond measure approved by voters in 1995. Focuses on targeted natural areas and regional trails. • *Three Rivers Land Conservancy Acquisition Program.* Works to encourage donation of conservation easements to protect targeted open space in the Metro region. • *Johnson Creek Willing Seller Program.* Portland program allows landowners in Johnson Creek floodplain to sell their property to the City at fair market value. After acquisition, properties are restored to natural floodplain function. Funded largely with dollars from FEMA after the 1996 flood. • *Sherwood program.* Requires system development charge (SDC) for development in floodplains, fee waived if flood area is donated to the city.

Restoration and enhancement

On the ground restoration and enhancement programs and projects were conducted by all of the organizations surveyed, with the exception of the Federal programs that fund many of the efforts. The Americorps program provides much needed labor; the U.S. Fish and Wildlife Service (USFWS) provides $300,000 per year to fund environmental education, conservation and restoration grant projects; and the Natural Resources Conservation Service (NRCS) cost-share program implements restoration projects on rural lands in the region. Environmental service districts[7] conduct much of the revegetation efforts, planting a substantial portion of the trees and plants in the year surveyed. Much of this work is accomplished through Portland's Bureau of Environmental Services (BES) "Watershed Revegetation Program." BES provides their services as a contractor outside of the city projects, contracting with organizations like Metro.

Watershed Councils and Park Districts also carry out projects in restoration and enhancement. Watershed councils frequently work in partnership with environmental service districts and other organizations. City governments and non-profits make extensive use of volunteers to conduct habitat restoration. Over 15,000 volunteers worked on restoration and enhancement efforts in the Metro region in 2002, contributing 49,150 hours of labor to remove 76 tons, 30 truckloads, and 382 cubic yards of debris and restoring 162 acres of land.[8] The Soil and Water Conservation Districts in the Metro region support restoration and enhancement efforts by helping landowners to revise land management practices to reduce erosion and non-point pollution of streams and rivers.

Education and outreach

Education and outreach programs are an important component of fish and wildlife habitat protection. Most of the organizations surveyed by Metro include some type of education and outreach in their work programs. Hands-on education is very popular, and significant amounts of volunteer time and resources are spent on this aspect of fish and wildlife habitat protection and restoration. A majority of habitat education programs included in Metro's study were conducted by non-profits. The Audubon Society of Portland surpassed all other organizations in attendance and number of classes due to the popularity of their bird and animal oriented classes. Also significant was the contribution by the environmental service districts, providing classes for school children and adults.

Park districts also provide educational programs. The Tualatin Hills Nature Park provides many adults and children with a hands-on experience in one of Washington County's oak savannahs. Portland Parks takes many school children to Hoyt Arboretum, Powell Butte, and Forest Park. Metro provides classes at regional parks[9], natural gardening, and recycling programs. Watershed Councils often work to educate residents as well; one example is the Slough School education program conducted by the Columbia Slough Watershed Council (funded by grants from OWEB and the Metropolitan Greenspaces Program).

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[7] Washington County's Clean Water Services (CWS), Clackamas County's Water Environmental Services (WES), and Portland's Bureau of Environmental Services (BES).

[8] *Accomplishment Report: Non-regulatory fish and wildlife stewardship in the Metro region* (Metro 2003).

[9] 10,000 people annually, including 7,000 children.

The organizations reviewed for this study used a number of tools to reach out to the public. More than 406,000 newsletters, 106,000 brochures and other promotional materials were distributed throughout the region in one year about environmental health in the Metro region. As is the case almost everywhere, the Internet is a fast growing outreach tool. A partial sample[10] of web-based outreach organizations reported 120,500 website hits and 15,000 electronically mailed newsletters during the sample year. Technical support to landowners interested in revising management practices on their properties was limited, and is mostly provided by the soil and water conservation districts which focus efforts on rural and agricultural areas.

Land acquisition

Land acquisition programs are used by a select set of organizations. The high cost of land limits the ability of many smaller organizations to purchase land. Primarily city governments, Metro, federal programs, and a few non-profit organizations utilize acquisition programs. Since 1995, all of the programs combined have succeeded in protecting 10,925 acres of land in the Metro region that is explicitly managed for fish and wildlife habitat protection (Table 2-3 below).[11] Close to 80 percent of the land that Metro has purchased is located outside of the urban growth boundary. Much of the restoration and enhancement work, as well as education and outreach activities, occur on these lands.

Table 2-3. Acres of land purchased for fish and wildlife habitat (as of August 2003).

Organization	Outright purchase or donation	Conservation easements	Total
Metro	7,872	81	7,953
Cities/Environmental Service Districts/Parks	2,035	4	2,039
Non-profits	769	164	933
Total	10,757	168	**10,925**

Metro's 1995 Open Spaces Bond Measure provided an impetus for acquisition to other organizations. The Open Spaces land acquisition program has acquired 7,953 acres, of those acres a little over 80 acres are conservation easements. In addition, through their own programs (bond measures or system development charge funds) the cities of Gresham, Portland, and Lake Oswego have acquired 1,254 acres of parks and open spaces. Since 1995 Portland Parks and Tualatin Hills Park and Recreation Districts have acquired 621.3 acres of habitat land, some through land donations and the rest funded by system development charges.

The city of Portland currently operates a willing seller floodplain acquisition program targeted to the Johnson Creek floodplain. The program was established after the floods of 1996, and used funds from the Federal Emergency Management Agency (FEMA) and the Department of Housing and Urban Development (HUD). More than 106 acres of floodplain have been acquired, although the major sources of funding have been used up. The City of Portland Bureau

[10] Not including Metro's website.
[11] As of August 2003.

of Environmental Services (BES) contributes $300,000 of Capital Improvement Project money to the program each year.

The Three Rivers Land Conservancy (TRLC) and the Wetlands Conservancy have acquired 769 acres inside the urban area to protect wetlands, riparian areas, and uplands that meet strict criteria in their value added to fish and wildlife habitat restoration and enhancement. TRLC also has a conservation easement program that has grown to 164 acres in the past decade. These lands are still privately owned but are strictly managed for their natural resource values in perpetuity.

Summary

While there is substantial evidence of non-regulatory approaches accomplishing habitat protection, restoration, and education in the Metro region, these efforts have not been successful in preventing a decline in overall ecosystem health. As described and catalogued in Metro's *Technical Report for Goal 5* and *Riparian Corridor and Wildlife Habitat Inventories*, the amount and quality of fish and wildlife habitat has been in steady decline over time. Most non-regulatory programs are dependent on unsteady sources of grant funding, volunteerism, and good stewardship, often without recognition or reward. Each program conducts important work, but even taken as a whole over the past decade only a small portion of the habitat in the region received the attention needed. There is a much greater need for restoration dollars; technical assistance for landowners, developers, and local jurisdictions; and permanent protection for critical habitats than is currently available.

Potential non-regulatory tools for protection and restoration

Non-regulatory tools are a key component of a strategy to protect fish and wildlife habitat. Incentives, education, and acquisition strategies are popular among landowners and can be used in conjunction with regulations and where regulations do not apply. For example, local land use regulations are generally triggered by a proposal for new development or redevelopment. Non-regulatory strategies can apply to other activities such as landscaping and reducing pesticide and herbicide use. Non-regulatory tools for habitat protection include acquisition (outright purchase and conservation easements), property tax relief, and good stewardship agreements.

Restoration is a critical component of an effective fish and wildlife habitat protection program. Without active restoration efforts, ecological conditions will likely deteriorate further, even if most habitat lands are protected through regulations. Mitigation for the negative environmental impacts of development may be included as part of a regulatory program. However, actions to restore habitat to a condition better than exists today cannot be required as part of a regulatory program; restoration could be included as a major part of a non-regulatory approach. Regulations can protect land that can then be restored through non-regulatory approaches to provide better functioning habitat.

Based on the results of the *Incentives Report* and Metro's analysis of existing non-regulatory tools for habitat protection and restoration, the following potential non-regulatory tools are examined:

- Stewardship and recognition programs
- Financial incentives (grants, incentives for green streets, property tax reduction)
- Education (information center, technical assistance, other education activities)
- Volunteer activities
- Agency-led restoration
- Acquisition (outright purchase, conservation easements, revolving acquisition fund)

A brief examination of potential costs and effectiveness of potential non-regulatory programs is included in Table 2-5 at the end of this chapter.

Stewardship and recognition programs

These programs publicly acknowledge landowners, businesses and other entities for conserving open space, protecting or restoring habitat areas, making financial contributions or carrying out good stewardship practices in general. Public agencies and nonprofit organizations can administer the programs, and the recognition could take the form of media publicity, awards ceremonies, or plaques and certificates. These programs, while not widely applied in the Metro region, have much potential for encouraging conservation behavior when combined with other programs.

A good stewardship agreement between a landowner and an organization interested in protecting or restoring habitat and monitoring success over time can be used to achieve some level of habitat protection. Such a program would recruit landowners to agree to voluntary stewardship agreements that allow residents to make a commitment to care for the land in a manner that promotes habitat value. A stewardship agreement program would be most effective when combined with other incentives such as education, technical assistance, and grants.

Landowner recognition programs on their own generally provide no permanent protection of resources because participation is voluntary. However, administrative costs may be relatively low compared to funding for programs such as acquisition that provide definitive permanent protection. This tool is most likely to be effective when integrated with other tools (e.g., grants and education) as part of an overall conservation strategy.

Potential programs

1. ***Yearly report.*** Develop a report (printed and/or on website) to publicize innovative examples of restoration, protection and habitat friendly development in the Metro region.
2. ***Stewardship recognition program.*** Develop a regional fish and wildlife habitat stewardship program that recognizes landowners for restoring and protecting habitat on their land and habitat friendly development practices. Sponsor a yearly award ceremony, provide certificates, and encourage media coverage.
3. ***Stewardship agreements.*** Develop signed voluntary stewardship agreements between a property owner and Metro or another sponsor for habitat protection. Most likely to be effective when used in conjunction with small grants and long-term monitoring.

Financial incentives

Achieving restoration on private and public lands typically requires some type of financial incentive to induce property owners to conduct activities such as planting of native vegetation, removal of invasive species, and other habitat improvements.

Grants

Grants for restoration can provide the incentive for supportive landowners and other organizations to restore habitat on private and public lands. A small grant program, targeted to watershed councils, non-profit organizations, or local governments, could be created similar to Metro's recent grants for regional and town center planning efforts. Applicants could submit projects one or two times per year, and they could be reviewed and ranked based on established criteria. Small grants given in strategic places could build on existing work and encourage more efforts in targeted areas.

Funding can leverage additional benefits such as education and volunteerism. Private landowners may be interested in the concept of improving the habitat value on a portion of their land, and the availability of dollars can provide the impetus to conduct restoration activities. Many grants are provided with a required match of either dollars or in-kind materials or labor. These incentives provide landowners who contribute a portion of the proposed cost for conservation or restoration activities with additional funding opportunities. There are several programs in place for rural land in agriculture or forestry use, and some for urban lands. A grant program could target specific activities along stream reaches or within watersheds in coordination with watershed action plans to accomplish the most effective restoration. A monitoring component of a restoration plan would be essential to assess effectiveness over time at restoring habitat function.

As part of a regional habitat friendly development program, Metro could develop a *Habitat-oriented Development Program* similar to Metro's Transit-oriented Development (TOD) Program to encourage construction of new developments or redevelopment that protects and restores fish and wildlife habitat. This would require funds to provide the incentives for developers to practice habitat friendly development. For example, 1000 feet of a stream in the Tryon Creek watershed will be daylighted (removed from pipes) through incentives provided to a housing redevelopment project.[12]

Potential programs

A small grant program could be targeted to residential or individual landowners, or targeted towards development and business practices. Grants could also be aimed at watershed councils or other non-profit groups.

1. ***Small grant program for restoration.*** Develop a small grant program to accomplish restoration on private or public property within the identified regionally significant fish and wildlife habitat areas. With larger grants require long-term monitoring.
2. ***Habitat friendly development grants.*** Provide grants to encourage habitat friendly development, similar to Metro's grant programs to encourage and support Transit-Oriented Development (TOD) and regional and town center planning.

[12] *Oregonian*, "Developer keeps at creek crusade" 10/3/2003.

3. ***Wildlife crossing/culvert replacement grants.*** Provide grants to encourage culvert replacement and wildlife crossings around the region.

Incentives for green streets

The Metro Council could establish a priority for funding transportation projects based on their impacts to regionally significant fish and wildlife habitat. This could help to prevent additional damage to habitat in the region and also provide incentives to restore habitat that has been impacted by development. A criterion could be added to the MTIP funding priorities that focuses on habitat issues, such as culvert replacement or removal, wildlife crossing improvements, or implementation of Green Streets design standards. Alternatively, a separate category or bonus points could be assigned to projects that meet habitat criteria to allow for the funding of projects that improve transportation and habitat in the region.

Property tax reduction

Providing landowners with a reduction in property taxes in exchange for habitat protection or restoration is not a new idea. There are many federal programs that encourage landowners to do just that; however, most of these programs are applicable to farm or forest land. There are two state programs that could be applicable within the urban area: the *Riparian Lands Tax Incentive Program* and the *Wildlife Habitat Conservation and Management Program*. Both of these programs would require county or city action to be implemented. The riparian tax incentive program allows for a tax exemption for property within 100 feet of a stream provided the land is protected and managed for habitat value. The program is limited to 200 stream miles per county. The wildlife habitat program allows designated habitat land to be taxed at a special, reduced rate as long as it is protected and managed for habitat value. This program is not limited by acres and can be applied to riparian or upland habitat.

Property tax reduction is a useful tool to provide motivated landowners with an incentive to manage their land for habitat values, and can also serve as a mechanism to achieve some restoration if a habitat management plan includes requirements for enhancement of existing habitat. However, property tax reductions would reduce jurisdictional revenues. Once enrolled in the program, these properties could also be targeted by agencies that conduct restoration activities such as Metro, Portland's Bureau of Environmental Services, or Clean Water Services in Washington County for greater public benefit. Habitat protection and restoration may be most effective ecologically if this tool is applied strategically, for example, in a specific stream reach or headwater area. This tool could serve as an important incentive to encourage landowners to work in a coordinated fashion to leverage ecological improvements in a specific area. If used on a "first-come, first-served" basis, there may be a scattered approach and less ecological benefit overall. A downside to using property tax relief as a tool for habitat protection is that a landowner can leave the program at any time, the only penalty being payment of back taxes, similar to opting out of a farm or forest tax deferral program.

Education

Information center for fish and wildlife habitat protection

One of the biggest challenges with any incentive/non-regulatory program is getting information into the hands of people who can use it. An "information center" that includes technical assistance, recognition programs, and potentially small grant funds could serve as a "one-stop shop" providing landowners and others with information and referrals needed to protect and restore fish and wildlife habitat. A center could also include assistance to landowners and others on regulatory compliance and provide coordination between multiple agencies. Metro has some experience providing information to the public – the Recycling Information Center has assisted people with recycling questions since 1981. Other Metro information programs that benefit the environment include Natural Gardening, Soils for Salmon, and Greenspaces education programs and grants. A similar system could be developed to provide landowners and others the information they need to protect fish and wildlife habitat. An alternative to a fully-fledged information center is a permanent hotline residents could call for information on habitat protection and restoration.

Potential programs

1. ***Hotline.*** Provide a permanent hotline for fish and wildlife habitat protection and restoration, include number on all brochures, handbooks, and other educational materials. The hotline could serve as a referral service to other experts in the region.
2. ***Information center.*** Develop an information center, similar to the Recycling Information Center but on a much smaller scale. Citizens could call and talk to a person about habitat protection and restoration or development questions.

Habitat education

Many landowners would like to manage their land in a way that benefits fish and wildlife habitat. However, frequently people do not know if certain activities are detrimental (using herbicides and pesticides), if there are alternatives (natural gardening), what to do to improve habitat (plant native plants, remove invasive species like ivy), and how to connect to agencies and organizations that provide grants and/or volunteers to help improve habitat. A program could be developed to focus efforts to increase people's awareness of the connections between their activities and the health of streams and rivers, similar to fish stencil programs. Landowners in regionally significant habitat areas could be targeted to raise awareness of how individual activities impact fish and wildlife habitat. Education activities would be most effective when used in conjunction with a stewardship certification program, grant programs, and regulatory programs.

Metro currently has several education programs that help fish and wildlife habitat in the Parks and Greenspaces Department and the Solid Waste and Recycling Department. Many other organizations in the region also provide classes about the environment. Several possible programs are described below.

Potential programs

1. ***Brochure.*** Provide an educational brochure about protecting and restoring habitat to be mailed once per year to landowners with significant habitat (also include on website).
2. ***Coordinate with other organizations.*** Distribute information about regionally significant fish and wildlife habitat through education programs provided by other organizations.
3. ***Expand existing education programs.*** Add to existing workshops and classes. Develop a program similar to "Naturescapeing" or "Natural Gardening" on habitat protection and restoration.
4. ***Curriculum for schools.*** Develop a curriculum for schools; work with teachers to implement.

Technical assistance

Technical assistance programs are noted for being responsive to landowner needs, providing practical information, and having knowledgeable resource staff. Such a program would not provide direct protection to habitat, but would offer a means of improving stewardship and enhancement by private landowners. Technical assistance could help supplement cost-sharing programs, such as grants, to further protection and restoration efforts. Technical assistance could be focused on landowners, development practices, and/or local partners. Metro has provided technical assistance to local partners throughout the implementation of the Regional Framework Plan and the Regional Urban Growth Management Functional Plan. This has proved especially important in the implementation of Title 3 (stream and floodplain protection) and planning for 2040 centers.

Metro could work with local partners to develop technical assistance, incentives, recognition programs, and awards for development that helps protect fish and wildlife habitat. Metro, in conjunction with local partners, could develop regional low impact development standards and designs to reduce development impacts on fish and wildlife habitat. The Green Streets Handbook serves as a successful model of technical assistance for transportation infrastructure.

Potential programs

1. ***Local partners.*** Provide assistance to staff from local jurisdictions and other organizations to enable them to assist property owners. If a regulatory program is chosen, provide assistance to local jurisdiction staff to aid in implementation.
2. ***Individual property owners.*** a) Develop and distribute materials focused on habitat protection, restoration and enhancement. b) Dedicate staff to assist property owners in habitat protection and restoration activities on a demand basis. c) Dedicate staff for a one-on-one outreach effort to property owners with high quality habitat, include workshops one to two times per year.
3. ***Development and business practices.*** a) Develop and distribute a manual on habitat-friendly development and green business practices. b) Dedicate staff to assist developers/businesses in habitat protection/restoration on a demand basis. c) Dedicate staff to proactively seek out developers/business owners to achieve habitat friendly development and restoration, include workshops one to two times per year.

Volunteer activities

Much habitat restoration has already been accomplished in the region through the efforts of volunteers. There are many groups that coordinate activities, including SOLV (the statewide Oregon non-profit organization founded in 1969 by Governor Tom McCall), Watershed Councils, Riverkeepers, and Friends' organizations. For example, the Friends of Forest Park organizes major efforts throughout the year to remove English ivy from the park and Friends of Trees organizes more than a dozen native planting events in natural areas each year. Metro currently works with volunteers to both educate (volunteer naturalists) and restore habitat. Involving volunteers in habitat restoration projects both helps to accomplish work and provides a forum for education and awareness of the fish and wildlife in the region. Metro could expand current efforts and partner with non-profit groups and public agencies to coordinate restoration activities to encourage restoration in areas that are designated as regionally significant fish and wildlife habitat.

Potential programs

1. ***Focus existing programs.*** Encourage existing volunteer organizations to focus restoration efforts in regionally significant fish and wildlife habitat areas.
2. ***Provide funding.*** Provide funds to existing volunteer organizations to conduct restoration on public lands with regionally significant fish and wildlife habitat.

Agency-led restoration

Several government agencies currently sponsor and conduct restoration. For example, Metro carries out restoration activities on its own properties to enhance existing habitat value. Metro is currently working with public landowners in the Clackamas River basin on a program to halt the spread of and hopefully eradicate Japanese knotweed – a tenacious non-native plant that overtakes riparian areas. Some agencies, such as the City of Portland's Bureau of Environmental Services, conduct restoration on private lands if they are invited to do so. Agency sponsored restoration could be used in conjunction with other incentive and regulatory programs to accomplish regional restoration goals.

Potential programs

1. ***Provide funding for public lands.*** Provide funds to agencies that conduct restoration to focus efforts in regionally significant habitat areas.
2. ***Provide funding for private lands.*** Provide funds to agencies to conduct restoration for private property owners with regionally significant habitat in exchange for habitat protection.

Acquisition

The most certain way to protect habitat is to acquire it. There are various ways to acquire land such as outright purchase, development rights, and property transfers. These programs address social concerns of fairness as well as real and perceived takings, since they conform to a market-based approach for habitat conservation.

Metro began focusing attention on fish and wildlife habitat protection in the early 1990's, identifying natural areas of regional significance and eventually developing the Greenspaces Master Plan to protect a system of regionally significant natural areas. Metro's $135 million bond measure passed in 1995 to primarily purchase open space and develop regional trails. The bond measure identified 14 target areas and six trail and greenway projects. These came from the Greenspaces Master Plan that identified "regionally significant" natural areas following an exhaustive inventory. Sites were selected based on the following criteria:

- Immediacy or threat of development
- Accessibility to residents of the region
- Protection of large contiguous blocks (patch size)
- Expanding on existing regionally significant areas that are protected

If additional funding to purchase habitat land was secured, an acquisition program could focus on regionally significant fish and wildlife habitat, targeted to achieve specific goals. The goals could include protection of Habitats of Concern, floodplains, regional connector habitat, strategically located, high-value habitat, and key restoration opportunities. Table 2-4 below shows the acres of undeveloped land in Metro's fish and wildlife habitat inventory. This helps to describe the magnitude of land that falls within the habitat inventory. For example, Riparian Class I contains over 11,000 acres of undeveloped habitat land. Based on the cost of land purchased through Metro's 1995 Open Spaces Bond Measure, land costs inside the UGB average about $45,000/acre and outside the UGB average about $8,600/acre. Due to the expense, acquisition clearly is not a tool that could be used alone to protect even this most ecologically valuable habitat.

Table 2-4. Acres of undeveloped habitat land.

Habitat classification	Total undeveloped habitat land
Riparian Class I	11,614
Riparian Class II	5,365
Riparian Class III	682
Wildlife Class A	8,643
Wildlife Class B	8,211
Wildlife Class C	4,711
Total	**39,226**

Outright purchase

A fee simple purchase of habitat land provides permanent protection but depends on willing sellers. Property is purchased for market prices and thus an acquisition program must be well funded to be effective on a large scale. For example, Metro's Open Spaces acquisition program was funded through a $135 million bond measure approved by voters in May 1995. As of July 15, 2003, Metro had acquired more than 7,935 acres of land for regional natural areas and regional trails and greenways, in 251 separate property transactions at a cost of $1.2 million.[13] These properties protect 70 miles of stream and river frontage.

Regional Revolving Land Purchase Fund

Sometimes valuable fish and wildlife habitat is located on only a portion of a property, and the rest of the parcel is either already developed (e.g., a house) or could be developed in the future. If these parcels are purchased through an acquisition program two concerns arise. First, if the property has a house or other existing use, Metro or another purchasing agency would then be in the position of either renting the useable portion of the property or retiring it from the marketplace and shouldering high maintenance costs. Second, the overall purchase cost of such a parcel would be high, and would effectively reduce available funds for other targeted habitat acquisitions. A program could be developed to purchase habitat land, place development restrictions or conservation easements to protect the habitat areas, and then sell or exchange (via land swaps) the remainder of the land for development or continued use. Funds from the sale could then be used to protect additional land. Such a program could maximize the use of conservation dollars by protecting only the habitat areas on a parcel of land, rather than the entire parcel.

[13] Part of the $135 million bond measure went to local jurisdictions for local parks and greenspaces purchases.

Conservation easement
A conservation easement is a legal agreement between a landowner and a land trust or government agency that permanently limits use of the land in order to protect its habitat values. It allows landowners to continue to own and use their land and to sell it or pass it on to heirs. Conservation easements offer great flexibility. An easement on a property containing rare wildlife habitat might prohibit any development, for example, while one on a farm might allow continued farming. An easement may apply to a portion of the property and need not require public access.

Conservation easements can be donated or purchased. If the donation benefits the public by permanently protecting important conservation resources and meets other federal tax code requirements, it can qualify as a tax-deductible charitable donation. The amount of the donation is the difference between the land's value with the easement and its value without the easement. Conservation easements could be used effectively to target dollars for protecting critical habitat areas. A few organizations currently use conservation easements in the region. A strategy could be developed to collaborate with groups that currently use this tool to protect portions of the regionally significant fish and wildlife habitat identified in Metro's inventory. In addition, agency-sponsored revegetation could be offered to landowners as an incentive to establish conservation easements.

Metro currently has eight easements acquired through the open spaces program (81.1 acres total). One is a flood easement, the other seven are conservation easements. The flood easement is not included in acreage numbers, but the other seven are included. Three easements were donated (59.11 acres), three were purchased (15.89 acres), and one was acquired through an exchange of a 25-year agricultural lease on one acre of property - easement is on 6.1 acres.

Conservation easements have some drawbacks. The legal agreements are complex and time-consuming, and the level of effort (both time and dollars) is often comparable to an outright purchase. Additionally, some property owners would prefer to sell their land outright rather than be encumbered with a conservation easement. Finally, after a conservation easement is in place, it requires resources and staff time to monitor it to ensure it is being followed, and to enforce in instances where its requirements have been disregarded.

Summary
There are many types of non-regulatory tools that could be used to protect and restore fish and wildlife habitat in the region. All of these tools require some type of funding, whether to pay for staff or provide direct dollars to purchase or restore land. Moreover, the success of non-regulatory tools also relies on the willingness of property owners and businesses to invest time and resources, and often to change historic practices. Many of the non-regulatory tools could be implemented at either the local or regional level. Table 2-5 on the following pages describes some of the implementation issues and costs associated with the non-regulatory tools identified in this analysis.

Acquisition is the most effective non-regulatory tool to achieve definitive habitat protection. Acquisition achieves permanent protection and also preserves land to be restored at a later date. However, the high cost of purchasing land, especially within the urban growth boundary, the dependence of an acquisition program on willing sellers, and the fact that much of the habitat is on partially developed land limits the effectiveness of such a program.

Many of the other non-regulatory habitat protection and restoration tools considered here are most effective when used in combination with each other and/or along with a regulatory program. A regulatory program can provide the incentive and motivation to develop innovative solutions to land development while protecting habitat. Grants and technical assistance are the tools that could be most effective in protecting and restoring habitat, in the absence of an acquisition program. A stewardship recognition program could help promote grants and serve to educate others about innovative practices. Coordinating with existing agencies and volunteer groups that conduct restoration as well as providing funds to focus efforts could be effective in enhancing regionally significant habitat.

Table 2-5. Potential non-regulatory programs for fish and wildlife habitat protection.

What	Effectiveness	Partnerships	Cost*
Stewardship & recognition programs 1. *Accomplishments report* to publicize innovative examples of restoration, protection, and habitat friendly development in region. 2. *Stewardship program* to recognize landowners for restoring and protecting habitat on their land and habitat friendly-development/business practices, include a yearly award ceremony. 3. *Voluntary stewardship agreements* between a property owner and either Metro or another sponsor for habitat protection.	• Limited acreage of total habitat covered • Long-term protection uncertain • Monitoring may increase effectiveness • Relies on willing participants • More effective when used with cost-sharing, grants and technical assistance to encourage more successful projects	Could be implemented by Metro, a local partner, or Watershed Councils.	Low to Medium
Grants for restoration & protection 1. *Residential owner.* Small grant program to accomplish restoration on private or public properties within resource area. 2. *Development activities and business practices.* Provide grants to: • businesses for habitat restoration • developers to encourage habitat friendly development or redevelopment • cities and counties for wildlife crossing and culvert replacement projects	• Effectiveness depends on funding, technical assistance and education, and long-term monitoring • Provides on-the-ground protection and restoration accomplishments • Grants to developers could effectively encourage innovative practices • Limited acreage of total habitat covered • Could increase effectiveness of regulations	A grant program could be implemented at the local or regional level. Partner with Watershed Councils and other groups.	Medium to High
Information center 1. *Hotline* for fish and wildlife habitat protection and restoration. (Calls would be returned periodically). 2. *Call center* for fish and wildlife habitat protection and restoration, referral to other agencies. (Immediate response).	• Effectiveness depends on publicity, technical expertise, and longevity • Depends on extensive marketing campaign and longevity	Could be implemented at the regional level and/or through partnerships.	Low to Medium
Habitat education activities 1. *Educational brochure* on maintaining and enhancing fish and wildlife habitat to be mailed once per year to landowners with significant habitat (also include on website). 2. *Coordinate* with existing organizations that provide habitat-oriented classes, distribute information on regionally significant resources. 3. *Add to Metro's existing workshops and classes* (e.g., Parks Dept. nature classes, tours, and birdwatching events; Solid Waste Dept. "Naturescaping" and "Natural Gardening" classes). 4. *Curriculum* for schools, work with teachers to implement.	• A long-term commitment is required to change behaviors and practices • Over time an education program can reach a large number of people • Could provide consistent message and economy of scale across the region	Could be implemented by Metro, local partners, Watershed Councils, or other non-profits.	Low to Medium
Technical assistance program *Focused on local partners* 1. Assistance to local jurisdiction staff and other organizations to enable them to assist property owners in their jurisdictions 2. Provide assistance to local jurisdiction staff to aid in implementation of a regulatory program (if one is chosen)	• Level of commitment and longevity of program would be key to effectiveness • Technical assistance supports stewardship programs and grants • Technical assistance could increase the effectiveness of a regulatory program	Could be implemented at the regional level and/or through a partnership with other jurisdictions and agencies (e.g.,	Low to Medium

What	Effectiveness	Partnerships	Cost*
Focused on residential, individual owners 3. Develop and distribute materials focused on habitat protection, restoration & enhancement 4. Dedicate staff to assist property owners in habitat protection/ restoration activities on a demand basis 5. Dedicate staff for a one-on-one outreach effort to property owners with high quality habitat, include workshops 1-2 times/year *Focused on development and business activities* 6. Develop and distribute a manual on habitat-friendly development and green business practices 7. Dedicate staff to assist developers/businesses in habitat protection/restoration activities on a demand basis 8. Dedicate staff to proactively seek out developers/business owners to achieve habitat friendly development, restoration; include workshops	• Most effective with high staff to client ratio; no single agency could address needs of so many properties without adequate staff • Knowledgeable staff is critical to providing effective technical assistance	Portland's Office of Sustainable Development).	
Volunteer activities 1. *Partner* with existing volunteer organizations to focus restoration efforts in regionally significant habitat areas. 2. *Provide funds* to existing volunteer organizations (e.g., SOLV) to conduct restoration on public lands with regionally significant habitat.	• Substantial restoration work currently conducted with volunteer efforts • Supports education efforts by training volunteers • Easier access on public lands	Coordinate with existing programs, such as Watershed Councils, friends' groups, SOLV.	Low to High
Agency-led restoration activities 1. *Restoration on public lands.* Provide funds to agencies (e.g., Metro, Portland Bureau of Environmental Services, Clean Water Services) that conduct restoration to focus on regionally significant habitat. 2. *Restoration on private lands.* Provide funds to agencies for restoration on private lands in exchange for habitat protection.	• A trained and experienced staff with monitoring capability could lead to effective restoration work • Maintenance and monitoring of the restoration site over time is necessary to accomplish effective long-term restoration	Implemented at regional and local partner level.	Medium to High
Property tax relief (Programs exist under Oregon state law) 1. Riparian Lands Tax Incentive Program 2. Wildlife Habitat Conservation and Management Program	• Limited landowner enrollment • Requires ongoing management plan with Oregon Department Fish & Wildlife • Landowners can opt out of program with payment of back taxes	Counties implement, Metro could facilitate implementation; encourage application in urban area.	Medium
Acquisition 1. Outright purchase 2. Conservation easement 3. Revolving acquisition fund 4. Donation/bequest program	• Most effective in long-term preservation • Properties may require maintenance • Conservation easements complex to negotiate • Revolving acquisition fund could make effective use of limited dollars	Could be implemented at federal, regional, or local level or by a non-profit.	High

*__About cost:__ High (grants, restoration, acquisition); Medium (dedicated staff); Low (materials only, some staff)

CHAPTER THREE: EXISTING REGULATORY ENVIRONMENT AND REGULATORY PROGRAM OPTIONS

Existing regional and local environmental regulations already cover a portion of the region's habitat land. Since 1998, cities and counties have implemented Metro's protection standards for flood management and water quality (Title 3) along streams and floodplains. Approximately 30 percent of regionally significant fish and wildlife habitat currently covered by Title 3 regulations achieves some, but not all, of the habitat protection needed in these areas. Very few of the wildlife areas in Metro's habitat inventory are covered by consistent regional standards.

In addition to implementing Title 3, some cities and counties have adopted local regulations to protect habitat. Regulations vary in the amount of habitat area they cover and in the level of protection they provide. None of them regulate all regionally significant fish and wildlife habitat within their jurisdiction. This chapter includes:

- a description of the baseline regulations (Title 3) for purposes of analysis
- a summary of Metro's analysis of local Goal 5 programs, and
- a description of the six regional regulatory program options to protect fish and wildlife habitat.

Baseline for analysis (Title 3)

This section describes the starting point for this Phase II ESEE analysis – a baseline from which to measure ESEE tradeoffs of the increment of additional protection posed by each option.

Metro's Title 3 (Water Quality and Flood Management Plan) provides a level of fish and wildlife habitat protection that is consistent across the region. For this reason, Title 3 serves as a proxy for measuring existing levels of protection and is the baseline for this analysis. Habitat outside of Title 3 management areas receives no additional regionally consistent protection. Although many local jurisdictions do provide protection beyond Title 3, none of them regulate all regionally significant habitat lands within their jurisdictions. A comparison of several local Goal 5 programs is made in the next section.

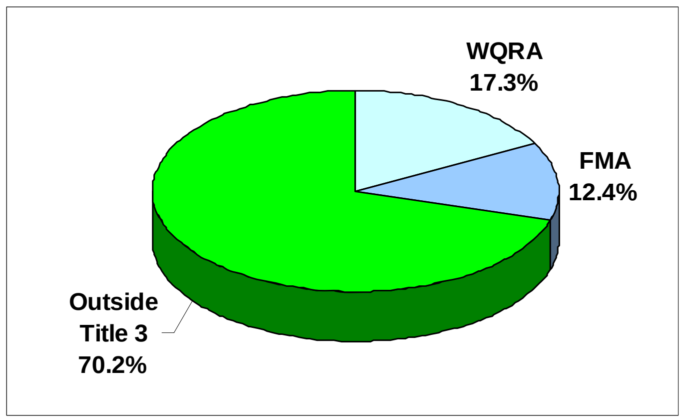
The water quality resource areas (WQRA) and flood management areas (FMA) established in Title 3 protect some of the regionally significant Goal 5 fish and wildlife habitat. Table 3-1 shows Title 3 coverage of fish and wildlife habitat and impact areas. Figures 3-5 and 3-6 graphically illustrate this information.

Table 3-1: Title 3 coverage of fish and wildlife habitat and impact areas (within Metro's jurisdiction)

Fish and wildlife habitat class	Acres within WQRA	Acres within FMA	Total WQRA/ FMA	Acres Outside Title 3	Total Acres	% WQRA/ FMA of Total Acres
Class I RC/WH	13,144	6,803	19,947	7,929	27,876	21%
Class II RC/WH	1,893	1,948	3,841	4,051	7,893	4%
Class III RC/WH	177	2,543	2,720	1,711	4,432	3%
Class A WH	214	108	322	19,359	19,682	0%
Class B WH	69	18	87	12,802	12,889	0%
Class C WH	42	92	134	7,328	7,463	0%
Impact Areas	1,067	419	1,486	14,235	15,721	2%
Total	***16,606***	***11,931***	***28,537***	***67,415***	***95,956***	***30%***

Habitat location (i.e., within WQRAs, within FMAs, outside Title 3), development status (vacant vs. developed), and conflicting land use (e.g., industrial development vs. single-family residential) are important factors for assessing the ESEE tradeoffs of additional protection proposed by the six program options.

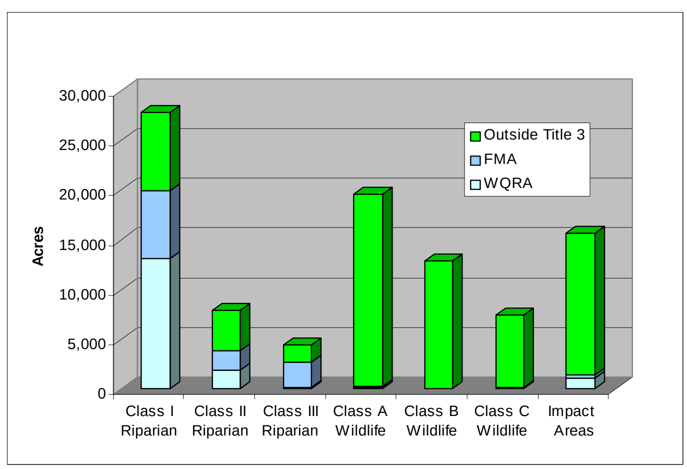
Figure 3-5. Proportion of habitat and impact areas covered by Title 3 (within Metro's jurisdiction).



Habitat location

Figure 3-5 shows that approximately 30 percent of habitat and impact areas are currently covered by Title 3 (28,537 acres). Title 3 achieves some, but not all, of the habitat protection needed in these areas. Most of the protection occurs in Class I-III riparian/wildlife corridors (see Figure 3-6); almost none of the upland wildlife habitat is covered by Title 3.

Figure 3-6. Title 3 coverage of habitat classes and impact areas (within Metro's jurisdiction).

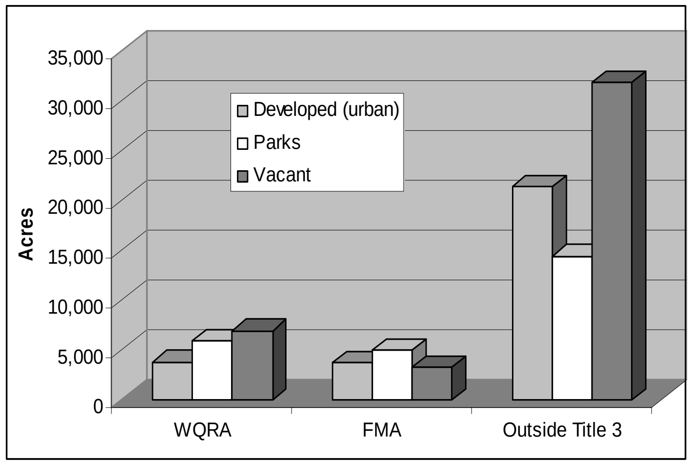


Title 3 performance standards differ in WQRAs and FMAs. Water quality resource areas vary in width from 15 feet to 50 feet from the water feature, and up to 200 feet in steeply sloped areas. New development is ***not allowed*** in these areas unless there is no practical alternative for locating it. In flood management areas, however, new development is ***allowed*** subject to the base zone or existing flood hazard overlay zones and Title 3 development standards (e.g., balance cut and fill). FMAs include the 100-year floodplain, flood area and floodway, and the 1996 flood inundation area.

The increment of additional protection would be greater in the FMAs than in the WQRAs if disturbance areas are limited by a Goal 5 program because Title 3 does not currently limit disturbance area size in FMAs. The increment of additional protection would be greatest in habitat and impact areas outside Title 3, where it is assumed for this analysis that habitat is not currently protected.

Development status

Figure 3-7. Development status of habitat and impact areas (within Metro's jurisdiction).



Development status also plays a part in assessing the increment of additional protection. As described in the Phase I ESEE analysis, development status refers to whether habitat land is developed or vacant. Figure 3-7 shows development status of habitat land and impact areas inside Metro's jurisdiction.

Developed habitat is land with improvements (e.g., buildings, roads) and specific land uses (e.g., residential, industrial). Two subsets are included in this category: developed urban and parks. An example of habitat categorized as developed urban is dense forest canopy over a developed residential subdivision. Thirty percent of habitat and impact areas (28,734 acres) is developed with urban uses. Parks are categorized as developed land because they generally are not available for urban development. Approximately 28 percent (26,841 acres) of the habitat and impact areas are in park status or zoned parks and open spaces (POS). Generally, the impact of additional protection would be less in developed habitat land than in vacant habitat land, at least in the short term because the regulations would apply to new land use development and would not affect existing development. Over time as redevelopment occurs, however, new Goal 5 regulations would apply.

Vacant land is defined as land without buildings, improvements or identifiable land use. Metro's vacant lands inventory includes vacant portions of developed tax lots that are one-half acre or larger. Vacant land also has two subsets: constrained (by Title 3 WQRA and FMA) and buildable (vacant land outside Title 3). Forty-four percent of habitat and impact areas is vacant (41,965 acres). The impact of additional protection will be greatest on vacant habitat land outside Title 3 areas. Factors other than Title 3 can affect the ability to develop vacant land, such as utility corridors.

Conflicting land uses

Phase I of the ESEE analysis examined conflicting uses; that is, a land use that could adversely affect regionally significant fish and wildlife habitat. Conflicting uses were identified using

Metro's seven regional zones – a compilation of local jurisdictions' zones (see Chapter 3 of the Phase I ESEE Analysis for a full discussion of conflicting uses). Zoning plays a part in assessing ESEE tradeoffs. For example, the increment of additional protection on land zoned for parks would likely be less than habitat land zoned for urban uses (e.g., industrial). Some uses that would conflict with habitat protection may occur in a variety zones such as roads, public utilities, and regionally significant public facilities (major medical facilities and educational institutions). These special uses will be considered in the program development phase.

In summary, the ESEE analysis considers current regulations, development status and regional zoning in assessing the consequences of limiting, allowing or prohibiting development in fish and wildlife habitat areas. Thirty percent of the fish and wildlife habitat inventory overlaps with Title 3 water quality and flood management areas; 70 percent is outside Title 3. The increment of additional protection is influenced by where the habitat is located (in WQRA/FMA vs. outside Title 3), development status of the habitat (developed vs. vacant), and conflicting land uses (regional zones). Title 3 standards focus on streams, floodplains and wetlands; upland wildlife habitat is not covered for the most part. Developed land will experience the impacts of program options through the eventual redevelopment and expansion of existing land uses. Vacant land not covered by Title 3 will experience the most immediate impact of regulatory program options. The extent of the effects varies further by the nature of the land use. The next section describes local Goal 5 programs.

Local Goal 5 programs

Metro conducted a review of local jurisdiction's plans for habitat protection from 1999 to 2002, resulting in the *Local Plan Analysis: A review of Goal 5 protection in the Metro region (August 2002).* Most of the local jurisdictions in the Metro region have adopted Goal 5 programs that have been acknowledged by the Department of Land Conservation and Development as being in compliance with the state rule. Some of these programs were developed prior to the Goal 5 rule revisions in 1996, while a few have been completed more recently.

The Goal 5 rule requires a three-step process, as described in the introduction to this report. However, local governments may also choose to utilize the State "safe harbor" approach rather than conduct an inventory using the standard methodology described above (OAR 660-23-020). A safe harbor approach may be used for riparian corridors and wildlife habitat. Using the safe harbor approach, a local government may determine the boundaries of significant riparian corridors within its jurisdiction using a standard setback distance from all fish-bearing lakes and streams (OAR 660-23-090(5)). This setback distance is determined as follows:

(a) for streams with average annual stream flow greater than 1,000 cubic feet per second (cfs), the riparian corridor boundary is 75 feet upland from the top of each bank
(b) for lakes and fish-bearing streams with average annual stream flow less than 1,000 cfs, the riparian corridor boundary is 50 feet upland from the top of each bank

Goal 5 is a process goal – the state does not prescribe a specific outcome as it does in other land use planning goals. The rule requires local jurisdictions to balance the need to protect natural resources against other state goals such as housing (Goal 10) and transportation (Goal 12) while providing ample opportunity for citizen involvement (Goal 1). Thus, the state rule allows local jurisdictions' Goal 5 programs to be in compliance with state law while being inconsistent with each other. However, Metro's code required an analysis of the consistency and/or adequacy of local natural resource protection prior to conducting a regional ESEE analysis and a regional protection program. The key findings from the *Local Plan Analysis* are reviewed below.

The Goal 5 process begins with the inventory of Goal 5 resource sites, providing information to locate and evaluate resources and to develop programs to protect such resources (OAR 660-023-0030(1)). The standard inventory process involves four steps. However, depending on the type of Goal 5 resource, not every step must be applied in the inventory stage.

Inconsistencies

Fish and wildlife habitat in the Metro region receive inconsistent treatment and protection across jurisdictions, considering the pervasive inconsistencies in Goal 5 inventory methodologies, data layer formats, ESEE analyses, and program decisions of local jurisdictions. Outside of the State safe harbor for riparian areas and wetlands, the Goal 5 rule provides little guidance to local governments on methods of protection, except the requirement that a protection program include clear and objective standards. The Goal 5 protection programs of local jurisdictions within the Metro region are inconsistent with each other on a number of levels. Some programs offer exclusive protection for riparian and wetland areas, prohibiting development unless exceptional circumstances apply, whereas other jurisdictions offer limited development within their most significant resource areas. Furthermore, protection levels for limited development range anywhere from five percent development to at least fifty percent development on significant natural resource land. Finally, there is no consistency between local jurisdictions' review processes, mitigation and enhancement procedures, or their monitoring and enforcement mechanisms.

Inadequacies

It is often difficult to determine what specific protection will be applied to resources by local governments when implementing Goal 5 programs. This not only leads to inconsistent protection around the region, but also may result in inadequate protection of natural resources. The most consistent protection is Metro's Title 3 regulations for protecting water quality and floodplain function.[14] In addition, several jurisdictions in the region have adopted the State's Safe Harbor provisions under Goal 5, which provide protection specific to fish-bearing streams based on stream size. Local jurisdictions' riparian corridor protection programs that do vary from either Title 3 or the State Safe Harbor range from 30 feet on a class I stream (Lake Oswego) to as much as 150 feet on a principal river (Clackamas County).[15]

Figure 1 compares the minimum widths recommended in the scientific literature[16] to the riparian corridor protection provided by Metro's Title 3 regulations and the State Safe Harbor. As the figure illustrates, even the maximum protection provided by Title 3 on steep slopes (200 ft.)

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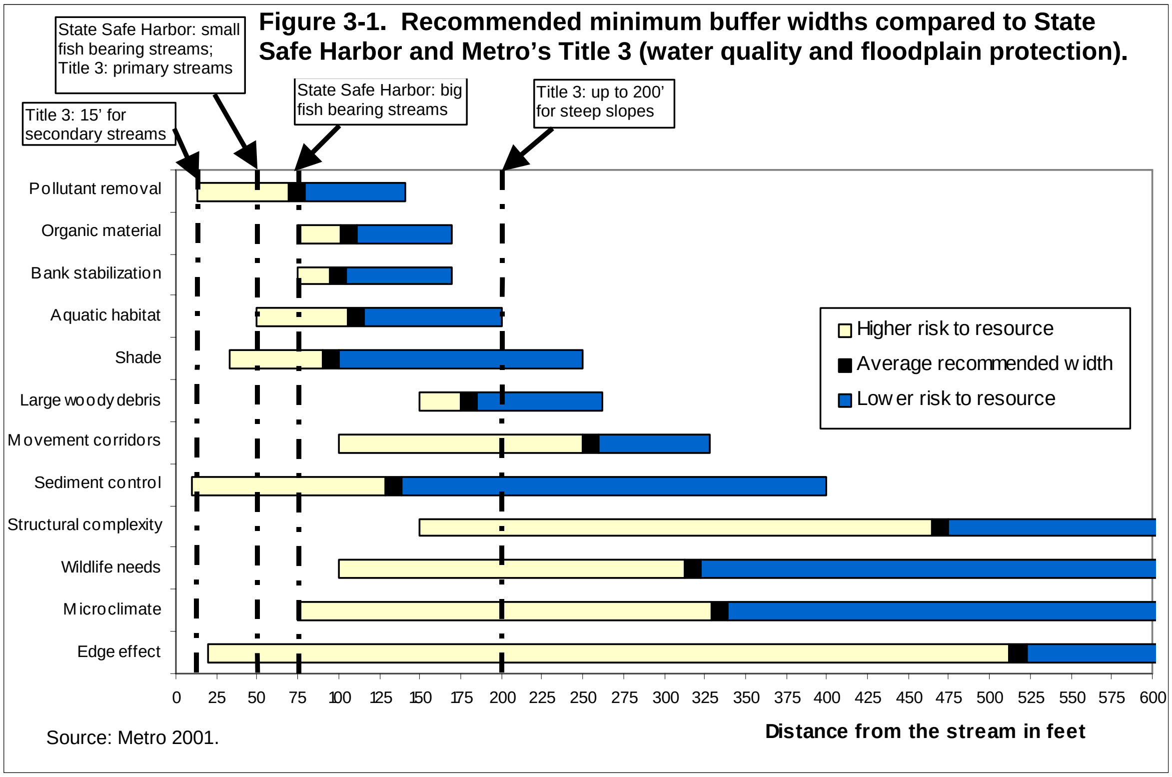
[14] This is why Metro is using Title 3 protection as a baseline for analysis purposes in the evaluation of the six program options, described later in this report.
[15] *(See Local Plan Analysis* section on inconsistencies – program decisions for more detail on local jurisdictions' programs.*)*
[16] See Metro's *Technical Report for Goal 5* (2002).

meets the average recommended width for only seven of the twelve functions included on the chart. However, the 200-foot vegetated corridor provides some protection for all twelve functions.[17] Furthermore, the State Safe Harbor, when applied to larger fish-bearing streams (75 ft), only meets the average recommended minimum width for one function, pollutant removal. The 75-foot buffer does not even meet the minimum recommendations for four functions, including one of the most important for listed salmon – large woody debris[18]. The 50-foot buffer provided by the State Safe Harbor on smaller fish-bearing streams and by Metro's Title 3 on primary streams only provides minimal protection for five functions. For smaller streams, those draining less than 50 acres, Title 3 provides for a 15-foot buffer that barely meets the most minimal scientific recommendations for two functions.

In effect, there is not a regulatory program in the region that provides sufficient protection for riparian corridors based on consideration of all the functions necessary for fish and wildlife habitat. While it is unlikely that any regulatory program could be implemented that would fully protect all of the functions depicted in Figure 3-1, habitat protection in the Metro region does not comport with the scientific knowledge of what is needed for full fish and wildlife habitat protection.

Figure 3-1. Recommended minimum buffer widths compared to State Safe Harbor and Metro's Title 3 (water quality and floodplain protection).



Source: Metro 2001.

[17] These 12 functions were identified in Metro's *Technical Report for Goal 5* that included a review of the scientific literature related to fish and wildlife habitat.

[18] Obviously, large woody debris does reach the stream at distances of less than 75 feet, providing some level of function to instream habitat. However, several studies have shown that larger buffer widths are necessary to provide adequate levels of large woody debris to both instream and riparian (terrestrial) habitats. Thus, any distance that is less than one site potential tree height (average in Metro region determined to be 150 ft) allows for a very high risk to the resource.

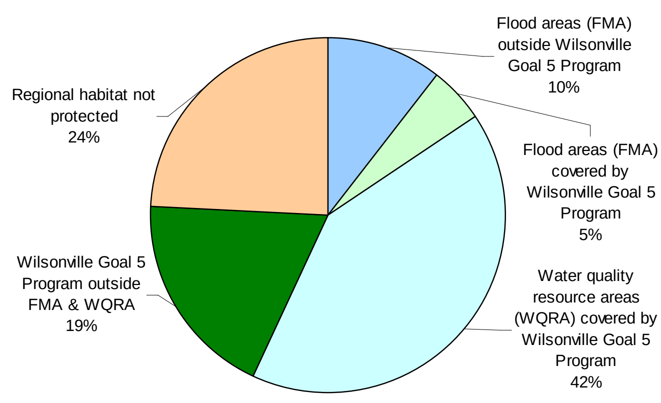
As described in the *Local Plan Analysis*, local protection of upland wildlife habitat is limited throughout the region. Only eight jurisdictions[19] have identified upland areas not associated with streams or wetlands for regulatory protection. By default, some steeply sloped areas are regulated due to natural hazards, such as earthquakes and landslides. The planning guidelines for upland habitats[20] recommend protection of large areas and retention of native vegetation. However, based on Metro's review of local regulations, protection of these areas in the region does not meet the scientific recommendations. Tree protection ordinances occur most frequently. However, ordinances that specifically protect upland habitat by limiting development are more effective but less common. For example, Lake Oswego requires protection of significant tree groves, but allows for up to 50 percent of the trees on a site to be removed for development purposes. Other jurisdictions such as Sherwood and Tigard require a tree inventory and provide incentives for retention of trees through the permit process. The city of Portland limits disturbance in upland areas and has established an ordinance for land divisions that requires preservation of existing tree canopy.

Comparison of three local programs with Metro's baseline regulations

For purposes of the Phase II ESEE Analysis, Metro chose three local Goal 5 programs as examples to compare the extent of the regional fish and wildlife habitat inventory covered by local environmental zones. These local zones also overlap, in many cases, with Title 3 water quality resource areas and flood management areas (see Figure 3-1 above). The extent of this overlap, as well as additional habitat areas covered by local environmental zones, is shown in Figures 3-2 to 3-4 for the cities of Wilsonville, Lake Oswego, and Portland.

The City of Wilsonville's Significant Resource Overlay Zone (SROZ) Ordinance as well as other ordinance requirements[21] exceed Metro's Title 3 baseline for water quality resource areas and flood management areas. Wilsonville's SROZ ordinance, combined with additional lands covered by Title 3 flood management restrictions, applies to 76 percent (927 acres) of regionally significant habitat. Twenty-four percent (296 acres) of regionally significant habitat is not covered by the SROZ ordinance or the Title 3 baseline (Figure 3-2). Wilsonville's SROZ ordinance

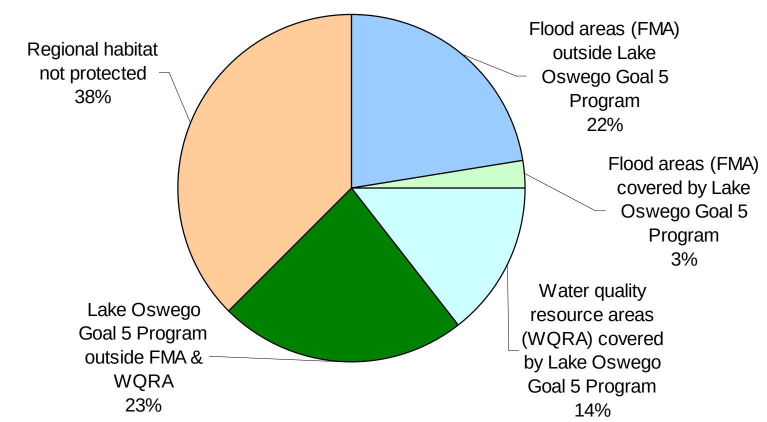
Figure 3-2. How existing habitat protection in Wilsonville addresses 1,222 acres of regionally significant habitat



[19] Beaverton, Hillsboro, Lake Oswego, Milwaukie, Portland, Wilsonville, Clackamas County, Multnomah County, and Washington County have specifically mentioned wildlife habitat not associated with riparian corridors in local code.
[20] See Metro's *Technical Report for Goal 5* (2002).
[21] Significant Resource Overlay Zone Section 4.139 of the Zoning Ordinance; see also Planning and Development Ordinance Section 4.172 (Floodplain Regulations), Section 4.171.06 (Protection of Natural Features and other resources); Section 4.6 (Tree Preservation and Protection).

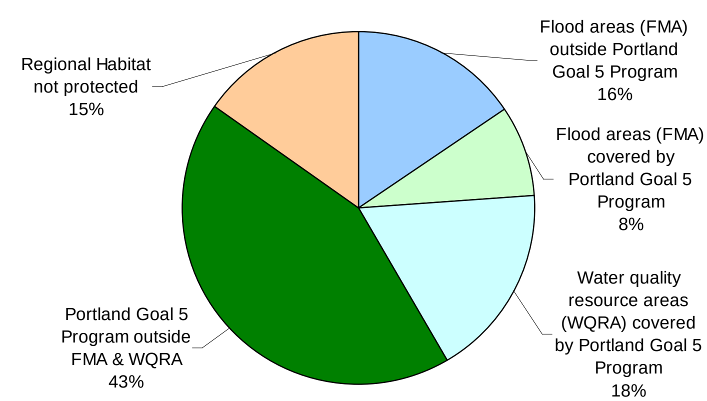
prohibits development within the overlay zone and impact area unless an applicant submits a significant resource impact report and mitigates for habitat loss. The City of Lake Oswego's Sensitive Lands Overlay District as well as other ordinance requirements exceed Metro's Title 3 baseline for water quality resource areas and flood management areas.[22] Lake Oswego's Sensitive Lands Overlay District, combined with additional lands covered by Title 3 flood management areas, applies to 1,627 acres (62 percent) of regionally significant habitat. There are 976 acres comprising 38 percent of regionally significant habitat that are not covered by the Sensitive Lands Overlay District or Title 3 flood management restrictions. (Figure 3-3). The Sensitive Lands Overlay District includes resource protection and conservation overlay zones to protect stream corridors, wetlands, and tree groves, and establishes mitigation requirements for habitat loss. Significant isolated tree groves and tree groves associated with wetlands or streams receive additional protection.

Figure 3-3. How existing habitat protection in Lake Oswego addresses 2,603 acres of regionally significant habitat



The City of Portland's Environmental Overlay Zone Regulations as well as other ordinance requirements exceed Metro's Title 3 baseline for water quality resource areas and flood management areas.[23] Portland's Environmental Overlay zones, combined with additional lands covered by Title 3 water quality and flood management restrictions, applies to 24,296 acres (85 percent) of regionally significant habitat. There are 4,374 acres comprising 15 percent of regionally significant habitat that are not covered by Portland's environmental overlay zones or Title 3 flood management restrictions (Figure 3-4). Portland's environmental overlay zones include the protection zone and the conservation zone. The protection zone applies to the most significant habitat, and strictly limits development in

Figure 3-4. How existing habitat protection in Portland addresses 28,659 acres of regionally significant habitat



[22] Sensitive Lands Overlay District (Section 48.17 of the Development Code); see also Section 17 (Floodplain Standards), Section 55 (Tree Ordinance), Section 48.17.600 (Mitigation)

[23] Environmental Zones (Section 33.430 of the Zoning Code); see also Greenway Zone (Section 33.440 of the Zoning Code), Open Space Zone (Section 33.100 of the Zoning Code), Flood Hazard Areas (Section 24.50 of the Building Code).

these areas; the conservation zone applies to significant habitat and allows development as long as adverse impacts are avoided, minimized, and mitigated.

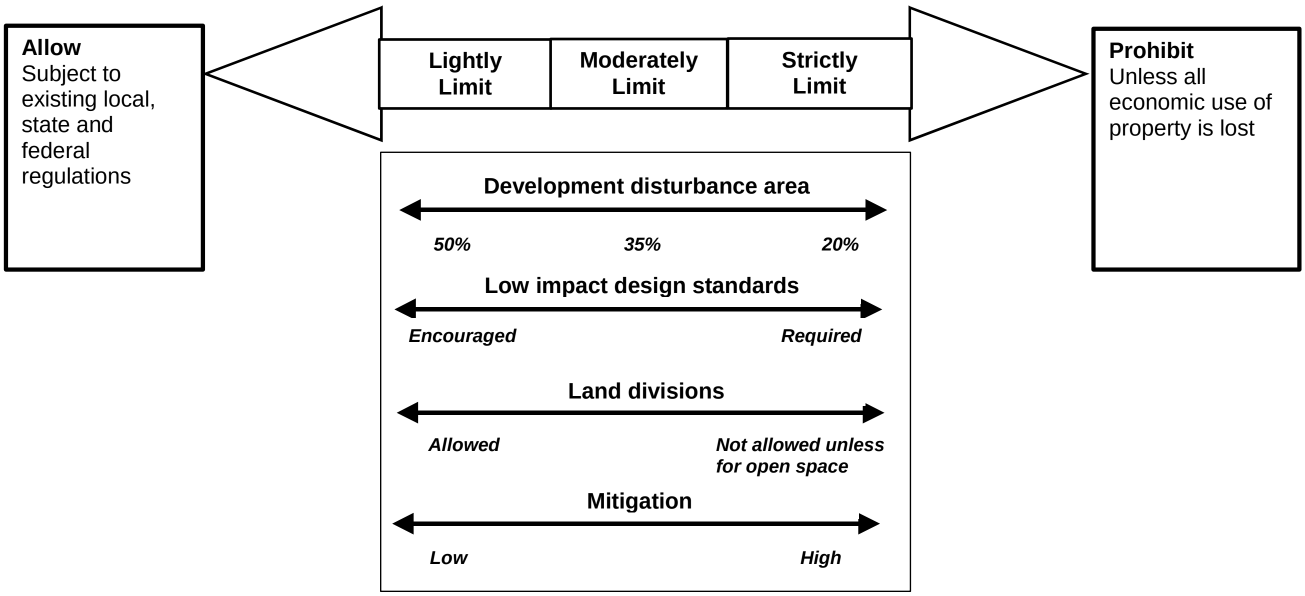
In summary, this comparison shows that at least some local programs currently exceed the minimum standards of Title 3 water quality resource areas and flood management areas. As a result, a portion of regionally significant habitat not covered by the Title 3 baseline receives protection by local programs. While it would be helpful to know the increment of local protection beyond the Title 3 baseline, the difficulties of measuring the extent of this coverage and the level of protection provided under all local government plans is well established in Metro's *Local Plan Analysis*.

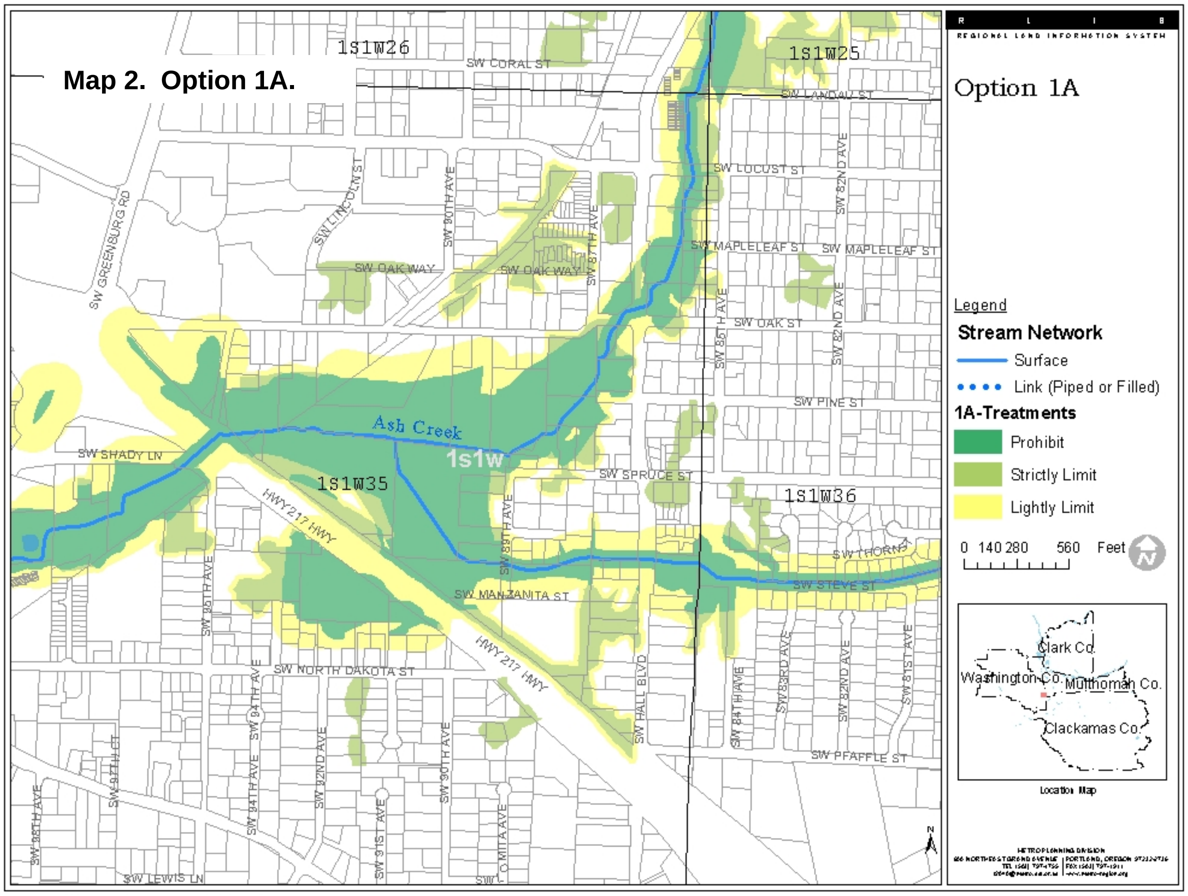
Regulatory program options

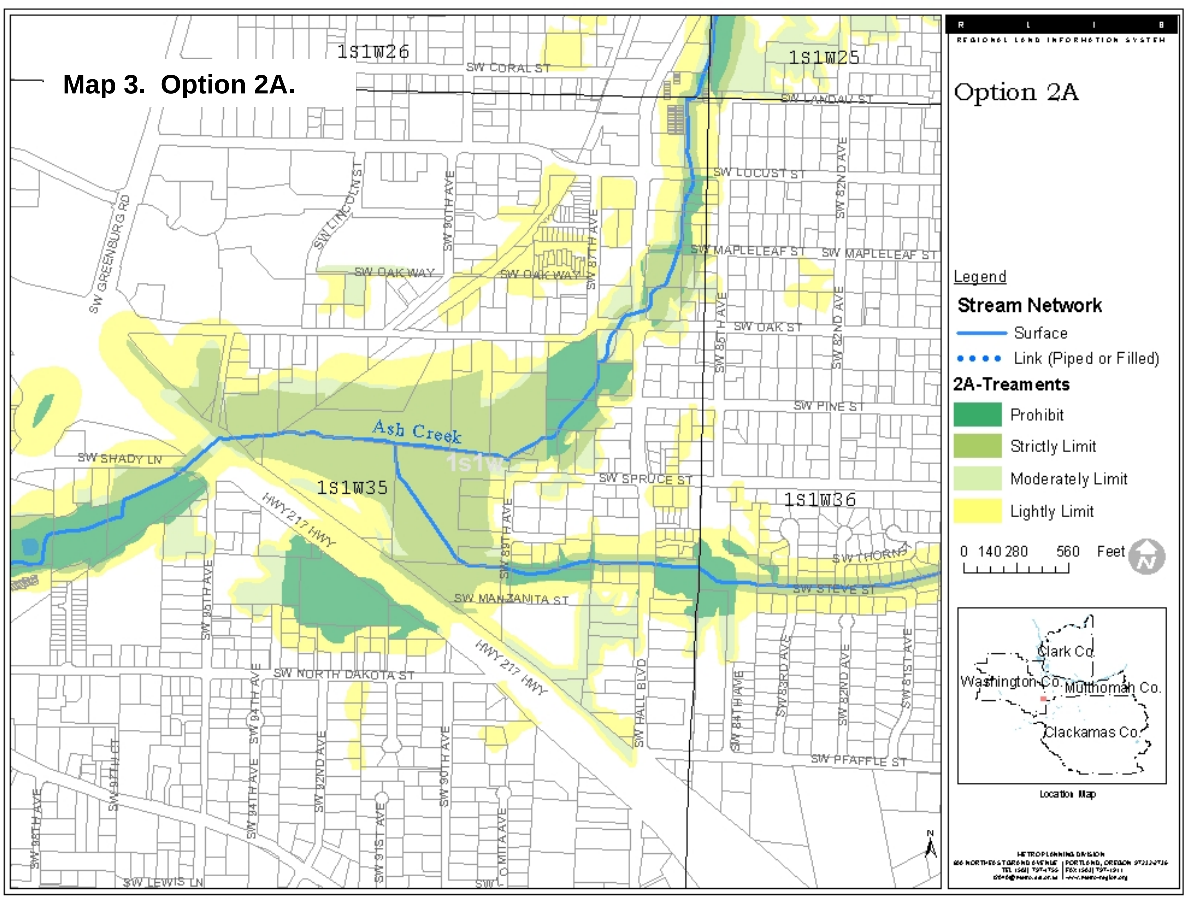
The Goal 5 rule requires Metro and local governments to develop a program to protect regionally significant fish and wildlife habitat based on ESEE decisions to allow, limit, or prohibit conflicting uses in significant resource sites. The six regulatory program options described in this section were developed to support Metro Council's decision. Maps 2-7 on the following pages depict the regulatory options for a specific geographic area that includes a regional center and several habitat types. These maps profile the differences among the options due to habitat types and urban development values.

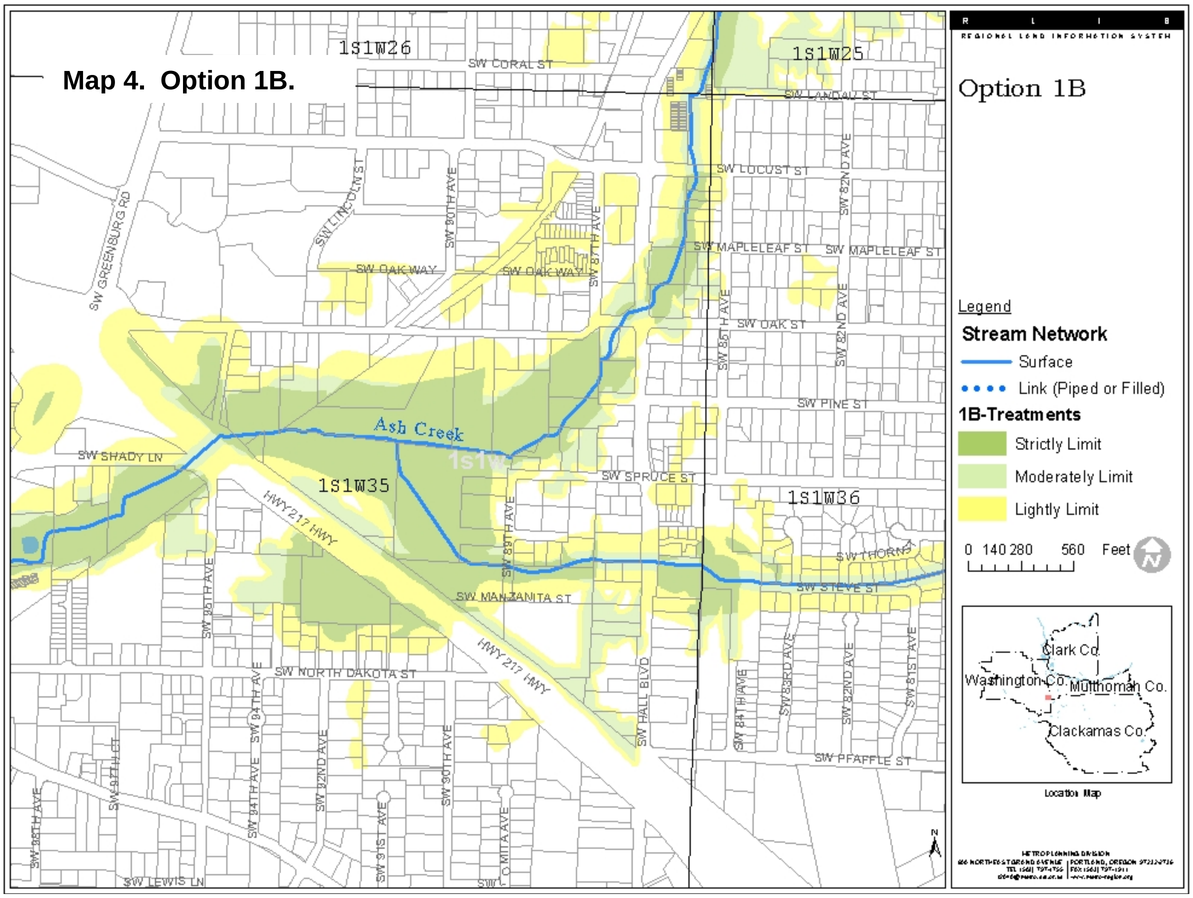
In each of the six options, allow, limit or prohibit "treatments" are assigned to each of the fish and wildlife habitat classes and impact areas. This results in a range of scenarios that provide varying levels of habitat protection. Figure 3-8 below shows the range of treatments (from least to most). In this analysis, the limit category has been expanded to three levels (lightly limit, moderately limit, strictly limit) to provide a continuum of protection approaches. The information in Figure 3-8 represents ***potential targets*** for protecting fish and wildlife habitat while allowing some level of development to occur. These potential targets are preliminary and are subject to revision during the third step of the Goal 5 process – the program development phase.

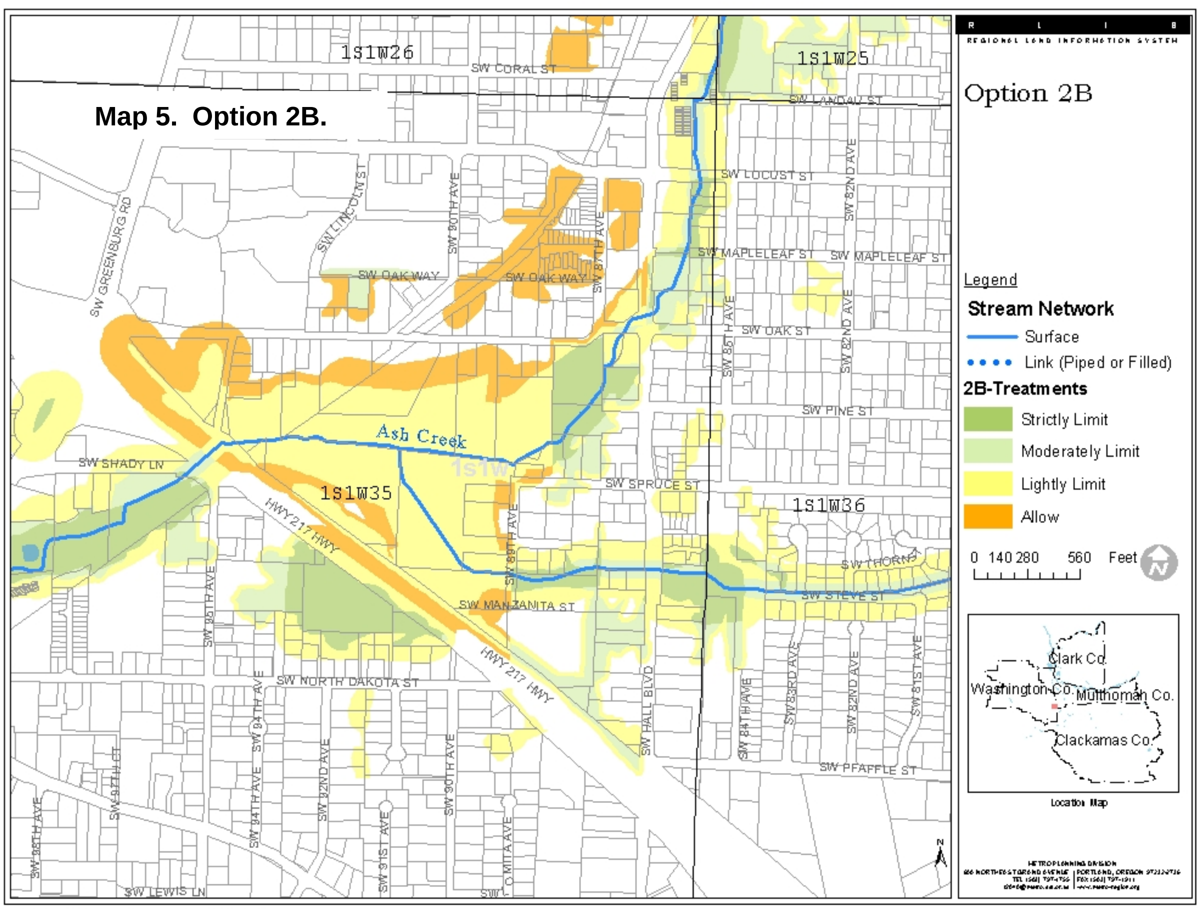
Figure 3-8. Allow, limit and prohibit treatments.
Range of Limit Treatments



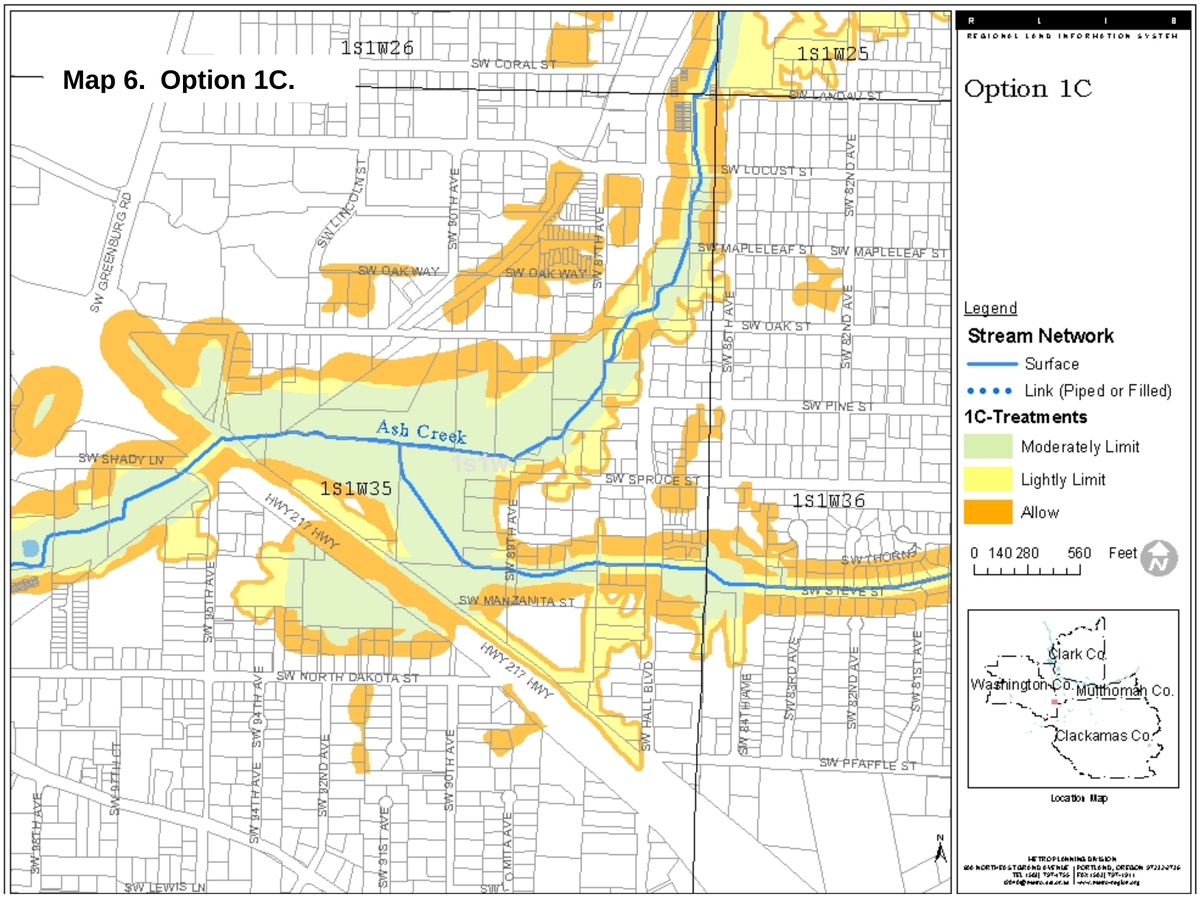

Map 2. Option 1A.
Option 1A
Legend
Stream Network
Surface
Link (Piped or Filled)
1A-Treatments
Prohibit
Strictly Limit
Lightly Limit
0 140 280 560 Feet
Ash Creek
1S1W26
1S1W25
1S1W35
1S1W36
Location Map
Clark Co.
Washington Co.
Multnomah Co.
Clackamas Co.


Map 3. Option 2A.
Option 2A
Legend
Stream Network
Surface
Link (Piped or Filled)
2A-Treaments
Prohibit
Strictly Limit
Moderately Limit
Lightly Limit
0 140 280 560 Feet
Ash Creek
1S1W26
1S1W25
1S1W35
1S1W36
Location Map
Clark Co.
Washington Co.
Multnomah Co.
Clackamas Co.

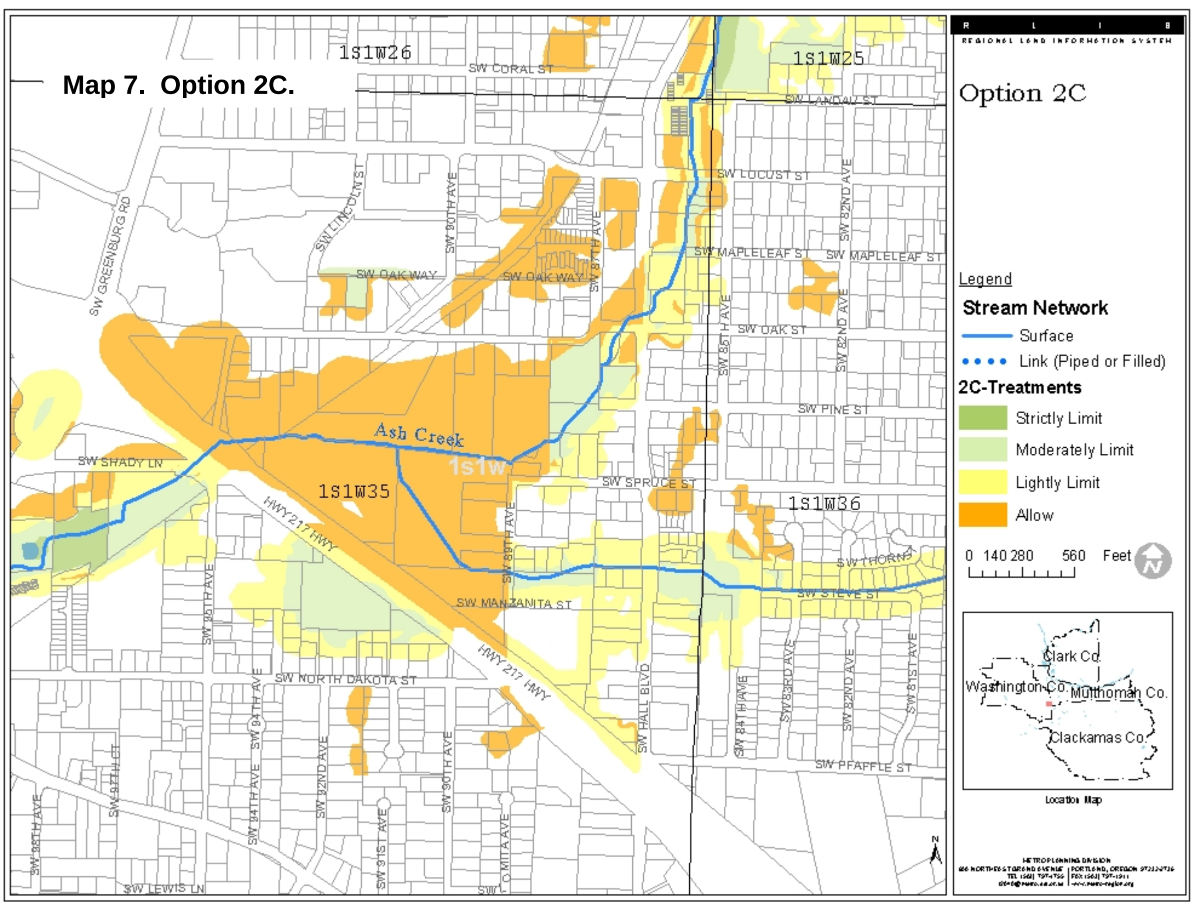

Map 4. Option 1B.
Option 1B
Legend
Stream Network
Surface
Link (Piped or Filled)
1B-Treatments
Strictly Limit
Moderately Limit
Lightly Limit
0 140 280 560 Feet
Ash Creek
1S1W26
1S1W25
1S1W35
1S1W36
SW CORAL ST
SW LANDAU ST
SW LOCUST ST
SW MAPLELEAF ST
SW OAK WAY
SW OAK ST
SW PINE ST
SW SHADY LN
SW SPRUCE ST
SW THORN ST
SW STEVE ST
SW MANZANITA ST
SW NORTH DAKOTA ST
SW PFAFFLE ST
SW LEWIS LN
HWY 217 HWY
SW GREENBURG RD
SW LINCOLN ST
SW HALL BLVD
Clark Co.
Washington Co.
Multnomah Co.
Clackamas Co.
Location Map


Map 5. Option 2B.
Option 2B
Legend
Stream Network
Surface
Link (Piped or Filled)
2B-Treatments
Strictly Limit
Moderately Limit
Lightly Limit
Allow
0 140 280 560 Feet
Ash Creek
1S1W26
1S1W25
1S1W35
1S1W36
SW CORAL ST
SW LANDAU ST
SW LOCUST ST
SW MAPLELEAF ST
SW OAK WAY
SW OAK ST
SW PINE ST
SW SHADY LN
SW SPRUCE ST
SW THORN ST
SW STEVE ST
SW MANZANITA ST
SW NORTH DAKOTA ST
SW PFAFFLE ST
SW LEWIS LN
HWY 217 HWY
SW GREENBURG RD
SW LINCOLN ST
SW HALL BLVD
Clark Co.
Washington Co.
Multnomah Co.
Clackamas Co.
Location Map

Map 6. Option 1C.



Map 7. Option 2C.



Habitat-based options (1A, 1B, 1C)

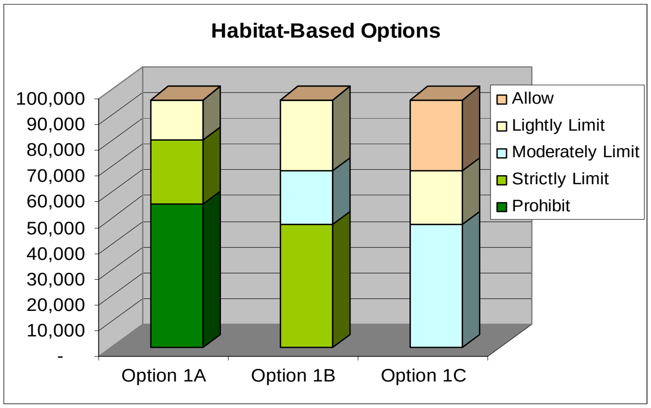
The three habitat-based options (Options 1A, 1B, and 1C) use habitat quality as the basis for varying protection regardless of land uses or urban development values. This approach recognizes fish and wildlife habitat as fixed assets in the urban landscape and orients urban development patterns around habitat areas based on the ecological values present. Ecological values were measured during Metro's Goal 5 inventory process and were based on landscape features (e.g., trees, woody vegetation, wetlands, etc.) and the ecological functions they provide (e.g., shade, streamflow moderation, wildlife migration, nesting and roosting sites, etc.). The inventory was then classified into six categories for the ESEE analysis (Class I-III riparian/wildlife corridors and Class A-C upland wildlife habitat) to distinguish higher value habitat from lower value habitat. Class I riparian/wildlife corridors and Class A upland wildlife habitat are the highest valued habitats.

Table 3-2: Habitat-based options (1A, 1B, 1C)

Fish & Wildlife Habitat Classification	Option 1A *Treatment*	Option 1B *Treatment*	Option 1C *Treatment*
Class I Riparian/Wildlife	P	SL	ML
Class II Riparian/Wildlife	P	ML	LL
Class III Riparian/Wildlife	SL	LL	A
Class A Upland Wildlife	P	SL	ML
Class B Upland Wildlife	SL	ML	LL
Class C Upland Wildlife	SL	LL	A
Impact Areas	LL	LL	A

Note: P = Prohibit; SL = Strictly Limit; ML = Moderately Limit; LL = Lightly Limit; A = Allow

Figure 3-9: Habitat-based program options



This approach assumes that all habitat lands have development value. As the ecological value decreases, the recommended treatment becomes less restrictive of development. In these options, the two high value habitat types (Class I riparian and Class A wildlife) would receive the same level of regulatory protection in industrial areas as they would in residential areas. In other words, these options establish a more equal shared responsibility for habitat protection across land uses.

Table 3-2 shows allow, limit and prohibit (ALP) treatments for each option. Figure 3-9 shows habitat and impact area acreage affected by ALP treatments under the three options. In Option 1A, the highest value habitat (Class I and II riparian and Class A wildlife) receives the highest level of protection, while lower valued habitat (Class III riparian and Class B and C wildlife) receives lower levels of protection. In Options 1B and 1C, habitats receive decreasingly lower levels of protection. In Option 1C, the lowest value habitat areas do not receive any protection other than existing local, state and federal regulations. Impact areas would face little or no regulatory requirements.

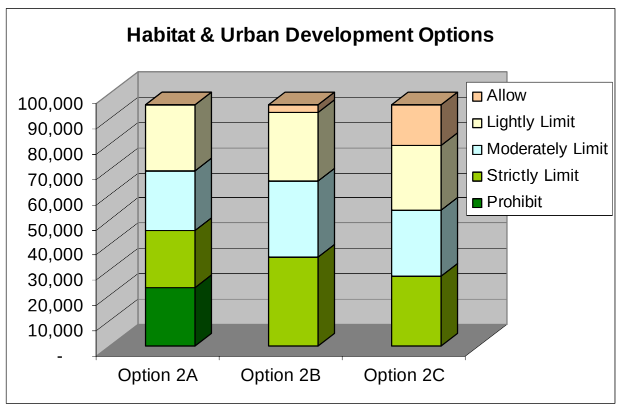
Habitat and urban development-based options (2A, 2B, 2C)

The three habitat and urban development-based options (2A, 2B, and 2C) use habitat values and urban development values as the basis for varying protection. Urban development values were categorized as high, medium or low in the Phase I ESEE analysis based on three measures: land value, employment density and 2040 design type hierarchy (based on Metro's 2040 Growth Concept). Areas receiving a high score in any of the three measures are called "high urban development value"; areas receiving no high scores but at least one medium score are called "medium urban development value"; and areas receiving all low scores are called "low urban development value." Areas without urban development value – parks and open space (both inside and outside the UGB) and rural areas outside the UGB – were not assigned development value.

High priority 2040 Growth Concept design types include the central city, regional centers and regionally significant industrial areas. Medium priority 2040 Growth Concept design types include town centers, main streets, station communities, other industrial areas and employment centers. Inner and outer neighborhoods and corridors are considered low priority 2040 Growth Concept design types. In the recent expansion areas, interim design types were used to determine urban development value.

Tables 3-3, 3-4 and 3-5 show the allow, limit and prohibit (ALP) treatments for each option. Habitat protection levels are adjusted based on urban development value in these options. For example, a Class I riparian corridor located within a regional center or industrial area (high urban development value) would receive less protection than one that passes through an inner or outer neighborhood (low urban development value) in all three tables. Figure 3-10 shows habitat and impact area acreage affected by ALP treatments under the three options.

Figure 3-10: Habitat and urban development-based program options



Option 2A provides the highest level of protection for high valued riparian habitat and less protection for wildlife and other habitat areas. Commercial and industrial areas, which are important to the region, have less protection than other areas in Option 2A. In Options 2B and 2C, the level of protection on the most highly valued habitat decreases, while the levels of protection in the high value urban development areas decrease even more. In Option 2C,the most highly valued urban development areas have no habitat protection, regardless of habitat quality. In all three habitat and urban development-based options, rural areas and parks and open spaces receive more protection than other areas due to their relatively low urban development value. Impact areas would face little or no regulatory requirements in these options.

Table 3-3. Habitat and urban development-based program option (2A) and ALP treatments.

Fish & Wildlife Habitat Classification	HIGH Urban Development Value	MEDIUM Urban Development Value	LOW Urban Development Value	Other Areas*
	Treatment	***Treatment***	***Treatment***	***Treatment***
Class I Riparian/Wildlife	SL	SL	P	P
Class II Riparian/Wildlife	ML	ML	SL	SL
Class III Riparian/Wildlife	LL	LL	LL	ML
Class A Upland Wildlife	LL	ML	ML	SL
Class B Upland Wildlife	LL	LL	ML	ML
Class C Upland Wildlife	LL	LL	LL	ML
Impact Areas	LL	LL	LL	LL

*Other areas include parks and open space within Metro's jurisdiction and areas outside the UGB with no design type.

Table 3-4: Habitat and urban development-based program option (2B) and ALP treatments.

Fish & Wildlife Habitat Classification	HIGH Urban Development Value	MEDIUM Urban Development Value	LOW Urban Development Value	Other Areas*
	Treatment	***Treatment***	***Treatment***	***Treatment***
Class I Riparian/Wildlife	LL	ML	SL	SL
Class II Riparian/Wildlife	LL	LL	ML	ML
Class III Riparian/Wildlife	A	LL	LL	ML
Class A Upland Wildlife	LL	ML	ML	SL
Class B Upland Wildlife	LL	LL	ML	ML
Class C Upland Wildlife	A	LL	LL	ML
Impact Areas	A	LL	LL	LL

*Other areas include parks and open space within Metro's jurisdiction and areas outside the UGB with no design type.

Table 3-5: Habitat and urban development-based program option (2C) and ALP treatments

Fish & Wildlife Habitat Classification	HIGH Urban Development Value	MEDIUM Urban Development Value	LOW Urban Development Value	Other Areas*
	Treatment	***Treatment***	***Treatment***	***Treatment***
Class I Riparian/Wildlife	A	LL	ML	SL
Class II Riparian/Wildlife	A	LL	LL	ML
Class III Riparian/Wildlife	A	A	A	ML
Class A Upland Wildlife	A	LL	ML	SL
Class B Upland Wildlife	A	LL	LL	ML
Class C Upland Wildlife	A	A	A	ML
Impact Areas	A	A	LL	LL

*Other areas include parks and open space within Metro's jurisdiction and areas outside the UGB with no design type.

Habitat acreage by allow, limit and prohibit treatments in program options

Table 3-6 below compares all six options and shows the number of acres that would be covered by each option and treatment type. For example, in Option 1A, 55,450 habitat acres would receive a prohibit treatment (almost 70 percent of habitat acres), whereas 23,084 acres in Option 2A (27 percent of habitat acres) would receive a prohibit treatment. The acreage in this table is for habitat areas and impact areas within Metro's jurisdictional boundary. Approximately 80,200 acres are fish and wildlife habitat; impact areas cover approximately 15,720 acres.

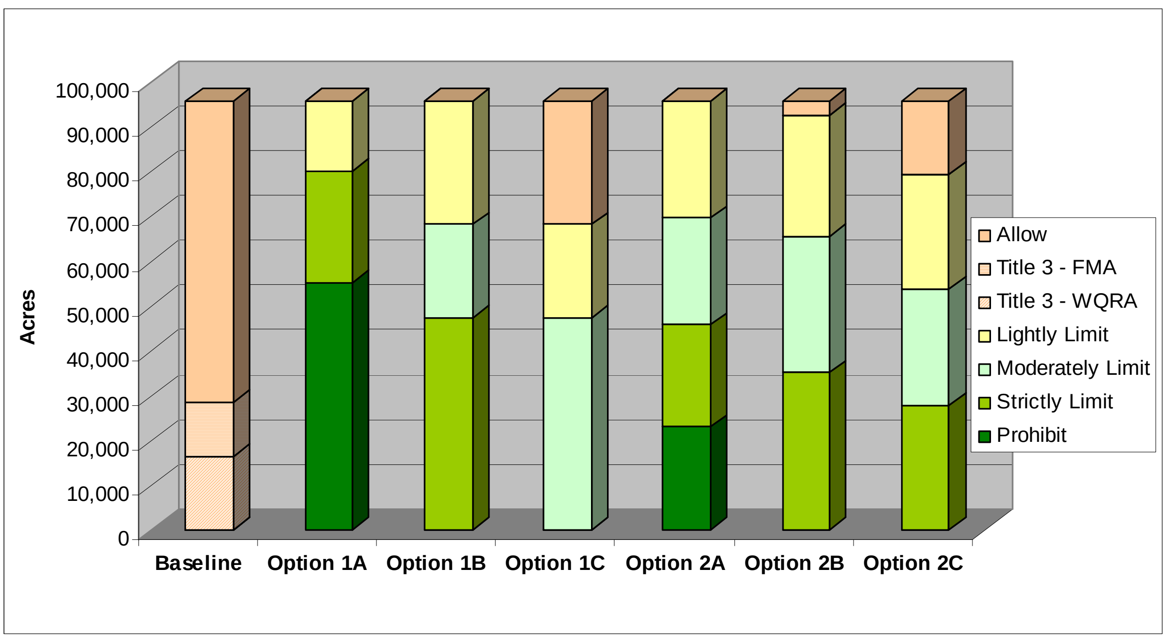
Table 3-6: Habitat and impact area acreage within Metro's jurisdictional boundary by allow, limit and prohibit treatments

Treatment	Option1A	Option 1B	Option 1C	Option 2A	Option 2B	Option 2C
Prohibit	55,450	0	0	23,084	0	0
Strictly Limit	24,784	47,557	0	22,775	35,212	27,872
Moderately Limit	0	20,782	47,557	23,965	30,352	25,983
Lightly Limit	15,721	27,616	20,782	26,131	27,323	25,727
Allow	0	0	27,616	0	3,069	16,374
Total	*95,956*	*95,956*	*95,956*	*95,956*	*95,956*	*95,956*

Figure 3-11 graphically illustrates the information in Table 3-6. The bar on the far left represents Title 3 protection of fish and wildlife habitat. Title 3 acreage is distributed within each of the bars representing the six options. However, these bars do not show in which treatment category this acreage occurs. For example, the 28,540 acres of Title 3 management areas may fall into any one of the treatment categories depending on the program option.

A comparison of the option bars shows that Option 1A provides the greatest habitat protection among the options with a total of 55,450 acres (Class I and II riparian/wildlife, Class A wildlife) covered by a prohibit treatment, and 15,721 acres (Class III riparian/wildlife, Class A and B wildlife) covered by a strictly limit treatment. The bars representing Option 2A-C show more variation in treatment than the habitat-based options, which is a result of considering urban development values. Option 1C provides the least habitat protection among these three options, considering the larger acreage in allow and lightly limit and lack of any habitat in strictly limit.

Figure 3-11: Comparison of options by allow, limit and prohibit treatments



These six program options are evaluated based on their economic, social, environmental and energy consequences in Chapter 4. Most of the data used in this analysis is shown in Table 3-7 (on the following two pages).

Table 3-7: Fish and wildlife habitat classes and impact areas by development status and development value (inside Metro's jurisdiction)

Fish & Wildlife Habitat Class & Urban Development Value	Option 1A	Option 1B	Option 1C	Option 2A	Option 2B	Option 2C	Developed (urban)			Developed (parks)			Total Devel. Habitat Acres	Vacant			Total Vacant Habitat Acres	Total Devel. & Vacant Habitat Acres
							Inside Title 3 WQRA	*Inside Title 3 FMA*	*Outside WQRA/ FMA*	*Inside Title 3 WQRA*	*Inside Title 3 FMA*	*Outside WQRA/ FMA*		*Inside Title 3 WQRA*	*Inside Title 3 FMA*	*Outside WQRA/ FMA*		
Class I Riparian/Wildlife Corridors																		
High	P	SL	ML	SL	LL	A	175	71	36	0	0	0	282	592	516	833	1,942	2,224
Medium	P	SL	ML	SL	ML	LL	254	66	140	0	0	0	460	1,274	288	545	2,107	2,567
Low	P	SL	ML	P	SL	ML	968	272	1,003	0	0	0	2,243	2,281	796	2,020	5,097	7,340
Other Areas	P	SL	ML	P	SL	SL	432	239	179	5,449	3,999	2,045	12,342	1,718	556	1,128	3,402	15,744
Total Acres							***1,829***	***648***	***1,357***	***5,449***	***3,999***	***2,045***	***15,327***	***5,866***	***2,156***	***4,527***	***12,549***	***27,876***
Class II Riparian/Wildlife Corridors																		
High	P	ML	LL	ML	LL	A	104	99	70	0	0	0	273	42	310	316	668	941
Medium	P	ML	LL	ML	LL	LL	184	39	186	0	0	0	409	123	128	434	686	1,095
Low	P	ML	LL	SL	ML	LL	607	102	793	0	0	0	1,502	227	262	875	1,364	2,866
Other Areas	P	ML	LL	SL	ML	ML	126	46	140	266	708	515	1,801	213	254	721	1,188	2,990
Total Acres							***1,021***	***286***	***1,189***	***266***	***708***	***515***	***3,986***	***606***	***954***	***2,347***	***3,907***	***7,893***
Class III Riparian/Wildlife Corridors																		
High	SL	LL	A	LL	A	A	22	918	127	0	0	0	1,066	0	6	41	48	1,114
Medium	SL	LL	A	LL	LL	A	42	487	321	0	0	0	851	2	4	125	131	982
Low	SL	LL	A	LL	LL	A	78	914	452	0	0	0	1,444	4	14	333	351	1,795
Other Areas	SL	LL	A	ML	ML	ML	25	152	57	3	45	123	405	1	3	133	137	541
Total Acres							***167***	***2,471***	***956***	***3***	***45***	***123***	***3,766***	***7***	***27***	***632***	***666***	***4,432***
Class A Wildlife Habitat																		
High	P	SL	ML	LL	LL	A	11	7	50	0	0	0	67	5	17	185	207	275
Medium	P	SL	ML	ML	ML	LL	12	0	88	0	0	0	101	6	0	365	372	473
Low	P	SL	ML	ML	ML	ML	20	2	2,031	0	0	0	2,054	25	2	4,726	4,753	6,807
Other Areas	P	SL	ML	SL	SL	SL	17	36	468	80	42	8,307	8,952	38	1	3,138	3,176	12,127
Total Acres							***60***	***45***	***2,637***	***80***	***42***	***8,308***	***11,173***	***74***	***21***	***8,414***	***8,508***	***19,682***
Class B Wildlife Habitat																		
High	SL	ML	LL	LL	LL	A	1	2	56	0	0	0	58	1	1	357	359	417
Medium	SL	ML	LL	LL	LL	LL	1	0	206	0	0	0	208	7	1	801	809	1,016
Low	SL	ML	LL	ML	ML	LL	15	2	2,674	0	0	0	2,690	15	3	3,094	3,112	5,802
Other Areas	SL	ML	LL	ML	ML	ML	2	1	640	16	4	1,481	2,144	11	4	3,494	3,509	5,653
Total Acres							***19***	***4***	***3,576***	***16***	***4***	***1,481***	***5,100***	***34***	***10***	***7,746***	***7,789***	***12,889***
Class C Wildlife Habitat																		
High	SL	LL	A	LL	A	A	3	6	109	0	0	0	118	4	38	421	462	580
Medium	SL	LL	A	LL	LL	A	2	1	313	0	0	0	317	10	4	809	822	1,139
Low	SL	LL	A	LL	LL	A	4	2	1,348	0	0	0	1,354	7	15	1,715	1,737	3,091
Other Areas	SL	LL	A	ML	ML	ML	1	5	256	9	21	892	1,184	3	0	1,465	1,468	2,653
Total Acres							***10***	***15***	***2,026***	***9***	***21***	***892***	***2,973***	***23***	***56***	***4,410***	***4,489***	***7,463***

Note: WQRA/FMA = Water Quality Resource Area/Flood Management Areas
P = Prohibit; SL = Strictly Limit; ML = Moderately Limit; LL = Lightly Limit; A = allow
Source: Metro 2003

Table 3-7 (cont.): Fish and wildlife habitat classes and impact areas by development status and development value (inside Metro's jurisdiction)

Fish & Wildlife Habitat Class & Development Value	Option 1A	Option 1B	Option 1C	Option 2A	Option 2B	Option 2C	Developed (urban)			Developed (parks)			Total Devel. Habitat Acres	Vacant			Total Vacant Habitat Acres	Total Devel. & Vacant Habitat Acres
							Inside Title 3 WQRA	*Inside Title FMA*	*Outside WQRA/ FMA*	*Inside Title 3 WQRA*	*Inside Title 3 FMA*	*Outside WQRA/ FMA*		*Inside Title 3 WQRA*	*Inside Title 3 FMA*	*Outside WQRA/ FMA*		
Impact Areas																		
High	LL	LL	A	LL	A	A	76	123	698	0	0	0	897	39	48	391	478	1,375
Medium	LL	LL	A	LL	LL	A	154	34	1,429	0	0	0	1,617	109	5	709	824	2,440
Low	LL	LL	A	LL	LL	LL	402	45	6,596	0	0	0	7,043	96	12	1,524	1,631	8,674
Other Areas	LL	LL	A	LL	LL	LL	52	6	801	103	143	1,005	2,109	37	2	1,084	1,123	3,232
Total Acres							***684***	***208***	***9,523***	***103***	***143***	***1,005***	***11,665***	***280***	***68***	***3,708***	***4,056***	***15,721***
Grand Total							***3,792***	***3,678***	***21,265***	***5,926***	***4,962***	***14,368***	***53,990***	***6,890***	***3,293***	***31,783***	***41,965***	***95,956***

Note: WQRA/FMA = Water Quality Resource Area/Flood Management Areas
RC/WH = riparian corridor, wildlife habitat; WH = upland wildlife habitat
P = Prohibit; SL = Strictly Limit; ML = Moderately Limit; LL = Lightly Limit; A = allow
Source: Metro 2002

CHAPTER FOUR: ANALYSIS OF REGULATORY PROGRAM OPTIONS

Six regulatory options are under consideration for land classified as regionally significant fish and wildlife habitat, as described in Chapter Three. Five potential regulatory treatments are applied in each of the options, ranging from allowing conflicting uses to prohibiting conflicting uses in habitat areas. The potential consequences of applying these treatments to fish and wildlife habitat are considered and evaluated with 19 criteria identified by the Metro Council in October 2003; 17 criteria are derived from the economic, social, environmental, and energy tradeoffs and two additional criteria consider how well the six regulatory options would assist in meeting the requirements of the federal Endangered Species Act and the Clean Water Act.

The criteria are based on the tradeoffs identified in the Phase I ESEE analysis of protecting or not protecting regionally significant fish and wildlife habitat. For example, the economic analysis identified the tradeoffs related to development opportunities and the regional economy. The economic analysis also identified the economic values associated with ecosystem services provided by fish and wildlife habitat. The criteria are assumed to have equal weight in the evaluation of program options. Table 4-1 below describes the evaluation criteria.

Table 4-1. Evaluation criteria.

Economic factors	**Description**
1. Supports the regional economy by providing development opportunities (such as residential, commercial, industrial)	The regional economy depends on urban development. Metro identified priorities for urban development based on land value, employment potential and regional growth management priorities (2040 Growth Concept).
2. Supports economic values associated with ecosystem services (such as flood control, clean water, recreation and amenity values).	Stream corridors and upland wildlife habitat provide economic value (e.g.,habitat provides services that can significantly reduce public and private costs over the long term). Higher value habitat provides more ecosystem services.
3. Promotes recreational use and amenities	Focuses on the recreational benefits – both active and passive – of retaining habitat. Options that protect more high quality habitat will help protect the recreational amenity values.
4. Distribution of economic tradeoffs	Highlights land uses (regional zoning) and ownership classes (public vs. private) that would bear a disproportional share of impacts.
5. Minimizes need to expand the urban growth boundary (UGB) and increase development costs.	Describes the effects of program options on the need to expand the urban growth boundary (UGB).
Social factors	
6. Minimizes impact on property owners	Potential regulations have different impacts on residential, business and rural property owners. Options that provide more habitat protection have more impact on property owners.
7. Minimizes impact on location and choices for housing and jobs	Applying regulations to protect habitat may affect the urban land supply and relates to people's basic needs for housing and jobs.
8. Preserves habitat for future generations	Species diversity, environmental quality and the potential economic benefits derived from fish and wildlife habitat are important for people today as well as future generations.
9. Maintains cultural heritage and sense of place	Fish and wildlife habitat provides important values such as cultural heritage (salmon) and regional identity (people move here to enjoy the proximity to the natural environment).

10. Preserves amenity value of resources (quality of life, property values, views)	Fish and wildlife habitat provides amenity values such as quality of life, increased property values and regional attractiveness.
Environmental factors	
11. Conserves existing watershed health and restoration opportunities	Preserving habitat protects existing ecosystem functions (such as clean, cold, reliable water sources) that promote a healthy watershed and retains lower quality habitat for future restoration opportunities.
12. Retains multiple habitat functions provided by forest areas	Forest cover is important to maintain healthy fish and wildlife habitat and a diversity of species in the region. Forested areas may be found in developed areas (such as neighborhoods) and on vacant land. Trees are more likely to be lost in vacant areas than in existing neighborhoods.
13. Promotes riparian corridor connectivity and overall habitat connectivity	Habitat connectivity is important to fish and wildlife. Stream corridor connectivity allows fish to travel safely to upstream areas. Many fish and wildlife species must make seasonal journeys to meet basic needs for food, shelter and breeding.
14. Conserves habitat quality and biodiversity provided by large habitat areas	Large habitats are more valuable to native wildlife than smaller ones because more wildlife species are retained over time. Animals sensitive to human disturbance still have a place to live.
15. Supports biodiversity through conservation of sensitive habitats and species	Some habitats once common are now scarce (such as wetlands, native meadows, white oaks, healthy urban streams). Sensitive species depend on these rare habitats; their loss could significantly impact biodiversity.
Energy Factors	
16. Promotes compact urban form	A compact urban form conserves energy by reducing auto travel times and need for roads.
17. Promotes green infrastructure	Trees and other vegetation reduce energy demand by decreasing water and air temperature, flooding, and air pollution associated with energy use.
Other criteria	
18. Assists in protecting fish and wildlife protected by the federal Endangered Species Act	The Endangered Species Act's ultimate goal is to recover species and conserve the ecosystems upon which they depend so they no longer need regulatory protection. Protecting slopes, wetlands, riparian functions, hydrologic conditions and areas of high habitat value may help species recover and prevent future listings.
19. Assists in meeting water quality standards required by the federal Clean Water Act	Protecting slopes and wetlands, habitat near streams, hydrologic conditions, and forested areas can assist local jurisdictions in meeting the standards of the federal Clean Water Act.

This chapter includes detailed analysis of the performance of the six regulatory program options against the criteria. It includes a ranking of the options for each criterion.

Evaluation of economic criteria

This section of the Phase II ESEE analysis compares the potential economic tradeoffs of the six regulatory programs. Based on the analysis of economic consequences in Phase I, Metro developed five criteria to measure the performance of program options in addressing the potential economic impacts. These criteria are:

1. Supports urban development priorities.
2. Supports economic values of ecosystem services.
3. Supports recreational access and amenities.
4. Distributes economic tradeoffs.
5. Minimizes need to expand the urban growth boundary (UGB).

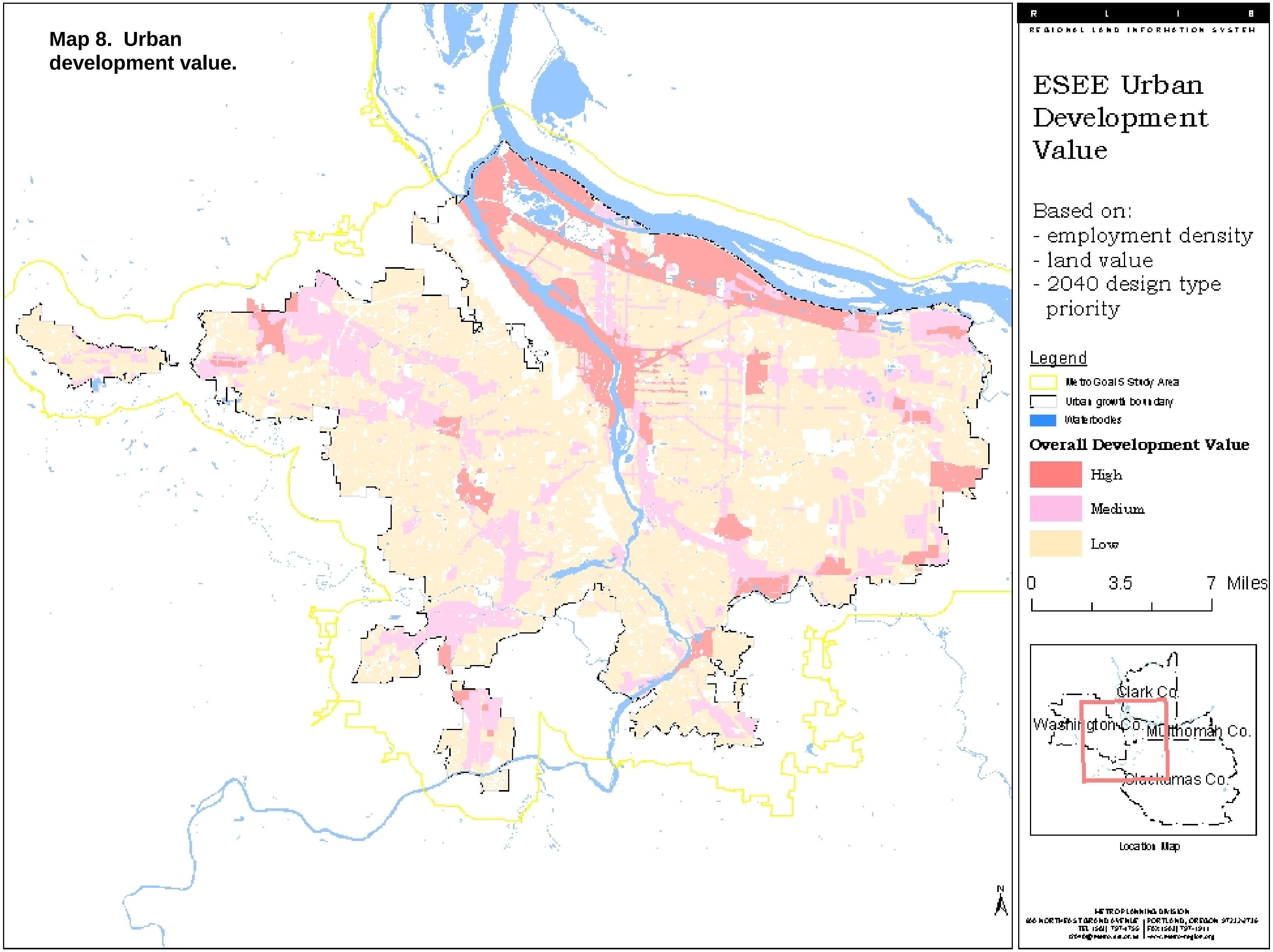
1. Supports urban development priorities.

This criterion uses the land rankings developed in Phase I of the ESEE analysis as a tool to identify where lands with high, medium or low development value are affected by allow, limit, or prohibit treatments under the six regulatory program options.

Not all land has the same economic importance for development. For example, land zoned for parks is assumed to have less economic importance than land zoned for industrial uses. In Phase I of the ESEE analysis, a method was developed to rank the relative economic importance of land for development, or “development value.” Urban lands were ranked into three categories – “high,” “medium” and “low” – using three measures: land value, employment density and 2040 design types (based on Metro’s 2040 Growth Concept). Land value and employment density describe relative economic importance based on the current land use and labor demands. The 2040 design type hierarchy ranks land using development priorities as described by Metro’s regional goals for future land use and development.

Lands that ranked high scored high on at least one of the three measures. Lands that ranked medium scored medium on at least one of the three measures, and lands that ranked low scored low on each of the three measures. A fourth category of lands, “other lands,” describes primarily non-urban lands that are not ranked for development value. Approximately half of these lands are inside the UGB, half are outside. These lands include parks and open space and agricultural and forestry land. Describing the economic consequences of program options using these measures provides information on current and future economic tradeoffs of protecting fish and wildlife habitat. Map 8 shows the urban development values.

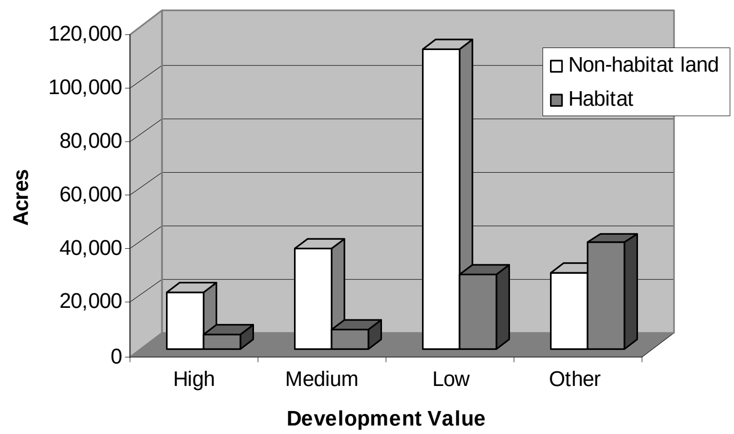
Map 8. Urban development value.



Potential impacts on urban development priorities

The economic analysis for this criterion evaluates urban development values on land containing fish and wildlife habitat. Comparing the acres of land that contain habitat with the total acres of land in Metro's jurisdiction provides insight into the relative magnitude of land affected by the six regulatory program options. Figure 4-1 illustrates the distribution of lands in Metro's jurisdiction (approximately 280,000 acres) by habitat status (non-habitat vs. habitat) and development value (high, medium, low).

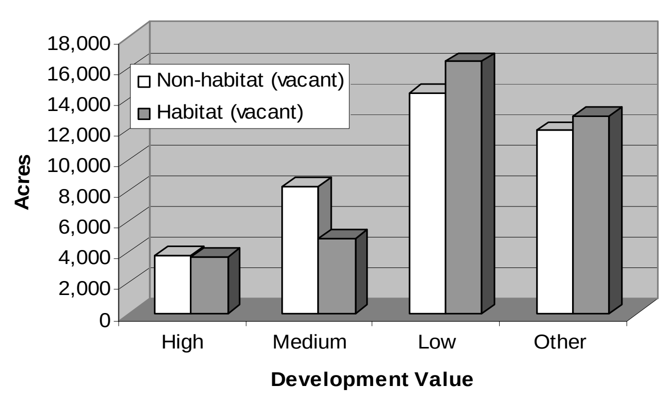
Figure 4-1: Non-habitat and habitat land by urban development value in Metro's jurisdiction.



This analysis assumes that Goal 5 treatments that protect habitat (i.e., prohibit or limit) could restrict urban use and development of these lands and/or increase development costs. About a quarter of the lands in Metro's jurisdiction with high, medium and low development values could potentially be affected by Goal 5 treatments and may have considerable negative consequences for the regional economy. Sixty-three percent of "other" lands in Metro's jurisdiction also contain fish and wildlife habitat. To the extent that program options protect habitat on these lands rather than on urban lands, negative impacts on urban development priorities may be limited.

Goal 5 treatments could impact half of all vacant land in Metro's jurisdiction. Figure 4-2 shows the breakdown of vacant lands in Metro's jurisdiction with and without fish and wildlife habitat. It describes a significant impact because in general, developing vacant land costs less and takes less time than redeveloping land, which makes this land more desirable for expanding urban development priorities. Also, because these lands are currently vacant and more easily developed, the negative impacts of reduced property value, increased development costs, and reduced employment associated with limit and prohibit treatments may begin in the short term.

Figure 4-2: Vacant non-habitat and habitat land by urban development value in Metro's jurisdiction.



Comparing Figure 4-1 with Figure 4-2 shows that a larger proportion of vacant land ranked high and low contain habitat compared with the average for all lands in Metro's jurisdiction.

Figure 4-3 Developed non-habitat and habitat by urban development value in Metro's jurisdiction.

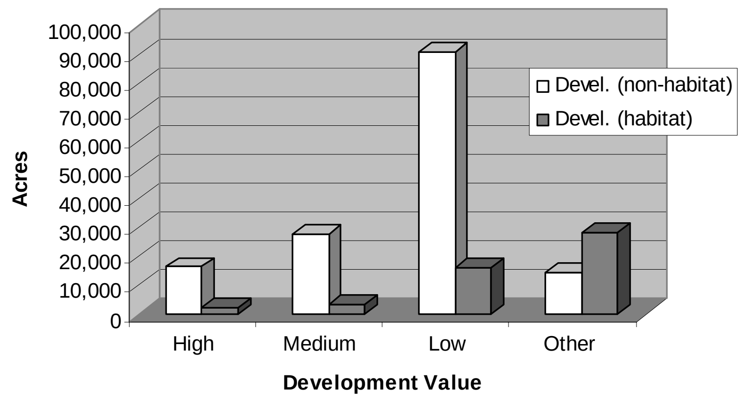


Figure 4-3 illustrates that most developed land in Metro's jurisdiction does not contain fish and wildlife habitat. Limit and prohibit treatments would affect development values on approximately 15 percent of the developed land in Metro's jurisdiction. Negative impacts on property value, development costs, and employment would accrue over the long term as redevelopment takes place on these lands.

Protecting habitat acres that otherwise could be developed under current regulations may reduce the developable area of a parcel, which could also reduce the parcel's market value. This result is more likely with strictly limit and prohibit treatments and less likely with lightly limit and moderately limit treatments.

Protection may also require modifying development plans, such as changing access routes or altering a development's configuration. Such changes may increase development costs, which may also negatively impact property values. Limiting developable area or increasing development costs for commercial or industrial sites may also negatively impact the site's employment potential. To the extent that protection limits or prevents developing land uses consistent with the 2040 Growth Concept, these actions may negatively impact the region's long-term planning goals.

Program options with the greatest support for use and development of land would rank highest for this criterion. These options have the greatest number of acres affected by allow, lightly limit and moderately limit treatments. Program options that least support use and development of land would rank lowest. These options have the greatest number of acres affected by strictly limit and prohibit treatments.

Measuring the criterion

Table 4-2 shows the number of acres of habitat land and impact areas in the four urban development categories (high, medium, low, and other) affected by allow, limit, and prohibit treatments for the six program options. Habitat acres considered developed, but in park status, are excluded from this table because they generally are not available for urban development.

Table 4-2: Acres of fish and wildlife habitat & impact areas by urban development priorities affected by program options (parks not included).

Treat-ment	Program Options	*HIGH* Urban Development Value			MEDIUM Urban Development Value			LOW Urban Development Value			Other Areas		
		Dev. urban	***Vacant inside Title 3***	***Vacant outside Title 3***	***Dev. urban***	***Vacant inside Title 3***	***Vacant outside Title 3***	***Dev. urban***	***Vacant inside Title 3***	***Vacant outside Title 3***	***Dev. urban***	***Vacant inside Title 3***	***Vacant outside Title 3***
Allow	Option 1A	0	0	0	0	0	0	0	0	0	0	0	0
	Option 1B	0	0	0	0	0	0	0	0	0	0	0	0
	Option 1C	2,081	135	853	2,785	134	1,643	9,841	148	3,572	1,354	45	2,683
	Option 2A	0	0	0	0	0	0	0	0	0	0	0	0
	Option 2B	2,081	135	853	0	0	0	0	0	0	0	0	0
	Option 2C	2,762	1,621	2,544	2,785	134	1,643	2,798	40	2,048	0	0	0
Lightly limit	Option 1A	897	87	391	1,617	114	709	7,043	108	1,524	859	39	1,084
	Option 1B	2,081	135	853	2,785	134	1,643	9,841	148	3,572	1,354	45	2,683
	Option 1C	331	355	673	617	260	1,235	4,192	507	3,970	955	483	4,215
	Option 2A	2,207	160	1,394	2,992	142	2,444	9,841	148	3,572	859	39	1,084
	Option 2B	681	1,486	1,691	3,402	394	2,878	9,841	148	3,572	859	39	1,084
	Option 2C	0	0	0	1,178	1,828	2,146	11,235	614	5,493	859	39	1,084
Moderately limit	Option 1A	0	0	0	0	0	0	0	0	0	0	0	0
	Option 1B	331	355	673	617	260	1,235	4,192	507	3,970	955	483	4,215
	Option 1C	349	1,132	1,018	561	1,568	911	4,296	3,104	6,746	1,372	2,312	4,266
	Option 2A	273	352	316	510	258	799	4,744	45	7,821	1,138	22	5,092
	Option 2B	0	0	0	561	1,568	911	6,246	534	8,696	1,450	489	5,814
	Option 2C	0	0	0	0	0	0	4,296	3,104	6,746	1,450	489	5,814
Strictly limit	Option 1A	1,243	50	819	1,375	28	1,734	5,488	58	5,143	1,138	22	5,092
	Option 1B	349	1,132	1,018	561	1,568	911	4,296	3,104	6,746	1,372	2,312	4,266
	Option 1C	0	0	0	0	0	0	0	0	0	0	0	0
	Option 2A	282	1,109	833	460	1,562	545	1,502	489	875	834	505	3,859
	Option 2B	0	0	0	0	0	0	2,243	3,077	2,020	1,372	2,312	4,266
	Option 2C	0	0	0	0	0	0	0	0	0	1,372	2,312	4,266
Prohibit	Option 1A	622	1,484	1,334	970	1,820	1,345	5,798	3,593	7,621	1,684	2,779	4,987
	Option 1B	0	0	0	0	0	0	0	0	0	0	0	0
	Option 1C	0	0	0	0	0	0	0	0	0	0	0	0
	Option 2A	0	0	0	0	0	0	2,243	3,077	2,020	850	2,274	1,128
	Option 2B	0	0	0	0	0	0	0	0	0	0	0	0
	Option 2C	0	0	0	0	0	0	0	0	0	0	0	0

Results

Figures 4-5 through 4-8 (at the end of this section) illustrate the findings in Table 4-2 for the four categories of urban development value: high, medium, low, and other lands. Program options that emphasize allow, lightly limit and moderately limit treatments rank higher for this criterion because, for the range of Goal 5 treatments, these would likely have the least negative impact on property values, employment and 2040 design types. Program options that rank higher for high and medium lands are not the same program options that rank higher for low and other lands. Low and other lands, however, account for more acres of land than high and medium lands.

Basic statistics

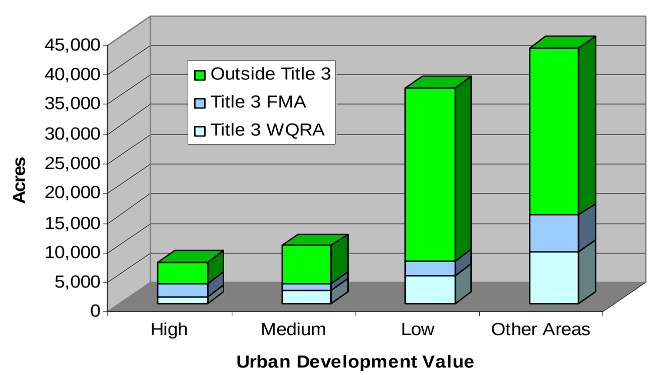
In total the analysis includes 95,956 acres of urban and non-urban fish and wildlife habitat and impact areas. This criterion would affect 53,015 acres of urban lands (ranked for development priority).

- 6,925 acres of land ranked high (habitat land – 5,550 acres; impact areas – 1,375 acres)
- 9,713 acres of land ranked medium (habitat land – 7,273 acres; impact areas – 2,440 acres)
- 36,376 acres of land ranked low (habitat land – 27,702 acres; impact areas – 8,674 acres)
- 42,940 acres of other areas, the non-urban lands that have not been ranked by high, medium, or low development value (habitat land – 39,708; impact areas – 3,232 acres)

Baseline protection (Title 3)

- Title 3 Water Quality and Flood Management Plan currently limits development in Water Quality Resource Areas, and requires specific design standards for development in Flood Management Areas. Any negative impacts of Goal 5 treatments on these lands represent marginal changes in development conditions rather than absolute changes compared with development conditions on the lands without Title 3 regulations. Some local regulations exceed Title 3 protection levels; therefore, the actual marginal changes in development conditions are less than if only Title 3 regulations were considered. However, for reasons stated in Chapter 3, it is not possible to measure the additional increment of land protection beyond the Title 3 baseline for all jurisdictions within the region.

Figure 4-4: Title 3 coverage of habitat & impact areas by urban development value.



- Figure 4-4 shows that Title 3 currently covers almost half of habitat lands with high development values.
- Approximately one-third of habitat lands with medium development values and one-fifth of lands with low urban development values currently receive Title 3 protection.

Potential economic tradeoffs vary by Goal 5 treatments

The extent to which the six program options support urban development priorities depends in part on the mix of allow, limit, and prohibit (ALP) treatments that comprise each program option. The ALP treatments will affect the amount of land protected, prescribe mitigating habitat damage, and identify guidelines on development design and land division. To the extent that land outside Title 3 WQRAs are covered by local programs, they would not necessarily be affected by regional program options.

- *Protecting habitat*. The proposed definition of Goal 5 treatments for protecting habitat range from no additional protection under allow treatments, to limiting conflicting uses to varying degrees (lightly limit, moderately limit, strictly limit), to prohibiting conflicting uses in habitat areas.

- *Mitigation.* In addition to protecting significant amounts of habitat from development the potential ALP treatments also call for mitigating negative ecological impact of developing habitat lands. Mitigation requirements may increase with increasing protection.

  Mitigation requirements may increase the cost of developing lands that contain habitat, which could negatively impact the urban development priorities. The actual impacts on development costs would depend on the percentage of habitat cover, the negative impacts of development on habitat, and the specifics of the mitigation requirements.

- *Design guidelines and land divisions*. The potential ALP treatments may include locating development as far away as possible from water features and minimizing fragmentation of wildlife habitat. Lightly limit and moderately limit treatments may encourage using low impact development techniques. These treatments may also encourage land divisions that designate habitat as open space. Planned densities will most likely not be affected under lightly and moderately limit treatments. Strictly limit treatments may require low impact development practices and require land divisions for dedicated open space. Prohibit treatments may not allow development.

  Potential ALP treatments that include design standards and land division restrictions may increase development costs. The actual impacts on development costs would depend on the details specific to the parcel and land use.

- *Allow Treatment*. The allow treatment would have no impact on development priorities beyond existing federal, state, or local regulations. Goal 5 would have no incremental or additional impact on lands affected by an allow treatment.
- *Impact Areas*. A majority lands categorized as impact areas are already developed (66 percent). (See Phase I ESEE report for information on impact areas.) These lands would receive allow or lightly limit treatments upon redevelopment.

Potential economic tradeoffs of treatments vary by the development status of lands
The development status of lands would influence the timing of the economic impacts of program options on urban development priorities.
- *Vacant lands outside Title 3*. These lands are currently vacant and are unconstrained by Title 3 (water quality and flood management). However, these lands could be constrained by federal, state, and local regulations, which apply beyond Title 3 boundaries. These lands would likely be developed first and experience the most immediate impacts of program options.

- *Vacant lands inside Title 3*. Development on these lands is constrained by current regulations aimed at protecting water quality and flood areas. Similar to vacant lands outside Title 3, vacant lands inside Title 3 would likely experience economic impacts of program options in the short run. The magnitude of Goal 5 impacts on these lands, however, would likely be less (depending on the strictness of Goal 5 treatments applied) because existing regulations limit development on these lands.
- *Developed urban lands*. Lands classified as developed urban would experience economic impacts of program options through redevelopment or expanding existing land uses. Current Title 3 regulations apply to redevelopment actions, so Goal 5 treatments could result in a marginal increase in development constraints depending on the treatment applied. These impacts would likely occur farther into the future compared with impacts on vacant lands inside and outside Title 3.

Comparison of program options

Lands with high urban development value (See Figure 4-5)

- Option 2C provides the greatest support for lands with high urban development value among the six program options. This result holds for developed lands, vacant lands outside Title 3 and vacant lands inside Title 3.
- In descending order of support for urban development priorities the remaining options rank: 2B, 1C, 2A, 1B, and 1A. Option 1C, which emphasizes habitat protection, performs better under this criterion than does Option 2A, which emphasizes urban development values.
- The ranking of the program options described above applies to developed urban lands and vacant lands outside Title 3. This ranking also reflects the outcome for vacant lands inside Title 3 except that Options 2A and 1B perform similarly rather than 2A dominating 1B.

Lands with medium urban development value (See Figure 4-6)

- Option 2C also performs best for lands with medium urban development value. This result also holds for the three development categories of land.
- The order of the remaining program options for medium value lands under this criterion reflects the order for high value lands except that Option 1C performs better than remaining options in the following order: 1C, 2B, 2A, 1B, 1A.
- The above ranking holds for developed urban and vacant lands outside Title 3. For vacant land inside Title 3 Options 2A and 1B perform comparably rather than 2A performing better than 1B as indicated above.

Lands with low urban development value (See Figure 4-7)

- Option 1C, which was designed to emphasize habitat protection, performs better than the other options under this criterion for lands with low urban development value. This result holds for the three development categories.
- In descending order of support for urban development priorities the remaining options rank: 2C, 2B, 1B, 2A, 1A.
- This ranking holds for developed urban and vacant lands outside Title 3. For vacant land inside Title 3, Options 2B and 1B perform comparably rather than Option 2B performing better 1B as indicated above.

Other lands (See Figure 4-8)

- As with lands ranked low, Option 1C also provides the greatest support for urban development values for other lands. This result holds for the three development categories.
- In descending order of support for urban development priorities, the remaining options rank: 1B, 2C and 2B are comparable, 2A and 1A.
- This ranking holds for developed urban and vacant lands outside Title 3. For vacant land inside Title 3, Option 1B performs similarly to Options 2C and 2B rather than Option 1B performing better than the other two.

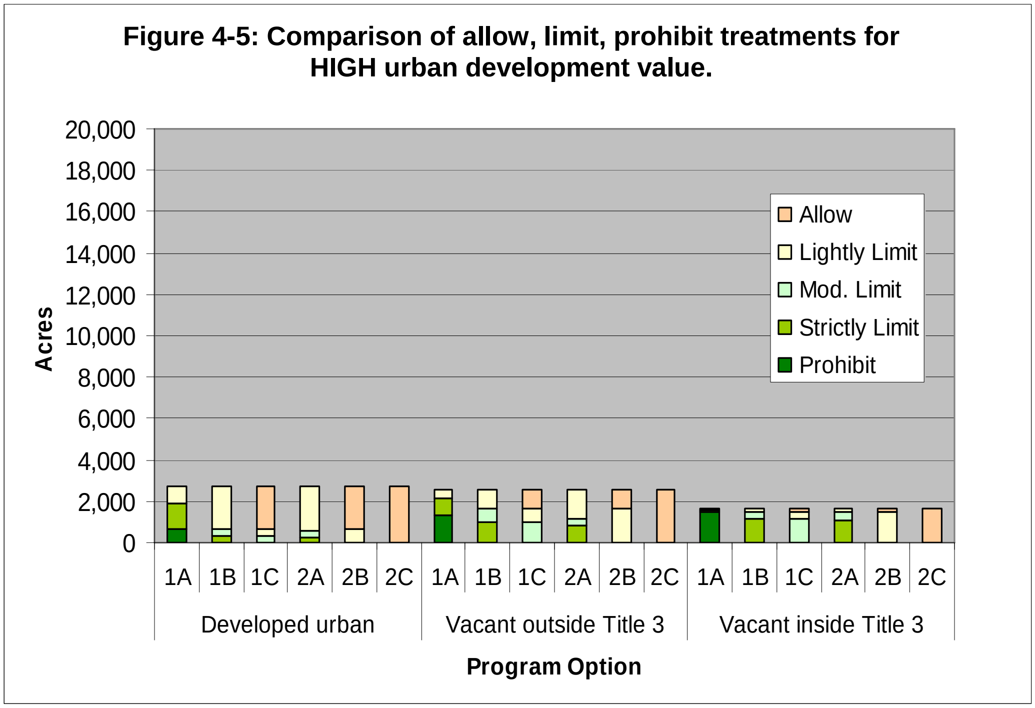


Figure 4-5: Comparison of allow, limit, prohibit treatments for HIGH urban development value.
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Acres
Allow
Lightly Limit
Mod. Limit
Strictly Limit
Prohibit
1A
1B
1C
2A
2B
2C
Developed urban
Vacant outside Title 3
Vacant inside Title 3
Program Option

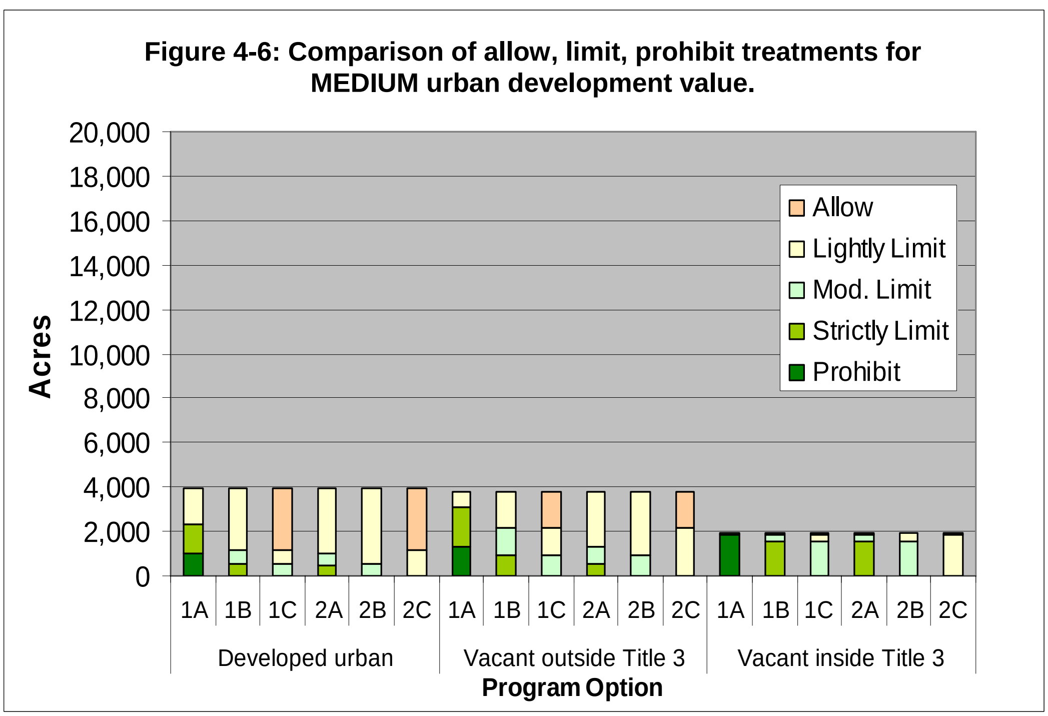


Figure 4-6: Comparison of allow, limit, prohibit treatments for MEDIUM urban development value.
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Acres
Allow
Lightly Limit
Mod. Limit
Strictly Limit
Prohibit
1A
1B
1C
2A
2B
2C
Developed urban
Vacant outside Title 3
Vacant inside Title 3
Program Option

Figure 4-7: Comparison of allow, limit, prohibit treatments for LOW urban development value.

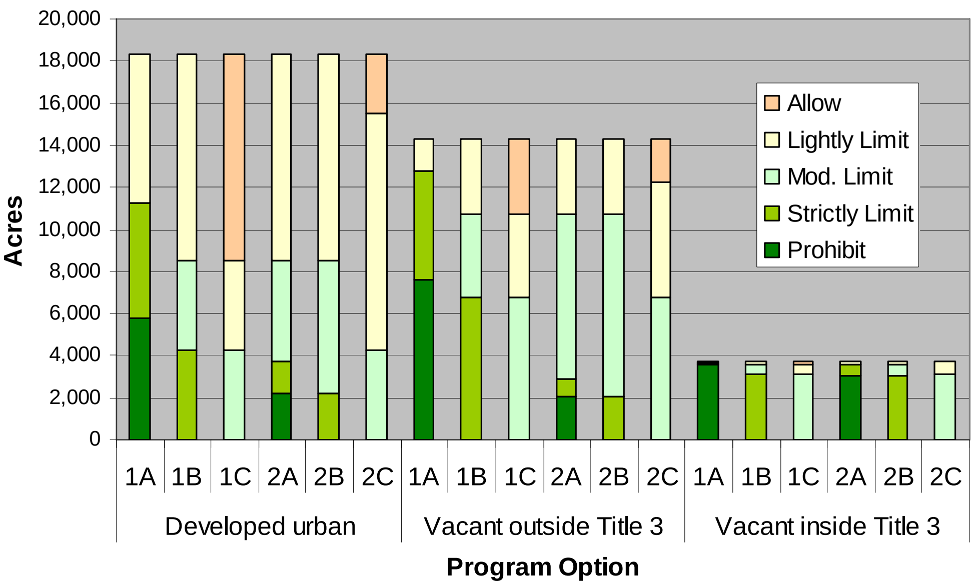
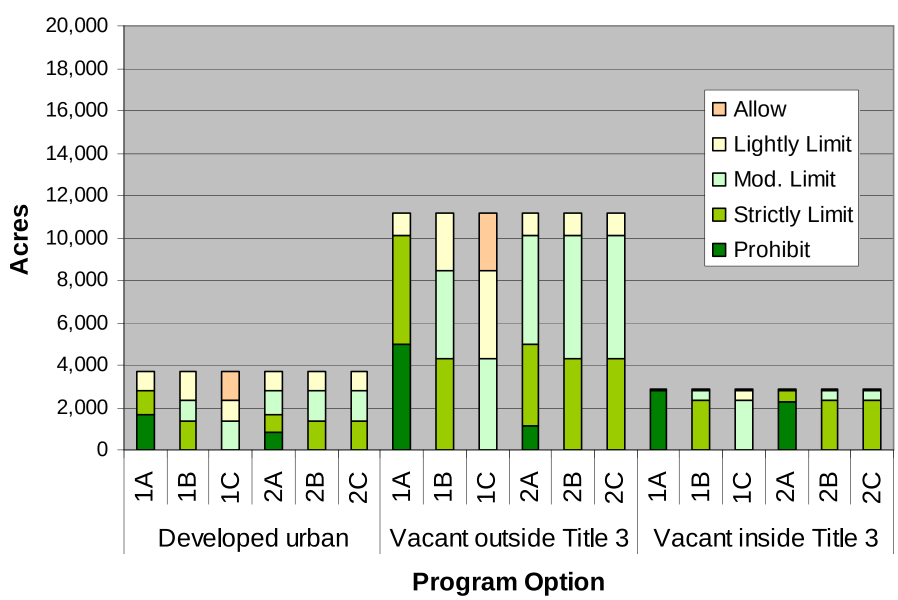


Figure 4-8: Comparison of allow, limit, prohibit treatments for OTHER areas (parks and open space, rural lands).



Summary

Table 4-3 summarizes the ranking of program options based on the outcome for lands with high urban development value. These lands contain the greatest concentration of high valued lands and lands with the highest employment density.

Table 4-3: Performance of options in meeting Economic Criterion 1: supports urban development priorities.

Rank	Option	Performance
1	2C	Option 2C provides the greatest support for urban development priorities among the six options, as described by the impacts on lands ranked "high." It has the greatest number of acres affected by allow treatments, which have no negative impacts on development, and no acres affected by strictly limit or prohibit treatments.
2	2B	Options 2B and 1C are second to Option 2C in the number of allow acres. 2B has more acres affected by lightly limit than 1C. 2B has zero acres affected by moderately limit, 1C has the most acres affected by moderately limit of any option. For these reasons 2B dominates 1C.
3	1C	Option 1C dominates option 2A because 1C has acres affected by allow treatments. 2A has no allow acres.
4	2A	Option 2A has more lightly limit acres than 1B or 1A. Option 1B has more acres affected by moderately limit and strictly limit than 2A. Option 1A is the only option with acres affected by prohibit treatments.
5	1B	Option 1B dominates 1A because it has more acres affected by lightly limit treatments and no acres affected by prohibit treatments.
6	1A	Option 1A has the greatest negative impact from prohibit treatments and the greatest negative impact overall on urban-development priorities of the six options.

Note that the ranking of program options based on the *average* outcome for the *total acres* in the analysis differs from the ranking in Table 4-3. A summary based on the average for all acres weighs more heavily the impacts on lands ranked low and other lands, because these rankings contain more acres than do lands with high or medium rankings. The ranking of program options based on the average for all acres is: 1C, 2C, 2B, 1B, 2A, 1A.

2. Supports economic values of ecosystem service

The acres of habitat protected by program options help determine the extent to which the options retain ecosystem services and related economic values. Regionally significant fish and wildlife habitat is ranked into six classes based on the amounts and types of ecological functions and wildlife characteristics: Class I-III riparian/wildlife corridors and Class A-C upland wildlife habitat. Areas with more ecological functions and/or areas with functions closer to streams, wetlands, or floodplains rank higher than areas with fewer functions or with functions further away from water features (see Chapter 4 of Metro's Phase I ESEE analysis for full discussion of ecosystem services).

Potential impacts on the value of ecosystem services

Metro's inventory and ranking focused on the ecological functions and wildlife characteristics that affect a habitat's biophysical health and wellbeing. Well-functioning habitats also produce ecosystem services that benefit society. Table 4-4 below lists the ecological functions and wildlife characteristics that were considered in ranking of fish and wildlife habitat, the related ecosystem services that benefit society, and where these ecosystem services occur in the inventory classes.

Table 4-4: Ecological functions, wildlife characteristics and related ecosystem services that benefit society.

Ecological function	Ecosystem service	Where ecosystem services occur in Metro's habitat classes
Microclimate, shade, and cooling of water temperature	Decreased summer temperatures, which helps reduce energy demand for cooling.	All habitat classes
Moderated stream flow and improved water storage	Reduced flood damage and flood management costs.	All habitat classes
Bank stabilization and sediment and pollution control	Improved water quality. Reduced demand for water filtration and treatment. Reduced landslides and related damage and clean-up costs.	All habitat classes
Large woody debris and channel dynamics	Reduced flood damage and flood-management costs.	Class I or II riparian/wildlife corridors
Well-functioning riparian areas in general	Increased amenity and intrinsic values associated with riparian areas.	All habitat classes
Habitats of concern and habitats for unique and sensitive species	Increased populations of salmon and other species and associated increases in commercial, recreational, spiritual and intrinsic values.	Class I riparian/wildlife corridors, Class A upland wildlife habitat
Well-functioning wildlife habitats in general	Increased amenity and intrinsic values associated with wildlife habitat.	All upland wildlife classes and Class I-II riparian/wildlife corridors

Source: ECONorthwest and Metro's inventory and ranking of riparian and wildlife resources.

The analysis of program options and their associated impacts on ecosystem services and related economic values assumes:

- Areas that provide more of the ecological functions and wildlife characteristics illustrated in Table 4-4 provide more ecosystem services and value to society than do areas that provide fewer functions and characteristics.
- Actions that enhance or protect ecosystem services also enhance or protect the economic values associated with those services. Actions that degrade these services will have the opposite effect.

This criterion emphasizes protecting habitats and associated ecosystem services. Criterion 1 emphasizes just the opposite, developing habitat in support of urban development priorities. In general, options that performed well under the Criterion 1, emphasizing urban development priorities, perform poorly under Criterion 2, because they degrade ecosystem functions, wildlife habitat, and the associated ecosystem services listed in Table 4-4. The resulting negative economic consequences over the long term may include:

- Higher summer temperatures with associated increased cooling costs in summer.
- Increased air pollution and associated impacts and costs.
- Increased flooding with related property damage, and disruption of commercial, business, and industrial activity, and increased transportation disruptions and costs.
- Increased landslides that may threaten residential, commercial and industrial properties, transportation routes and water quality.
- Decreased water quality and associated increased treatment costs.
- Reduced amenity and intrinsic values associated with habitat and species.

Degrading habitat on a regional scale, such as the lands in Metro's jurisdiction, may generate significant negative economic consequences, especially over the long term. Protecting these resources over the long term may yield economic benefits throughout the region. (See Metro's Phase 1 ESEE Report for information on methods of estimating the value of the affected ecosystem services and the magnitudes of the values.)

Environmental Criterion 1 (conserves existing watershed health and restoration opportunities) describes the impact of program options on the amount and quality of ecosystem functions for fish and wildlife habitat. It is assumed that program options that promote or protect these functions also promote or protect the related ecosystem services and values to society. It is also assumed that options that rank high on this environmental criterion will also rank high for related ecosystem services and economic values.

The analysis of program options and their impacts on the value of ecosystem services builds upon the biophysical analysis of ecosystem functions. The ecosystem functions provide the ecosystem services that society values. This criterion describes the impacts of program options on related ecosystem services and values to society. Not incidentally, to assign values to the ecosystem services derived from the biophysical analysis of ecosystem functions does not double count the economic importance of ecosystem functions or ecosystem services. The two analyses— biophysical and economic—are separate, with the economic analysis converting the findings of the biophysical analysis to different units of measurement.

Measuring the criterion

Table 4-5 shows the number of acres of habitat, by habitat class, affected by allow, limit, and prohibit treatments for the six program options. The habitat classes are subdivided for developed and vacant acres. As described in Economic Criterion 1, vacant acres will experience the most immediate impacts of program options. Developed lands will experience impacts of program options through the eventual redevelopment and expansion of existing land uses.

Table 4-5: Retention of ecosystem services by program option (in number of acres of habitat).

Program treatment		Option 1A		Option 1B		Option 1C		Option 2A		Option 2B		Option 2C	
		Developed	Vacant	Developed	Vacant	Developed	Vacant	Developed	Vacant	Developed	Vacant	Developed	Vacant
Class I	A	0	0	0	0	0	0	0	0	0	0	282	1,942
	LL	0	0	0	0	0	0	0	0	282	1,942	460	2,107
	ML	0	0	0	0	15,327	12,549	0	0	460	2,107	2,243	5,097
	SL	0	0	15,327	12,549	0	0	742	4,050	14,585	8,499	12,342	3,402
	P	15,327	12,549	0	0	0	0	14,585	8,499	0	0	0	0
Class A	A	0	0	0	0	0	0	0	0	0	0	67	207
	LL	0	0	0	0	0	0	67	207	67	207	101	372
	ML	0	0	0	0	11,173	8,508	2,154	5,125	2,154	5,125	2,054	4,753
	SL	0	0	11,173	8,508	0	0	8,952	3,176	8,952	3,176	8,952	3,176
	P	11,173	8,508	0	0	0	0	0	0	0	0	0	0
Class II	A	0	0	0	0	0	0	0	0	0	0	273	668
	LL	0	0	0	0	3,986	3,907	0	0	682	1,354	1,911	2,050
	ML	0	0	3,986	3,907	0	0	682	1,354	3,303	2,553	1,801	1,188
	SL	0	0	0	0	0	0	3,303	2,553	0	0	0	0
	P	3,986	3,907	0	0	0	0	0	0	0	0	0	0
Class B	A	0	0	0	0	0	0	0	0	0	0	58	359
	LL	0	0	0	0	5,100	7,789	266	1,168	266	1,168	2,898	3,921
	ML	0	0	5,100	7,789			4,834	6,622	4,834	6,622	2,144	3,509
	SL	5,100	7,789					0	0	0	0	0	0
	P	0	0	0	0	0	0	0	0	0	0	0	0
Class III	A	0	0	0	0	3,766	666	0	0	1,066	48	3,361	530
	LL	0	0	3,766	666	0	0	3,361	530	2,295	482	0	0
	ML	0	0	0	0	0	0	405	137	405	137	405	137
	SL	3,766	666	0	0	0	0	0	0	0	0	0	0
	P	0	0	0	0	0	0	0	0	0	0	0	0
Class C	A	0	0	0	0	2,973	4,489	0	0	118	462	1,789	3,021
	LL	0	0	2,973	4,489	0	0	1,789	3,021	1,671	2,559	0	0
	ML	0	0	0	0	0	0	1,184	1,468	1,184	1,468	1,184	1,468
	SL	2,973	4,489	0	0	0	0	0	0	0	0	0	0
	P	0	0	0	0	0	0	0	0	0	0	0	0

Notes for table 4-5:
Developed: sums parks and urban acres because the focus of this criterion is the retention of habitat irrespective of development status
Vacant: sums constrained and unconstrained acres (by Title 3 baseline regulations) for the same reason above.

Results

Figures 4-9 through 4-11 illustrate the findings in Table 4-5. Program options that protect more fish and wildlife habitat overall, as well as more of the most valuable habitat, rank higher for this criterion.

Figure 4-9: Performance of program options for Class I and Class A habitat.

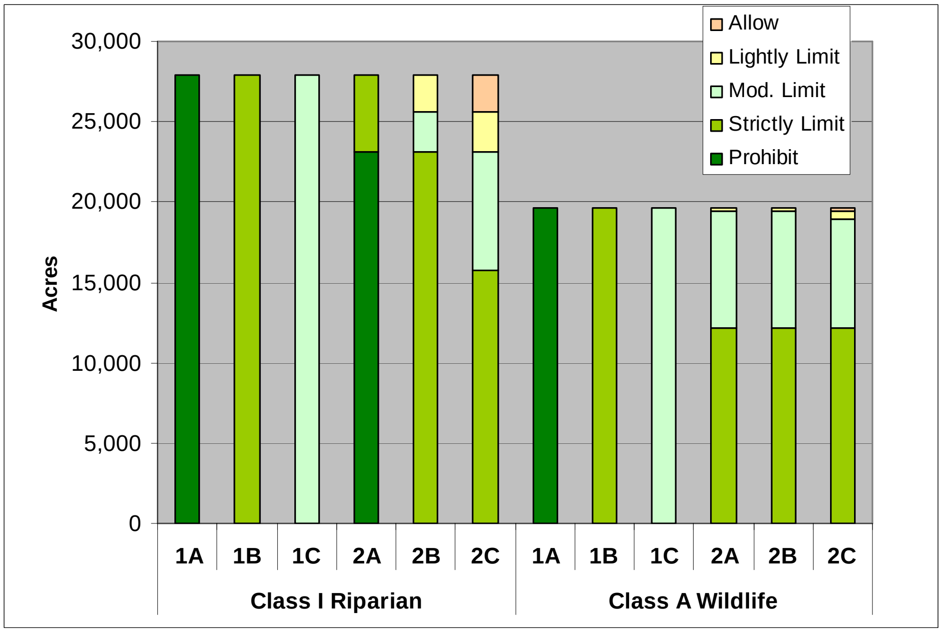


Figure 4-10: Performance of program options for Class II and Class B habitat.

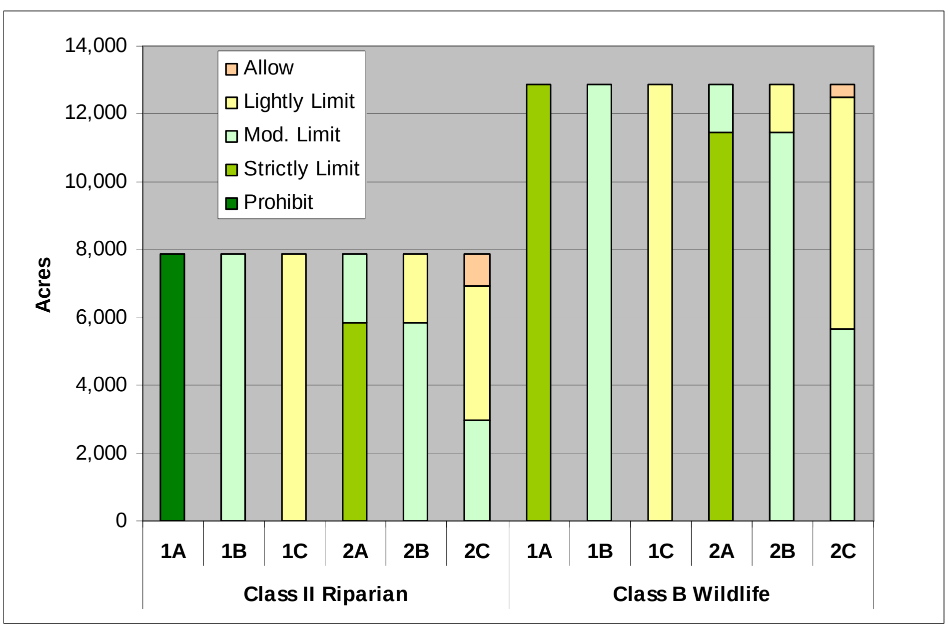
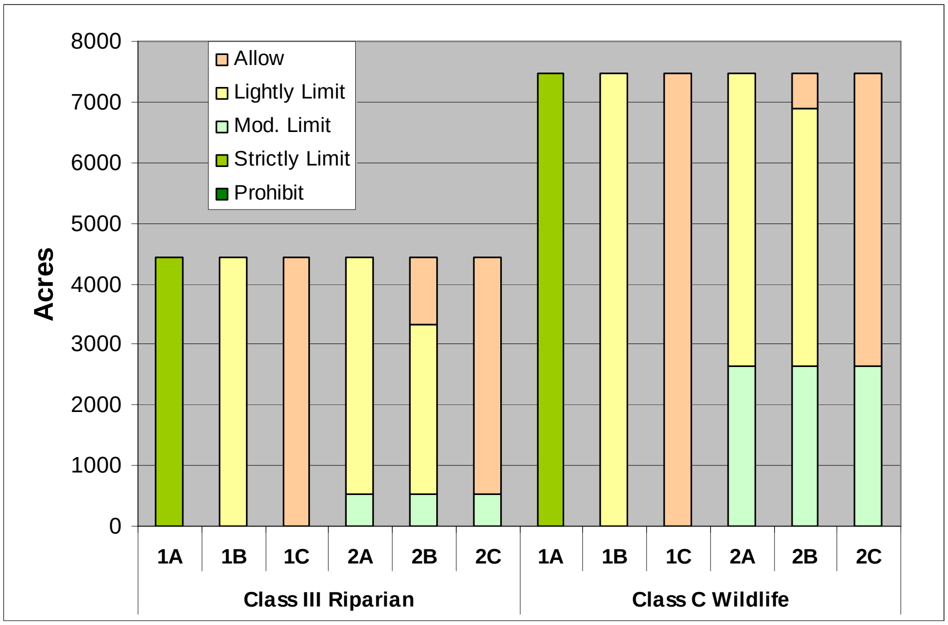


Figure 4-11: Performance of program options for Class III and Class C habitat.



Basic statistics

- This analysis includes 40,201 acres of Class I, II, and III riparian/wildlife corridors and 40,032 acres of Class A, B, and C wildlife habitat.
- The highest quality riparian/wildlife corridors (Class I) account for 69 percent of the total number of acres of riparian habitat.
- The highest quality wildlife habitat (Class A) account for 49 percent of the total number of acres of wildlife habitat.

Baseline protection (Title 3)

- Program options that provide the least protection to habitat lands will, in general, have more negative impacts on Class A, B, and C lands over the long term compared to the impacts on Class I, II, and III lands, because the lands in the latter group receive more baseline protection from Title 3. For example, nearly half of Class I and a quarter of Class II riparian/wildlife corridors are included in Title 3 Water Quality Resource Areas.
- Title 3 Water Quality Resource Areas (WQRA) and Flood Management Areas (FMA) protect 72, 49, and 61 percent of Class I, II, and III lands, respectively (See Chapter 3, *Baseline for Analysis*).
- To the extent that the WQRAs and FMAs also protect the ecosystem services specific to Class I through III habitat lands, they also protect the associated economic values.
- Title 3 provides almost no protection for Class A, B, and C lands or the associated ecosystem services and values. Inside Title 3 protection, Class A lands account for two percent, Class B lands for one percent, and Class C lands for two percent.

Comparison of program options

Class I, II, and III riparian/wildlife corridors

- Option 1A promotes the greatest retention of ecosystem services and associated economic values among the six options for Class I, II, and III lands. This result holds for developed and vacant land in Metro's jurisdiction.
- In descending order of retaining ecosystem services and associated values, the remaining options rank: 2A, 1B, 2B, 2C, 1C.

Class A, B, and C upland wildlife

- The six program options perform similarly for Class A and B lands but not for Class C lands.
- Similar to Class I, II, and III lands, Option 1A promotes the greatest retention of ecosystem services and associated economic values among the six options for Class A and B lands.
- In descending order for lands in Class A and B, the remaining options rank: 1B, 2A = 2B, 2C, and 1C. This ranking applies to developed and vacant land.
- Option 1A also promotes the greatest retention of ecosystem services and associated economic values among the six options for Class C lands.
- In descending order for lands in Class C, the remaining options rank: 2A, 2B, 2C, 1B, 1C. This ranking applies to developed and vacant land.

Summary

Table 4-6 summarizes the performance ranking of the program options based on the average outcome for the total acres in the analysis. As a group, Class I, II and III lands cover approximately the same number of acres as the lands in Class A, B and C. Thus, the outcomes for these two groups receive approximately the same weight. The outcomes for the individual classes, however, do not receive equal weights because the number of acres in each class differs. The classes rank in the following descending order based on the acres of lands in the class expressed as a percentage of the total acres in the analysis: Class I (35 percent of total acres), Class A (25 percent), Class B (16 percent), Class II (9 percent), Class C (9 percent), and Class III (6 percent). The results in Table 4-6 reflect the weighting of the results for the individual classes based on these percentages.

Table 4-6: Performance of options in meeting Economic Criterion 2: promotes retention of ecosystem services

Rank	Option	Performance
1	1A	This option provides the greatest retention of ecosystem services and related economic values among the six options. This is true for all classes of habitat and for developed and vacant lands.
2	2A	Comparable to Option 1B in overall retention of ecosystem services and related values. Option 2A retains more higher quality riparian services, while Option 1B retains more higher quality wildlife habitat services.
3	1B	See the description for Option 2A.
4	2B	Performs comparable to Option 2A for Class A and B lands. For all other lands, Option 1B performs better.
5	2C	Performs consistently behind Options 2B, and consistently dominates Option 1C.
6	1C	This option provides the least retention of ecosystem services and related economic values of the six options. This ranking applies for all classes of habitat and for developed and vacant lands.

The proposed Goal 5 guidelines include mitigating adverse impacts of development on habitat. Detailed mitigation guidelines have not yet been developed. The site-specific nature of habitat and the impacts of development on the habitat will also influence the type and amount of Goal 5 mitigation that may be required. Given these uncertainties, and the conclusions from Metro's Technical Report for Goal 5 that mitigating habitat damage in urban areas faces considerable challenges, the ranking of program options in Table 4-6 does not reflect the outcome of potential Goal 5 mitigation.

3. Promotes recreational access and amenities.

This criterion ranks program options based on the extent to which they promote recreational access and amenities. The analysis of this criterion uses data similar to that for the analysis of Environmental Criterion 1 and Economic Criterion 2 – acres of habitat protected. The criterion, however, focuses on the subset of total habitat acres that support recreational opportunities. Metro classifies these lands as parks and open space.

The analysis of this criterion distinguishes between public and private recreational lands because ownership may influence the impacts of program options on recreational access. For example, public ownership implies more open access to recreational opportunities. Private ownership implies that access requires membership or has other restrictions. Public park and open space lands include parks, schools and rights-of-way. Private park and open space lands includes golf courses and cemeteries.

Potential impacts on recreational opportunities

In general, the program options would have a limited impact on the number of acres of recreational and open space lands. This is true for two reasons. First, existing land uses either support recreational use and open space directly (e.g., public parks or golf courses) or support recreation related uses indirectly (e.g., schools). The options would have more limited impacts on the number of acres of these types of land uses compared with the more intensive urban development uses described in Criterion 1. The second reason is that the large majority of the lands in this analysis are publicly owned. Public ownership makes it unlikely (though not impossible) that recreational and open space uses will change significantly in the future.

The options may impact the *quality* of recreational and open space experiences on the lands at issue in this analysis. Options that protect more habitat, and more higher quality habitat, will help protect the recreational related amenity values associated with the habitat. The analysis of program options and their associated impacts on recreational access and amenities assumes:

- Fish and wildlife habitat provide recreation and open space related ecosystem services and values to society. Higher quality habitat provides higher quality ecosystem services and values compared with lower quality habitat.
- Actions that enhance or protect habitat also enhance or protect the recreation and open space related amenities that influence the quality of recreational experiences. Actions that degrade these services will have the opposite effect.
- Program options that protect habitat lands with more restrictive treatments will also promote greater access to recreational opportunities and higher quality recreational experiences. Options that provide less protection will have the opposite effect.

Other lands outside park and open space can contribute to recreational experiences and amenities. For example, bird and fish habitat on non-parklands contribute to the amenity value of bird watching and fishing on parklands. The analysis of Criterion 3 focuses only on parks and open spaces; thus, it likely underestimates the true scope and values of recreational amenities affected by Goal 5 program options.

Measuring the criterion
Table 4-7 below shows the habitat acres that support recreation (25,265 acres) by ownership (public vs. private) and by allow, limit, and prohibit treatments for the six program options.

Table 4-7: Acres in parks and open space lands by ownership and by program treatment

Program Options	Program treatments	Publicly owned	Privately owned	Total acres	Public: % of total	Private: % of total
Option 1A	Prohibit	19,046	2,372	21,418	89%	11%
	Strictly limit	2,076	521	2,596	80%	20%
	Moderately limit	0	0	0	0%	0%
	Lightly limit	950	302	1,252	76%	24%
	Allow	0	0	0	0%	0%
Option 1B	Prohibit	0	0	0	0%	0%
	Strictly limit	17,967	1,959	19,926	90%	10%
	Moderately limit	2,301	692	2,993	77%	23%
	Lightly limit	1,804	542	2,346	77%	23%
	Allow	0	0	0	0%	0%
Option 1C	Prohibit	0	0	0	0%	0%
	Strictly limit	0	0	0	0%	0%
	Moderately limit	17,967	1,959	19,926	90%	10%
	Lightly limit	2,301	692	2,993	77%	23%
	Allow	1,804	542	2,346	77%	23%
Option 2A	Prohibit	10,311	1,185	11,495	90%	10%
	Strictly limit	8,736	1,187	9,923	88%	12%
	Moderately limit	2,076	521	2,596	80%	20%
	Lightly limit	950	302	1,252	76%	24%
	Allow	0	0	0	0%	0%
Option 2B	Prohibit	0	0	0	0%	0%
	Strictly limit	17,967	1,959	19,926	90%	10%
	Moderately limit	3,155	933	4,088	77%	23%
	Lightly limit	950	302	1,252	76%	24%
	Allow	0	0	0	0%	0%
Option 2C	Prohibit	0	0	0	0%	0%
	Strictly limit	17,967	1,959	19,926	90%	10%
	Moderately limit	3,155	933	4,088	77%	23%
	Lightly limit	0	0	0	0%	0%
	Allow	950	302	1,252	76%	24%

Results

Figure 4-12 displays the information from Table 4-7. It shows that the large majority of land at issue in this case is in public ownership. Figure 4-13 shows park lands by quality of habitat and by ownership. The large majority of park lands in this analysis also contains the highest quality fish and wildlife habitat.

Figure 4-12: Performance of program options for parks and open space lands, by ownership.

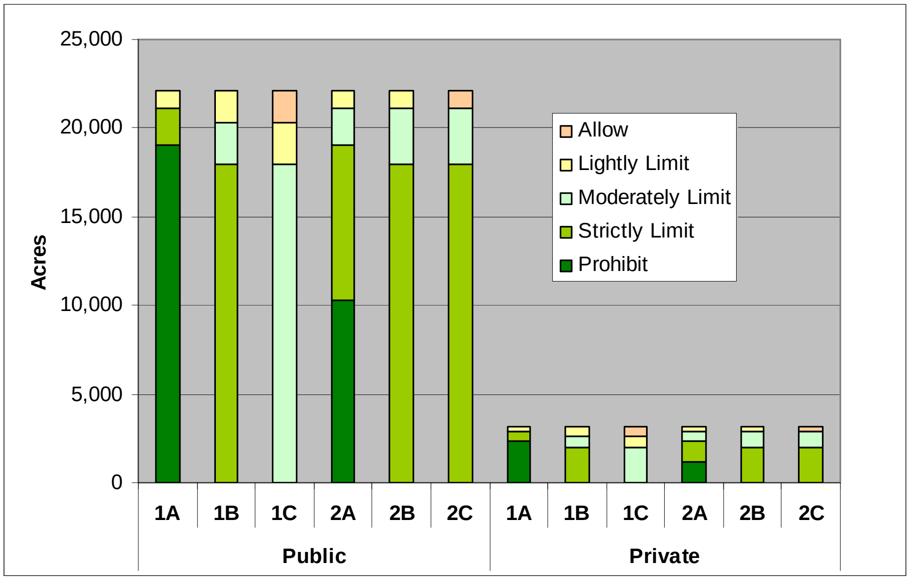
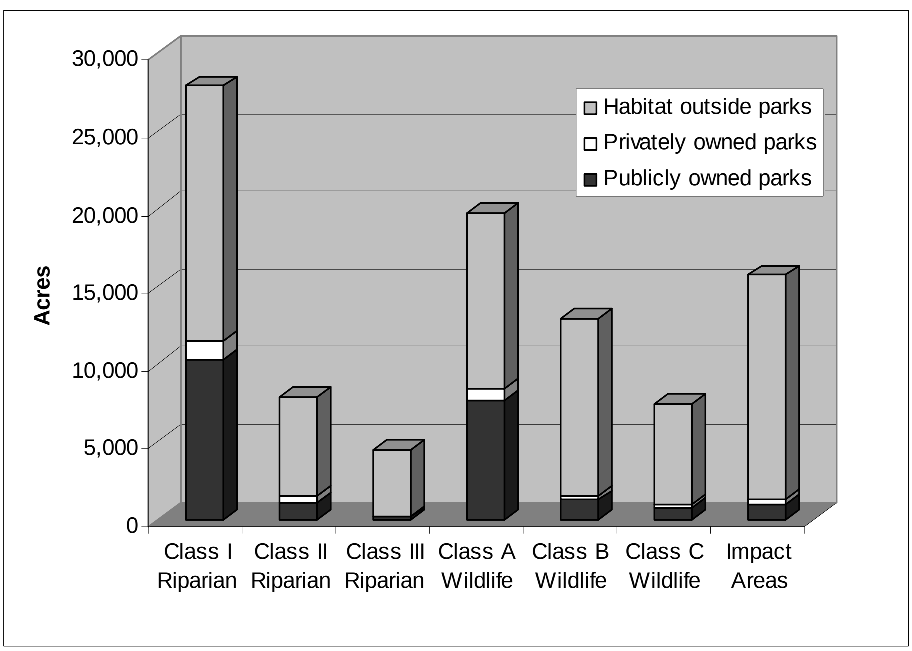


Figure 4-13: Park lands by habitat class and ownership.



Program options that protect more park and open space lands overall will more likely promote recreational access, higher quality recreational experiences and score higher for this criterion. Program options that protect more *public* park and open space lands will more likely promote recreational access with fewer restrictions compared with protecting *private* park and open space lands. The quality of remaining habitat land will also affect the quality of recreational experiences.

Basic statistics

- The analysis for this criterion includes 25,265 acres of park and open space lands.
- 22,071 acres, or 87 percent, are publicly owned; 3,194 acres, or 13 percent, are privately owned.

Comparison of Program Options

Park and open space lands in public ownership

- Option 1A promotes recreational access to the greatest extent of the six program options by protecting over 21,000 acres of public and private park and open space lands with prohibit treatments. Given that the large majority of these lands also contains Class I and Class A habitat, this option also protects habitat lands that provide the highest quality recreational and open space amenities.
- In descending order of promoting recreational access and the quality of recreational amenities, the options rank: 2A, 2B, 1B, 2C, 1C.
- Two of the options that take into account urban development values rather than quality of habitat, 2A and 2B, perform better under this criterion than do options 1B and 1C, which were designed with greater habitat protection in mind.

Park and open space lands in private ownership

- The program options rank the same for privately owned park lands as they do for lands in public ownership.
- Ownership does influence the performance of the less protective treatments of the program options. In general, private lands account for a higher proportion of the less protective treatments compared with their portion of the total park and open space acres. For example, under option 1B, private park land accounts for 23 percent of the lands with moderately and lightly limit treatments. But these lands account for 13 percent of the total park lands. In general, private lands receive a larger percentage of the less protective treatments and a smaller percentage of the more protective treatments relative to public lands.

Summary

Table 4-8 summarizes the ranking of the performance of the program options based on the average outcome for the total acres in the analysis.

Table 4-8. Performance of options in meeting Economic Criterion 3: promotes recreational access and amenities.

Rank	Option	Performance
1	1A	This option promotes the greatest access to recreational opportunities, and highest quality recreational experiences among the six options. This holds for both public and private park lands. This option protects over 21,000 acres with prohibit treatments, the most of any option.
2	2A	This option relies on a mix of prohibit and strictly limit treatments. It performs better than options 1B and 1C, which take habitat protection into account.
3	2B	This option relies on a mix of limit treatments, without allow or prohibit treatments. This option also performs better than options 1B and 1C.
4	1B	This option relies on a mix of limit treatments, without allow or prohibit treatments. Option 2B dominates this option even though both rely on a mix of limit treatments.
5	2C	This option relies on a mix of limit and allow treatments.
6	1C	This option provides the least support for recreational opportunities and quality of recreational experiences among the six options. This holds for both public and private park lands.

4. Distributes economic tradeoffs

This discussion of Criterion 4 has two parts. The first part considers the distributional impacts of program options on property owners as described by public and private land. The second considers the distributional impacts on land use as described by regional zoning types.

The other economic criteria (1, 2, 3 and 5) in this analysis rank program options on a scale, for example, from least to most supportive of urban development priorities. The analysis for this criterion does not emphasize ranking program options because they do not vary significantly by land ownership or regional zone. It focuses instead on describing the extent to which the strictness of program options (e.g., allow vs. lightly limit, or lightly limit vs. moderately limit, etc.) varies by ownership or by regional zone. This criterion highlights property owners or regional zones that would bear a greater burden of the land use impacts that may stem from the more restrictive Goal 5 treatments.

Distribution of impacts by property ownership

This portion of the analysis describes the impact of program options on land ownership as measured by acres of public and private land. Economic Criterion 1 describes the impacts of program options on urban development values. In this criterion, the *distribution* of the impacts of program options on public and private lands that support the urban development values (described in Criterion 1) are examined. Similar to the analysis of Economic Criterion 1, the analysis for this criterion also assumes that the Goal 5 program options that protect habitat would restrict use and development of public and private land. Restrictions are assumed to be more likely with prohibit and strictly limit treatments and less likely with lightly limit or allow treatments.

Measuring the criterion

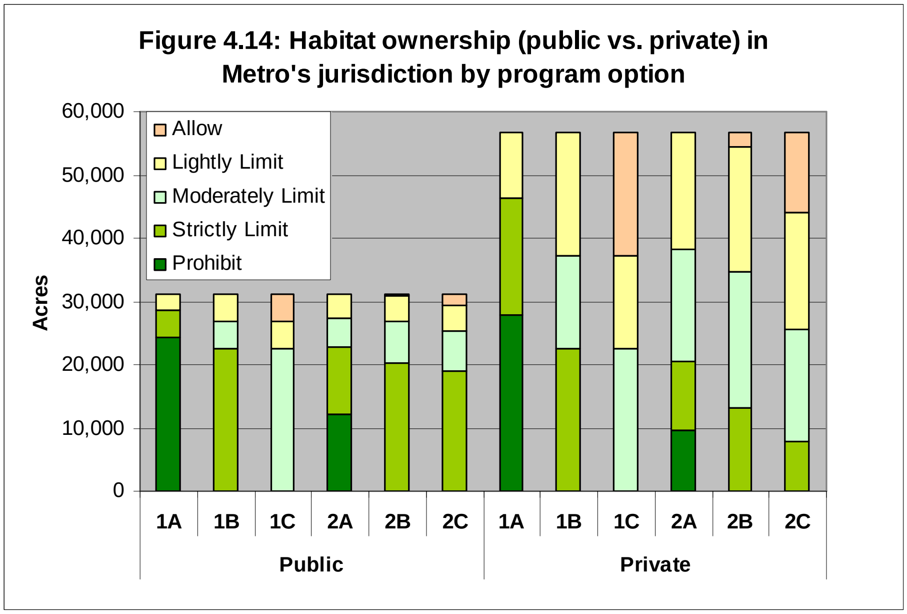
Table 4-9 shows the breakdown of Goal 5 allow, limit, and prohibit treatments by public and private lands for each program option.

Table 4-9: Habitat and impact area acres by land ownership and program options.

Program Option	Program Treatment	Acres of Resource in Taxlots			% of Resource in Taxlots			% of Treament in Taxlots			% of Ownership in Taxlots		
		Private	Public	Total*	Private	Public	Total*	Private	Public	Total*	Private	Public	Total*
	P	27,840	24,341	52,182	32%	28%	59%	53%	47%	100%	49%	78%	59%
	SL	18,423	4,156	22,579	21%	5%	26%	82%	18%	100%	32%	13%	26%
	ML	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	LL	10,491	2,534	13,025	12%	3%	15%	81%	19%	100%	18%	8%	15%
	AL	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Option 1A	Total*	56,754	31,032	87,786	65%	35%	100%	65%	35%	100%	100%	100%	100%
	P	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	SL	22,527	22,507	45,034	26%	26%	51%	50%	50%	100%	40%	73%	51%
	ML	14,797	4,245	19,042	17%	5%	22%	78%	22%	100%	26%	14%	22%
	LL	19,431	4,280	23,710	22%	5%	27%	82%	18%	100%	34%	14%	27%
	AL	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Option 1B	Total*	56,754	31,032	87,786	65%	35%	100%	65%	35%	100%	100%	100%	100%
	P	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	SL	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	ML	22,527	22,507	45,034	26%	26%	51%	50%	50%	100%	40%	73%	51%
	LL	14,797	4,245	19,042	17%	5%	22%	78%	22%	100%	26%	14%	22%
	AL	19,431	4,280	23,710	22%	5%	27%	82%	18%	100%	34%	14%	27%
Option 1C	Total*	56,754	31,032	87,786	65%	35%	100%	65%	35%	100%	100%	100%	100%
	P	9,658	12,197	21,855	11%	14%	25%	44%	56%	100%	17%	39%	25%
	SL	10,972	10,525	21,497	12%	12%	24%	51%	49%	100%	19%	34%	24%
	ML	17,495	4,629	22,124	20%	5%	25%	79%	21%	100%	31%	15%	25%
	LL	18,630	3,680	22,310	21%	4%	25%	84%	16%	100%	33%	12%	25%
	AL	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Option 2A	Total*	56,754	31,032	87,786	65%	35%	100%	65%	35%	100%	100%	100%	100%
	P	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	SL	13,230	20,256	33,486	15%	23%	38%	40%	60%	100%	23%	65%	38%
	ML	21,456	6,550	28,006	24%	7%	32%	77%	23%	100%	38%	21%	32%
	LL	19,639	3,974	23,613	22%	5%	27%	83%	17%	100%	35%	13%	27%
	AL	2,430	251	2,681	3%	0%	3%	91%	9%	100%	4%	1%	3%
Option 2B	Total*	56,754	31,032	87,786	65%	35%	100%	65%	35%	100%	100%	100%	100%
	P	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	SL	7,740	18,953	26,693	9%	22%	30%	29%	71%	100%	14%	61%	30%
	ML	17,923	6,319	24,241	20%	7%	28%	74%	26%	100%	32%	20%	28%
	LL	18,291	3,997	22,288	21%	5%	25%	82%	18%	100%	32%	13%	25%
	AL	12,801	1,763	14,564	15%	2%	17%	88%	12%	100%	23%	6%	17%
Option 2C	Total*	56,754	31,032	87,786	65%	35%	100%	65%	35%	100%	100%	100%	100%

* Total habitat acres differ from original number (95,955 acres) because some areas do not have tax lots (e.g., roads).

Results
Figure 4-14 illustrates the findings from Table 4-9.



Basic Statistics

- Privately owned land accounts for 56,745 acres, or 65 percent of the total acres in this analysis.
- Publicly owned land accounts for 31,031 acres, or 35 percent of the total acres in this analysis.

Comparison of program options

- The ranking of program options from least to most restrictive does not vary by property ownership. The program options rank, from least to most restrictive: 1C, 2C, 2B, 1B, 2A, and 1A.
- Even though the rank of program options does not vary by ownership, the degree of restriction does vary by public or private ownership. In general, publicly owned lands bear a higher proportion of the most restrictive Goal 5 treatments than do privately owned lands, relative to the distribution of public and private acres in the analysis. For example, Option 1C, which is the least restrictive option, splits the number of acres affected by the most restrictive treatment (moderately limit) evenly between public and private land (see Table 4.11 below). However, private land accounts for 65 percent, and public land accounts for 35 percent of total acres. If the impacts of the most restrictive treatment were distributed proportionally based on the number of acres of private and public lands in the analysis, private lands would receive approximately 65 percent of the most restrictive treatment and public lands 35 percent.

Table 4-10: Distribution of Allow, Limit and Prohibit Treatments between Private and Public Land for Option 1C.

Treatment	Private Lands (65% of total acres)	Public Lands (35% of total acres)	Total
Prohibit	0%	0%	
Strictly Limit	0%	0%	
Moderately Limit	50%	50%	100%
Lightly Limit	78%	22%	100%
Allow	82%	18%	100%

- The reverse is true for the less restrictive treatments. The less restrictive Goal 5 treatments affect private lands in a proportion greater than their percentage of total acres in the analysis. Public lands receive less-than-proportional impacts from the less restrictive treatments.
- For example, private lands account for 65 percent of the acres in the analysis but account for 78 percent of the acres affected by lightly limit treatments and 82 percent of the acres affected by allow treatments. Public lands, in contrast, account for 35 percent of the acres but 22 percent of the lightly limit treatments and 18 percent of allow treatments.

Distribution of impacts by regional zoning type

In this portion of the analysis, the impacts of program options on land uses in Metro's jurisdiction are described. There are seven regional zones (see Metro's Phase I ESEE report for a description of regional zoning types).

- Single-family residential (SFR)
- Multi-family residential (MFR)
- Mixed-use centers (MUC)
- Commercial (COM)
- Industrial (IND)
- Parks and open space (POS)
- Rural (RUR)

Potential impacts on zoning types

In this part of the analysis, it is assumed that program options that protect habitat would restrict land uses as described by regional zoning types. Land use restrictions are assumed to be more likely with prohibit and strictly limit treatments and less likely with moderately or lightly limit treatments.

The extent to which any one zoning type bears a disproportional share of acres affected by program options, relative to the zoning type's share of total acres in Metro's jurisdiction, are considered. Also described for a given program option are the land uses that receive less restrictive treatments (e.g., moderately limit and lightly limit) and those that receive more (e.g., strictly limit and prohibit).

Measuring the criterion

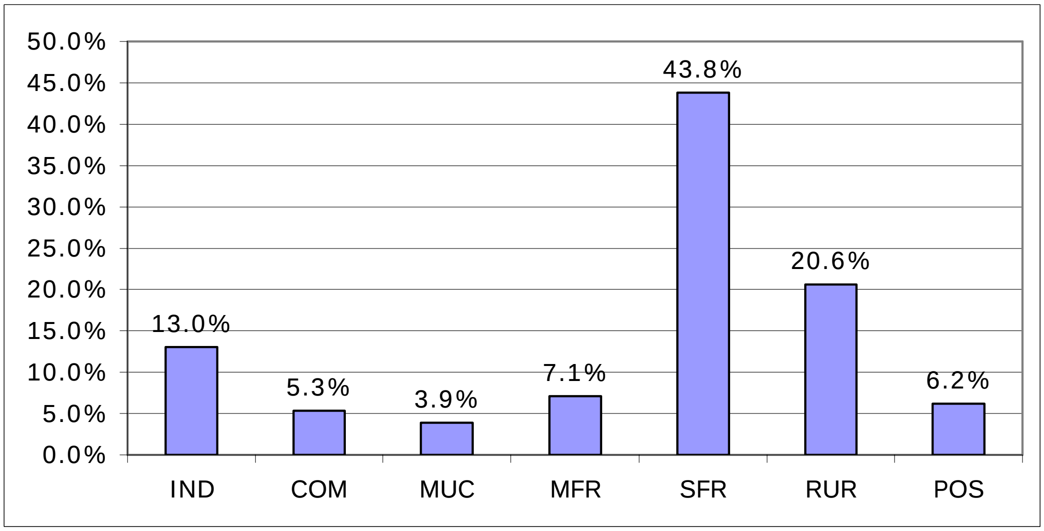
This criterion is measured by evaluating the number of acres in each zoning type affected by allow, limit and prohibit treatments.

Results

As background to the analysis of the distributional impacts of program options on land uses, Metro considered the extent to which any one zoning type bears a disproportional share of impacts from Goal 5 treatments relative to the zoning type's share of total acres in Metro's jurisdiction. Such an outcome would occur if a zoning type accounts for a larger proportion of the acres affected by a program option relative to the zoning type's proportion of total acres in Metro's jurisdiction.

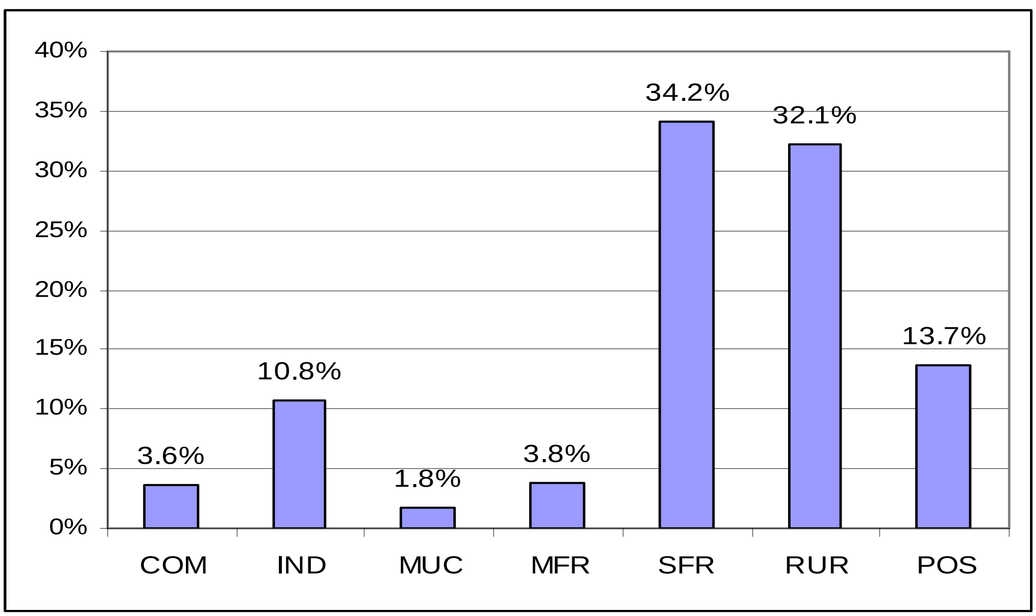
Figures 4-15 and 4-16 illustrate the relevant distributions. Figure 4-15 shows the percentage of total acres in Metro's jurisdiction by zoning type. For example, industrial lands (IND) account for 13 percent of the total acres in Metro's jurisdiction. Figure 4-16 shows the distribution of acres affected by program options, by zoning type. Industrial lands, for example, account for approximately 11 percent of the total acres affected by program options.

Figure 4-15: Percentage of total acres in Metro's jurisdiction by zoning type.



Source: ECONorthwest with data provided by Metro.

Figure 4-16: Percentage of total acres of habitat, by zoning type.



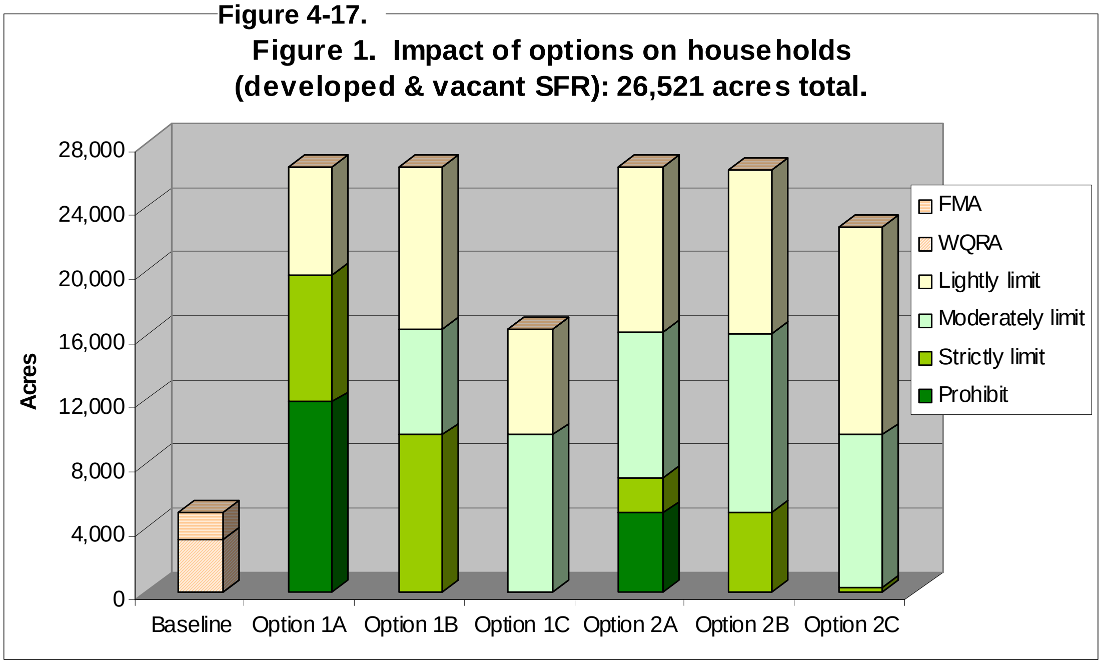
Source: ECONorthwest with data provided by Metro.

Comparing Figures 4-15 and 4-16:

- RUR and POS land uses would carry a disproportional share of the burden of Goal 5 treatments, relative to their share of total acres in Metro's jurisdiction. RUR lands account for approximately 21 percent of land but 32 percent of Goal 5 treatments. POS account for approximately 6 percent of land but 16 percent of Goal 5 treatments.
- Land uses with urban residential and business applications would shoulder a smaller share of the burden of Goal 5 treatments, relative to their proportion of total acres in Metro's jurisdiction. For example, SFR lands account for approximately 44 percent of land but only 32 percent of Goal 5 treatments. IND lands account for 13 percent of land but 11 percent of Goal 5 treatments.
- These results illustrate the interaction between the existing distributions of land uses and riparian and wildlife habitat and describe the *amount* and *type* of acres that would be affected by Goal 5 treatments. The *degree* to which any one program option would restrict land uses depends on the mix of allow, limit and prohibit treatments for that option. The following figures illustrate these impacts.

Figures 4-17, 4-18 and 4-19 illustrate the findings from Metro's analysis of social criteria based on the number of acres affected by allow, limit, and prohibit treatments for residential, business-related and rural land uses. Figure 4-17 illustrates the impacts of program options on SFR lands. Figure 4-18 shows the impacts on lands with business uses (MFR, MUC, COM, and IND). Figure 4-19 shows the impacts on RUR lands. Figure 4-20, which comes from the analysis of Economic Criterion 3, shows the impacts of Goal 5 treatments on park lands.

Figure 4-17.



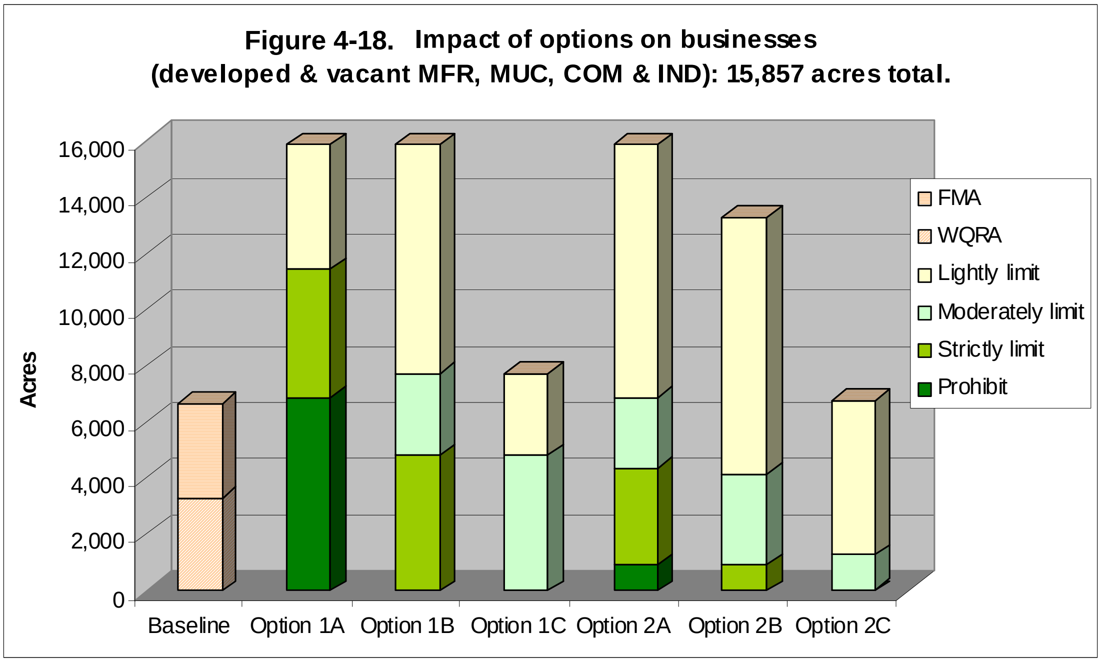


Figure 4-18. Impact of options on businesses
(developed & vacant MFR, MUC, COM & IND): 15,857 acres total.
Acres
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Baseline
Option 1A
Option 1B
Option 1C
Option 2A
Option 2B
Option 2C
FMA
WQRA
Lightly limit
Moderately limit
Strictly limit
Prohibit

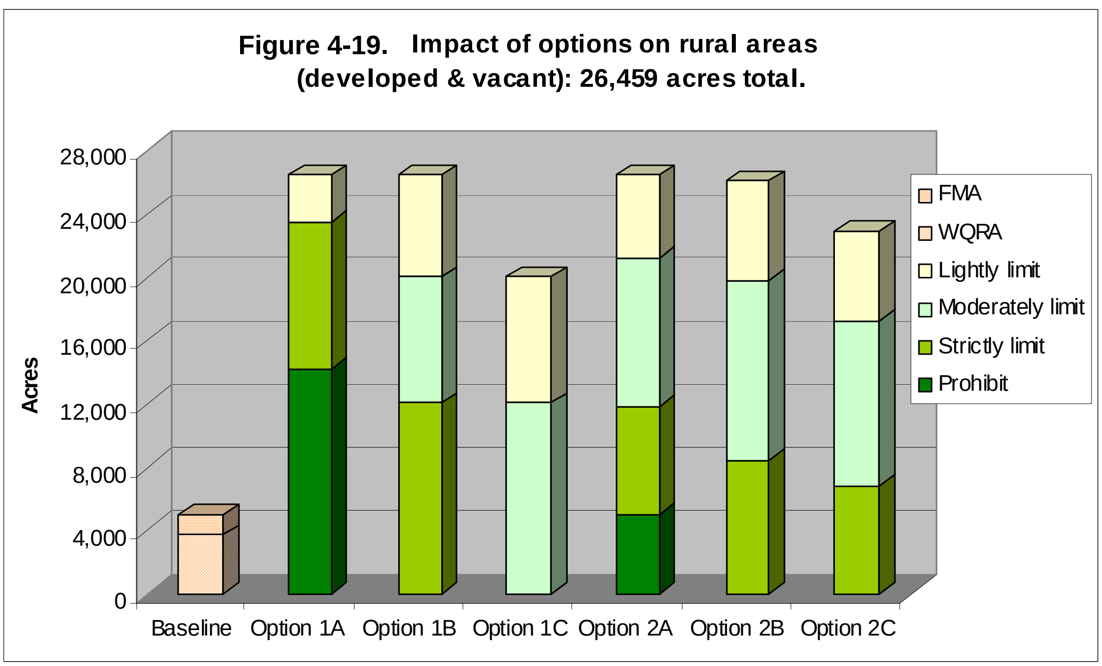
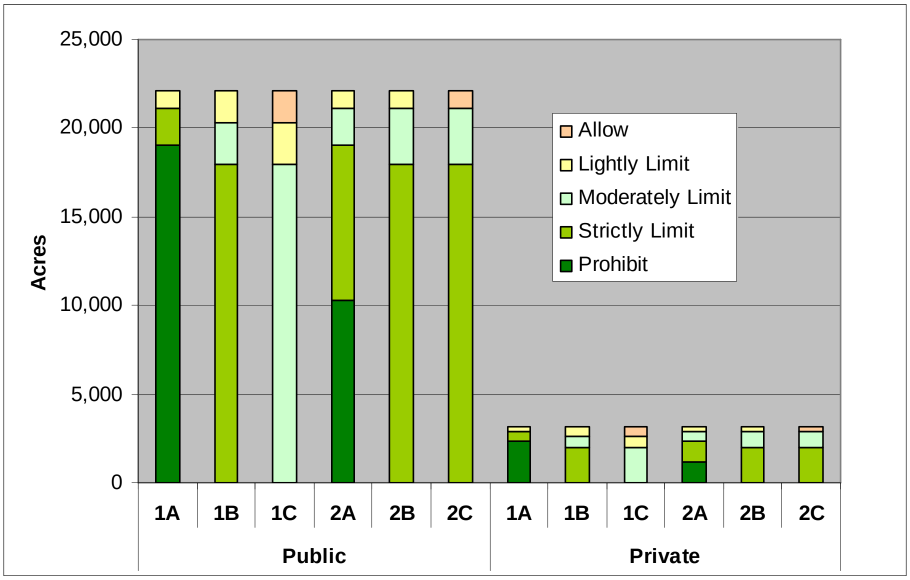


Figure 4-19. Impact of options on rural areas
(developed & vacant): 26,459 acres total.
Acres
28,000
24,000
20,000
16,000
12,000
8,000
4,000
0
Baseline
Option 1A
Option 1B
Option 1C
Option 2A
Option 2B
Option 2C
FMA
WQRA
Lightly limit
Moderately limit
Strictly limit
Prohibit

Figure 4-20: Performance of program options for parks and open space lands, by ownership



Basic Statistics

The number of acres that Goal 5 treatments would affect, by regional zone:

- SFR 26,521 acres
- MFR 2,886 acres
- MUC 1,625 acres
- COM 2,124 acres
- IND 9221 acres
- POS 13,118 acres
- RUR 26,460 acres.

Comparison of program options

- The ranking of program options, from least to most restrictive, varies little for residential, business-related, or rural land uses. In general, the program options that would restrict SFR lands the most would also restrict business-related (MFR, MUC, COM, IND) and rural (RUR) land uses the most.
- The ranking of program options for residential, business-related and rural land uses, from least to most restrictive, is 1C, 2C, 2B, 1B, 2A, and 1A. The only exception to this ranking is that for MUC and IND, 2C dominates 1C as the least restrictive option.
- The ranking of program options varies slightly for parks (POS) relative to the other regional zones. The ranking for POS, from least to most restrictive, is 1C, 1B, 2B, 2C, 2A, and 1A.
- Even though the rankings of program options would vary little among the regional zones, the limitations the program options would place on land uses would vary by regional zone. In general, the Goal 5 treatments under Criterion 4 would favor business-related land uses over POS, RUR, and SFR land uses. The non-business related land uses (POS, RUR, and SFR) would typically receive more restrictive Goal 5 treatments than would business-related land uses (MFR, MUC, COM, IND), for a given program option. For example, for option 1C,

approximately 38 percent of SFR lands would receive an allow treatment. For COM lands, 52 percent would receive an allow treatment. Option 1C ranks as the least restrictive option for both SFR and COM. See Table 4-11.

Table 4-11: Distribution of allow, limit and prohibit treatments for Option 1C by regional zone.

Treatment	SFR	MFR	MUC	COM	IND	POS	RUR
Allow	38%	52%	47%	52%	52%	9%	24%
Lightly Limit	25%	18%	19%	21%	17%	8%	30%
Moderately Limit	37%	29%	33%	27%	31%	83%	45%
Strictly Limit	0%	0%	0%	0%	0%	0%	0%
Prohibit	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%[1]	100%[1]	100%	100%	100%	100%[1]

1: Total reflects rounding for the percentage by treatment.

- Among the non-business-related land uses, the ranking of regional zones from most restricted to least restricted is POS, RUR, and SFR. This ranking applies for all options.
- IND lands receive the least restrictive Goal 5 treatments of any of the regional zones.
- Among the business-related land uses, the ranking from most to least restricted is (in general) MFR, MUC, COM, and IND. This ranking applies primarily for options 2A, 2B and 2C. For example, for option 2C, approximately 71 percent of IND lands would receive an allow treatment. The comparable figures for the other business-related land uses are 25 percent for MFR, 49 percent for MUC, and 46 percent for COM. See Table 4-12.

Table 4-12: Distribution of allow, limit and prohibit treatments for Option 2C, by Regional Zone.

	SFR	MFR	MUC	COM	IND	POS	RUR
Allow	14%	25%	49%	46%	71%	0%	13%
Lightly Limit	49%	50%	47%	42%	26%	5%	21%
Moderately Limit	36%	25%	4%	12%	2%	12%	40%
Strictly Limit	1%	0%	0%	0%	0%	83%	26%
Prohibit	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%[1]	100%	100%

1: Total reflects rounding for the percentage by treatmen

t.

5. Minimizes need to expand the urban growth boundary (UGB).

In this discussion of Criterion 5, the effects of the program options on the need to expand Metro's urban growth boundary (UGB) are described. The program options that would have the least impact on the need to expand the UGB rank higher for this criterion.

Potential impacts on the need to expand the UGB

State land use laws require that Metro's UGB accommodate anticipated population and employment growth over the next twenty years. As the area's population grows and urban development intensifies, pressure to expand the UGB increases. By how much and where to expand the UGB depends on a variety of factors including population distribution, the suitability of land on the urban fringe, and the intensity of in-fill development within the existing UGB. The program options that protect fish and wildlife habitat to a greater extent may also decrease the amount of developable land available inside the UGB. As the amount of developable land inside the UGB decreases, the likelihood that the UGB will expand in response to population and development growth increases.

Previous expansions of the UGB and related developments provide a context for the analysis of the impacts of program options on the need to expand the UGB. Metro's UGB expansions and related developments include:

- In 1995, the Metro Council adopted the 2040 Growth Concept, which anticipated adding 15,000 to 19,000 acres to the UGB over 50 years.
- In 1998-99, Metro added 4,000 acres to the UGB.
- In May of 2002, voters approved ballot measure 26-29, which prohibits higher densities in existing neighborhoods. Increasing urban densities as a means of avoiding or minimizing UGB expansions cannot target existing neighborhoods and will focus instead on downtown city centers and transportation corridors.

- In December of 2002, Metro Council added 18,638 acres to the UGB, with 2,851 of these acres dedicated to employment needs.
- Metro's current deliberations on UGB expansion include a proposal to add 2,000 acres targeting industrial use.

The assumption is made in this criterion that the program options which would restrict to a greater extent the development of vacant lands would increase the likelihood of expanding the UGB. Impacts on vacant land would have the most immediate impact on vacant land because these lands provide the greatest development opportunities.

Program options that increase the likelihood of expanding the UGB may also contribute to sprawl related economic consequences, such as increased travel times, increased vehicle miles traveled with associated increased concentrations of air pollutants, and increased costs of extending or expanding roads, water and sewer infrastructure. Program options that minimize UGB expansions by promoting development within the existing UGB may minimize sprawl related costs but may generate other economic consequences. For example, developing lands within the existing UGB, at the expense of riparian and wildlife habitat, would reduce the concentrations or availability of habitat related ecosystem services near population centers. In effect, development would push these resources and associated ecosystem services further out to the urban fringe away from employment and population concentrations.

Measuring the criterion

Table 4-2 in Criterion 1 (supports urban development priorities) shows the number of acres of lands in the four urban development categories (high, medium, low, and other) affected by allow, limit, and prohibit treatments for the six program options. It also shows impacts by development status including vacant lands inside and outside Title 3 protection. The analysis for this criterion uses the data in Table 4-2.

Results

Comparison of program options

Lands with high urban development value

- Option 2C provides the least restrictive impact on vacant lands inside and outside Title 3 and would have the least likelihood of promoting UGB expansions of the six program options.
- In ascending order of increasing restrictions on vacant lands outside Title 3 and increasing the likelihood of UGB expansions—the remaining options rank: 2B, 1C, 2A, 1B, and 1A. This ranking also reflects the outcome for lands inside Title 3 except that Options 2A and 1B perform comparably rather than 2A performing better 1B.

Lands with medium urban development value

- The results for lands with medium urban development value reflect the outcome for lands with high value.

Lands with low urban development value

- Option 1C performs better than the other options under this criterion in that it would have the least restrictive impact on vacant lands inside and outside Title 3, and would be the least likely to promote UGB expansions of the six program options.

- In ascending order of increasing restrictions on vacant lands outside Title 3, and increasing likelihood of promoting UGB expansions, the remaining options rank: 2C, 2B, 1B, 2A, and 1A. This ranking also reflects the outcome for lands inside Title 3 except that Options 2B and 1B have about the same effect rather than 2B dominating 1B.

Other lands

- Option 1C also performs better under this criterion for park land and rural inside and outside Title 3.
- In ascending order of increasing restrictions on vacant lands outside Title 3, and increasing likelihood of promoting UGB expansions, the remaining options rank: 1B, 2C and 2B are comparable, 2A, and 1A. This ranking also reflects the outcome for lands inside Title 3 except that Option 1B performs similarly to Options 2C and 2B rather than dominating these options.

Summary

Table 4-13 summarizes the ranking of the performance of the program options based on the average outcomes for the total acres in the analysis. This summary weighs more heavily the impacts on vacant lands ranked low and other lands because these rankings contain more acres of land than do vacant lands with high or medium rankings.

Table 4-13: Performance of options in meeting Economic Criterion 5: minimizes the need to expand the UGB.

Rank	Option	Performance
1	1C	Option 1C provides the greatest support for developing vacant land among the six options and will least likely promote UGB expansions. It has the greatest number of acres affected by allow treatments, which have no negative impacts on development, and no acres affected by strictly limit or prohibit treatments.
2	2C	Option 2C is second only to Option 1C in supporting the development of vacant lands and in the number of acres affected by allow treatments. No acres affected by prohibit treatments.
3	2B	Option 2B supports developing vacant land to a greater extent than does Option 1B because the allow treatments in this option generate no negative development impacts and there are no negative impacts from prohibit treatments.
4	1B	All Goal 5 treatments for Option 1B would have some negative impact on developing vacant land. Option 2B dominates 1B because it has allow treatments for high-valued vacant land. 1B has no allow treatments. This option supports developing vacant land to a greater extent than do Options 2A and 1A primarily because it has no negative impacts from prohibit treatments.
5	2A	Option 2A would have a slightly more negative impact on developing vacant lands, and thus promote UGB expansions to a greater extent, than Option 1B because of the negative impacts associated with prohibit treatments.
6	1A	Option 1A has the greatest negative impact from prohibit and strictly limit treatments and the greatest negative impact overall on developing vacant land of the six options. This option would likely promote UGB expansions to a greater extent than the other options.

Evaluation of social criteria

The Goal 5 process requires local governments to make a decision to allow, limit, or prohibit conflicting uses to protect fish and wildlife habitat based on balancing the consequences of the four ESEE factors. Based on the analysis of social consequences in Phase I, Metro developed five criteria to measure the performance of the six regulatory program options in addressing the potential social impacts. These criteria are:

1. Minimizes impact on property owners,
2. Minimizes impact on location and choices for housing and jobs,
3. Preserves habitat for future generations,
4. Maintains cultural heritage and sense of place, and
5. Preserves amenity value of habitat.

Some of the key questions considered in the analysis were:

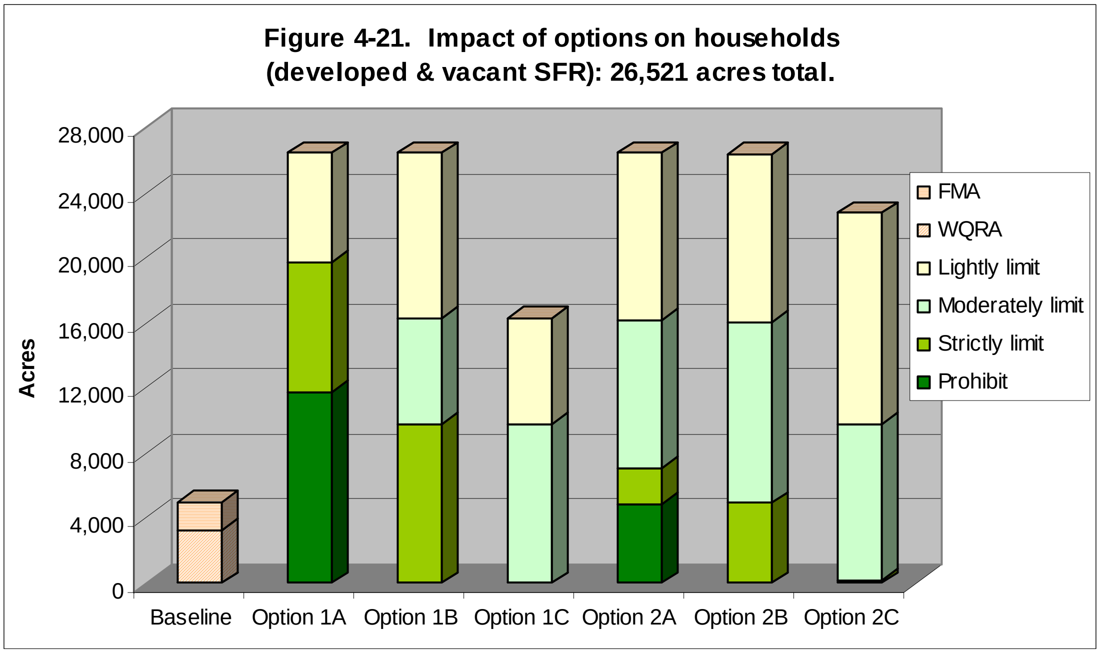
- How much of the habitat and impact areas are affected?
- How much of the habitat land is already protected to some extent by the baseline?
- Do the effects differ by habitat class?
- Do the effects differ by urban development values?
- What would be affected by a decision to “allow” or ‘lightly limit” the impact areas?

1. Minimizes impact on property owners

Property ownership and land use regulations are sensitive issues central to habitat protection. Landowners may be concerned about impacts to property rights, takings issues, and the distribution of the burden of protecting habitat. Other landowners may be supportive of protection programs despite being personally affected for several reasons including an appreciation of habitat and the wish to see it remain in addition to the increased property values that can result from trees and proximity to water. For this criterion the data is analyzed by three main groups: households, businesses, and rural areas. It should be noted that, because treatments may be applied to only a portion of a lot, and several treatments could apply to the same lot, considering the acres affected by each treatment might produce statistics that tend to magnify potential impacts greater than they likely would be felt. Metro has already stated that potential regulations will not be imposed on particular, buildable lots if the result would be to render such lots unbuildable.

Potential impact on households

For residential land in particular, personal financial security or the expectation to maintain, develop or redevelop land within the existing regulatory framework could be impacted by a program option. A decision to allow, limit, or prohibit conflicting uses in fish and wildlife habitat has an impact on individual landowners. Thirty-four percent of the habitat lands are located in areas zoned for single-family residential uses, a third of which is in impact areas. Many residential properties are on small lots, thus options impacting more residential land could affect a large number of property owners, when compared to business and rural properties that have large lots. Figure 4-21 shows the distribution of the treatments on residential land (developed and undeveloped) for each option.



Results
The following observations are made from Figure 4-21 above.

Basic statistics & baseline protection

- 34 percent (26,521 acres) of habitat and impact areas are SFR.
- A third of the 26,521 acres of SFR land in Figure 4-21 is in impact areas, two-thirds has habitat value.
- SFR lands are distributed across all habitat classes.
- Most SFR lands fall in the low urban development value category.
- Baseline protection only covers a small portion of single-family land, with WQRA restrictions applied to about 10 percent and an additional five percent covered by FMA design guidelines.

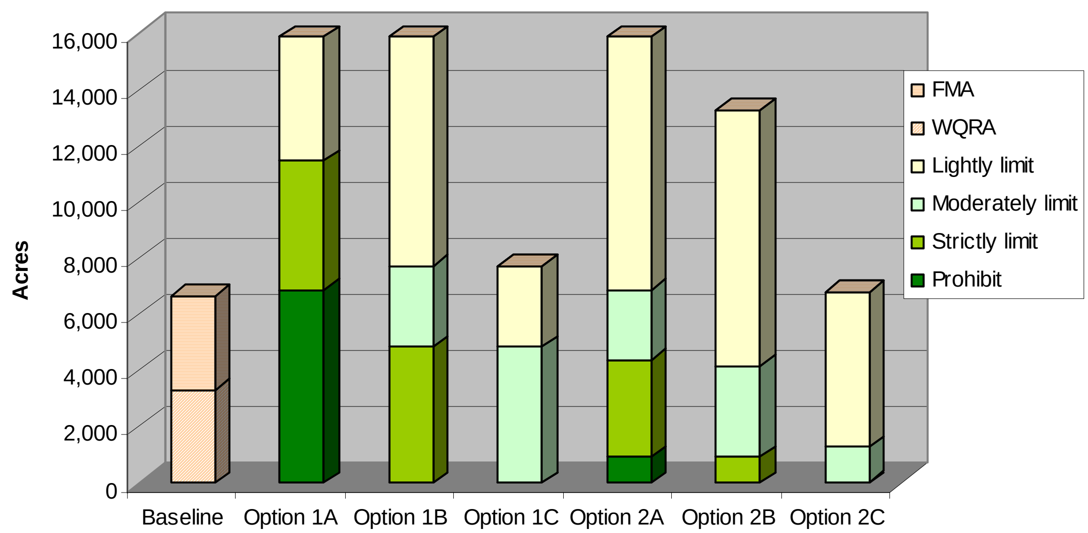
Comparison of options

- The urban development value options (2A-C) apply more stringent treatments to SFR lands than most other zoning types; while the habitat based options (1A-C) apply treatments to zoning types depending on habitat value.
- Option 1C, followed closely by 2C, has the least stringent treatments applied to the largest acreage of land zoned for single-family uses.
- Options 1A, 1B, 2A, and 2B each would apply some type of limit or prohibit decision to ***all*** land zoned for single-family with significant habitat.
- Option 1A would have the most impact on households, applying a prohibit treatment to 40 percent of the land, a strictly limit treatment to about 30 percent, and lightly limit to the remaining 30 percent (the impact areas).

Potential impact on businesses

Land used for business purposes, whether developed or vacant, would also be impacted by any of the regulatory program options. For developed land, the impact would be in the future if a property owner chose to redevelop and was required to follow new Goal 5 regulations. Reducing development opportunities and/or requiring specific habitat friendly development practices could impact vacant land. Restrictions on development could have an overall impact on the regional economy, (see economic criteria). Most business land includes commercial and industrial properties and apartment complexes located on large lots. This reduces the number of property owners potentially impacted. Figure 4-22 below shows the distribution of the treatments on land used for businesses (developed and undeveloped) for each option. Land used for businesses includes multi-family (MFR), mixed-use centers (MUC), commercial (COM), and industrial (IND).

Figure 4-22. Impact of options on businesses (developed & vacant MFR, MUC, COM & IND): 15,857 acres total.



Observations

The following observations are made from Figure 4-22 above.

Basic statistics & baseline protection

- Seventeen percent (15,857 acres) of total habitat and impact areas are zoned for business purposes.
- A third of the 15,857 acres of business land is in impact areas, two-thirds have habitat value.
- Baseline protection covers almost 40 percent of land used for business purposes, with WQRA restrictions applied to close to 20 percent and an additional 20 percent covered by FMA design guidelines.
- About 25 percent of business land contains the highest value riparian and wildlife habitat.

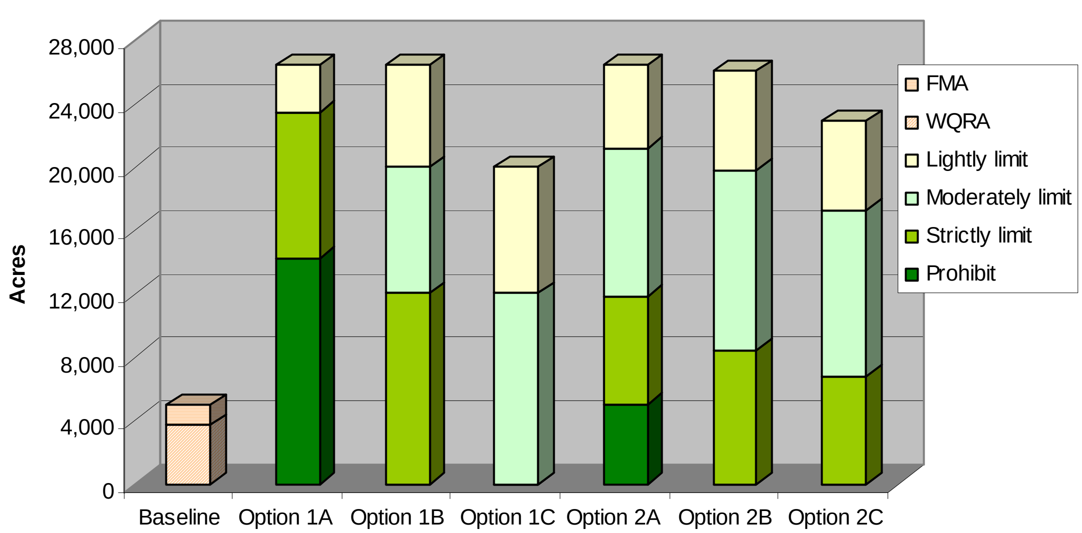
Comparison of options

- The urban development value options (2A-C) apply less stringent treatment to most business land; while the habitat based options (1A-C) apply treatments to zoning types depending on the habitat value.
- Option 2C, followed by 1C, has the least stringent treatments applied to the largest acreage of land zoned for businesses. Over 50 percent of business land receives an allow treatment in 2C.
- Option 2B provides substantially more protection than 1C and 2C, but less than 1A, 1B and 2A since about 20 percent of the land would receive an allow treatment.
- Options 1A, 1B and 2A each would apply some type of limit or prohibit decision to ***all*** land zoned for businesses with significant habitat.
- Option 1A would have the most impact on businesses with significant habitat, applying a prohibit treatment to over 40 percent of the land, strictly limit to about 30 percent, and lightly limit to the remaining 30 percent (impact areas).

Potential impact on rural areas

Much of the regionally significant fish and wildlife habitat falls on rural land, over 26,000 acres. Rural properties tend to be larger than those in other zones, impacting a smaller number of property owners but a large number of acres. Land uses include some residential and a substantial amount of farming and timber production. Farm and forestry practices have special regulations under Senate Bill 1010 and are not regulated by Metro. However, if these properties were urbanized in the future they would be subject to a regional fish and wildlife habitat protection program if those areas were to eventually become urbanized. Figure 4-23 shows how rural areas might be impacted by the six regulatory program options and how much of the rural landscape is covered by the baseline regulations.

Figure 4-23. Impact of options on rural areas (developed & vacant): 26,459 acres total.



Results

The following observations are made from Figure 4-23 above.

Basic statistics & baseline protection

- Twenty-eight percent (26,459 acres) of total habitat and impact areas are in rural areas.
- About 15 percent of the 26,459 acres of rural land is in the impact area, 85 percent has habitat value.
- Baseline protection only covers about 15 percent of rural land, with WQRA restrictions applied to about 10 percent and close to five percent covered by FMA design guidelines.
- Over 40 percent of rural land contains the highest value riparian and wildlife habitat.
- Urban development values apply to rural zoning with design types that fall inside Metro's urban growth boundary.

Comparison of options

- The urban development value options (2A-C) apply the most stringent treatments to rural areas that do not have a design type; while the habitat based options (1A-C) apply treatments to zoning types depending on the habitat value.
- Option 1C, followed by 2C, has the least stringent treatments applied to the largest acreage of rural land.
- Option 2B would apply an allow treatment to about two percent of rural lands, otherwise it is similar to 1B in the treatments applied.
- Options 1A, 1B and 2A each would apply some type of limit or prohibit decision to ***all*** rural land with significant habitat.
- Option 1A would have the most impact on rural land with significant habitat, applying a prohibit treatment to about 50 percent of the land, strictly limit to about 35 percent, and lightly limit to the remaining 15 percent.

Performance of options

All six regulatory options have some impact on landowners. The options that apply more stringent treatments to a larger part of the landscape have more of an impact than the options that apply lightly limit or allow treatments. The affect of applying the urban development values in Options 2A-C benefits business land substantially more than single-family residential and rural areas. In addition, the Metro Council's commitment not to adopt a program that would render currently buildable lots as unbuildable also moderates, to some degree, the impact that any option would have on property owners.

Table 4-14. Performance of options in meeting Social Criterion 1: minimizes impact on property owners.

Rank	Option	Performance
1	Option 1C	This option affects the fewest property owners with stringent treatments.
2	Option 2C	Most business land receives an allow treatment under this option but a substantial number of residential and rural property owners are affected.
3	Option 2B	Urban development values reduce amount of business land receiving strict treatments but residential and rural areas receive strictly and moderately limit treatments.
4	Option 1B	This option affects the same number of property owners as Options 1A and 2A, but none would receive a prohibit treatment and a larger number would receive lightly limit.
5	Option 2A	Despite applying urban development values, this option affects a large number of property owners with stringent treatments, especially in residential and rural areas.
6	Option 1A	This option affects the most property owners with the highest level of restrictions.

2. Reduces impact on types/locations of jobs and housing

The urban land supply is a social issue because it relates to people's basic needs for housing, jobs and urban services. A constriction of the existing land supply could negatively affect the social needs these lands serve (e.g., housing and employment). An urban growth boundary (UGB) expansion could offset the impacts, but urbanizing rural land spreads the development pattern towards the periphery of the region. This could increase travel times and congestion and could encroach further on fish and wildlife habitat in rural areas.

Potential impact on housing location and choices

Residential zones (SFR and MFR) make up the largest component of buildable land in the fish and wildlife habitat inventory. The types of housing opportunities available may change depending on habitat protection. Rather than reduce the number of housing units allowed on a lot, regulations may allow for the same units in a denser configuration, such as rowhouses, condominiums, or apartments. Clustering units on smaller lots in a subdivision may allow fish and wildlife habitat to be preserved. However, these potential changes have social impacts. Many people who might choose to purchase or rent a single-family home with a yard may not view these other housing options as equivalent. The location of the housing is important as well. Housing opportunities closer to existing employment, shopping, and entertainment will not be replaced by residentially zoned land in areas on the urban fringe. Housing affordability may also be affected if protecting fish and wildlife habitat results in changes to the land supply. Figures 4-24 and 4-25 show how the options treat vacant single and multi-family land as compared to the baseline.

Figure 4-24. Treatment of vacant single family habitat land: (11,250 vacant, 15,271 developed acres)

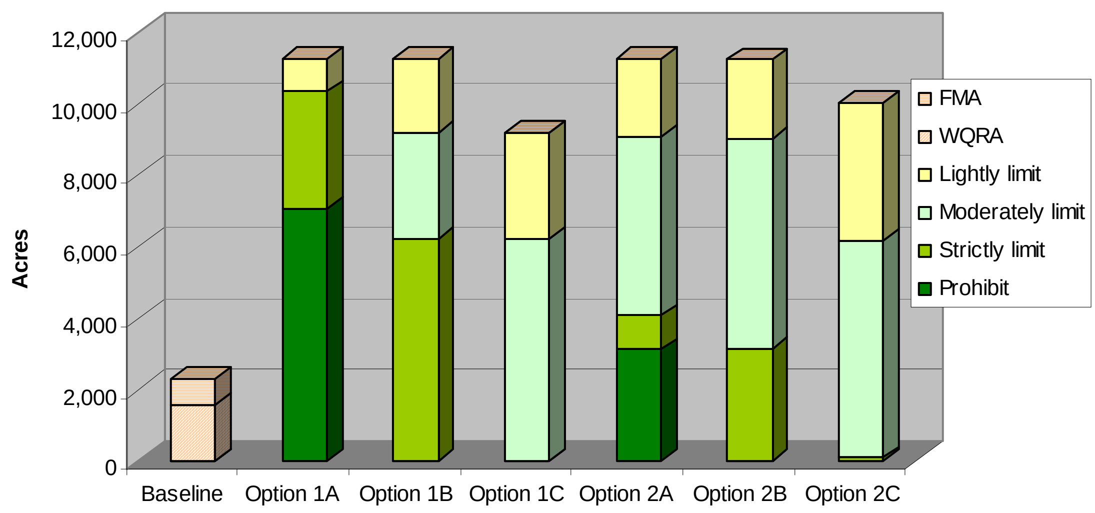


Figure 4-25. Treatment of vacant multi-family habitat land: (1,060 vacant, 2,886 developed acres).

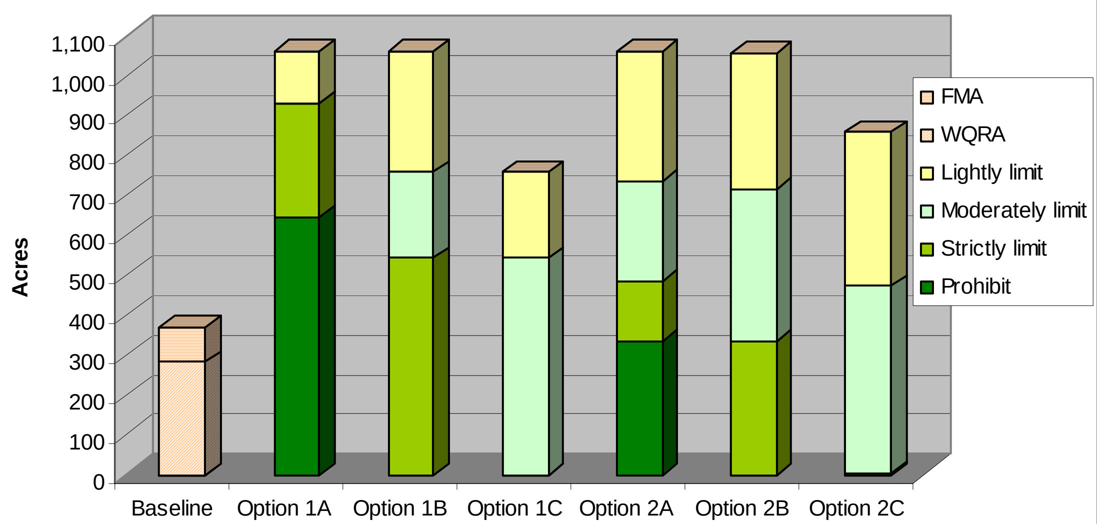


Table 4-15. Vacant residential land: acres potentially affected.

	Status of vacant land	Allow		Lightly limit		Moderately limit		Strictly limit		Prohibit	
		SFR	MFR	SFR	MFR	SFR	MFR	SFR	MFR	SFR	MFR
Option 1A	Inside Title 3	0	0	63	16	0	0	33	7	2,214	348
	Outside Title 3	0	0	851	114	0	0	3,256	278	4,833	297
	% covered by baseline	*0.0%*	*0.0%*	*6.9%*	*12.3%*	*0.0%*	*0.0%*	*1.0%*	*2.5%*	*31.4%*	*54.0%*
Option 1B	Inside Title 3	0	0	85	19	297	47	1,927	304	0	0
	Outside Title 3	0	0	1,960	282	2,676	168	4,304	238	0	0
	% covered by baseline	*0.0%*	*0.0%*	*4.2%*	*6.3%*	*10.0%*	*21.9%*	*30.9%*	*56.1%*	*0.0%*	*0.0%*
Option 1C	Inside Title 3	85	19	297	47	1,927	304	0	0	0	0
	Outside Title 3	1,960	282	2,676	168	4,304	238	0	0	0	0
	% covered by baseline	*4.2%*	*6.3%*	*10.0%*	*21.9%*	*30.9%*	*56.1%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Option 2A	Inside Title 3	0	0	88	20	39	16	386	86	1,797	249
	Outside Title 3	0	0	2,071	305	4,980	236	572	62	1,318	86
	% covered by baseline	*0.0%*	*0.0%*	*4.1%*	*6.2%*	*0.8%*	*6.3%*	*40.3%*	*58.1%*	*57.7%*	*74.3%*
Option 2B	Inside Title 3	5	1	145	29	362	92	1,797	249	0	0
	Outside Title 3	9	2	2,080	315	5,499	286	1,352	86	0	0
	% covered by baseline	*35.7%*	*33.3%*	*6.5%*	*8.4%*	*6.2%*	*24.3%*	*57.1%*	*74.3%*	*0.0%*	*0.0%*
Option 2C	Inside Title 3	84	8	409	110	1,762	248	55	5	0	0
	Outside Title 3	1,138	193	3,442	276	4,319	219	41	0	0	0
	% covered by baseline	*6.9%*	*4.0%*	*10.6%*	*28.5%*	*29.0%*	*53.1%*	*57.3%*	*100.0%*	*0.0%*	*0.0%*

Results

The following observations are made from Figures 4-24 and 4-25, and Table 4-15.

Basic statistics and baseline protection

- Thirteen percent of habitat and impact areas comprise vacant residential land (SFR and MFR).
- Baseline protection only covers about 17 percent of vacant single-family land and about 30 percent of multi-family land. More restrictive WQRA restrictions are applied to about 10 percent of SFR land and a little over 20 percent of MFR land. An additional seven percent of SFR and eight percent of MFR are covered by FMA design guidelines.

Comparison of options

- Applying urban development values (options 2A-C) does not substantially change treatments applied to residential land.
- *Minimum impact:* Option 1C, followed by 2C, would apply the least stringent treatments to the largest acreage of residential land (both SFR and MFR). 2,346 acres (SFR & MFR) in option 1C and 1,423 acres in 2C would receive an allow treatment.
- *Maximum impact:* a prohibit designation would affect 7,700 acres in 1A and 3,450 acres in 2A of vacant SFR & MFR.
- Options 1A, 1B and 2A each would apply some type of limit or prohibit decision to ***all*** residential land with significant habitat.
- Option 1A would have the most impact on residential land with significant habitat, applying a prohibit treatment to almost 60 percent of SFR and over 55 percent of MFR,

strictly limit to about 30 percent (both SFR and MFR), and the remaining acres would receive a lightly limit treatment.

- Option 2A is more restrictive on MFR than SFR: about 40 percent of MFR is covered by prohibit and strictly limit treatments compared to about 30 percent of SFR.
- As described above, some of the vacant residential land is already covered by baseline regulations that limit housing location and development options. Limit and prohibit treatments would have less impact in those areas.
- All options apply a lightly limit treatment to some portion of the vacant residential land. A small percentage is already covered by baseline regulations in all options, but in options 1C and 2C over 20 percent of MFR land that receives a lightly limit treatment is covered by baseline, reducing the impact.
- All options except for 1A apply a moderately limit treatment to some portion of the vacant residential land with significant habitat. In options 1C and 2C over 50 percent of land receiving a moderately limit treatment is covered by baseline regulations, reducing the impact.
- All options except for 1C apply a strictly limit treatment to some portion of the vacant residential land with significant habitat. In 1A only a small percentage of land receiving strictly limit is covered by baseline, but in all other options the area covered by baseline that receives strictly limit ranges from 31 percent to 100 percent, reducing the impact.
- Only options 1A and 2A apply a prohibit treatment to vacant residential land with significant habitat. A significant portion of the habitat that would receive a prohibit treatment is covered by baseline, especially in 2A with 58 percent of SFR and 74 percent of MFR, reducing the impact.

Jobs

Employment opportunities typically occur on land that is zoned for commercial, industrial, or institutional uses. Vacant land zoned for commercial, industrial, or mixed-use development makes up 28 percent of the land within the fish and wildlife habitat inventory, and almost half is not constrained by Title 3. The location of these lands is an important factor in determining the social impact of allowing, limiting, or prohibiting use in these areas. Metro is able to add land to the UGB if employment capacities are reduced due to habitat protection.

However, it is important to consider the social impacts of adding employment land on the urban fringe. Will job opportunities located in newly developed areas be equivalent to lost opportunities located near existing concentrations of housing? Residents choosing to work in locations further from their homes will incur additional travel expenses as well as a reduction in quality of life due to more time spent commuting and away from home. Additionally, the types of jobs may be different, as a company that might choose to locate in an existing commercial or industrial area may not choose to move to a new location. Figure 4-26 graphically depicts the treatments for vacant employment land by option as compared to the baseline. Table 4-16 provides additional information on the existing environmental constraints on vacant employment land and the increment of regulations added by option.

Figure 4-26: Treatment for vacant employment habitat land (COM/MUC/IND): 6,915 acres total.

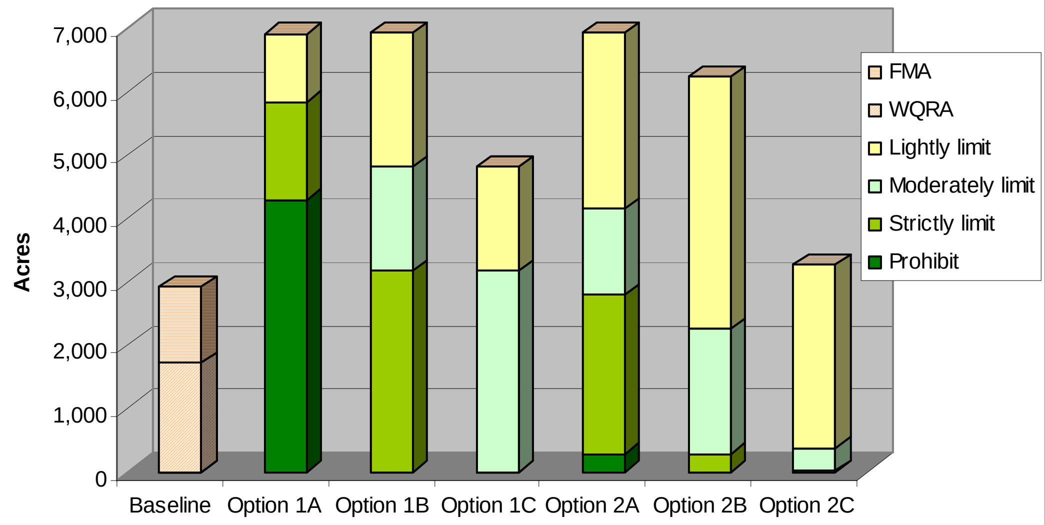


Table 4-16. Vacant employment land: acres potentially affected.

	Status of vacant land	Allow		Lightly limit		Moderately limit		Strictly limit		Prohibit	
		COM/ MUC	IND	COM/ MUC	IND	COM/ MUC	IND	COM/ MUC	IND	COM/ MUC	IND
Option 1A	**Inside Title 3**	0	0	21	162	0	0	7	78	572	2,077
	Outside Title 3	0	0	229	671	0	0	486	964	599	1,046
	% covered by baseline	*0.0%*	*0.0%*	*8.4%*	*19.4%*	*0.0%*	*0.0%*	*1.4%*	*7.5%*	*48.8%*	*66.5%*
Option 1B	**Inside Title 3**	0	0	26	235	133	458	442	1,624	0	0
	Outside Title 3	0	0	511	1,328	370	678	433	676	0	0
	% covered by baseline	*0.0%*	*0.0%*	*4.8%*	*15.0%*	*26.4%*	*40.3%*	*50.5%*	*70.6%*	*0.0%*	*0.0%*
Option 1C	**Inside Title 3**	26	235	133	458	442	1,624	0	0	0	0
	Outside Title 3	512	1,328	370	678	433	676	0	0	0	0
	% covered by baseline	*4.8%*	*15.0%*	*26.4%*	*40.3%*	*50.5%*	*70.6%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Option 2A	**Inside Title 3**	0	0	28	259	85	442	366	1,514	121	101
	Outside Title 3	0	0	690	1,783	364	479	215	403	46	18
	% covered by baseline	*0.0%*	*0.0%*	*3.9%*	*12.7%*	*18.9%*	*48.0%*	*63.0%*	*79.0%*	*72.5%*	*84.9%*
Option 2B	**Inside Title 3**	2	120	141	1,224	337	872	121	101	0	0
	Outside Title 3	66	491	799	1,814	405	359	46	18	0	0
	% covered by baseline	*2.9%*	*19.6%*	*15.0%*	*40.3%*	*45.4%*	*70.8%*	*72.5%*	*84.9%*	*0.0%*	*0.0%*
Option 2C	**Inside Title 3**	86	1,187	393	1,021	120	104	2	4	0	0
	Outside Title 3	561	1,812	650	827	105	41	1	3	0	0
	% covered by baseline	*13.3%*	*39.6%*	*37.7%*	*55.2%*	*53.3%*	*71.7%*	*66.7%*	*57.1%*	*0.0%*	*0.0%*

Results

The following observations are made from Figure 4-26 and Table 4-16.

Basic statistics and baseline protection

- Seven percent of habitat and impact areas are vacant and zoned for employment (MUC, COM, IND).
- Baseline protection covers about 40 percent of the vacant employment land in the habitat inventory. More restrictive WQRA restrictions are applied to about 20 percent of employment land; about 18 percent is covered by FMA design guidelines.

Comparison of options

- Applying urban development values (options 2A-C) substantially changes treatments applied to employment land.
- *Minimum impact:* Option 2C has the least impact on job location and choices, as it applies an allow treatment to 3,646 acres of vacant employment land.
- *Maximum impact:* Applying urban development values reduces the number of vacant acres that would receive a prohibit treatment from 4,300 in 1A to 286 in 2A.
- Options 1A, 1B and 2A each would apply some type of limit or prohibit decision to ***all*** employment land.
- Option 1A would have the most impact on employment land, applying a prohibit treatment to almost 60 percent, strictly limit to a little over 20 percent, and lightly limit to the remaining 20 percent (impact areas).
- As described above, some of the vacant employment land is already covered by baseline regulations that limit job location and development options. Limit and prohibit treatments would have less impact in those areas
- The urban development value options (2A-C) apply stricter treatments to more land that is already covered by baseline than the habitat-based options (1A-C), reducing the potential impact on jobs.
- Most of the vacant employment land that would receive a prohibit treatment in Option 2A is already covered by baseline regulations. Similarly, in Option 1A a substantial portion of the land that would receive a prohibit treatment is covered by baseline.

Performance of options

All six regulatory options have some impact on housing and job location and choices. The options that apply more stringent treatments to a larger part of the landscape are likely to have more of an impact than the options that apply lightly limit or allow treatments. Applying the urban development values in Options 2A-C benefits employment land more than residential land.

Table 4-17. Performance of options in meeting Social Criterion 2: Jobs and housing location and choices.

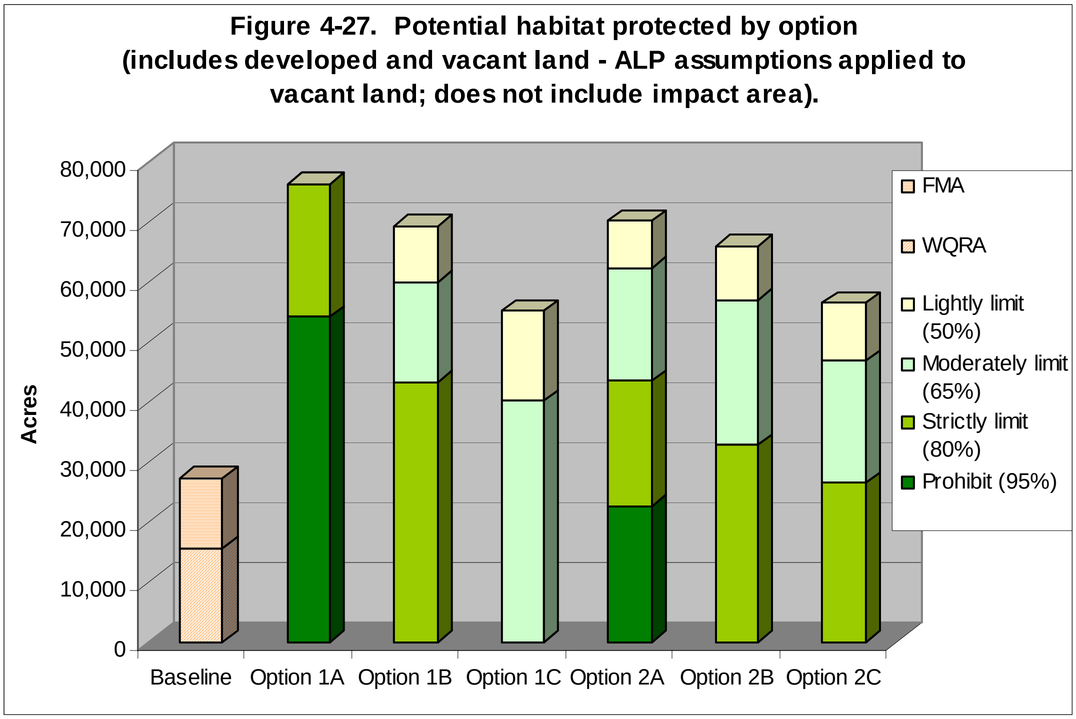
Rank	Option	Performance
1	Option 2C	Employment land benefits the most from the application of the urban development values, however residential land would receive almost as the same treatments as in Option 1C.
2	Option 1C	Residential land fares better under this option but employment land is substantially more impacted than in Option 2C.
3	Option 2B	Urban development values affect the amount of employment land receiving stringent treatments; residential land receives some benefit as well.
4	Option 1B	This option applies a similar level of protection to residential and employment land.
5	Option 2A	Employment land fares substantially better than residential land under this option.
6	Option 1A	This option has a significant effect on the location and choices available for jobs and housing.

3. Preserves resources for future generations

An important social responsibility for people today is to preserve resources for future generations. The Iroquois Confederacy stated: "In every deliberation, we must consider the impact of our decisions on the next seven generations." This criterion is based on the concept that our children and grandchildren should be able to enjoy the resources we do now, from the perspective of species diversity and environmental quality as well as the potential economic benefits derived from fish and wildlife habitat. An example is the plethora of pharmaceutical applications found in the natural world, from the Amazon jungle to the cancer fighting agents found in the yew tree.

One way to assess the performance of each option in addressing this criterion is the total number of habitat acres protected. An allow treatment can be assumed to protect zero acres and therefore is not shown in Figure 4-27 on the following page, while a prohibit treatment can be assumed to do a substantial job of protecting habitat where applied. The three types of limit protect the habitat to varying degrees.

While the role of restoration is important for the environmental health of the future, Environmental Criterion 1 addresses this. Opportunities for restoration are best addressed by options that protect existing habitat.



Results
The following observations are made from Figure 4-27.

Basic statistics and baseline protection

- All habitat land is included in this criterion, 80,234 acres.
- Baseline protection covers about 30 percent of the habitat inventory (not including impact areas), or 27,300 acres. More restrictive WQRA restrictions are applied to about 15 percent of habitat land; about 15 percent is covered by FMA design guidelines.

Comparison of options

- Applying ALP disturbance area assumptions to the base of 80,234 acres results in varying levels of habitat protection. This ranges from a minimum of 41,000 acres protected in Option 1C to a maximum of 72,000 acres in Option 1A.
- Options 1A and 2A would apply the stringent treatments to the most acres, preserving the most habitat for future generations.
- Option 1C leaves the most habitat at risk for loss to future generations.

Performance of options

All six regulatory options protect some habitat for future generations. The options that apply more stringent treatments to a larger part of the landscape would preserve more habitat and potential for restoration.

Table 4-18. Performance of options in meeting Social Criterion 3: Preserves habitat for future generations.

Rank	Option	Performance
1	Option 1A	Preserves the most habitat for future generations by applying strict treatments to all habitat types.
2	Option 2A	Applying urban development values reduces the amount of habitat preserved but this option still protects a substantial amount of habitat.
3	Option 1B	A moderate level of protection is applied across the landscape, focused on high value habitat.
4	Option 2B	Close to the same level of protection as 1B, but more habitat is left unprotected in areas of high urban development value.
5	Option 2C	Habitat in areas of high urban development value is not preserved, more protection than Option 1C.
6	Option 1C	Leaves the most habitat at risk for loss to future generations, also reduces potential for restoration.

4. Maintains cultural heritage and sense of place

Protection of fish and wildlife habitat preserves many important social values. These include our cultural heritage, regional identity, sense of place, and neighborhood character. Opportunities for education abound in areas with healthy fish and wildlife habitat. Part of the region's cultural heritage is the retention of the salmon and other endangered species. The salmon are a ubiquitous symbol for the Pacific Northwest, and a key aspect of Native American culture. It is difficult to measure how well these more ambiguous values are retained by the application of the six potential program options. As a proxy for a more specific quantitative measure, retention of Habitats of Concern and Riparian/wildlife Class I habitat is used to assess how well each option addresses this criterion (the same measurements are used in Environmental Criterion 5). Habitats of Concern are places that have been identified by local field biologists and other experts as providing habitat for critical species, while Class I riparian areas are essential to providing habitat for threatened and endangered salmon, as well as birds, deer and other wildlife that are of cultural importance in the region.

Figure 4-28. Treatment of Habitats of Concern by option (developed & vacant): 25,822 acres.

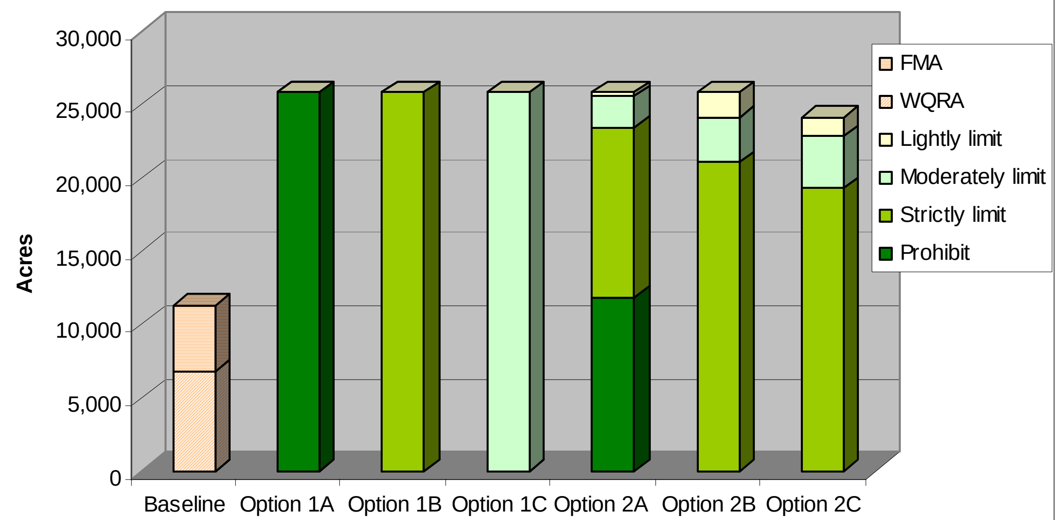
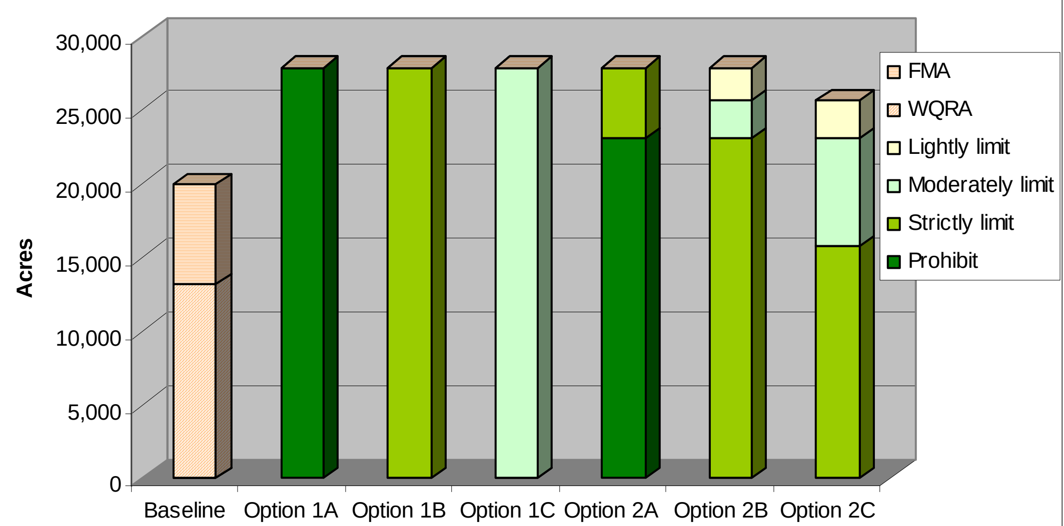


Figure 4-29. Protection level of Class I Riparian/wildlife habitat by option: (developed and vacant) 27,876 acres.



Results

The following observations are made from Figures 4-28 and 4-29.

Basic statistics and baseline protection

- Class I riparian includes 27,872 acres, Habitats of Concern (HOCs) encompass 25,822 acres. Some of the HOCs are included in the Class I riparian, but it is useful to consider them as a group due to their importance.
- Baseline protection covers about 65 percent of the Class I habitat and about 40 percent of HOCs. More restrictive WQRA restrictions are applied to about 42 percent of Class I and 22 percent of HOCs; FMA design guidelines cover a little over 20 percent of Class I and about 18 percent of HOCs.

Comparison of options

- Option 1A, 1B, and 2A would apply a strictly limit or prohibit treatment to all Class I habitat.
- Applying urban development values leads to loss of a small amount of HOCs and Class I habitat with allow and lightly limit treatments.
- Option 1C would apply the least stringent treatments to the largest amount of HOCs and Class I habitat.

Performance of options

All six regulatory options help to preserve cultural heritage and sense of place. The options that apply more stringent treatments to a larger part of the landscape have more of a positive impact than the options that apply lightly limit or allow treatments.

Table 4-19. Performance of options in meeting Social Criterion 4: Cultural heritage and sense of place.

Rank	Option	Performance
1	Option 1A	Does the best job of preserving cultural heritage and sense of place when measuring the effect on Class I habitat and Habitats of Concern. However, if a prohibit treatment resulted in an expansion of the urban growth boundary the resulting environmental effects could negatively impact cultural heritage and the salmon.
2	Option 2A	Comparable to 1A, however the application of urban development values would result in slightly less protection of cultural heritage and sense of place in areas with high urban development value.
3	Option 1B	Applies a strictly limit treatment to all Class I habitat and Habitats of Concern, providing substantial benefit to salmon and other endangered species but without as much potential for expansion of the UGB.
4	Option 2B	A large amount of Class I and Habitats of Concern receive stringent treatments in this option, with lightly limit applied to areas of high urban development value.
5	Option 2C	Similar to 2B, however a small amount of these highest value habitat areas would be lost due to the application of an allow treatment in high urban development value areas.
6	Option 1C	Applies the lowest level of protection to the highest value habitat, putting some of the social values contained in cultural heritage and sense of place at risk of loss.

5. Preserves amenity value of resources

The amenity value of habitat land on quality of life, property values, and regional attractiveness is an important consideration. For example, proximity to some types of natural areas actually increases property values, thus preservation of these habitats could positively impact nearby property owners. Private individuals and firms can capture the value of location, such as nearby parks, open space or schools, or good accessibility to services or transportation infrastructure. This results in higher demand and higher dollar valuation of these properties. On the other hand, public parks, schools, highways, and other perceived amenities capture individual or commercial value by the usage, time, and willingness of people to pay for them.

One way to assess the effectiveness of each option in addressing this criterion is the reliability of protection provided to the fish and wildlife habitat. An option that relies more on regulations and applies strict treatments to habitat land is more likely to produce reliable protection. Options that rely less on regulations and more on voluntary actions or incentives that are dependent on funding sources may be less likely to provide certainty of habitat protection. Thus, the amenity value that attracted landowners to purchase particular properties in the first place may be lost due to the absence or ineffectiveness of protection measures on adjacent lands. Figures 4-30 to 4-33) on the following page graphically depict the treatments to vacant land in the highest four habitat classes as a proxy for retaining amenity value.

Figure 4-30. Treatment of vacant Class I Riparian/wildlife land by option: 12,549 acres total.

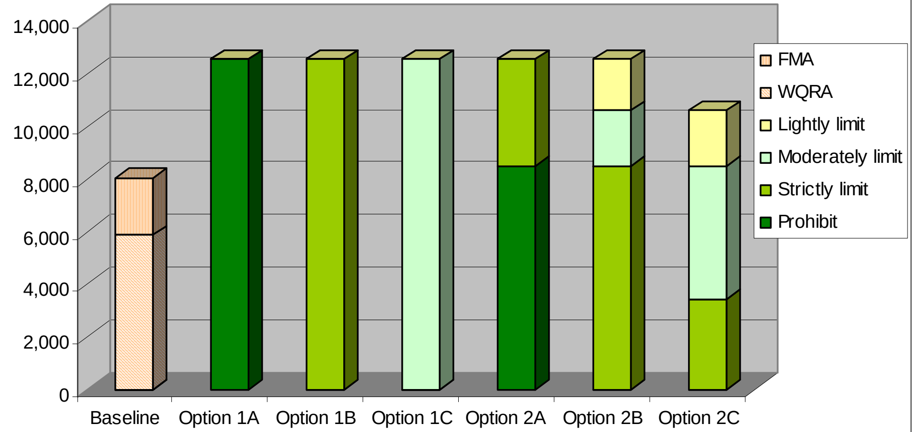


Figure 4-31. Treatment of vacant Class II Riparian/wildlife land by option: 3,907 acres total.

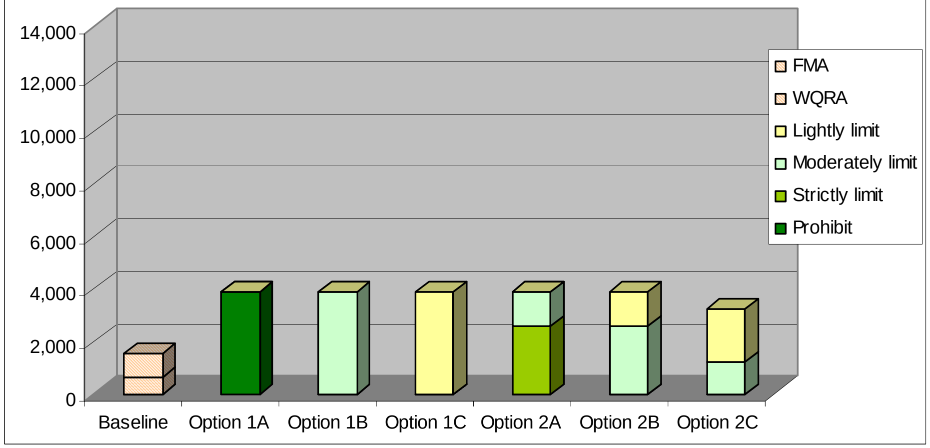


Figure 4-32. Treatment of vacant Class A Wildlife land by option: 8,508 acres total.

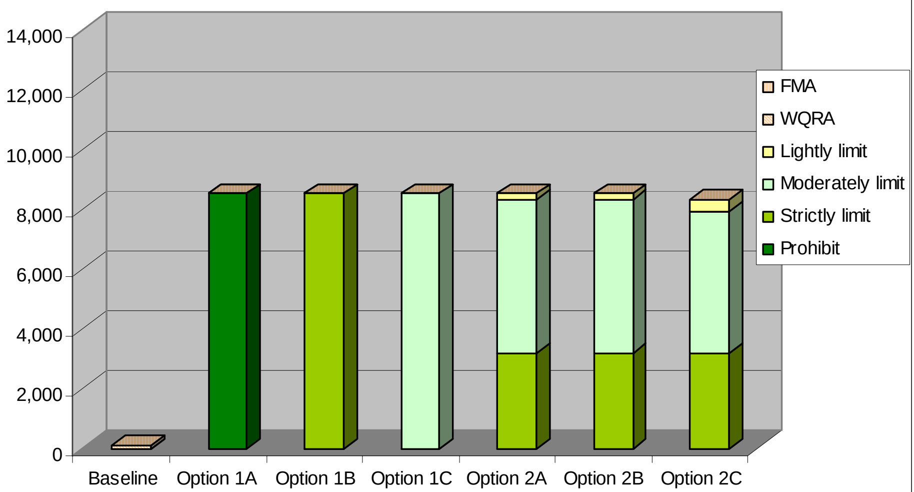
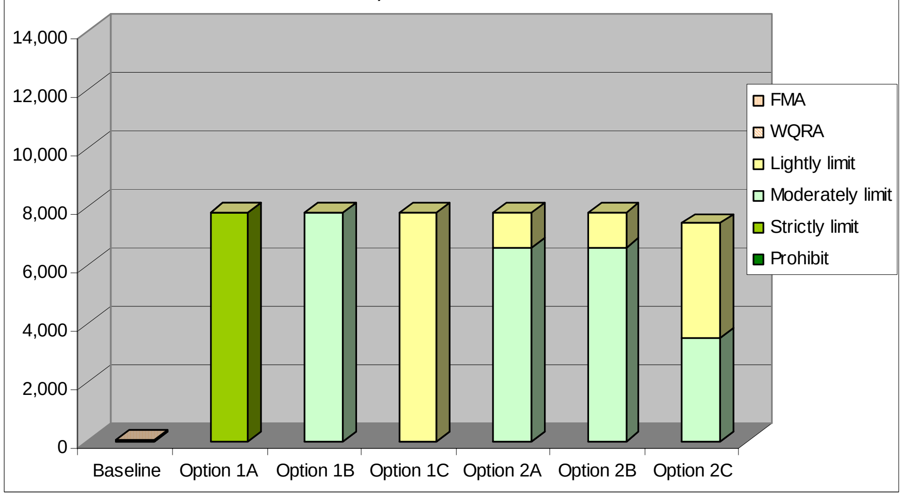


Figure 4-33. Treatment of vacant Class B Wildlife land by option: 7,789 acres total.



Results

The following observations are made from Figures 4-30 to 4-33.

Basic statistics and baseline protection

- Vacant Class I riparian includes 12,549 acres, vacant Class II riparian includes 3,907 acres, vacant Class A wildlife includes 8,508 acres, and vacant Class B wildlife includes 7,789 acres.
- Baseline protection covers about 65 percent of the Class I riparian, 40 percent of Class II riparian, and only one percent of Class A and B wildlife. More restrictive WQRA restrictions are applied to about 47 percent of Class I, 16 percent of Class II, about one percent of Class A and B wildlife; FMA design guidelines cover 17 percent of Class I, 24 percent of Class II, and a negligible amount of Class A and B wildlife.

Comparison of options

- Options 1A, 1B, and 2A would apply a strictly limit or prohibit treatment to all Class I habitat.
- Option 1A is the only option that would apply a prohibit treatment to Class A wildlife habitat and Class II riparian habitat, treatments for these habitat types range from strictly limit to allow in the other options.
- Applying urban development values does not substantially effect the treatment of Class A wildlife habitat, due to the fact that very little of this habitat type is in the high urban development category.
- Option 1C would apply the least stringent treatments to Class II and Class B habitats.

Performance of options

All six regulatory options help to preserve amenity value. The options that apply more stringent treatments to a larger part of the landscape have more of a positive impact than the options that apply lightly limit or allow treatments.

Table 4-20. Performance of options in meeting Social Criterion 5: Amenity value.

Rank	Option	Performance
1	Option 1A	Preserves amenity value consistently in all four of the highest habitat classes.
2	Option 2A	Applying the urban development values results in a small loss of amenity value in areas with high urban development value; preserves more amenity value in riparian habitat than wildlife habitat.
3	Option 1B	Applies consistent level of protection to all four habitat types, but riparian habitats are not as well preserved as in 2A.
4	Option 2B	Urban development values result in very similar protection for wildlife habitat as 2A, but riparian protection would be less than in 1B.
5	Option 2C	Amenity value provided by the highest value wildlife habitat receives similar protection to 2A, but the other three habitat categories receive less stringent treatment.
6	Option 1C	Retains the least amount of amenity value in wildlife habitat areas, provides a bit more protection for riparian habitat.

Evaluation of environmental criteria

The environmental portion of this phase of the ESEE analysis is intended to compare the potential effects of the six program options on fish and wildlife habitat. Five criteria will assist in this process:

1. Conserves existing watershed health and restoration opportunities;
2. Retains multiple functions provided by forest canopy cover;
3. Promotes riparian corridor continuity and overall habitat connectivity;
4. Conserves habitat quality and biodiversity provided by large habitat patches; and
5. Promotes biodiversity through conservation of sensitive habitats and species.

Criteria were selected based on the findings in Metro's Technical Report for Goal 5 and Phase I ESEE analysis (Metro 2002, Metro 2003). Charts depicting program performance for the most vulnerable habitat are embedded in the text. Habitat lands in parks and Title 3 WQRA are typically omitted from the graphs because they are currently afforded some protection. Habitat lands in Title 3 FMA are included in charts that illustrate vulnerability of the fish and wildlife habitat under the options because FMA areas do not protect vegetation.

The summary of each criterion includes a table ranking the programs in order of performance, from most to least protective. The criteria provide important new information about how each program performs relative to the others, and will aid Metro, its partners, and the public in designing a fish and wildlife habitat protection program appropriate to the region.

1. Conserves existing watershed health and restoration opportunities

The amount of fish and wildlife habitat protected or partially protected by each regulatory program option will help determine whether the option preserves habitat, existing ecosystem functions, and restoration opportunities for the future.

Potential impacts on fish and wildlife habitat

Partial or full loss of natural habitat impairs ecological functioning. The type and extent of impairment depends on the habitat class and, within each habitat class, the attributes that make each area valuable to fish and wildlife habitat. Metro's Phase I ESEE analysis (Metro 2003) describes the impacts on ecological systems when such functions are removed, and the Technical Report for Goal 5 (Metro 2002) describes how the region's natural habitats have been altered over time.

In riparian areas, highest value habitats provide the most functions. Class I riparian habitats provide at least three of the five key, or "primary," ecological functions mapped in the inventory. These areas are typically near streams and wetlands and often include forests or undeveloped floodplain areas; they are critical to maintaining aquatic habitat and water quality. Class II habitats provide one or two primary functions, and often also several secondary functions. Class III areas are lower value areas that still provide some degree of ecological function, such as small forest patches that are disassociated from the stream. Thus, protection of Class I is most important, followed by Class II, then Class III.

Wildlife habitat is similarly valued in a tiered approach; Class A is more valuable to wildlife than Class B, and Class B is more important than Class C. Metro mapped wildlife habitat based on spatial ecology principles, where large patches that are well connected to other patches, contain less edge habitat, and contain good water resources are considered most valuable. However, in the case of wildlife habitat, removal of lower valued habitats (Class C) can negatively impact the remaining habitats to a higher degree than for riparian due to connectivity issues (see criterion 3, Connectivity).[24]

Potential impacts on restoration opportunities

Restoration potential is preserved where habitat areas still exist (e.g., not paved); therefore, the level of protection provided by each program option illustrates the relative amount of potential restoration opportunities retained. This analysis does not identify the precise location or quality of restoration opportunities; however, because as habitats differ between classes, so do restoration opportunities. For example, areas of low-structure vegetation along streams may provide excellent opportunities to control non-native species and increase native tree and shrub cover; this would increase habitat to support diverse native wildlife communities. Native tree and shrub cover provide many vital ecological functions, including valuable riparian wildlife habitat, shading streams for cooler water, etc. Low-structure areas near streams are most typically found in Class II riparian and Class B wildlife.

Restoration opportunities are also found in high-value habitat areas; for example, Forest Park contains substantial amounts of non-native, invasive English Ivy. Efforts to control such invasions are ongoing. Because Forest Park is currently protected from development, the habitat and the restoration opportunities continue to exist. In upland areas, restoration is often needed to enhance wildlife habitat or control non-native species, particularly near forest edges. Thus, small habitat patches or long, narrow patches that contain a high proportion of edge habitat also provide restoration opportunities. Streams, wetlands, lakes and rivers can often be rehabilitated to create channel meanders, enhance water filtration capacity, or re-connect to natural floodplain areas. [25]

Metro's habitat inventories focused on the most important remaining habitats, and did not include every potential restoration opportunity due to the large scale nature of the regional inventory and because the Goal 5 rule applies to existing habitat.

Measuring the criterion

For each habitat class and each program option, the acreage that falls under various ALP designations is the measure for this criterion. The data is broken down between developed and vacant lands, because the time frame for habitat risk is different. Redevelopment will presumably occur over a longer time frame than new development. Additionally, habitats on

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[24] It is important to consider the interactions between the riparian and wildlife inventories. The two inventories were conducted separately then reconciled so that a program could be developed for a single inventory map. As a result, some of each inventory was allocated to the other. For example, when Class I riparian coincided with any wildlife class, the wildlife portion became Class I riparian. Thus the loss of one habitat type may also include loss of another due to the extensive spatial overlap of the two inventories.

[25] Metro's Technical Report for Goal 5 (Metro 2002) includes a chapter describing how to go about watershed planning and prioritizing opportunities for restoration and other ecologically important activities.

vacant lands unconstrained by existing protection are more likely to be subjected to new conflicting uses. Title 3 WQRA acreage is excluded from this criterion because it is already partially protected (see introductory chapter). Similarly, Criterion 1 does not include parks, but focuses on habitat areas that may be placed at risk through development or redevelopment.

Results

Figures 4-34 through 4-37 illustrate the findings. Program options that are likely to protect more fish and wildlife habitat overall, as well as more of the most valuable habitat, are assumed to perform better than other options.

Basic statistics

- This criterion includes 80,143 acres of fish and wildlife habitat. Of that:
  - 27,851 acres are in class I riparian (34 percent of total)
  - 7,901 acres are in class II riparian (10 percent of total)
  - 4,434 acres are in class III riparian (6 percent of total)
  - 19,662 acres are in class A wildlife (25 percent of total)
  - 12,828 acres are in Class B wildlife (16 percent of total)
  - 7,468 acres are in Class C wildlife (9 percent of total)
- Riparian habitat comprises 17,500 acres (38 percent), while wildlife habitat comprises 28,960 acres (62 percent).

Baseline protection (Title 3)

- This analysis removed WQRA because it provides a degree of habitat protection.
- Of total habitat lands, 19 percent is in WQRA (7 percent parks, 4 percent in developed urban, and 8 percent in vacant).
- Of total habitat lands, 17 percent is in parks.
- If WQRA are included in the acreage figures, nearly half of Class I habitat and one-fourth of Class II habitat are WQRA, with all other habitat classes containing less than 5 percent WQRA.
- Fifteen percent of developed urban and vacant habitats are in Title 3 FMA, but vegetation is not protected in FMA and wetlands may be filled with proper DSL permission. Thus FMA does not protect habitat, and only partially protects the water storage function in riparian habitats. FMA are included as vulnerable to conflicting uses in Figures 4-34 through 4-37.
- The acres included under this criterion are outside WQRA and are subject to conflicting uses if no increase in protection level is applied; therefore, any program option that is not allow will provide incrementally more protection on the lands considered in Figures 4-34 through 4-37.

Potential effects of treatments vary by development status and habitat class

- Two-thirds of these habitat lands are vacant and one-third is developed urban. Treatments applied to vacant lands may have disproportionately high impacts compared to the same treatments applied to developed urban.
- Of vacant habitats, riparian comprises 34 percent, while wildlife comprises the remaining 66 percent. Of developed urban habitats, riparian only comprises 15 percent, with the remaining 85 percent in wildlife. These opposing trends indicate that treatments applied to vacant lands may disproportionately influence riparian habitats, whereas treatments applied to developed

urban lands may more strongly influence wildlife habitat.

- Class I dominates vacant riparian, comprising 63 percent of the acreage, but only 29 percent of developed urban riparian (Class III comprises half of the riparian acreage in developed urban). Treatments applied to vacant Class I riparian will profoundly influence the future ecological conditions of aquatic and riparian habitats.
- Class A comprises 41 percent of vacant wildlife and 32 percent of developed urban wildlife. Treatments applied to both vacant and developed urban wildlife will be important determinants of future wildlife conditions.
- Average riparian and wildlife habitat values tend to be lower in developed urban compared to vacant, because conflicting uses tend to degrade habitats. For example, developed floodplains do not retain the same ecological functions as the original floodplain, and riparian and wildlife habitat is more fragmented in developed areas.

Impact Areas

- Impact areas are designated where adjacent land use may harm the habitat.
- An allow decision in impact areas may harm remaining habitat over time, whereas a lightly limit decision may help protect habitat.
- Lightly limit program definitions may need to differ between habitats and impact areas, because impact areas, by definition, are not habitat. For example, impact areas to protect streams may require low impact development standards upon redevelopment.
- If a program option is selected that includes an allow decision for certain habitats, it would be sensible to administer an allow decision for adjacent impact areas, because impact areas are designed to address where adjacent land use might adversely affect *existing* resources.

Program Option performance

- In options 2A-2C, the urban development value plays a role in what may happen to the habitat because treatments change based on both habitat class and by urban development value. Options 1A-1C are based solely on habitat value.
- For wildlife habitat, options 1A and 1B are most protective.
- For riparian habitat, options 1A and 2A are most protective.
- Options 1C and 2C are the least protective for both riparian and wildlife habitat.
- Potential effects of program options depend in part on the amount of land falling within each habitat class; Class I, Class A and Class B contain the most acreage, whereas Class III and Class C hold the least. For example, options affording less protection to Class B (1C, 2B, 2C) will have greater adverse effects on overall wildlife habitat protection.
- Class C wildlife is most vulnerable to loss under all options (least protective treatments applied). Class II and III are also vulnerable under certain program options (e.g., 1C, 2C).

Summary

Program options show a marked decline in protection levels, as indicated in Table 4-21 below. The options that apply more stringent treatments to a larger portion of resources, particularly high value resources, will protect a larger proportion of regionally significant resources in the long term. Table 4-21 provides a ranking of program options for this criterion.

Table 4-21. Performance of options in meeting Environmental Criterion 1: Conserves existing watershed health and restoration opportunities.

Rank	Option	Performance
1	1A	Charts 1a-1d indicate that this option will provide the most effective protection for the highest value resources (class I and class A habitat). This option also provides the highest protection levels for the remaining resource categories.
2	2A	This option still provides excellent protection for the majority of class I resources, and good protection for other riparian classes. The protection level is diminished, but still good for wildlife resources; however, option 1B provides better protection for wildlife habitat than 2A.
3	1B	Protection for all classes of riparian habitat is substantially reduced in this option compared to 1A and 2A. Class III riparian in appears to be particularly vulnerable. For wildlife habitat, this option performs at a higher level than 2A, but the importance of riparian habitat was considered first in this criterion.
4	2B	Performs moderately well for the higher classes in both riparian and wildlife habitat. This is the point at which protection levels drop off significantly for lower value resources. Poses substantial risk to habitat in classes III and C, due to lower protection levels and because some acreage is in the allow category.
5	2C	Lower protection levels for all resources. In particular, classes III and C are predominantly allow. Likely to result in substantial loss of riparian function unless extensive non-regulatory programs are put in place.
6	1C	Low protection levels for all habitat classes. Likely to result in significant habitat loss and ecosystem function over time in both developed and vacant lands.

Figure 4-34. Criterion 1a: Comparison of allow, limit, prohibit treatments by riparian class in developed urban lands (excludes WQRA)

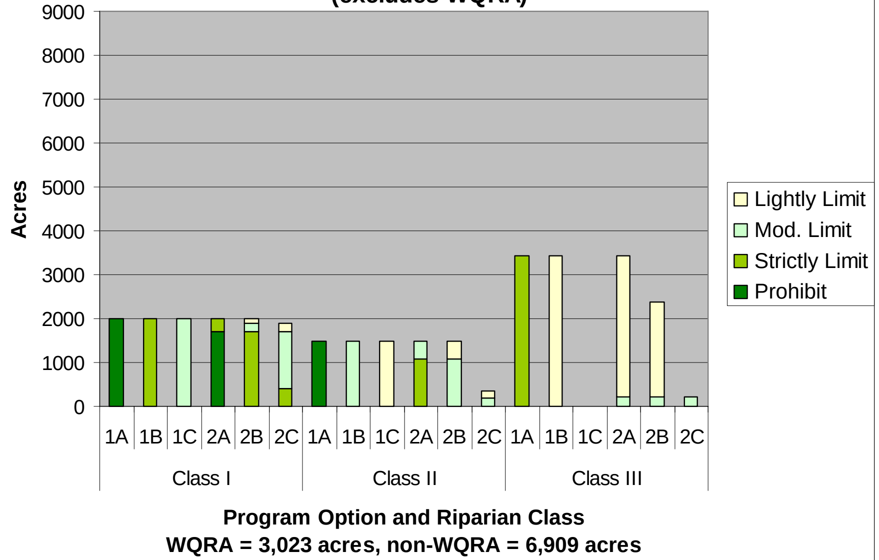


Figure 4-35. Criterion 1b: Comparison of allow, limit, prohibit treatments by riparian class in vacant lands (excludes WQRA)

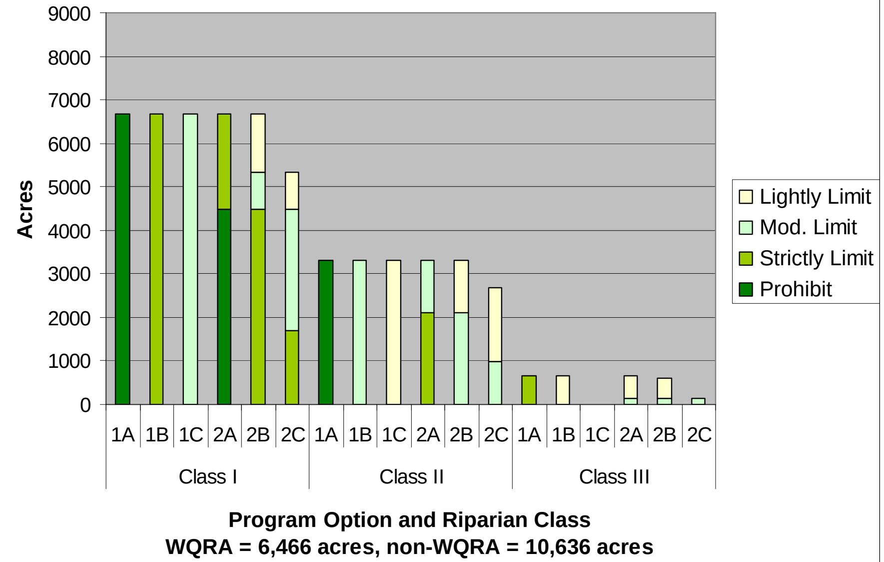


Figure 4-36. Criterion 1c: Comparison of allow, limit, prohibit treatments by wildlife class in developed urban lands (excludes WQRA)

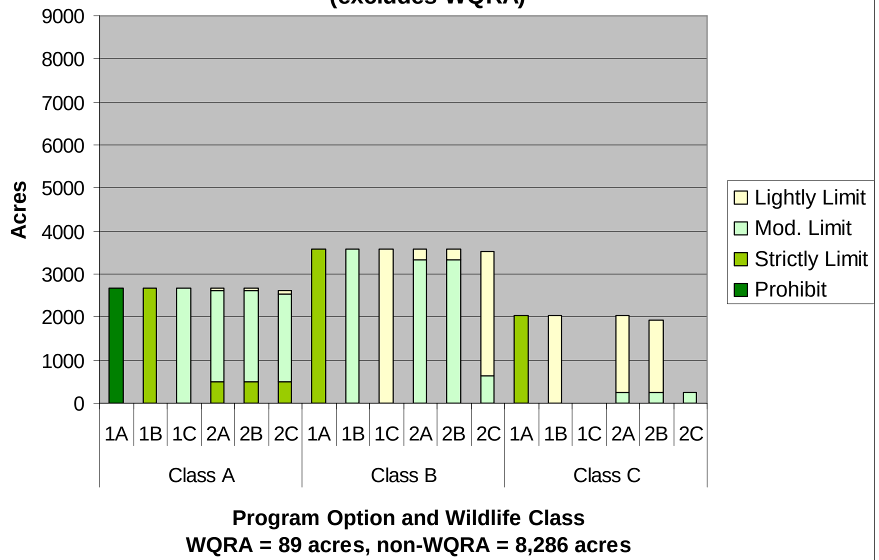
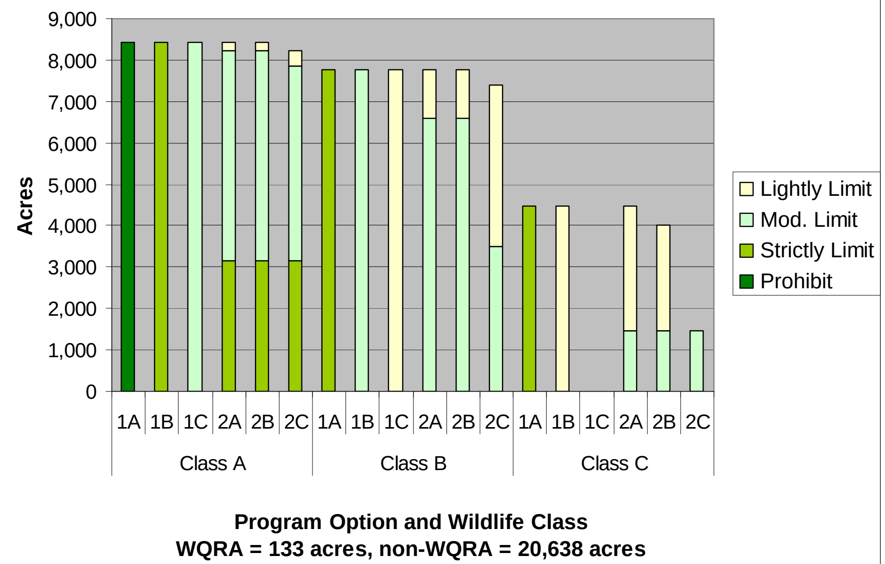


Figure 4-37. Criterion 1d: Comparison of allow, limit, prohibit treatments by wildlife class in vacant lands (excludes WQRA)



2. Retains multiple functions provided by forest canopy cover

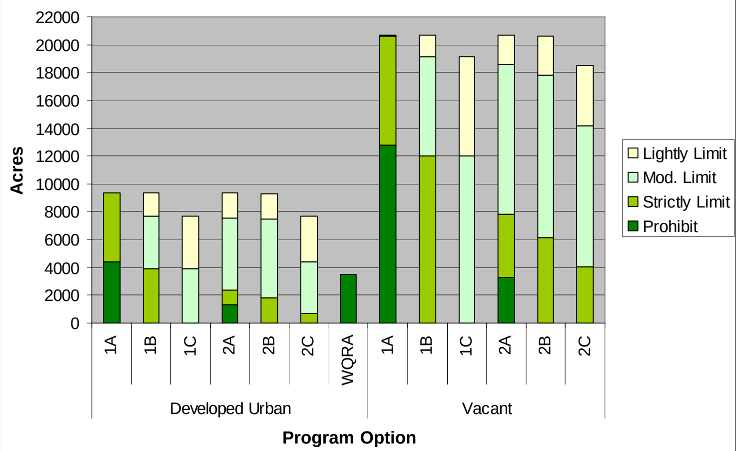
The Metro region is naturally forested, and trees play a pivotal role in maintaining healthy fish and wildlife habitat and regional biological diversity. Local studies affirm the importance of trees to stream health both near streams and throughout the watershed. Forest canopy plays a major role in all five ecological functions mapped in Metro's riparian habitat inventory, and forest habitat comprise the majority of the wildlife inventory.

Trees are also directly linked to each of the eight major ecological impact categories described in the ESEE Phase I discussion draft (Metro 2003). For example, trees help prevent altered hydrology and physical stream damage, and mitigate flooding caused by altered hydrology. They maintain water quality by taking up excess nutrients, heavy metals and other toxins, and provide shade over streams to cool water. Trees provide a primary source of wildlife habitat, and salmon and other aquatic wildlife frequently linger in shaded stream areas for thermal and predator protection.

Measuring the criterion

This criterion is measured by calculating the acreage of forest associated with each ALP category by program option. Forest canopy is a component of every habitat class, therefore this analysis does not differentiate by habitat class (for analysis by habitat classes, see criterion 1). The analysis does differentiate between vacant and developed status, because developed lands are less likely to experience much further tree loss, whereas vacant lands may be developed with substantial tree loss. However, forest loss can be an issue when redevelopment occurs, particularly when redevelopment occurs at higher densities. Program options that are likely to protect more acres of trees overall will receive a better rating in this criterion.

Figure 4-38. Criterion 2: Comparison of allow, limit, prohibit treatments for forest canopy (excludes WQRA)



WQRA = 4,679 acres, non-WQRA = 29,980 acres

Results

Figure 4-38 illustrates the findings from acreage calculations. Program options that are more likely to protect forest canopy cover are assumed to perform better than options providing less protection.

Basic statistics

- This criterion considers 50,134 acres of forested fish and wildlife habitat.
- Parks comprise 15,475 acres (31 percent of total forested acres), developed urban comprises 10,504 acres (21 percent of total forested acres), and vacant comprises 24,155 acres (48 percent of total forested acres).
- The bar chart for this criterion considers the most at-risk categories (developed urban and vacant, both outside WQRA).

Baseline protection (Title 3)

- WQRA comprise 2,916 forested park acres, 1,165 forested urban developed acres, and 3,514 forested vacant acres, or 15 percent of total forest habitat.
- Comprising about a third of forested lands, parks provide important protection to trees.
- The graph for criterion 2 excludes WQRA for the same reasons as stated in criterion 1.

Potential effects of treatment vary by development status

- Nearly half of forested habitat is in vacant lands. Of this, only 15 percent is protected as WQRA, while the remaining 85 percent is unprotected. Many of these lands are in rural zoning in new Urban Growth Boundary expansion areas.
- Of developed lands, two thirds receive some level of protection through parks or WQRA.
- Eleven percent of developed urban lands with forest are in WQRA. The remaining 9,339 acres are vulnerable to conflicting uses, particularly if redevelopment occurs at higher densities.
- Treatments applied to vacant lands may have disproportionately high impacts to forest habitat compared to the same treatments applied to developed urban lands.

Program option performance

- Options 1A and 1B are most protective of forest canopy in both developed urban and vacant lands. Options 2C and 1C are least protective.
- Options 2A and 2B fall in the mid-range in terms of protecting forest canopy.
- Option 1A is substantially more protective than option 1B. The difference between options 1B and 2A are less clear.
- The program options do not vary much between developed urban and vacant in terms of the proportions falling within allow, limit, prohibit designations.

Summary

Program options vary considerably in terms of forest canopy protection. The options that apply more stringent treatments to a larger part of the forested landscape will protect more forest canopy over the long term. Table 4-22 below provides a ranking of program options for this criterion, based on the most at-risk acres illustrated in Figure 4-38.

Table 4-22. Performance of options in meeting Environmental Criterion 2: Retains multiple functions provided by forest canopy.

Rank	Option	Performance
1	1A	Protects by far the most canopy cover of any other program option for vulnerable forested lands in both vacant and developed.
2	1B	Substantially less protection than option 1A, but still performs better than the remaining options. However, options 1B and 2A appear relatively close in terms of potential effects on the region's forest canopy. No Allow designations mean that all forest habitat would be afforded at least some level of protection.
3	2A	Similar to 1B.
4	2B	Little Allow (76 acres), but overall protection levels lower than options 1B and 2A.
5	2C	Low protection levels for forest canopy, with 38 percent of vacant and developed urban in Lightly Limit or Allow. Likely to result in significant habitat loss over time in both developed and vacant lands.
6	1C	Low protection levels for forest canopy, with 47 percent of vacant and developed urban in Lightly Limit or Allow. Likely to result in significant forest habitat loss over time.

3. Promotes riparian corridor continuity and overall habitat connectivity

Habitat connectivity is important to fish and wildlife for several reasons. Riparian, or longitudinal, connectivity ensures continued ecological functioning of streams and helps enable fish passage to areas upstream. Many fish and wildlife species must migrate seasonally to meet basic needs for food, shelter and breeding, and connections between habitat patches, including aquatic habitat, allow this migration to occur.

Fish and wildlife populations that are connected to each other are more likely to survive over the long term than an isolated population. In addition, when connectivity is lost between habitats the remaining habitat tends to become less native, attracting non-native and generalist wildlife species that can out-compete more sensitive native species, thereby reducing biodiversity. Metro's Phase I ESEE report describes the importance of connectivity to regional fish and wildlife habitat and populations (Metro 2003).

Measuring the criterion

Connectivity is an important indicator of habitat fragmentation. It is also very difficult to accurately measure, and prohibitively time-intensive to measure for six different program options. As a proxy for connectivity this criterion examines the following indicators:

- Criterion 3a: Riparian corridor continuity. Measures the amount of habitat within 150 feet of streams that falls within each allow, limit, prohibit designation for each program.
- Criterion 3b: The relative risk to all fish and wildlife habitat by program option.
- Criterion 3c: Discussion of the potential for disproportionate impacts by Metro's 27 subwatersheds.

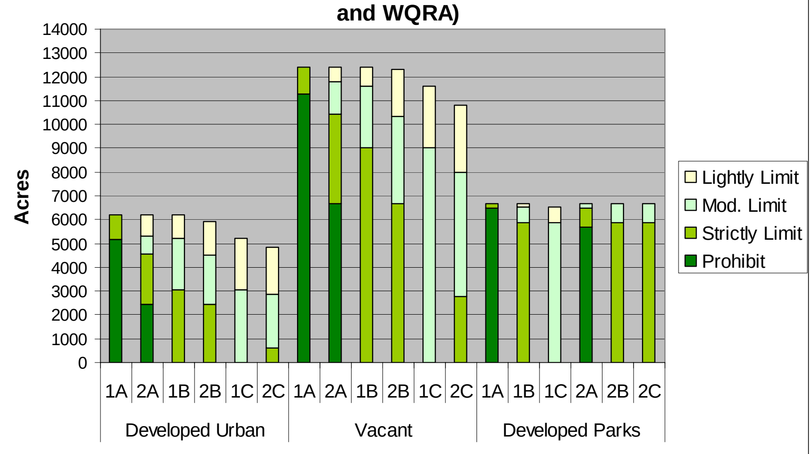
Results: Criterion 3a - Riparian corridor continuity

The figure below illustrates the findings. Program options that protect more habitat within 150 feet of streams are more likely to retain existing riparian corridor continuity.

Basic statistics

- This criterion includes 25,260 acres of fish and wildlife habitat near streams.
    - 6,186 acres are in developed urban (24 percent of total).
    - 12,395 are in vacant (49 percent of total).
    - 6,680 acres are in parks (26 percent of total).

Figure 4-39. Criterion 3a: Comparison of allow, limit, prohibit treatments for habitat within 150' of streams (includes parks and WQRA)



Baseline protection (Title 3)

- Of developed urban, 2,579 acres (40 percent) are in WQRA.
- Of vacant, 4,936 acres (40 percent) are in WQRA.
- Of parks, 3,221 acres (48 percent) are in WQRA.

This analysis included WQRA and parks because it constitutes a significant portion of riparian corridor continuity. The bar chart does not specifically delineate WQRA due to graph complexity.

Potential effects of treatments vary by development status

- About half of the acreage is vacant, with another quarter each in parks and developed urban. Parks are afforded some degree of protection, and so are WQRA.
- Excluding parks and WQRA, 7,459 acres are at risk in vacant. Less than half that amount, 3,607 acres, is in developed urban. Treatments applied to vacant habitat may have disproportionately high impacts on riparian corridor continuity.
- Parks are assumed to have some existing level of protection, but conflicting uses could impact these resources as well. However, nearly half of park acres are in WQRA.

Program option performance

- For all development statuses, Option 1A is most protective of habitat within 150 feet of streams, followed closely by Option 2A. Option 1B provides the next best protection, followed by 2B.
- Options 1C and 2C are least protective for these resources, and could negatively influence riparian corridor continuity.

Results: Criterion 3b – Relative risk to all fish and wildlife habitat

This sub-criterion is derived from Criterion 1. Figures 4-34 through 4-37 illustrate the findings. Program options that are likely to protect more fish and wildlife habitat overall, as well as more of the most valuable habitat, are assumed to perform better than other options. Here the findings from Criterion 1 are summarized as they related to Criterion 3b:

Basic statistics

- This criterion includes 80,143 acres of fish and wildlife habitat:
  - 27,851 acres are in Class I riparian (34 percent of total); of that, 2,005 developed acres are vulnerable (outside of parks or WQRA) and 6,683 vacant acres are vulnerable.
  - 7,901 acres are in Class II riparian (10 percent of total); of that, 1,475 developed acres are vulnerable and 3,301 vacant acres are vulnerable.
  - 4,434 acres are in Class III riparian (6 percent of total); of that, 3,427 developed acres are vulnerable and 659 vacant acres are vulnerable.
  - 19,662 acres are in Class A wildlife (25 percent of total); of that, 2,682 developed acres are vulnerable and 8,435 vacant acres are vulnerable.
  - 12,828 acres are in Class B wildlife (16 percent of total); of that, 3,580 developed acres re vulnerable and 7,756 vacant acres are vulnerable.
  - 7,468 acres are in Class C wildlife (9 percent of total); of that, 2,041 developed acres are vulnerable and 4,466 vacant acres are vulnerable.

Baseline protection (Title 3)

- See criterion 1 for baseline statistics.
- Nearly half of Class I habitat and one-fourth of Class II habitat are WQRA, with all other habitat classes containing less than 5 percent WQRA. This leaves lower habitat classes more vulnerable than the top two riparian classes.

Potential effects of treatments vary by development status and habitat class

- Class B and C wildlife habitat, in terms of acreage, provide disproportionately important connectivity links, such as stepping-stones between larger patches for migratory stopover and other wildlife movement.
- Class B and C wildlife habitat comprise 39 percent of vulnerable resources outlined above. Because these habitat patches are small, this equates to an high number of connector patches.
- Class B and C wildlife habitat tend to receive lower protective treatments in the program options compared to other habitat classes.
- The majority (68 percent) of vulnerable Class B and C acres are vacant, therefore program treatments applied to vulnerable vacant lands may have a disproportionate negative impact on regional connectivity.

Program Option performance

- Option 1A afford highest protection to Class B and C wildlife habitat, with strictly limit designations assigned to all acres.
- Option 1B provides less protection, but still provides protection to Class B and C habitat at the moderately and lightly limit levels, respectively.
- Options 2A and 2B provide less protection, but are generally similar to one another.
- Option 2C performs poorly, placing an allow designation on the majority of Class C habitat.
- Option 1C completely fails to protect vulnerable Class C habitat. Class C wildlife is most vulnerable to loss under all options (least protective treatments applied).

Results: Criterion 3c – Potential for disproportionate impacts by subwatershed

The findings for Criterion 3a are illustrated in the two figures below.

Basic statistics

- This criterion includes all 80,143 acres of regionally significant fish and wildlife habitat in Metro’s 27 subwatersheds, plus 15,730 acres of impact areas (see context chapter for more information on distribution of impact areas by development status).
- Impact areas are addressed in this subcriterion because conflicting uses in impact areas may adversely impact fish and wildlife habitat.
- Resources sites with a lower percentage of fish and wildlife habitat typically contain proportionally more impact areas. These subwatersheds are also typically more developed.
- Of the total, 53,939 acres are in developed, while 41,934 are in vacant.
- The criterion discerns between the most vulnerable habitats and those with some existing protection.

Baseline protection (Title 3)

- Of developed urban habitat and impact areas, 3,795 acres (seven percent of developed urban; four percent of all acres) are in WQRA.
- Of vacant habitat and impact areas, 6,881 acres (16 percent of vacant; seven percent of all acres) are in WQRA.
- Of all acres, 25,212 acres (26 percent) are in parks, shown in black in Figure 4-40.

Potential effects of treatments vary by subwatershed

- Variability exists between subwatersheds; some subwatersheds contain more habitat/impact areas overall, while others contain varying proportions of habitat within the subwatershed.
- In all subwatersheds, WQRA comprises a relatively small proportion of acreage, whether considering vacant or developed urban habitat.
- The bar chart illustrates that some subwatersheds contain more vulnerable lands than others. For example, subwatersheds #8, 26, and 27 contain relatively high amounts of vulnerable developed habitat and impact areas; these areas would be most vulnerable under redevelopment. Subwatersheds #11, 18, and 27 contain relatively high amounts of vulnerable vacant habitat and impact areas; these habitat acres are more immediately vulnerable.
- Some subwatersheds contain low proportions of habitat and impact areas. Examples include subwatersheds #6, 20 and 24, containing from 20-22 percent of acres in habitat or impact areas. Because these subwatersheds contain relatively little existing habitat, program treatments could have disproportionately high impacts on existing connectivity.

Figure 4-40. Criterion 3c: Developed lands - Habitat and impact areas in Metro's 27 subwatersheds

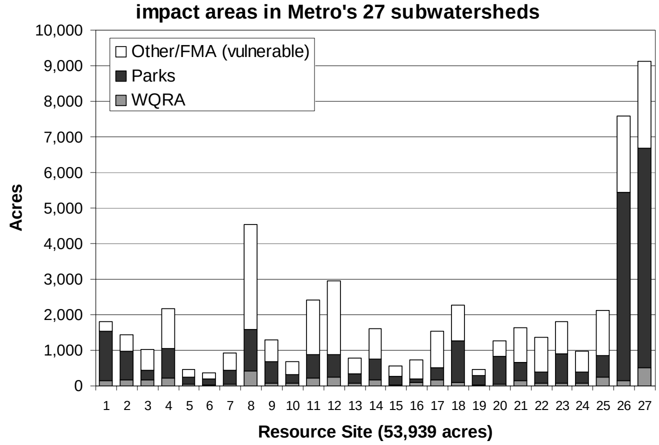
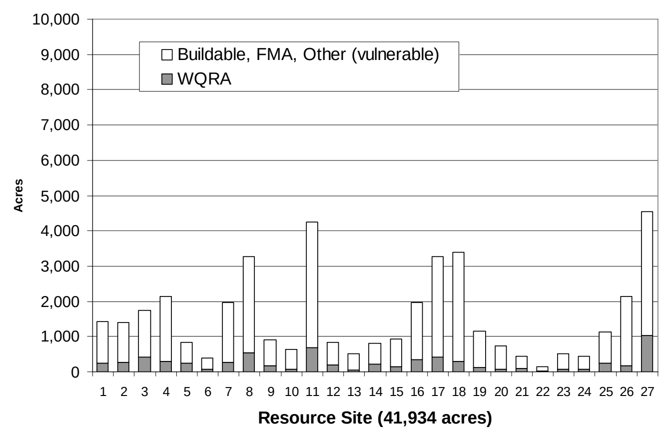


Figure 4-41. Criterion 3c: Vacant lands - Habitat and impact areas in Metro's 27 subwatersheds



Program option performance

- Some subwatersheds contain more habitat and impact areas than others.
- Criterion 1 describes how the six options perform in terms of protecting various habitat classes. More protective options are more likely to retain existing connectivity.
- Large habitat patches (see criterion 4), while vulnerable to fragmentation, may not be as important to systemic connectivity as smaller patches or more linear habitats.
- Program options providing more protection to lower value habitat areas, which tend to be small but important connectors or stepping stones, are more likely to promote connectivity,

particularly in subwatersheds with lower proportions of habitat.

- Options 1A, 2A, and to a lesser extent, 1B are likely to best protect the region's existing connectivity.
- Options 2B, 2C and 1C are likely to significantly reduce connectivity in the region.

Summary

Program options show a marked decline in protection levels, as indicated in Table 4-23 below. The options that apply more stringent treatments to a larger portion of habitat, particularly high value habitat, will protect a larger proportion of regionally significant habitat in the long term. Table 4-23 provides a ranking of program options for this criterion.

Table 4-23. Performance of options in meeting Environmental Criterion 3: Promotes riparian corridor continuity and overall habitat connectivity.

Rank	Option	Performance
1	1A	Program option 1A perform best for all three sub-criteria. This option is most likely to promote riparian corridor continuity and overall habitat connectivity.
2	2A	For riparian corridor continuity (sub-criterion 3a) and protecting subwatersheds from disproportionate impacts (sub-criterion 3c), program option 2A performs best. However, for risk to smaller connector habitats (sub-criterion 3b), 1B is the best performer.
3	1B	This option performs better for protecting small connector habitats than 2A, but does not perform as well for riparian corridor continuity and protecting subwatersheds from disproportionate impacts.
4	2B	This program option performs at a reduced, but fairly consistent, level for all three sub-criteria.
5	2C	This option greatly reduces protection levels for all three sub-criteria, and is likely to result in significantly reduced regional connectivity.
6	1C	This option greatly reduces protection levels for all three sub-criteria, and is likely to result in significantly reduced regional connectivity. In particular, class C wildlife habitat is 100% allow under this option.

4. Conserves habitat quality and biodiversity provided by large habitat patches

The extent to which large habitat patches are disrupted by conflicting uses will help determine habitat quality. Program options that perform better in this regard are more likely to retain the region's biological diversity.

Potential impacts on fish and wildlife habitat

Large habitat patches are primarily forested areas, but also include wetlands. Larger habitat patches are more valuable to native wildlife than smaller patches because more species are retained over time, and species sensitive to human disturbance still have a place to live. Long-term trends in wildlife populations are directly related to the area of habitat available – the larger the patch size, the longer a population can sustain itself. Larger habitat patches also retain more natural predators to keep rodent populations in check[26].

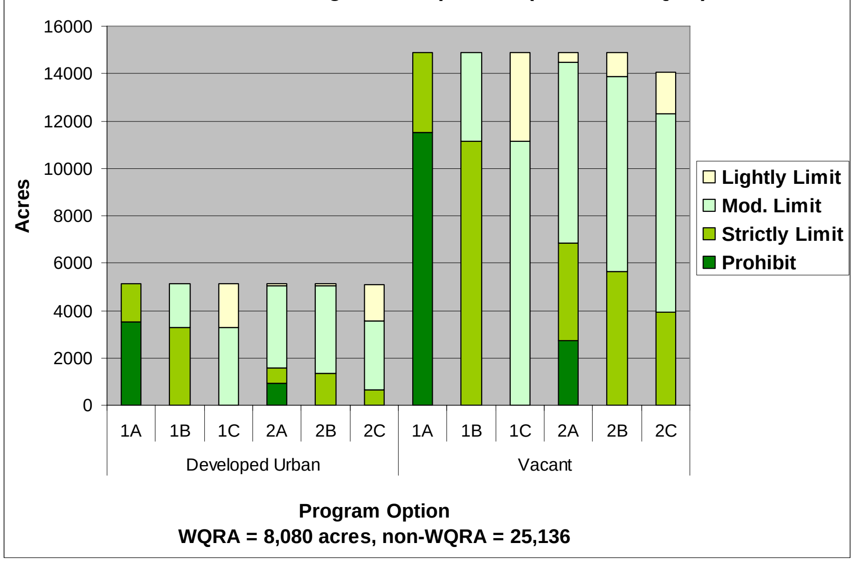
Habitat quality tends to be higher in large patches because negative edge effects, such as invasive species introductions and increased nest predation, are reduced. Local studies show that the complex multi-layered forest and shrub structure important to birds, small mammals and other wildlife is enhanced in larger habitat patches. Large patches also typically contain more woody debris.

Certain sensitive species and groups of species, such as Neotropical migratory songbirds and area-sensitive species, are likely to be negatively affected by less protective options. Large habitat patches are also linked, directly or indirectly, to each of the eight major ecological impact categories described in the ESEE Phase I discussion draft (Metro 2003). Thus, large habitat patches are a key component to retaining the region's biodiversity.

Measuring the criterion

Habitat patch size was a criterion in Metro's wildlife habitat inventory. Because the wildlife and riparian inventories were subsequently combined, portions of large habitat patches near waterways were incorporated into riparian Classes I and II. As a result, large patches were typically split into Class I and II riparian or Class A and B wildlife. For this criterion the wildlife model score prior to reconciling the two inventories, including patches scoring 6-9 points, was used in an effort to gauge the potential programmatic results on large habitat patches.

Figure 4-42. Criterion 4: Comparison of allow, limit, prohibit treatments for large habitat patches (excludes WQRA)



[26] See Metro's Technical Report for Goal 5, Metro 2002.

Results

For each program option, the acreage of large habitat patches that fall under various ALP designations was calculated. The data is reported separately for vacant and developed lands, for the reasons described under criterion 1; similarly, WQRA and parks are excluded in Figure 4-42. Figure 4-42 illustrates the most at-risk acres.

Basic statistics

- The total amount of large habitat patches, as defined in this criterion, is 38,360 acres.

Baseline protection (Title 3)

- Parks comprise 14,155 acres, or 37 percent of the total.
- WQRA comprise 8,090 acres (including 3,899 in parks) for 21 percent of the total.
- Six percent of the total habitat is in Title 3 FMA, but vegetation is not protected in FMA, therefore FMA areas do not protect large habitat patches.
- Excluding parks and WQRA, there are 20,014 acres of at-risk fish and wildlife habitat illustrated in Figure 4-42.
- The acres included in Figure 4-42 are subject to conflicting uses if no increase in protection level is applied; therefore, any program option that is not allow will provide incrementally more protection on these lands.

Potential effects of treatments vary by development status

- Excluding parks and WQRA, developed urban contains 26 percent of this habitat type, while 74 percent falls under vacant.
- The high percentage in vacant suggests that vacant habitat may be disproportionately affected by program choices.
- Developed urban is vulnerable as redevelopment occurs.
- The majority of habitat lands fall in single family residential zoning.
- Current trends for smaller lot sizes render large patches in both developed urban and vacant vulnerable to loss or fragmentation over time.

Program Option performance

- Urban development values in options 2A-2C substantially reduce protection of large habitat patches.
- For both vacant and developed urban habitat, Program Option 1A and to a lesser extent, Option 1B are most likely to keep large patches intact.
- Options 2A and 2B are marginal and may result in significant large patch encroachment.
- Options 2C and 1C are unlikely to retain large patches within the system.

Summary

Program options show a marked decline in protection levels, as indicated in Table 4-24 below. Options that apply stronger protection levels to large patches have a much greater chance of retaining the integrity of these important wildlife resources over time, and thus retaining good habitat quality and biodiversity. Incremental drops in protection may have more severe consequences in this criterion than in most other environmental criteria, because each drop in protection level raises the potential for large patch fragmentation.

Table 4-24. Performance of options in meeting Environmental Criterion 4: Conserves habitat quality and biodiversity provided by large habitat patches.

Rank	Option	Performance
1	1A	Figure 4-42 indicates that this option will provide the most effective protection for large habitat patches, with protection levels of Prohibit or Strictly Limit for all habitat.
2	1B	Protection level diminished, but still good, with Strictly or Moderately Limit for all habitat. However, any reduction in protection level will increase fragmentation of large patches, particularly with trends toward higher density development.
3	2A	Protection levels slightly lower than Option 1B. Three percent of vacant, unprotected habitat would fall under Lightly Limit in this option, with the remainder in Moderately Limit (51 percent), Strictly Limit (28 percent), or Prohibit (18 percent). No Allow.
4	2B	An incremental drop in protection levels compared to 2A. Seven percent of vacant, unprotected habitat would fall under Lightly Limit in this option, with the remainder in or Moderately Limit (55 percent) or Strictly Limit (38 percent).
5	2C	Substantially lower protection levels, with six percent of vacant, unprotected habitat in Allow, 12 percent in Lightly Limit, 56 percent in Moderately Limit, and 26 percent in Strictly Limit. No Prohibit. Likely to result in significant fragmentation of large patches.
6	1C	2C and 1C are fairly similar. 1C has decreased protection levels for all habitat classes, with 25 percent of vacant, unprotected habitat in Lightly Limit and 75 percent in Moderately Limit. Likely to result in significant fragmentation of large patches.

5. Promotes biodiversity through conservation of sensitive habitats and species

The amount and configuration of fish and wildlife habitat play important roles in the region's biodiversity, and these are addressed in Criteria 1 through 4. Also important, but not implicit in the first four criteria, are species and habitats that may be disproportionately at risk due to natural scarcity, habitat loss, or other factors.

Potential impacts on fish and wildlife habitat

For the purposes of this criterion both Habitats of Concern and Class I riparian habitat are included, because high-value riparian areas are widely acknowledged to be at-risk and because these habitats are mapped comprehensively for the region. In addition, known Species of Concern sightings are included to provide a relative measure of risk to wildlife. For these already-depleted habitats and species, a small habitat reduction could deal a major blow to regional biodiversity.

Criterion 5a: Habitats of Concern.

Habitats of Concern are specific areas known to provide a unique and at-risk habitat type, a unique and vital wildlife function, or both. Examples include wetlands, Oregon white oak habitat, riverine delta and island habitat, and critical migratory pathways. Habitats of Concern are premier wildlife areas that are elevated in importance and status within the inventory; all Habitats of Concern fall in either Class I riparian or Class A wildlife. Many of these areas, such as small wetlands, are less than the two-acre minimum established for the wildlife inventory but are included as Habitats of Concern due to their regional importance to biological diversity.[27] Program options providing more protection to these habitats will do a better job of retaining Habitats of Concern throughout the region.

Criterion 5b: Class I riparian.

The Habitats of Concern data is incomplete because it relies on local knowledge rather than comprehensive surveys. Therefore, for the purposes of this criterion Class I riparian habitat is also included because it is a widely acknowledged at-risk habitat and is mapped comprehensively for the region. Some of the implications of Class I habitat loss are described in Criterion 1. In addition to the ecological functions described there, high value riparian habitat contains more species than most other habitats; for example, the region's riparian areas are known to support approximately 93 percent of native bird species at some point in their lives. They also support more sensitive species, such as those found in Criterion 5c. Riparian areas provide vital fish and wildlife habitat connectivity throughout the region. The more a program option places Class I habitat at risk, the more negatively it will affect regional biological diversity.

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[27] Metro collected information on Species of Concern and Habitats of Concern for the Goal 5 wildlife habitat inventory from a variety of sources with site-specific knowledge of the region. ODFW, USFWS, the Oregon Biodiversity Project, and the Oregon-Washington chapter of Partners in Flight identify wetlands, native grasslands, Oregon white oak habitat, and riparian forests as the top four Willamette Valley habitats at risk. ODFW also lists urban natural area corridors as important at-risk habitats. Metro used these habitat types, plus other key contributors to diversity such as riverine islands and deltas and key migratory bird stopover habitats, to map Habitats of Concern.

Measuring the criterion

For each program option, acreage of Habitats of Concern (Criterion 5a) and Class I riparian (Criterion 5b) falling under various ALP designations was calculated. The two are reported separately and are not mutually exclusive.

The data are reported separately for vacant and developed urban habitats, for the reasons described under Criterion 1. Similarly, Title 3 Water Quality Resource Areas (WQRA) and parks are excluded from Figures 4-43 and 4-44 in order to focus on the habitats most at risk of development or other conflicting uses.

Figure 4-43. Criterion 5a: Comparison of allow, limit, prohibit treatments for Habitats of Concern (excludes WQRA)

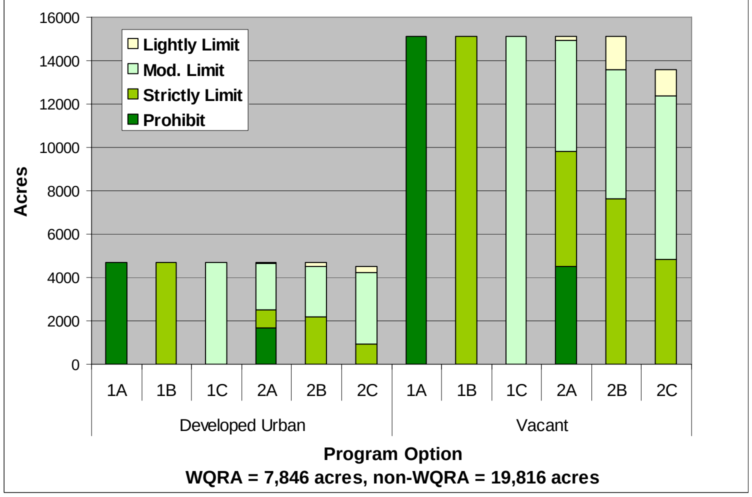
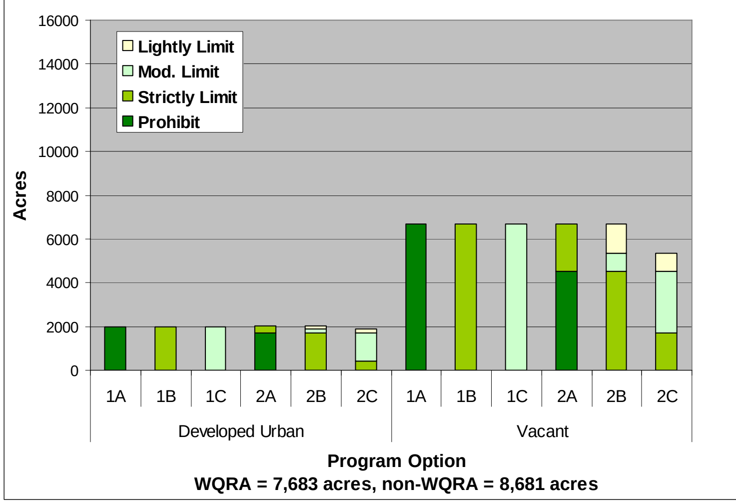


Figure 4-44. Criterion 5b: Comparison of allow, limit, prohibit treatments for Class I (excludes WQRA)



Results

Figures 4-43 and 4-44 illustrate Habitats of Concern, Class I riparian habitat, and Species of Concern, respectively. Program options that are likely to protect more at-risk habitats and species are assumed to perform better than other options.

Basic statistics: Habitats of Concern and Class I riparian

- The data illustrated by Figures 4-43 and 4-44 represent the portion of the habitat expected to be most at risk through development or redevelopment.
- The bar charts include 19,616 acres of Habitats of Concern and 8,688 acres of Class I riparian.
- Figures 4-43 and 4-44 exclude WQRA and parks from analysis for the same reasons stated in criterion 1.

Potential effects of treatments vary by habitat class, development status, and urban development value

- There are many more acres of vacant Habitats of Concern and Class I riparian than there are in developed urban. Therefore, the degree of protection afforded by each program option will have a stronger influence on vacant than on developed urban habitat.
- Where Habitats of Concern fall within Class I riparian, they are treated similarly under the various program options but where they are Class A wildlife, they receive lower protection

levels than Class I under options 2A-2C.
- This places non-riparian Habitats of Concern more at risk than riparian Habitats of Concern.

Program Option performance
- Options 1A and 1B are most protective of Habitats of Concern.
- Options 1A and 2A are most protective of riparian Class I.
- There is a larger discrepancy in protection levels between the two most protective options for Habitats of Concern than for Class I riparian.
- Options 1C and 2C are least protective for Habitats of Concern and are likely to result in substantial further loss of these depleted habitats.
- Options 2B and 2C are least protective of Class I riparian and are likely to result in substantial further loss of these depleted habitats. Option 1C is not much better.

Summary
Habitats of Concern and Class I riparian habitat are closely associated with declining or sensitive species in the region, and these habitats have declined greatly in extent and quality. It will be important to consider the relative rarity of the remaining habitats addressed in this criterion, because substantial further loss may result in regional species extirpations or potential Endangered Species Act listings. More protective options are more likely to prevent or minimize these undesirable results.

Table 4-25. Performance of options in meeting Environmental Criterion 5: Promotes biodiversity through conservation of sensitive habitats and species.

Rank	Option	Performance
1	1A	This option provides the highest protection levels for both Habitats of Concern and Class I riparian by assigning a Prohibit designation to all acres.
2 / 3	1B / 2A	Option 1B is important for Habitats of Concern, which includes more than twice as many acres as Class I riparian. However, Option 2A performs best for Class I riparian, and at a higher protection level than 1B provides Habitats of Concern.
4	2B	This option performs better than 1C or 2C for all Habitats of Concern, and for developed urban Class I riparian. However, for vacant Class I riparian it is difficult to discern whether Option 2B or 1C is more protective.
5	1C	Substantially lower protection levels, but consistent among development status and resource type, with all acres falling within Moderately Limit.
6	2C	Protection levels lowest of all options, with nine percent Allow in unprotected Habitats of Concern and 17 percent Allow in unprotected Class I riparian. Likely to result in substantial loss of sensitive habitats and sensitive species.

Evaluation of energy criteria

The analysis of energy criteria is intended to compare the potential effects of the six program options on energy use in the region. Two criteria will assist in this process:

1. Promotes compact urban form, and
2. Promotes green infrastructure.

Criteria were selected based on the findings in Metro's Technical Report for Goal 5 and Phase I ESEE analysis (Metro 2002, Metro 2003). The energy criteria discussed here are applied using data already collected in the Social, Environmental, and Economic Phase II ESEE analyses.

The summary of each criterion includes a table ranking the programs in order of performance, from most to least energy efficient as relates to each criterion. The criteria provide important new information about how each program performs relative to the others, and will aid Metro, its partners, and the public in designing an energy-efficient fish and wildlife habitat protection program.

1. Promotes compact urban form

A compact urban form conserves energy by reducing transportation related energy output and infrastructure needs, reduces the spatial extent of vegetation loss, and reduces the spatial extent of the urban heat island effect.[28] The amount of fish and wildlife habitat protected or partially protected by each regulatory program option and the zoning type and development status influence whether the option increases the need for Urban Growth Boundary expansions.

Importance of urban development priorities

The region's 2040 Growth Concept is designed to provide a compact urban form through efficient land use, a well-planned transportation system, and protection of natural areas. The second energy criterion below addresses natural area protection.

The extent to which a program option supports development priorities influences the ability to maintain a compact urban form, thus conserving energy by reducing transportation and infrastructure energy output. While program options 1A-1C consider only habitat value, program options 2A-2C incorporate the importance of land value, employment density, and the 2040 Design Types.

Importance of substitutability of lands

The Goal 5 rule requires Metro to consider the effect a Goal 5 program may have on the inventory of buildable lands. Any changes in density requirements may be difficult to reallocate within the current Urban Growth Boundary.

Some land uses can be more easily re-allocated, or substituted, to other parts of the region than other land uses. This can relate to a number of factors such as scarcity, lot size requirements, and the physical characteristics needed for certain land use types. For example, residential land

[28] See Metro's Economic, Social, Environmental and Energy Analysis (ESEE), September 2003.

comprises a majority of the region's vacant zoning and housing can be built on relatively small parcels in a variety of landscapes. As a result, residential lands to a certain extent can be flexible in how they are located on a site, and more sites may be available compared to other land use types. However, Metro cannot force existing residential neighborhoods to accommodate density increases.[29]

Conversely, industrial lands are much more difficult to relocate, and there is a regional shortage of industrial sites to meet our needs over the next 20 years. Industrial sites typically require flat terrain, access to transportation facilities, and some industrial sites need large contiguous parcels. Mixed use zoning, a highly energy efficient land use, can also be difficult to place in alternative sites if it doesn't meet market needs. Commercial land placement affects driving distance and infrastructure requirements.

Thus these land uses may be less substitutable within the existing Urban Growth Boundary than other land use types. New restrictions imposed by a program may limit the capacity for meeting housing and employment needs, and may increase energy use associated with the need for Urban Growth Boundary expansions and related transportation and infrastructure needs.

Measuring the criterion and results

As outlined above, urban development priorities and the substitutability of lands are both important to maintaining a compact urban form. Each of these is addressed in other ESEE criteria. Therefore no new data was collected for this criterion, and the results are available through other ESEE criteria:

- "Supports urban development priorities" (economic criterion 1), and
- "Reduces impact on types/location of jobs and housing" (social criterion 2).

Economic criterion 1, "Supports urban development priorities," assessed program performance for supporting urban development priorities. In descending order of performance, the program options for economic criterion 1 were ranked as follow: 1C, 2C, 2B, 1B, 2A and 1A.

Social criterion 2, "Reduces impact on types/locations of jobs and housing," assessed program performance for limiting new restrictions on vacant industrial, mixed use, and commercial lands (see figure xx in social section, "Treatment of vacant employment habitat land"). In descending order of performance, the program options for social criterion 1 ranked as follow: 2C, 1C, 2B, 1B, 2A and 1A.

Summary

Information pertaining to maintaining a compact urban form has already been assessed under economic criterion 1 and social criterion 2. The program performance for both criteria is similar but not identical, as summarized in the table below. For the energy criterion, emphasis was given to urban development priorities when program rankings differed (i.e., 2C and 1C), due to the importance of the 2040 Growth concept in regional planning.

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[29] See Metro Ordinance #xxx.

Table 4-26. Performance of options in meeting Energy Criterion 1: Promotes compact urban growth form.

Rank	Option	Performance
1	1C	Provides the most support (lack of development restrictions) for lands with high urban development priorities and the second-best support for allowing development on existing vacant industrial, mixed use, and commercial lands.
2	2C	Substantial support for lands with high urban development value, and excellent support for lands with medium urban development value. Provides the best support for allowing development on existing vacant industrial, mixed use, and commercial lands.
3	2B	Good support for urban development priorities and allowing development on existing vacant industrial, mixed use, and commercial lands.
4	1B	Moderate support for maintaining a compact urban growth form. No prohibit treatments for urban development priorities, but significantly stronger impact than 2A or 1A. For vacant industrial, mixed use, and commercial lands, performs at a slightly reduced level compared to option 2A.
5	2A	Slightly less support for urban development priorities than 1B due to a small proportion of prohibit treatment. For vacant industrial, mixed use, and commercial lands, provides slightly more support than option 1B.
6	1A	Promotes compact urban form the least. Substantial restrictions possible on high urban development priorities and on development potential for existing vacant industrial, mixed use, and commercial lands.

2. Promotes green infrastructure

Trees and other vegetation reduce energy demand by moderating stream and air temperature increases, flooding, and air pollution associated with energy use.[30] Fish and wildlife habitat that are considered important or necessary to support cities and suburbs can be considered a type of infrastructure: "green infrastructure." The energy benefits provided by green infrastructure are a type of ecosystem service.

Ecosystem services may be defined as the processes and functions of natural ecosystems that sustain life and are critical to human welfare (see Evaluation of Energy, Criterion 2 for more detail). For example, trees help clean air and water, and wetlands and floodplains store water and help avert flooding. When ecosystem services are removed or diminished, a common alternative is to implement technological surrogates such as stormwater piping or water purification systems. Such solutions tend to require more energy than preserving existing green infrastructure and ecosystem functions.

Measuring the criterion and results

The amount of fish and wildlife habitat protected or partially protected by each program option, as well as the value of that habitat, help determine whether the option protects the energy-related green infrastructure and ecosystem services provided by trees, other vegetation, wetlands and floodplains. Green infrastructure and ecosystem services are strongly related.

This criterion is best assessed using a combination of three criteria from the environmental and economic ESEE:

- "Promotes retention of ecosystem services" (economic criterion 2);

[30] See Metro's Economic, Social, Environmental and Energy Analysis (ESEE), September 2003.

- “Conserves existing watershed health and restoration opportunities (environmental criterion 1); and
- “Retains multiple functions provided by forest canopy cover (environmental criterion 2).

This combination of criteria appropriately addresses energy concerns. No new data was collected, and the detailed results are available through the relevant criteria in the environmental and economic sections.

Ecosystem services are addressed in economic criterion 2, “Promotes retention of ecosystem services.” In that criterion, areas with more ecological functions and/or areas with functions closer to streams, wetlands, or floodplains ranked higher than areas with fewer functions or with functions further away from water features. Economic criterion 2 ranked identically to environmental criterion 1: 1A, 2A, 1B, 2B, 2C, and 1C.

Although green infrastructure is addressed in all environmental criteria environmental criterion 1, “Conserves existing watershed health and restoration opportunities” and criterion 2, “Retains multiple functions provided by forest canopy cover,” are particularly relevant to energy use. These are the resources that protect existing ecosystem functions.

Environmental criterion 1 assesses the performance of program options in conserving existing watershed health and restoration opportunities based on protection levels for fish and wildlife habitat. In descending order of performance, the program options for environmental criterion 1 were ranked as follow: 1A, 2A, 1B, 2B, 2C, and 1C.

Environmental criterion 2 estimates how well each program option would protect existing forest canopy cover, identified in the Phase I ESEE analysis as a key energy-related feature. This is an important separate measure because although all forest is ecologically important to the region, not all forest ranks as high-value fish and wildlife habitat. In descending order of performance, the program options for environmental criterion 2 ranked as follow: 1A, 1B, 2A, 2B, 2C, and 1C.

Summary

Information pertaining to retaining green infrastructure and ecosystem services has already been assessed under economic criterion 1 and environmental criteria 1 and 2. The program performance for all three criteria is similar but not identical, as summarized in the table below.

Table 4-27. Performance of options in meeting Energy Criterion 2: Promotes green infrastructure.

Rank	Option	Performance
1	1A	Provides the most protection for all habitats and best protection to forest canopy cover and ecosystem services.
2	2A	Protection level substantial for high-value riparian habitat, and good for other habitat classes. Ecosystem services also reflect this ranking. However, 1B provides better protection for upland wildlife habitat. Options 2A and 1B fairly similar for forest canopy.
3	1B	Substantially reduced protection for all riparian habitat compared to 1A and 2A. Ecosystem services also reflect this ranking. For wildlife habitat, performs better than 2A. For forest canopy, fairly similar to option 2A.
4	2B	Options 2B, 2C and 1C ranked identically for habitat, tree canopy, and ecosystem service protection. Moderate performance for higher riparian and wildlife classes, but protection drops significantly for lower habitat classes. Similar findings for forest canopy and ecosystem services.
5	2C	Places nearly 40 percent of all forest canopy at risk through low or no protection levels. Low protection levels for all resources. May result in substantial loss of riparian and upland habitat functions, ecosystem services, and forest canopy over time.
6	1C	Places nearly half of all forest canopy at risk through low or no protection levels. Low protection levels for all resources. Most likely to result in substantial loss of riparian and upland habitat functions, ecosystem services, and forest canopy over time.

Evaluation of federal Endangered Species Act

The Endangered Species Act's (ESA's) ultimate goal is to recover species and conserve the ecosystems upon which they depend so they no longer need regulatory protection. Twelve salmon species or runs are listed as either threatened or endangered in the Columbia River and Willamette River basins. The National Oceanic and Atmospheric Administration (NOAA) Fisheries is the federal agency responsible for these species.

The U.S. Fish and Wildlife Service (FWS) has jurisdiction over terrestrial species and aquatic species that spend the majority of their life cycle in fresh water. Listed species under their jurisdiction that currently or historically occurred in the Metro region include bald eagle, bull trout, golden Indian paintbrush, Willamette daisy, water howellia, Bradshaw's lomatium, Kincaid's lupine, and Nelson's checker-mallow. The FWS was petitioned to list pacific lamprey, western brook lamprey and river lamprey in January 2003; processing of the petition has not yet been completed and is currently on hold. Additionally, several candidate species and species of concern are also known to occur in the Metro region. Although these species do not currently receive ESA regulatory protection, efforts to conserve these species may help to sustain existing populations and preclude the need for future listings.

Will a Metro fish and wildlife habitat protection program meet the ESA? There is no clear answer, because program details are not yet developed and it is not possible to fully predict the outcome of any program. It is also worth noting that the full suite of factors that affect the habitats upon which these species depend will not all be addressed in Metro's Goal 5 program. For example, stormwater runoff can have significant impacts on stream health and channel complexity, but Goal 5 is not designed to explicitly or comprehensively address stormwater management.

However, the Goal 5 program will help to define the types of land uses that will be allowed within and near regionally significant habitats, ultimately determining the degree to which these habitats and their ecological functions are conserved over time. The program's non-regulatory components, particularly the degree of investment in restoration, will also play a key role. An effective Metro program that provides adequate species protection could provide a template that could serve as a model for local jurisdictions to come into ESA compliance, and may also contribute to efforts designed to prevent future ESA species listings.

The federal ESA portion of this phase of the ESEE analysis is intended to compare the potential effects of the six program options on listed fish and wildlife and related species of conservation interest such as the three species of lamprey that have been petitioned for listing. Three criteria will assist this process:

1. Protects slopes, wetlands, and areas of high habitat value;
2. Maintains hydrologic conditions; and
3. Protects riparian functions.

These criteria provide important information about how each program performs relative to the others in protecting habitats and watershed health, and will aid Metro, its partners, and the public determine the general consequences to fish and wildlife species under each program.

1. Protects slopes, wetlands and areas of high habitat value

Steep slopes are vulnerable to erosion and landslides that can negatively affect aquatic resources, particularly when trees and other vegetation are removed.[31] Wetlands provide important off-channel rearing habitat for young salmon and functions important to stream health. They also provide key habitat for many of the region's other known at-risk species – for example, bald eagles, northern red-legged frogs, northwestern pond turtles, and numerous neotropical migratory bird species[32]. At-risk species relate to the ESA because if they continue to decline, they may become future candidates for ESA listings. Habitats of Concern include wetlands, riparian bottomland forest, stands of Oregon white oak, native grassland, important migratory pathways, and other critical habitats that potentially support listed plants and animals, as well as numerous other at-risk species. Large habitat patches retain higher habitat quality than smaller patches and provide homes to species most sensitive to human disturbance, such as neotropical migratory songbirds[33], and maintaining the connections between these valuable habitats is vital to supporting the region's sensitive species over time.

Measuring the criterion

Steep slopes are addressed in Metro's riparian GIS model as a primary and secondary functional contributor to Bank Stabilization, Sediment and Pollution Control. Wetlands receive primary functional value in the riparian model under the Streamflow Moderation and Water Storage and Bank Stabilization, Sediment and Pollution Control criteria, and are also captured under Class I riparian as Habitats of Concern. Areas of highest habitat value, including all Habitats of Concern and most large habitat patches, are captured under Class I riparian and Class A wildlife habitat. In addition, large habitat patches were specifically addressed in environmental criterion 2. Thus, this criterion is best assessed using a combination of criteria from the Environmental ESEE:

- Class I riparian and Class A wildlife habitat derived from the criterion entitled "Conserves existing watershed health and restoration opportunities" (environmental criterion 1);
- Promotes riparian corridor continuity and overall habitat connectivity (environmental criterion 3);
- Conserves habitat quality and biodiversity provided by large habitat patches (environmental criterion 2); and
- Promotes biodiversity through conservation of sensitive habitats and species (environmental criterion 5).

Results

The data tables and graphs associated with this criterion are available in the Environmental ESEE section. Option 1A provides the most protection for this criterion, but Options 2A and 1B

[31] The ecological damage associated with excess sediments entering streams is described in Metro's Technical Report for Goal 5 (Metro 2002) and Phase I ESEE report (Metro 2003).
[32] See Metro's species list for at-risk species and their general habitat associations.
[33] Neotropical migratory songbirds have been identified by ODFW as an at-risk group of species. Local studies (Hennings and Edge 2003) confirm that Neotropical migrants are negatively associated with urbanization.

also provide substantial protection. Option 2B provides a moderate level of protection. Options 2C and 1C are least likely to protect sensitive species over time, because substantial habitat and connectivity may be lost.

Table 4-28. Performance of options in meeting ESA criterion 1: Protects slopes, wetlands, and areas of high habitat value.

Rank	Option	Performance
1	1A	Most protective of all variables assessed. Best option for protecting slopes, wetlands, and areas of high habitat value; most likely to reduce need for future ESA listings.
2 / 3	2A / 1B	Option 2A is second-most protective for Class I habitat, promoting overall connectivity. Option 1B is second-most protective for Class A habitat and large patches. Options 2A and 1B are similar in terms of protecting sensitive habitats and species.
4	2B	Incrementally less protection for all variables assessed. Options 2A and 2B are similar in terms of protecting Class A habitat.
5	2C	Ranks fifth for Class A, overall connectivity, and large patches. Ranks sixth for Class I and sensitive habitats. More likely to result in species depletion or loss over time, and may increase future ESA listings.
6	1C	Minimal protection for Class A, overall connectivity, and large patches. Ranks fifth for Class I and sensitive habitats. Most likely to result in species depletion or loss over time, and may increase future ESA listings.

2. Maintains hydrologic conditions

Hydrology, in part, refers to how water is delivered to streams and rivers during storms. Under natural hydrologic conditions in the Pacific Northwest, rainwater movement to streams is slowed and retained by trees, plants, wetlands, floodplains and soils. When these natural features are altered or removed and hard (impervious) surfaces are installed, rainwater is delivered quickly, in high volumes, to streams and rivers. This causes channel damage, excessive flooding, groundwater depletion, and alters habitat such that animals adapted to natural conditions are sometimes no longer able to survive there. Altered hydrology has strongly, negatively impacted the region's threatened salmon and other native aquatic species including lamprey.

All habitat in Metro's inventory is important to maintaining hydrologic conditions. In this naturally forested region, trees are particularly important to hydrology because they slow and store large quantities of stormwater.[34]

Measuring the criterion

This criterion is best assessed using a combination of criteria from the Environmental ESEE:

- "Conserves existing watershed health and restoration opportunities" (environmental criterion 1), and
- Retains multiple functions provided by forest canopy cover (environmental criterion 2).

[34] Metro's field studies showed that the amount of tree cover, both near streams and throughout watersheds, is positively associated with stream health (Frady et al. 2002).

Results
The data tables and graphs associated with this criterion are available in the Environmental ESEE section. Option 1A provides the most protection for this criterion, but Options 2A and 1B also provide substantial protection. Options 2C and 1C are least likely to protect sensitive species over time, because substantial habitat and connectivity may be lost. Less protective options may lead to an increase in future ESA species listings.

Table 4-29. Performance of options in meeting ESA criterion 2: Maintains hydrologic conditions.

Rank	Option	Performance
1	1A	This option provides the most protection and restoration opportunities for existing fish and wildlife habitat, and therefore provides the strongest regulatory approach to maintain current hydrologic conditions.
2 / 3	2A / 1B	Option 2A ranks second for conserving existing watershed health and restoration opportunities, but ranks third for retaining forest canopy cover. Both options could aid in maintaining hydrologic conditions, depending on the amount of habitat retained and whether new trees and habitat are added over time.
4	2B	Ranks fourth for conserving watershed health and restoration opportunities, as well as for conserving forest canopy. Unlikely to maintain hydrologic conditions over time without substantial non-regulatory investments.
5	2C	Ranks fifth for conserving watershed health and restoration opportunities, as well as for conserving forest canopy. Unlikely to maintain hydrologic conditions over time, even with substantial non-regulatory investments. Strong likelihood for increased harm to salmon habitat and increased potential for future ESA species listings.
6	1C	Ranks last for conserving watershed health and restoration opportunities, as well as for conserving forest canopy. Unlikely to maintain hydrologic conditions over time due to extensive loss of existing resources and loss of restoration opportunities. Strong likelihood for increased harm to salmon habitat and increased potential for future ESA species listings.

3. Protects riparian functions

Metro's extensive review of the scientific literature revealed that ecological functions are not limited to the areas nearest the stream. Existing riparian habitat areas protect water quality and provide key habitat to many of the region's at-risk species, including those living on the land or in water. Due to the extent of riparian habitat loss over time, all remaining riparian areas are important to stream health. Lower value areas not only contribute to watershed function, but also provide key restoration opportunities that may help improve watershed health and offset detrimental effects from future development elsewhere in the watershed.

Measuring the criterion
This criterion is derived from the riparian corridor portion of the criterion entitled "Conserves existing watershed health and restoration opportunities" (environmental criterion 1). It measures the amount of riparian habitat affected by allow, limit, prohibit treatments under each program option. Class I riparian receives special consideration in Table 4-29 due to the multiple ecological functions provided in these high-value areas.

Results
The data tables and graphs associated with this criterion are available in the Environmental ESEE section. It is important to note that no matter which option is selected, riparian habitat

may be lost and remaining habitat degraded over time due to continued development within the UGB and the urban effects associated with development, such as increased runoff and decreased water quality. The extent to which a program protects riparian function depends, in part, on non-regulatory program elements such as restoration in existing resources and new habitat creation in key areas of importance.

Option 1A provides the most protection for all riparian habitat. Option 2A provides less protection for habitat within one site potential tree height, and Option 1B is a substantial step downward in protection levels. Option 2B is slightly less protective of riparian habitat than Option 1B. Option 2C provides a substantially reduced level of protection for Class I and II habitat, and very little protection for Class III. Option 1C provides low level protection for Class I and II, and no protection at all for Class III riparian; this option is least likely to protect riparian functions. Options 1C and 2C are unlikely to protect existing sensitive species, and will likely result in future ESA listings over time as riparian habitat is lost or damaged.

Table 4-30. Performance of options in meeting ESA criterion 3: Protects riparian corridors

Rank	Option	Performance
1	1A	Most likely to retain existing riparian function and watershed health. Class I and II habitat in prohibit designation, and Class III in strictly limit. Most likely to help conserve sensitive species and aid in preventing future ESA listings.
2	2A	Incrementally less protection for riparian habitat, but generally still good protection levels for Class I and II. Protection drops significantly for Class III, with the majority in lightly limit designation.
3	1B	Substantially less protection compared to Options 1A and 2A. Class III riparian in appears to be particularly vulnerable, with lightly limit designations.
4	2B	Incrementally less protection than previous options. Moderate loss of high-value riparian habitat likely, with potential for negative effects on sensitive species. Protection levels drop off significantly for Class III habitat, with primarily lightly limit designation, similar to option 2A. May increase potential for future ESA listings.
5	1C	Class I receives moderately limit, Class II lightly limit, and Class III receives allow designations. Less likely to protect existing sensitive species than options above. May result in substantial loss of riparian habitat and increases potential for future additional ESA listings.
6	2C	Poor protection for riparian habitat. Least likely to protect existing sensitive species. Most likely to lead to future ESA listings.

Evaluation of federal Clean Water Act

The federal Clean Water Act (CWA) sets a national goal to "restore and maintain the chemical, physical and biological integrity of the Nation's waters." In Oregon, the Department of Environmental Quality (DEQ) implements the CWA, with review and approval by the U.S. Environmental Protection Agency.

The DEQ is responsible for protecting the beneficial uses of rivers, streams and lakes of the state. The DEQ carries out this responsibility in part by identifying those water bodies that are not meeting current water quality standards. This inventory is known as the 303(d) list. For waters identified on the 303(d) list, DEQ must develop total maximum daily loads (TMDLs) for those pollutants that exceed water quality standards. The TMDLs become part of implementation plans at the watershed scale intended to meet water quality standards. In urban areas, local governments are often the parties responsible for such plans, with input from watershed councils, landowners and other stakeholders.

The DEQ recently informed Metro Council that a Goal 5 program that provides shading, pollutant removal, and infiltration could protect and restore fish and wildlife habitat and help meet water quality standards in the Willamette and Tualatin Basins. Retaining fish and wildlife habitat, and the ecological functions these areas provide, is less expensive than constructing water quality treatment facilities. Potentially, the amount of Goal 5 resources preserved for protection and restoration may be an important management measure in a watershed's TMDL implementation plan.

The federal CWA criterion compares the potential effects of the six program options on the importance of fish and wildlife habitat to the region's water quality. Four criteria will assist this process:

1. Protects steep slopes and wetlands;
2. Protects resources within 150 feet of streams;
3. Maintains hydrologic conditions (see ESA criterion 2); and
4. Protects forested areas throughout the watershed.

Some of the criteria used to assess program performance related to the CWA are similar to those assessed for the federal ESA, because existing fish and wildlife habitat also protects water quality. These criteria provide important information about how each program performs relative to the others, and will aid Metro, its partners, and the public in determining the relative consequences to water quality under each program.

1. Protects slopes and wetlands

Steep slopes are vulnerable to erosion and landslides, particularly when trees and other vegetation are removed.[35] Wetlands collect and treat soil runoff and help control stream bank erosion to help meet turbidity, sedimentation, and nutrient TMDLs. Wetlands collect and treat

[35] The ecological damage associated with excess sediments entering streams is described in Metro's Technical Report for Goal 5 (Metro 2002) and Phase I ESEE report (Metro 2003).

pesticides, heavy metals, and other toxic pollutants to help meet TMDLs for these pollutants. Wetlands also collect and store water to provide base flow in streams during summer low-flow months, which helps meet temperature TMDLs.

Measuring the criterion

Steep slopes are addressed in Metro's riparian GIS model as a primary and secondary functional contributor to Bank Stabilization, Sediment and Pollution Control. Wetlands receive primary functional value in the riparian model under the Streamflow Moderation and Water Storage, Bank Stabilization, Sediment and Pollution Control, and are also captured as Class I riparian as a Habitat of Concern.

This criterion is best assessed using a subset of one of the criteria from the Environmental ESEE. Class I and Class II riparian habitat derived from the criterion entitled "Conserves existing watershed health and restoration opportunities" (environmental criterion 1) captures all wetlands and the majority of vegetated steep slopes near streams. As in the ESA criteria, the extent to which restoration is included as part of any Goal 5 program will help determine its effectiveness in protecting water quality.

Results

The data tables and graphs associated with this criterion are available in the Environmental ESEE section and associated appendices. Option 1A provides the most protection for Class I and II riparian habitat. Option 2A provides incrementally less. Options 1B and 2B fall in the middle. Options 1C and 2C perform poorly in protecting these habitat areas, and are likely to result in future 303(d) listings and TMDL requirements due to unprotected steep slopes and wetland areas.

Table 4-31. Performance of options in meeting CWA criterion 1: Protects slopes and wetlands.

Rank	Option	Performance
1	1A	Highest protection level for all Class I and Class II riparian habitat; most likely to protect steep slopes and wetlands. **For every program option, restoration will still be needed to meet temperature and other standards.**
2	2A	Excellent protection for Class I habitat. Good protection for Class II habitat, but definitely a step downward from 1A, with about two thirds of Class II in moderately limit designations and the remainder in Lightly Limit. Where steep slopes occur in Class II, may increase erosion and sedimentation and degrade water quality.
3	1B	Incrementally less protection for Class I and Class II habitat.
4	2B	Somewhat less protection for Class I and II habitat compared to Option 1B, but most habitat areas still receive strictly or moderately limit designations.
5	1C	Substantially reduced protection for steep slope areas and wetlands. Likely to result in non-compliance for existing TMDLs and future 303(d) listings and TMDL requirements.
6	2C	Poor protection for Class I resources (particularly in Developed Urban areas), and dismal protection for Class II. Highly likely to result in degraded water quality, non-compliance for existing TMDLs, and increased future 303(d) listings and TMDL requirements.

2. Protects resources within 150 feet of streams

The importance of riparian areas in maintaining water quality is well documented.[36] These areas provide shading to help meet temperature TMDLs, collect and treat soil runoff, and control stream bank erosion to help meet turbidity, sedimentation, and nutrient TMDLs. Riparian areas collect and treat bacteria in runoff to help meet bacteria TMDLs and collect and treat pesticides, heavy metals, and other toxic pollutants to help meet TMDLs for these pollutants. Like wetlands (and generally including wetlands), riparian areas collect and store water to provide base flow in streams during summer low-flow months, helping to meet temperature TMDLs.

Measuring the criterion

This criterion is assessed using the riparian corridor continuity portion of the criterion entitled "Promotes riparian corridor continuity and overall habitat connectivity" (environmental criterion 3a). It measures the amount of habitat within 150 feet of streams affected by allow, limit, prohibit treatments under each program option.

Results

The data tables and graphs associated with this criterion are available in the Environmental ESEE section. Option 1A provides the most protection for Class I and II riparian habitat. Option 2A, 1B and 2C provide incrementally less protection for areas within one site potential tree height, respectively. Options 1C and 2C perform very poorly in protecting these habitat areas, and are likely to result in future 303(d) listings and TMDL requirements due to habitat loss closest to streams, as well as non-compliance with existing TMDLs.

Table 4-32. Performance of options in meeting CWA criterion 2: Conserves habitat within 150 feet of streams.

Rank	Option	Performance
1	1A	Excellent performance for conserving existing habitat within 150 feet of streams, with primarily Prohibit plus some Strictly Limit designations. This option is most likely to assist in meeting current TMDLs and preventing future non-compliance issues. **For every program option, restoration will still be needed to meet temperature and other standards.**
2	2A	Substantial step downward from 1A, but still good protection levels. About half of the habitat within 150 feet of streams receives Prohibit treatment, with the remainder falling within the three degrees of limit. Loss of any habitat within this zone, particularly without restoring key areas, is likely to decrease water quality and increase CWA non-compliance issues.
3	1B	Incremental step downward from Option 2A. Increases likelihood of water quality issues and CWA non-compliance.
4	2B	Relatively small step downward from Option 1B, with similar repercussions possible.
5	1C	Very poor protection for near-stream habitat. Unlikely to conserve existing resources or retain restoration opportunities within 150 feet of streams. Highly likely to degrade water quality, resulting in non-compliance with current TMDLs and necessitating future 303(d) and TMDL listings.
6	2C	Similar to Option 1C, but slightly worse.

[36] See Metro's Technical Report for Goal 5 (Metro 2002) and Phase I ESEE Report (Metro 2003).

3. Maintains hydrologic conditions

This criterion is described and measured in ESA criterion 2. Altered hydrology is a leading cause of degraded water quality. The key negative effects associated with altered hydrology are described in Metro's Technical Report for Goal 5 and Phase I ESEE documents (Metro 2002, 2003). Program options for this criterion rank as follow, from best to worst in terms of maintaining hydrologic conditions: 1A, 2A/1B, 2B, 2C, and 1C.

4. Protects forested areas throughout the watershed

Trees are vitally important to the region's water quality, as demonstrated through local studies and as recognized by DEQ.[37] Trees provide infiltration to recharge both groundwater and down gradient streams, providing base flow for streams during summer low-flow months and helping to meet temperature TMDLs. Trees are especially effective in reducing sedimentation and erosion, runoff speed and volume, excess nutrients, and water temperature, thereby helping to meet nutrient, sediment, turbidity, and temperature TMDLs.

Measuring the criterion

This criterion is measured using Environmental criterion 2, "Retains multiple functions provided by forest canopy cover."

Results

The data tables and graphs associated with this criterion are available in the Environmental ESEE section. Option 1A provides the most protection for the region's upland and riparian forests. Option 1B provides substantially less protection, with Option 2A close behind. Options 1B and 2B fall in the middle. Option 2C performs very poorly in protecting forest canopy, and is likely to result in future 303(d) listings and TMDL requirements due to unprotected steep slopes and wetland areas.

[37] Metro's field studies showed that the amount of tree cover, both near streams and throughout watersheds, is positively associated with stream health (Frady et al. 2002).

**Table 4-33. Performance of options in meeting CWA criterion 4:
Protects forest canopy throughout the watershed.**

Rank	Option	Performance
1	1A	Protects by far the most canopy cover of any other program option for vulnerable forested lands in both vacant and developed lands. This option is most likely to aid in current Clean Water Act compliance and help prevent future 303(d) listings and TMDL requirements. **For every program option, restoration will still be needed to meet temperature and other standards.**
2	1B	Substantially less protection than option 1A, but still performs better than the remaining options. However, options 1B and 2A appear relatively close in terms of potential effects on the region's forest canopy, and therefore, water quality. No Allow designations mean that all forested habitat would be afforded at least some level of protection.
3	2A	Similar to 1B, with slightly less protection.
4	2B	Little Allow, but overall protection levels lower than options 1B and 2A. Potential for significant forest loss and increased water quality issues.
5	2C	Low protection levels for forest canopy, with 38 percent of vacant and developed urban in Lightly Limit or Allow. Likely to result in significant forest canopy loss over time. Highly likely to degrade water quality, resulting in non-compliance with current TMDLs and likely necessitating future 303(d) and TMDL listings.
6	1C	Low protection levels for forest canopy, with 47 percent of vacant and developed urban in Lightly Limit or Allow. Likely to result in significant forest habitat loss over time. Highly likely to degrade water quality, resulting in non-compliance with current TMDLs and likely necessitating future 303(d) and TMDL listings.

Summary of analysis of regulatory options

Metro's analysis of the six regulatory program options against the 19 criteria provides a substantial amount of information for the Metro Council to use in their consideration of a program direction for protecting fish and wildlife habitat. Generally, the options that protect more habitat (Options 1A and 2A) perform similarly across criteria. The option that least protects the highest value habitat (Option 1C) and the option with the lowest level of protection for habitat in industrial areas and centers (Option 2C) also perform similarly. However, Option 2C favors factors important for urban development by focusing on the economic concerns, while Option 1C reduces protection equally for all land uses. Table 4-34 summarizes the analysis.

Table 4-34. Summary of program option analysis.

Criteria	Option 1A: Most habitat protection	Option 1B: Moderate habitat protection	Option 1C: Least habitat protection	Option 2A: Most habitat protection	Option 2B: Moderate habitat protection	Option 2C: Least habitat protection
	Highest level of protection for all habitats	*High level of protection for highest value habitat, moderate protection for other habitats*	*Moderate level of protection for higher value habitats, no protection for lowest value habitat*	*Moderate level of protection in high urban development value areas, high level of protection in other areas*	*Low level of protection in high urban development value areas, moderate level of protection in other areas*	*No protection in high urban development value areas, moderate level of habitat protection in other areas*
Economic factors						
1. Supports the regional economy by providing development opportunities (such as residential, commercial, industrial)	**Ranks 6th**: Provides least development opportunities due to highest levels of habitat protection on residential, commercial and industrial lands.	**Ranks 4th:** Provides some development opportunities for residential, commercial and industrial.	**Ranks 2nd:** Provides substantial development opportunities for all types of development.	**Ranks 5th:** Provides minimal development opportunities because residential development in some high value habitat is prohibited.	**Ranks 3rd:** Provides moderate development opportunities due to less habitat protection in all commercial and industrial areas and some residential land.	**Ranks 1st:** Provides most development opportunities due to relaxed habitat protection; provides more development opportunities in commercial and industrial areas than in residential areas.
2. Supports economic values associated with ecosystem services (such as flood control, clean water, recreation, amenity values)	**Ranks 1st**: Retains most existing ecosystem services across all habitat classes. Highest protection for habitat.	**Ranks 3rd**: Retains moderate ecosystem services with moderate protection to high value habitat.	**Ranks 6th**: Retains least ecosystem services overall for all habitat classes.	**Ranks 2nd**: Retains substantial ecosystem services with strict protection to high and medium value stream corridors.	**Ranks 4th**: Retains some ecosystem services. Applies moderate protection to stream corridors but higher protection to upland wildlife habitat.	**Ranks 5th**: Retains minimal ecosystem services due to relaxed protection in areas with high and medium development value.
3. Promotes recreational use and amenities	**Ranks 1st**: Promotes the most recreational benefits by prohibiting development in highest quality habitat lands.	**Ranks 3rd**: Provides moderate recreational benefits by applying relatively strong protection to the highest value habitats.	**Ranks 6th**: Provides least recreational benefits because it applies only moderate protection to highest value habitat.	**Ranks 2nd**: Promotes substantial recreational benefits of stream corridors, does not apply same protection to wildlife habitat.	**Ranks 4th**: Promotes some recreational benefits, mostly on park land.	**Ranks 5th**: Promotes minimal recreational benefits mostly on park land.
4. Distribution of economic tradeoffs	**No rank:** Privately-owned habitat land bears greater proportion of highest protection than publicly-owned habitat.	**No rank**: Privately-owned and publicly-owned land bears equal proportion of highest protection.	**No rank:** Privately-owned and publicly-owned land bears equal proportion of highest protection.	**No rank:** Publicly-owned habitat land bears greater proportion of highest protection than privately-owned habitat land.	**No rank:** Publicly-owned habitat land bears greater proportion of highest protection than privately-owned habitat land.	**No rank:** Publicly-owned habitat land bears greatest proportion of highest protection.
5. Minimizes need to expand the urban growth boundary (UGB) and increase development costs.	**Ranks 6th**: Affects the need to expand the UGB the most; highest level of protection restricts development.	**Ranks 4th**: Moderately affects the need to expand the UGB because of restrictive protection levels.	**Ranks 1st**: Least need to expand UGB; lowest protection levels provide most development opportunity.	**Ranks 5th**: Substantially affects need to expand the UGB because of restrictive protection levels.	**Ranks 3rd**: Some need to expand UGB but less restrictive protection.	**Ranks 2nd**: Minimal need to expand the UGB because low level of protection provides development opportunity.
Social factors						
6. Minimizes impact on property owners	**Ranks 6th:** Affects the most property owners with the highest level of habitat protection regardless of zoning.	**Ranks 4th:** Moderately affects all property owners, but does not apply highest habitat protection anywhere.	**Ranks 1st:** Affects the least number of property owners and applies lower levels of habitat protection.	**Ranks 5th:** Substantially affects large number of property owners with strong protection, especially in residential and rural areas.	**Ranks 3rd:** Affects some business landowners with moderate protection, but high protection is applied to residential and rural owners.	**Ranks 2nd:** Minimally affects business landowners, but many residential and rural property owners are affected with lower levels of protection.
7. Minimizes impact on location and choices for housing and jobs	**Ranks 6th:** Most effect on the location and choices available for jobs and housing by	**Ranks 4th:** Moderate effect on the location and choices available for jobs and housing,	**Ranks 2nd:** Minimal effect on housing location and choices, some effect on job location	**Ranks 5th:** Substantial effect on housing location and choices, moderate effect on	**Ranks 3rd:** Some effect on job location and choices, moderate effect on housing	**Ranks 1st:** Least effect on job location and choices, minimal effect on housing location and

Criteria	Option 1A: Most habitat protection *Highest level of protection for all habitats*	Option 1B: Moderate habitat protection *High level of protection for highest value habitat, moderate protection for other habitats*	Option 1C: Least habitat protection *Moderate level of protection for higher value habitats, no protection for lowest value habitat*	Option 2A: Most habitat protection *Moderate level of protection in high urban development value areas, high level of protection in other areas*	Option 2B: Moderate habitat protection *Low level of protection in high urban development value areas, moderate level of protection in other areas*	Option 2C: Least habitat protection *No protection in high urban development value areas, moderate level of habitat protection in other areas*
	applying high protection levels to all habitats.	applies a medium protection level to residential and employment land.	and choices. Applies lower protection levels to all land regardless of zoning.	job location and choices. Applies high protection levels to residential land, medium protection levels to most employment land.	location and choices. Applies lower protection levels to employment land, moderate protection levels to residential land.	choices. Applies lowest protection levels to employment land, moderate protection levels to residential land.
8. Preserves habitat for future generations	**Ranks 1st:** Preserves the most habitat for future generations by applying high levels of protection to all habitats.	**Ranks 3rd:** Preserves a moderate amount of habitat for future generations, focuses protection on higher value habitats.	**Ranks 6th:** Preserves the least amount of habitat for future generations, applies lower level of protection to higher value habitats.	**Ranks 2nd:** Preserves a substantial amount of habitat for future generations. Higher protection levels applied to highest value stream corridors, moderate and high protection applied to other habitats.	**Ranks 4th:** Preserves some habitat for future generations. Applies some protection to highest value habitats and moderate protection to other habitats.	**Ranks 5th:** Preserves a minimal amount of habitat for future generations. Habitat in areas of high urban development value is not preserved, habitat in other areas receives low and moderate protection.
9. Maintains cultural heritage and sense of place	**Ranks 1st:** Provides the most protection for the highest value habitat, highest level of protection may result in need for expanding the UGB.	**Ranks 3rd:** Provides moderate protection for highest value habitat, less potential for expanding the UGB.	**Ranks 6th:** Provides the least protection to highest value habitat, habitat outside UGB at less risk.	**Ranks 2nd:** Provides substantial protection to highest value habitat, a small portion in high urban development value areas receive moderate protection.	**Ranks 4th:** Provides some protection to highest value habitat; applies low protection to habitat in high urban development value areas.	**Ranks 5th:** Provides minimal protection to highest value habitat, habitat in high urban development values receives no protection.
10. Preserves amenity value of resources (quality of life, property values, views)	**Ranks 1st:** Retains the most amenity value in the highest value habitats.	**Ranks 3rd:** Retains moderate level of amenity value in the highest value habitats.	**Ranks 6th:** Retains least level of amenity value in wildlife habitat, slightly more in stream corridors.	**Ranks 2nd:** Retains substantial amenity value in highest value habitats, more protection for streams than upland habitat.	**Ranks 4th:** Retains some level of amenity value in highest value habitat, more protection for streams than upland habitat.	**Ranks 5th:** Retains a minimal level of amenity value, highest value wildlife habitat receives more protection.
Environmental factors						
11. Conserves existing watershed health and restoration opportunities	**Ranks 1st**: Preserves most high value habitat; provides substantial protection to other habitats.	**Ranks 3rd**: Preserves moderate amount of all habitats; higher protection for highest value habitat.	**Ranks 6th**: Preserves least amount of habitat; moderate protection for higher value habitat; no protection for lowest value habitat.	**Ranks 2nd**: Preserves substantial amount of habitat. Highest protection levels for most high value habitat, moderate protection for other habitats.	**Ranks 4th**: Preserves some amount of habitat. Higher value habitats receive moderate protection levels; other habitats receive lower protection.	**Ranks 5th**: Preserves minimal amount of habitat. Provides low protection levels for all habitat classes, no protection for highest value habitat in some circumstances.
12. Retains multiple habitat functions provided by forest areas	**Ranks 1st**: Retains the most forest cover in both vacant and developed habitat lands.	**Ranks 2nd**: Retains substantial amount of forest cover in both vacant and developed habitat lands.	**Ranks 6th**: Retains least amount of forest cover, likely to result in significant forest habitat loss over time.	**Ranks 3rd**: Retains moderate amount of forest cover, some protection for all forested habitat areas and highest protection for forested habitat in stream corridors.	**Ranks 4th**: Retains some amount of forest cover, some protection for almost all forested habitat areas.	**Ranks 5th**: Retains minimal amount of forest cover, low protection levels for most forested habitat areas.
13. Promotes riparian corridor connectivity and overall habitat	**Ranks 1st**: Promotes most stream corridor continuity and overall habitat connectivity.	**Ranks 3rd**: Promotes moderate retention of connectivity. Provides small	**Ranks 6th**: Promotes least retention of connectivity and likely to result in most	**Ranks 2nd**: Promotes substantial retention of stream corridor continuity; moderate	**Ranks 4th**: Promotes some retention of connectivity in stream corridors and between	**Ranks 5th**: Promotes minimal retention of connectivity, likely to result in significantly

Criteria	Option 1A: Most habitat protection	Option 1B: Moderate habitat protection	Option 1C: Least habitat protection	Option 2A: Most habitat protection	Option 2B: Moderate habitat protection	Option 2C: Least habitat protection
	Highest level of protection for all habitats	*High level of protection for highest value habitat, moderate protection for other habitats*	*Moderate level of protection for higher value habitats, no protection for lowest value habitat*	*Moderate level of protection in high urban development value areas, high level of protection in other areas*	*Low level of protection in high urban development value areas, moderate level of protection in other areas*	*No protection in high urban development value areas, moderate level of habitat protection in other areas*
connectivity		connector habitats with higher protection, does not preserve as much stream corridor continuity.	reduction of regional connectivity. No protection for small connector habitats.	protection for small connector habitats.	upland habitats.	reduced regional connectivity.
14. Conserves habitat quality and biodiversity provided by large habitat areas	**Ranks 1st**: Conserves the most large habitat areas.	**Ranks 2nd:** Conserves a substantial amount of large habitat areas, moderate risk for urban development fragmenting large habitats.	**Ranks 6th**: Conserves least amount of large habitat areas, likely to result in significant fragmentation.	**Ranks 3rd:** Conserves moderate amount of large habitat areas, small amount of low protection applied to portions of some large habitats.	**Ranks 4th:** Conserves some amount of large habitat areas, lower protection levels applied to all large habitats.	**Ranks 5th:** Conserves minimal amount of large habitat areas, likely to result in significant fragmentation of large habitats.
15. Supports biodiversity through conservation of sensitive habitats and species	**Ranks 1st**: Supports the most biodiversity by applying highest levels of protection to sensitive habitats and stream corridors.	**Ranks 2nd/3rd:** Supports a substantial amount of biodiversity, applies more protection to sensitive habitats than stream corridors.	**Ranks 5th:** Supports a minimal amount of biodiversity, applies moderate protection level to sensitive habitats and stream corridors.	**Ranks 2nd/3rd:** Supports a substantial amount of biodiversity, applies more protection to stream corridors than sensitive habitats.	**Ranks 4th:** Supports some biodiversity, applies higher protection to stream corridors than sensitive habitats.	**Ranks 6th:** Supports the least amount of biodiversity, likely to result in substantial loss of sensitive habitats and sensitive species.
Energy Factors						
16. Promotes compact urban form	**Ranks 6th**: Promotes compact urban form the least. Highest protection levels applied to vacant land intended for urban uses (housing & jobs).	**Ranks 4th:** Moderately promotes compact urban form. Some reduction in development potential on all habitat land.	**Ranks 1st**: Promotes compact urban form the most. Development allowed in lowest habitats, moderate protection to other habitat lands.	**Ranks 5th:** Minimally promotes compact urban form. Development opportunities reduced in all habitat areas.	**Ranks 3rd:** Promotes some amount of compact urban form. Development opportunities reduced in most habitat areas.	**Ranks 2nd:** Substantially promotes compact urban form. Development opportunities on business land less impacted than residential land.
17. Promotes green infrastructure	**Ranks 1st:** Conserves the most vegetation and forested areas.	**Ranks 3rd:** Conserves a moderate amount of vegetation and forested areas.	**Ranks 6th:** Conserves the least amount of vegetation and forested areas.	**Ranks 2nd:** Conserves a substantial amount of vegetation and forested areas.	**Ranks 4th:** Conserves some vegetation and forested areas.	**Ranks 5th:** Conserves a minimal amount of vegetation and forested areas.
Other criteria						
18. Assists in protecting fish and wildlife protected by the federal Endangered Species Act	**Ranks 1st:** Provides most protection to sensitive habitats; most protection for hydrology and riparian functions; most likely to protect sensitive species.	**Ranks 3rd**: Provides substantial protection to sensitive habitats and species. Similar to 2A, but provides less protection for hydrologic conditions.	**Ranks 6th:** Provides least protection to sensitive habitats and species, hydrology. Minimal protection for riparian functions.	**Ranks 2nd:** Provides substantial protection to sensitive habitats and species. Similar to 1B, but provides more protection for hydrologic conditions.	**Ranks 4th:** Provides some protection to sensitive habitats; less likely to maintain hydrologic conditions or riparian functions.	**Ranks 5th:** Provides minimal protection to sensitive habitats and species and hydrology. Provides least protection for riparian functions.
19. Assists in meeting water quality standards required by the federal Clean Water Act	**Ranks 1st:** Provides most protection for clean water. Most protective of forest canopy, habitat near streams and on steep slopes; most protection for hydrology.	**Ranks 3rd**: Provides moderate protection for clean water. Moderate protection for for slopes, wetlands, and resources near streams. Substantial protection for forested areas.	**Ranks 5th:** Provides minimal protection for the natural resources important to protecting water quality. Least protection for forested areas.	**Ranks 2nd:** Provides substantial protection for clean water, with strict protection for slopes, wetlands, and resources near streams. Moderate protection for forested areas.	**Ranks 4th:** Some protection for slopes and wetlands, hydrologic conditions, habitat near streams, hydrologic conditions and forest. Potential for decreased water quality.	**Ranks 6th:** Provides least protection for slopes and wetlands, habitat near streams, and hydrology; minimal protection for forested areas. Most potential for poor water quality.

CHAPTER FIVE: SUMMARY AND CONCLUSIONS

Protecting fish and wildlife habitat in the urban area is complex, and there are many important tradeoffs to balance. Metro's consideration of several non-regulatory tools for habitat protection describes several approaches that could be developed further, building on the restoration, education, and acquisition work that Metro currently does. Metro's analysis of the six regulatory program options identifies the number of affected acres of land in each habitat and urban development class, and describes the economic, social, environmental, and energy consequences associated with various protection levels. Evaluating the performance of each option against the 19 criteria provides the Metro Council with valuable information necessary to choose which type of regulatory approach makes the most sense for the region. Non-regulatory and regulatory tools can be complementary, increasing the effectiveness of each approach. This chapter includes:

- a brief summary of the potential non-regulatory tools,
- results of the analysis of the six regulatory options,
- a discussion of the interaction between non-regulatory and regulatory tools,
- potential funding sources, and
- the next steps in the development of a regional fish and wildlife habitat protection program.

Potential non-regulatory tools for habitat protection

While there is substantial evidence of current non-regulatory efforts accomplishing habitat protection, restoration, and education in the Metro region, they have not been successful in preventing the decline in overall ecosystem health. Most non-regulatory programs are dependent on unsteady sources of grant funding, volunteerism, and good stewardship, often without recognition or reward. Each program conducts important work, but even taken as a whole over the past decade only a small portion of the habitat in the region received the attention needed. There is a much greater need for restoration dollars; technical assistance for landowners, developers, and local jurisdictions; and permanent protection for critical habitats than is currently available.

There are many types of non-regulatory tools that could be used to protect and restore fish and wildlife habitat in the region. All of these tools require some type of funding, whether to pay for staff or provide direct dollars to purchase or restore land. Many of the non-regulatory tools could be implemented at either the local or regional level. Below is a list of tools identified in this report:

- Stewardship and recognition programs
- Grants for restoration and protection
- Information resources
- Technical assistance program
- Habitat education activities
- Volunteer activities
- Agency-led restoration activities
- Acquisition

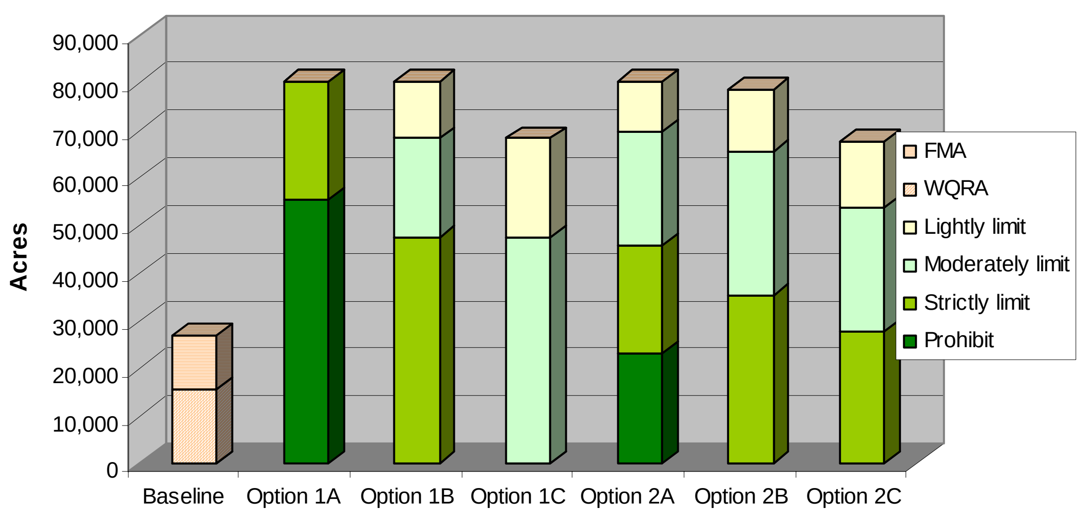
Acquisition is the most effective non-regulatory tool to achieve habitat protection. Acquisition achieves permanent protection and also preserves land to be restored at a later date. However, the high cost of purchasing land, especially within the urban growth boundary, and the dependence of an acquisition program on willing sellers limits the effectiveness of such a program.

Many of the other non-regulatory habitat protection and restoration tools considered in this report are most effective when used in combination with each other and/or along with a regulatory program. A regulatory program can provide the incentive and motivation to develop innovative solutions to land development while protecting habitat. Grants and technical assistance are the tools that could be most effective in protecting and restoring habitat, in the absence of an acquisition program. A stewardship recognition program could help promote grants and serve to educate others about innovative practices. Coordinating with existing agencies and volunteer groups that conduct restoration as well as providing funds to focus efforts could be effective in enhancing regionally significant habitat.

Comparison of regulatory options

Metro developed six regulatory options to protect land classified as regionally significant fish and wildlife habitat. Three of the options consider habitat quality (1A, 1B, and 1C) and three options (2A, 2B, and 2C) consider habitat quality and urban development value. Five possible treatments are applied in the options, identifying whether development would be allowed, lightly limited, moderately limited, strictly limited, or prohibited. The six options were evaluated based on how they met 19 criteria. Most of the criteria were based on the issues identified in Metro's general evaluation of the economic, social, environmental, and energy tradeoffs, two criteria were based on how well the options met the federal Endangered Species Act and Clean Water Act. Figure 5-1 graphically illustrates how the five treatment levels are applied in the six options as compared to the baseline regulations (Title 3).

Figure 5-1. Habitat protected by option
(vacant & developed land; does not include impact area)



Overall, the options that protect the highest-value habitat (Options 1A and 2A) perform similarly. The option that provides the least protection for the highest-value habitat (Option 1C) and the option with the lowest level of protection in the industrial and commercial areas (Option 2C) also perform similarly. However, Option 2C favors factors important for urban development while Option 1C reduces protection levels equally for all land uses. Table 5-1 compares the tradeoffs of applying the six regulatory options.

Table 5-1. Comparing the regulatory options.

Options 1A, 2A	Options 1B, 2B	Options 1C, 2C
• Reduces development opportunities within the existing urban growth boundary • Increases possibility of expanding the urban growth boundary, potentially increasing development costs (such as streets and utility connections) • Potentially adds to the cost of urban development (such as environmental review process, low impact development standards) • Protects the most habitat and restoration opportunities • Preserves the most ecosystem services (such as flood management and water quality) • Promotes conservation of sensitive species (such as Pileated woodpeckers and painted turtles) and at risk habitats (such as white oak forests and wetlands) • Supports cultural heritage (such as salmon), regional identity (such as proximity to open spaces), and amenity values (such as property values) • Greatest affect on the location and choices for jobs and housing • Increases property owner concerns about limiting use of land, especially single family residential	These options provide the middle ground between the most restrictive and least restrictive options.	• Provides the most development opportunities within the current urban growth boundary • Minimizes need to expand the urban growth boundary by allowing compact urban development • Supports urban centers and industrial areas by not applying new regulations (Option 2C) • Minimizes habitat protection and preserves the fewest restoration opportunities (but may increase future cost to restore ecosystem services such as flood control) • Increases habitat fragmentation along streams and between streams and upland habitats • Reduces variety of plants and animals that make up a healthy ecosystem • Increases energy demand for cooling air and water temperatures by removing trees and vegetation • Reduces opportunity for future generations to enjoy fish and wildlife habitat and their associated benefits • Minimizes property owner concerns about limiting use of land, especially residential and business land

Interaction of non-regulatory and regulatory tools

A program to protect fish and wildlife habitat may be most effective if it includes a variety of tools and approaches, both non-regulatory and regulatory. Both approaches have strengths and weaknesses, for example non-regulatory tools rely heavily on funding and willing landowners, while regulations only apply when triggered by a land use action. While regulatory and quasi-regulatory tools can offer some flexibility, regulations can and often are used to achieve a baseline level of protection. Protection can be greatly enhanced by supplementing a regulatory component with non-regulatory tools for fish and wildlife habitat protection. If a program option is chosen that includes less regulatory protection then it may be necessary to apply more non-regulatory approaches and a higher level of funding if the same level of habitat protection is desired. The following constitutes a brief summary of how acquisition and incentives can interact with and increase the effectiveness of regulatory tools.

Incentives and regulations

When used in conjunction with regulations, the opportunity of incentives to encourage fish and wildlife habitat protection on private lands cannot be overstated. Through tax benefits, regulatory certainty, public recognition, cost sharing, and other incentives, landowners can be encouraged and rewarded for protecting valuable fish and wildlife habitat on their property. Takings issues, whether actual or perceived, are important to many property owners, thus regulatory programs may be unpopular. The application of incentives, however, can provide willing landowners some kind of compensation for conserving habitat on their land. Incentives can thus be used to support compliance with regulations or to fill in protection gaps for regionally significant habitat where regulations are not applied.

The Riparian Lands Tax Incentive Program (RLTIP), for example, can potentially apply in already urbanized areas to protect regionally significant riparian corridors adjacent to private property where the standards of buffer programs may be difficult to implement. Inside the UGB, where most of the significant riparian corridor habitat is developed rather than vacant, incentives can offer a tremendous opportunity to encourage voluntary protection and restoration. Other incentives[38] can apply to new development or redevelopment where habitat-friendly development is a feasible option for stormwater management and erosion and sediment control.

Acquisition and regulations

Just as incentive programs and regulatory tools can work together to protect significant habitat, combining acquisition with regulatory and quasi-regulatory approaches can create a more comprehensive protection strategy for fish and wildlife habitat. Further, where regulatory tools and incentive programs fail to provide adequate protection, acquisition of land from willing sellers offers a last line of defense for the habitat. Acquisition, by willing sellers, can be applied to conserve some of the remaining significant habitat.

Regulatory flexibility

Regulations to protect fish and wildlife habitat limit development options on land with habitat value. Some ways in which regulations could limit development include lowered density, minimum disturbance areas, and setbacks from significant resources. Incentives can work with regulations to allow development to occur in a manner that reduces the impact on the habitat. For example, cluster development, streamside buffers, and habitat-friendly development

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[38] Such as: the City of Portland's Bureau of Environmental Services (BES) Ecobiz and Ecoroof Programs, the city's Office of Sustainable Development's (OSD) G-Rated Program, and Oregon Department of Environmental Quality's (DEQ) Nonpoint Source Pollution Control Facility Tax Credit Program (NSPCFTC). BES's Ecoroof Program, for example, provides developers with sewer rate discounts for building greenroofs on new buildings or for retrofits, while the DEQ's NSPCFTC program provides cost share opportunities for other innovative LID stormwater management designs. The soon-to-be-implemented Ecobiz program will serve to further encourage the use of LID for new and redevelopment by publicly recognizing landscapers who use these designs.

techniques can all provide some level of regulatory flexibility that allows development to occur while protecting habitat.

Cluster development

Clustering and open space development are land division and development tools used to conserve land on one portion of a site in exchange for concentrated development on another portion of the site. Typically, road frontages, lot sizes and setbacks are relaxed to allow the preservation of open space areas. Clustering has the potential for regulatory flexibility because ordinances implementing these tools can be designed to establish performance standards with objective evaluation criteria for protecting resources from development.

Riparian buffer performance standards

Riparian buffers frequently establish predominantly fixed-width setback standards to protect habitat in and around streams, wetlands and riparian areas. Buffer programs tend to regulate actions rather than establish standards to achieve a specific outcome or performance. However, the potential exists to establish performance standards when implementing buffer programs and to protect fish and wildlife habitat. Some of these standards can include, but are not limited to: variable-width provisions that allow a buffer to expand and contract with the landscape; maintaining or enhancing percentages of native forest cover within buffer areas; and reducing impervious surfaces and road crossings through buffer areas.

Low impact, habitat-friendly development

Low Impact Development (LID) tools, especially those for reducing impervious surfaces and controlling stormwater, contain the most flexible standards from a performance-based perspective. Since the primary objectives of LID are to improve hydrologic conditions and increase water quality in urban watersheds, many LID ordinances, whether mandatory or voluntary, provide flexibility in the types of practices that can be used to meet these objectives. Since LID tools also focus on improving water quality, many jurisdictions specify objective criteria that can be used to evaluate the outcome or performance. Such criteria include, but are not limited to: the number and lengths of roads and other impervious surfaces reduced; percentages of tree canopy maintained or created; maintenance or reduction of stream temperatures; amount of sediment, nutrient, and pollutant loading to water reduced; and the minimization of runoff volumes.

Funding

Protecting and restoring fish and wildlife habitat costs money, with either a non-regulatory focus, regulatory approach, or a combination of the two. All non-regulatory programs would require some type of funding, either to purchase land, restore habitat, provide grants for habitat-friendly development, or to retain staff to develop a technical assistance or stewardship recognition program. Nor are regulations without cost. Staff time (regional and local) is used to develop ordinances and implement new laws and changes in development capacity may result in a reduced property tax base for local partners.

Funding for habitat protection programs could be provided by a non-specific mechanism such as a bond measure or Metro’s excise tax on solid waste, or a funding source could be tied to specific activities that impact fish and wildlife habitat. Below are several ideas for raising funds for protecting and restoring fish and wildlife habitat that could be implemented at the regional or local level.

Increase Metro's excise tax

Metro collects an excise tax on each ton of solid waste produced within the region. An additional per ton fee could be added that would be dedicated to funding the protection and restoration of fish and wildlife habitat. Such a decision would require an action of the Metro Council.

Urban area inclusion fee

Metro manages the region's urban growth boundary (UGB), expanding it according to development needs as the region grows. Land outside the UGB is not allowed to develop at urban capacities. When the boundary expands the new lands increase in value due to the increased ability to develop. An urban area inclusion fee would capture a portion of this increase in the value of property due to inclusion within the UGB. Funds raised could be used to purchase or restore habitat land within Metro's jurisdiction. It could be targeted to lands in the expansion areas as they are developed.

The *Incentives Report* included substantial review of this tool. Based on that study, a partition fee seemed to have the best potential for successful implementation as a method of collecting revenue. A partition fee could be imposed as a flat fee uniformly applied across all land parcels on a per lot or per acre basis. Since the fee would be collected when land is partitioned (typically a one-time event), it would not be assessed multiple times on the same property. Revenue would depend on the amount of developable land brought inside the UGB, the pace of development in the expansion areas, and the proposed fee rate.

Systems development charge (SDC) program

Local jurisdictions, typically municipalities, across the state regularly apply SDCs to new development in an attempt to pay for the cost of new infrastructure. SDCs can only be charged for specified purposes, *water supply, treatment and distribution, drainage and flood control*, and *parks and recreation* all could be construed to relate to the protection and restoration of fish and wildlife habitat. SDCs are a major cost for new development, and the imposition of any additional charge is likely to be challenged in a court of law.

An SDC could be collected to fund mitigation of the environmental impacts of development on fish and wildlife habitat. Fees would be collected by the permitting agency. However, fees generated through an SDC must be used on "capacity increasing capital improvements " that "increase the level of performance or service provided by existing facilities or provides new facilities" (ORS § 223.307(2)). It may be difficult to tie protection or restoration of habitat to a capacity increasing improvement. A more legally viable argument could be made if a regional SDC was collected for stormwater management.

Stormwater management fee

Water providers (e.g., Clean Water Services, Portland Bureau of Environmental Services) collect fees for stormwater management purposes. Some of these funds are currently used for restoration activities, but Metro could encourage these agencies to devote more dollars to habitat protection and restoration. Metro could also impose a regional fee to be used for restoration and protection of significant fish and wildlife habitat to be collected by the water providers.

Bond measure

Metro could put forth a regional bond measure to raise funds to purchase or restore habitat lands from willing sellers. The 1995 Parks and Openspaces bond measure was very successful and allowed the creation of a system of regional parks and trails that will be appreciated for generations. A similar approach could be taken focused on Metro's fish and wildlife habitat inventory. The voters would need to pass a bond measure, and polling has shown that a targeted approach is most likely to be successful. Fish and wildlife habitat targets could include purchasing and restoring Habitats of Concern and floodplains. Funds could also be used to purchase properties that are significantly affected by new regulations.

Funds from outside sources

There are funds to protect fish and wildlife habitat that could be raised from other sources such as national non-profits and federal agencies. Land conservancy organizations could be contacted to encourage the purchase of targeted habitat types (e.g., Nature Conservancy, Trust for Public Land). The US Fish and Wildlife Service has funds available for restoration in urban areas, and has worked in partnership with Metro's Parks Department to provide grants to property owners and organizations to conduct restoration activities. The city of Portland received a grant from the Federal Emergency Management Agency (FEMA) to acquire lands in the Johnson Creek floodplain after the floods of 1996. Additional partnerships with federal agencies could be pursued. Such an effort would require staff time to develop and implement programs for protection or restoration.

Next steps

The Metro Council is scheduled to consider a program direction, including non-regulatory and regulatory components, in May 2004 after a rigorous review process during which the public, local partners, and interested stakeholder groups will have the opportunity to provide input on the best approach for protecting fish and wildlife habitat in the region. Metro will then develop a program to protect fish and wildlife habitat to be considered by the Council in December 2004. Metro's program would include a standard ordinance and may include provisions for a riparian or wildlife district plan as a means of substantial compliance.

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EXHIBIT F -- ORD. NO. 05-1077C
ATTACHMENT 5. SEPT. 2004 HABITAT INVENTORY UPDATE

Habitat Class & Habitat Conservation Area (HCA)	Developed			Parks			Total Devel. & Park Habitat	Vacant				Total Vacant Habitat	Total Devel., Park, & Vacant Habitat
								Constrained			Unconstrained		
	Inside Title 3 FMA	Inside Title 3 WQRA	Outside WQRA/FMA	Inside Title 3 FMA	Inside Title 3 WQRA	Outside WQRA/FMA		Inside Title 3 FMA	Inside Title 3 WQRA	Outside WQRA/FMA	Outside Title 3		
Class I Riparian Corridors													
HIGH HCA	624	1,499	1,654	3,729	5,041	3,509	16,056	1,517	4,425	1,002	4,127	11,070	27,126
MODERATE HCA	85	227	81	168	123	22	707	537	687	227	633	2,084	2,790
LOW HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOW	1	0	1	0	0	0	3	2	0	0	0	2	5
Total acres	*711*	*1,726*	*1,736*	*3,897*	*5,164*	*3,532*	*16,765*	*2,056*	*5,112*	*1,229*	*4,760*	*13,156*	*29,921*
Class II Riparian Corridors													
HIGH HCA	1	2	2	1	1	4	11	1	1	0	1	4	14
MODERATE HCA	163	742	1,121	667	350	602	3,645	480	778	253	1,742	3,254	6,899
LOW HCA	142	303	325	17	7	5	799	378	312	162	795	1,646	2,445
ALLOW	6	1	6	0	0	1	14	4	0	1	2	6	20
Total acres	*311*	*1,048*	*1,453*	*685*	*359*	*612*	*4,468*	*862*	*1,092*	*416*	*2,540*	*4,910*	*9,378*
Class III Riparian Corridors													
HIGH HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
MODERATE HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
LOW HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOW	2,165	156	1,000	62	7	134	3,523	61	23	99	482	665	4,188
Total acres	*2,166*	*156*	*1,000*	*62*	*7*	*134*	*3,524*	*61*	*23*	*99*	*482*	*665*	*4,189*
Class A Wildlife Habitat													
HIGH HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
MODERATE HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
LOW HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOW	34	63	2,536	51	107	6,858	9,649	32	201	891	6,254	7,379	17,027
Total acres	*34*	*63*	*2,536*	*51*	*107*	*6,858*	*9,649*	*32*	*201*	*891*	*6,254*	*7,379*	*17,028*
Class B Wildlife Habitat													
HIGH HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
MODERATE HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
LOW HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOW	7	27	3,343	8	16	1,323	4,724	25	97	716	7,312	8,150	12,874
Total acres	*7*	*27*	*3,343*	*8*	*16*	*1,323*	*4,724*	*25*	*97*	*716*	*7,312*	*8,150*	*12,874*
Class C Wildlife Habitat													
HIGH HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
MODERATE HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
LOW HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOW	16	14	1,901	13	16	805	2,766	70	81	459	3,776	4,386	7,152
Total acres	*17*	*14*	*1,901*	*13*	*16*	*805*	*2,766*	*70*	*81*	*459*	*3,776*	*4,386*	*7,152*
Total Habitat	*3,246*	*3,035*	*11,969*	*4,715*	*5,668*	*13,263*	*41,897*	*3,105*	*6,607*	*3,810*	*25,124*	*38,646*	*80,542*
Impact Areas													
HIGH HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
MODERATE HCA	0	0	2	0	0	0	2	0	0	0	0	0	2
LOW HCA	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOW	361	763	9,809	166	131	968	12,197	103	326	608	3,327	4,364	16,561
Total acres	*361*	*763*	*9,810*	*166*	*131*	*968*	*12,199*	*103*	*327*	*608*	*3,327*	*4,365*	*16,564*