

Environmental Overlay Zone Map Correction Project

EXISTING CONDITIONS REPORT

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Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.

City of Portland, Oregon
Ted Wheeler, Mayor • Susan Anderson, Director



ACKNOWLEDGEMENTS

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Table of Contents**Chapter 1. INTRODUCTION**

1.A. Project Summary	1
1.B. Background	2
1.C. Timeline	3

Chapter 2. NATURAL RESOURCES INVENTORY

2.A. Background	5
2.B. NRI Approach and Methodology	5
2.C. NRI Results	10

Chapter 3. ENVIRONMENTAL OVERLAY ZONES

3.A. Background	19
3.B. Types of Environmental Overlay Zones	19
3.C. Adopted Conservation and Protection Plans	20
3.C.1. Columbia Corridor Industrial/Environmental Mapping Project (1989)	22
3.C.2. Balch Creek Watershed Protection Plan (1991)	25
3.C.3. Johnson Creek Basin Protection Plan (1991, 1992, 1998 and 2003)	28
3.C.4. Northwest Hills Natural Areas Protection Plan (1991)	31
3.C.5. Southwest Hills Natural Areas Protection Plan (1992)	34
3.C.6. East Buttes, Terraces and Wetlands (1993)	37
3.C.7. Columbia South Shore (1993 and 2000)	41
3.C.8. Fanno Creek and Tributaries (1994)	44
3.C.9. Skyline West Conservation Plan (1994)	47
3.C.10. Boring Lava Domes/Johnson Creek (1997)	50
3.C.11. Multnomah County Unincorporated Areas (2002)	53
3.C.12. Pleasant Valley District Plan (2004)	57
3.C.13. Middle Columbia Corridor/Airport Futures (2011)	60
3.C.14. Citywide Environmental Overlay Zone Map Refinement Project (1998)	63
3.D. Natural Resources and Environmental Overlay Zones	64

Chapter 4. DEMOGRAPHICS and LAND USE

4.A. Demographics	66
4.A.1. Individuals	66
4.A.2. Households	67
4.A.3. Equity	68
4.B. Land Use	70

Chapter 5. PUBLIC HEALTH 72**Appendix A: NRI Methodology** 75**Maps**

1. Portland 2017 Aerial Photography	12
2. Water-Related Natural Resource Features	13
3. Vegetation Features	14
4. Flood Area and Steep Slopes	15
5. Riparian Corridors	16
6. Wildlife Habitat	17
7. Combined Relative Ranks	18

8. Columbia Corridor Industrial/Environmental Mapping Project Environmental Overlay Zones	24
9. Balch Creek Environmental Overlay Zones	27
10. Johnson Creek Basin Environmental Overlay Zones	30
11. Northwest Hills Environmental Overlay Zones	33
12. Southwest Hills Environmental Overlay Zones	36
13. East Buttes, Terraces and Wetlands Environmental Overlay Zones (East)	39
14. East Buttes, Terraces and Wetlands Environmental Overlay Zones (West)	40
15. Columbia South Shore Environmental Overlay Zones	43
16. Fanno Creek and Tributaries Environmental Overlay Zones	46
17. Skyline West Environmental Overlay Zones	49
18. Boring Lava Domes Environmental Overlay Zones	52
19. Multnomah County Unincorporated Areas Environmental Overlay Zones (South/East)	55
20. Multnomah County Unincorporated Areas Environmental Overlay Zones (West)	56
21. Pleasant Valley Environmental Overlay Zones	59
22. Middle Columbia Corridor/Airport Futures Environmental Overlay Zones	62
23. Natural Resources and Environmental Overlay Zones Comparison Map	65
24. Project Areas with High Vulnerability Risk	69
25. General Zoning	71

Figures

1. Stream Mapping using LiDAR	2
2. Example of an Unprotected Stream Segment	3
3. Environmental Overlay Zone Map Correction Project Schedule	4
4. Natural Resources Inventory GIS Model Flow Diagram	9
5. City of Portland Conservation and Protection Plans	20
6. Columbia Corridor Industrial/Environmental Mapping Project Plan Area	22
7. Columbia Corridor Industrial/Environmental Mapping Project Resource Mapping at Smith and Bybee Wetlands	22
8. Balch Creek Watershed Project Plan Area	25
9. Johnson Creek Basin Plan District	28
10. Northwest Hills Resource Site Vicinity Map	31
11. Southwest Hills Study Area	34
12. East Buttes and Terraces Conservation Plan Area	37
13. Columbia South Shore Study Area	41
14. Fanno Creek and Tributaries Conservation Plan	44
15. Skyline West Resource Protection Plan Area	47
16. Boring Lava Domes Supplement Study Area	50
17. Multnomah County Unincorporated Areas Study Area	53
18. Pleasant Valley	57
19. Middle Columbia Corridor/ Airport Futures Plan Area	60
20. Social Determinants of Health	72
21. Relationship of Natural Resources to Public Health	74

Tables

1. Summary of Natural Resource Features in Portland	10
2. Summary of Natural Resource Functions and Relative Ranks	11
3. Estimated Racial and Ethnic Composition	67
4. Household Demographic Characteristics	68
5. Land Use	70

1 INTRODUCTION

1.A. Project Summary

Environmental overlay zones and their associated regulations protect Portland's natural resources, including streams, wetlands and wildlife habitat, and minimize risk of damage to homes from natural hazards, including landslides, flooding and wildfire. The protections also mitigate the effects of climate change, such as reducing air temperature, which helps maintain Portland's livability and access to nature in the city.

The environmental regulations encourage flexibility and innovation in site planning and provide for development that is carefully designed to be sensitive to natural resources. The environmental overlay zones have been applied across Portland over the past 30 years through district plans.

The purpose of the Environmental Overlay Zone Map Correction Project is to synchronize the location of the overlay zones with the location of existing natural resources identified in the Natural Resources Inventory. This project is part of bringing the zoning code into compliance with the 2035 Comprehensive Plan and ensures resources across Portland are mapped accurately and are regulated in a consistent way.



Photo – People Canoeing in the Columbia Slough

1.B. Background

Beginning in 1989, Portland adopted natural resource conservation plans for areas in the city where there are significant natural resources. Following a process laid out by Oregon State Land Use Planning Goal 5, environmental overlay zones have been applied to protect streams, wetlands, forests, steep slopes and wildlife habitat. By 2002, environmental overlay zones had been applied to resources throughout all of Portland.

In the early 1990s, the City's environmental overlay zones were applied using relatively "low-tech" methods. Today, technology has advanced significantly and can help us identify and better map natural resources. For example, LiDAR is a remote sensing tool that detects light reflected off objects on the ground. LiDAR can be used to accurately and consistently map topography, streams, wetlands and vegetation – even the height of individual trees.

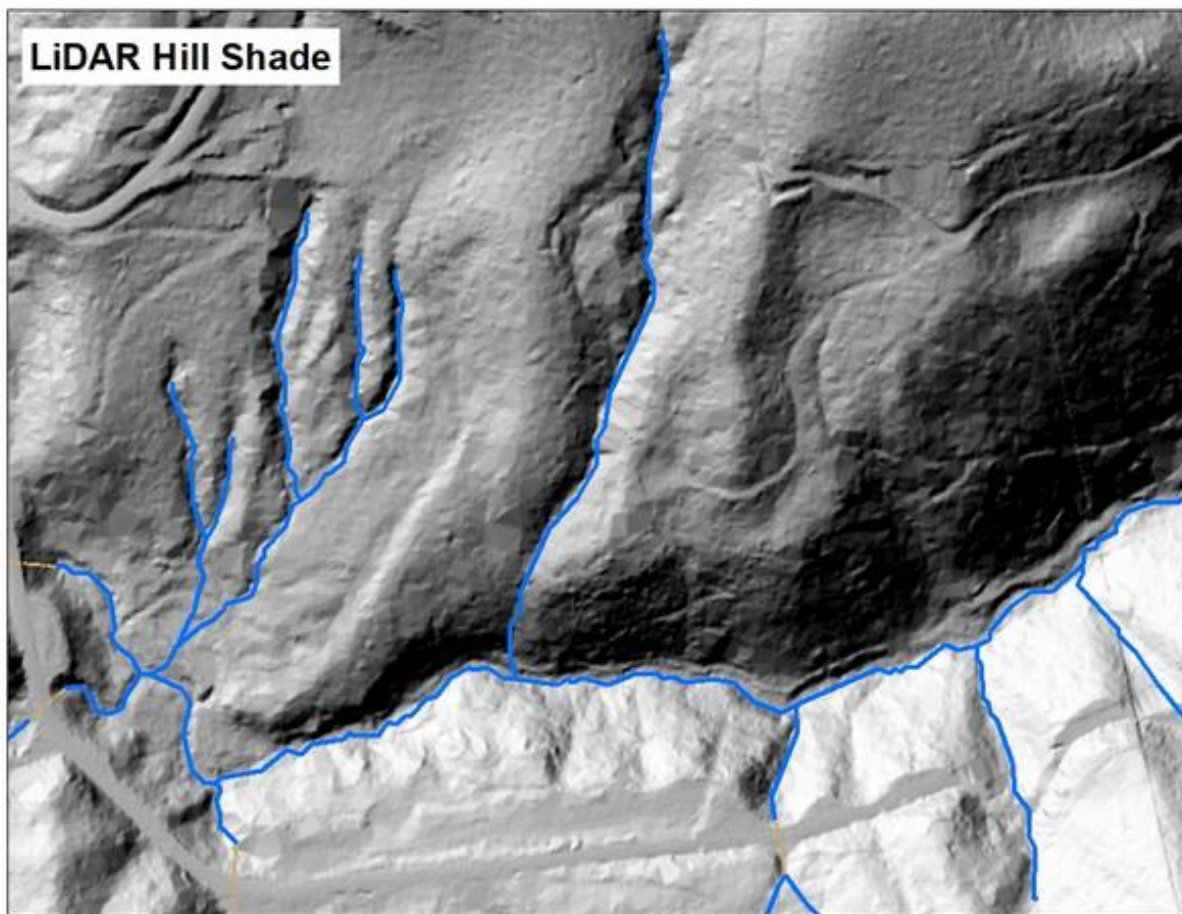


Figure 1: Stream Mapping using LiDAR

Using this new technology, the City updated maps of Portland's natural resources. Over 160 miles of streams were remapped and approximately 75 miles of previously unmapped streams were added. The new data was documented in the [National Resources Inventory](#) (NRI) and adopted by City Council in 2012.

This updated NRI revealed discrepancies between the environmental overlay zone boundaries and the location of resources those overlay zones were intended to protect. This means the environmental overlay zones need to be updated. The work will be done by taking the new NRI data showing where natural resources are located and adjusting the environmental overlay zone boundaries to match.

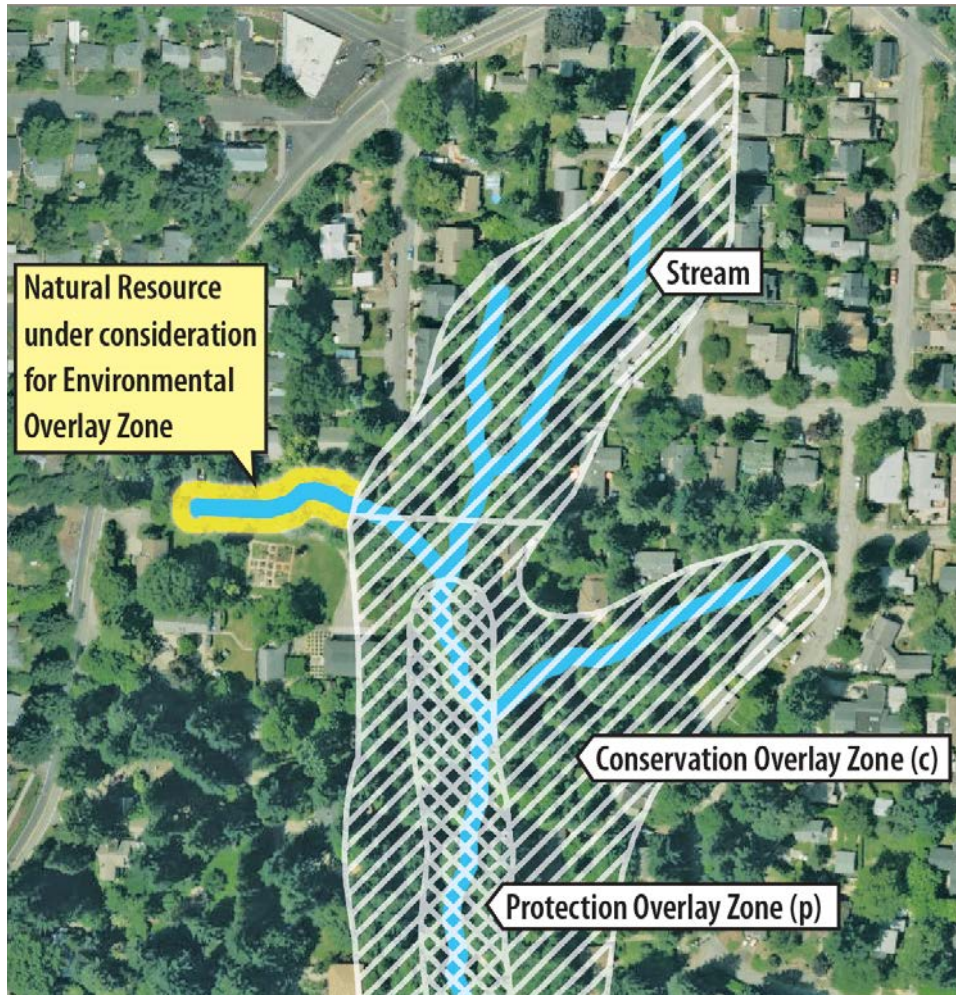


Figure 2: Example of an Unprotected Stream Segment

1.C. Timeline

The E-zone Map Correction Project will likely take three years to complete. The work will be done watershed by watershed starting in summer 2018 and culminating in hearings before City Council in 2020. Staff will be updating the natural resource feature data and drafting corrected e-zones in the following order (see also figure 3):

- Summer 2018 – Johnson Creek and Outer East
- Winter 2018/2019 – Columbia Slough and Columbia River
- Summer 2019 – Northwest Hills
- Spring 2020 – Southwest Hills

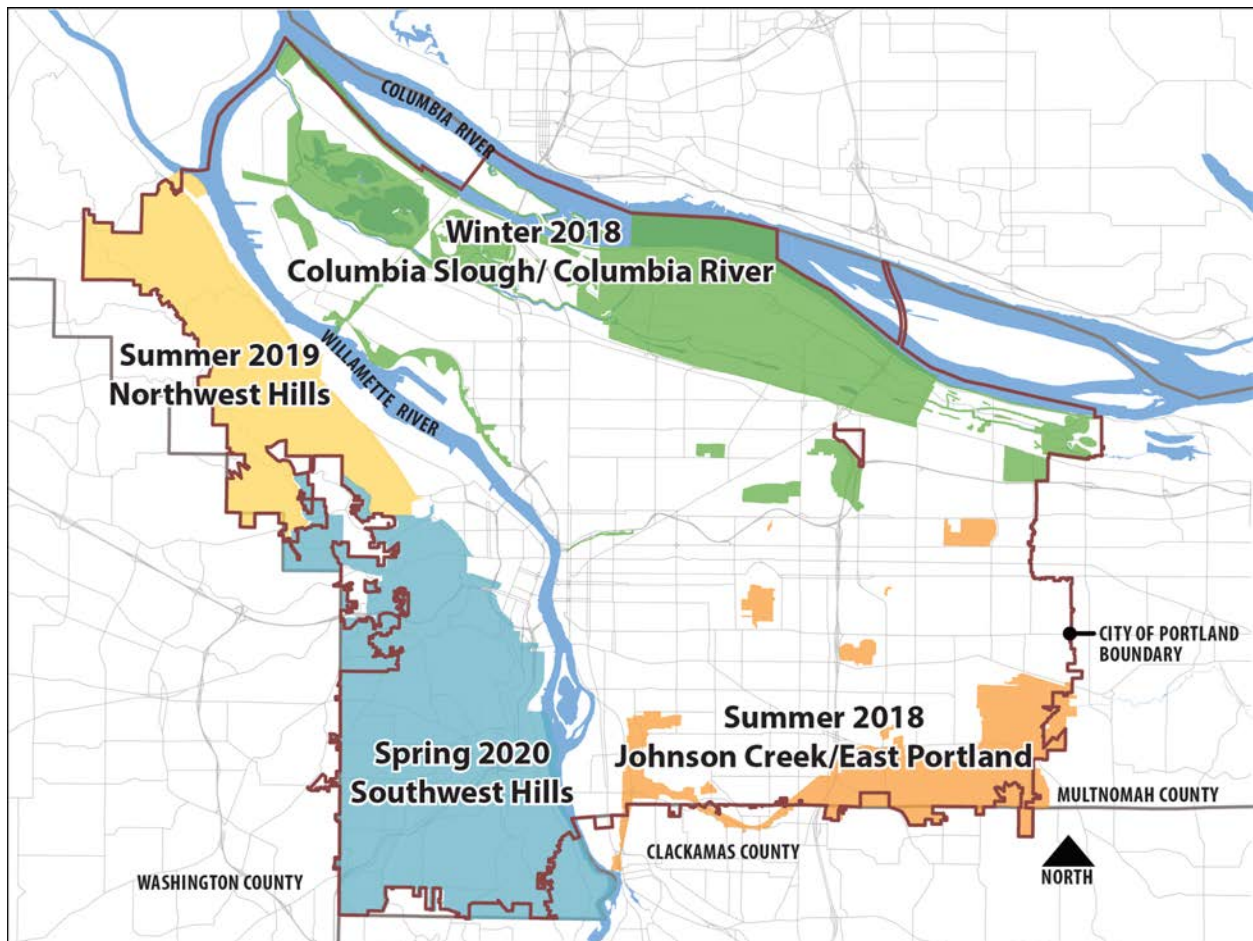


Figure 3: Environmental Overlay Zone Map Correction Project Schedule

2 NATURAL RESOURCES INVENTORY

2.A. Background

The Bureau of Planning and Sustainability adopted a new citywide Natural Resources Inventory (NRI) in 2012. The NRI methodology, described below, is based on Metro's Title 13, Nature in Neighborhoods, inventory of regionally significant riparian corridors and wildlife habitat.

The development of Metro's inventory is documented in the *Technical Report for Fish and Wildlife* (Metro, 2005), *Riparian Corridor and Wildlife Habitat Inventories* (Metro, 2005) and *Addendum and Update to Metro's Riparian Corridor and Wildlife Habitat Inventories* (Metro, 2005). In 2007, the Oregon Department of Land Conservation and Development (DLCD) acknowledged Title 13 as in compliance with Oregon State Land Use Goal 5, Natural Resources, Scenic and Historic Areas, and Open Spaces, and Goal 6, Air, Water and Land Resources Quality. As such, Title 13 established new regional requirements that Metro area cities and counties must meet to achieve compliance with specified elements of Oregon Land Use Planning Goals 5 and 6.

In 2012, Portland City Council adopted the new citywide NRI as the "factual basis" for the 2035 Comprehensive Plan. DLCD acknowledged the NRI in 2014 as in compliance with Oregon State Land Use Goal 5. The NRI is the natural resource information BPS uses to update and maintain zoning code regulations. As projects are undertaken, the NRI data is updated to reflect current existing conditions.

2.B. NRI Approach and Methodology

Below is a summary of the approach and methodology used in the NRI. Appendix A contains a detailed description of the NRI methodology.

The NRI reflects fundamental information from Metro's extensive review of scientific literature pertaining to riparian corridors and wildlife habitat. The scientific foundation upon which both inventories are based can be summarized as follows:

Riparian corridors are comprised of rivers and streams, drainageways, riparian vegetation and off-channel areas, including wetlands, side channels and floodplains. Riparian corridors usually contain a complex mix of vegetation consisting of trees or woody vegetation, shrubs and herbaceous plants. Portland's urban riparian corridors may also include riprap or other types of bank hardening, invasive species and development. Riparian corridors provide the transition between the stream banks and upland areas.

The predominance of riparian corridor functions occur within 100 to 300 feet of a water body, but some functions, such as the microclimate effect associated with forest vegetation, can occur up to 780 feet from a water body. Functions provided by natural resources located in riparian corridors include:

- **Microclimate and shade** – Open water bodies, wetlands, flood areas, and surrounding trees and woody vegetation are associated with localized air cooling, soil moisture and increased humidity.
- **Bank function and control of sediments, nutrients and pollutants** – River, stream, drainageway channels and flood areas have a direct relationship to bank functions and the conveyance of sediments, nutrients and pollutants. Trees, vegetation, roots and leaf litter intercept precipitation; hold soils, banks and steep slopes in place; slow surface water runoff; take up nutrients; and filter sediments and pollutants found in surface water. Structures, such as pilings, can also help stabilize banks and contain contaminants.
- **Stream flow moderation and flood storage** – Waterways and floodplains provide for conveyance and storage of stream flows and floodwaters in channel and above and below the ground surface; trees and vegetation intercept precipitation and promote infiltration which tempers stream flow fluctuations or “flashiness” that often occurs in urban waterways.
- **Organic inputs, nutrient cycling and food web** – Water bodies, wetlands, flood areas and nearby vegetation provide food (e.g., plants, leaves, twigs, insects) for aquatic and terrestrial species and are part of an ongoing chemical, physical and biological nutrient cycling system.
- **Large wood and channel dynamics** – Rivers, streams, drainageways, riparian wetlands, flood areas, large trees and woody vegetation contribute to natural changes in location and configuration of the waterway channel over time.
- **Wildlife movement corridors** – Rivers, streams, drainageways, wetlands, floodplains and vegetated corridors along waterways allow wildlife to migrate and disperse among different habitat areas and provide access to water.

Wildlife habitats provide food, cover, and roosting and nesting sites for a broad array of birds, mammals, reptiles and amphibians. The terrestrial habitat features that provide these functions include forests, woodland, shrubland, grassland and meadows, wetlands, rocky slopes and uplands, buttes and other topographic features. (For the purposes of this inventory, rivers, streams and drainageways are included in the riparian corridor.) The following wildlife habitat attributes are indicators of habitat function and habitat fragmentation due to urbanization:

- **Habitat patch size** – Larger habitat patches generally provide more food, cover, dispersal and nesting/denning opportunities for multiple wildlife species.
- **Interior habitat area** – Larger, rounder-shaped habitat patches experience less “edge effect” (disturbance from urban land uses such as noise/light/vibration, predation and invasive species) and provide more interior habitat area, a requirement for some sensitive wildlife species, than narrow patches.

- **Connectivity between habitat patches (including distance and edge effect)** – Patches located closer together allow for species dispersal and migration, and provide additional access to food, cover, nesting sites and reproduction opportunities.
- **Connectivity/proximity to water** – Access to water is vital to wildlife survival.
- **Special Habitat Areas** – The inventory recognizes specific habitat types or features that provide important functions for wildlife, including plant and wildlife species at risk, rare or declining habitat types such as native oak assemblages, critical habitat for threatened or endangered species, and urban structures such as bridges that are utilized by Peregrine Falcons for nesting.

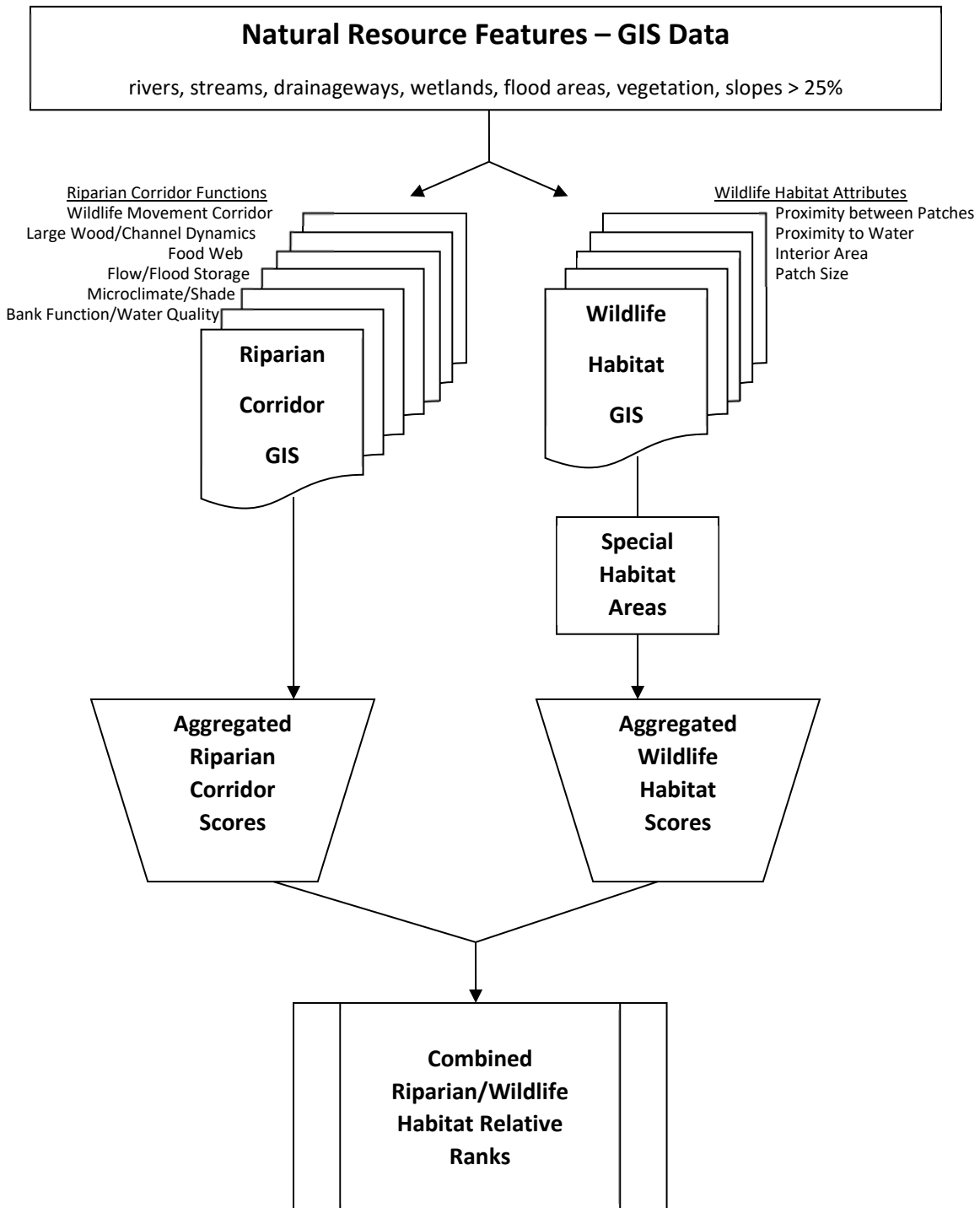
Within the city, natural resources generally reflect the impacts of urbanization; however, the resources still provide critical riparian and wildlife habitat functions. For example, vegetated areas in riparian corridors and upland habitats are often comprised of a mix of native, non-native and invasive plants. Native plant species generally provide a broader suite of benefits, such as varied wildlife food sources and effective slope stabilization. However, plants of all types, including non-native species, provide important watershed functions such as water storage, nutrient cycling and cover and nesting opportunities for wildlife. Other examples of the effects of urbanization include rivers and streams with constrained or altered channels, wetlands with soil contamination and developed flood plains. In each of these cases, the resource has experienced some degradation but still provides important functions such as water conveyance and storage, and fish and wildlife habitat.

BPS completed four steps to develop the NRI (Figure 4 is a flow chart depicting the steps):

1. Compiled GIS data and mapped key natural resource features including rivers, streams, drainages, wetlands, flood area, vegetation and topography.
 - Rivers, streams and drainageways are mapped using Light Detection and Ranging (LiDAR), a method for precisely measuring the elevation of the Earth's surface.
 - Wetlands are mapped based on state and city permit information and formal delineations following a state or federally-approved wetland delineation methodology.
 - Vegetation patches ½-acre or more in size are mapped and classified as forest (60-100% canopy coverage), woodland (25-60% canopy coverage), shrubland or herbaceous.
 - The flood area includes the 2004 and 2010 FEMA 100-year floodplain.
 - Topography is also mapped using LiDAR.
2. Ran two GIS models to map the functions provided by the natural resource features. Individual features are scored as providing riparian functions (listed above) and the score are aggregated into a riparian relative rank. Separately, individual features are scored as providing wildlife habitat (also listed above) and the scores are aggregated into a wildlife relative rank.
 - Examples of typical riparian corridor scores:
 - High – Rivers, streams, drainageways and wetlands; forest or woodland vegetation within a flood area or in close proximity to a water body; and woody vegetation on steep slopes.
 - Medium – Shrubland and herbaceous vegetation within a flood area or in close proximity to a water body.

- Low – Vegetation outside the flood area and further from a water body; developed flood areas; and hardened, non-vegetated banks of the Willamette River North Reach and South Reach and Columbia River surrounding Hayden Island.
 - Examples of typical wildlife habitat scores:
 - High – Large forest and wetland areas such as Forest Park, Smith and Bybee Wetlands, and Tryon Creek State Natural Area.
 - Medium – Moderate-sized forest and wetland areas such as those at Kelley Point Park, Oaks Bottom Wildlife Refuge and Powell Butte.
 - Low – Numerous smaller forest and wetland areas throughout the city.
3. Designated Special Habitat Areas (SHA). SHA are areas with documented sensitive/threatened/at-risk fish or wildlife species, sensitive/unique plant populations, wetlands, native oak, bottomland hardwood forests, riverine islands, river deltas, migratory stopover habitat, connectivity corridors, upland meadow and other unique natural or built structures or resources (such as bridges that provide habitat for Peregrine Falcons).
4. Produced maps of the combined relative ranks. The riparian corridor scores, wildlife habitat scores and SHA's are overlain and a singled combined relative rank is produced. Where ranked riparian corridors and wildlife habitat areas overlap, and if the two aggregated relative ranks differ, the higher of the two ranks becomes the overall combined rank for that resource area. For example, a feature that ranks medium for riparian corridor functions and low for wildlife attributes, would receive a medium combined relative rank.

The E-zone Map Correction Project will update the NRI GIS feature data based on new information and site visits. The updated NRI will be used to ensure the correct placement of environmental zones. In all cases, the feature data (rivers, streams, drainages, wetlands, flood area, vegetation and topography) is used to adjust the location of the environmental overlay zone boundaries. Sometimes, if the legislation adopting the environmental overlay zones meant to protect specific riparian corridor or wildlife habitat functions or features with an overall "high" or "medium" rank or quality, then the NRI functions, scores or combined ranks may be used.

Figure 4: Natural Resources Inventory GIS Model Flow Diagram

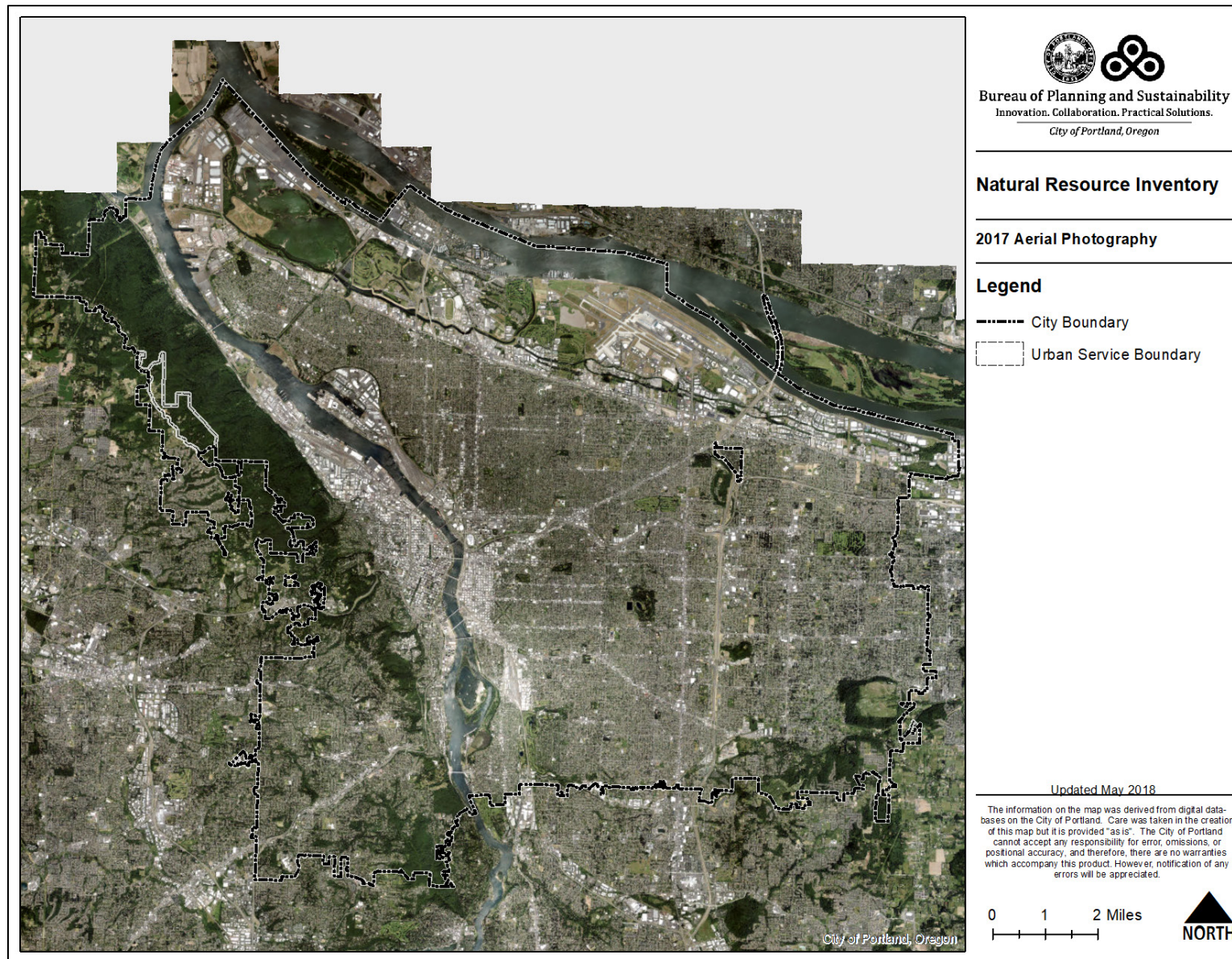
2.C. NRI Results

Below are the overall results and maps for natural resource features and functions in Portland. Results for each watershed and subdistrict are provided in Chapter 3 Environmental Overlay Zones. Note - The E-zone Map Correction Project will not include corrections within the Willamette River Greenway Boundary. Those corrections are being addressed through a separate River Plan process.

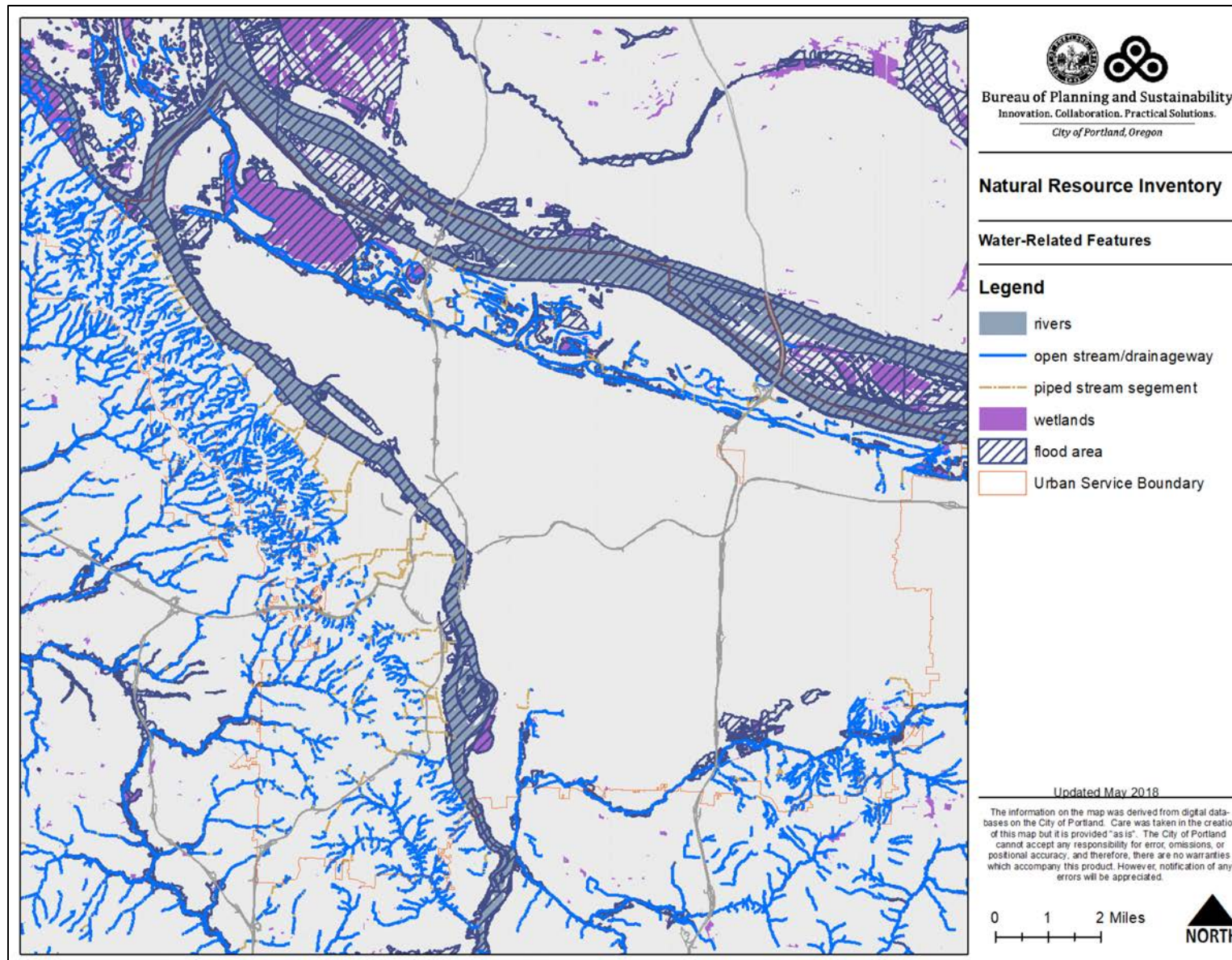
Table 1: Summary of Natural Resource Features in Portland	
River *	16.0 miles
Stream/Drainageway	344 miles
Wetlands	2,358 acres
Flood Area**	
Vegetated	2,962 acres
Non-vegetated	1,652 acres
Open Water*	4,146 acres
Vegetated Areas >= ½ acre ***	
Forest	15,052 acres
Woodland	3,759 acres
Shrubland	9,59 acres
Herbaceous	7,374 acres
Steep Slopes >25%	21,155 acres
* Excludes the Willamette River, land within the Willamette Greenway Boundary and West Hayden Island **The flood area includes the FEMA 100-year flood plain plus the adjusted 1996 flood inundation area. ***The vegetation classifications are applied in accordance with the National Vegetation Classification System specifications developed by The Nature Conservancy. The data within the primary study area and within 300 feet of all open water bodies in Portland is draft and is currently being updated based on 2008 aerial photography.	

The net result is that, not including the Willamette River or land within the Willamette River Greenway Boundary, 31% (28,760 acres) of the City of Portland contains significant natural resources. Of those areas, 72% are high ranked resources, 14% are medium and 14% are low ranked resources.

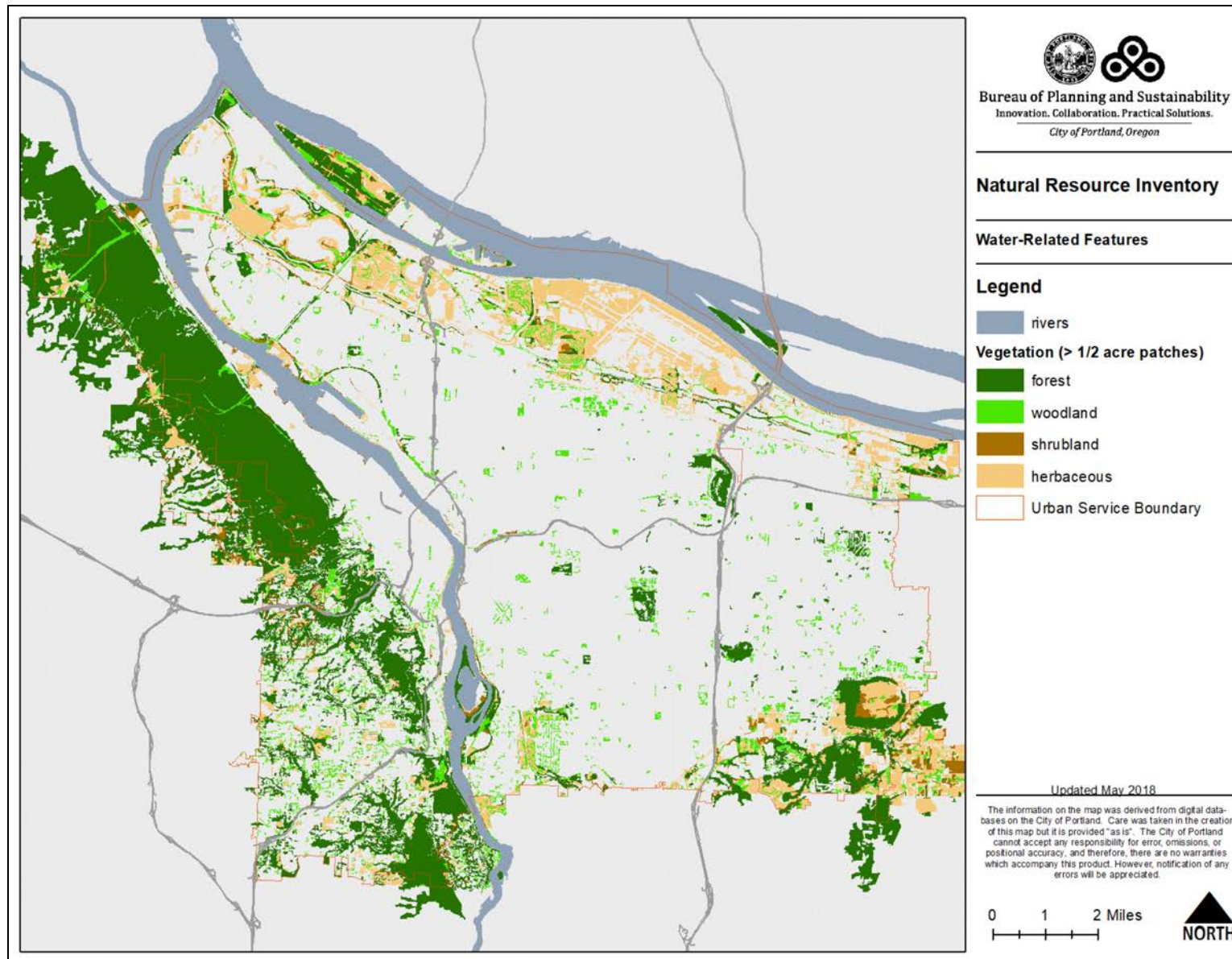
Table 2: Summary of Natural Resource Functions and Relative Ranks in Portland				
Total area = 92,310 acres*				
	High	Medium	Low	Total
Riparian Corridors*				
acres	11,745	5,311	8,554	25,610
percent of total area	13	6	9	28
Wildlife Habitat				
acres	9,318	6,623	1,539	17,481
percent of total area	10	7	2	19
Special Habitat Areas**				
acres	16,249			
percent of total area	17			
Wildlife Habitat - adjusted by Special Habitat Areas***				
acres	18,429	3,969	1,378	23,776
percent of total area	20	4	1	26
Combined Relative Ranks***				
acres	20,780	3,915	4,065	28,760
percent of total area	23	4	4	31
* Excludes the Willamette River, land within the Willamette Greenway Boundary and West Hayden Island ** Special Habitat Areas rank high for wildlife habitat. *** Because riparian resources, Special Habitat Areas, and wildlife habitat overlap, the results cannot be added together to determine the combined results.				



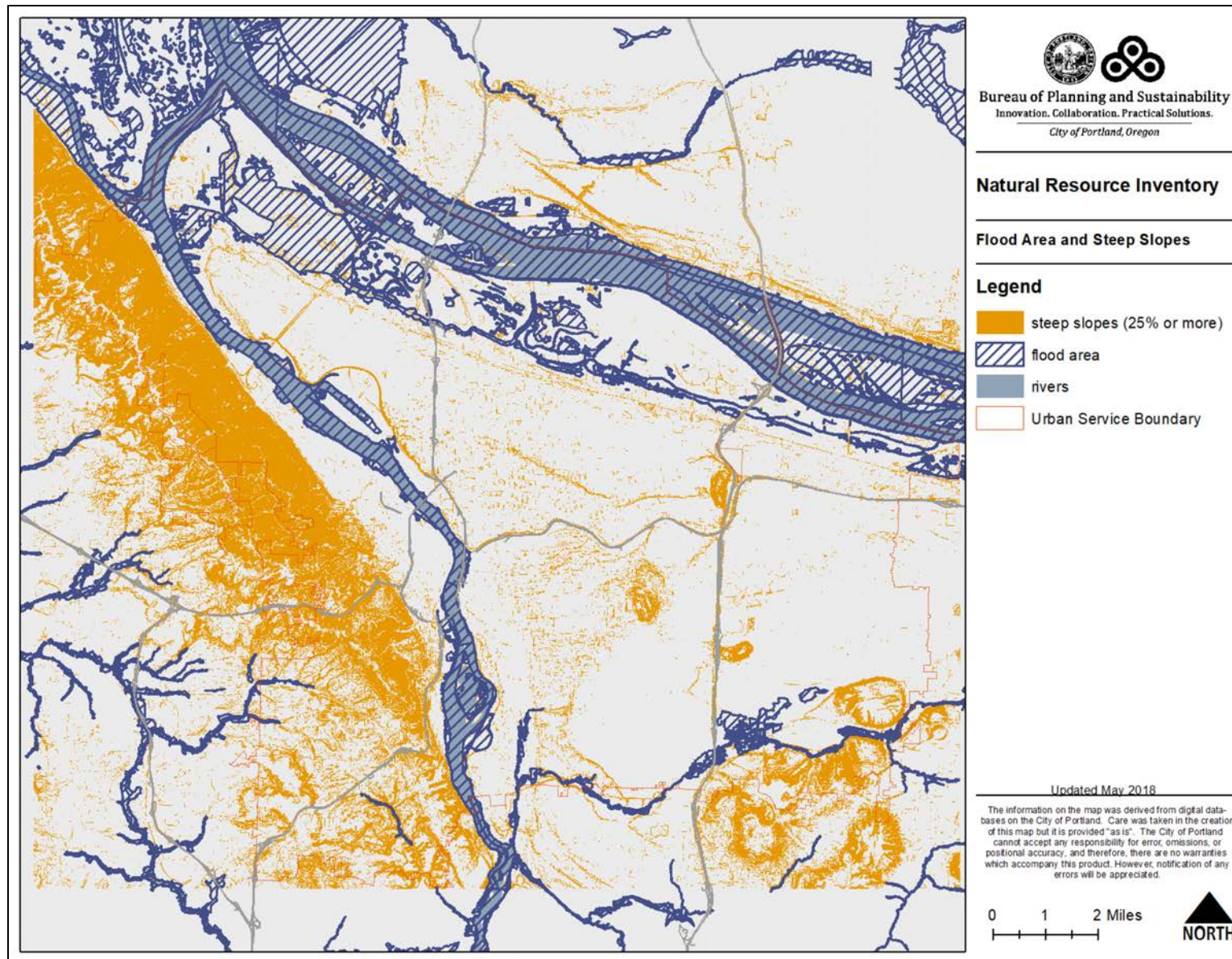
Map 1: Portland 2017 Aerial Photography



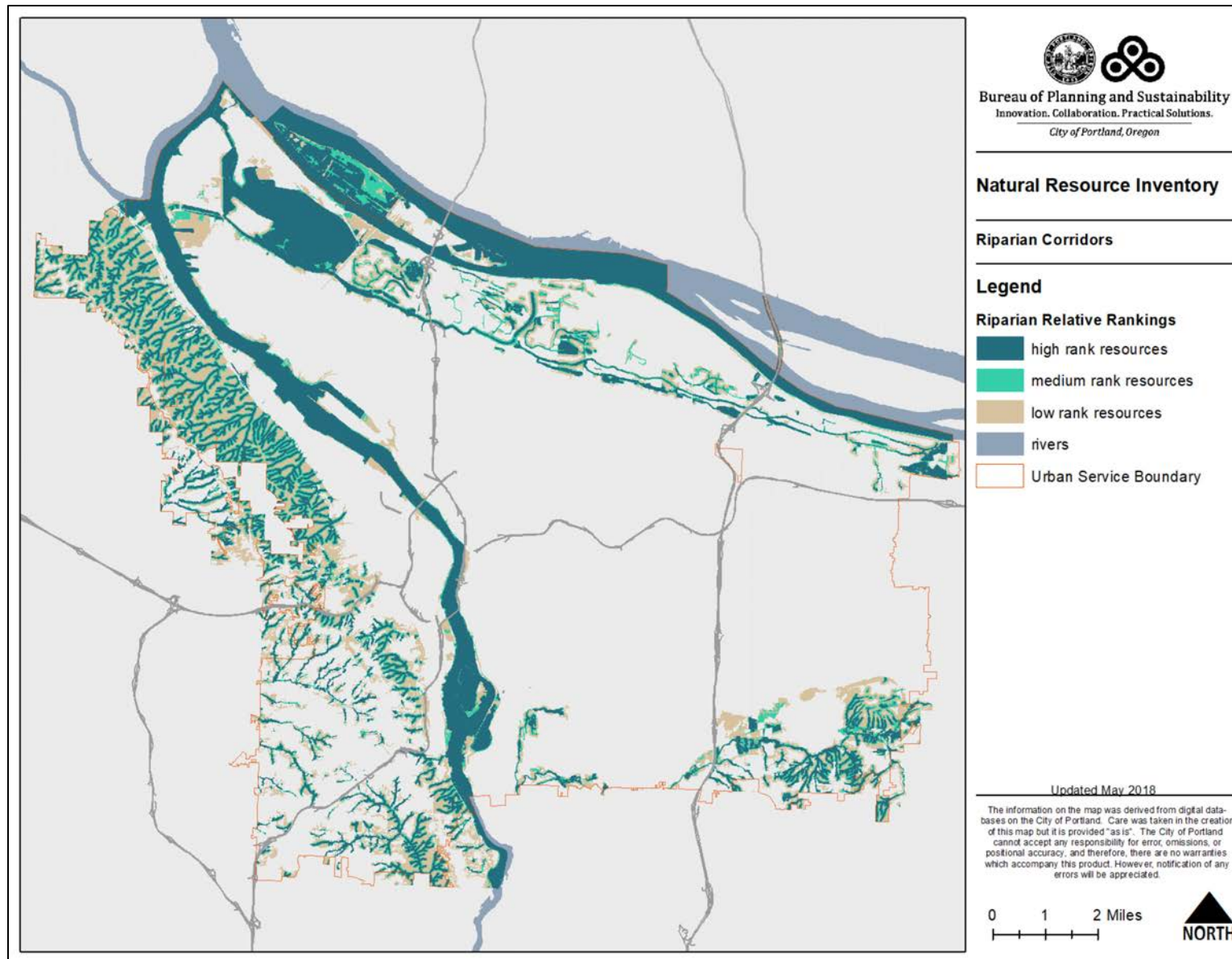
Map 2: Water-Related Natural Resource Features



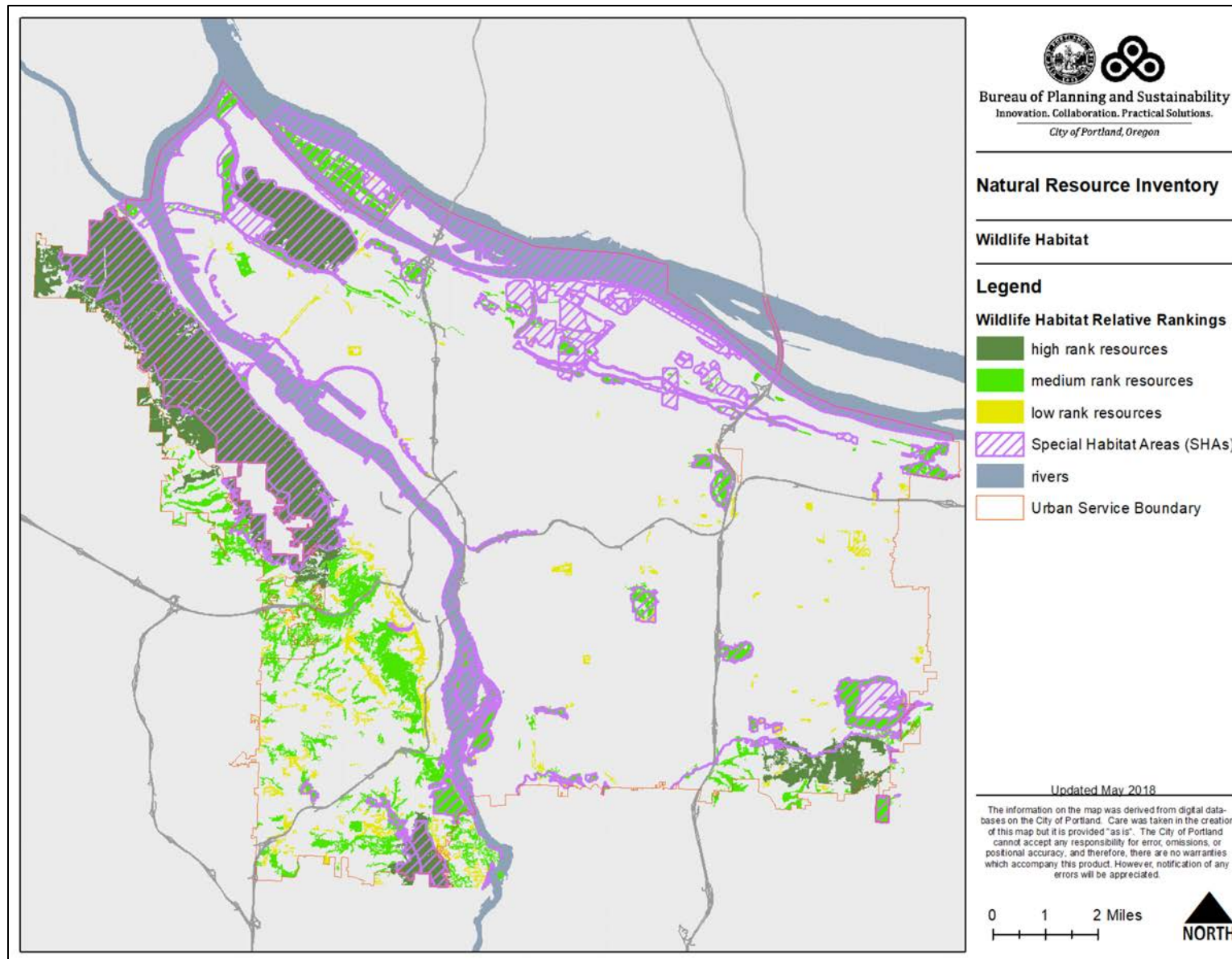
Map 3: Vegetation Features



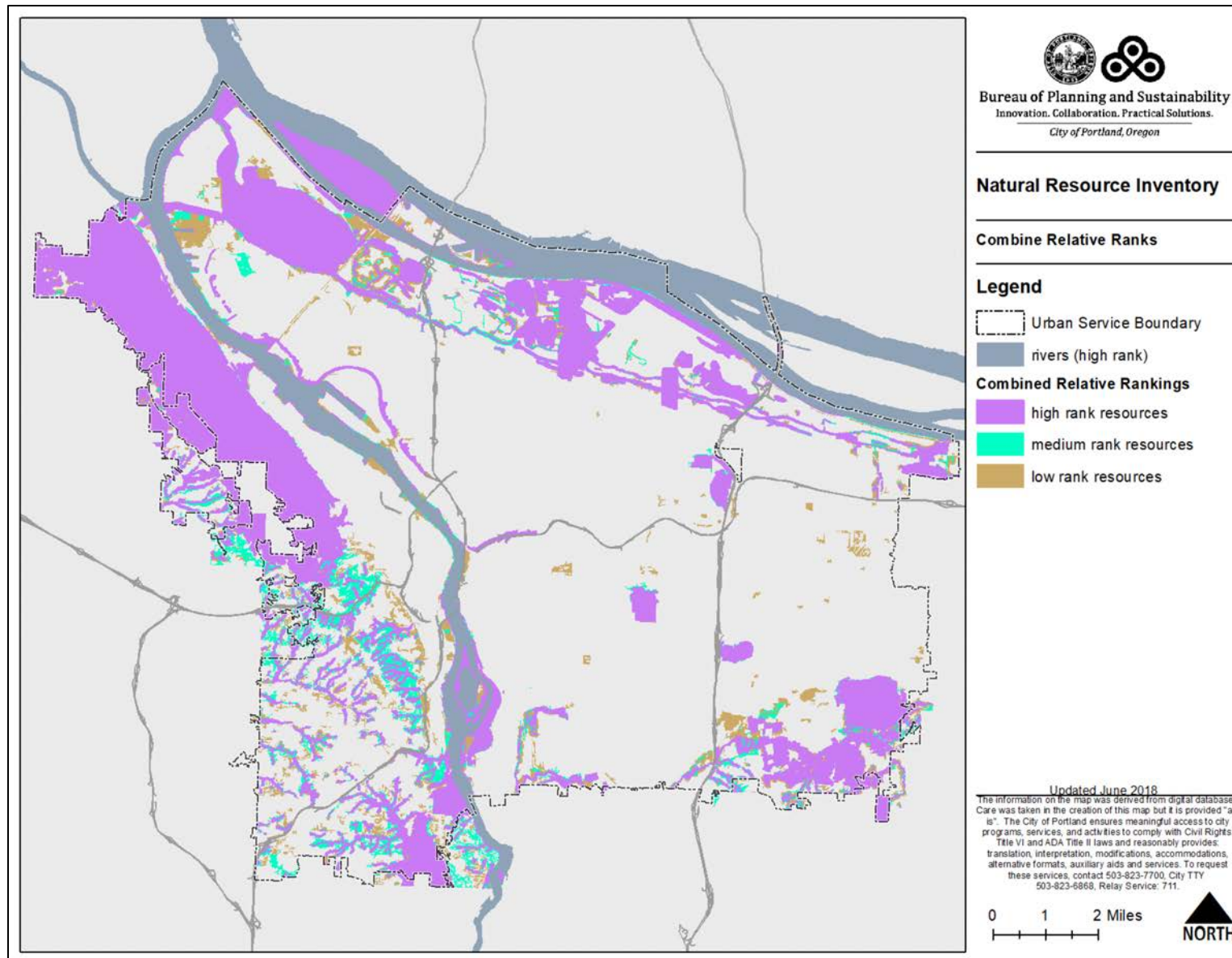
Map 4: Flood Area and Steep Slopes



Map 5: Riparian Corridors



Map 6: Wildlife Habitat



Map 7: Combine Relative Ranks

3 ENVIRONMENTAL OVERLAY ZONES

3.A. Background

In Portland, formal protection of natural resources through application of zoning codes and regulations began in the 1980's to comply with Oregon Statewide Planning Goal 5, Natural Resources, Scenic and Historic Areas, and Open Spaces. Goal 5 requires local jurisdictions to inventory natural resources, evaluate those resources for protection and then adopt a program to implement the results of the evaluation. Portland took a systematic approach, between 1989 and 2003, to apply a new environmental overlay zone program through adoption of conservation and protection plans.

The environmental overlay zones and regulations are also used to comply with the City's Comprehensive Plan goals and policies and support implementation of the Climate Action Plan.

3.B. Types of Environmental Overlay Zones

There are three types of environmental overlay zones addressed in this project: protection (p-zone), conservation (c-zone) and Pleasant Valley (v-zone). Each has slightly different regulations and requirements.

- **Protection Overlay Zone (p-zone)**

The p-zone is applied to the most critical natural resources where new development and impacts should be avoided, except under rare circumstances. The p-zone is typically applied to open rivers, streams, drainageways and wetlands, as well as areas within roughly 50 feet of the waterbodies. The p-zone may be applied to areas that provide unique upland habitat or are at a high risk of natural hazards like flooding, landslides or wildfire.

- **Conservation Overlay Zone (c-zone)**

The c-zone is applied to significant natural resources where new development can be designed to minimize impacts to the resources and mitigation for unavoidable impacts can often be achieved through on-site actions. The c-zone is typically applied to vegetated areas that are located more than 50 feet from open waterbodies.

- **Pleasant Valley Overlay Zone (v-zone)**

The v-zone is a hybrid between the p-zone and c-zone. It applies only to the area of Portland known as Pleasant Valley. The v-zone is applied to Johnson Creek and its tributaries, wetlands, floodplains and land within 100-200 feet of the waterbodies.

3.C. Adopted Conservation and Protection Plans

The environmental overlay zones have been applied and updated through the adoption of the following protection and conservation plans (see Figure 5):

1. Columbia Corridor Industrial and Environmental Mapping Project (1989)
2. Balch Creek Watershed Protection Plan (1991)
3. Northwest Hills Natural Areas Protection Plan (1992)
4. Southwest Hills Resource Protection Plan (1992)
5. East Buttes, Terraces and Wetlands Conservation Plan (1993)
6. Fanno Creek and Tributaries Conservation Plan (1993)
7. Skyline West Conservation Plan (1994)
8. Citywide Environmental Overlay Zone Map Refinement Project (1998)
9. Columbia Southshore Natural Resource Protection Plan (2000)
10. ESEE Analysis and Recommendation for Natural, Scenic and Open Space Resources within Multnomah County Unincorporated Areas (2002)
11. Johnson Creek Basin Protection Plan (1991, 1997, 1998, 2003)
12. Pleasant Valley Natural Resources Protection Plan (2004)
13. Middle Columbia Corridor/Airport Economic, Social, Environmental and Energy Analysis (2010)

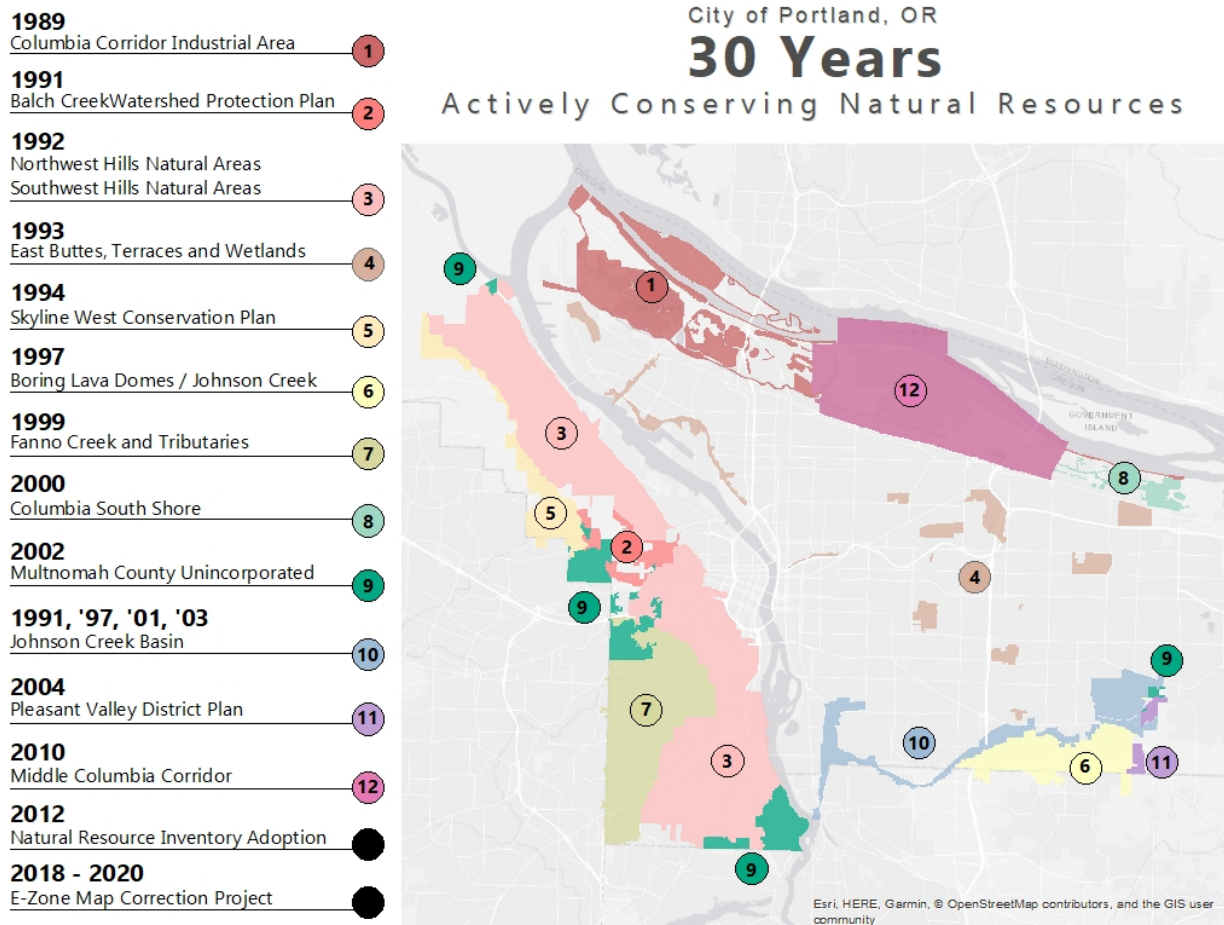


Figure 5: City of Portland Conservation and Protection Plans

Each plan includes descriptions of the significant natural resource features and functions and decisions regarding which of those resources should be protected with environmental overlay zones. The plans were adopted by City Council and acknowledged by the Oregon Department of Land Conservation and Development as being in compliance with Oregon Land Use Goal 5.

The next sections summarize each of the conservation and protection plans. These include:

1. Description of significant natural resource features and functions.
2. Decisions regarding which natural resources should be protected with environmental overlay zones.
3. A map of the existing environmental overlay zones and the current NRI mapped significant natural resources features.



Photo – Kelly Creek floodplain restoration

3.C.1. Columbia Corridor Industrial/Environmental Mapping Project (1989)

The *Industrial/Environmental Mapping Project* was adopted in 1989 (Ordinance No. 161895) (See Figure 6). The final report includes an inventory of natural resource features and the City of Portland's first Economic, Social, Environmental and Energy (ESEE) analysis. Unlike subsequent projects, the Industrial/Environmental Mapping Project limited the extent of each resource site to 1) water features, or 2) wetlands, riparian areas and uplands. The result was 33 individual resource sites.

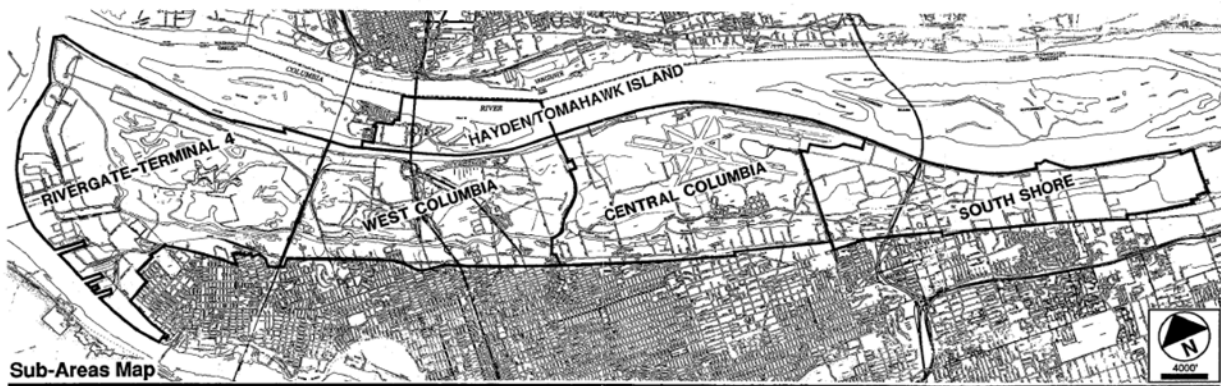


Figure 6: Columbia Corridor Industrial/Environmental Mapping Project Plan Area

Natural Resource Description

This was one of the first conservation planning efforts in Portland and did not use a standardized approach. A high number of assessment variables and methods were applied. The results were reviewed and refined by a technical advisory committee several times before adoption. Experts evaluated each site and assigned a wildlife habitat score ranging from 17 to 106. Smith and Bybee Wetlands and West Hayden Island were the two highest-ranking sites.

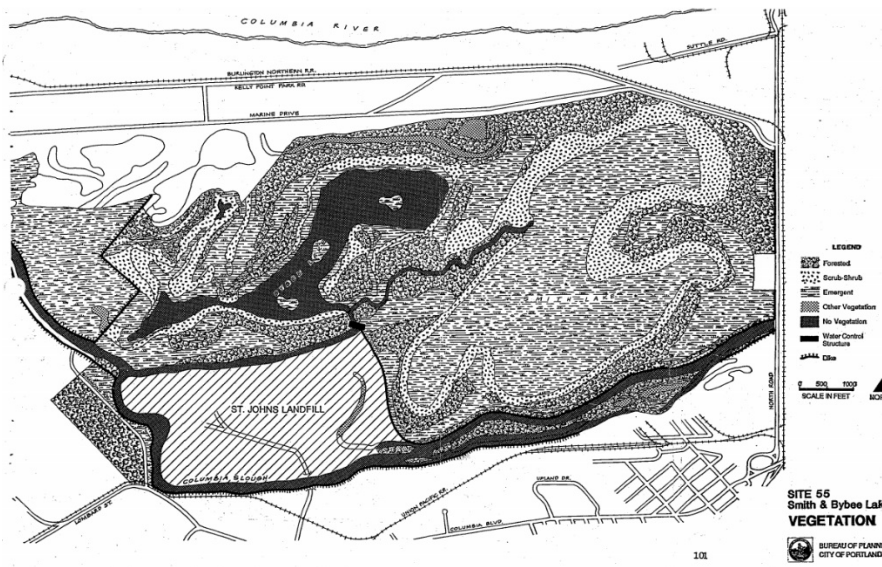


Figure 7: Columbia Corridor Industrial/Environmental Mapping Project Resource Mapping at Smith and Bybee Wetlands

Significant Features:

- fish habitat
- mature cottonwood and willow
- riparian forest
- uncommon wildlife
- Lombardy poplars
- open wetland grassland
- wetland forest
- Johnson Lake
- wetland within 100-year flood boundary
- 50-acre juncus/willow wetland (unusual to Portland)

Significant Functions:

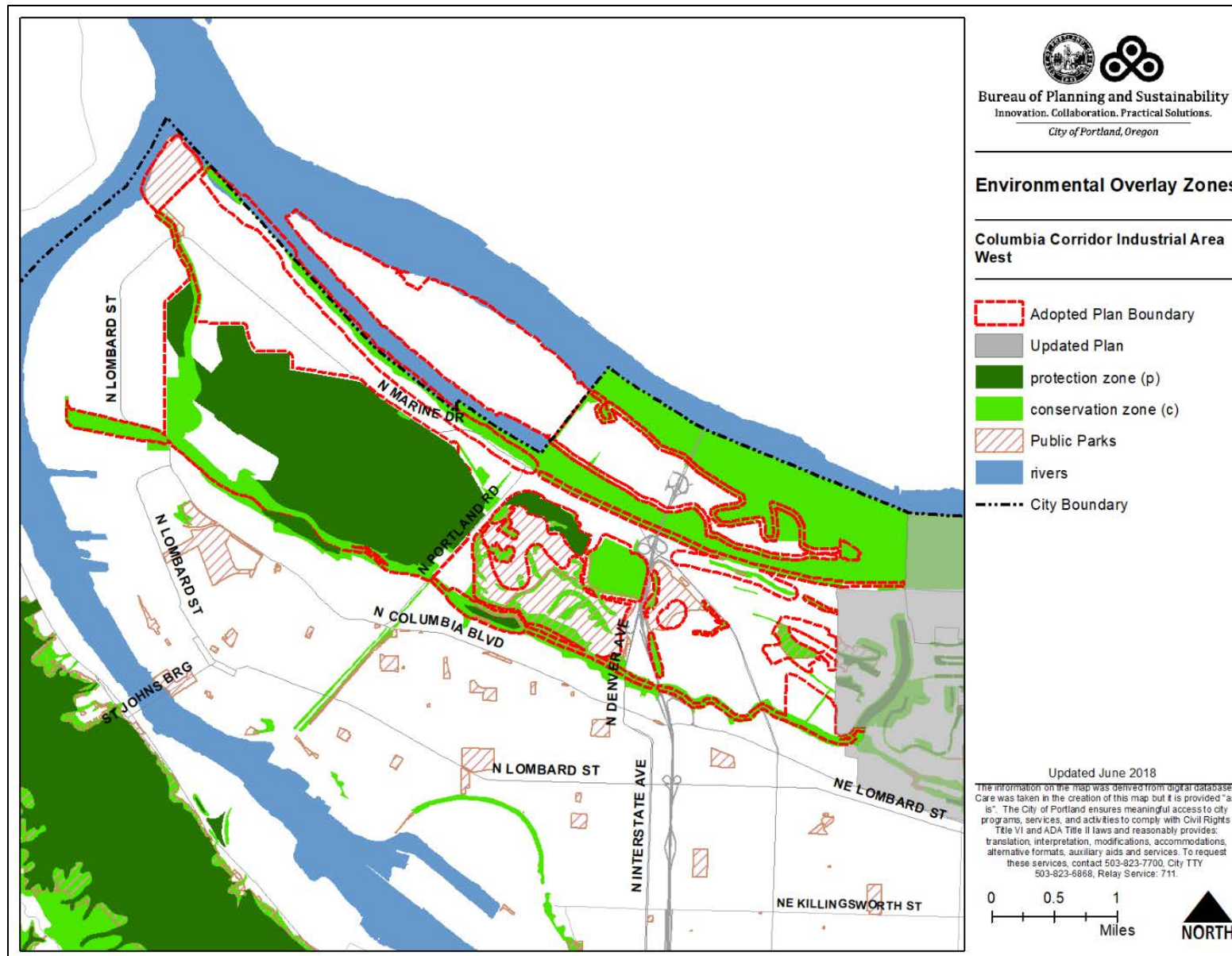
- groundwater functions
- flood control
- fish habitat
- pollution nutrient retention
- drainage
- cover, perch, roost and nesting sites for raptors, woodpeckers, and songbirds
- scenic and aesthetic qualities, recreation

Summary of Protections

The environmental zone was applied to natural resources and the adjacent areas. The plan “intent is to buffer and protect the resource, and to provide both a visual and functional transition between the resource and the maximum development allowed by the base zone.”

In general, the conservation (c) overlay zone was applied to the Columbia Slough and associated drainageways, as well as small wetlands. The protection (p) overlay zone was applied to larger wetlands, including Smith and Bybee Wetlands and Ramsey Lake. A transition area was applied to many, but not all, of the resources. The transition area was defined as “land in the outer 25 feet of an environmental zone” intended to “ensure that development will not harm the adjacent resource”.

Map 8 shows the portion of the Columbia Slough and Columbia River that are included in the *Columbia Corridor Industrial/Environmental Mapping Project* and have not been subsequently updated by more recent plans.



Map 8: Columbia Corridor Industrial/Environmental Mapping Project Environmental Overlay Zones

3.C.2. Balch Creek Watershed Protection Plan (1991)

The *Balch Creek Watershed Protection Plan* was first adopted in 1991 (Ordinance No. 164472) (See Figure 8). The City Council adopted a separate ESEE analysis that met the State Goal 5 requirements, in 1995 (Ordinance # 168699). The 1991 Balch Creek Protection Plan provided general direction on the protection of resources. It stated that “high resource values and functions warrant a high degree of protection” and to accomplish protection through “directing residential development away from center of the watershed and toward the least sensitive edge.” (pg. 107).



Figure 8: Balch Creek Watershed Protection Plan Area

Natural Resource Description

The *Balch Creek Watershed Protection Plan* used a Wildlife Habitat Assessment (WHA) methodology to score natural resources. The WHA focused on plants, wildlife, water, food, cover, relationship to other habitats and human disturbance. The scores range from 22 (low) to 102 (high).

Significant features:

- Dawn redwoods, forests and native trees
- Thompson branch of Balch Creek and creeks
- Cornell Road Tunnel
- steep portion of residential lots
- critical migration routes
- intermittent streams
- down-slope and edge forests
- ravines

Significant functions:

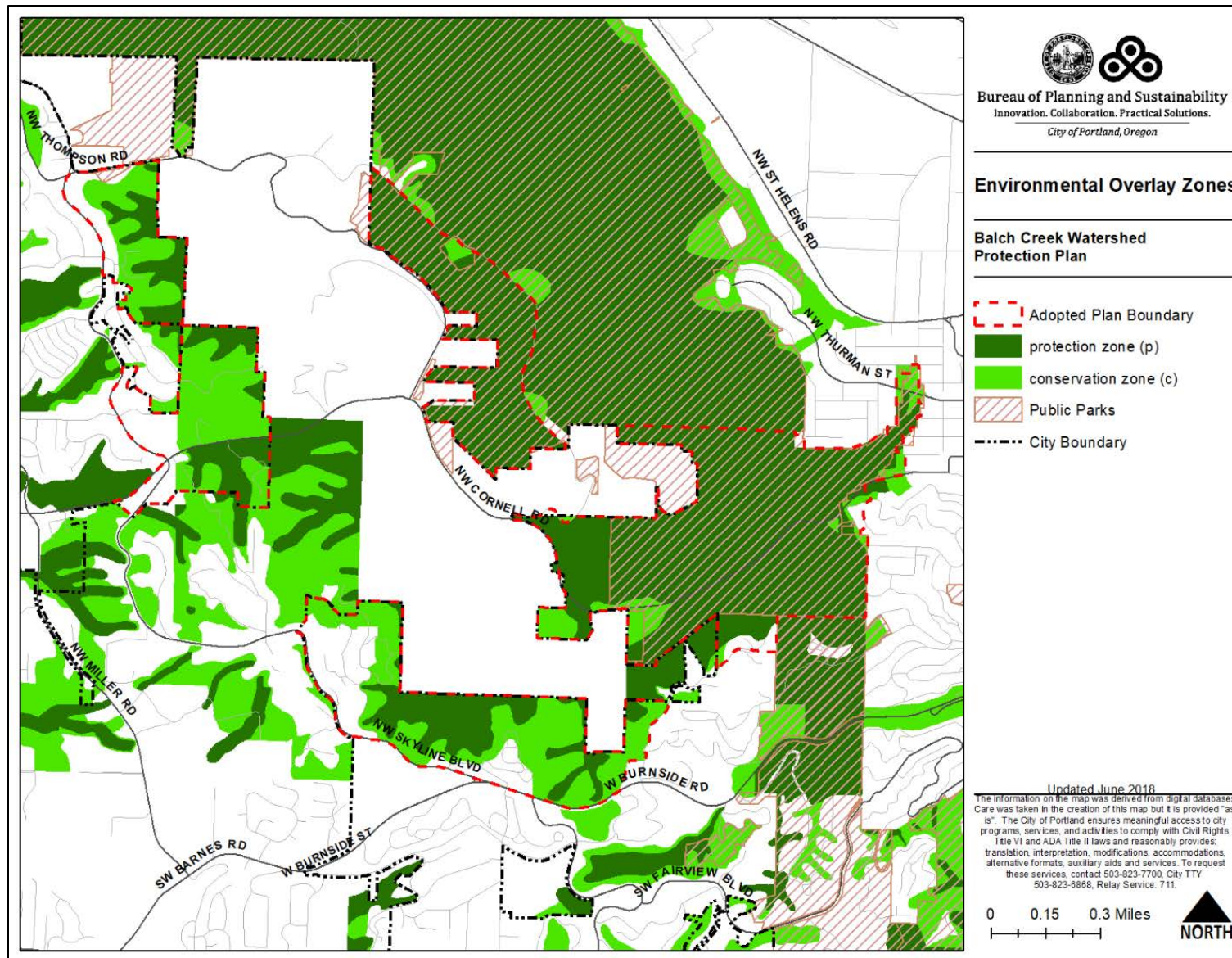
- stream bank stabilization
- erosion and pollutant control
- microclimate and cool water for trout
- wildlife habitat

Summary of Protections

Although the natural resources were scored, there is no stated relationship between the WHA scores and the environmental overlay zones.

Generally, the ESEE decisions were to apply environmental protection zones to streams, tributaries and drainageways, forests, native forests, rare tree stands, steep areas, migration routes, and ravines. Environmental conservation zones were recommended for uphill areas, some second-growth forests, forest edges within possible building sites or not associated with creeks, or ravines, and to limit agricultural and forestry activity.

There was a decision for some sites to place “all land within 50 feet of the centerline of Balch Creek and its tributaries, including seasonal drainageways and topographic lows, in environmental protection zones.”



Map 9: Balch Creek Environmental Overlay Zones

3.C.3. Johnson Creek Basin Protection Plan (1991, 1997, 1998 and 2003)

The *Johnson Creek Basin Protection Plan* was first adopted in 1991 (Ordinance No. 164472) with the Johnson Creek Basin Plan District (See Figure 9). The purpose of the plan district, and supporting regulations, is to provide for safe, orderly and efficient development of land subject to physical constraints such as steep and hazardous slopes, floodplains, and wetlands. The protection plan was amended in 1997, 1998 and 2003.

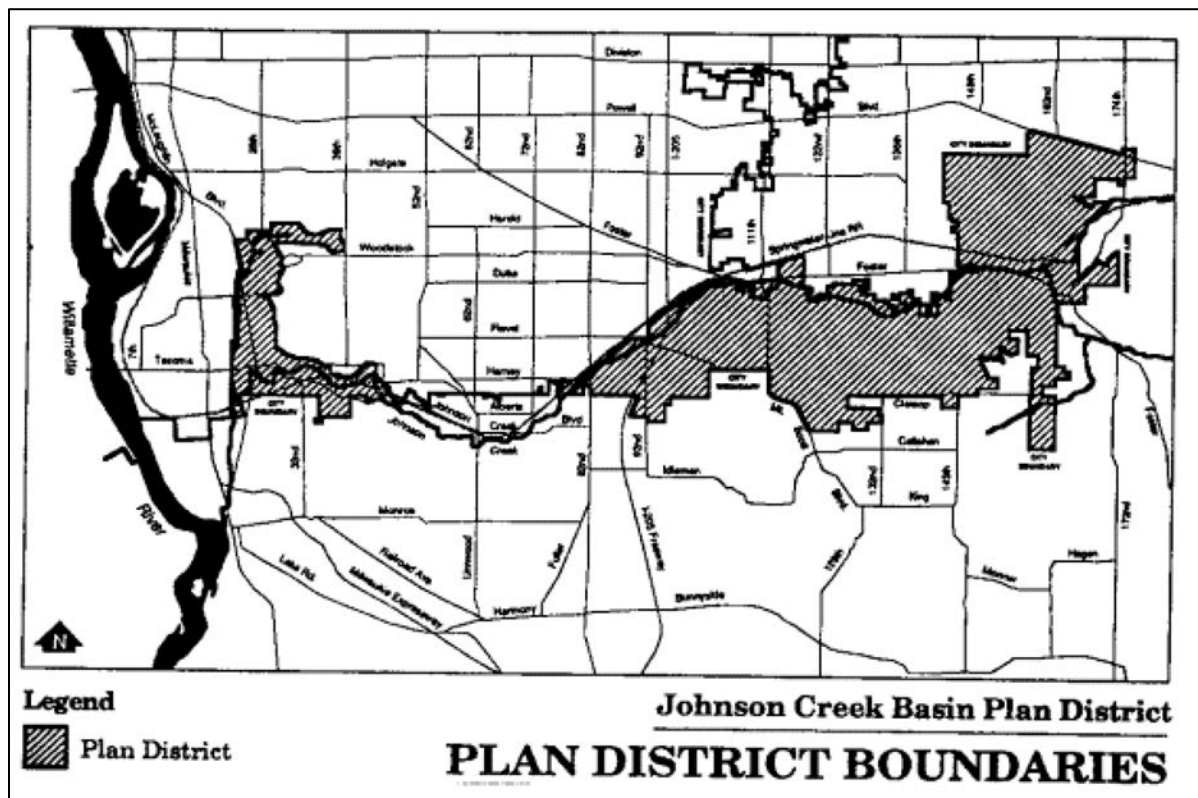


Figure 9: Johnson Creek Basin Plan District

Natural Resource Description

The *Johnson Creek Basin Protection Plan* used a Wildlife Habitat Assessment (WHA) methodology to score natural resources. The WHA focused on plants, wildlife, water, food, cover, relationship to other habitats and human disturbance. The scores range from 18 (low) to 83 (high).

Significant features:

- Johnson Creek and its tributaries and creek banks
- wetlands
- floodplains
- forested steep slopes
- upland wildlife habitat

Significant functions:

- stormwater drainage
- flood storage
- pollution and nutrient retention and removal
- sediment trapping
- fish and wildlife habitat
- aesthetics
- recreation, education and heritage

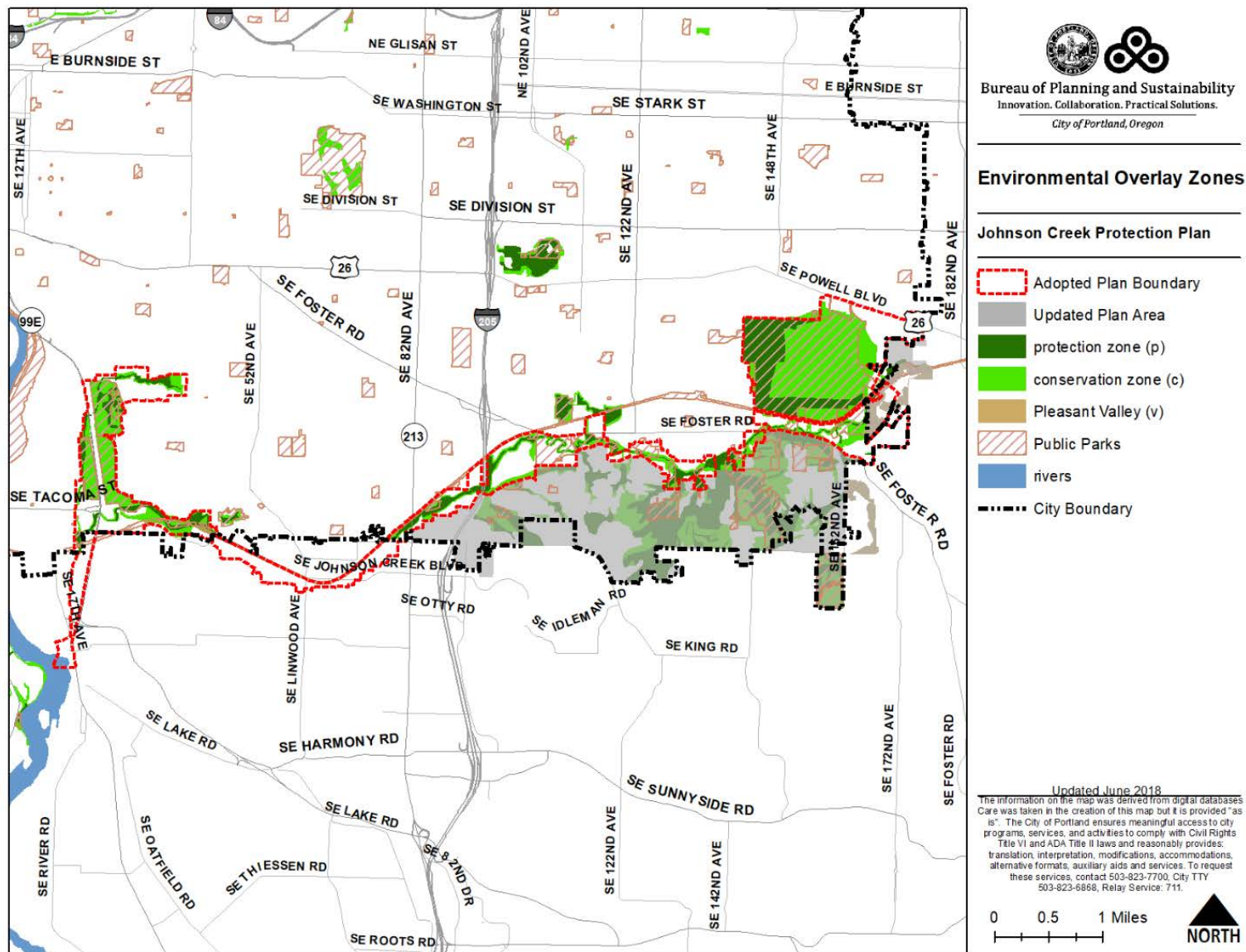
Summary of Protections

Although the natural resources were scored, there is no stated relationship between the WHA scores and the environmental overlay zones.

The protection (p) overlay zone was applied to Johnson Creek, floodways, main tributaries, significant wetlands, creek banks, and very high-quality upland resources, including steep slopes on Powell Butte, Mt. Scott and the Boring Hills.

The conservation (c) overlay zone was applied to significant natural resources surrounding the p-zone and to resources which are “of value to the overall system but could be altered to allow development with mitigation.” Most upland forests and woodlands, as well as smaller drainages are protected with a c-zone.

The floodplain is not specifically called out as a feature that the p- or c-zone boundary should follow.



Map 10: Johnson Creek Basin Environmental Overlay Zones

3.C.4. Northwest Hills Natural Areas Protection Plan (1991)

The *Northwest Hills Natural Areas Protection Plan* was first adopted in 1991 (Ordinance No. 164517) and revised in 1995 (Ordinance #168699). The project study area covers 6,000 acres stretching west from N.W. St. Helens Road and the Willamette Greenway up to N.W. Skyline Boulevard, and north from the Willamette Heights area to the Portland city limits near N.W. Newberry Road.

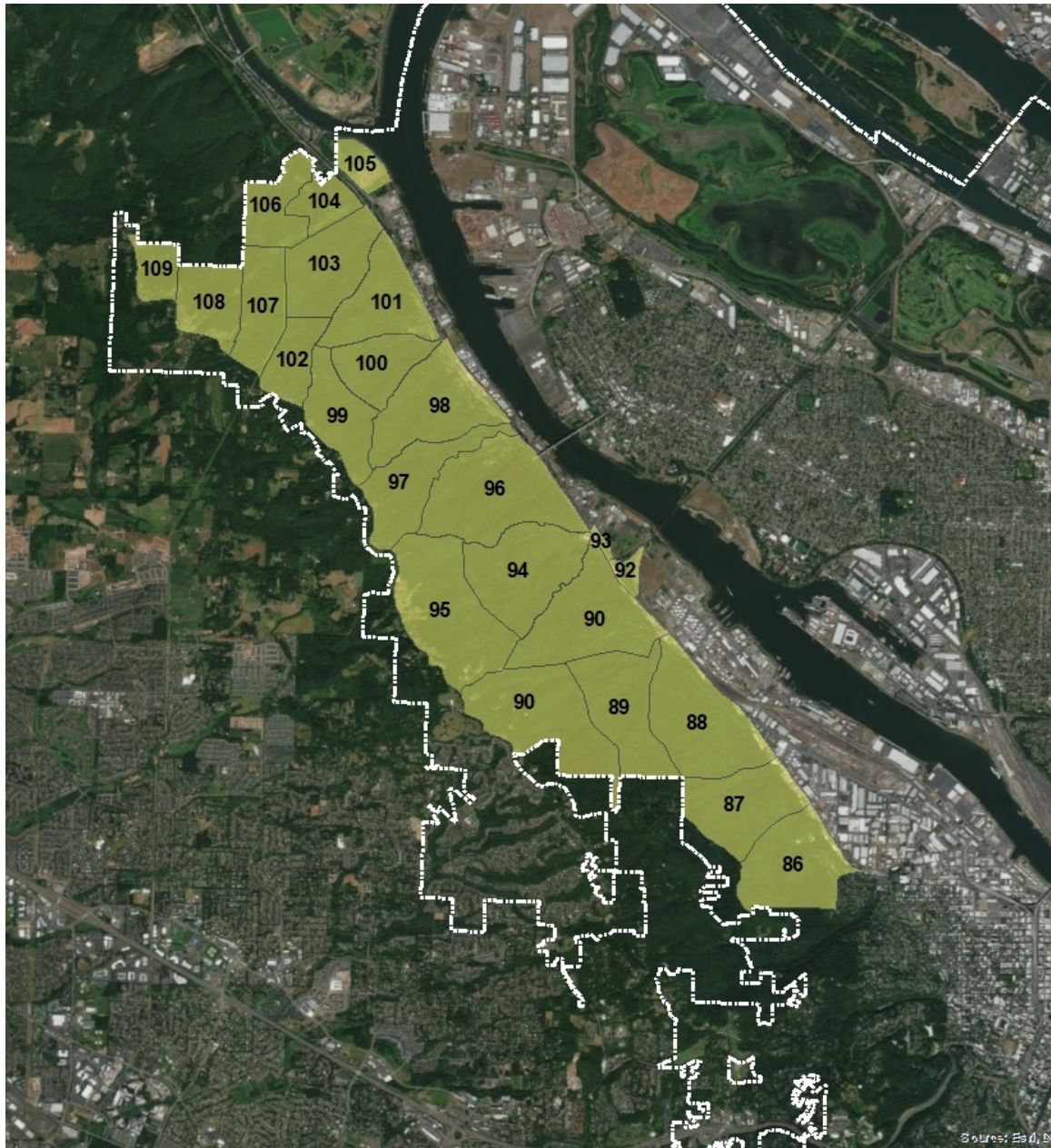


Figure 10: Northwest Hills Resource Site Vicinity Map

Natural Resource Description

The *Northwest Hills Natural Areas Protection Plan* used the Wildlife Habitat Assessment (WHA) methodology to score natural resources. This method specifically scored water, food, cover, as well as interspersed, uniqueness and disturbance, where high disturbance receives a low score. The scores for the plan's resource sites ranged from 55 (low) to 98 (high).

Significant features:

- forests
- drainages
- hillside slopes
- riparian areas
- Doane Creek and tributaries
- forested upland areas
- intermittent creek corridors
- snags, downed logs and woody debris
- forested wetland
- ravines

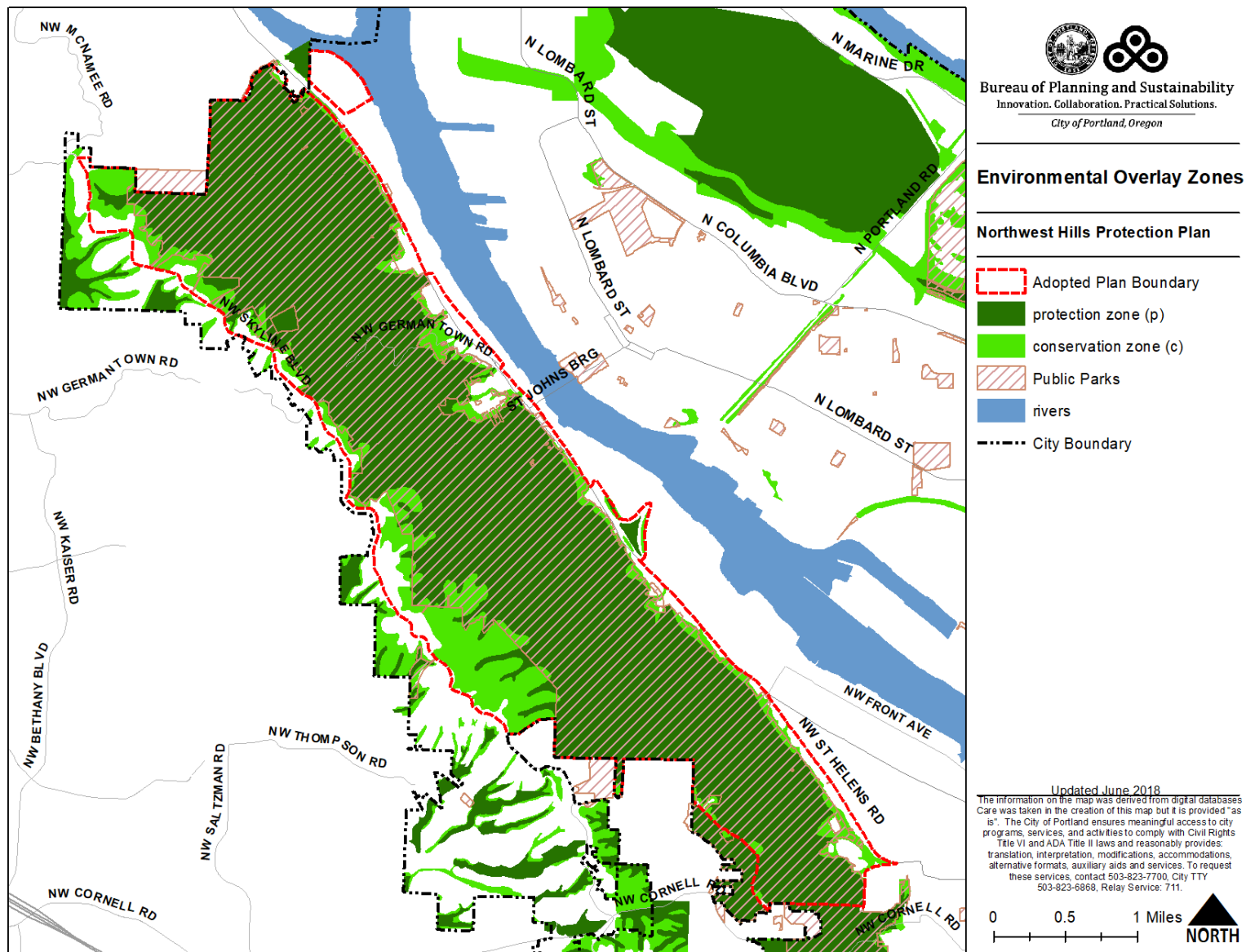
Significant functions:

- scenic and recreational resources
- habitat for resident and migratory wildlife
- connection to the Willamette River enhances wildlife value
- soil stabilization
- erosion control
- groundwater recharge

Summary of Protections

Although the natural resources were scored, there is no stated relationship between the scores and application of the environmental overlay zones. In addition, there is a big difference between the acreage stated for protection in the plan and the actual acreage of environmental overlay zones applied to the resources. In the end, the protection (p) overlay zone was applied to most of the resources.

The conservation (c) overlay zone was applied along outside edges of the plan area. Specifically, a strip of conservation overlay zone was applied along SW St. Helens Rd on the east side, and along the periphery of Forest Park have a conservation zone overlay that allows for limited, residential development.



Map 11: Northwest Hills Environmental Overlay Zones

3.C.5. Southwest Hills Natural Areas Protection Plan (1992)

The 7,000 acre *Southwest Hills Natural Areas Plan* was adopted in 1992 (Ordinance No. 165002) (See Figure 11). The purpose of the plan was to protect the forested areas of the southwest hills that provide a multitude of ecosystem benefits. These forests help to prevent landslides and protect downstream neighborhoods from flooding, along with providing a host of human and wildlife benefits.

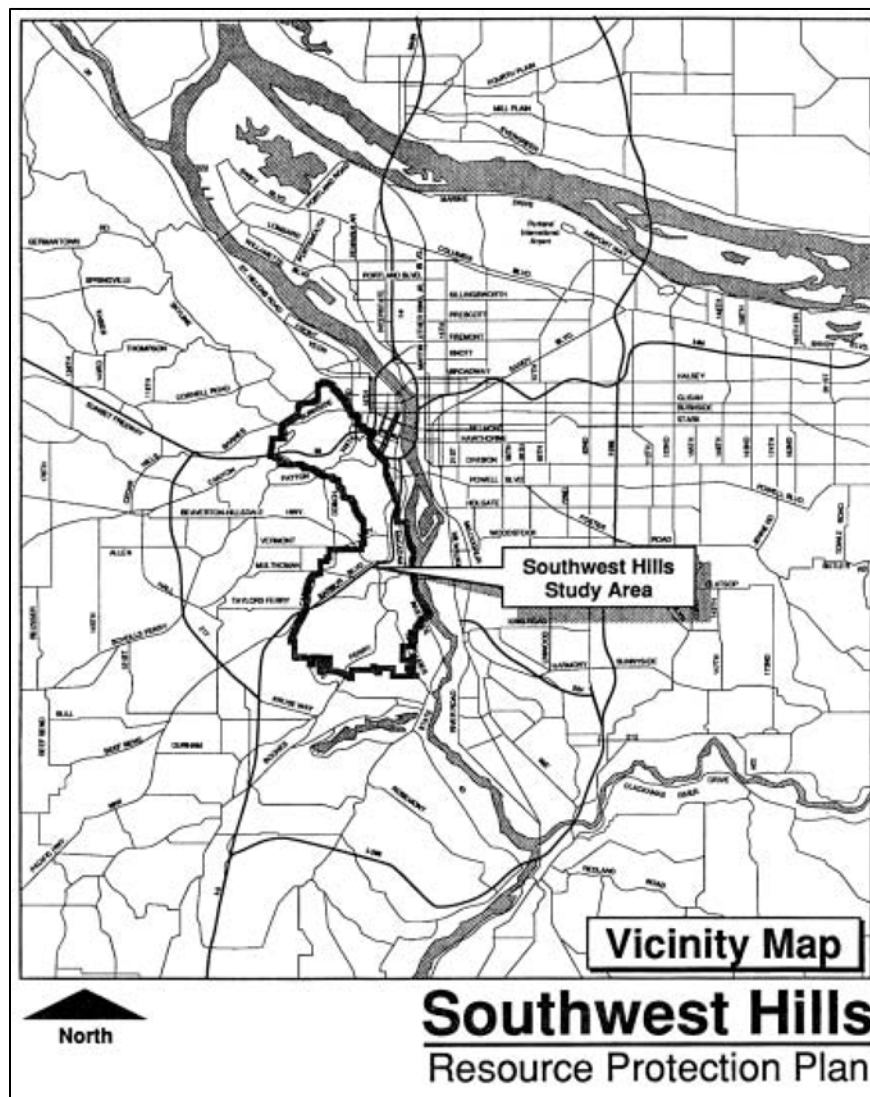


Figure 11: Southwest Study Area

Natural Resource Description

The *Southwest Hills Natural Areas Plan* used a Wildlife Habitat Assessment (WHA) methodology to score natural resources. The WHA focused on plants, wildlife, water, food, cover, relationship to other habitats and human disturbance. The scores range from 50 (low) to 86 (high).

Significant features:

- Creeks and drainages
- Wetlands and ponds
- Forested slopes adjacent to creeks
- Rock outcroppings or shallow bedrock on steep slopes or along known fault lines

Significant functions:

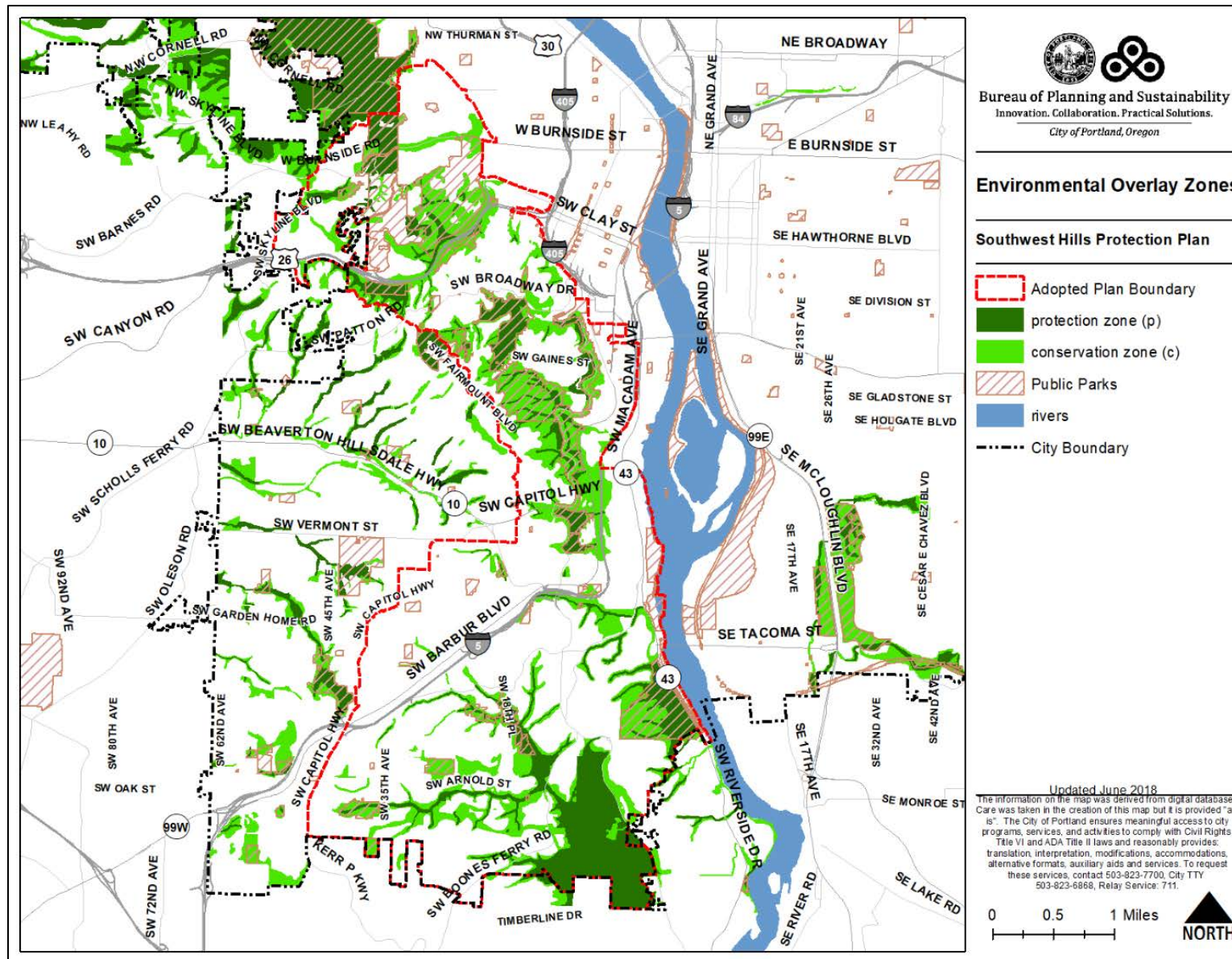
- Protection of habitat for sensitive, threatened or locally rare species
- soil and slope stabilization
- riparian areas that provide shade and organic material to water bodies

Summary of Protections

Although the natural resources were scored, there is no stated relationship between the WHA scores and the environmental overlay zones.

The protection (p) overlay zone was applied to portions of Washington Park that link the Northwest Hills to the Southwest Hills habitat, and Johnson Creek and its tributaries, forested areas adjacent to Washington Park or near parks, creeks and drainages, Marquam Park, creek and tributaries, vacant properties near Terwilliger Parkway, George Himes Park, Marshall Park, and drainages which link habitat to Tryon Park.

The conservation (c) overlay zone was applied portions of some parks, some of the forested areas south of Washington Park and Highway 26, forest canopy on steep slopes, properties surrounding parks, areas of future access to natural areas, drainages and forested areas near I-5, forested portions of River View Cemetery, portions of Falling Creek, forest canopy in riparian areas located further from streams, and steep slopes connecting stream corridors.



Map 12: Southwest Hills Environmental Overlay Zones

3.C.6. East Buttes, Terraces and Wetlands (1993)

The *East Buttes, Terraces and Wetlands Conservation Plan* was first adopted in 1993 (Ordinance No. 166572) (See Figure 12). The planning area is made up of a collection of ten resource sites including Mt. Tabor, Rocky Butte and Kelly Butte and seven additional upland sites in East Portland, and two sites, Beggars Tick Marsh (John Creek Basin Protection Plan) and a portion of Smith and Bybee Lakes (Columbia Corridor Plan), that were recently annexed into the city. These sites represent geologically and biologically significant elements of the Portland landscape.

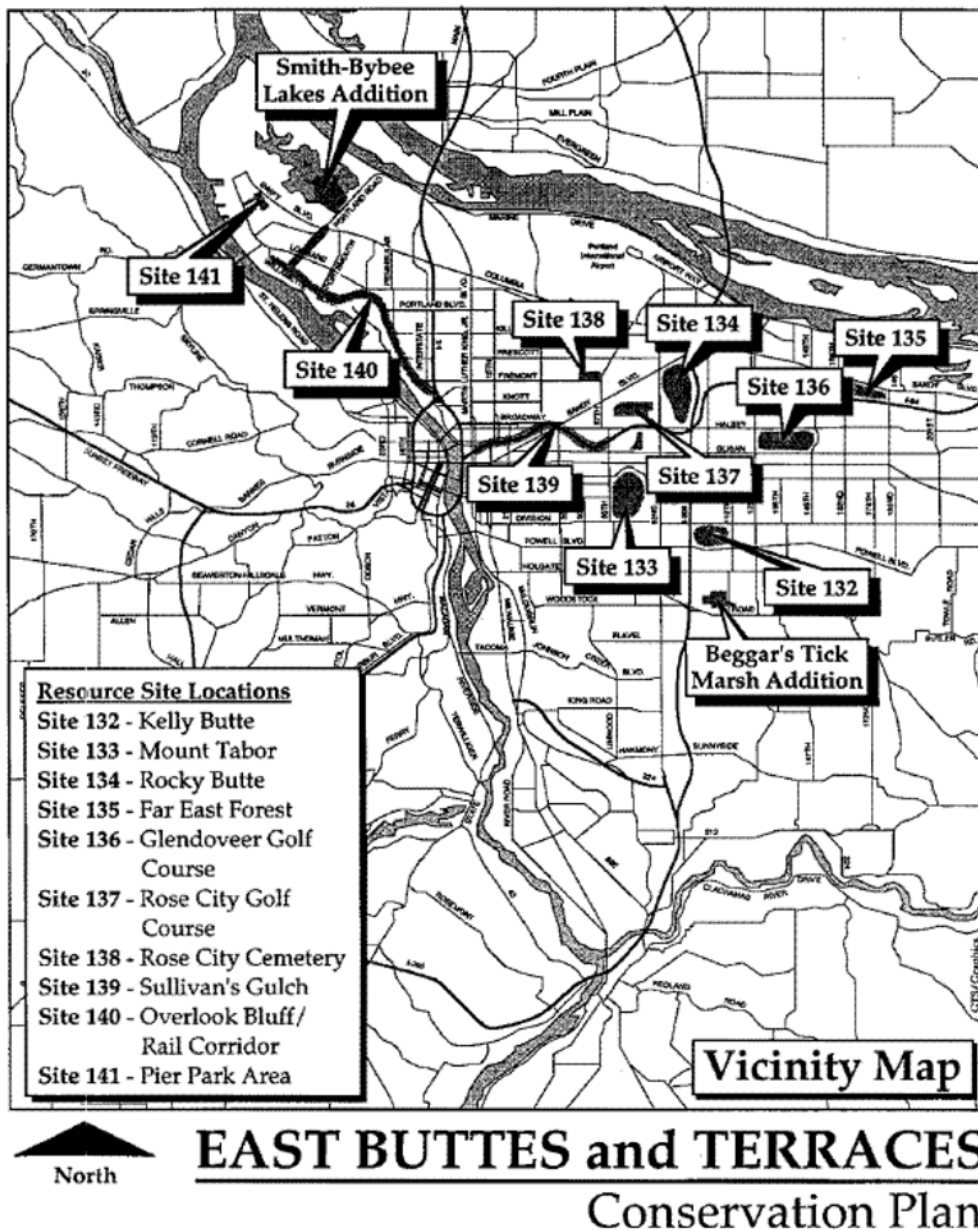


Figure 12: East Buttes and Terraces Conservation Plan Area

Natural Resource Description

The *East Buttes, Terraces and Wetlands Conservation Plan* used a Wildlife Habitat Assessment (WHA) methodology to score natural resources. The WHA focused on plants, wildlife, water, food, cover, relationship to other habitats and human disturbance. The scores range from 5 (low) to 65 (high).

Significant features:

- Bluffs
- forests in neighborhoods where there is a scarcity of greenspace and on steep slopes
- large and small wetlands, including Beggars Tick Marsh
- former cinder cone volcanos

Significant functions:

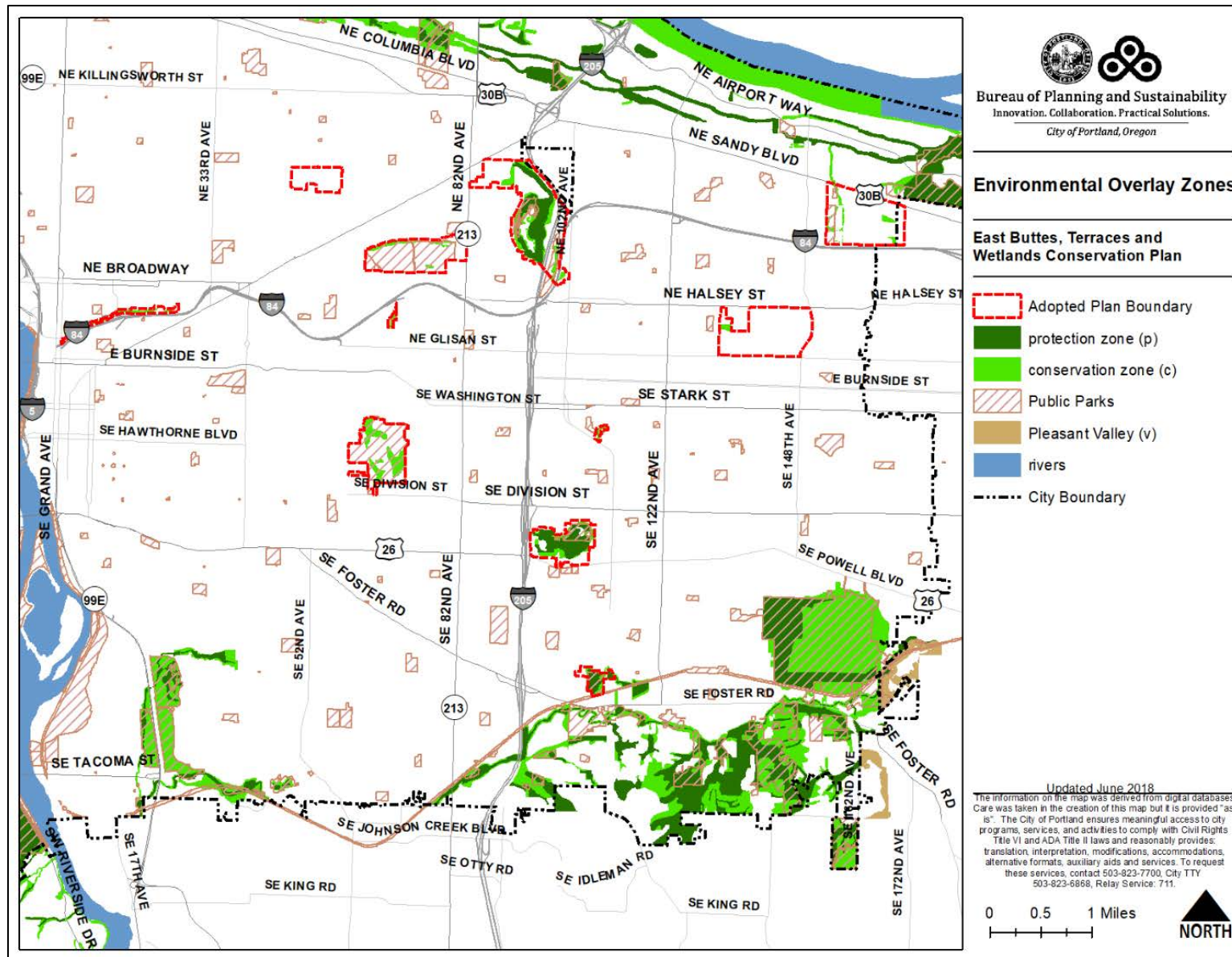
- Buffer sights and sounds of city
- slope and soil stabilization
- habitat for rare species of plants (Trout Lily) and animals (Anna's Hummingbird)
- recreation
- geologic and educational values
- cinder cones act as landmarks
- archeological resources
- scenic values

Summary of Protections

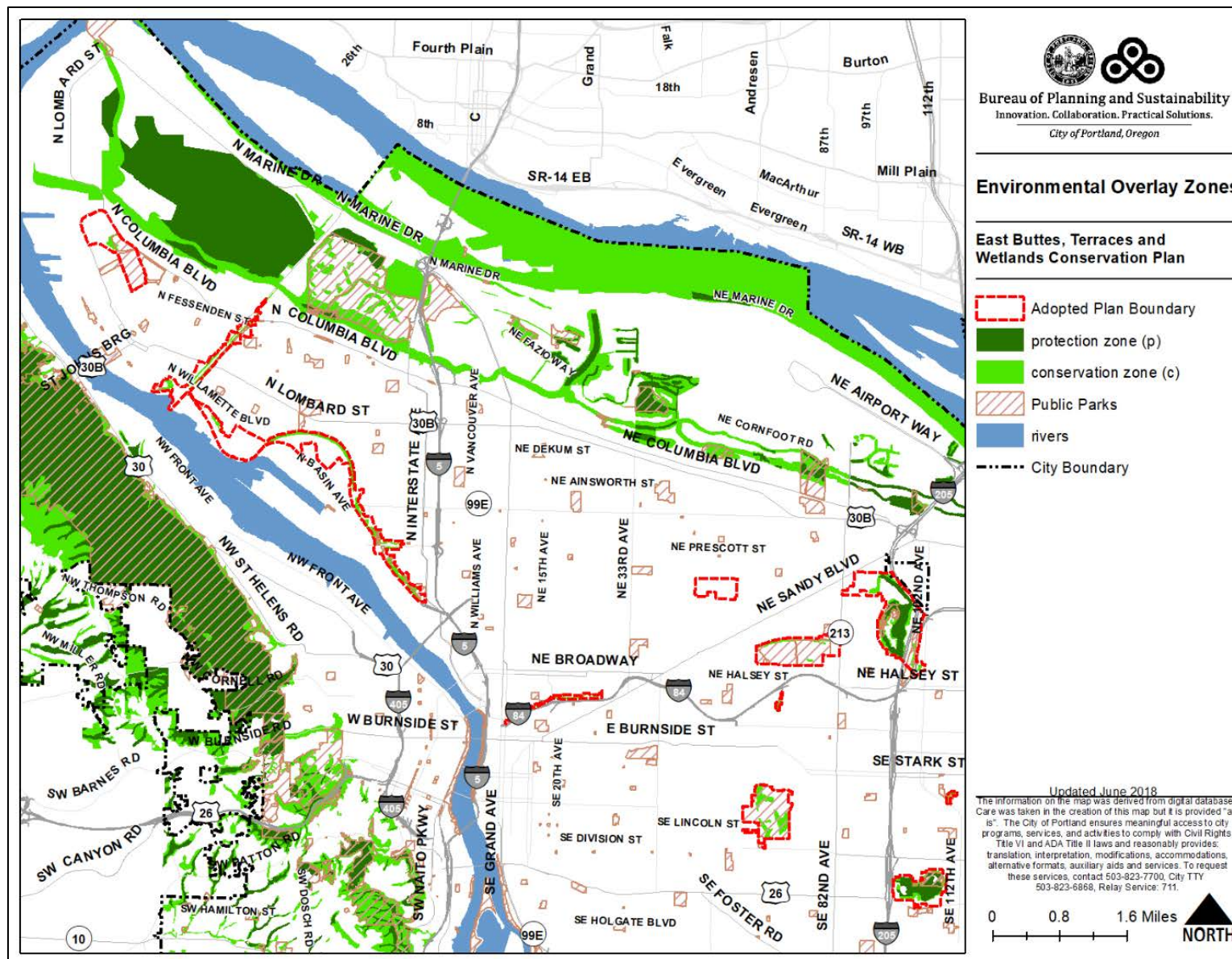
Although the natural resources were scored, there is no stated relationship between the WHA scores and the environmental overlay zones.

The protection (p) overlay zone was applied to rare plants on south slope of Kelly Butte, areas needing slope stabilization, steep areas of Rocky Butte, and lakes and wetlands.

The conservation (c) overlay zone was applied to vegetated areas on lower portions of buttes, the northwestern and southeastern regions of Mont Tabor Park, on forested areas with moderate scenic, habitat and slope stabilization values, some open areas and degraded wetlands, the northwest woodland of Glendover Golf Course, the forested northern bluff of Rose City Golf Course. The forested bluff between NE 12th and 28th Avenues, forested areas on Overlook Bluff, forest and habitat areas in the Chimney Park vicinity, vegetation, banks and buffer areas bordering wetlands between 50 and 75 feet in width, upland areas bordering wetland transition areas.



Map 13: East Buttes, Terraces and Wetlands Environmental Overlay Zones (East)



Map 14: East Butte, Terraces and Wetlands Environmental Overlay Zones (West)

3.C.7. Columbia South Shore (1993 and 2000)

The *Natural Resources Protection Plan for the Columbia South Shore* was adopted in 1993 (Ordinance No. 163609) (See Figure 13). It was then updated in 2000. The purpose of the plan was to provide an area-wide approach for conservation of significant natural resources and preservation of resource values for remnants of the ecosystem related to the Columbia Slough in the Columbia South Shore.

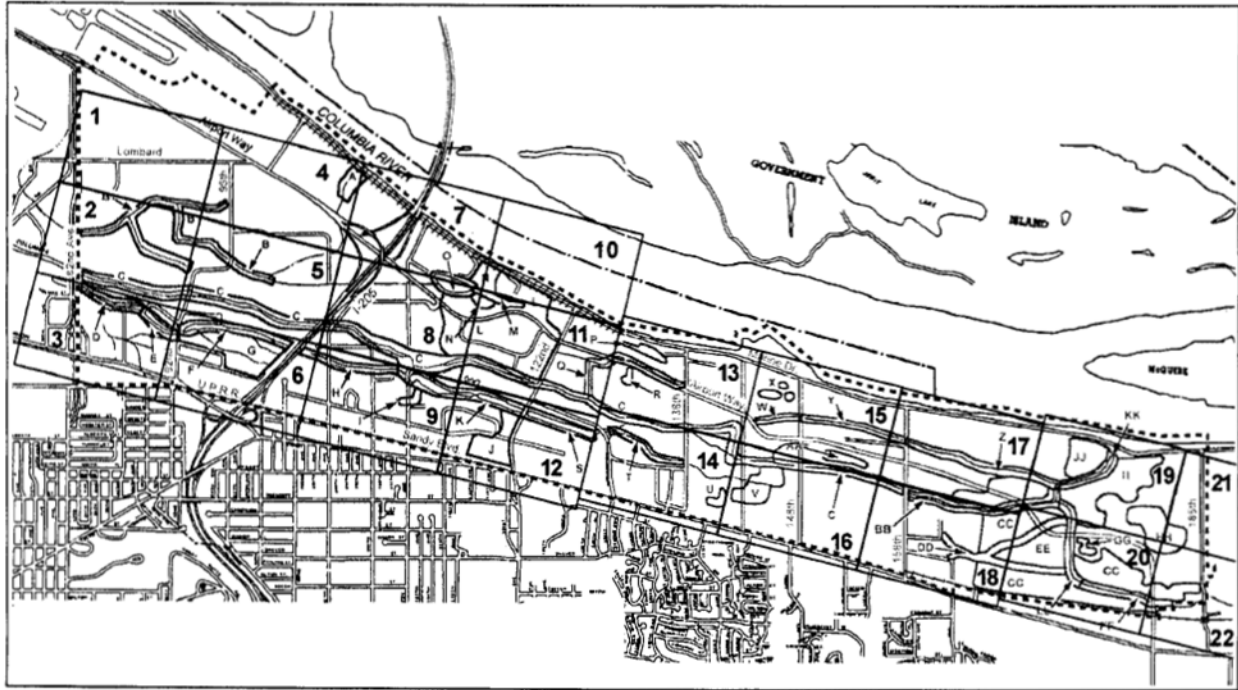


Figure 13: Columbia South Shore Study Area

Natural Resource Description

The *Natural Resources Protection Plan for the Columbia South Shore* plan used functionality, location, quality and quantity to assess natural resources. In contrast to earlier conservation plans, it did not use the Wildlife Habitat Assessment (WHA) to score resource sites.

In many other natural resource conservation plans, the resource sites are contiguous and consist of an area that includes natural resources. For the Columbia South Shore plan, the sites are not contiguous, and many of them consist only of areas where there are natural resources.

Significant features:

- small drainageways with wooded riparian areas
- old/large cottonwoods and mature Gary Oaks
- floating logs
- fish habitat
- springs
- wetlands

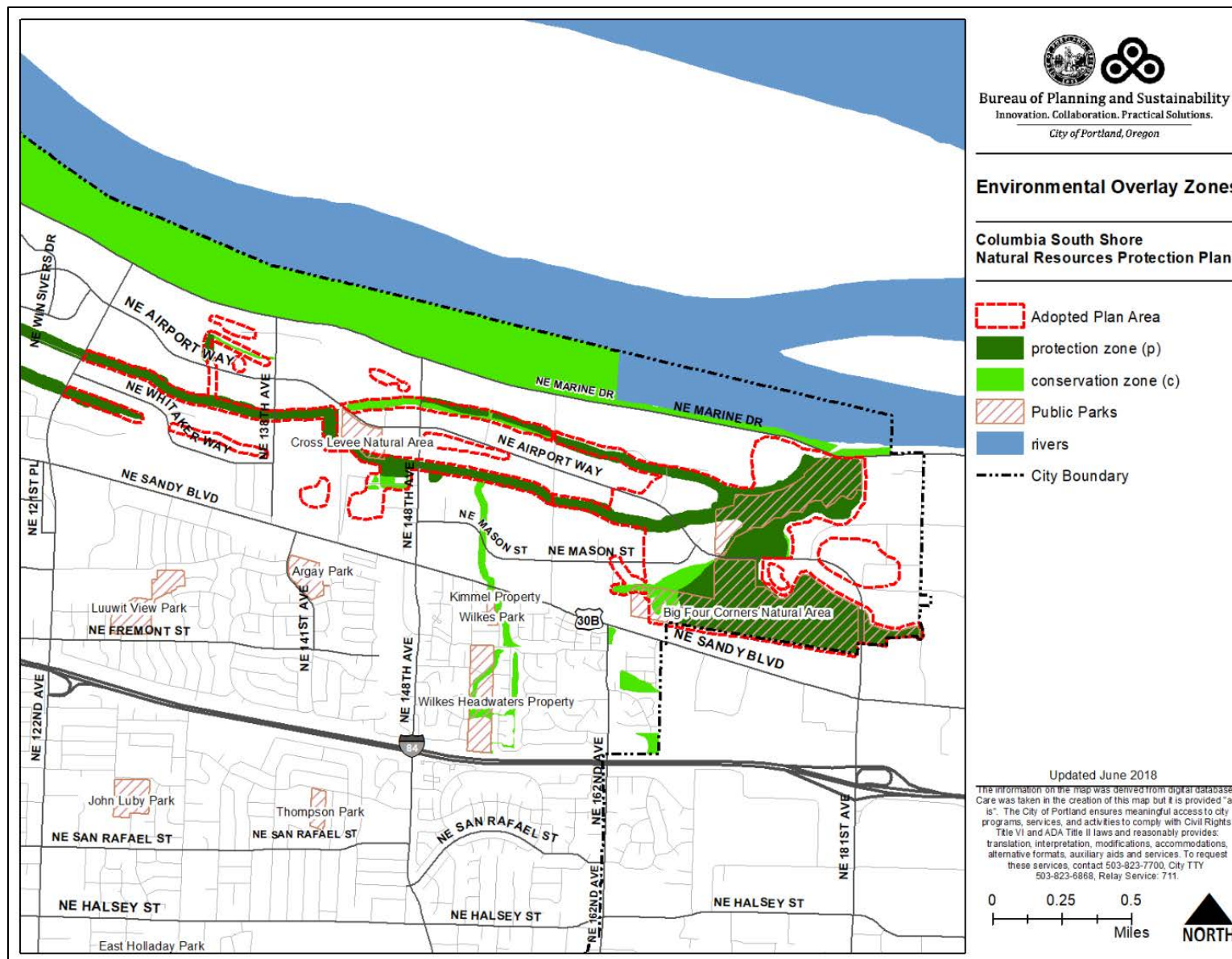
Significant functions:

- groundwater recharge
- drainage
- flood storage
- nutrient retention
- wildlife habitat
- visual amenity
- potential recreation
- dispersion

Summary of Protections

The methodology for determining the location, quantity and quality of resources utilized various sources (including USGS maps, Wetland Inventory Maps, 1989 infra-red aerial photographs and field reconnaissance). The plan states that the methodology “provides an acceptable base for information, while allowing augmentation from other sources.”

There are three main levels of natural resource protection that were applied in the area. The protection (p) overlay zone was applied to significant resources that warrant the highest level of protection. The conservation (c) overlay zone was applied to other significant resources that can be altered as long as mitigation standards are followed. A 50-foot transition area, which is the outer edge to the (p) or (c) zone, limits development to that which provides access and service, resource maintenance, resource enhancement and passive recreation.



Map 15: Columbia South Shore Environmental Overlay Zones

3.C.8. Fanno Creek and Tributaries (1994)

The *Fanno Creek and Tributaries Conservation Plan* was first adopted in 1994 (Ordinance No. 167293) (See Figure 14). Fanno Creek starts in Portland's West Hills and meanders 15 miles through residential, commercial and industrial lands of west Portland, Beaverton, Tigard, and portions of Washington and Clackamas counties. Albert, Gabriel, and Woods Memorial Parks offer opportunities to engage the Fanno Creek and its tributaries.

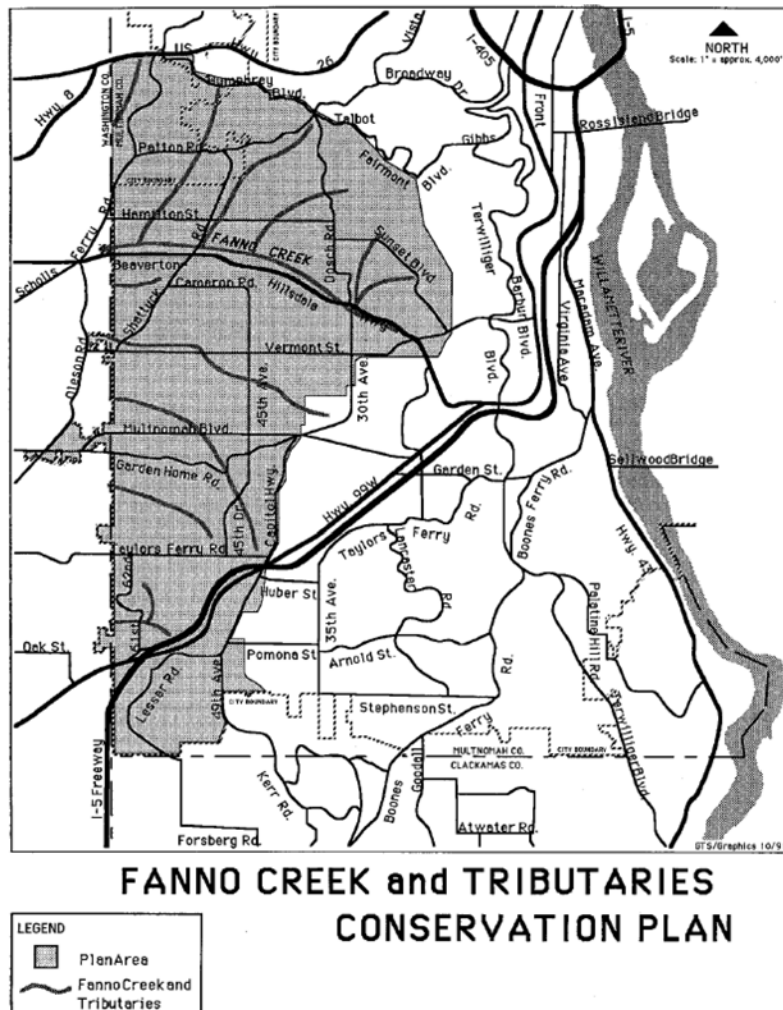


Figure 14: Fanno Creek and Tributaries Conservation Plan

Natural Resource Description

The *Fanno Creek and Tributaries Conservation Plan* used a Wildlife Habitat Assessment (WHA) methodology to score natural resources. The WHA focused on plants, wildlife, water, food, cover, relationship to other habitats and human disturbance. The scores range from 17 (low) to 92 (high). Due to the high level of development and heterogeneity within the Fanno Creek area, multiple assessments were done for each site in order to have better representation of the ecological features and functions.

Significant features:

- streams
- ponds and marshes
- riparian areas
- forests
- scrub-shrubs
- urban landscapes

Significant functions:

- maintain native forest microclimate
- retain and stabilize soil
- store and convey storm water
- trap pollutants
- groundwater discharge
- anchor streambanks and shorelines
- provide area for fish to feed, spawn and hide

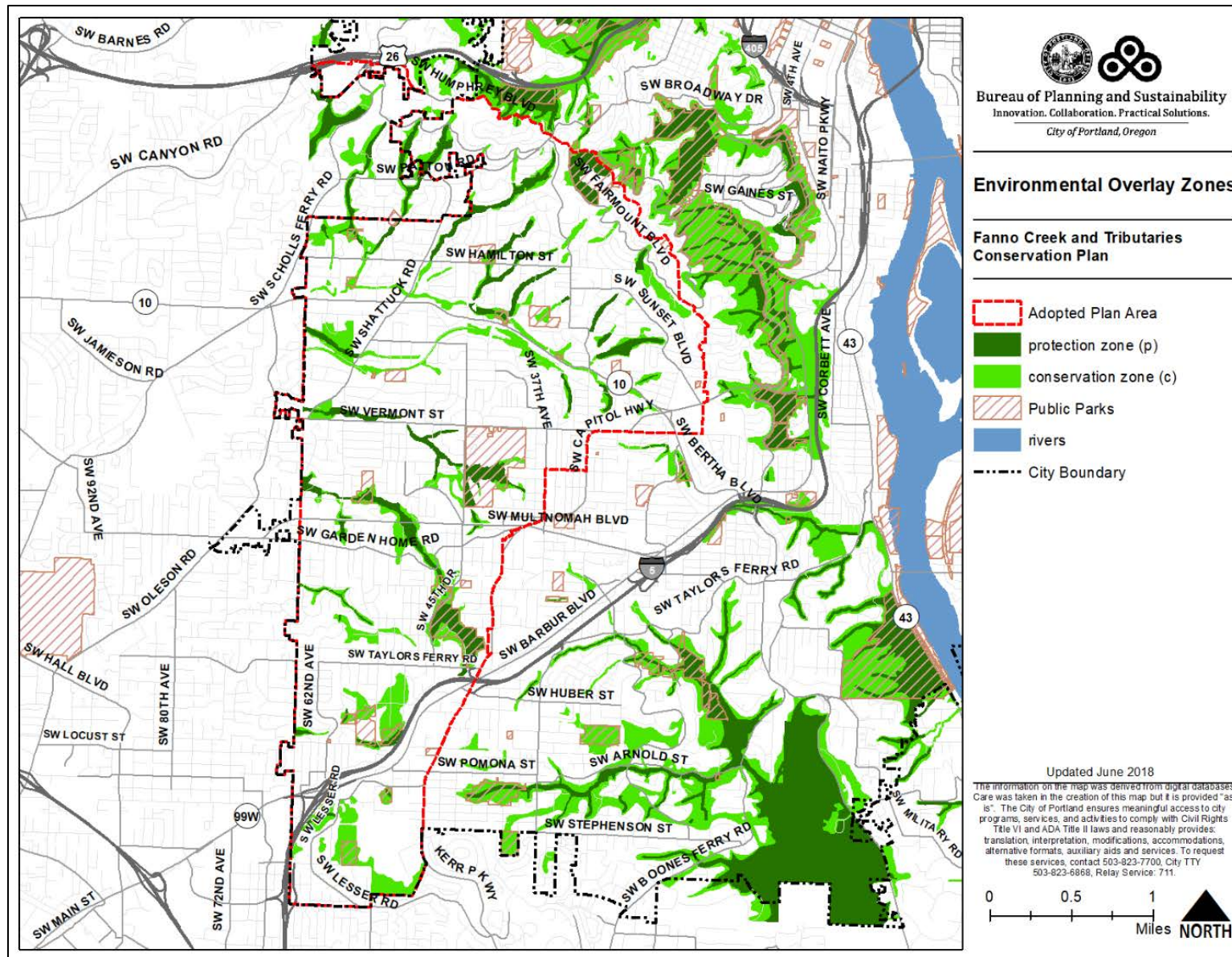
Summary of Protections

Differing from previous conservation plans, the Wildlife Habitat Assessment (WHA) form was not used to assess natural resources. Instead, an in-depth ESEE analysis resulted in decision about whether to prohibit, allow, or uses of the land that conflict with natural resource conservation. The application of environmental zones were specified where the resource value was greater than that conflicting uses. The value of the resource was “gauged by the values it provides, its scarcity, how easily it could be replaced over the short term, and its connectivity or the contribution of its location toward maintaining a functioning ecological unit.

A protection (p) overlay zone was generally applied to open streams and riparian areas within 50 to 100 feet. A conservation (c) overlay zone was often applied to areas where an open stream was likely but not confirmed.

Gabriel Park, April Hill Park, Woods Memorial Park, Hamilton Park, Albert Kelly Park, Dickinson Park, and Council Crest Park all have a mix of p- and c-zone covering portions. Sylvania Park, Lesser Park, and Ash Creek Natural Area have a c-zone covering most, if not the entire area.

There is a swath of residential area to the northeast of Dickinson Park that has an c-zone, and another along SW Ash Creek Lane.



Map 16: Fanno Creek and Tributaries Environmental Overlay Zones

3.C.9. Skyline West Conservation Plan (1994)

The *Skyline-West Resource Protection Plan* was adopted in 1994 (Ordinance No. 168154) (See Figure 15). The purpose of the plan was to provide recommendations for protection of significant natural, scenic and open space resources located along the west slope of the Tualatin Mountain ridge in northwest Portland.

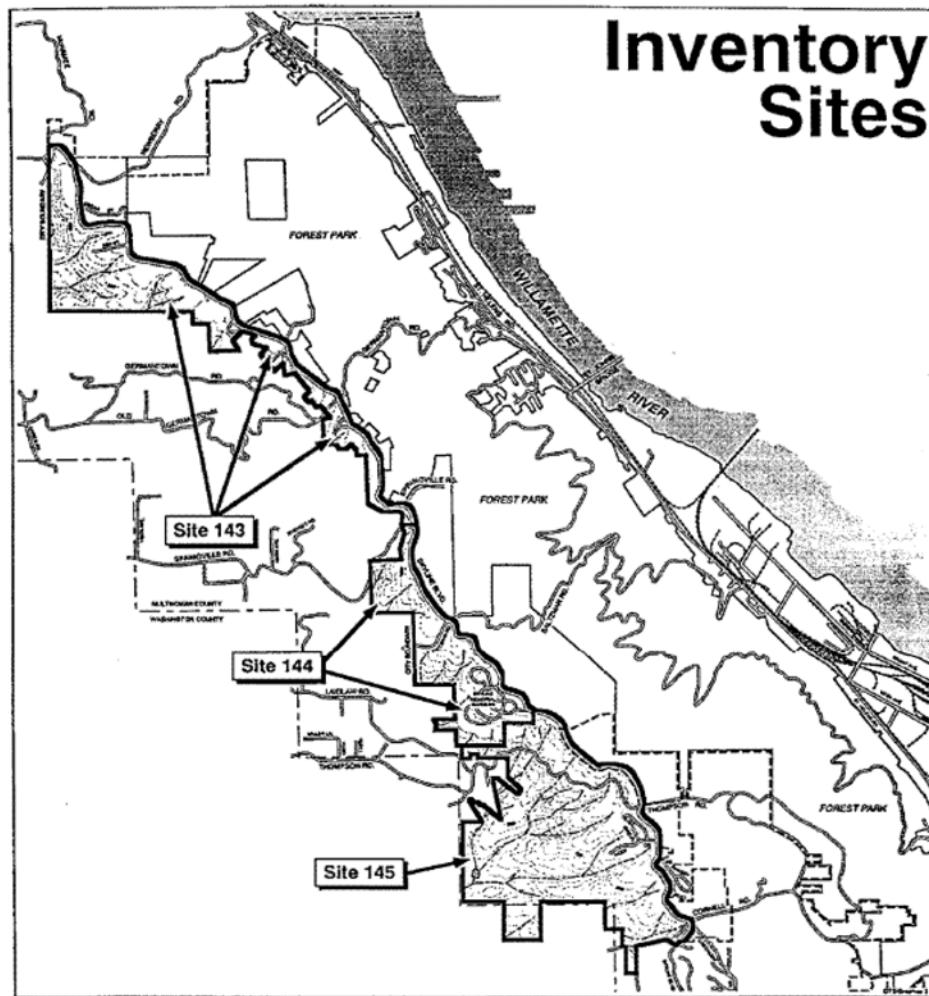


Figure 15: Skyline West Resource Protection Plan Area

Natural Resource Description

The *Johnson Creek Basin Protection Plan* used a Wildlife Habitat Assessment (WHA) methodology to score natural resources. The WHA focused on plants, wildlife, water, food, cover, relationship to other habitats and human disturbance. The scores range from 14 (low) to 80 (high).

Significant features:

- forest, drainages
- hillside slopes
- ravines and creeks
- ravine boundaries and other boundary areas
- open space for sites with subdivision plats

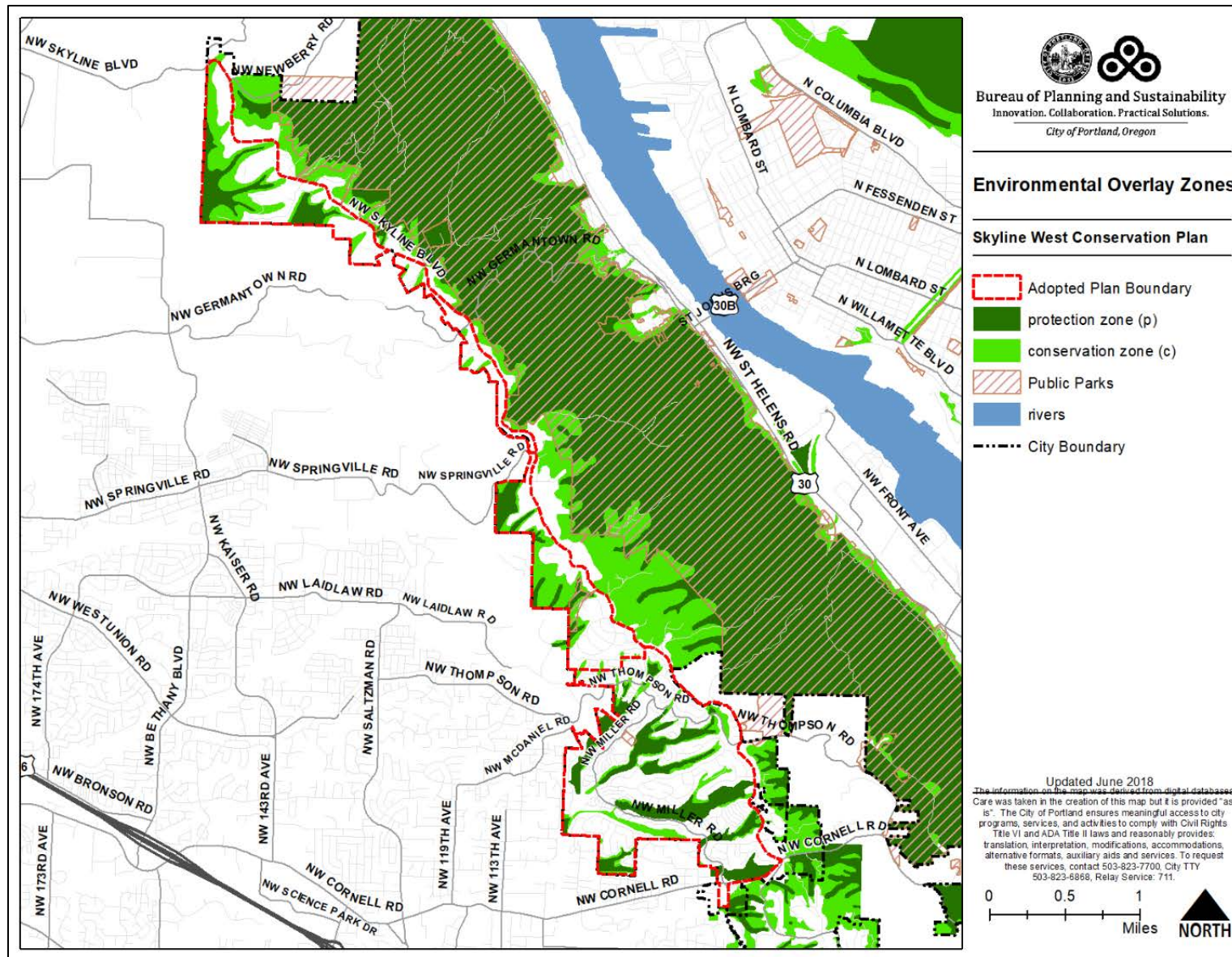
Significant functions:

- wildlife habitat
- soil enrichment
- water filtration
- pest control
- sound and sight buffer
- microclimate
- recreation
- reduction in heating and cooling
- water conveyance
- education
- physical and psychological health

Summary of Protections

Although the natural resources were scored, there is no stated relationship between the WHA scores and the environmental overlay zones.

The *Skyline West Conservation Plan* proposed a protection (p) overlay zone for those natural resources essential for the operation of the interconnected ecosystem. The p-zone was applied to highly valued resources such as creeks, wetlands, sensitive species or habitats with net positive ESEE consequences. The conservation (c) overlay zone was applied to significant resources to balance conflicts between land uses and resources.



Map 17: Skyline West Environmental Overlay Zones

3.C.10. Boring Lava Domes/Johnson Creek (1997)

The *Boring Lava Domes Supplement* was first adopted in 1997 (Ordinance No. 164472) (See Figure 16). The sites that comprise the area were part of the *Johnson Creek Basin Protection Plan*, adopted in 1991, and the supplemental report is a refinement of the original report. Natural characteristics of the Lava domes includes buttes, typically forested and steep, divided by perennial streams.

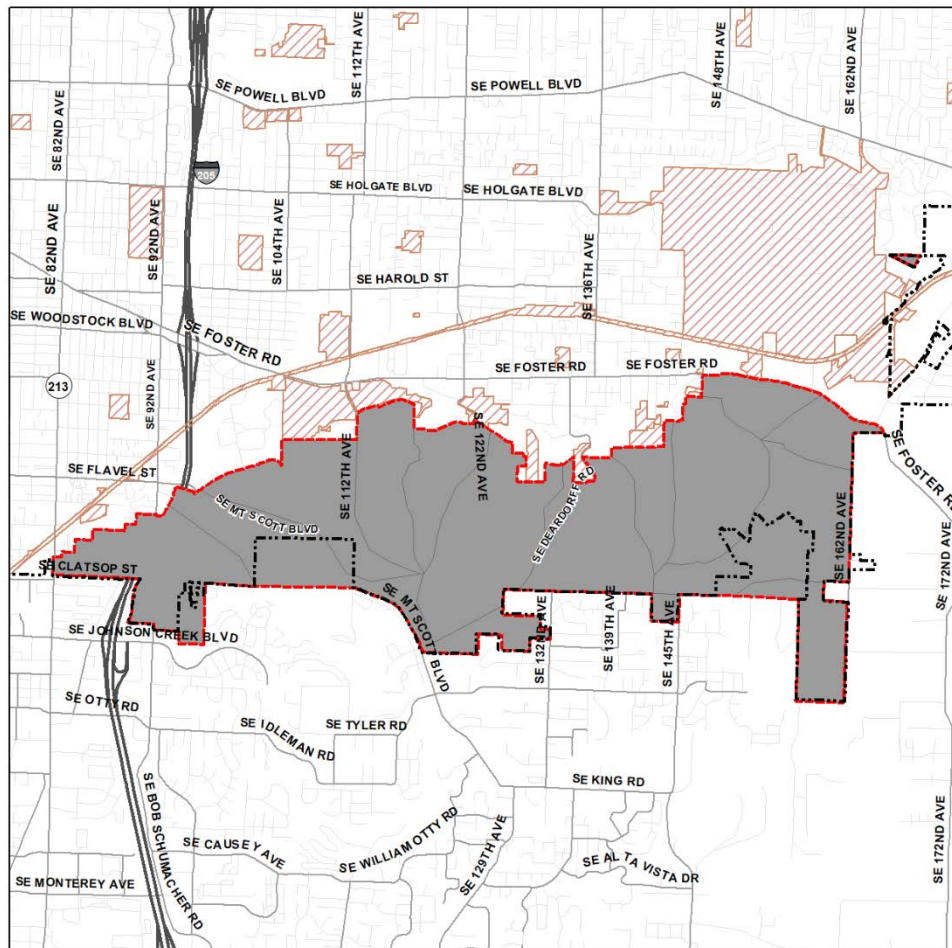


Figure 16: Boring Lava Domes Supplement Study Area

Natural Resource Description

The *Boring Lava Domes Supplement* used a Wildlife Habitat Assessment (WHA) methodology to score natural resources. The WHA focused on plants, wildlife, water, food, cover, relationship to other habitats and human disturbance. The scores range from 23 (low) to 91 (high). From a habitat perspective, resources with a WHA score of 45 or higher were deemed significant. Additionally, the ESEE analysis summarized natural resource features and functions for the purposes of making recommendations and decisions. Each resource received a rank (A, B or C). Generally, the decisions were to apply environmental protection zones to Rank A resources, a mix of protection or conservation to Rank B resources and to allow for Rank C.

Significant features:

- open space in Cottonwood Creek watershed
- vacant lots and open space tracts in Veteran's Creek watershed
- vacant lots in Indian Creek watershed
- open space and developed lots in Frog Creek watershed, and open space land
- vacant lots and developed lots in Cedar Creek watershed
- special features in large cottonwoods, 100+ year old trees

Significant functions:

- fish and wildlife habitat
- red-legged frog habitat
- water purification
- storm drainage
- groundwater recharge and discharge
- flood storage
- pollution and nutrient retention/removal
- sediment trapping and erosion control
- aesthetics
- education and recreation

Summary of Protections

Compared to the original *Johnson Creek Basin Protection Plan*, the Boring Lava supplement increased the environmental overlay zones. The protection (p) overlay zone applied most streams and forested areas on portions of specific lots where there was a low risk of housing unit loss. Creeks not covered by the (p) zone had the conservation (c) overlay zone applied to them. The (c) zone also covers the swaths of land between the streams.

Many of the park areas are almost completely within the environmental overlay zones, including Wahoo Creek Natural Area, Deardorff Creek Natural Area, Buttes Natural Area, and Mitchell Creek Natural Area. Portion of parks that do not have environmental overlay zones are the west portion of Clatsop Butte Park, the southwest corner of Eastridge Park, and most of Playhaven Park.



3.C.11. Multnomah County Unincorporated Areas (2002)

The *Economic, Social, Environmental, And Energy Analysis and Recommendations for Natural, Scenic, And Open Space Resources Within Multnomah County Unincorporated Urban Areas* was adopted in 2002 (County Ordinance No. 967) (See Figure 17). These are areas outside Portland's city limit but for which the City of Portland has been granted planning authority by Multnomah County. The purpose of the plan was to perform an Environmental, Social, Economic and Energy analysis and apply environmental zoning to protect significant resources.

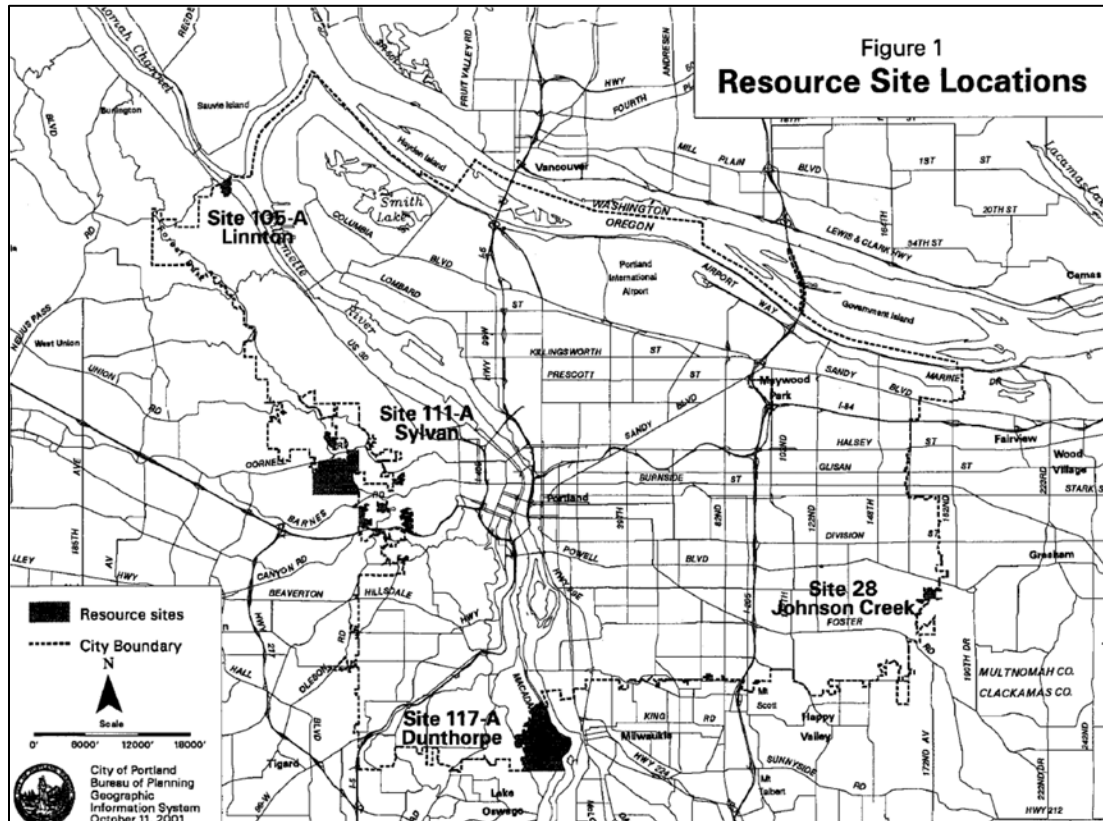


Figure 17: Multnomah County Unincorporated Areas Study Area

Natural Resource Description

There was no stated relationship between the ESEE analysis and specific decisions to apply environmental overlay zones.

Significant features: Features varied since the sites have different geographic locations. For Johnson Creek, significant features include Johnson Creek area wildlife habitat, riparian corridors, seeps and wetlands. For the Linnton site, significant resources were Miller Creek, Willamette tributaries, bottomland wetlands, Multnomah Channel, and terrestrial/aquatic habitat. For the Sylvan site, A-ranked resources include Balch Creek, Sylvan Creek, Cedar Mill Creek, Johnson Creek (west), Golf Creek, the tributaries of these creeks, as well as associated wetlands and riparian corridors. For the Dunthorpe Resource site, streams, tributaries, ravines, rock outcroppings, and high-quality terrestrial/aquatic habitat are resources that received A-ranks.

Significant functions:

- reduction in risk of flooding and erosion
- screening and buffering
- health, safety and welfare
- historic values
- reduced heating and cooling costs
- recreational and scenic values

Summary of Protections

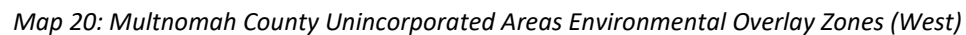
The results of the study were to prohibit conflicting uses for A-quality resources on vacant and developed parcels for all four resource sites. Additional decisions were to prohibit and limit conflicting uses for A-, B- and C-quality resources differ by resource site.

For Johnson Creek, the decision was to apply a protection (p) overlay zone to A and B-quality resources on vacant parcels and developed parcels. As stated in the adopted plan “all water resources are significant, including Johnson Creek and associated wetlands, ponds, springs, and groundwater resources. All riparian vegetation within at least 50 feet of the Johnson Creek top-of-bank, and all contiguous forest, is significant.”

For the Linnton resource site, the decision was to apply the (p) zone to A-quality resources and the conservation (c) overlay zone to B-quality resources. This applies to both vacant and developed parcels. There are a few areas that were significant but are not associated with an environmental zone; this discrepancy is not explained in the plan.

The decision at the Sylvan and the Dunthorpe resource sites was to apply the (p) zone to A-quality resources on vacant parcels and developed parcels and the c-zone to B and C-quality resources on vacant parcels and developed parcels. The plan also allows conflicting uses in the disturbed floodplain.





3.C.12. Pleasant Valley District Plan (2004)

The *Pleasant Valley Natural Resources Protection Plan* was adopted in 2004 (Ordinance No. 178961 by the Portland City Council, and by the Gresham City Council (CPA 04-1480). (See Figure 18). The purpose of the plan, and supporting regulations, was to plan for future development, maintain a sense of place and integrate land use, transportation and natural resources.

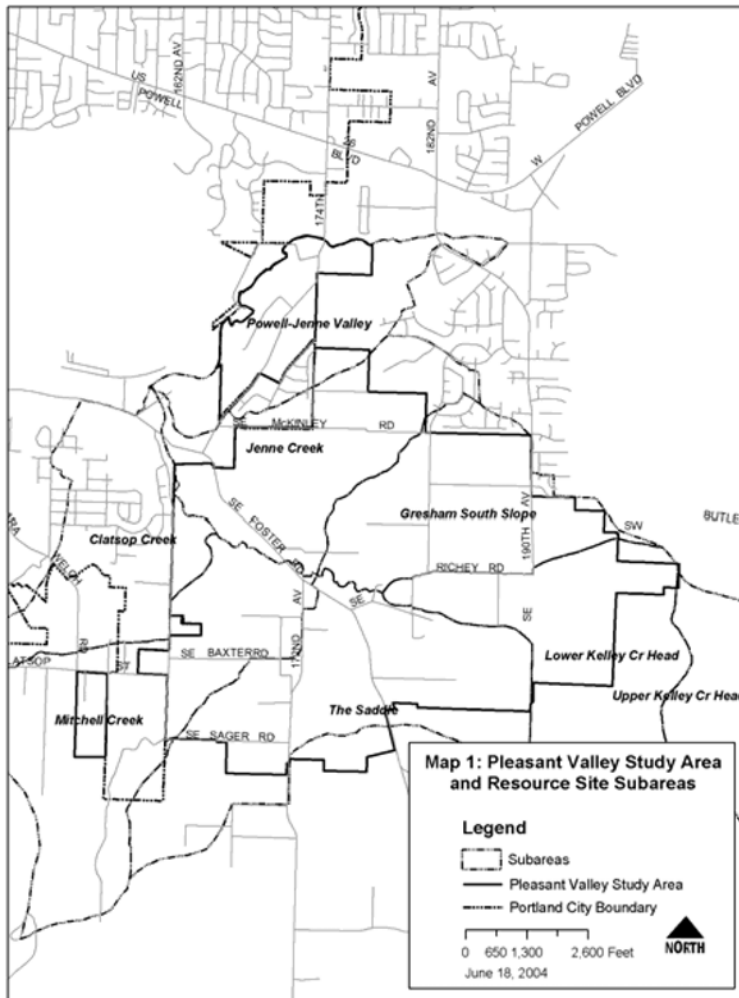


Figure 18: Pleasant Valley

Natural Resource Description

The *Pleasant Valley Natural Resources Protection Plan* used a Wildlife Habitat Assessment (WHA) methodology to score natural resources. WHA ratings for individual subareas ranged from 39 (low) to 87 (high). The Pleasant Valley site as a whole received a rating of 63. The inventory process identified important natural features and functions, and established Environmentally Sensitive Areas (ESRA), also referred to as “significant resource sites.” The adopted plan recommended different levels of protection for natural resources in the ESRAs.

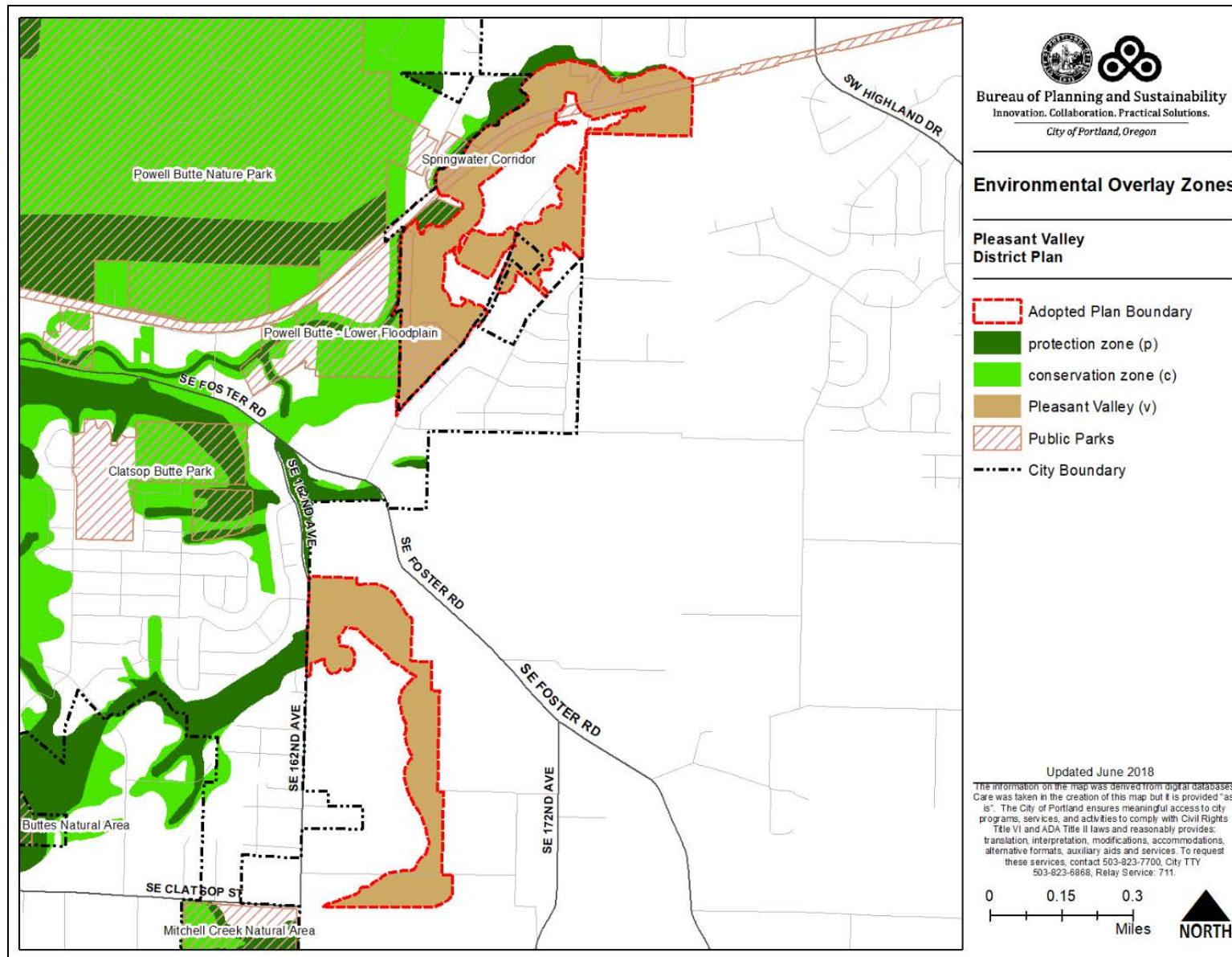
Significant features: These resources received ranks as follows: A signifies the highest significance, B is highly significant, and C is significant. These features include forests and creeks and valleys such as: Jenne Creek, Mitchell Creek, The Saddle, Lower Kelley Creek Headwaters, and Powell-Jenne Valley. In terms of sensitive species, Steelhead is on federal list of threatened species; peregrine falcon, pileated woodpecker, and red-legged frogs also rely on the area for survival.

Significant functions:

- water quality
- channel dynamics and morphology
- water quality (stream flow, sources and storage)
- microclimate
- fish and aquatic habitat
- organic inputs
- riparian and upland wildlife habitat quality
- upland sensitive species
- upland interior habitat

Summary of Protections

Unlike the other resource plans in Portland, the *Pleasant Valley Natural Resources Protection Plan* applied a unique overlay zone – Pleasant Vally (v). The v-zone represents an ESEE decision to “limit” conflicting uses on all lots, whether they had no ESRA, partial ESRA or substantial ESRA. There is an additional disturbance allowance for 27 highly constrained properties that have substantial ESRA coverage.



Map 21: Pleasant Valley Environmental Overlay Zones

3.C.13. Middle Columbia Corridor/Airport Futures (2011)

The *Middle Columbia Corridor/Airport Futures* was adopted in 2011 (Ordinance #184521) (See Figure 19). Unlike previous conservation plans approaches, the Airport Futures approach utilized the methodology that was ultimately adopted in the 2012 Natural Resource Inventory. This is the most current approach and methodology and is anticipated to be used on future planning efforts.

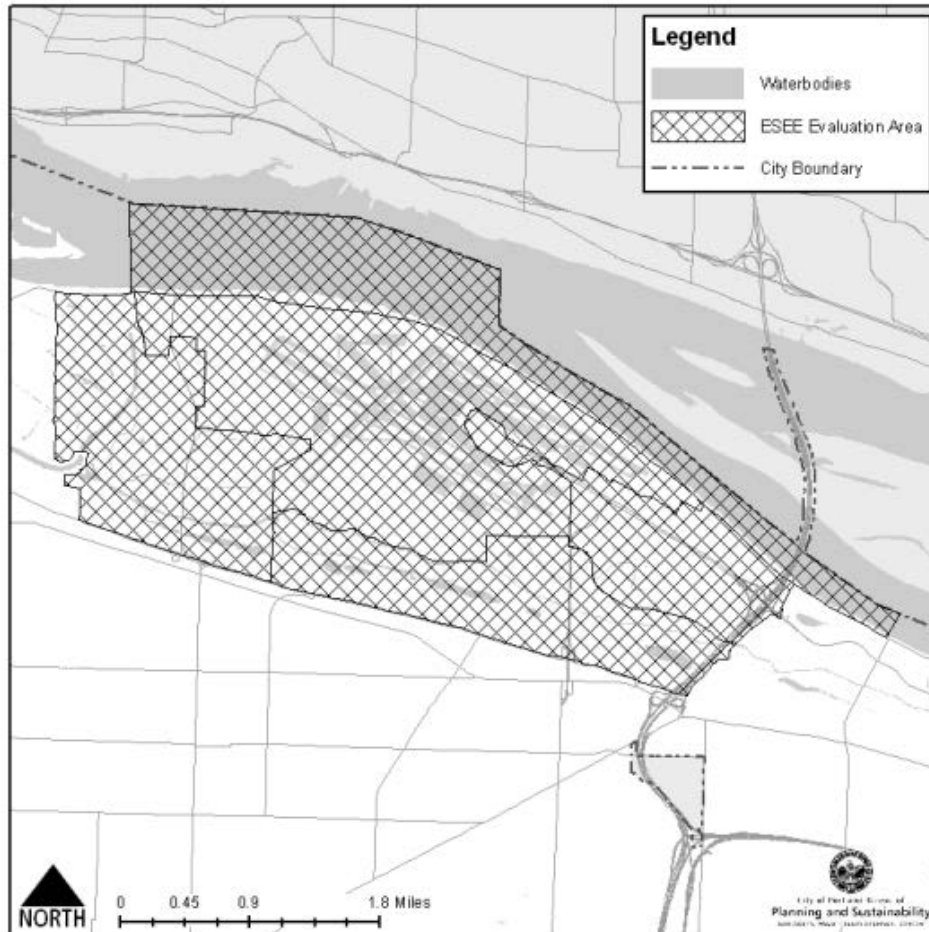


Figure 19: Middle Columbia Corridor/Airport Futures Plan Area

Natural Resource Description

The *Middle Columbia Corridor/Airport Futures* plan used Natural Resource Inventory (NRI) to assess natural resources features and functions. The inventory includes classification of natural resources in terms of riparian corridor functions and wildlife habitat attributes including Special Habitat Areas. This process started with compiling GIS data, developing criteria to rank and map the relative functions of natural resources and then combining the results to produce an overall relative rank for each resource.

Significant features:

- rivers, streams and drainageways
- wetlands and seeps
- flood area
- forest and woodland vegetation greater than ½ acre in size
- shrubland and herbaceous vegetation in the riparian area
- wildlife habitat

Significant functions:

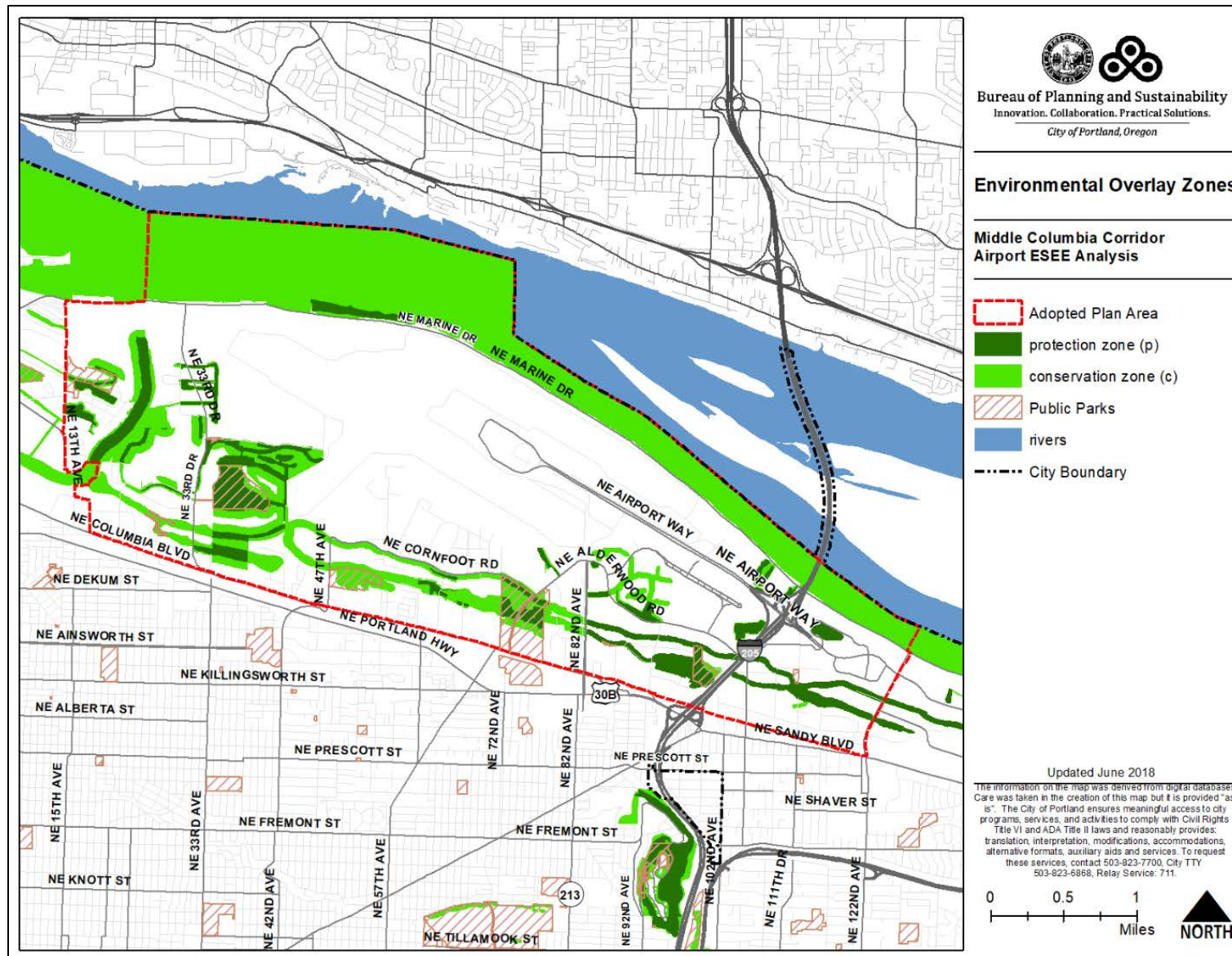
- microclimate and shade
- bank function and control of sediments, nutrients and pollutants
- stream flow moderation and flood storage
- organic inputs, nutrient cycling and food web
- large wood and channel dynamics
- wildlife movement corridors
- wildlife habitat patch size, interior area and proximity to water

Summary of Protections

The general decision was to apply the protection (p) overlay zone to the Columbia Slough and associated open drainageways as well as land within 50 feet of the waterways. The p-zone was also applied to wetlands and land within 50 feet of a wetland. However, at the time of adoption the City of Portland had not updated its Economic Opportunity Analysis (EOA) which is a required step in assessing the supply of land to meet job growth. Without an updated EOA, the ESEE decision could not be applied to land zoned industrial, employment or commercial outside of Port of Portland-owned property. Therefore, the previous decisions of the *Industrial/Environmental Mapping Project* (1989) and *Columbia South Shore* (1993/2000) were retained on many segments of the Columbia Slough.

The general decision was also to apply the conservation (c) overlay zone to the Columbia River and land within 50 feet of the river and to medium ranked resources located more than 50 feet from rivers, streams, drainageways and wetlands in residential and open space base zones.

Each resource site has additional supplemental ESEE decisions that augment the general application of p- and c-zones to reflect site specific resource uniqueness and conditions.



Map 22: Middle Columbia Corridor/Airport Futures Environmental Overlay Zones

3.C.14. Citywide Environmental Overlay Zone Map Refinement Project (1998)

The *Citywide Environmental Overlay Zone Map Refinement Project* was adopted in 1998 (Ordinance #172421) (See Figure 19). This plan is not reported in chronologic order because it is not an area specific plan – it address the entire City of Portland. The purpose of the project was to more accurately map the boundaries of the environmental overlay zones. The project was a result of the conversion of the official zoning maps from mylar/paper to Geographic Information System (GIS) base. GIS topography, water features, vegetation, property lines, roads and structures were used to adjust environmental overlay zone boundaries. The biggest benefit of GIS at the time was the ability to project all data together on one map instead of having to compare separate maps. When possible, staff also cross-checked refinements on the ground. All of the changes were consistent with previously adopted plans and policies.

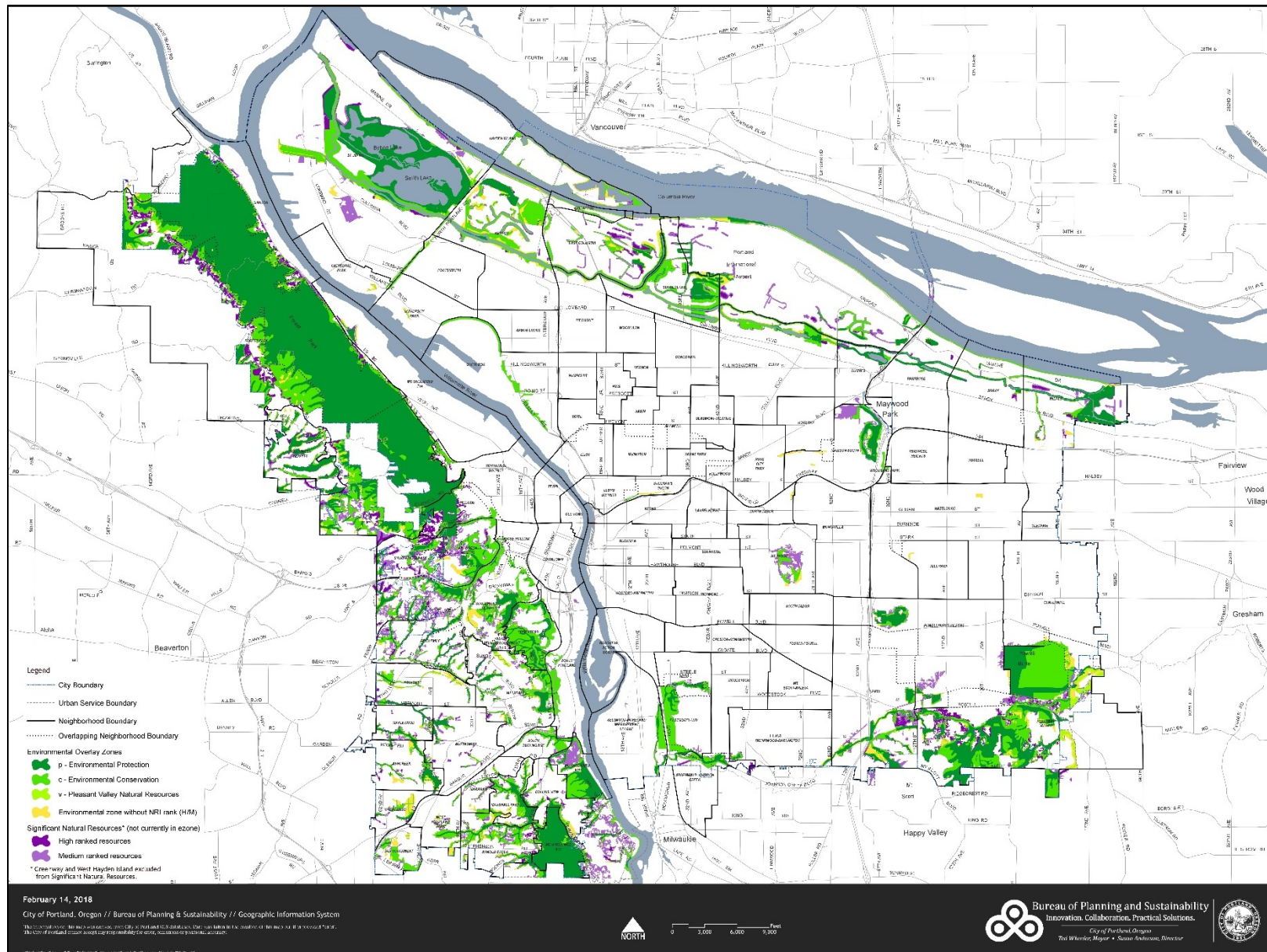
3.D. Natural Resources and Environmental Overlay Zones

The primary goal of the Environmental Overlay Zone Map Correction Project is to correct the overlay zones to better match the natural resource features. In general, the conservation and protection plans described in 3.C recommend applying a protection (p), conservation (c) or Pleasant Valley (v) overlay zone to natural resource features that typically rank high or medium in the 2012 Natural Resources Inventory – rivers, streams, wetlands, vegetated floodplains, riparian areas and patches of upland forest and woodland habitat.

Comparing the NRI results with the existing environmental overlay zones (see also Map 21):

- 14,027 acres of high/medium ranked resources are within an environmental overlay zone (protected)
- 2,776 acres (17%) of high/medium ranked resources are outside an environmental overlay zone (not protected)
- 8% of streams are outside an environmental overlay zone
- 12% of wetlands are outside an environmental overlay zones
- Roughly 8,000 properties have environmental overlay on portions of the property without high/medium ranked resources

Note – These statistics do not include the Willamette River, Columbia River or West Hayden Island



Map 23: Natural Resources and Environmental Overlay Zones Comparison Map

4 DEMOGRAPHICS and LAND USE

4.A. Demographics

The information presented in this chapter is a summary of the Census Block Group information for the Federal Census every 10 years and the American Community Survey (ACS) estimated annually. There are 124 census block that include natural resources and environmental overlay zones; however, the census blocks are always larger than the areas with natural resources and e-zones. This is significant because the results reported below are reported by census block (or other census area as discussed), but not all of those people will be impacted by updates to environmental overlay zones. More detailed information about people living and working only with the areas that contain natural resources and environmental overlay zones is not available.

4.A.1. Individuals

In 2016, there were 209,749 people living within the census blocks that overlap with environmental overlay zones. These individuals reside in a mix of single-family and multi-family residential developments. Of this total, 29,043 school-age children reside in the study area, representing 13.8 percent of the study area population. This percentage is similar to the City of Portland as a whole, where approximately 14 percent of the population is school-age children. Approximately 13.8 percent (28,947 people) of the population are 65 years or older. This percentage is higher than the City as a whole, where 11.3 percent of the population is in this age group. Most of the population lives in the Johnson Creek Watershed, Northwest Hills and Southwest Hills.

English was the primary language spoken by almost all the population in 2015. Based on responses to the ACS, 3.7 percent of the population in the study area are estimated to speak English “not well” or “not at all.” A mix of other languages are spoken in the homes in the study area including Spanish (6 percent), Asian and Pacific Island languages (6 percent), and Other Indo-European languages (5 percent).

The proportion of individuals living below the poverty level within the study area was lower than the City as a whole in 2015. It is estimated that 13.5 percent (28,316 individuals) of the population (in the study area) earned an income below the poverty level in the 12 months prior to 2015. Compared to 18 percent of the City of Portland estimated to earn an income below the poverty level during that same period. The area with the highest percentage of individuals living below the poverty level is Johnson Creek and Outer Southeast.

In contrast to the data described above, which focused on 2015 estimates, 2016 estimates were used to characterize the racial and ethnic composition of the study area. As shown in Table 3, a majority (73.8 percent) residents are classified as white. The second largest group are Asian residents, which make up 7.3 percent of the study area population. The third largest group are Hispanic/Latino resident, which make up 8.6 percent. Black/African American individuals make up 4.5 percent of the population as do individuals of mixed racial/ethnic

make-up. Other individuals that live within the study area but comprise less than 1 percent of the population include American Indian, Native Hawaiian/Pacific Islander or another race.

Table 3: Estimated Racial and Ethnic Composition			
Individual Characteristics	Count	Percent of Total in Study Area	Citywide Percent
Total	209,749		100%
White alone	154,699	73.8%	71.4%
Asian alone	15,392	7.3%	7.5%
Hispanic/Latino alone	17,947	8.6%	9.9%
Black / African American alone	9,469	4.5%	5.6%
American Indian/AK Native alone	878	0.4%	0.5%
Native Hawaiian/Pacific Islander alone	1,032	0.5%	0.6%
Some other race alone	517	0.2%	0.3%
Two or more races	9,815	4.7%	4.3%

ACS 2016 estimates building upon 2010 Census data and trends.

4.A.2. Households

There are 86,074 households in the study area. Using the ACS for 2016, the average household size within the study area is 2.34 persons, lower than the city average of 2.39. The largest family sizes, at just under 3 persons, is found in the Johnson Creek and Outer Southeast plan areas.

A broader range of household characteristics in the study area have been estimated for 2015. These estimates are shown in Table 4. Non-family households represent 44 percent of the households in the study area. Of those households, 59 percent are owner-occupied and 41 percent are renter-occupied.

Average median household income for this area in 2016 is \$76,033. Approximately 17 percent of households in the study area are estimated to earn over \$150,000. 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. A similar percentage utilized Supplemental Nutrition Assistance Program (SNAP) (also known as food stamps) during that time, 14 percent, as compared to the city as a whole of 4.1 percent.

Table 4: Household Demographic Characteristics		
Household Characteristics	Count¹	Percent of Total in Study Area
Number of Households (count)	86,074	
Overall Household Size (average)	2.34	
Non-family ² Household	37,725	44%
With 1+ persons w/disability	19,090	22%
Below 80% MFI ³	46,129	40%
With food stamps/Supplemental Nutrition Assistance Program (SNAP)	12,285	14%
Owner-Occupied	50,797	59%
Renter-Occupied	35,277	41%

¹ American Community Survey (2010-15) estimates generated for the study area by ArcGIS Business Analyst (<http://www.esri.com/software/businessanalyst/get-started/saas>).

² "Non-family" includes households of individuals living alone or with non-relatives only.

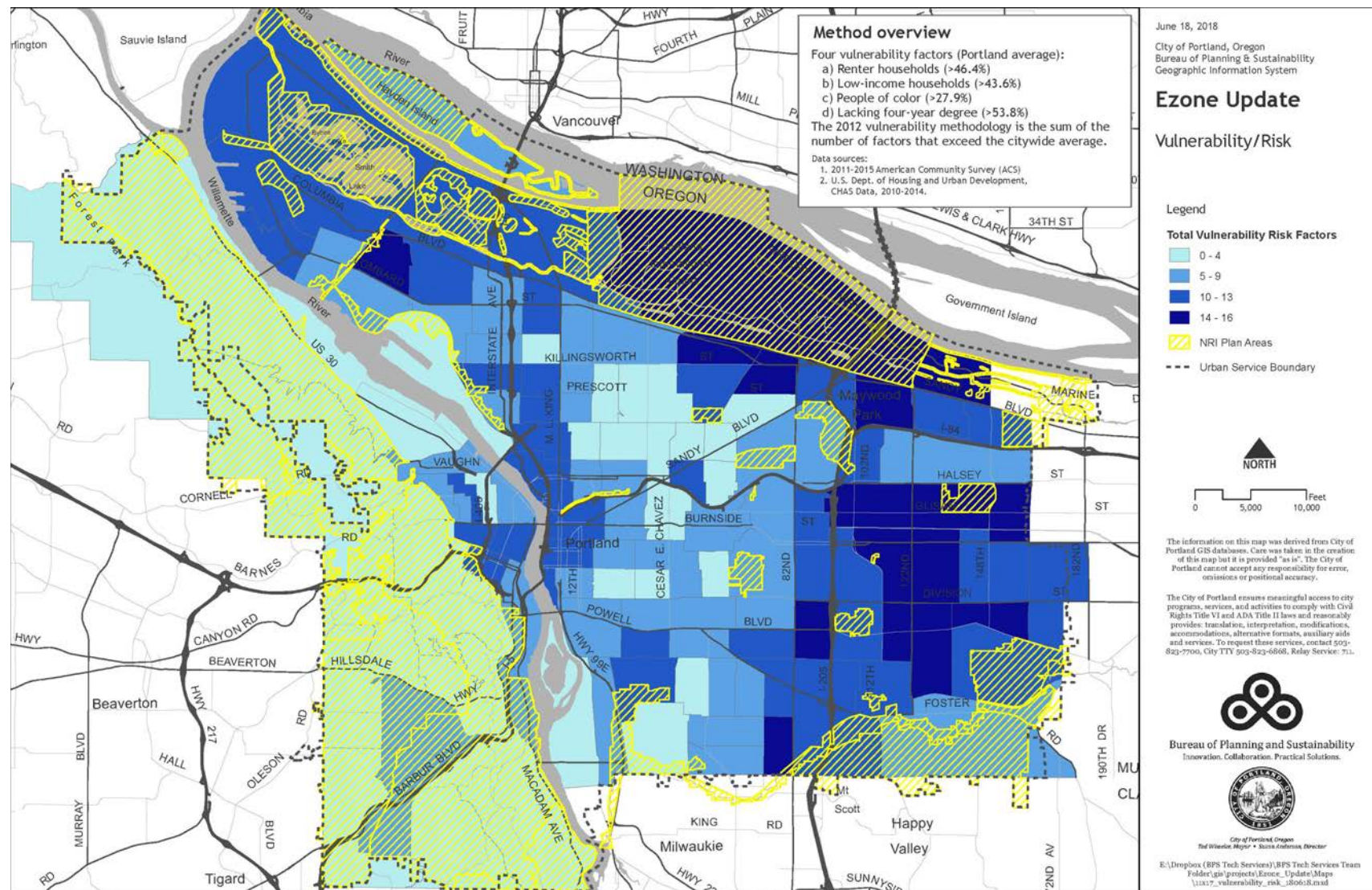
³ Based on census tract, not block group.

4.A.3 Equity

The measures reported above provide some simple information about the demographic make-up of the people and households in the study area. However, it is difficult to gage from those statistics where people live who are more vulnerable to regulatory changes and who may not have the same level or type of access to those who are making decisions about regulatory changes. A goal of this project is to engage vulnerable populations.

To characterize the key indicators of vulnerability, the City of Portland uses a measure of "Vulnerability Risk", which includes the collective ranking of the following factors: (1) Renters; (2) Communities of color; (3) Educational attainment; and (4) Households with income at or below 80 percent of median family income (MFI) for the city. Map 22, Vulnerability Risk, depicts the vulnerability risk of communities in and adjacent to the study area.

The areas with the highest vulnerability risk are in the following neighborhoods: Powellhurst-Gilbert, Lents, Eastmoreland/Reed, Wilkes, Argay, Sumner, Cully, Sunderland, East Columbia, Portsmouth, Kenton and St. Johns. The areas with the lowest vulnerability risk are in the Northwest Hills and Southwest Hills.



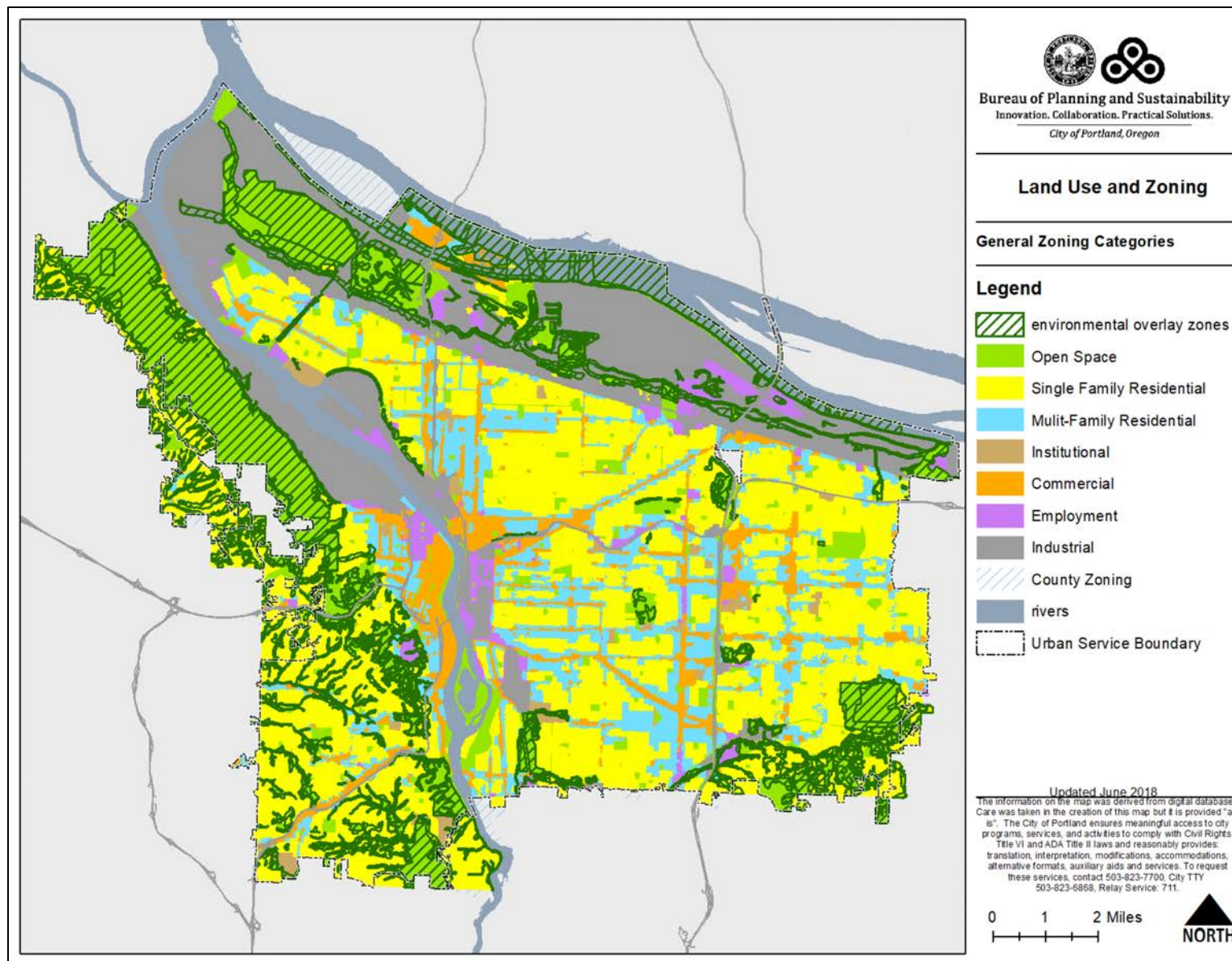
Map 24: Project Areas with High Vulnerability Risk

4.B Land Use

This project encompasses most of Portland outside of the Central City. The summary provides a snap shot of the range of land uses (Map 23). Within the study area, there are 40,755 tax lots, making up 33,302 acres, that have either existing environmental overlay zones or NRI high/medium ranked natural resource features.

The two largest land use types in the study area are recreational/open space and single family residential. Recreational and open spaces areas include Forest Park, Smith and Bybee Wetlands, Tryon State Park and Powell Butte. Most of the industrial land use that has environmental overlay zones or natural resources are located in the Columbia Slough watershed, including the Portland International Airport. “No data” includes rights-of-way and easements.

Table 5: Land Use		
Land Use, General	Tax Lots	Acres
Recreation/Open Space	1,342	10,346
Residential	31,390	10,585
Single-family residential	30,282	9,961
Multi-family residential (condos)	152	191
Multi-family residential (apts)	956	433
Industrial	67	309
Commercial	531	742
Institutional, County and Other	6,446	10,724
No Data	979	597
TOTAL	33,302	40,755



Map 25: General Zoning

5 PUBLIC HEALTH

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 a determining factor in overall health.

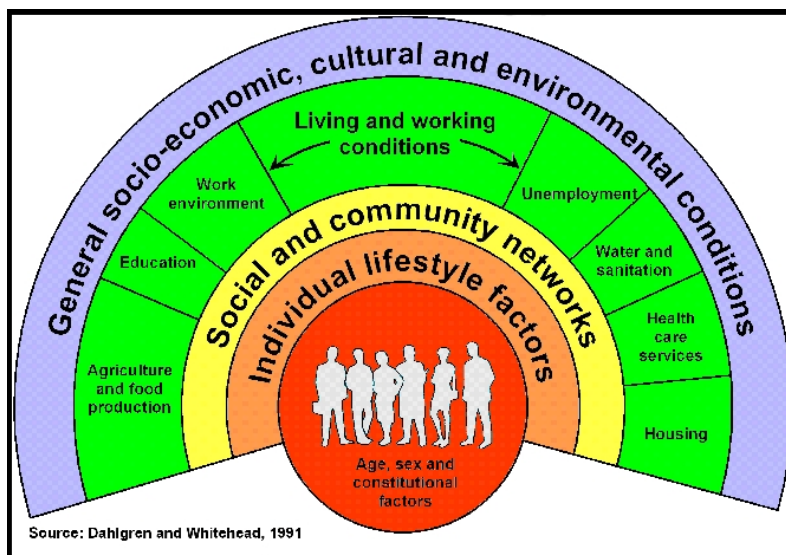


Figure 20: Social Determinants of Health¹

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.

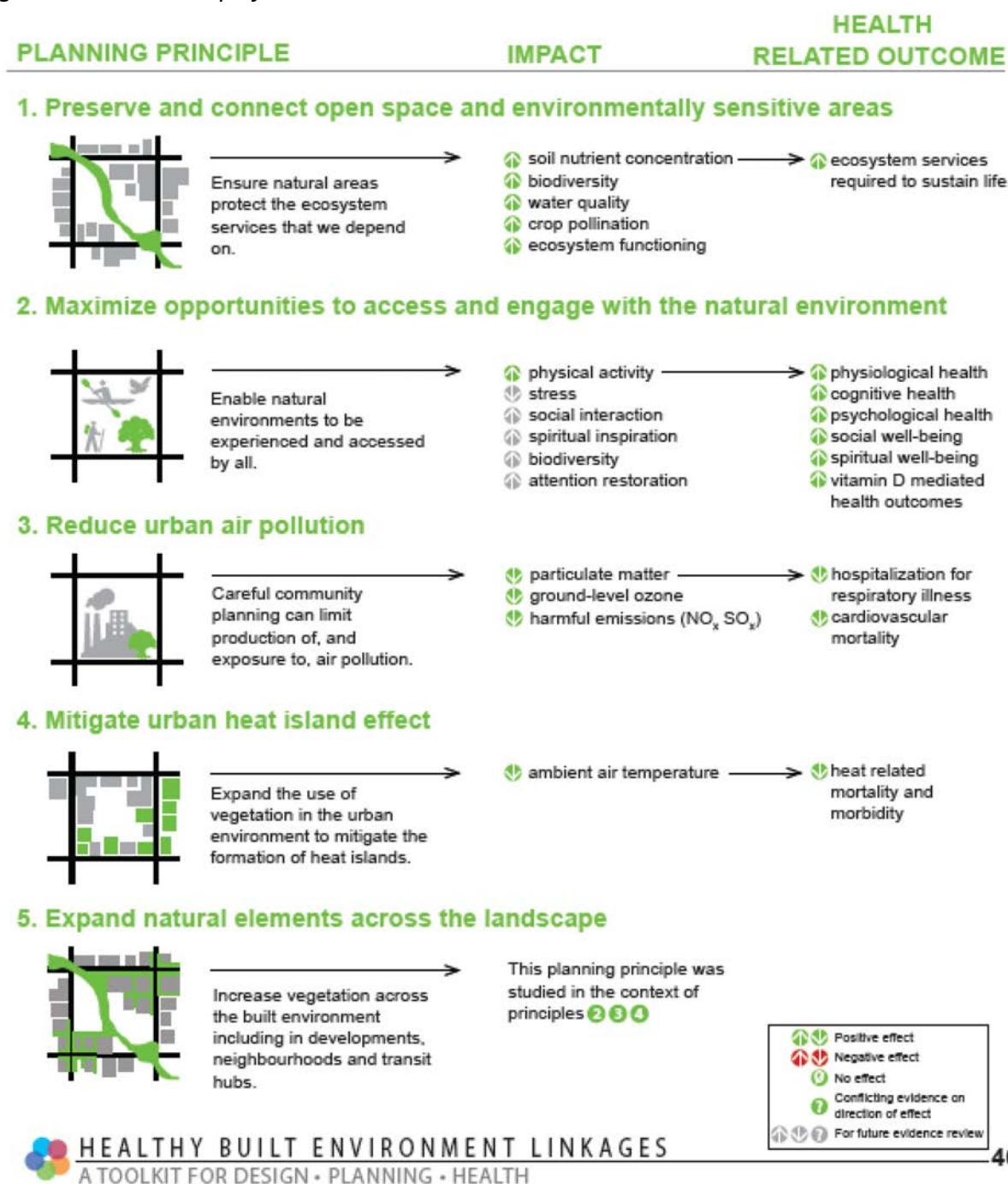
¹ Dahlgren, G. and Whitehead, M. (1991). Policies and strategies to promote social equity in health. Institute for Future Studies. Retrieved from <https://core.ac.uk/download/pdf/6472456.pdf>.



Photo: People walking at Kelley Point park

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 and wetlands and parks, and areas without access to transit, bicycle lanes or sidewalks. As reported in Chapter 4, there are multiple neighborhoods in the study area with high vulnerability risk.

The British Columbia Center for Disease Control, developed a toolkit that makes links between planning, design and health (Figure X). 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.

Figure 21: Relationship of Natural Resources to Public Health²

² 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.

Appendix A: NRI Methodology

Below is a detailed summary of the citywide Natural Resources Inventory (NRI) methodology for mapping and ranking riparian corridors and wildlife habitat (also see figure 1). The full inventory approach and methodology, including citations, can be found in *City of Portland Natural Resource Inventory Update: Project Report* (2012).

City staff completed these four actions to produce the citywide inventory of riparian corridors and wildlife habitat:

1. Compiled GIS data and mapped key natural resource features, including rivers, streams, drainageways, wetlands, flood areas, vegetation and topography
2. Developed criteria and GIS models to rank and map the relative functional value of existing natural resources
3. Designated Special Habitat Areas and Updated Regional Species Lists
4. Produced Combined Relative Ranks and Maps

The following is a detailed explanation of each action:

1. Compiled GIS data and mapped key natural resource features, including rivers, streams, drainageways, wetlands, flood areas, vegetation and topography.

The natural resource feature data are the primary inputs to the GIS inventory models for riparian corridors and wildlife habitat. BPS improved the regional natural resource feature GIS data by:

- Remapping more than 160 miles of stream/drainageway centerlines and adding 100 stream/drainageway miles to the maps.
- Mapping smaller vegetation units (1/2 acre minimum), and classifying forest, woodland, shrubland and herbaceous vegetation over a wider area (using the National Vegetation Classification System as shown below). Vegetation mapping does not include land that is sparsely vegetated.³
 - Forest: Trees with their crowns overlapping, generally forming 60-100 percent of cover.
 - Woodland: Open stands of trees with crowns not usually touching, generally forming 25-60 percent of cover. Tree cover may be less than 25 percent in cases where it exceeds shrubland and herbaceous vegetation.
 - Shrubland: Shrubs generally greater than 0.5 meters tall with individuals or clumps overlapping to not touching, generally forming more than 25 percent of cover with trees generally less than 25 percent of cover. Shrub cover may be less than 25 percent where it exceeds forest, woodland, and herbaceous vegetation. Vegetation dominated by woody vines (e.g., blackberry) is generally included in this class.
 - Herbaceous: Herbs (graminoids, forbs, ferns and shrubs less than 0.5 meters tall) dominant, generally forming at least 25 percent of cover. Herbaceous cover may be less than 25 percent where it exceeds forest, woodland and shrubland vegetation.

³ Sparse vegetation is defined as areas with a predominance of boulders, gravel, cobble, talus, consolidated rock and/or soil with unconsolidated, low-structure vegetation.

- Verifying the existing wetland data using state and city permits and site visits; modifying some wetland boundaries where there was sufficient data.
- Updating the City's flood area data for use in the inventory, including incorporation of the 2004 and 2010 FEMA 100-year floodplain.
- Using Light Detection and Ranging (LiDAR), a method for precisely measuring the elevation of the Earth's surface, and objects on the surface (trees, buildings, etc.).

2. Developed criteria and GIS models to rank and map the relative functional value of existing natural resources.

Like Metro, the City produced GIS models to assess the relative functional value of riparian corridors and wildlife habitat. The riparian corridor and wildlife habitat GIS models assign relative ranks of high, medium, low or no rank to natural resource features. The relative ranks are produced using a consistent and replicable scoring method based on the number and types of functions provided by specific natural resource features in the city. The ranks are not tied to a reference or baseline condition, but allow comparison of the relative condition of natural resources within the region or city.

Science-based model criteria were developed to score, assign relative ranks and map the natural resources that provide the specific riparian functions and wildlife habitat attributes listed above. The City's model criteria focus on the presence, type and extent of specific natural resource features. Additional descriptive information on natural resources and disturbances (e.g., development, contamination and invasive species) are provided in the inventory site narratives.

The City's inventory models apply the same general sets of evaluation criteria that Metro developed. However, BPS refined some of the regional criteria to reflect additional detail, more recent data and studies, and local conditions. For example, the City's wildlife habitat model was refined to assign a higher value to somewhat smaller habitat patches than Metro's model. Shifts in the patch size scoring thresholds were based on additional scientific studies and recent wildlife studies conducted in Portland's natural areas.

The City worked closely with Metro and technical experts to ensure that refinements to the regional inventory would be consistent with Metro's work and would support the City's watershed health goals.

Riparian Corridor Model

The riparian corridor GIS model assigns primary and secondary scores to natural resources for six riparian functions. The scores reflect the types of landscape features present and the proximity of those features to a river, stream or wetland. Primary scores are applied to features that provide the most direct and substantial contribution to a particular riparian function. Secondary scores are assigned to features that provide lesser, but still important, contributions to riparian functions. The scientific literature indicates that the preponderance of riparian functions, such as nutrient cycling, occurs within 30 to 100 meters (approximately 100 to 300 feet) of a water body. The microclimate effect associated with forest vegetation can occur up to several hundred feet from a water body. The model criteria are not sensitive to the species of vegetation present or whether vegetation is native

or non-native. However, the model criteria do assign different riparian functional values to cultivated, heavily manicured and managed landscapes versus semi-natural and natural vegetation.

Table 2 presents the riparian corridor GIS model criteria. The criteria reflect some refinements to the criteria Metro used to map riparian corridors across the region.

For example, Metro assigned a medium or high rank to all river banks and land within 50 feet of rivers and streams to recognize the direct and important impact of those areas on the river. This methodology was reviewed by independent experts and adopted as part of Title 13, Nature in Neighborhoods. The City refined the regional inventory to further recognize the variability of riverbank conditions in Portland. The refinement resulted in a lesser level of function being assigned to hardened, non-vegetated banks along specific segments of the Willamette and Columbia rivers. Initially, this refinement was made to recognize the impact of extensive river bank hardening associated with Portland Harbor marine terminal facilities in the Willamette River North Reach. In the North Reach, land within 50 feet of the river where the river bank is hardened and not vegetated is assigned a low relative rank. This recognizes the lower level of function but continues to highlight the importance of the riverbanks and adjacent land to overall riparian function.

The Willamette River North Reach refinement for hardened non-vegetated, riverbank is extended to apply to non-vegetated, hardened banks of the Central Reach. Like the North Reach, the Central Reach riverbanks have been extensively hardened with a seawall and with riprap on steep slopes. The extent of hardening impacts the overall functionality of the riparian area in the Central Reach. Therefore, hardened and non-vegetated riverbanks in the Central Reach receive a low relative rank for riparian functions. The model continues to assign a medium or high relative riparian rank to vegetated and non-hardened river banks.

Table 2: Riparian Corridor GIS Model Criteria

Riparian Function	Landscape Feature	Features Assigned a Primary Score	Footnotes	Features Assigned a Secondary Score	Footnotes
Microclimate and Shade	Water bodies	River, stream/drainageway or wetland	2, 5		
	Vegetation	Forest vegetation within the flood area (except within a drainage district)	3, 4	Woodland vegetation within the flood area (except within a drainage district)	3, 4
		Forest vegetation that is outside the flood area and contiguous to and within 100 feet of a river, stream/drainageway or wetland	1, 2	Forest vegetation that is outside the flood area, contiguous to primary vegetation and between 100 feet and 780 feet of a river, stream/drainageway or wetland	1, 2
				Woodland vegetation that is outside the flood area and contiguous to and within 100 feet of a river, stream/drainageway or wetland	1, 2
				Shrubland vegetation that is contiguous to and within 50 feet of a stream/drainageway or wetland	1, 2
Stream Flow Moderation and Water Storage	Water bodies	River, stream/drainageway or wetland	2, 5		
	Flood area	Vegetation within the flood area (except within a drainage district)	3, 4	Non-vegetated land within the flood area (except within a drainage district)	3, 4
	Vegetation			Woodland or shrubland vegetation that is outside the flood area and within 300 feet of a river, stream/drainageway or wetland	1, 2
				Forest vegetation that is contiguous to primary forest vegetation or starts within 300 feet of a river, stream/drainageway or wetland and is within 780 feet of a river, stream/drainageway or wetland	1, 2
				Herbaceous vegetation that is outside the flood area and within 100 feet of a river, stream/drainageway or wetland	1, 2
				Where the slope is at least 25%: herbaceous vegetation that is outside the flood area, that starts within 100 feet and is within 200 feet of a river, stream/drainageway or wetland	1, 2

Riparian Function	Landscape Feature	Features Assigned a Primary Score	Footnotes	Features Assigned a Secondary Score	Footnotes
Bank Function, and Sediment, Pollution and Nutrient Control	Water bodies	River, stream/drainageway or wetland (except Willamette River North or Central Reach)	2, 5	Willamette River North and Central Reach	Water bodies
	Land	Land within 50 feet of a river, stream/drainageway or wetland except land within 50 feet of a hardened, non-vegetated river bank in the Willamette River North and Central Reaches and the Columbia River within the Hayden Island NRI study area	1, 2, 7	Land within 50 feet of a hardened, non-vegetated river bank in the Willamette River North and Central Reaches and the Columbia River within the Hayden Island NRI study area	7
	Vegetation	Forest, woodland or shrubland vegetation within the flood area (except within a drainage district)	3, 4	Herbaceous vegetation within the flood area (except within a drainage district)	3, 4
		Forest and natural/semi-natural woodland or shrubland vegetation outside a flood area, between 50 feet and 100 feet of a river	1, 6, 8	Herbaceous or cultivated woodland or shrubland vegetation outside the flood area and between 50 feet and 100 feet of a river	1, 6, 8
		Forest, woodland or shrubland vegetation outside a flood area, between 50 feet and 100 feet of a stream/drainageway or wetland	1, 2	Herbaceous vegetation outside the flood area and between 50 feet and 100 feet of a stream/drainageway or wetland	1, 2
		Where the slope is at least 25%: forest and natural/semi-natural woodland or shrubland vegetation that is outside the flood area and between 100 feet and 200 feet of a river	1, 6, 8		
		Where the slope is at least 25%: forest, woodland or shrubland vegetation that is outside the flood area and between 100 feet and 200 feet of a stream/drainageway or wetland	1, 2	Where the slope is at least 25%: forest, woodland or shrubland vegetation that is outside the flood area, contiguous with primary vegetation and more than 200 feet of a river, stream/drainageway or wetland, but does not extend beyond the area with at least 25% slope.	1, 2
				Where the slope is at least 25%: herbaceous vegetation that is outside the flood area, contiguous to vegetation within 100 feet and between 100 feet and 200 feet of a river, stream/drainageway or wetland	1, 2

Riparian Function	Landscape Feature	Features Assigned a Primary Score	Footnotes	Features Assigned a Secondary Score	Footnotes
Large Wood and Channel Dynamics	Water bodies	River (including Willamette and Columbia River beaches) or stream/drainageway	2, 5		
	Land	Land within 50 feet of a river, stream or wetland, except land within 50 feet of a river in the Willamette River North and Central Reaches and the Columbia River within the Hayden Island NRI study area	1, 4		
	Vegetation	Forest vegetation within 50 feet of a river in the Willamette River North Reach and Columbia River surrounding Hayden Island		Woodland, shrubland, herbaceous or non-vegetated land within 50 feet of the river within the Willamette River North Reach and Columbia River surrounding Hayden Island	
		Forest vegetation within the flood area (except within a drainage district)	3, 4	Woodland, shrubland or herbaceous vegetation within a flood area (except within a drainage district)	3, 4
		Forest vegetation that is outside the flood area, contiguous to and within 150 feet of a river or stream/drainageway (except within a drainage district)	1, 3, 4	Where the slope is at least 25%: forest vegetation that is outside the flood area, contiguous with primary forest vegetation and between 150 feet and 260 feet of a river or stream/drainageway (except within a drainage district)	1, 3, 4
				Within a drainage district, forest vegetation that is contiguous to and within 150 feet of stream/drainageway	1, 4
		Forest that is contiguous to and within 150 feet of a wetland that is located completely or partially within the flood area or 150 feet of a river or stream (except within a drainage district)	1, 2, 3, 4	Where the slope is at least 25%: forest vegetation that is contiguous with primary forest vegetation and is between 150 feet and 260 feet of a wetland, where the wetland is located completely or partially in a flood area or within 150 feet of a river or stream/drainageway (except within a drainage district)	1, 2, 3, 4
	Water bodies	Wetland located completely or partially within the flood area or within 150 feet of a river or stream/drainageway (except within a drainage district)	1, 2, 3, 4		

Riparian Function	Landscape Feature	Features Assigned a Primary Score	Footnotes	Features Assigned a Secondary Score	Footnotes
Organic Inputs, Food Web and Nutrient Cycling	Water bodies	River, stream/drainageway or wetland	2, 5		
	Vegetation	Forest and natural/semi-natural woodland or shrubland vegetation within the flood area (except within a drainage district)	3, 4, 8	Cultivated woodland and shrubland vegetation within a flood area (except within a drainage district)	3, 6, 8
		Forest and natural/semi-natural woodland or shrubland vegetation that is outside the flood area and within 100 feet of a river	1, 2, 6	Forest and natural/semi-natural woodland or shrubland vegetation that is outside the flood area, contiguous to primary or secondary vegetation and within 170 feet of a river	1, 2, 6
				Cultivated woodland or shrubland vegetation that is outside the flood area and within 100 feet of a river	1, 2, 6, 8
		Forest, woodland or shrubland vegetation that is outside the flood area and within 100 feet of a stream/drainageway or wetland	1, 2	Forest, woodland or shrubland vegetation that is contiguous to primary vegetation and within 170 feet of a stream/drainageway or wetland	1, 2
Riparian Wildlife Movement Corridor	Water bodies	River, stream/drainageway or wetland	2, 5		
	Vegetation	Vegetation that is contiguous to and within 100 feet of a river, stream/drainageway or wetland	1, 2	Vegetation that is contiguous to primary vegetation and within 300 feet of a river, stream/drainageway or wetland	1, 2

Footnotes:

1. Rivers, streams/drainageways and wetlands are primary features for riparian functions under evaluation. The model produces functional rankings for such features if open water area has been mapped. Map notations will indicate relative riparian function levels associated with streams or drainageways where only centerline data are available.
2. All riparian search distances are measured from either: a) top-of-bank, b) the Ordinary High Water Mark, c) the edge of the mapped water body or d) the stream/drainageway centerline.
3. "Wetland" refers to all mapped regional wetlands fully or partially within 1/4 mile of a river or stream/drainageway, unless otherwise specified.
4. "Flood area" is comprised of the combined FEMA 100-year floodplain (2004/2010) and the 1996 flood inundation area as initially adjusted, and to reflect recent permitted activities affecting site elevation.
5. Portland-area drainage districts: Peninsula Drainage District #1, Peninsula Drainage District #2 and Multnomah County Drainage District #1.
6. Hardened, non-vegetated river banks are defined as seawalls, pilings and non-vegetated riprap and adjacent land within 50 feet of the North or Central Reach of the Willamette River.
7. Natural/semi-natural vegetation has a composition or structure that is self-maintaining, can include native and non-native species, or is managed as a natural area or restoration/enhancement project. Cultivated vegetation is consistent with traditional landscaping and is highly manicured and regularly managed and maintained. Cultivated vegetation is often dominated by turf grasses and ornamental shrubs and trees and may be managed using a combination of mowing, pruning, fertilizers and pesticides. Residential yards, common areas, golf courses, parks and right-of-ways are typically considered cultivated.

The primary and secondary scores for each function are combined to produce aggregated relative riparian corridor rankings of high, medium or low. The formula is similar to **those** that Metro used for the regional inventory and also reflects the distribution of primary scores assigned to features in the city (Table 3).

Table 3: Riparian Corridor Aggregated Relative Ranking Formula		
Riparian Corridor Relative Rank	Ranking Formula	
	Primary Functions	Secondary Functions
High	4-6	0-6
Medium	1-3	0-6
Low	0	1-6

Features that receive any score, whether primary or secondary, provide significant riparian corridor functions. Features that receive at least one secondary score and no primary scores receive a low relative rank. Features that receive one or more primary scores receive a medium or high relative rank. The number of secondary scores does not affect medium and high ranks.

Typically, the riparian corridor model assigns aggregated relative ranks to natural resource features as follows:

- High – Rivers, streams, drainageways and wetlands; forest or woodland vegetation within a flood area or in close proximity to a water body; and woody vegetation on steep slopes
- Medium – Shrubland and herbaceous vegetation within a flood area or in close proximity to a water body
- Low – Vegetation outside the flood area and further from a water body; developed flood areas; and hardened, non-vegetated banks of the Willamette River North Reach and South Reach and Columbia River surrounding Hayden Island⁴

Within the city, natural resources generally reflect the impacts of urbanization; however, the resources still provide critical riparian functions. For example, vegetated areas in riparian corridors are often comprised of a mix of native, non-native and invasive plants. Native plant species generally provide a broader suite of benefits, such as more effective slope stabilization. However, non-native plants still provide important watershed functions such as water storage, nutrient cycling, erosion control and organic inputs. Other examples of the effects of urbanization include constrained or altered river and stream channels, contaminated wetlands and soil, and developed floodplains. In each of these cases, the resource has experienced some degradation but still provides important functions such as water conveyance and storage.

Wildlife Habitat Model

The wildlife habitat GIS model assigns scores to mapped habitat patches based on their size, shape and connectivity to other patches or water bodies as shown in Table 4 below. For purposes of the inventory model, habitat patches are defined as areas of forest vegetation and wetland that are at least 2 acres in size, plus adjacent woodland vegetation.⁵ The model does not assign scores to habitat areas smaller than 2 acres, or to shrubland or grassland habitats or woodland that is not associated

⁴ Hardened, non-vegetated river banks include seawalls, pilings and non-vegetated riprap.

⁵ Woodland vegetation that is contiguous to a forest/wetland patch that is greater than 2 acres in size is evaluated for wildlife habitat. Woodland vegetation independent of a forest/wetland patch is not evaluated by the wildlife habitat model.

with a 2 acre forest/wetland patch. However, these habitats may be designated Special Habitat Areas if the habitats meet specific criteria (described in Step 3 below). Additional detail regarding the wildlife habitat methodology can be found in Appendix F: City of Portland Natural Resource Inventory Update: Project Report.

Table 4: Wildlife Habitat GIS Model Criteria		
High Value (3 points)	Medium Value (2 points)	Low Value (1 point)
Habitat Patch Size¹		
Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is 585 acres or larger.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 30 acres and smaller than 585 acres.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres and smaller than 30 acres.
Interior Habitat Area²		
Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the interior area of the forest vegetation and/or wetland patch area is 500 acres or larger.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the interior area of the forest vegetation and/or wetland patch area is at least 15 acres and smaller than 500 acres.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the interior area of the forest vegetation and/or wetland patch area is at least 2 acres and smaller than 15 acres.
Proximity to Other Patches³		
Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres, and the patch proximity index value is 100 or more.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres, and the patch proximity index value is at least 30 and less than 100.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres and the patch proximity index value is less than 30.
Proximity to Water⁴		
Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres, and where at least 75% of the patch area is within 300 feet of a river, stream/drainageway or wetland.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres, and where at least 25% and less than 75% of the patch area is within 300 feet of a river, stream/drainageway or wetland.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres, and less than 25% of the patch area is within 300 feet of a river, stream/drainageway or wetland.

Footnotes:

1. A "habitat **patch**" is defined as an area of contiguous forest and/or wetland greater than 2 acres in size, plus any woodland vegetation adjacent and contiguous to the core forest/wetland area.
2. "Interior area" is defined as the area within the forest and/or wetland portion of a habitat patch that is situated at least 200 feet from the edge of that portion of the patch.
3. Proximity to water relative value thresholds were determined by identifying "natural breaks" in the distribution of the values using the Jenk's Natural Breaks method, which determines the best arrangement of values into a

specified number of classes by comparing and minimizing the sum of the squared differences of values from the means of potential classes.

4. Proximity to other patches is calculated using the Fragstats 3.3 proximity index (PROX). The specified search radius is ¼ mile. The proximity index is a dimensionless measure of the relative size and distance of all patches whose edges are within the specified search radius of each vegetation patch. For more information on Fragstats and the proximity index, refer to <http://www.umass.edu/landeco/research/fragstats/fragstats.html>.

Features that receive scores for one or more attributes provide significant wildlife habitat functions. Individual scores for each attribute are combined to produce an aggregated relative ranking of high, medium or low for each wildlife habitat patch. As with the riparian corridor model, the formula used to generate the aggregated wildlife habitat rank is similar to those Metro used for the regional inventory (see Table 5).

Table 5: Wildlife Habitat Aggregated Relative Ranking Formula	
Wildlife Habitat Relative Rank	Ranking Formula
High	9 or more points
Medium	4-8 points
Low	1-3 points

Natural resource features that receive points for one or more of these attributes provide important wildlife habitat functions. Typically, the wildlife habitat model assigns aggregated relative ranks to natural resource features as follows:

- High – Large forest and wetland areas such as Forest Park, Smith and Bybee Wetlands, and Tryon Creek State Natural Area.
- Medium – Moderate-sized forest and wetland areas such as those at Kelley Point Park, Oaks Bottom Wildlife Refuge and Powell Butte.
- Low – Numerous smaller forest and wetland areas throughout the city.

Within the city, natural resources generally reflect the impacts of urbanization; however, the resources still provide critical wildlife habitat functions. For example, vegetated areas in upland habitats are often comprised of a mix of native, non-native and invasive plants. Native plant species generally provide a broader suite of benefits, such as varied wildlife food sources. However, non-native plants still provide important watershed functions such as cover and nesting opportunities for wildlife. Other examples of the effects of urbanization include rivers and streams with constrained or altered channels, wetlands with soil contamination and developed floodplains. In each of these cases, the resource has experienced some degradation but still provides important functions such as fish and wildlife habitat.

3. Designated Special Habitat Areas and Updated Regional Species Lists.

As part of the regional Title 13 inventory, Metro designated Habitats of Concern for areas with documented sensitive/threatened fish or wildlife species, sensitive/unique plant populations, wetlands, native oak, bottomland hardwood forests, riverine islands, river deltas, migratory stopover habitat, connectivity corridors, upland meadow and other unique natural or built structures or resources (such as bridges that provide habitat for Peregrine Falcons).

Portland began with Metro's Title 13 inventory of designated Habitats of Concern, which are referred to in the city as Special Habitat Areas (SHAs), and expanded the documentation, refined the mapping, and honed the eligibility criteria explanations. The City has also added and removed SHA designations for certain areas based on additional analysis.

Like the Title 13 Habitats of Concern, SHAs are mapped more generally than the landscape feature data used in the riparian and wildlife GIS models. The SHA boundaries may extend beyond the specific landscape features to capture seasonal variations in conditions (e.g., water levels) or a feature containing one or more habitat points, such as nesting areas on a bridge. Boundaries are determined on a case-by-case basis rather than through the use of model criteria. The rationale for the boundary is described in the natural resource descriptions for each inventory site.

The City has updated the SHA criteria to include National Oceanic and Atmospheric Administration (NOAA) designated Critical Habitat for anadromous salmonids. Within this inventory, the Willamette River is designated as Critical Habitat for multiple fish species. The City has also designated certain urban structures as SHAs, including chimney roosting sites for Vaux's Swifts and several bridges on the Willamette and Columbia rivers that provide nesting sites for Peregrine Falcons. A full list of SHA criteria is available in Natural Resources Inventory: Project Report (2012).

Like Metro Title 13 Habitats of Concern, SHAs receive a high relative rank for wildlife habitat, which supersedes medium or low ranks assigned by the Wildlife Habitat Model.

The citywide inventory also includes up-to-date plant and wildlife species lists. The list does not include all the plant and wildlife species found in the city, focusing instead on "special status" species. Special status species include fish, wildlife and plant species that are officially listed under the Endangered Species Act by the NOAA Fisheries or the U.S. Fish and Wildlife Service, and species receiving specific designations from:

- Oregon Natural Heritage Information Center ranked or listed species
- Oregon Watershed Enhancement Board priority species
- Partners In Flight focal species
- National Audubon Society and American Bird Conservancy Watch List species
- Northwest Power and Conservation Council Willamette and Columbia Subbasin Plans focal species

Special status species are identified by these entities for a variety of reasons. For example, the species may be:

- Experiencing local, regional, state or national population declines.
- Endemic to Oregon.
- Vulnerable to local extirpation.
- A focal or indicator species (a species that encompasses structural and functional needs of broader ecological communities).
- A keystone species (a species that physically alters environments and whose absence is detrimental to ecosystem function).

The City uses this information to track species trends at different scales and to provide context for evaluating management options and prioritizing local habitat protection and enhancement efforts. Information about special status species is included in the natural resource descriptions for each inventory site.

The City also maintains a list of at-risk wildlife species. The at-risk species list is a subset of the full special status species list, and includes only those species that are:

1. Listed by USFWS or NOAA Fisheries as:
 - a. LE: Listed Endangered
 - b. LT: Listed Threatened
 - c. PE: Proposed Endangered
 - d. PT: Proposed Threatened
 - e. SoC: Species of Concern
2. C: Candidate Listed by ODFW as:
 - a. LE: Listed Endangered
 - b. LT: Listed Threatened
 - c. SC: Critical
 - d. SV: Vulnerable
3. Received an Oregon Biodiversity Information Center rank or list 1, 2 or 3.



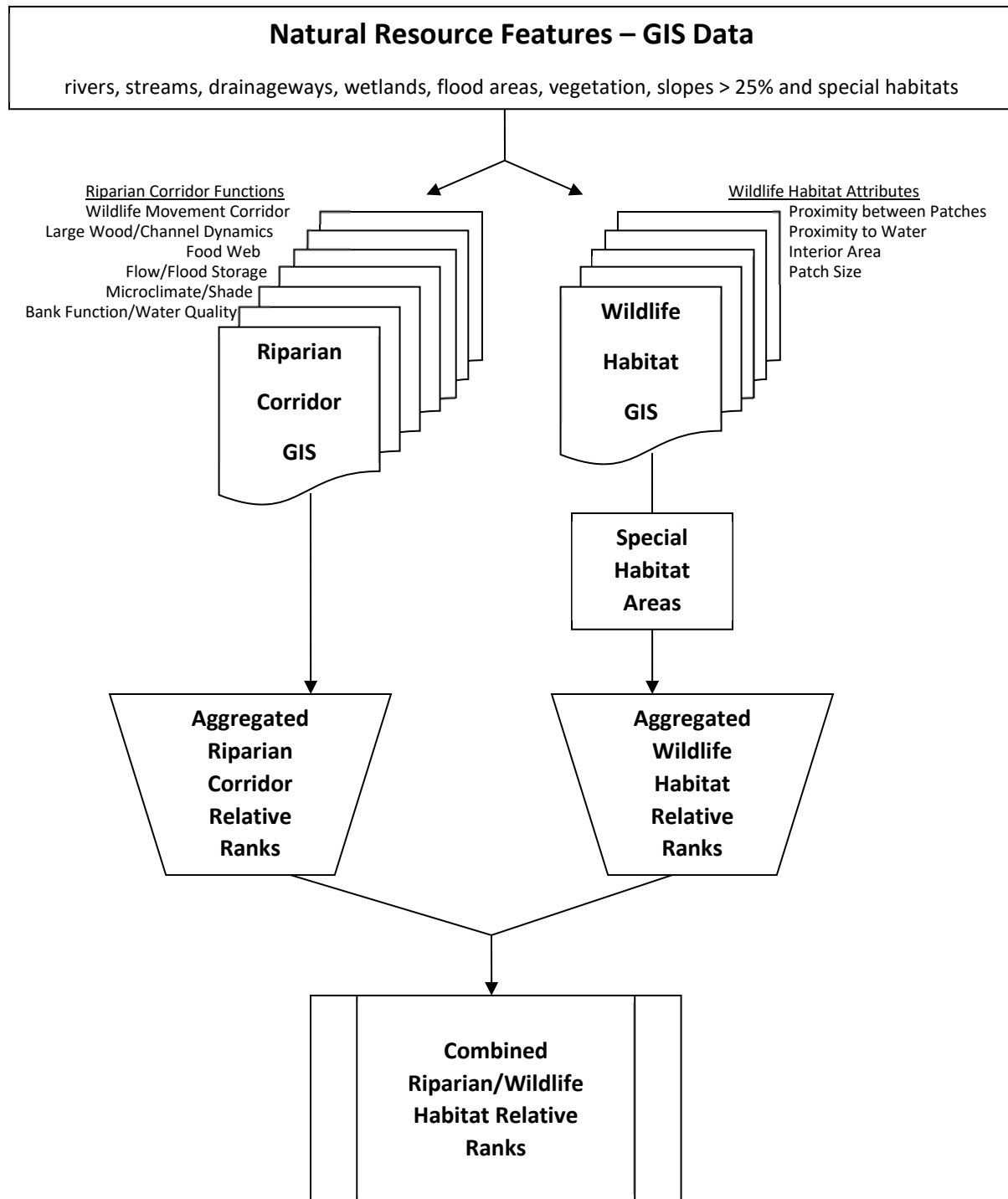
These at-risk species are the most vulnerable of the special status species. The at-risk species list, not the full sensitive species list, is used to designate SHAs based on the Species (S) criteria. The full special status species list and the list of at-risk species are included in Natural Resources Inventory: Project Report (2012).

4. **Produced Combined Relative Ranks and Maps.**

Once the GIS models produce the aggregated riparian corridor and wildlife habitat ranks and are Special Habitat Areas are designated, a single combined relative rank for riparian corridor/wildlife habitat areas is produced. Where ranked riparian corridors and wildlife habitat areas overlap, and if the two aggregated relative ranks differ, the higher of the two ranks becomes the overall combined rank for that resource area. For example, a feature that ranks medium for riparian corridor functions and low for wildlife attributes, would receive a medium combined relative rank.

As noted in previous sections, it is important to keep in mind that natural resource features can rank high based on the specific inventory criteria and also be impacted by land management activities, invasive plants or animals, or contamination as discussed in the natural resource description for each inventory site.

The City can produce different inventory maps displaying the GIS model results for individual riparian and wildlife habitat functions and attributes, the Special Habitat Areas, the aggregated riparian corridor and wildlife habitat relative ranks, and the combined riparian corridor/wildlife habitat relative ranks. Maps of the aggregated riparian corridor and wildlife habitat ranks and combined riparian/wildlife habitat relative ranks are presented in this report for each inventory site.

Natural Resources Inventory GIS Model Flow Diagram

Environmental Overlay Zone Map Correction Project

Do you have feedback on this draft?

Bureau of Planning and Sustainability staff would like to hear your comments on the **Draft Existing Conditions Report**. The report will be updated as needed.

Please send comments:

Bureau of Planning and Sustainability

1900 SW 4th Avenue, Suite 7100

Portland, OR 97201

Or via email to ezone@portlandoregon.gov

If you have questions about the Environmental Overlay Zone Map Correction Project, please call 503-823-4225 or email ezone@portlandoregon.gov

The Bureau of Planning and Sustainability is committed to providing meaningful access. For accommodations, modifications, translation, interpretation or other services, please contact at 503-823-7700, or use City TTY 503-823-6868, or Oregon Relay Service 711.

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Traducere sau Interpretare	Письмовий або усний переклад	翻訳または通訳	Turjumida ama Fasiraadda
	الترجمة التحريرية أو الشفهية	ການແປພາສາ ຫຼື ການອະທິບາຍ	
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