ENVIRONMENTAL OVERLAY ZONE MAP CORRECTION PROJECT

VOLUME 2:

General Economic, Social, Environmental & Energy Analysis

Discussion Draft

November 2019

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.
City of Portland, Oregon

How to Comment

You may submit comments to Bureau of Planning and Sustainability staff on the Environmental Overlay Zone Map Correction Discussion Draft by:

Email
Send an email to ezone@portlandoregon.gov

U.S. Mail
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201
Attention: Ezone Map Correction Project

For more information
Visit the project website: https://www.portlandoregon.gov/bps/e-zone
Contact the project team: 503-823-4225

COMMENTS DUE: **January 31, 2020**

Acknowledgements

This plan is the culmination of three years of work across the City of Portland. Many thanks to the thousands of stakeholders, property owners, renters, business owners and interested people who attended dozens of neighborhood and community meetings and invited staff to their homes and businesses to perform site visits.

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A. Introduction and Background

Oregon State Land Use Goal 5, Open Spaces, Scenic and Historic Areas, and Natural Resources, establishes a process in which natural resources are inventoried and evaluated for significance. If a resource is found to be significant, the local government must evaluate the consequences of three policy choices: protecting the resource, allowing proposed uses that conflict with the resource, or limiting proposed uses that conflict with the resource by establishing a balance between protecting and allowing uses. The ESEE analysis is the process used to evaluate the conflicts and protection options. The local government must then adopt a program based on the results of this evaluation.

Portland has an existing environmental program that is in compliance with State Land Use Goal 5. The program began in 1989 in the Columbia Slough Watershed and was finalized in 2004 in the Pleasant Valley Plan District.

The purpose of General ESEE analysis is to establish a consistent baseline recommendation for the protection of natural resources. This ESEE analysis evaluates the economic, social, environmental and energy trade-offs associated with prohibiting, limiting or allowing uses that conflict with significant natural resources. The result is recommendations regarding which natural resources should be protected. The General ESEE recommendations are then affirmed, clarified or modified by additional resource site-specific ESEE analyses found in Volume 3, Part A-G. The end results are ESEE decisions for each resource site and the decisions are implemented by adjusting the environmental overlay zone boundaries to match the ESEE decisions. The draft adjusted overlay zone boundaries are found in Volume 1.

B. Relationship to Previous Protection Plans

The Environmental Overlay Zone Map Correction Project repeals and replaces the Statewide Planning Goal 5 inventories, ESEE analysis, recommendations and decisions related to natural resources and contained in the following conservation and protection plans:

1. Balch Creek Watershed Protection Plan (1991) – full replacement
2. Northwest Hills Natural Areas Protection Plan (1992) – full replacement
3. Southwest Hills Resource Protection Plan (1992) – full replacement
4. East Buttes, Terraces and Wetlands Conservation Plan (1993) – *partial* replacement
5. Fanno Creek and Tributaries Conservation Plan (1993) – full replacement
6. Skyline West Conservation Plan (1994) – full replacement
7. Southwest Community Plan (1997) – full replacement
8. ESEE Analysis and Recommendation for Natural, Scenic and Open Space Resources within Multnomah County Unincorporated Areas (2002) – full replacement
9. Johnson Creek Basin Protection Plan (1991, 1997, 1998, 2003) – full replacement

This ESEE does not repeal or replace any ESEE analyses or decisions related to Statewide Planning Goal 5 scenic, historic or cultural resources contained within the previously adopted plans listed above. When only partial replacement occurs, those portions of the previous plans that remain in effect are clarified in the document.

C. ESEE Methodology

The Goal 5 rule (OAR 660-023-0040) requires local governments to follow these steps:

1. Determination of significance. Local governments must assess inventoried natural resources to determine if the resources are "significant" based on location and relative quantity and quality. Resources that have been deemed significant must then be evaluated to determine if and how those resources should be protected.

2. Determine the impact area. Local governments shall determine an impact area for each resource site. The impact area shall be drawn to include only the area in which allowed uses could adversely affect the identified significant scenic resources. The impact area defines the geographic limits within which to perform ESEE analysis.

3. Identify conflicting uses. Local governments shall identify conflicting uses that exist, or could occur, within resource sites. To identify these uses, local governments shall examine land uses allowed outright or conditionally within the zones applied to the resource site and in its impact area. A "conflicting use" is a land use or other activity reasonably and customarily subject to land use regulations, that could adversely affect a significant resource (except as provided in OAR 660-023-0180(1)(b)). Conflicting uses described in two categories: 1) common impacts of conflicting uses that occur in any zone; and 2) conflicting uses that are specific to each base zone.

4. Analyze the ESEE consequences. Local governments shall analyze the ESEE consequences that could result from decisions to allow, limit, or prohibit a conflicting use. The analysis may address each of the identified conflicting uses, or it may address a group of similar conflicting uses.

5. Develop a program. Based on and supported by the analysis of ESEE consequences, local governments shall determine whether to allow, limit, or prohibit identified conflicting uses that could negatively affect significant natural resources:

(a) *Prohibit* – A local government may decide that a significant natural resource 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.

(b) *Limit* – A local government may decide that both the significant natural resource and the conflicting uses are important compared with each other and, based on the ESEE analysis, the conflicting uses should be allowed in a limited way that protects the resource to a desired extent or requires mitigation of loss of scenic resources.

(c) *Allow* – A local government may decide that the conflicting uses should be allowed fully, notwithstanding the possible impacts on the significant natural resources. The ESEE analysis must demonstrate that the conflicting use is of sufficient importance relative to the resource and must

indicate why measures to protect the resource to some extent should not be provided, as per subsection (b) of this section.

The City of Portland has an established program that applies environmental overlay zones to significant natural resources based on the adopted ESEE decisions. The established program does not result in a *prohibit* decision for any significant natural resources. Instead the program clarifies that for some natural resources the conflicting uses should be *strictly limited*, while for other natural resources the conflicting uses should simply be *limited*. The *strictly limit* and *limit* decisions are both consistent with the Goal 5 *limit* definition because neither prohibits conflicting uses.

In the City's existing implementation program, a protection overlay zone (p-zone) is applied to natural resources where conflicting uses should be *strictly limited*; and a conservation overlay zone (c-zone) is applied to natural resources where conflicting uses should be *limited*. A river environmental overlay zone (river e-zone) may be applied, instead of the p- or c-zone, where conflicting uses should be either *strictly limited* or *limited*. When there was a decision to fully *allow* the conflicting uses, no environmental overlay zone is applied.

D. Determination of Significance

The Natural Resources Inventory, presented in Volume 3, Part A-H and methodology described in Appendix B, describes and provides a map of the existing natural features and functions in Portland.

<u>Riparian Corridor Resources</u>
OAR 660-023-0090(3) states that a determination of significance is made using the standard inventory process as described in OAR 660-023-0030(4). The standard inventory process for determining significance is based on the quality, quantity and location information as well as any additional criteria adopted by the local government.

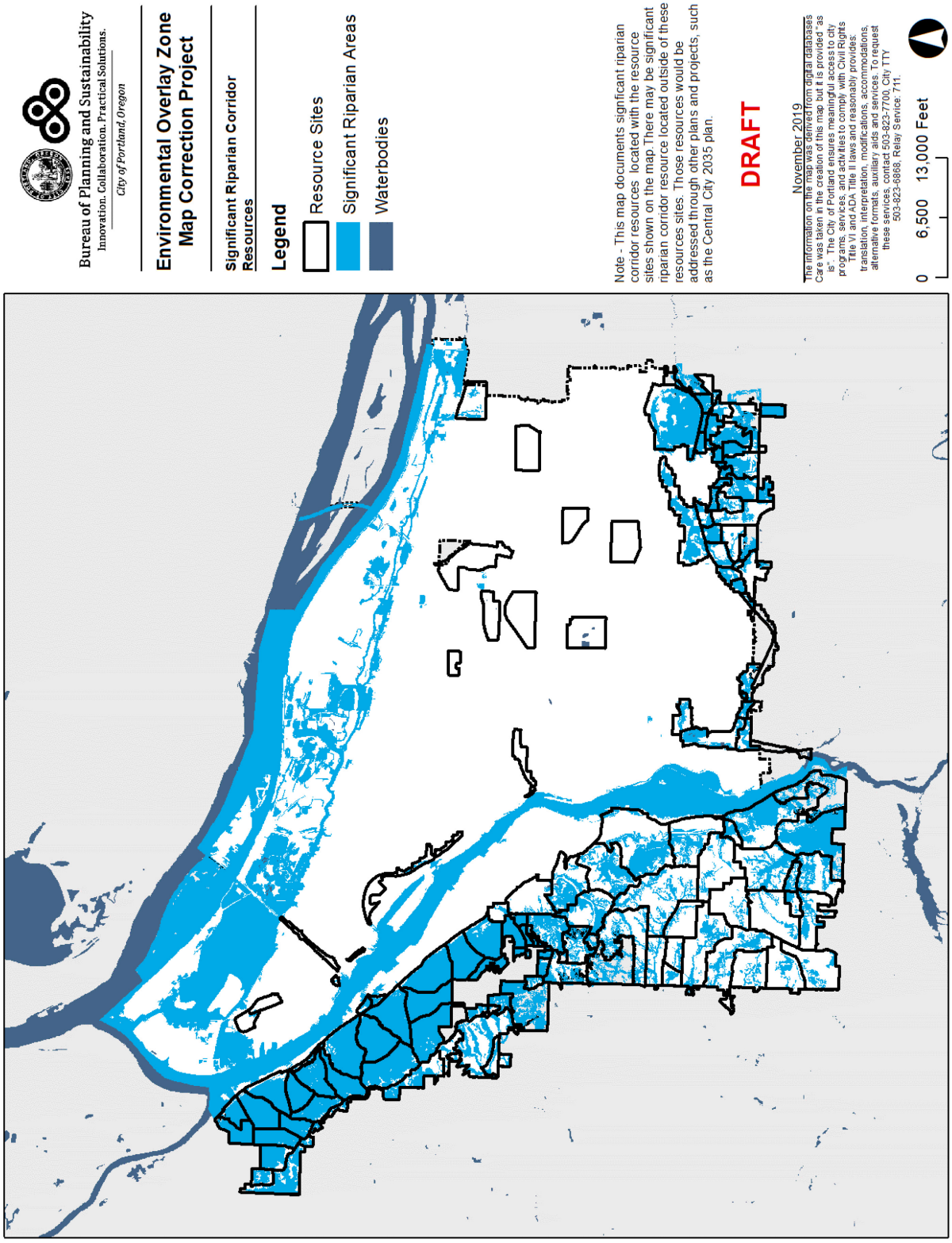
Pursuant to OAR 660-023-0030(4), all resource sites containing natural resource features mapped as providing riparian corridor functions are determined to be significant (Map 1).

> **Significant riparian features include:** rivers, streams (perennial and intermittent), wetlands and flood areas (vegetated and developed); forest, woodland, shrubland or herbaceous vegetation within 300 feet of waterbodies; forest vegetation on steep slopes (>25% slope) contiguous to and within 780 feet of waterbodies; and developed land within 50 feet of waterbodies.
>
> **Significant riparian functions include:** microclimate and shade; stream flow and moderation; bank function and sediment, pollution and nutrient control; large wood and channel dynamics; organic inputs, food web and nutrient cycling; and riparian wildlife movement corridor.

Rivers, streams (perennial and intermittent), wetlands and flood areas (vegetated and developed) and the land surrounding these waterbodies are essential components for providing properly functioning habitat for fish and wildlife. Several functions important for fish and wildlife are influenced by the entire system of interconnected waterbodies and flood areas. For example, studies have shown that water

temperature, a limiting factor for many aquatic species, is influenced by vegetation adjacent to the waterbody as well as upstream and upland conditions (Pollock and Kennard, 1998). The hydrologic regime of a stream at any given point is directly related to development patterns and activities throughout the entire contributing watershed (Wigmosta et al, 1994; Booth 2000).

In urban areas the functions of aquatic ecosystems are altered. Increased urbanization causes increased stormwater flow, additional input of sediments and contaminants, and reduction of organic inputs within rivers, streams and wetlands. In urban areas, buffers around waterbodies are necessary to protect the water quality, water quantity and fish and wildlife habitat (Johnson and Ryba, 1992). When there is existing development near waterbodies that have a negative impact on quality and quantity, existing impacts should be minimized/mitigated and additional development should be avoided to maintain habitat for aquatic and riparian-associated wildlife. These developed areas also represent an opportunity for restoration to improve the conditions and functions provided by the altered aquatic ecosystem.



Map 1: Significant Riparian Corridor Resources

Wildlife Habitat Resources

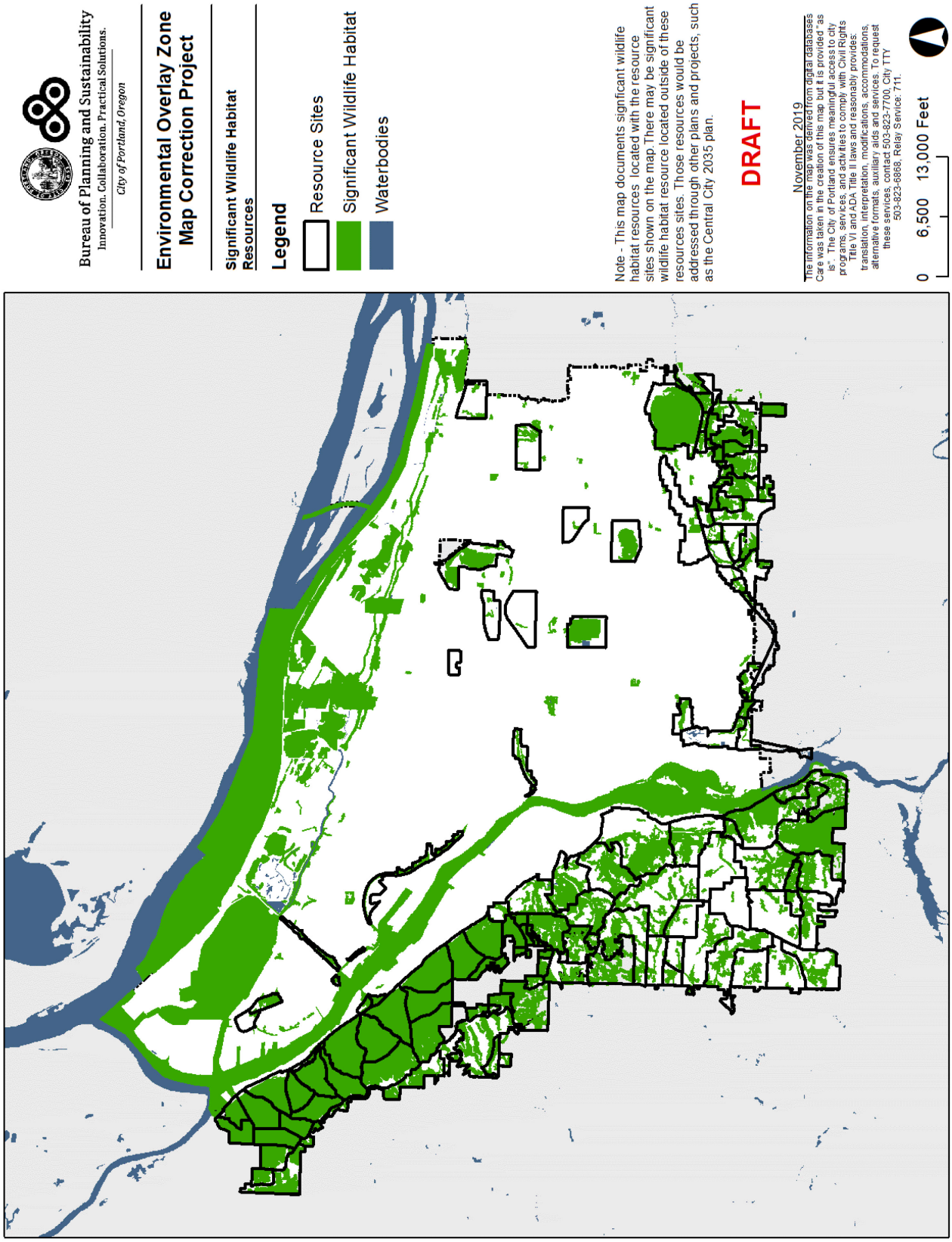
OAR 660-023-0110(4) states that a determination of significance is made using the standard inventory process as described in OAR 660-023-0030(4). The standard inventory process for determining significance is based on the quality, quantity and location information as well as any additional criteria adopted by the local government.

Pursuant to OAR 660-023-0030(4), all resource sites containing areas mapped as providing wildlife habitat are determined to be significant (Map 2).

> **Significant wildlife habitat features include:** forest patches and associated and contiguous woodland patches two acres in size or larger; wetlands; and Special Habitat Areas.
>
> **Significant wildlife habitat functions include:** food and water; resting, denning, nesting and rearing; movement and migration; reduction of noise, light and vibration; and functions specific to Special Habitat Areas including habitat patches that support special status plant, fish and wildlife species.

Special Habitat Areas (SHA) contain or support special status fish or wildlife species, sensitive/unique plant populations, wetlands, native oak, bottomland hardwood forests, riverine islands, river deltas, migratory stopover habitat, wildlife connectivity corridors, grassland and other unique features (e.g., bridges that provide nesting opportunities for Peregrine falcons).

Wildlife habitat loss has been pervasive in Portland and the region and has resulted in widespread fragmentation and degradation of the remaining habitats. Several habitat types and many wildlife and fish species are considered *at-risk* by federal, state or local natural resource agencies. Therefore, all remaining wildlife habitat is significant for supporting native plants and wildlife. Remaining large patches of habitat typically contain more diversity of vegetation, more downed wood and leaf litter, and less edge impacts (noise, light, vibration) than smaller patches. However, in the urban context even small patches of habitat or lines of street trees provide critical stepping blocks between riparian areas and larger habitat areas. Urban habitat is also impacted by non-native plants that can push out native vegetation; this represents an opportunity for restoration.



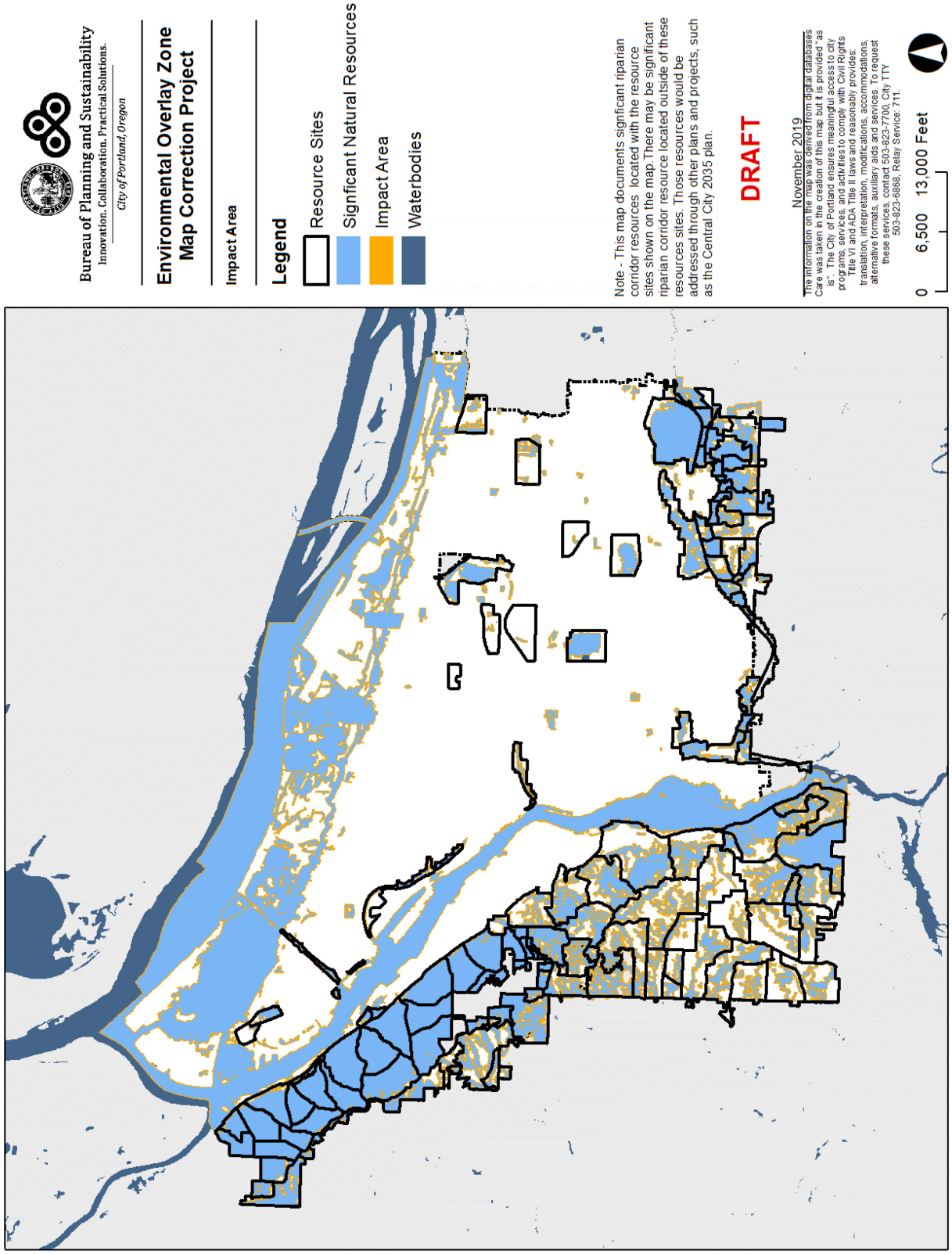
Map 2: Significant Wildlife Habitat Resources

E. Impact Area

A required step in the ESEE analysis is to identify "impact areas." An impact area is the area surrounding natural resources that may impact the quality, quantity, functionality or extent of those resources. Per the Goal 5 rule:

> *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 660-023-040 (3).*

The effects of urbanization on the natural resource feature and functions are pervasive. The cumulative effects of vegetation removal, development of impervious surfaces, and filling in flood areas and wetlands impact natural resources throughout Portland. More direct impacts are seen in closer proximity to the significant natural resource features. The impact area is land, natural features and development, within 100 feet of significant riparian corridor habitat and land, natural features and development within 25 feet of significant wildlife habitat (Map 3).



Map 3: Impact Area

F. Conflicting Use Analysis

In Portland there are uses, such as vegetation remove and development of structures, that if allowed would negatively impact significant natural resources. These are called *conflicting uses*. Conflicting uses are identified by evaluating what is allowed, outright or conditionally, by the base zones applied throughout Portland.

The conflicting uses are consolidated into two categories: 1) common impacts of conflicting uses that occur in any base zone; and 2) conflicting uses that are specific to each base zone. Below are descriptions of the conflicting uses and how those uses may negatively impact significant natural resources.

1. Common Impacts of Conflicting Uses

Development and disturbance activities can adversely affect natural resources found within each of the City's base zones; however, the degree or intensity of the impacts may vary depending on the intensity of the land use, the form, layout or design of the development, construction protocols or ongoing operation and maintenance activities. Below is a description of activities associated with the conflicting uses, and their related impacts on natural resources.

The following impacts are site specific and cumulative with respect to other impacts and conditions in the watershed.

<u>Clearing vegetation</u>
Rainwater is intercepted and taken up by vegetation. This function is impaired when vegetation is cleared, resulting in increased overland runoff. In turn, this increases runoff volume and rate flows into receiving water bodies following storm events. Increased streamflow volume and rate flows can cause bank erosion, undercutting, slumping, and flooding. Vegetation also filters surface stormwater removing pollutants and sediment. Vegetation clearing can affect hydrology and water quality functions in streams that are far from the development site because stormwater is often piped great distances within the city.

Vegetation within 100 feet of streams also contributes to in-stream food web functions and can contribute beneficial structure to the stream. Trees can contribute large wood to streams and create habitat for aquatic species. This is especially important when trees are located near shallow water areas used by Endangered Species Act-list aquatic species.

Clearing vegetation removes roots systems that hold soils in place and canopy that intercepts rain water. This can result in soil erosion and landslides, particularly on steep slopes. Soil erosion can impact water bodies by adding additional sediment to streams and wetlands, impairing the functions including hydrology, channel dynamics, water storage, water quality, flooding and in-

water habitat. Landslides can impact land even far away from the resources, causing significant damage to public infrastructure and private property.

Clearing vegetation removes important structural features of the forest such as multiple canopy layers, snags and downed logs, large trees, and root systems. This can result in impaired habitat for native wildlife. Vegetation removal reduces food, nesting opportunities, cover, and perching and roosting opportunities for wildlife. Removing streamside or shoreline vegetation also eliminates sources of leaf litter, which provide food and nutrients for aquatic organisms, and woody debris, which provides river habitat structure and food resources for fish. Wildlife affected by vegetation removal includes mammals, birds, reptiles, amphibians, fish and insects. Removal of vegetation can fragment riparian and upland wildlife movement corridors, isolate remaining vegetation patches, and limit wildlife access to water. These impacts impede wildlife migration and can limit recruitment from other areas, making wildlife populations more vulnerable to disease, predation and extirpation.

Tree canopy and associated understory vegetation create shade and local microclimate effects that cool the air and water and maintain humidity and soil moisture. Trees and vegetation also help capture carbon dioxide; carbon dioxide is a contributing factor to global warming. All of these functions are affected when the vegetation is removed.

Some vegetation types have been declining in the Portland area due to clearing and grading for development and the use of ornamental vegetation in landscaping (not replacing cleared vegetation with similar native species). Certain assemblages, such as native bottomland hardwood forests and native oak stands, require specific soil, water and sun exposure to survive and are slow growing, taking many years to become established. These vegetation assemblages still exist including bottomland forest along the Columbia Slough and Columbia River and oak escarpments along buttes, bluffs and terraces. Removal not only reduces habitat functions as discussed previously, but also contributes to the decline in these unique vegetation types, and potentially, extirpation within the city.

<u>Grading, excavation, filling and soil compaction</u>
Grading activities and soil compaction can reduce the capacity of soil to support vegetation by disturbing the soil structure, accelerating erosion, and decreasing soil fertility, microorganisms, seeds and rootstocks. Soil porosity and stormwater infiltration can be reduced by grading, excavating, filling and soil compaction. This in turn can reduce groundwater recharge and in-stream summer and fall low flows, which adversely affects aquatic species. Grading, excavation, filling and compaction also affect wildlife habitat for some species. For example, long-toed salamanders require forest leaf litter and downed logs for thermal protection and foraging areas.

<u>Adding impervious surface</u> (e.g. buildings, parking areas, roads, sidewalks, driveways)
Impervious surfaces alter the hydrologic cycle by preventing natural stormwater infiltration into the ground and concentrating overland flow. This results in increased stormwater runoff and decreased groundwater recharge. Increased stormwater runoff can result in increased volume and flows into receiving water bodies (see vegetation clearing). Decreased groundwater recharge can reduce in-

stream summer low flows (see grading, excavation, filling and soil compaction). Concentration of overland flows can also increase soil erosion and landslides, particular on steep slopes. Impervious surfaces also contribute to urban heat island effect, which affects local air quality. Increased impervious surfaces can also cause wildlife habitat fragmentation and create hazards or barriers to wildlife movement (see vegetation clearing).

Modifying rivers and flood areas (e.g. filling, bank armoring, channelizing)
Altering the natural configuration, geomorphology, and structure of river banks and the flood area results in:

- increased in-stream flow velocity, which can cause bank erosion, undercutting and slumping on-site or at upstream or downstream locations
- a decrease in aquatic habitat area and simplified remaining habitat when side channels, wetlands and oxbows are disconnected from the main river channel
- removal of shallow water habitat that supports Endangered Species Act-list aquatic species
- a decrease in areas of wood deposition where side channels and wetlands are filled in
- reduced flood storage capacity and other benefits associated with active flood areas (e.g., nutrient transport, off-channel habitat)
- reduced flood storage capacity and increased flow volume and rate also increases flood risks to downstream properties
- reduction in vegetation that attenuates flows and provides important fish habitat during flood events

Generating pollution
Oil, gas, tar, antifreeze, dissolved metals, pesticides, herbicides, fertilizers, and other contaminants degrade habitat and water quality. These pollutants are transported to water bodies in stormwater via runoff from streets, driveways, parking lots, farms, parks, golf courses, and buildings. Dirt and sediments from eroded areas or deposited from vehicles can also be transported via stormwater to water bodies and degrade aquatic habitat. Pesticides, herbicides and fertilizers used in landscaping can pollute ground and surface waters, degrade habitat, and harm fish and wildlife.

Landscaping with non-native and/or invasive vegetation (e.g., ornamental trees)
The removal of native vegetation and establishment of cultivated landscapes can change or reduce food, cover, and nesting opportunities for native wildlife. Manicured landscaped areas generally lack complex vertical structure – little if any multi-layered canopy, large trees, snags, thick understory vegetation, and downed logs are retained in landscaped areas. The reduction in vertical structure impairs wildlife habitat and alters microclimate effects and hydrology. Some non-native plants used in landscaping are invasive (e.g. ivy, morning glory, holly and laurel) and can out-compete native plants reducing biodiversity. Non-native landscapes may also require irrigation and may be treated with chemical fertilizers and pesticides, which can run-off into local waterways and wetlands, or may be ingested by wildlife.

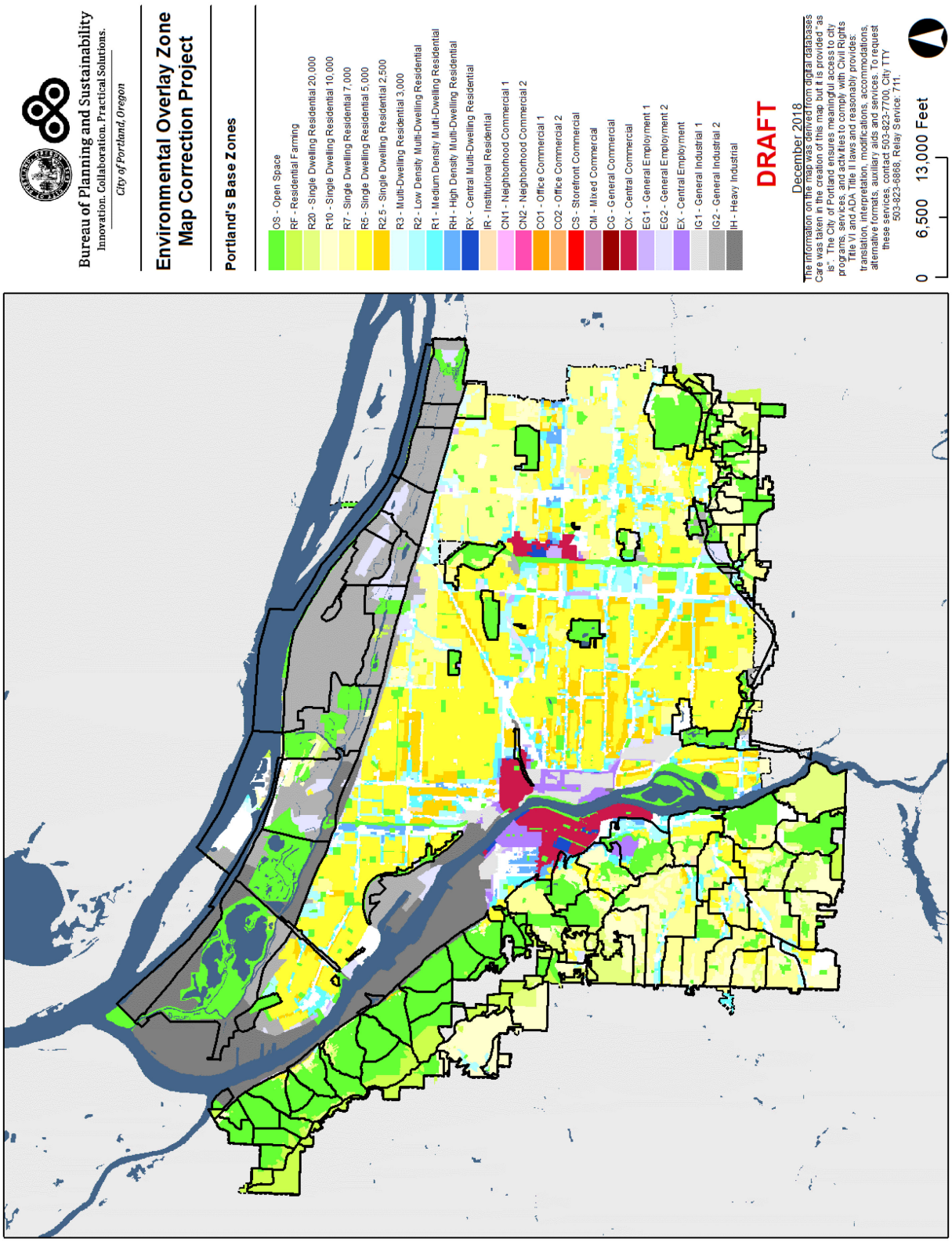
Building fences and other wildlife barriers
Barriers to wildlife movement can include buildings, roads, rail lines, fences, and other manmade features. These barriers fragment connectivity between wildlife habitats and reduce the ability of

native wildlife species to thrive (see clearing vegetation). Some barriers, such as roads and rail lines, may create hazards that increase the risk of wildlife mortality.

Other impacts: pets, light, noise, vibration, litter, etc.
Human activities that create outdoor noise, vibration and light can disrupt the competition, communication, reproduction, and predation habits of wildlife (Brown, 1987). For example, night-time lighting can interrupt the navigation of migrating birds and bats. Domestic pets can kill or injure native wildlife or compete for limited space. For example, allowing dogs to run freely in a grassland area can disrupt grassland-associated wildlife that build nests on the ground. Domestic pet waste, litter, and garbage can degrade natural resources including soil and water quality.

B. Impacts of Specific Conflicting Uses by Base Zone

The previous section outlines the impacts generally associated with conflicting uses like clearing and grading. This section evaluates the impacts associated with specific land uses such as residential or industrial. Conflicting uses are identified by looking what is allowed, outright or conditionally, by the base zones applied throughout Portland. Map 4 are the existing base zones.



Map 4: Existing Base Zones

Industrial and Employment Uses

Industrial and employment uses are allowed outright or conditionally in the IH, IG1, IG2, EG1, EG2 and EX base zones. Examples of uses are warehouse, manufacturing and production, freight movement, aviation, vehicle service and repair, self-service storage, agriculture, and commercial recreation. Development patterns are typically large buildings or warehouse type structures with surrounding parking and loading areas. Sites generally have medium to low building coverage and the buildings are typically set back from the street and are arranged in irregular lot patterns.

Industrial and employment uses have similar negative impacts as other uses, including vegetation clearing, grading, filling and soil compaction, impervious surfaces, landscaping with non-native plants, generating pollutants and creating edge impacts (e.g., noise, light).

Some industrial activities require the use of water in the manufacturing processes (e.g. cooling equipment) and draw substantial amounts of water from wells and public water sources. The resulting effluent, which is typically warm, may be discharged to receiving waters, such as a river, and influence in-water temperature. Cool water temperature is a fundamental requirement for many native aquatic species in this region, particularly federal Endangered Species Act-listed aquatic species. Industries that discharge effluent into water bodies are generally required to obtain a discharge permit through the Oregon Department of Environmental Quality.

Industrial areas can contribute high quantities of heavy metals and other toxic material to the soil, water, and air, but are typically regulated to manage the impacts. In addition, the use, storage, and transport of hazardous materials, waste storage and recycling, and similar activities often occurs in industrial areas and can require special permitting.

Commercial, Campus Institutional and Residential Uses

Commercial uses are allowed outright or conditionally in the CR, CM1, CM2, CM3, CE and CX base zones. Campus institutional uses are allowed outright or conditionally in the CR, CM1, CM2, CM3, CE and CX base zones. Commercial uses include office, retail, vehicle servicing and repair, self-service storage, event facilities, hotels, apartments and condos and associated parking, churches, daycare and single-dwelling houses. Institutional uses include schools, churches and campuses. Development of new uses would involve vegetation clearing, grading, filing, and soil compaction, as well as the addition of impervious surfaces, landscaping with non-native plants and new edge impacts (e.g., noise, light, vibration), all of which impact the natural resources. In commercial base zones, development is allowed to cover most of the site with impervious surfaces. Replacement of existing uses could preclude opportunities to restore natural resources.

Residential uses are allowed outright or conditional in the RF, R20, R10, R7, R5, R2.5, R3, R2, R1, RH, RX and RMP base zones. Residential uses include single dwelling houses, townhomes, duplexes, triplexes and quadplexes, accessory dwelling units, apartments, condos and manufactured housing development. Residential uses have similar negative impacts as other uses, including vegetation clearing, grading, filling and soil compaction, impervious surfaces, landscaping with non-native plants, generating pollutants and creating edge impacts (e.g., noise, light, pets). More intense development including condos and apartments often cover most of the site with impervious surfaces. Less intense

development including single dwellings and plexes may have less impervious surface but include more landscaping with non-native vegetation including lawn and use of fertilizers and pesticides.

Open Space

Undeveloped open space has the least amount of disturbance of all urban uses; however, all open spaces can be formally developed with trails, landscaping and other uses. Trails can create different levels of impact on natural resources depending on trail design and location. Examples of trail-related impacts are fragmenting habitats and creating opportunities for invasive plant intrusion into a habitat area. Landscaping with non-native plants and the use of irrigation, herbicides, pesticides, and fertilizers can have detrimental effects on natural resources.

Impacts associated with more active open space uses can be similar to residential or commercial development. For example, sports fields or golf courses generally require significant grading and vegetation management. Some open space uses require development of parking lots, which can generate stormwater runoff. Areas used for large-scale events often experience significant soil compaction, resulting in nearly impervious surfaces.

Basic Utilities

Basic utilities are infrastructure services such as water and sewer pump stations, electrical substations, and power line corridors that need to be located in or near areas where the utility service is provided. Construction and maintenance of utilities can have negative impacts on natural resources. Corridors cleared of vegetation can increase wind and light penetration into adjacent habitat areas and can provide opportunities for intrusion of invasive, non-native plant species. Construction of basic utility facilities often fragments wildlife habitat. Operation of existing facilities has few adverse impacts on natural resources, except in the case of overhead electrical lines, which must be cleared of high structure vegetation.

Mining

Mining is allowed as a conditional use in the Open Space (OS) base zone and is prohibited in all other zones. Mining has the most severe environmental impacts of all uses allowed in the OS zone, as it generally eliminates all natural resources from the area being mined and often results in long-term water quality degradation. Once the mining operation is closed, enhancement of soil and vegetation is possible, but natural resources often cannot be fully restored.

Radio and Television Broadcast Facilities

Low powered transmitters, such as cordless telephones and citizen band radios, are allowed in all zones. More powerful and larger radio, television, and cell phone broadcast facilities are allowed in all zones subject to limitations or as conditional uses. The impacts of these facilities are minimal as compared to other uses, except in areas that are zoned open space. Certain of these facilities can pose hazards to migratory birds. During bad weather, birds fly lower and may be disoriented by the lights of the towers and may run into towers or guy wires.

Rail Lines and Utility Corridors

Construction of rail lines often requires substantial quantities of excavation and fill to meet the 0-3 percent slope standards. Generally, additional grading results in natural resource disturbance and degradation of soil, vegetation and wildlife habitat. Most rail corridors are maintained by extensive chemical vegetation treatment with a potential for ground and surface water impacts. Rail corridors can also create wildlife hazards or barriers to wildlife movement.

Rail and utility corridors can pose additional risk of wildfire. Rail lines can cause sparks that can ignite dry vegetation. Utility corridors typically must be kept clear of tall vegetation that could harm overhead facilities. Topping or removal of trees is a common practice in utility corridors. Topped trees are more susceptible to disease and are less inhabitable by wildlife.

Other Land Use and Enabling Procedures

There are certain allowed uses and enabling procedures that are not assigned to a single category by the City zoning code. These include infrastructure, nonconforming situations, land divisions, partitions and property line adjustments.

Infrastructure – Infrastructure uses are accessory to urban development and include roads, water, sewer, electric, television lines and other public and private utilities not described by the zoning code category "basic utilities." Infrastructure is allowed in all city zones. Some of these uses are regulated by city public works and building codes. The uses generally have similar impacts to other development activities like vegetation clearing, soil grading, piping streams, etc.

Land Divisions, Partitions and Property Line Adjustments – These are procedures that establish lots or relocate property lines within a zone. While the act of adjusting or creating lot lines does not directly impact resources, the new or modified lots may allow more conflicting uses or a greater intensity of development than the original lots. Often the outcome of adjusting lot lines or creating lots is to increase development opportunities, thus increasing impacts on natural resources.

Table 1: Employment and Industrial Zone Primary Uses						
Use Categories	**EG1**	**EG2**	**EX**	**IG1**	**IG2**	**IH**
Residential Categories						
Household Living	N	N	Y	CU [1]	CU [1]	CU [1]
Group Living	N	N	L/CU [2]	N	N	N
Commercial Categories						
Retail Sales And Service	L/CU [3]	L/CU [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Office	Y	Y	Y	L/CU [4]	L/CU [5]	L/CU [6]
Quick Vehicle Servicing	Y	Y	N	Y	Y	Y
Vehicle Repair	Y	Y	Y	Y	Y	Y
Commercial Parking	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]
Self-Service Storage	Y	Y	L [7]	Y	Y	Y
Commercial Outdoor Recreation	Y	Y	Y	CU	CU	CU
Major Event Entertainment	CU	CU	CU	CU	CU	CU
Industrial Categories						
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Bulk Fossil Fuel Terminal	L [17]	L [17]	N	L [17]	L [17]	L [17]
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU [8]	L/CU [8]	L/CU [8]
Institutional Categories						
Basic Utilities	Y/CU [12]	Y/CU [12]	Y/CU [12]	Y/CU [13]	Y/CU [13]	Y/CU [13]
Community Service	L [9]	L [9]	L [10]	L/CU [11]	L/CU [11]	L/CU [11]
Parks And Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	N	N	N
Colleges	Y	Y	Y	N	N	N
Medical Centers	Y	Y	Y	N	N	N
Religious Institutions	Y	Y	Y	N	N	N
Daycare	Y	Y	Y	L/CU [11]	L/CU [11]	L/CU [11]
Other Categories						
Agriculture	L [16]	L [16]	L [16]	L [16]	L [16]	L [16]
Aviation And Surface Passenger Terminals	CU	CU	CU	CU	CU	CU
Detention Facilities	CU	CU	CU	CU	CU	CU
Mining	N	N	N	CU	CU	CU
Radio Frequency Transmission Facilities	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]
Rail Lines And Utility Corridors	Y	Y	Y	Y	Y	Y

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Table 2: Commercial Zone Primary Uses						
Use Categories	**CR**	**CM1**	**CM2**	**CM3**	**CE**	**CX**
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]
Commercial Categories						
Retail Sales And Service	L [2]	L [2]	Y	Y	Y	Y
Office	L [2]	L [2]	Y	Y	Y	Y
Quick Vehicle Servicing	N	L [12]	L [2]	L [2]	Y	N
Vehicle Repair	N	N	Y	Y	Y	L [5]
Commercial Parking	N	N	L [9]	L [9]	Y	CU [9]
Self-Service Storage	N	N	N	L [4]	L [4]	L [4]
Commercial Outdoor Recreation	N	N	Y	Y	Y	Y
Major Event Entertainment	N	N	CU	CU	CU	Y
Industrial Categories						
Manufacturing And Production	N	L/CU [3,5]	L/CU [3,5]	L/CU [3,5]	L/CU [3,5]	L/CU [3,5]
Warehouse And Freight Movement	N	N	N	L [3,5]	L [3,5]	N
Wholesale Sales	N	N	L [3,5]	L [3,5]	L [3,5]	L [3,5]
Industrial Service	N	N	CU [3,5]	CU [3,5]	CU [3,5]	CU [3,5]
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	Y/CU [8]	Y/CU [8]	Y/CU [8]	Y/CU [8]	Y/CU [8]	Y/CU [8]
Community Service	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [8]
Parks And Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	Y	Y	Y
Colleges	Y	Y	Y	Y	Y	Y
Medical Centers	Y	Y	Y	Y	Y	Y
Religious Institutions	Y	Y	Y	Y	Y	Y
Daycare	Y	Y	Y	Y	Y	Y
Other Categories						
Agriculture	L [10]	L [10]	L/CU [11]	L/CU [12]	L/CU [12]	L/CU [11]
Aviation And Surface Passenger Terminals	N	N	N	N	CU	CU
Detention Facilities	N	N	N	CU	CU	CU
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	N	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]
Rail Lines And Utility Corridors	N	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Table 3: Mulit-Dwelling Zone Primary Uses						
Use Categories	**R3**	**R2**	**R1**	**RH**	**RX**	**RMP**
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	N
Commercial Categories						
Retail Sales And Service	L [12]	L [12]	L [12]	CU [2]	L/CU [3]	L [13]
Office	N	N	N	CU [2]	L/CU [3]	N
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	CU [4]	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	CU	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	N
Industrial Categories						
Manufacturing And Production	N	N	N	N	N	N
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	N
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [10]	L/CU [10]	L/CU [10]	L/CU [10]	L/CU [10]	L/CU [10]
Community Service	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [5]	L/CU [6]
Parks And Open Areas	L/CU [7]	L/CU [7]	L/CU [7]	Y	Y	L/CU [7]
Schools	CU	CU	CU	CU	L/CU [5]	CU
Colleges	N	CU	CU	CU	CU	CU
Medical Centers	N	CU	CU	CU	CU	CU
Religious Institutions	N	CU	CU	CU	CU	CU
Daycare	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	Y	L/CU [8]
Other Categories						
Agriculture	L [11]	L [11]	L [11]	L [11]	L [11]	L [11]
Aviation And Surface Passenger Terminals	N	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]
Railroad Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Table 4: Open Space and Single-Dwelling Zone Primary Uses							
Use Categories	**OS**	**RF**	**R20**	**R10**	**R7**	**R5**	**R2.5**
Residential Categories							
Household Living	N	Y	Y	Y	Y	Y	Y
Group Living	N	CU	CU	CU	CU	CU	CU
Commercial Categories							
Retail Sales And Service	CU [1]	CU [10]	CU [10]	CU [10]	CU [10]	CU [10]	CU [10]
Office	N	N	N	N	N	N	N
Quick Vehicle Servicing	N	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N	N
Commercial Parking	N	N	N	N	N	N	N
Self-Service Storage	N	N	N	N	N	N	N
Commercial Outdoor Recreation	CU	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	N	N
Industrial Categories							
Manufacturing And Production	CU [6]	CU [6]	N	N	N	N	N
Warehouse And Freight Movement	N	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	N	N
Bulk Fossil Fuel Terminal	N	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N	N
Institutional Categories							
Basic Utilities	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]
Community Service	CU [4]	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]
Parks And Open Areas	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]
Schools	CU	CU	CU	CU	CU	CU	CU
Colleges	N	CU	CU	CU	CU	CU	CU
Medical Centers	N	CU	CU	CU	CU	CU	CU
Religious Institutions	N	CU	CU	CU	CU	CU	CU
Daycare	CU	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]
Other Categories							
Agriculture	L [7]	L [7]	L [7]	L/CU [8]	L/CU [8]	L [9]	L [9]
Aviation And Surface Passenger Terminals	N	CU	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N	N
Mining	CU	CU	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [3]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]
Railroad Lines And Utility Corridors	CU	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Table 5: Campus Institutional Primary Uses			
Use Categories	**CI1**	**CI2**	**IR**
Residential Categories			
Household Living	N	Y	Y
Group Living	N	Y	Y [9]
Commercial Categories			
Retail Sales And Service	CU [1]	Y	L/CU [10
Office	N	Y	L/CU [10]
Quick Vehicle Servicing	N	N	N
Vehicle Repair	N	N	N
Commercial Parking	N	Y	N
Self-Service Storage	N	N	N
Commercial Outdoor Recreation	N	N	N
Major Event Entertainment	CU	CU	CU
Industrial Categories			
Manufacturing And Production	L [2]	L/CU [2]	N
Warehouse And Freight Movement	N	N	CU
Wholesale Sales	N	N	N
Industrial Service	L [2]	L/CU [2]	N
Bulk Fossil Fuel Terminal	N	N	N
Railroad Yards	N	N	CU
Waste-Related	N	N	N
Institutional Categories			
Basic Utilities	L/CU [3]	L/CU [3]	L/CU [3]
Community Service	CU [4]	Y	CU [4]
Parks And Open Areas	L/CU [5]	L/CU [5]	L/CU [5]
Schools	N	N	L/CU [5]
Colleges	Y/CU [6]	Y/CU [6]	L/CU [11]
Medical Centers	Y	Y	L/CU [11]
Religious Institutions	CU	CU	CU
Daycare	Y	Y	L/CU [12]
Other Categories			
Agriculture	L [7]	L [7]	L [7]
Aviation And Surface Passenger Terminals	N	N	N
Detention Facilities	N	N	N
Mining	N	N	N
Radio Frequency Transmission Facilities	L/CU [8]	L/CU [8]	L/CU [8]
Rail Lines And Utility Corridors	CU	CU	CU

Y = Yes, Allowed L = Allowed, But Special Limitations
CU = Conditional Use Review Required N = No, Prohibited

G. General ESEE Analysis

This section presents the general ESEE analysis and recommendation. This portion of the ESEE analysis is intended to describe the potential consequences of allowing, limiting, and prohibiting conflicting uses for categories of significant natural resource features:

a. Rivers
b. Streams
c. Wetlands
d. Flood Areas
e. Vegetation
f. Steep Slopes
g. Riparian Corridors
h. Wildlife Habitat

The general ESEE analysis includes a subsection for each of the four ESEE factors evaluated – economic, social, environmental and energy. Each subsection includes a narrative that describes the factors being assessed. For example, the social analysis addresses cultural and historic values, education, physical health, mental health, etc. Following the narrative there is a summary of the consequences of allowing, limiting or prohibiting conflicting uses and a recommendation based on each factor. The recommendation is intended to balance the consequences to produce a recommended level of protection taking only that factor into account.

The recommendations of each ESEE factor are evaluated together to produce an overall ESEE general recommendation. Consistent with the 2035 Comprehensive Plan, the intent of the general ESEE is to recommend program decisions that meet multiple objectives and optimize the economic, social, environmental, and energy consequences for natural resources and conflicting uses in Portland.

The general ESEE analysis and general recommendation establishes a consistent baseline for categories of natural resource features the resource sites. In Volume 3, Part A-G, the ESEE general recommendations are affirmed, clarified or modified for each resource site to address specific conditions, goals, and policies. The ESEE decisions are made for each resource site. For example, the ESEE general recommendation may be to *limit* conflicting uses in areas with forests on steep slopes but within a specific resource site that has higher risk of landslides due to soil conditions, the resource site ESEE decision may be to *strictly limit* conflicting uses.

1. Economic Consequences

This portion of the analysis summarizes the economic consequences of protecting significant natural resources. The economic consequences are expressed as the qualitative and relative costs, benefits, and impacts of allowing, limiting, or prohibiting conflicting uses. The economic analysis relies on current information related to:

- The economic goods and services provided by the conflicting uses (e.g., development); and
- The ecosystem services provided by the significant natural resources (e.g., flood control, slope stability).

a. Goods and Services Provided by Conflicting Uses

The information related to the economic goods and services provided by conflicting uses comes from the *Economic Opportunities Analysis* (2016), which was adopted as factual basis for the 2035 Comprehensive Plan.

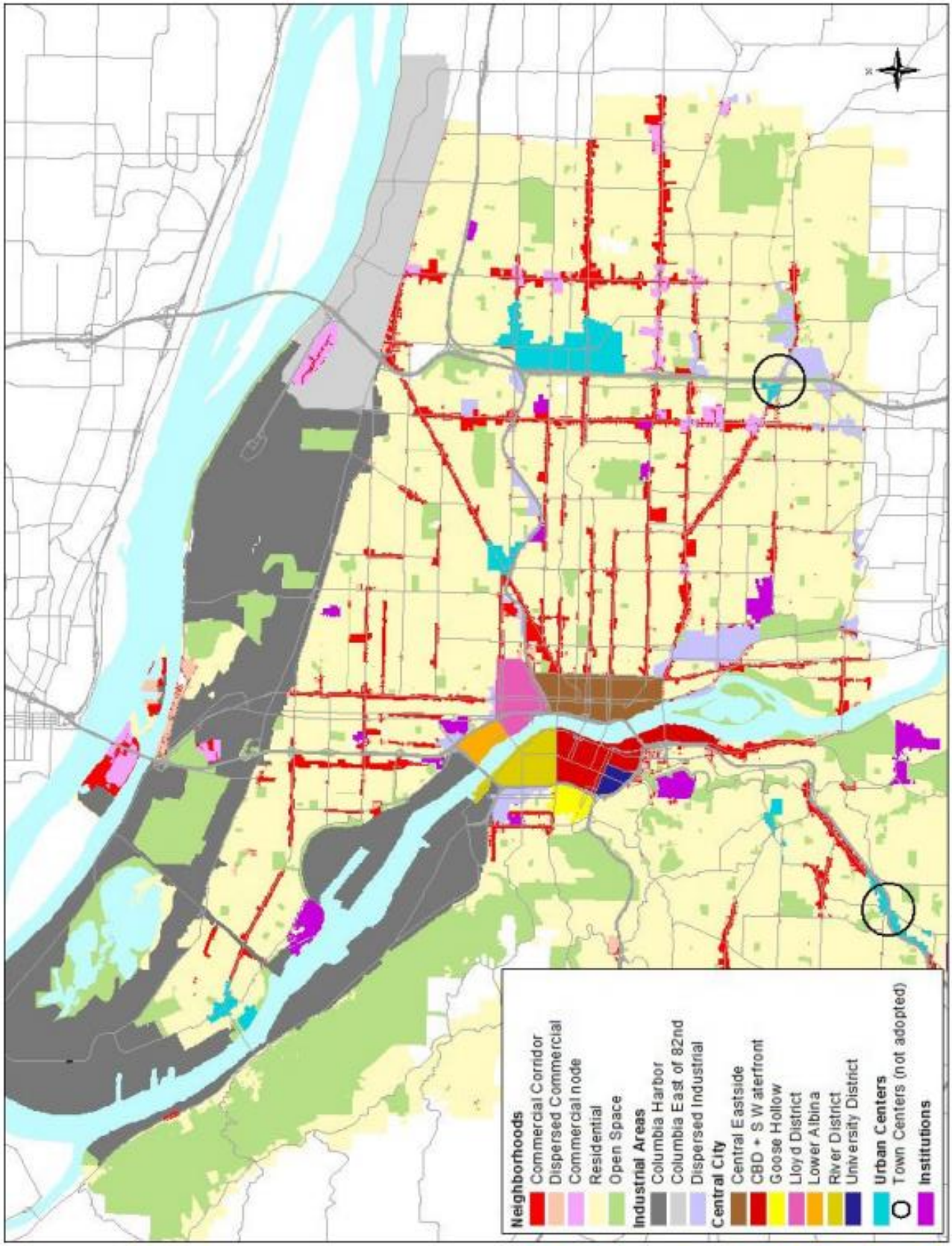
Employment and Wages

Portland is the regional job center, providing 38% of the 1.02 million employment base of the Portland-Metro Service Area. The largest employment sectors are institutional, office and manufacturing. Manufacturing is a particularly important sector with above-average wages and a significant multiplier effect – one manufacturing job supports 3.69 total jobs in the region.

Since 1980, the wage distribution of the economy has been changing, and job growth has become increasingly polarized in low- and high-wage occupations with shrinking middle-wage job opportunities. This national trend is mirrored in the state and the region. For the majority of the workforce that does not have a 4-year college degree, middle-wage job opportunities are primarily in industrial occupations, as seen in the Columbia Harbor (aka Columbia Corridor), and administrative-support occupations that are prevalent in all of the Central City districts (see Map 5).

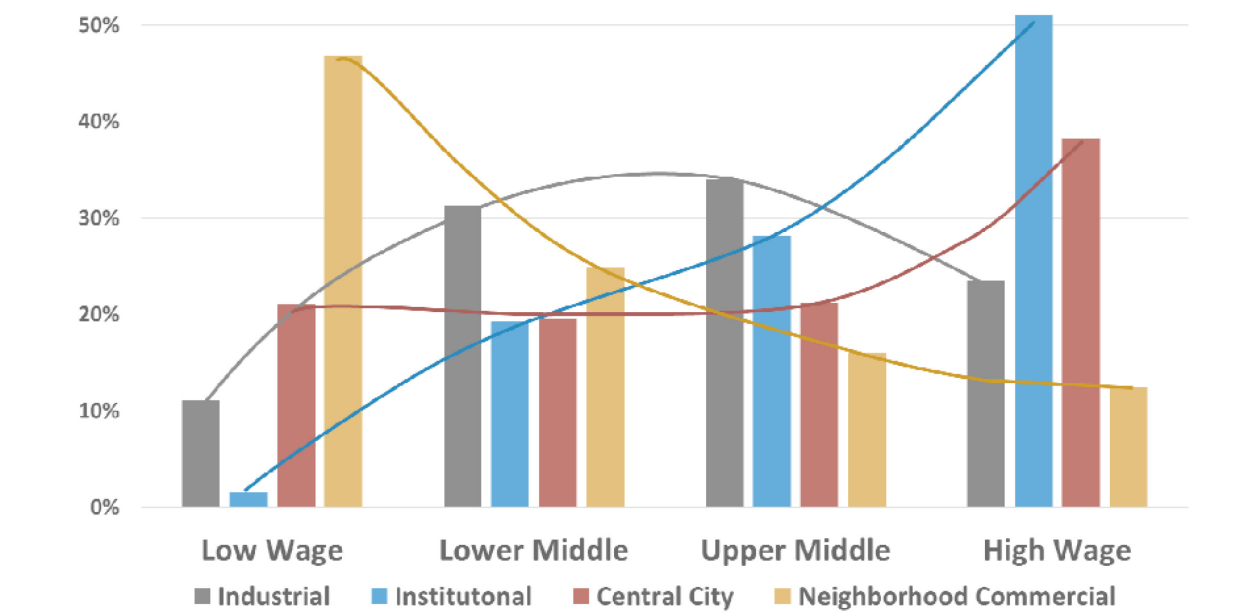
Wage inequality has become a prominent feature of the Portland area economy's growth since 2000. The region's share of jobs in middle-wage occupations shrunk from 58% in 2000 to 48% in 2018, nearly twice the pace of the national change. A third of Multnomah County households (34%) were poor in 2017, up from 23% in 2008, measured by income self-sufficiency metrics. This trend reduces upward-mobility alternatives for most workers who do not have a bachelor's degree. Large concentrations of high-wage job growth and high-income housing growth have put upward pressure on local prices, while wages in low and middle-wage occupations have remained relatively flat.

Most of the region's middle-wage jobs are in industrial and office-support occupations (72% in 2018), which are particularly concentrated in industrial, employment and central commercial districts. While many metropolitan economies have been able to generate substantial middle-wage job growth and shared-prosperity outcomes, Portland is among the leading regions nationally in wage-polarized growth. Much of the region's growing wage inequality is explained by global and national factors, such as automation and economic globalization changes that have replaced many middle-wage jobs.



Map 5: Economic Opportunity Analysis Subareas (Hovee, 2012)

That said, wide regional differences in the wage distribution of new jobs are also influenced by policy choices that guide how regions grow, including the Portland region's tight growth capacity of industrial land, freight infrastructure, and vocational education.



Source: Bureau of Planning and Sustainability. The wage distribution of covered employment in Portland's EOA employment geographies is grouped by citywide wage quartiles. The Low Wage quartile is less than $26,400 annually; Lower Middle is $26,400-46,400; Upper Middle is $46,400-67,600; and High Wage is more than $67,600.

Figure 1: Portland Wage Distribution

The Metro forecast allocates 147,000 additional jobs to the City of Portland by 2035 – an annual average growth rate of 1.3%. This represents a 27% capture rate of the regional employment growth, which is consistent with the historic long-term capture rate for the City of Portland. A goal of the City of Portland is to attract a higher percentage of jobs that provide a living-wage.

The 2035 Comprehensive Plan demonstrated sufficient land supply for job growth projections through 2035. Figure 2 shows the supply and demand of land per job sector. All sectors, with the exception of industrial districts, have more land supply than demand for employment. There is a risk within the industrial districts and any reduction of land supply could results in a shift of employment from middle wage industrial jobs to other job sectors and could exacerbate the wage-polarization in Portland. The two main industrial districts – the Columbia Harbor and the Columbia East of 82nd (see Map 5) – are not included in this project and therefore not part of this ESEE analysis.

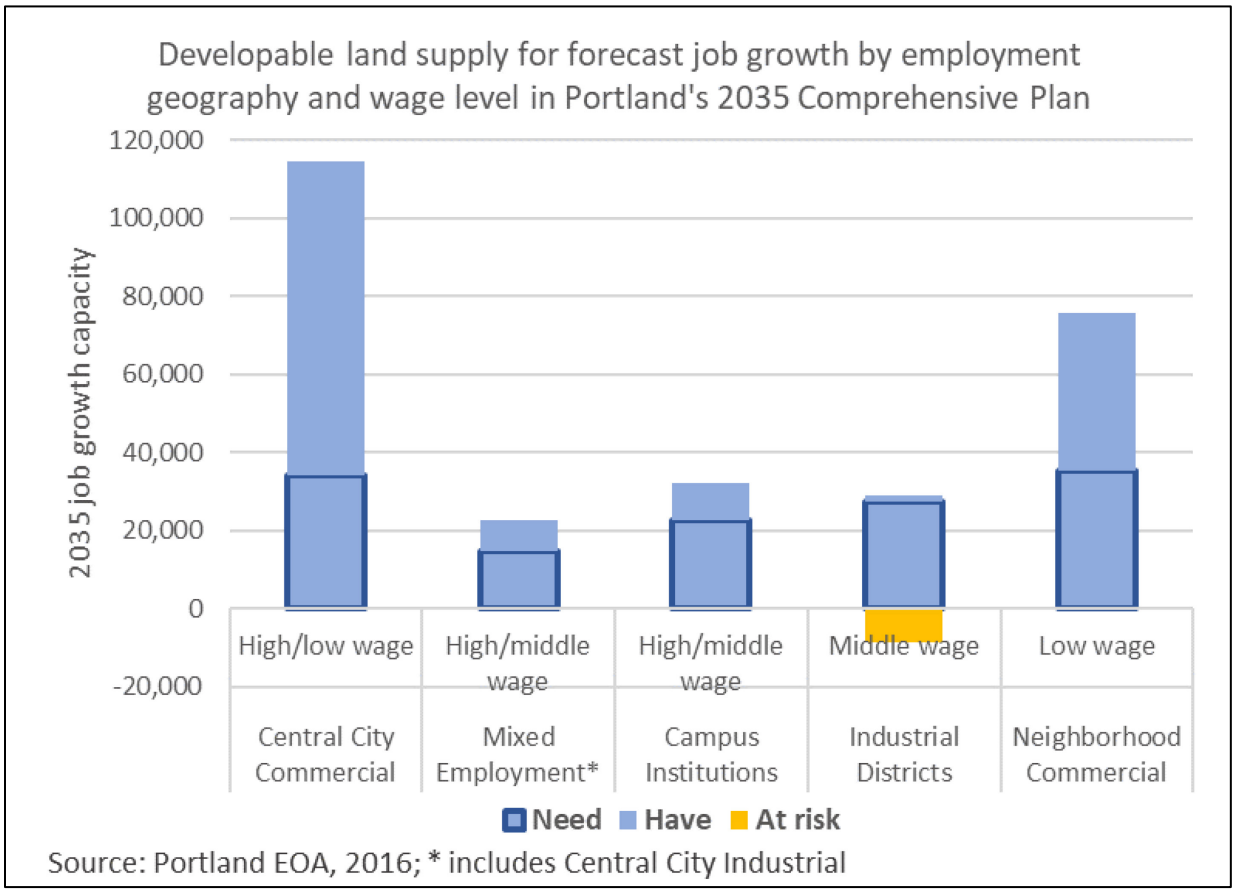


Figure 2: Land Supply and Employment Demand in Portland

Generally speaking, *prohibiting* or *limiting* conflicting uses within areas of significant natural resources would have a negative impact on goods and services provided by employment by limiting the size or extent of commercial, employment or industrial development. However, the industrial districts are not included in this project and neither is the Central City and not part of this ESEE. Other job sectors have surplus land supply to meet job growth. Therefore, *limiting* conflicting uses has no impact on land supply needed to meet projected job growth through 2035.

In addition, many of the significant natural resources addressed by this ESEE are also regulated by state or federal rules. For example, the federal government generally *prohibits* development, other than transportation infrastructure and utilities, within river and stream floodways and *limits* development within river and stream flood areas. State and federal rules *strictly limit* development within waters of the state, including wetlands. Areas that are designated critical habitat for Endangered Species Act-listed species have limitations on development as well. The majority of these state and federal regulations are related to riparian corridors. Therefore, the local limits on development within significant riparian corridors have a negligible negative impact on overall employment throughout the city. There may be larger negative impact of local limits on development within significant wildlife habitat areas outside of riparian corridors.

Traded Sector

Traded sector businesses are companies that sell many of their products and services to people and businesses outside the Portland region, nationally and globally. Examples include most manufacturing and many professional and business service companies as well as smaller craft businesses with local and global customers. Traded sector businesses may be locally owned and can be small, medium or large in size. Portland is considered a small to medium-sized hub in the national and international business and trade community.

Traded sector businesses are important to the local economy. By selling to people and businesses outside Portland, locally-based traded sector businesses bring new money into the local economy. The additional income brought in from exporting goods is further circulated within the local economy as these local firms purchase additional services. Traded sector productivity and market size tends to lead these businesses to offer higher wage levels. Jobs at traded sector companies help anchor the city's middle class employment base by providing stable, living wage jobs for residents. For these reasons, Portland's traded sector businesses have the power to drive and expand Portland's economy.

Portland has a strong traded sector job base. The EcoNorthwest *Evaluation of Economic Specialization* (2009) found that the City of Portland's 2nd and 5th largest economic specializations are wholesale trade and transportation, which are the city's freight distribution industries. In 2008, the Portland region's traded sector businesses brought $22 billion of export income into the regional economy, which was 21 percent of total regional economic output. Portland ranked second among U.S. metropolitan areas in export growth over five years. The 118,700 jobs in Portland's industrial districts accounted for 30 percent of the city's employment, including 30,400 manufacturing jobs and 44,000 wholesale and transportation jobs, (Bureau of Planning and Sustainability, 2012). Part of the reason for the strong traded sector is Portland's proximity to shipping channels in the Columbia and Willamette rivers, rail lines and an international airport. However, because the Columbia Harbor and Columbia East of 82nd (see Map 5) are not part of this project, there are no ESEE consequences to these industrial districts.

Portland's Climate Action Plan calls for protection of existing intermodal freight facilities, and support for centrally located and regionally significant industrial areas that may provide for future intermodal facilities. Given geographic and competitive challenges, Portland's role as a leading exporter is fragile because of the limits of the current transportation system. The system is burdened with many obsolete, end-of-life assets (e.g. the functional condition of many roadways and bridges.) Maintaining a cutting-edge built environment is an important aspect of sustaining the region's freight and trade dependent economy.

Generally speaking, *prohibiting* or *limiting* conflicting uses within areas of significant natural resources would have a negative impact on the traded sector economy by limiting the size or extent of industrial development; however, the impact is negligible because nearly all of the traded sector economy is located in the Columbia Harbor or Columbia East of 82nd, two areas that are not subject to this ESEE.

Housing

Housing can be a conflicting use with respect to natural resources because development of new houses, condos and apartments can remove or displace significant natural resources. Maintaining sufficient land to accommodate population growth in a range of housing options is a goal for Portland. The 2035

Comprehensive Plan demonstrated capacity for 201,000 additional housing units, which is more than the Metro growth projection for Portland of 123,000 housing units. RIP increased Portland's capacity by roughly 35,000 units.

The following information about housing is from the report the *State of Housing in Portland*, 2018.

Portland is the 26th most populous city in the United States and the 5th largest city on the west coast. Within the last five years, Portland has moved up two spots—from 28th to 26th. Between 2000 and 2010 Portland grew by 54,655 people. That puts the average annual growth rate at just under 1 percent. In comparison, Portland grew by 44,046 people between 2011 and 2016—that puts the average annual growth rate about 1.5 percent—a much faster rate of growth. Unlike the population growth, formation of households is occurring at a slower pace. Between 2000 and 2010, households grew 11 percent while between 2011 and 2016, households grew by 4 percent. The noticeable shift is the increasing share of households.

At the neighborhood level, the Central City, MLK-Alberta, Lents-Foster, and East Portland are gaining the greatest number of population growth but in terms of most households growth Northwest, Central City, South Portland-Marquam Hill, and Interstate Corridor are gaining the greatest number.

In 2017, annual production and permitting levels were higher than at any point in the last fifteen years. Portland added 7,300 units to the housing stock in 2017—a 2 percent increase overall. Multifamily unit production continues to constitute the bulk of new residential development with 91 percent of all new housing units falling within the multifamily category.

The City of Portland recently approved the Residential Infill Project (RIP) to increase the range of housing types. In the R2.5, R5 and R7 base zones RIP allows triplexes and fourplexes on lots. In addition, more opportunities exist for creating additional accessory dwelling units (ADUs) on lots by allowing two ADUs on a lot with a house and one ADU on a lot with a duplex. To qualify, lots are required to meet specific minimum lot sizes: R2.5=3,200 sq ft; R5= 4,500 sq ft; R7=5,000 sq ft. These housing type proposals are counterbalanced with new caps on building floor area that reduce the maximum size of the dwellings by ⅓ to ½ from what can typically be built in the R2.5, R5 and R7 base zones. Minimum parking requirements are removed for residential uses in these zones, lowering the base cost for providing housing and reducing impacts to stormwater and potential tree canopy from previously required driveway impervious area. The result of RIP is reduced impacts on natural resources by reducing building floor area and removing parking requirements.

Overall, *limiting* or *prohibit* new housing in areas of significant natural resources may reduce the capacity of housing supply but will not impact Portland's ability to meet Metro growth projections through 2035. Generally speaking, *limiting* or *prohibiting* new housing development may affect the scale, location or type of housing that can be provided, but may not necessarily affect the number of potential dwelling units. If a portion of a site has limitations due to natural resources, housing can often be clustered to avoid the resources resulting in smaller lot sizes and/or dwelling units. *Limiting* or *prohibiting* new housing development may result in a slight increase in price to account for site planning or mitigation. This may have a long-term effect on the mix of housing types and size available on the market.

Limiting or *prohibiting* the conflicting uses could decrease development entitlement on some lots and could negatively impact the value of land for property owners. However, there are many factors that impact property value including access to improved streets and public transit, access to sewer and water, views, proximity to amenities, etc.

Further, due to state and federal rules that *prohibit* or *limit* development within rivers, streams, wetlands and flood areas, the impacts of local limitations on housing development within areas of significant riparian corridors is expected to have a small negative impact on the overall housing stock or value of land.

Property Values and Rent

Generally, as an area becomes more densely developed, property values and rents will rise as the concentration of businesses, residents, and customers make the area more attractive.

Homeownership rates in Portland generally have decreased in the last few years. This decrease varies by race and ethnicity. All but two communities—the Hispanic-Latino community and Native American community—experienced decreased homeownership rates from 2011-2016. In 2017, the median home sales price in Portland exceeded $400,000 in over two-thirds (68 percent) of the neighborhoods in the city.

Rentership continues to increase steadily in Portland as seen from the increase to 47 percent in 2016 from 46 percent in 2011. Portland appears to be heading toward an even split between renter and homeowner households. In 2015 the overall rent growth in Portland was an average of 8 to 9 percent—one of the highest in the nation. Rent growth slowed in 2016 to an average rate of 7 percent over the previous year. In 2017, after years of citywide rent increases, Portland saw a slight softening in rents with a smaller overall rent growth of 2 percent.

Although property values and rents are determined by a number of complex factors, *limiting* or *prohibiting* new housing development significant natural resource areas may affect the scale, location or type of housing allowed and that may impact property value or rents. However, allowing new housing development within significant natural resource areas can have negative impacts on adjacent properties including increased risk of landslide or flooding, removal of trees that provide shade and reduce heat island affects and reducing the visual amenities provided by trees and water. This could reduce property value.

The existence of trees, greenspaces and other natural resources have been positively correlated with residential property values in Portland (EcoNorthwest, 2009). Natural resources contribute to the quality of neighborhood, local and regional recreation and trail systems, and also to the quality of views. Screening and buffering residential from industrial and commercial land uses can be provided by established trees and vegetation and can improve the economic value of both uses (e.g. noise reduction). Therefore, limiting new housing development in significant natural resource areas may maintain property values.

Tourism

Portland is viewed around the world has a city that protects its natural resources and invests in sustainability. Portland is a popular tourist destination with a variety of attractions that draw people to the area. These destinations include natural resources like the Willamette and Columbia Rivers and

parks like Forest Park and Smith/Bybee Wetlands. Generally, limited conflicting uses within significant natural resource areas supports tourism. However, limitations can have negative impacts on tourism by reducing opportunity for new hotels, attractions, restaurants or shops within the resource areas.

b. Ecosystem Services Provided by Significant Natural Resources

Natural resources provide ecosystem goods and services, which in turn provide economic and social value. Ecosystem services include water conveyance, purification, and flood control, air cooling and purification, carbon sequestration, soil fertilization, and pollination. Ecosystem goods include commodities like food, fuel, fisheries, timber, minerals, etc. Ecosystem goods also include supporting recreation and tourism.

Information related to ecosystem services comes from the following reports:

- ECONorthwest, *West Hayden Island Benefits/Costs Analysis*, 2012.
- ENTRIX, *West Hayden Island Environmental Foundation Study*, July 2010.
- ECONorthwest, *Economic Arguments for Protecting the Natural Resources of the East Buttes Area in Southeast Portland*, 2009.
- Bergstom, Loomis and Brown, *Defining, Valuing and Providing Ecosystem Goods and Services*, Natural Resources Journal, 2007.
- Banzhaf and Boyd, *What Are Ecosystem Services? The Need for Standardized Environmental Accounting Units*, 2006.
- Anielski and Wilson, *Counting Canada's Natural Capital: Assessing the Real Value of Canada's Boreal Ecosystems*, Pembina Institute, 2005.
- Olewiler, N., *The Value of Natural Capital in Settled Areas of Canada*, Published by Ducks Unlimited Canada and the Nature Conservancy of Canada, 2004.

Table 6 provides a summary of the economic value of the ecosystem services provided by different significant natural resource features. The information is further explained in the following sections.

Table 6: Ecosystem Services Valuation (2011$/Acre/Year)

Habitat Type	Air Purification	Carbon Sequestration	Water Purification	Wildlife Habitat Value	Total Value
Forest/Woodland	$73–$267	$26–$92	Not Quantified	$309–$516	$408–$875
Wetland	$74–$266	Not Quantified	$153–$664	$3,095–$11,347	$3,322–$12,277
Shrubland	$30–$110	$24–$88	Not Quantified	$309–$516	$363–$714
Grassland	$24–$89	$24–$88	Not Quantified	$309–$516	$357–$693
Shallow Water	Not Quantified	Not Quantified	Not Quantified	$1,037–$15,473	$1,032–$15,473
Source: ECONorthwest (2012)					

Riparian Forests and Woodlands

Riparian forests and woodlands provide several different types of ecosystem services. One way to estimate the values of these ecosystem services is to evaluate the avoided cost of preserving the functions provided by natural resources. For example, Clean Water Services, a water-resource management utility in northwestern Oregon, avoided investing in a chiller for a water treatment plant on the Tualatin River by planting riparian vegetation to shade and cool the river, for a savings of $50 million.

Forests and woodlands also provide air quality benefits from purification and pollutant removal. Table 7 below shows the kilograms of pollutant removal by forestland per acre per year and the economic value of those pollutants in avoided health care costs.

Table 7: Annual Quantity and Value of Pollutant Removal by Forests and Woodlands (2011$)

Pollutant	Annual Kilograms Removed per Acre	Annual Value per Ton	Annual Value per Acre
CO	2.03	$1,403	$3
NO^2	3.65	$4,039—$9,875	$15—$36
O^3	14.57	$2,019—$9,875	$29—$144
PM^{10}	10.53	$6,593	$69
SO^2	2.83	$2,418—$9,546	$7—$27
Source: ECONorthwest, 2012			

Wetland Habitat

Table 8 provides estimated values for key ecosystem services that wetlands provide. The table presents values associated with wetlands that were assumed to provide only a single type of service. The range of values associated with single-service wetlands is about $2–$9,669 per acre per year. In many cases wetlands provide multiple services; however, the values cannot simply be added up and an estimate for multiple services was not made.

The next set of rows estimates the values associated with ecosystem services provided by both native and restored wetlands. The way the ecosystem services are tallied in this section combine more of the single-services into larger categories. For example, recreation can include fishing, bird hunting, bird watching, amenity, etc. The values in the second set of rows are additive. It was estimated that the total value associated with native wetlands is about $29,400 per acre per year and that the total value associated with restored wetlands is about $27,400 per acre per year.

Wetlands also provide ecosystem services that include water quality improvement, water temperature regulation, and flood regulation. However, these values in the context of the Willamette River Basin are likely small. The exception is local water-quality benefits derived from existing wetlands.

Table 8: Value of Ecosystem Services Associated with Wetlands (2011$/Acre/Year)

Single-Service Wetlands		
Single-Service Wetland Type	**Mean Value**	**Range of Values**
Flood	$676	$153-$3,007
Quality	$718	$2,177-$2,372
Quantity	$219	$10-$4,425
Recreational Fishing	$614	$163-$2,310
Commercial Fishing	$1,339	$186-$9,669
Bird Hunting	$120	$43-$339
Bird Watching	$2,086	$909-$4,788
Amenity	$5	$2-$24
Habitat	$527	$163-$1,688
Storm	$408	$19-$8,850
Ecosystem Service	**Native Wetlands**	**Restored Wetlands**
Gas regulation	$128	$93
Disturbance regulation	$15,300	$15,300
Water supply	$1,424	$1,424
Nutrient cycling	$7,706	$5,780
Commodities	$2,907	$2,907
Biodiversity	$185	$163
Recreation	$1,744	$1,744
Total	**$29,394**	**$27,410**

Source: Woodward, R., and Y. Wui. 2001. "The Economic Value of Wetland Services: A Meta-Analysis." *Ecological Economics* 37: 257-270; Dodds, W. K. Wilson, R. Rehmeier, et al. 2008. "Comparing Ecosystem Goods and Services Provided by Restored and Native Lands." *BioScience* 58(9):837-845.

Shrubland and Grassland

One estimate of shrubland value, based on the net primary productivity of various landscapes in the U.S. National Wildlife Refuge System, suggests that the ecosystem service value may be about $600–$800 per acre per year. The same study estimated the value of grasslands, and suggests that the ecosystem service values of grassland, generally, may be about $30–$140 per acre per year. Table 9 shows the annual per acre pollutant removal by shrubland and grassland, and a range of economic values of those pollutants in avoided health care costs.

Table 9: Annual Quantity and Value of Pollutant Removal by Shrubland and Grassland (2011$)

Pollutant	**Annual Kilograms Removed per Acre**	**Annual Value per Ton**	**Annual Value per Acre**
CO	0.79	$0—$1,403	$1
NO^2	1.45	$4,039—$9,875	$6—$14
O^3	6.05	$2,019—$9,875	$12—$60
PM^{10}	4.34	$0—$6,593	$29
SO^2	1.18	$2,418—$9,546	$3—$11

Source: ECONorthwest

Value of Wildlife

Economic research has shown that people place a considerable value on the continued survival of sensitive species, such as those listed as threatened or endangered. Such studies also suggest that the value associated with protecting threatened, endangered, and rare species similar to those found in Portland ranges from an annual payment of $11 per household to a one-time payment of nearly $400 per household (see Table 10).

Table 10: Willingness to Pay to Protect Threatened, Endangered, and Rare Species

Studies Reporting Annual Values		
	Average Value	**Range of Values**
Bald eagle	$43.51	$23.43-$50.21
Owl	$72.52	$43.51-$145.05
Salmon/Steelhead	$90.38	$11.16-$155.09
Whooping Crane	$62.48	$49.09-$76.99
Woodpecker	$17.85	$14.50-$22.32
Studies Reporting Lump Sum Values		
	Average Value	**Range of Values**
Arctic grayling	$25.66	$22.32-$29.01
Bald eagle	$331.38	$273.36-$390.52
Falcon	$35.70	-
Source: Richardson and Loomis, 2009		

It is important to note that willingness to pay a different measure than estimating the economic value associated with maintaining individual species and biodiversity. For example, the courts have interpreted Congress to say that the value of threatened and endangered species is incalculable (TVA v. Hill).

Development-related threats to sensitive species in Portland also may lead to higher future costs for governments, firms, and households engaging in activities that affect the species. Such costs might be associated with required or voluntary species monitoring, as well as measures to ensure their protection. Avoiding such costs could be supported by pre-emptive efforts to protect sensitive species and prevent future threatened and endangered species listings.

Flood Area

Studies have found that the relative flood storage capacity in Portland, as compared to the Willamette River and Columbia River basins, is relatively small. Dams along the Willamette and Columbia River are managed, in part, to control flooding. However, the flood storage capacity along smaller water bodies, such as Johnson Creek, is much more significant.

Flooding can cause significant damage to homes and businesses as well as public infrastructure like roads. Lands around Johnson Creek have experience frequent and repeated flooding for many years. In 1997, Environmental Services developed the Johnson Creek Willing Seller Land Acquisition Program. The

program has moved X number of people and property out of areas that frequently flood. The land is then restored to increase flood storage, improve fish and wildlife habitat, restore wetlands and create passive recreational activities for city residents. BES has spent roughly $$$ on the project through YEAR. *[ADDITIONAL INFORMATION TO BE ADDED IN THE NEXT DRAFT]*

Other examples of the economic impacts of flooding are below (Gruntfest, University of Colorado, 1995):

- On July 31, 1976 a flash flood in Big Thompson Canyon resulted in damages exceeding $30 million.
- Following the 1993 Mississippi River Floods the town of Valmyer, Illinois took roughly $28 million in recovery funds and moved the entire town.
- In 1997 in Grand Forks, North Dakota (population of roughly 50,000 at the time), sustained more than $1 billion in damages from flooding.

Reducing additional development in the flood area avoids costs that will result from flooding.

Summary of Ecosystem Services

The existing natural resources in Portland provide ecosystem services that have economic benefits as described in Table 11. The total ecosystem services provided by the existing natural resources within the resources sites addressed in this project are estimated at XX-XX million annually. Generally speaking, *limiting* or *prohibiting* conflicting uses in significant natural resource areas will have a positive economic impact on ecosystem services.

Table 11: Ecosystem Services Provided by Existing Natural Resources *[TO BED ADDED IN NEXT DRAFT]*

Habitat Type	**Acres**	**Annual Value ($/Year)**
Forest/Woodland		
Shrubland		
Grassland		
Wetland		
Shallow Water Habitat		
Flood Area		
Total		

In addition to the ecosystem services described above, existing natural resources in Portland provide other general services that are important considerations in this analysis.

Property Values

The existence of trees, greenspaces and other natural resources have been positively correlated with residential property values in Portland (EcoNorthwest, 2009). Natural resources contribute to the quality of neighborhoods, to local and regional recreation and trail systems, and also to the quality of views. Screening and buffering between residential and industrial land uses can be provided by established trees and vegetation, and can improve the economic value of both uses (e.g. noise reduction). Other indirect “quality of life” values associated with natural resources include labor force

retention, attraction of new employees, and reputation. Portland is generally known nationally and internationally as a *green* city and a desirable place to live, visit, work, and play, which has a positive impact on aspects of the local and regional economy. As described above, limiting or prohibiting conflicting uses within significant natural resource area can have both a positive and negative economic impact.

Off-Site Benefits of Ecosystem Services

Natural resource benefits can occur beyond the immediate area. For example, large forest patches located in close proximity to other large patches provide a habitat network for wildlife residency, migration and dispersal. The benefits of flood storage on a site may reduce the cost of flood repair at upstream or downstream from the site itself. When benefits occur off-site, the property cannot capture the value of these benefits directly. As a result, the market price for natural resources, whether the flood area or a stand of trees, does not fully reflect a true exchange value relative to other goods. In fact, most natural resources are not priced because they are not bought and sold like other products. This makes establishment of value difficult.

Temporal Considerations

Some of the benefits provided by natural resources take many years to be realized. For example, the value of an immature stand of trees may not be realized for 25-50 years, when the trees have grown and matured and are providing maximum shade, carbon sequestration, rainwater interception, and evapotranspiration functions. Another factor that complicates the determination of the economic value of natural resources is that many natural resources have “irreversibility” properties. If the resource is eliminated there may be little or no chance of regeneration in any meaningful timeframe. Therefore the cost of losing natural resources must also include the opportunity costs, or the cost of future choices foregone.

Scarcity

Another topic of consideration is *scarcity*. As an area develops and natural resources are removed or degraded, the functions those resources provide become scarce. This can increase the value of the remaining natural resources. One example is bottomland hardwood forests. Bottomland hardwood forest is identified by the Oregon Conservation Strategy (ODFW, date) as a conservation strategy habitat with a regional priority for preservation. Bottomland hardwood forest is an important habitat type for migrating birds, particularly neotropical birds, and bats. Another example is grassland habitat. In the Willamette Valley, grassland has been reduced to less than 2% of its historic extent. This means that the wildlife species that depend on grassland habitat to complete their life cycle (e.g. ground nesters that need land sparsely vegetated with herbaceous vegetation) have significantly less habitat areas to choose from. The scarcity of bottomland hardwood forests and grasslands increases the value of the remaining habitat from a biodiversity standpoint and with regard to preventing future species listings under the federal Endangered Species Act.

Mitigation

The objective of most mitigation efforts is to make up for disturbances or damages to the ecosystem functions and services in a natural area by improving the functional capacity in another area or portion of a development site. In many instances, state or federal agencies have established guidelines outlining

the proper mitigation ratios to consider for a particular type of mitigation. Several studies tracking the success of mitigation projects have found that many mitigation efforts do not result in full economic replacement of impacted ecosystem services (ECONW, 2012).

Regulatory Compliance

Many different regulations address the types of natural resources that currently exist in Portland (see Chapter 2: Regulatory and Policy Context). Regulatory compliance is important for City of Portland to avoid cost and liability. Please see the Social section for additional explanation of regulatory compliance.

c. Summary of Economic Consequences

Allowing conflicting uses would have the following consequences:

i. Maintain land supply to meet forecasted job growth demand through 2035
ii. Expand local and regional economic benefits of industrial development and associated middle-wage jobs
iii. Enhance opportunities for housing diversity and affordability
iv. Increase risks and private and public costs associated with natural hazards such as flooding
v. Have both negative and positive impacts on property values
vi. Reduce the contribution of natural resource towards tourism
vii. Reduce the economic benefits derived from multiple ecosystem functions and increase costs, both private and public, associated with replacing the functions lost
viii. Complicate efforts to comply with regional, state and federal requirements (e.g., Clean Water Act, Endangered Species Act) resulting in potential liability and associated costs
ix. Reduce the City of Portland's ability to minimize risks and costs associated with Climate Change
x. Reduce ability to leverage development to protect and improve ecosystem services

Limiting conflicting uses would have the following consequences:

i. Neither increase or decrease land supply to meet forecasted job growth demand through 2035
ii. Maintain local and regional economic benefits of industrial development and associated middle-wage jobs
iii. Maintain opportunities for housing diversity and affordability
iv. Maintain risks and private and public costs associated with natural hazards such as flooding
v. Contribute to the maintenance of property values
vi. Maintain the contribution of natural resource towards tourism
vii. By requiring mitigation, maintain economic benefits derived from multiple ecosystem functions; however, there would be increased replacement costs
viii. Support efforts to comply with regional, state and federal requirements (e.g., Clean Water Act, Endangered Species Act)
xi. By requiring mitigation, may help maintain the City of Portland's ability to minimize risks and costs associated with Climate Change
ix. Maintain opportunities to leverage development to protect and improve ecosystem services

Prohibiting conflicting uses would have the following consequences:

i. Decrease the land supply to meet forecasted job growth demand through 2035
ii. Reduce local and regional economic benefits of industrial development and associated middle-wage jobs
iii. Reduce opportunities for housing diversity and affordability
iv. Reduce risks and private and public costs associated with natural hazards such as flooding
v. Have both negative and positive impacts on property values
vi. Reduce opportunities for development that supports tourism
vii. Maintain economic benefits derived from multiple ecosystem functions; however, there would be increased replacement costs
viii. Support efforts to comply with regional, state and federal requirements (e.g., Clean Water Act, Endangered Species Act)
ix. Maintain the City of Portland's ability to minimize risks and costs associated with Climate Change
x. Maintain opportunities to leverage development to protect and improve ecosystem services

d. Economic Recommendation

Based solely on the economic consequences analysis of *allowing*, *limiting*, or *prohibiting* development in significant natural resource areas, the following general recommendations are intended to optimize the economic values described in the narrative.

Strictly limit conflicting uses within rivers, streams, wetlands, and flood areas.
Rivers, streams, wetlands and flood areas are critical infrastructure in the City of Portland and provide multiple ecosystem functions that cannot be replaced without significant economic costs. These water features move water, provide water quality functions and reduce risks of flooding. Many waterbodies are also designated as "critical habitat" for ESA-listed species and are necessary to support the fisheries industry. Larger rivers are also shipping channels and other non-shipping development within the channels should be strictly limited to maintain shipping capabilities. Finally, water features enhance property values and contribute towards the tourism industry.

Limit conflicting uses within 50 feet of rivers, streams, and wetlands.
The land immediately surrounding rivers, streams and wetlands has a direct and critical impact on the ecosystem functions provided by water features. Vegetation removal, grading, soil compaction, and impervious surfaces change the hydrology and quality of the water entering the water features. Limiting conflicting uses would neither increase or decrease the supply of land needed to meet forecasted job growth through 2035. Limiting conflicting uses would require minimizing development impacts on the features where possible. Mitigation for unavoidable impacts could replace lost ecosystem services. Requiring mitigation could result in additional costs to develop. This could have a negative, but small, impact on job and housing diversity and affordability. However, limiting conflicting uses would maintain the off-site services that protect property values including reducing flooding, erosions and landslide risks. Limiting conflicting uses would also retain the ability to leverage future development to enhance and restore ecosystem services.

Limit conflicting uses within riparian forests and woodlands

Riparian tree canopy provides a host of ecosystem functions and contributes directly to the ecosystem functions provided by rivers, streams, and wetlands. Tree removal changes hydrology and quality of the water entering the water features, as well as reducing habitat quality and diversity. Tree removal can result in increased erosion and risk of landslides. Tree removal also impacts air quality and temperature. Limiting conflicting uses would neither increase or decrease the supply of land needed to meet forecasted job growth through 2035. Limiting conflicting uses would require minimizing develop impacts on the features where possible. Mitigation for unavoidable impacts could replace lost ecosystem services. This could have a negative, but small, impact on housing diversity. Limiting conflicting uses would also retain the ability to leverage future development to enhance and restore ecosystem services.

Limit conflicting uses within forests vegetation on steep slopes

Trees on steep slopes help to stabilize the soil and reduce the risk of landslides. The trees also provide habitat, maintain air temperature, and contribute to property values. Limited conflicting uses in upland forests and woodlands would have little to no impact on industrial land demand. Limiting conflicting uses would require minimizing development impacts on the features where possible. Mitigation for unavoidable impacts could replace lost ecosystem services. This could have a negative, but small, impact on housing diversity. Limiting conflicting uses would also retain the ability to leverage future development to enhance and restore ecosystem services.

Allow conflicting uses within other areas of significant natural resources

The economic benefit of conflicting uses generally outweigh the economic benefit of non-forested areas located outside of flood areas, further than 50 feet from rivers, streams, and wetlands or on steep slopes.

2. Social Consequences

This portion of the analysis summarizes the social consequences of protecting natural resource areas. The social consequences are expressed as the qualitative and relative costs, benefits, and impacts of allowing, limiting, or prohibiting conflicting uses. The social analysis relies on current information related to:

- Human Health and Welfare
- Historic, Heritage, and Cultural Values
- Regulatory Compliance

a. Human Health and Welfare

Employment Opportunities

One of the most important factors in determining human health and welfare is household income, which is dependent on employment. The reason that income has such a strong influence on health is that it determines whether people are able to make healthy choices such as living in safe, healthy homes and neighborhoods, eating nutritious food, fully participating in family and community life, and obtaining timely and appropriate health care. Many studies have shown that people with health insurance are healthier than those without (Mult. Co. Health Department, 2012). In the United States the risk for mortality, morbidity, unhealthy behaviors, reduced access to health care, and poor quality of health care increases with decreasing socioeconomic circumstances (CDC, 2011). Research has linked unemployment to stress, depression, obesity, and increases in cardiovascular risk factors such as high blood pressure (Mult. Co. Health Department, 2012).

A 2012 informational piece published by the American Psychological Association states that "the current state of the economy continues to be an enormous stressor for Americans…Unemployed workers are twice as likely as their employed counterparts to experience psychological problems such as depression, anxiety, psychosomatic symptoms, low subjective well-being, and poor self-esteem. The piece continues, "Like unemployment, underemployment…is unequally distributed across the U.S. population, with women, younger workers, and African Americans reporting higher rates of involuntary part-time employment and low pay, as well as higher proportions of "discouraged" workers who have given up on searching for a job.

Average median household income for Portland in 2016 is $76,033. The City of Portland commonly uses an income at or above 80 percent MFI as a proxy for the minimum income needed to pay living expenses. Based on the 2014 data, approximately 40 percent of households are at or below 80 percent MFI.

Generally speaking, *prohibiting* or *limiting* conflicting uses within areas of significant natural resources would have a negative impact on employment by limiting the size or extent of commercial, employment or industrial development. This could have a negative impact on the availability of living-wage jobs.

However, many of the significant natural resources addressed by this ESEE are also regulated by state or federal rules. For example, the federal government generally *prohibits* development, other than transportation infrastructure and utilities, within river and stream floodways and *limits* development

within river and stream flood areas. State and federal rules *strictly limit* development within waters of the state, including wetlands. Areas that are designated critical habitat for Endangered Species Act-listed species have limitations on development as well. The majority of these state and federal regulations are related to riparian corridors. Therefore, the local limits on development within significant riparian corridors have a negligible negative impact on overall employment throughout the city.

Access to Nature

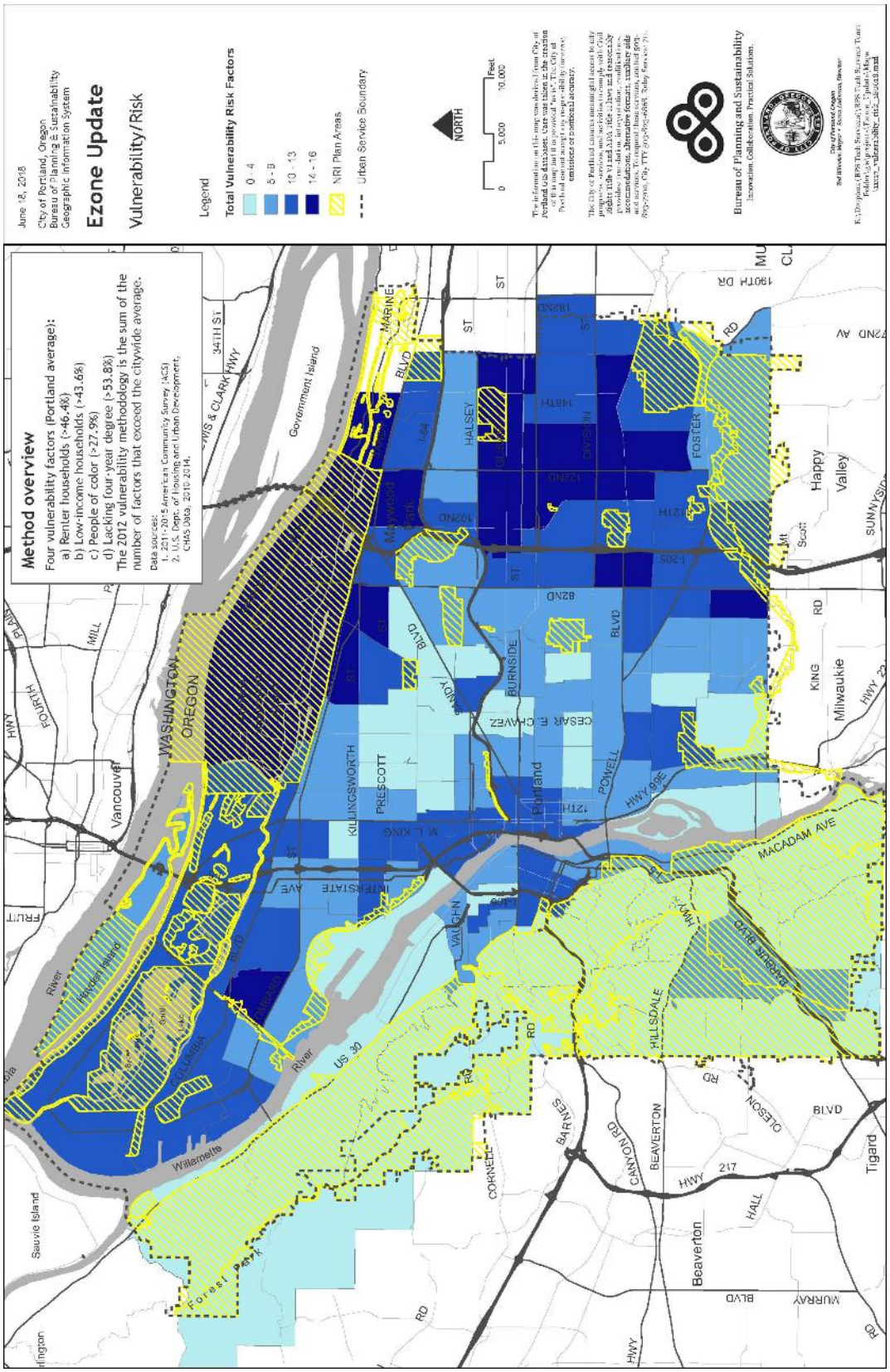
Access to natural areas and open spaces has an impact on human behavior and psyche. Access can mean a range of things from viewing vegetation to bird watching to hiking or boating. Dr. Roger Ulrich of Texas A&M's Center for Health Systems and Design found that passive scenic values, such as looking at trees, reduces stress, lowers blood pressure, and enhances medical recovery (Ulrich et al. 1991). The presence of trees and grass can lower the incidence of aggression and violent behavior (Kuo and Sullivan, 2001b). Common green areas in neighborhoods can also increase community ties and support social networks, which are determining factors in overall health.

Recreation has multiple health benefits. For people who are inactive, even small increases in physical activity can yield numerous health benefits (Mult. Co. Health Department, 2012). Exercise improves overall health, which reduces public and private health care costs, improves quality of life, and may help people live longer (Nieman, 1998). Activities such as walking in forested areas help boost the immune system (Sachs and Segal, 1994). In addition, the Centers for Disease Control and Prevention strongly recommends improving access to places for physical activities such as biking or hiking trails to reduce the risk of cardiovascular disease, diabetes, obesity, selected cancers, and musculoskeletal conditions.

Melody Goodman, an assistant professor at Washington University in St. Louis, conducted research that found "your zip code determines more of your health than your genetic code." (www.hsph.harvard.edu/news/features/zip-code-better-predictor-of-health-than-genetic-code/) This is because people with a higher vulnerability risk typically live in areas of the city that do not support good health – areas near highways/railroads which decrease air quality and increase air temperature, areas without green infrastructure like trees, streams, wetlands and parks, and areas without access to transit, bicycle lanes, or sidewalks. Map 6 shows areas in Portland high vulnerability risks.

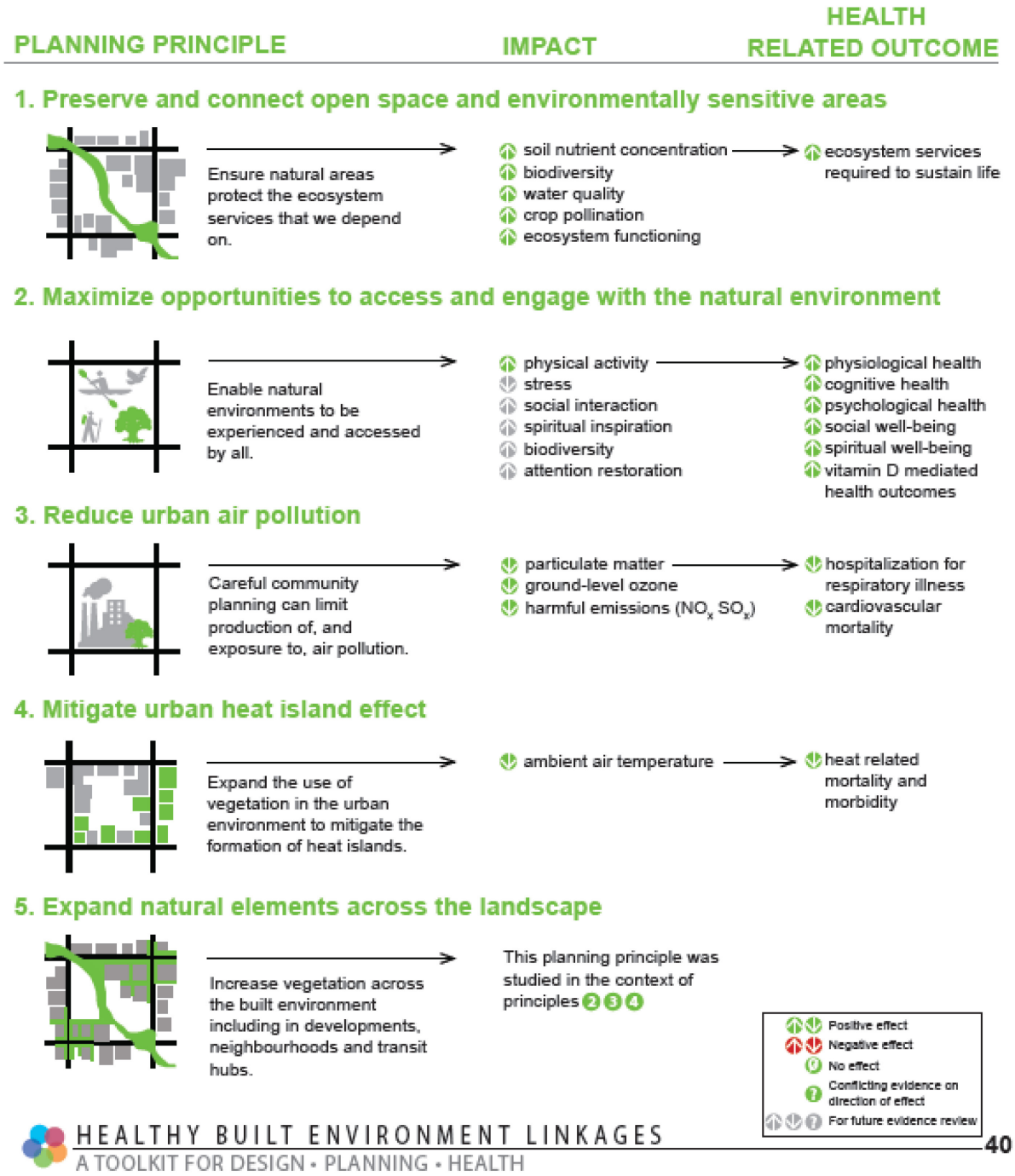
The British Columbia Center for Disease Control, developed a toolkit that makes links between planning, design, and health (Figure 3). The first planning principle is to preserve and connect open space and environmentally sensitive areas. Correcting the environmental overlay zones to better protect existing natural resources, coupled with actions that increase human access to the resources, will contribute towards improved public health for vulnerable communities in Portland.

Generally speaking, *limiting* or *prohibiting* conflicting uses in significant natural resource areas maintains nature and supports access to nature and the associated public health benefits.



Map 6: Vulnerability Risks in Portland

Figure 3: Relationship of Natural Resources to Public Health[1]



[1] BC Centre for Disease Control. (2018). Healthy Built Environment Linkages Toolkit: making the links between design, planning and health, Version 2.0. Vancouver, B.C. Provincial Health Services Authority. Retrieved from http://www.bccdc.ca/pop-public-health/Documents/HBE_linkages_toolkit_2018.pdf.

Climate Change and Public Health

Climate change impacts are already evident, both globally and in Oregon, and more impacts are inevitable, if uncertain. Currently available model projections for the Pacific Northwest have a higher degree of certainty related to expected changes in precipitation patterns and temperature increases but are inconclusive about what should be expected for total annual precipitation or extreme weather events. It is fairly certain that the Portland region will experience the following changes:

- Increased temperatures overall, including average, maximum and minimum temperatures in the summer and winter months (projected 0.5 ºF increase per decade).
- Changes in precipitation patterns, with more precipitation falling in mid-winter and less precipitation in the summer. More precipitation falling as rain rather than as snow in lower elevation watersheds.
- Continued influence of ocean-driven weather patterns (e.g. La Niña/El Niño and the Pacific Decadal Oscillation) and swings between hot/dry and cold/wet (Oregon Climate Change Research Institute, 2010).

These changes will have a negative impact on public health through more frequent and longer heat waves, more air quality advisory days, more flooding, and potentially less access to nature if certain habitats cannot adjust to the changes in weather.

Non-developed areas that provide multiple natural resource functions can play an important role in adapting to climate change in the region. Tree canopy helps cool and clear the air. Open water also helps cool the air. Flood storage provided by active flood areas may become even more important to accommodate potential changes in flows and flood regimes. Maintaining diverse habitats will be important for maintaining access to nature.

Limiting or *prohibiting* conflicting uses in significant natural resource area supports efforts to reduce climate change impacts.

Noise and Light Pollution

Natural resource areas and open spaces create natural screens and buffers between incompatible land uses, separating them and reducing a broad array of impacts. For example, the US Department of Agriculture reports that a 100-foot wide and 45-foot tall patch of trees (approximately 1/10 an acre) can reduce noise levels by 50 percent (1998). Trees can also reduce the off-site impacts of lighting or visual impacts from intensive development.

Noise and light pollution are often a concern of neighborhood residents living in close proximity to industrial, employment and commercial development. Rivers, streams and wetlands, as well as vegetated riparian areas around waterbodies form natural screens between land uses and can mitigate for noise and light pollution.

Limiting or *prohibiting* conflicting uses in significant natural resource area reduces the impacts of noise and light pollution.

b. Historic, Heritage and Cultural Values

Portlanders place a high value on the environment and quality of life. The Oregon state symbols reflect this value. The Oregon state bird is the Western Meadowlark, which is currently a state-listed Species of Concern and has been nearly extirpated from the city due to loss of native grasslands. Portland's City Bird, the Great Blue Heron, is found along rivers, streams and wetlands. Fourteen runs of the state fish, the Chinook salmon, use the Columbia River and all fourteen are federally listed as Threatened or Endangered. The beaver is Oregon's state animal and still resides in many of Portland's waterways.

Portland's identification with nature and wildlife is reflected in many ways. The Audubon Society of Portland is over 100 years old and is the largest chapter of the national Audubon Society. Many Portlanders are avid bird-watchers. Local festivals, Wild Arts Festival, Raptor Road Trip, and annual migratory bird festival at Ridgefield Wildlife Refuge in Washington state are attended by thousands of residents.

Metro has recognized the importance of fish and wildlife and their habitats by adopting the regional "Nature in Neighborhoods" program in 2005. This program establishes regional baseline requirements to protect fish and wildlife habitat and water quality. The requirements focus on protecting, conserving and restoring natural resource functions and values in riparian corridors. Establishing this program reflects the importance of environmental quality to the residents of the Metro region, including Portlanders.

There is a long history of human inhabitance in the study area. A short summary of the history and current cultural values, focusing on natural resources, is provided below. It is intended to illustrate the history humans have had with the Willamette River, Columbia River and the valley; as well as some of the cultural values humans have place on the natural resources.

<u>Native American History and Cultural Values</u>
The area now known as Portland has been populated with people from various tribes for thousands of years. In the Portland area, Native Americans lived primarily on the north and south shores of the Columbia River and near the mouth of the Willamette River, and other native peoples also traveled to and through the area. They camped, fished, hunted and gathered first foods such as salmon, lamprey, deer, camas, wapato, acorns and huckleberries. They also used the rivers to travel and trade among area tribes.

And today there are tribes throughout the northwest and beyond that retain an interest in the Portland area. Portland has a robust Native American community of roughly 40,000 people that represent over 300 tribes. These native peoples have an interest in ensuring the long-term protection and abundance of natural and culturally significant resources in order to continue their long-standing connection to the land and its waters. The rivers, streams, wetlands and natural areas have and continue to be important places for gathering food, conducting ceremonies and celebrations and maintaining lifeways practiced since time immemorial.

Post European Contact

European settlement occurred at the confluence of the Willamette and Columbia rivers due to the abundant natural resources and opportunities for trade. As more urban development occurred, the rivers played a key role in the economy. In the 1800's the Willamette River was used to move goods, particularly logs and agricultural products. In the mid-1900's shipbuilding was located in the Willamette River North Reach. The value Portlanders placed on the environment was reflected in city plans, including the 1903 Olmsted vision for a 40-mile loop trail that encompassed Portland and would provide its residents access to open spaces. The 40-mile loop trail is still being realized today through a system of trails throughout the city.

Today, Portlanders value the environment and quality of life. The Oregon state bird is the Western Meadowlark, which is currently a state-listed Species of Concern and has been nearly extirpated from the city due to loss of native grasslands. Five runs of the state fish, the Chinook salmon, use the Columbia and Willamette rivers and all five are federally listed as Threatened or Endangered. Many of Portland's waterways are still inhabited by beaver, the Oregon state animal.

Portland's identification with nature and wildlife is reflected in many ways. The Audubon Society of Portland is over 100 years old and is the largest chapter of the national Audubon Society. Many Portlanders are avid bird-watchers. Local festivals including the Wild Arts Festival and Salmon Festival are attended by thousands of residents. The City is currently co-sponsoring a new event to celebrate the role of the Willamette River in Portland. The first "River Fest" was held in Portland in summer 2008.

Metro has recognized the importance of fish and wildlife and their habitats by adopting the regional "Nature in Neighborhoods" program in 2005. This program establishes regional baseline requirements to protect fish and wildlife habitat and water quality. The requirements focus on protecting, conserving, and restoring natural resource functions and values in riparian corridors. Establishing this program reflects the importance of environmental quality to the residents of the Metro region, including Portlanders.

c. Regulatory Compliance

Regulatory compliance is important for the City of Portland to avoid cost and liability, and because Portland values its role as a leader in sustainability and environmental management. There are multiple regulations described in Appendix A for which Portland must maintain compliance. Below are summaries of three regulations that the existing Environmental Program complies with.

Endangers Species Act

After the 1998 listing of steelhead trout in the Lower Columbia River, the City of Portland began developing a comprehensive, coordinated citywide response to threated and endangered species for City Council adoption (Resolution No. 35715). The City Council established an intent to avoid "take" of a listed species (i.e., harming individuals or populations or their habitat), and to assist with recovery of listed fishes. The City has since taken actions such as identifying and prioritizing City programs that could affect listed species, providing technical support to bureaus, providing oversight for activities involving federal permitting or funding, and developing a watershed management plan to help guide city actions. The protection and enhancement of habitats critical to threatened and endangered species are important actions to aid in the recovery of listed species.

Areas that provide habitat for ESA-listed species are designated in the NRI as Special Habitat Areas and received the highest rank. *Limiting* or *prohibiting* conflicting uses in these areas will support recovery of ESA-listed species.

National Flood Insurance Program
The Federal Emergency Management Agency (FEMA) manages the National Flood Insurance Program (NFIP) which includes regulatory components for flood area management, flood area mapping and flood insurance. The NFIP flood area management regulations (44 CFR 60) are implemented through local jurisdictions. The City of Portland's local flood area ordinance is found in Portland City Code 24.50.

In 2016, the National Marine Fisheries Service (NMFS) issued a Biological Opinion in consultation under Section 7 of the Endangered Species Act (ESA) that the development in the floodplain has impacts on critical salmon habitat. The Biological Opinion, or FEMA BiOp, was in response the settlement of a 2009 lawsuit made by the Audubon Society of Portland, National Wildlife Federation, Northwest Environmental Defense Center, and the Association of Northwest Steelheaders against FEMA implementation of the NFIP. In the FEMA BiOp, NFMS concluded that FEMA's implementation of the NFIP jeopardizes protected salmon and steelhead and directed FEMA to amend the requirements of participation in the NFIP so as to ensure the protection of flood area habitat and flood storage. Suggested amendments include limits on the types of uses allowed in the flood area, high ratios mitigating for new fill in the flood area and protection of trees and vegetation in the flood area.

Using the FEMA BiOp and expected FEMA requirements to maintain access to flood insurance as a catalyst, the City of Portland has begun the Floodplain Management Update Project (FMUP). This multi-bureau project is an effort to advance City goals for health, safety, and the environment, while meeting all FEMA requirements for the NFIP and ensuring compliance with ESA, in excess of the FEMA requirements. *Limiting* or *prohibiting* conflicting uses in the flood area will support compliance with the FEMA BiOp.

Title 13: Nature in Neighborhoods
Metro Title 13: Nature in Neighborhoods is the regional program that complies with portions of State Land Use Goals 5 Natural Resources, Scenic and Historic Areas, and Open Spaces and 6 Air, Water and Land Resources Quality. By complying with Title 13, local jurisdictions are complying with Goals 5 and 6 as well. Title 13 calls for programs to avoid adversely affecting significant natural resources and mitigating for unavoidable impacts on those resources. The City of Portland is in substantial compliance with Title 13 through the existing program which generally limits conflicting uses in areas containing High or Moderate Habitat Conservation Areas, which are synonymous with City of Portland High and Medium Rank Resources. *Limiting* conflicting uses will maintain substantial compliance with Title 13.

d. Summary of Social Consequences

Allowing conflicting uses would have the following consequences:

i. Expand local and regional employment benefits associated living-wage jobs
ii. Reduce human health and welfare benefits associated with natural resources
iii. Reduce screening and buffering benefits of natural resources between land uses
iv. Reduce the ability of the City to comply with regional, state, and federal regulatory requirements

Limiting conflicting uses would have the following consequences:

i. Maintain most or all local and regional employment benefits associated living-wage jobs
ii. Maintain most human health and welfare benefits associated with natural resources
iii. Maintain most screening and buffering benefits of natural resources between land uses
iv. Maintain the ability of the City to comply with regional, state, and federal regulatory requirements

Prohibiting conflicting uses would have the following consequences:

i. Reduce some local and regional employment benefits associated living-wage jobs
ii. Preserve human health and welfare benefits associated with natural resources
iii. Preserve screening and buffering benefits of natural resources between land uses
iv. Enhance the ability of the City to comply with regional, state, and federal regulatory requirements

e. Social Recommendation

Based solely on the social consequences analysis of allowing, limiting, or prohibiting development in significant natural resource areas, the following general recommendations are intended to optimize the social values described in the narrative.

Strictly limit conflicting uses within rivers, streams, wetlands, and flood areas.
Rivers, streams, wetlands, and flood areas provide multiple social benefits such as air quality, air temperature moderation, recreational opportunity, and health benefits. These water features move water and reduce risks of flooding. Waterways are culturally and historically important. There would be negligible impacts on employment. Strictly limiting conflicting uses would support the city's compliance with regional, state, or federal rules.

Strictly limit conflicting uses within 50 feet of rivers, streams and wetlands.
Land and natural resources immediately adjacent to rivers, streams, and wetlands directly impact the social benefits provided by the water features. Riparian vegetation also provides multiple social benefits. Riparian areas are culturally and historically important. Limiting conflicting uses would require minimizing development impacts on the features where possible. Mitigation for unavoidable impacts could replace lost social benefits. This could have a negative, but likely negligible, impact on employment. Strictly limiting conflicting uses would support the city's compliance with regional, state, or federal rules.

*Limit c*onflicting uses within riparian forests and woodlands and other high or medium ranked riparian corridors
Forest and woodlands adjacent to rivers, streams, and wetlands directly impact the social benefits provided by the water features. Riparian forest and woodlands also provide multiple social benefits.

Riparian areas are culturally and historically important. Limiting conflicting uses would require minimizing development impacts on the features where possible. Mitigation for unavoidable impacts could replace lost social benefits. This could have a negative, but likely negligible, impact on employment. Limiting conflicting uses would support the city's compliance with regional, state, or federal rules.

Limit conflicting uses within forests on steep slopes

Trees on steep slopes help to stabilize the soil and reduce the risk of landslides. The trees provide multiple social benefits such as air quality, air temperature moderation, recreational opportunity, and health benefits. Limiting conflicting uses would require minimizing development impacts on the features where possible. Mitigation for unavoidable impacts could replace lost social benefits. This could have a negative, but likely negligible, impact on employment.

Allow conflicting uses within low ranked riparian corridors and non-steep upland wildlife habitat

Allowing conflicting uses would contribute to the employment benefits provided by uses. Allowing conflicting uses would have a negative, but likely negligible, impact on the social benefits provided by low ranked natural resources.

3. Environmental Consequences

This portion of the analysis summarizes the environmental consequences of protecting natural resource areas. The natural environment in urban areas is altered and disturbed by human activities. However, human welfare depends in part on vital ecosystem services provided by natural resources such as fresh air, clean water, slope stability, food supply, shade, and access to nature. Fish and wildlife also depend on having adequate quantity and quality of habitat, especially in urban areas where habitat is limited.

a. Environmental Analysis

Ecosystem Services

Natural resources provide multiple services to associated development; these are called *ecosystem services*. Examples of the ecosystem services provided by natural resources include air purification, maintenance of water quality and quantity, flood storage, soil stabilization, air cooling, aesthetics, screening, and buffering, and employee benefits such as opportunities for recreation and exercise. Some of these services, when displaced by development, must be replaced using infrastructure. For example, when a site is converted from a natural area to a parking lot, the hydrologic and water quality functions provided by the natural area must be replaced in the form of stormwater management and/or landscaping. Another example is flood storage. When the flood area is filled to allow for development the change in hydrology can increase the risk of flooding off-site and may require mitigation by creating flood storage elsewhere. A final example, when tree on steep slopes are removed, erosion and landslides can damage property.

Development can have many negative impacts on natural resources. Development reduces the overall size and complexity of existing natural resources features. Often mitigation for these impacts is required through federal, state, or local regulations; however, mitigation actions rarely can replace all impacted features or functions in full (ECONorthwest, 2012).

Development also has negative impacts to adjacent remaining habitat. Reducing the size of the habitat increases the edge to interior habitat ratio. Reducing the riparian area around a river, stream, or wetland has negative impacts on the water body. Noise, light, dust, and vibration from the development penetrate into the edge of the remaining habitat. Impacts from actions like construction can last long-after the action is completed. Physical pollution, such as chronic noise, light, and vibration, have negative environmental impacts, including significant changes in migration, foraging, predator-avoidance behaviors, reproductive success, and community structure of many fish and wildlife species (Barber et.al., 2009). Light pollution can affect salmon migration (Tabor, 2004) and noise pollution can have impacts on bats (*citation needed*). Chemical pollution from industrial accidents, effluent discharge, and particulate releases also disrupts similar behavior and life history strategies of fish and wildlife. Some species can adapt to such changes to their environment; however, many others cannot.

Fragmentation of natural resources by roads and trails creates places where invasive plants can intrude into the habitat. People using these facilities can also have a negative impact on the resources. For example, people hiking on trails cause noise that can disturb wildlife, particularly if people bring dogs on

the hike. Leaving behind trash, pet waste, and trampled vegetation, and the act of plant/animal harvesting are common impacts of human use of natural areas.

Limiting or *prohibiting* conflicting uses within significant natural resource areas has a positive impact on the environment.

Climate Change

Climate change impacts are already evident, both globally and in Oregon, and more impacts are inevitable, if uncertain. To adapt, the region must understand and prepare for change. Portland's Climate Action Plan calls for a comprehensive review to better understand the possible and the likely impacts of climate change. The purpose is to assess climate-related vulnerabilities, and the strengths and resiliency of: local food, water and energy supplies, infrastructure, transportation and freight movement, flood areas, watersheds, public health, public safety, social services, and emergency preparedness.

Decision-making in the face of uncertainties in climate change projections, especially in regional downscaling of global climate change models, remains a challenge. Climate projections work well for some variables and poorly for others. For example, currently available model projections for the Pacific Northwest have a higher degree of certainty related to expected changes in precipitation patterns and temperature increases but are inconclusive about what should be expected for total annual precipitation or extreme weather events.

That being said, it is fairly certain that the Portland region will experience the following changes:

- Increased temperatures overall, including average, maximum and minimum temperatures in the summer and winter months (projected 0.5 ºF increase per decade).
- Changes in precipitation patterns, with more precipitation falling in mid-winter and less precipitation in the summer. More precipitation falling as rain rather than as snow in lower elevation watersheds.
- Continued influence of ocean-driven weather patterns (e.g. La Niña/El Niño and the Pacific Decadal Oscillation) and swings between hot/dry and cold/wet (Oregon Climate Change Research Institute, 2010).

In addition, the Portland region may also experience:

- Changes in total annual precipitation amounts (increases or decreases).
- A change in the frequency, magnitude or duration of extreme weather events (intense rainfall, wind storms, ice, and snow).

Non-developed areas that provide multiple natural resource functions can play an important role in adapting to climate change in the region. Flood storage provided by active flood areas may become even more important to accommodate potential changes in flows and flood regimes. Maintaining diverse habitats and migration corridors will be critical for resident and migratory wildlife that may be required to adapt their behaviors and life cycles to changes in air and water temperature, weather patterns, habitat ranges, and food sources.

Limiting or *prohibiting* conflicting uses in significant natural resource area supports efforts to reduce climate change impacts.

Regulatory Compliance

There are several regulations that address the types of natural resources that currently exist (see Chapter 2: Regulatory and Policy Context). Regulatory compliance is important for the City of Portland to avoid cost and liability, and because Portland values its role as a leader in sustainability and environmental protection and management. Non-compliance with environmental regulations results a greater loss of habitat and wildlife species.

b. Summary of Environmental Consequences

Allowing conflicting uses would have the following consequences:

i. Reduce functions provided to development and people by natural resources including air cooling and purification, maintenance of water quality and quantity, flood storage, aesthesis, and screening, and buffering between uses
ii. Require replacement of some lost functions with hard infrastructure (e.g., stormwater facilities, erosion control)
iii. Loss of significant environmental functions and increased negative impacts on environmental functions of remaining, adjacent natural resources (e.g., noise, light, runoff, etc.)
iv. Complicating efforts to comply with regional, state, and federal requirement (e.g., Clean Water Act, Endangered Species Act)
v. Increased chance for future Endangered Species Act listings of at-risk fish and wildlife species
vi. Reduction, incrementally, in the capacity of the region to adapt to climate change
vii. Foregoing opportunities to leverage future development and redevelopment to help enhance and restore ecosystem services

Limiting conflicting uses would have the following consequences:

i. By requiring mitigation, maintaining functions provided to development and people by natural resources including air cooling and purification, maintenance of water quality and quantity, flood storage, aesthetics, and screening and buffering between uses
ii. Would require replacement of some lost functions with hard infrastructure (e.g., stormwater facilities, erosion control)
iii. By requiring mitigation, maintaining most significant environmental functions; however, some feature and functions cannot be mitigated for and some functions may be shifted elsewhere through off-site mitigation
iv. Reduce the loss of significant environmental functions and maintain buffers between adjacent natural resources
v. Support efforts to comply with regional, state, and federal requirements (e.g., Clean Water Act, Endangered Species Act)
vi. By requiring mitigation, may help avoid risk of future Endangered Species Act listings of at-risk fish and wildlife species
vii. By requiring mitigation, may help maintain region's capacity to adapt to climate change
viii. Maintaining opportunity for natural resource enhancement and restoration; however, may forego some opportunities to leverage development to improve environmental functions

Prohibiting conflicting uses would have the following consequences:

ix. Maintaining functions provided to development and people by natural resources including air cooling and purification, maintenance of water quality and quantity, flood storage, aesthetics, and screening and buffering between uses
i. Avoid costs associated with replacing lost functions with hard infrastructure
ii. Maintaining significant environmental functions provided by the natural resources
iii. Support efforts to comply with regional, state and federal requirements (e.g., Clean Water Act, Endangered Species Act)
iv. Reduce risk of future Endangered Species Act listings of at-risk fish and wildlife species
v. Maintaining the region's capacity to adapt to climate change
vi. Foregoing opportunities to leverage development to enhance and restore environmental functions

c. Environmental Recommendation

Based solely on the environmental consequences analysis of allowing, limiting, or prohibiting development in significant natural resource areas, the following general recommendations are intended to optimize the environmental values described in the narrative. The economic, social, environmental, and energy recommendations are balanced and optimized in Section H. General ESEE Recommendation, and further refined in Chapter 3.

Prohibit conflicting uses within rivers, streams, wetlands, and flood areas
Rivers, streams, wetlands, and flood areas are critical infrastructure in the City of Portland and provide for the storage and movement of runoff. These water features reduce risks of flooding and provide all riparian corridor functions described in the NRI including water quality, sediment control, pollution control, nutrient cycling, and food web. Many waterbodies are also designated as "critical habitat" for ESA-listed species. Water features are migratory corridors for fish and wildlife species. Prohibiting conflicting uses within water features would maintain the functions of the features.

Strictly limit conflicting uses within 100 feet of rivers, streams, and wetlands
The land immediately surrounding rivers, streams, and wetlands has a direct and critical impact on the condition and functionality of the water features. Strictly limiting conflicting uses would prevent most additional direct impacts of development such as vegetation clean, grading, soil compaction, and impervious surfaces. Mitigation for unavoidable impacts could address most unavoidable impacts, except narrowing of the buffer between development and the water features. Strictly limiting conflicting uses would retain the ability to leverage future development to enhance and restore the riparian area.

Strictly limit conflicting uses within forests located on steep slopes
Trees on steep slopes help manage stormwater and reduce the risks of landslides. Strictly limiting conflicting uses in these areas would maintain the most functions provided by the trees. Mitigation for unavoidable impacts could address most unavoidable impacts. Strictly limiting conflicting uses would retain the ability to leverage future development to enhance and restore the forest and woodland vegetation.

Limit conflicting uses within all other areas providing significant riparian corridor or wildlife habitat
Limiting conflicting uses would result in most development needing to avoid, minimize or mitigate for adversity impacts on natural resource features and functions. This approach would help reduce the impacts of development on riparian corridors and wildlife habitat. This approach would maintain buffers between development and remaining natural resources and the ability to leverage future development to enhance and restore natural resources.

4. Energy Consequences

The energy analysis focuses on the following topics: transportation, infrastructure (water, sewer, stormwater), and the heating and cooling of structures. A general discussion of these topics is provided below.

a. Energy Analysis

Transportation

Energy expenditures for transportation relate primarily to travel distances from origin to destination and mode of transportation used. Both variables can be affected by natural resource protection in terms of the location of development and routing of transportation facilities. Major air, road, rail and water transportation infrastructure are located in close proximity to housing and employment in Portland, which helps reduce transportation-related energy consumption.

The availability of jobs near housing reduces commuter miles and energy consumption. Portland is the job and housing center for Oregon. The regional availability of alternative modes of transportation, such as buses, light rail, and walking and cycling routes, can also help reduce transportation-related energy consumption.

Designing transportation routes and facilities to avoid adversely affecting natural resources could increase or decrease the size or length of an infrastructure facility, and could affect the distance or travel time between origin and destination, for both people and goods. However, the majority of the transportation infrastructure in Portland is already built.

Generally speaking, *limiting* or *prohibiting* new or expanded transportation infrastructure in areas of significant natural resources would have a negligible impact on energy expenditures.

Infrastructure

Infrastructure services require energy to construct, operate and maintain. Efficient site design, e.g., clustered housing and other facilities, enables the provision of adequate sewer, stormwater, and water services while reducing overall demand for infrastructure (e.g., shorter lines, more efficient stormwater and wastewater treatment). Efficient site design can also allow development to avoid significant natural resources, although in some instances additional infrastructure may be needed to avoid the resource. Development located away from flood hazards can eliminate the need for additional structural components or hazard control structures.

Natural resources can be considered part of the infrastructure of the City. Trees and other vegetation intercept rain and snow, which reduces stormwater runoff and the need for stormwater management in the form of pipes and detention ponds. Rivers, streams, wetlands and flood areas provide hydrologic functions including providing a location for water to flow and storing floodwaters. When water bodies are filled, channelized or otherwise altered, additional infrastructure is needed to move water through the urban landscape (e.g. pipes). Soil, water bodies and vegetation filter pollutants from the water, improving water quality and reducing the need for treatment.

Generally speaking, *limiting* or *prohibiting* new built infrastructure in areas of significant natural resources maintains reduces energy consumption required to build infrastructure required to replace the natural functions provided by water bodies, floodplains and vegetation. However, the energy costs associated with some infrastructure could increase if the distance or size of the infrastructure must be increase to avoid significant natural resource.

Heating and Cooling

Energy demand for heating and cooling structures can be affected by site design, building form, and presence of trees, vegetation or water bodies. The orientation of buildings and use of vegetation to maximize solar heating in the winter and shading in the summer reduce both heating and cooling needs. The retention of trees, vegetation and water bodies, and the planting of new trees and vegetation reduce ambient air temperature and maintains local humidity, which can also help cooling needs.

Vegetation can also create a windbreak that can slow or divert cold winter winds reducing heat loss. Construction techniques that reduce the surface to volume ratio of a building (e.g., common wall), can also help reduce heating and cooling needs.

Generally speaking, *limiting* or *prohibiting* conflicting in areas of significant natural resources maintains the heating and cooling benefits provided by the natural resources and reduces energy consumption by buildings.

b. Summary of Energy Consequences

Allowing conflicting uses would have the following consequences:

i. May reduce additional transportation energy demand by maintaining employment opportunities in close proximity to housing
ii. Would require energy for land preparation and construction of stormwater management, flood control and erosion control
iii. Would require energy for land preparation and construction of sewer, water and other infrastructure
iv. May require additional energy for heating and cooling

Limiting conflicting uses would have the following consequences:

i. May reduce additional transportation energy demand by maintaining employment opportunities in close proximity to housing
ii. Would require energy for land preparation and construction of stormwater management, flood control and erosion control
iii. Would require energy for land preparation and construction of sewer, water and other infrastructure
iv. May require additional energy for heating and cooling

Prohibiting conflicting uses would have the following consequences:

i. May increase, although the impacts would be negligible, transportation energy demand by reducing employment opportunities in close proximity to housing
ii. Would retain functions of the natural resources for stormwater management, erosion
iii. May require additional energy for heating and cooling

c. Energy Recommendation

Based solely on the energy consequences analysis of allowing, limiting, or prohibiting development in significant natural resource areas, the following general recommendations are intended to optimize the environmental values described in the narrative. The economic, social, environmental, and energy recommendations are balanced and optimized in Section H. General ESEE Recommendation, and further refined in Chapter 3.

Prohibit conflicting uses within streams, wetlands, and flood areas
Streams, wetlands, and flood areas are critical infrastructure in the City of Portland and provide for natural stormwater management, flood control and erosion and landslide control. Prohibiting conflicting uses within water features would maintain the functions of the features and reduce energy consumption needed to replace the functions with built infrastructure.

Strictly limit conflicting uses within rivers
Rivers are critical infrastructure in the City of Portland and provide for natural stormwater management and flood control. Rivers are also major shipping channels, moving goods and services. Strictly limiting conflicting uses would maintain the natural functions of the rivers while maintaining the existing infrastructure for shipping, thus reducing energy consumption by creating or expanding shipping infrastructure further away from Portland's employment base.

Limit conflicting uses within 100 feet of rivers, streams, and wetlands
The land immediately surrounding rivers, streams, and wetlands has a direct and critical impact on functionality of the water features for stormwater management and flood control and provide heating and cooling benefits for the buildings. Limiting conflicting uses would prevent most additional direct impacts of development such as vegetation clean, grading, soil compaction, and impervious surfaces and thus reduce energy consumption to create built infrastructure to replace the natural functions. Mitigation for unavoidable impacts could address most impacts. Limiting conflicting uses would retain the ability to continue to development employment and housing and reduce sprawl.

Limit conflicting uses within forests
Trees on steep slopes help manage stormwater, reduce the risks of landslides and maintain the heating and cooling benefits of trees. Strictly limiting conflicting uses in these areas would maintain the most functions provided by the trees and reduce energy consumption needed to replace the natural functions with built infrastructure. Mitigation for unavoidable impacts could address most impacts. Limiting conflicting uses would retain the ability to continue to development employment and housing and reduce sprawl.

Allow conflicting uses within all other significant natural resources
Allowing conflicting uses in all other areas would maintain the capacity to centralize new housing and employment near the existing built infrastructure in Portland, reducing energy consumption associated with sprawl.

H. ESEE General Recommendations

The ESEE general recommendation balances the economic, social, environmental, and energy consequences of protecting natural resources. Portland is a highly developed area and impacts from conflicting uses cannot be fully avoided. Allowing some future development in natural resource areas is inevitable, particularly development associated with utilities and public infrastructure. However, conflicting uses should be limited overall in areas of high or medium ranked natural resources.

The ESEE general recommendations are taken forward into specific resource site ESEE analyses, resulting in an ESEE decision specific to each resource site. The general recommendations may be affirmed, modified or clarified in the resource site-specific ESEE decision.

1. No Rollback

The first recommendation is a "no rollback" policy approach to updating the environmental overlay zone boundaries. The previously adopted protection and conservation plans applied the environmental overlay zones to significant resources. This ESEE is replacing the previous ESEE recommendations and related decisions, but the results of this ESEE should not reduce the level of protection for significant natural resources features addressed in the previous plans. For example, if the previously adopted plan applied a *strictly limit* decision for a specific wetland, this ESEE will not recommend reducing the level of protection to a *limit* or *allow* decision for that specific wetland.

The "no rollback" policy approach is consistent with Metro's Title 13 Nature in Neighborhoods that specifically directed local jurisdictions, when updating their environmental programs to comply with Title 13, to not rollback existing protection levels.

The "no rollback" approach should not be construed to mean that environmental overlay zones cannot be updated to correctly apply to the location of existing resources, thus resulting in removal of an overlay zone or reducing the level of protections for a particular property or properties or a portion of a property. For example, if the previous ESEE decision was a *strictly limit* decision for streams and land within 50 feet of the stream but the overlay zone was incorrectly mapped and did not follow the stream; moving the boundary of the overlay zones to align with the stream and land within 50 feet is not a rollback even if some properties may have regulations removed.

2. ESEE General Recommendation

The City of Portland has an established program that applies environmental overlay zones to significant natural resources. The established program does not result in a *prohibit* decision for any significant natural resources. Instead the program clarifies that for some natural resources the conflicting uses should be *strictly limited*, while for other natural resources the conflicting uses should be simply *limited*. Both the *strictly limit* and *limit* recommendation are consistent with a *limit* recommendation as explained in OAR 660-023-0040(4). This approach is maintained.

There are positive and negative consequences to any decision to protect, or not, significant natural resources. Generally, there are more positive outcomes to protecting rivers, streams, and wetlands, plus the land within 50 feet, as well as flood areas, steeps slopes and forest and woodland vegetation, than there are negative outcomes. Within any given resource site there may be specific resources or

Special Habitat Areas that are unique or critical and also warrant protection – these are addressed in the resource site-specific ESEE decisions.

The ESEE general recommendations are to:

1. *Strictly limit* conflicting uses within rivers, streams or wetlands. Rivers and streams are mapped as the channel, bed, and banks, located between the tops-of-bank.

2. *Strictly limit* conflicting uses on land within 50 feet of rivers, streams or wetlands. The land is measured from the top-of-bank landward or from the edge of the wetland landward. Land includes any natural resource or development associated with the land including vegetation, flood area (vegetated or developed), structures, buildings or paved surfaces.

3. *Strictly limit* conflicting uses within the vegetated flood area within 170 feet of rivers and streams. The flood area within 170 feet of the rivers and streams is measured from the ordinary high-water mark landward. Vegetation includes forest, woodland, shrubland and herbaceous patches.

4. *Limit* conflicting uses within the developed/non-vegetated flood area located between 50 and 170 feet of rivers or streams. The flood area within 170 feet of the rivers and streams is measured from the ordinary high-water mark landward.

5. *Limit* conflicting uses within areas of vegetated flood area that are more than 170 feet of rivers or streams. Vegetation includes forest, woodland, shrubland and herbaceous patches. The flood area more than 170 feet of the rivers and streams is measured from the ordinary high-water mark landward.

6. *Limit* conflicting uses within areas of forest or woodland vegetation that are contiguous to rivers, streams or wetlands and between 50 feet to 100 feet from river or stream top-of-bank or edge of wetland.

7. *Limit* conflicting uses within areas of forest vegetation that are located on steep slopes (>25% slope) or are 30 acres in size or larger, including contiguous wetland area[2].

8. *Allow* conflicting uses within all other significant riparian corridors, wetlands or wildlife habitat areas.

The ESEE general recommendations provide a baseline approach that is further analyzed in the ESEE for each resource site. The ESEE general recommendations may be affirmed, modified or clarified. The resource site-specific ESEE decisions may maintain, increase or decrease the level of protection recommended by the general recommendations.

[2] The patch may be all forest or a combination of forest and wetland. If the combination of forest and wetland are 30 acres or larger then it qualifies for this ESEE recommendation. Example: 20 acres forest + 10 acres wetland.

J. Implementation Tools

The final ESEE decisions, documented in Volume 3, Part A-H, should be implemented through the updates to existing zoning code regulations and maps, presented in Volume 1, in the following ways:

1. Where there is a *strictly limit* decision, it is recommended that conflicting uses be restricted to a narrow set of environmentally appropriate development such as natural resource enhancement, major public trails, and structures for river-dependent and river-related uses; as well as public utilities and infrastructure, such as bridges, and maintenance, repair, and replacement of existing structures. Other development should be very narrowly limited to reduce impacts to significant natural resources. The code should require negative impacts to natural resource features and functions be avoided and minimized to the maximum extent practicable; and unavoidable negative impacts should be fully mitigated. Mitigation for unavoidable impacts should result in no net loss of features or functions and account for:
    - location of the mitigation site in proximity to the impact site;
    - timing of the mitigation action(s) in relation to the timing of impacts;
    - lag-time to achieve desired future conditions and functions of the mitigation actions;
    - relationship between the mitigation site and adjacent habitats and land uses; and
    - monitoring needed to ensure the mitigation is successful.

    A *strictly limit* decision can be implemented using the existing or updated protection overlay zone (p-zone) or river environmental overlay zone (river e-zone) code requirements. The boundaries of the overlay zones should be corrected periodically over time to better align with the natural resource features and functions the *strictly limit* decision applies to.

2. Where there is a *limit* decision, it is recommended that impacts to the natural resources be minimized but not fully avoided. The code should require negative impacts to natural resource features and functions be minimized to the maximum extent practicable and unavoidable negative impacts should be fully mitigated. Mitigation for unavoidable impacts should result in no net loss of features or functions and account for:
    - location of the mitigation site in proximity to the impact site;
    - timing of the mitigation action(s) in relation to the timing of impacts;
    - lag-time to achieve desired future conditions and functions of the mitigation actions;
    - relationship between the mitigation site and adjacent habitats and land uses; and
    - monitoring needed to ensure the mitigation is successful.

    A *limit* decision can be implemented using the existing or updated conservation overlay zone (c-zone) or river environmental overlay zone (river e-zone) code requirements. The boundaries of the overlay zones should be corrected periodically over time to better align with the natural resource features and functions the *limit* decision applies to.

3. Where there is an *allow* decision, it is recommended that conflicting uses be fully allowed. [3]

4. The zoning codes should provide exemptions or a non-discretionary review track for conflicting uses with minimal and definable impacts on natural resource feature and functions and for residential development. For other conflicting uses with impacts that are not minimal and definable or not residential, a discretionary review track should be used. Under either a non-discretionary or discretionary review track, full mitigation for unavoidable negative impacts to features and function should be required.

[3] The ESEE recommendations and implementation measures here and in Volume 1 and Volume 3 comply with Statewide Planning Goal 5 and Metro Title 13. However, the environmental overlay zone codes and maps are not specific to Goal 5. The environmental overlay zone codes and maps are also used to protect natural resources in compliance with Statewide Planning Goal 6 or Goal 7 and Metro Title 3. There are circumstances where the ESEE decision for Goal 5 is to *allow* conflicting uses for a specific natural resources, but an environmental overlay zone is applied to those resources as it relates to Goal 6 or Goal 7 or Title 3. An *allow* decision should not be construed to mean no environmental overlay zone may ever be applied to resources.

The *Environmental Overlay Zone Map Correction Project* plan documents:

Volume 1 – Project Report, Summary of Results and Implementation

The purpose of the Project Report is to document the overall project approach and methodology, summarize public engagement, provide an at-a-glance summary of the results by resource site, and present the updated zoning code maps and refinements to zoning code chapter 33.430, Environmental Zones.

Volume 2 – General Economic, Social, Environmental and Energy Analysis

The General ESEE evaluates the tradeoffs between protecting natural resources and other city goals for economic development, housing, public health, etc. The General ESEE provides an overall recommendation regarding which natural resource features should be protected. The General ESEE recommendations are then affirmed, clarified or modified for each resource site based on resource site-specific circumstances. The resource site-specific ESEEs are presented in Volume 3, Part A-H.

Volume 3 – Resource Site Inventory and ESEE Decisions

For the each of the geographies listed below, each document presents an inventory of natural resource features and functions, a site-specific Economic, Social, Environmental and Energy Analysis (ESEE), and the ESEE decisions regarding which natural resource should be protected for each resource site.

Part A1 – Forest Park and Northwest District, Resource Sites 1 – 20

Part A2 – Forest Park and Northwest District, Resource Sites 21 – 41

Part B – Skyline West

Part C – Tryon Creek and Southwest Hills East

Part D – Fanno Creek

Part E – East Buttes and Terraces

Part F – Johnson Creek

Part G – Boring Lava Domes

Volume 4 – Appendices

Appendices include the Regulatory Context; 2012 NRI Project Report; stream, vegetation and wetland mapping protocols; and the at-risk species list.