SPRINGWATER COMMUNITY PLAN REPORT
NATURAL RESOURCES REPORT

Introduction/Overview

SITE LOCATION

The Springwater Phase I Planning Area (Springwater) begins at the southeastern edge of the City of Gresham's urban growth boundary in Multnomah County. The Springwater planning area (Figure 1) also includes a portion of Clackamas County south of Rugg Road and part of incorporated Gresham in the "brickworks" area. The total study area for resources comprises about 1,727 acres and is a roughly rectangular piece of land bounded in the east by 282nd Avenue and in the west by Hogan Butte and other volcanic geologic features.

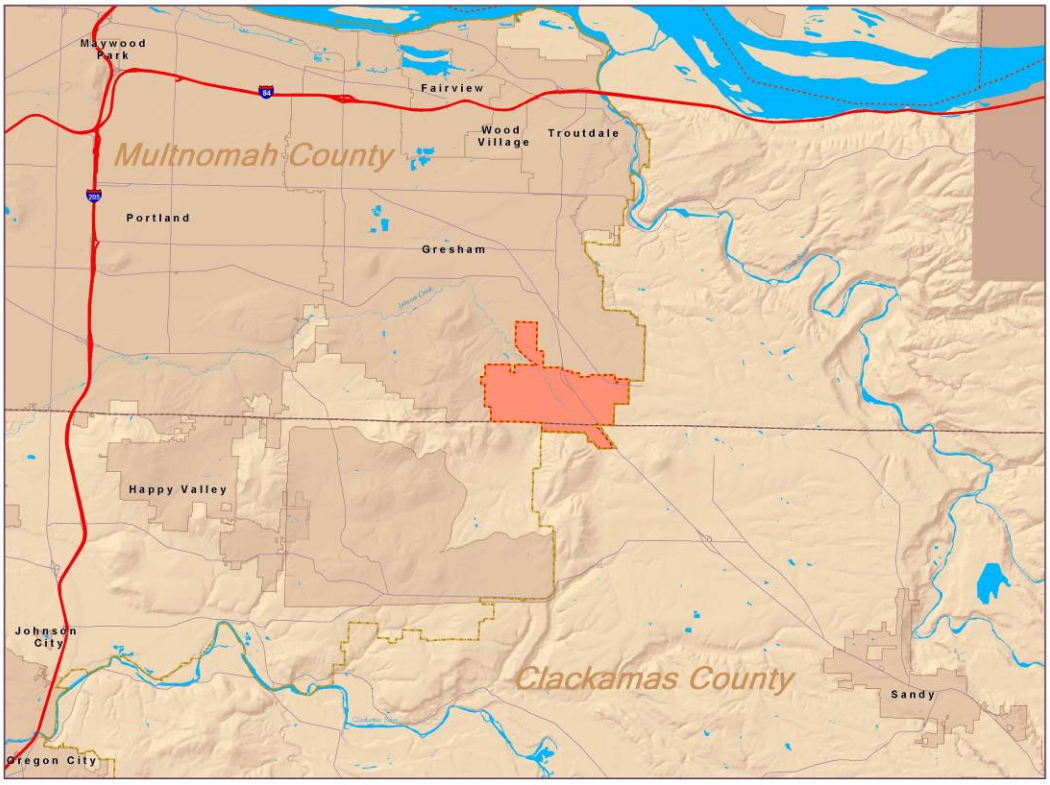

Figure 1. Site Location - Springwater Phase I Planning Area

OVERVIEW OF AREA'S NATURAL RESOURCES

Natural resources and significant physiographic features within the Springwater planning area are aesthetically pleasing and ecologically diverse (Figure 2). Its environmentally sensitive natural features include unique habitats such as the buttes with their steep terrain; seasonal drainages, springs and seeps; ponded wetlands; a two-mile section of mainstem Johnson Creek (Figure 3). Johnson Creek is the region's principal basin that feeds into the Willamette Valley, and four miles of major tributaries.

Figure 2. Landscape of the Springwater Planning Area June 2004

The portion of Johnson Creek flowing through Springwater features a wide range of habitat and water quality conditions. There are areas where the main stem or tributaries have been channelized and denuded of riparian vegetation, but there do also exist intact sections of high quality. The small portion of Reach 16 (ODFW 2000), for instance, that is located within the plan area includes some of the highest functioning riparian and aquatic resources in the watershed, according to analyses completed by the Oregon Department of Fish and Wildlife (2000).

Figure 3. Johnson Creek at Bankfull Flow 2004

HISTORICAL CONTEXT

The natural resource planning area for Springwater extends just beyond the Multnomah and Clackamas County line into the Sunshine Creek basin. It is defined by rolling hills in the west and a series of highways and flat agricultural parcels with mostly single-family residential areas along most of the areas local roads. Steeper slopes on the western buttes are typically forested and contain some areas of seeps and springs that feed the tributaries of Johnson Creek. The buttes also feature a number of seasonal drainages that collect precipitation during the rainy season and direct it to receiving tributaries on the eastern portion of the plan area. The buttes were cleared in the early 1900's, but are now covered mostly by mid-succession forest that is 60 to 100 years old. The lowlands were originally forested but were cleared in the late 1800's and early 1900's for farming and timber. The majority of the lowland areas have remained in agricultural and residential use, and in many areas have been tiled for drainage. The site contains forest types in the Willamette Valley vegetation zone (Franklin and Dyrness, 1988).

Johnson Creek is one of the last streams in the Portland Metro region with anadromous salmon and steelhead present, albeit in small numbers. These fish-bearing waters and the associated floodplains and riparian corridor form the spine of the natural resources through the Springwater Community. The mainstem of Johnson Creek runs through the study area flowing west, then entering the urban growth boundary of Gresham at the edge of study area about 500 feet east of SE Palmblad Rd. Its headwaters are to the east of the study area where nursery and other agricultural industrial inputs from upstream introduce pollutants and sediments into the water column. Paralleling the creek throughout the plan area is the Springwater Recreational Trail, which was created by the City of Portland on the rail line that once ran between Portland and Clackamas County. This trail is still maintained by the City. Large areas of cleared riparian corridor and multiple manmade discharge outlets from surrounding rural agricultural uses have changed the stream hydraulics, resulting in increased flood damage and downcutting in many areas within the entire basin.

Natural Resources as a Framework for the Springwater Community

The resources of the natural and physical environment within the Springwater planning area are beautiful to view and rich with a variety of landscape types. Central to the planning area is the confluence of four major tributaries with the Johnson Creek mainstem. There are also several other tributaries (Figure 4) as well as the steep butte slopes at the western border. The planning team and community members agreed that the physical layout of the landscape and creeks provided an environmental framework around which development decisions could be made, based upon features of the landscape that best lend to certain land uses. As such, careful analysis of the current and potential function of Springwater's natural resources was needed in order to develop a green framework that adequately considered the landscape's unique features. This analysis would be used to inform the decision making process regarding the siting of the roadway network, determining land use designations, placement of public infrastructure, providing adequate open space and habitat areas, and ensuring optimal function of the creek system to help meet water quality goals and minimize potential downstream impacts from Springwater development.

NATURAL RESOURCE PLANNING OVERVIEW

This section of the report describes the framework in which the natural resource planning was conducted. It describes the goals and policies of the natural resource planning effort, reviews existing regulatory guidance, and describes data used to conduct the natural resource inventory.

Figure 4. Riparian Condition on Bus Creek Brickworks Site

Goals

The Community Working Group (CWG) – the public committee that provided input through the planning process – worked with the project team to develop a goal and set of policies to guide natural resource protection and enhancement in Springwater. The goal established for Springwater natural resources reads:

The plan will preserve, protect and enhance natural resources. *It will define, protect, restore and enhance significant natural resources, including stream corridors, wetlands, and forested areas. Resource areas will provide the basis for identifying development constraints as well as serving as open space amenities for the Springwater community. Resource protection and enhancement will be a shared responsibility of property owners, developers, and governments.*

To achieve this goal, a natural resource needs analysis and protection strategy for Springwater was developed to:

- Embrace community values for regionally connected greenspaces that have outstanding views, healthy wildlife habitats, clean water, and can support diverse plant assemblages.
- Conform to the legal requirements and policies adopted by the City, Metro, the State of Oregon Goal 5 process and the Federal Government.

- Consider the role that natural resources play in sustainable land development and incentives for economic growth.
- Include land use code and ordinance responsibilities that are simple to understand and limit costly maintenance or monitoring for compliance.
- Integrate with the design and implementation of public parks and recreation, roads, sewer and stormwater facilities.

Policy Statements
The project team and CWG also developed policy statements to guide the team in developing a plan to achieve the natural resource goal. These policy statements directed the Springwater Community Plan to:

1. The Springwater Community Plan shall recognize the importance of the upper Johnson Creek system for Gresham, the Portland Metro region and the Willamette Valley.

2. Mitigation for any impacts of development in Springwater to stream corridor function shall be prioritized first to other sites in the Springwater Plan District and second to within the upper Johnson Creek basin.

3. The Plan will result in a green infrastructure that will provide regional natural amenities for future generations.

4. The plan will identify potential opportunities for “natural park” facilities that would enhance the sense of place for economic developments and that could be an attraction for residents and businesses.

5. Stream crossings will be minimized to the greatest extent feasible.

6. Road and pedestrian crossings of the natural resources areas shall be designed for the least impact practical.

7. The entire Johnson Creek Watershed and ecosystem will be considered.

8. To the extent practical, watershed functions and sensitive/natural species will be restored.

9. Barriers to wildlife habitat corridors, such as bridges and roads, shall be designed to provide proper opportunities for wildlife migration.

10. The urbanization of the Springwater Community shall be balanced with the protection of sensitive species and habitat, water quality, and groundwater resources.

11. The urbanization of the Springwater Community shall achieve, to the maximum extent practical, low levels of effective impervious surfaces, high levels of tree protection and reforestation, management of stormwater as close to the point of origin as possible, improved hydrology and flood protection, and removal of barriers to fish passages.

12. Urbanization of the Springwater Community shall provide appropriate erosion control and shall control sedimentation through the use of green development practices, context sensitive design, and appropriate construction management practices, re-vegetation of disturbed areas, and regular maintenance and monitoring.

13. Lands with slopes of 25 percent or above shall be protected.

14. The use of native plants shall be a priority for re-vegetation and Green Streets.

15. The development code for Springwater shall maintain fish and wildlife habitat protection measures that are at least as protective as those adopted by Multnomah County for the West of Sandy River Plan Area upon annexation.

Furthermore, the plan was developed to support urbanization in Springwater that is:

- Balanced with the protection of sensitive species and habitat, water quality, and groundwater resources.
- Achieves, to the maximum extent practical, low levels of effective impervious surfaces, high levels of tree protection and reforestation, management of stormwater as close to the point of origin as possible, improved hydrology and flood protection, and removal of barriers to fish passages.
- Provides appropriate erosion control and controls sedimentation through the use of green development practices, context sensitive design, appropriate construction management practices, vegetation of disturbed areas with native plants, and regular maintenance and monitoring.

Regulatory Guidance

The lands within Springwater are managed by an array of laws, ordinances, regulations, plans and policies via various jurisdictions that have authority in the area. One of the primary regulatory programs guiding the land use in Springwater is Oregon's land use planning goal for "Open Spaces, Scenic and Historic Areas, and Natural Resources," known as Goal 5 (Oregon Administrative Rule (OAR) 600-023-0000, et. al.; Goal 5 is "to protect natural resources and conserve scenic and historic areas and open spaces"). Various jurisdictions have developed programs to meet the Goal 5 vision. The City of Gresham has specifically adopted Multnomah County's program for Goal 5 protection. For Springwater, however, the City's intention is to establish a new district that has a unique set of guidance, a separate Goal 5 Resource Inventory, a separate Economic, Social, Environmental and Energy (ESEE) analysis and a development code unique to Springwater. To achieve this, it is prudent to research and compare the Goal 5 programs and floodplain protections currently in place to use as references in developing the Springwater Community guidelines.

Multnomah County and the City of Gresham entered into an intergovernmental agreement (IGA) that provides a concept of environmental protection measures that are al least as protective as thos of Multnomah County. Multnomah County has recently adopted wildlife habitat protection measures for the Springwater area, has adopted a Metro Title 3 implementation program, and the Senate Bill 1010 Basin Plan that is implemented by the Oregon Department of Agriculture has also recently been adopted. As well, the County currently has a Goal 5 resource map and manages all County lands in accordance with the West of Sandy River Rural Area Transportation and Land Use Plan. The results of the ESEE analysis propose conserving a 200-foot corridor on either side of the stream channels and limiting development (while allowing existing uses to continue) within that 200-foot corridor. This is further discuss within the section describing the West of Sandy Plan and Metro's Allow/Limit/Prohibit (ALP) discussion in the ESEE analysis report for this Springwater Community Plan.

The Metro Council recently developed the definitions for allowing, limiting and prohibiting development within the Metro Goal 5 resource areas. Metro Council proposes to adopt these definitions in the fall of 2005 as part of the Functional Plan adoption. Once adopted, Metro's Goal 5 Protection Program will define the level of protection that is necessary for natural resources within the entire tri-county Metro area. The various regulatory programs within Metro's plan do not prohibit activities; rather they suggest varying levels of limited activity based upon the activity's proximity to the resource and magnitude of impact. Although not protective of all Goal 5 resources, the guidance in Metro's Title 3 - Water Quality and Flood Management Plan is a good basis for protection of aquatic habitat and riparian areas from perturbations such as flooding and erosion. For water quality protection and flood control, this plan recommends that structures not be built and activities are limited with a specified distance from top of bank on either side of all the channels. The actual distance varies between 50 and 200 feet depending on the creek flow volume, the slope of the bank, and the extent of the drainage basin. Table 1 compares the recommendations or development limits under the current programs for the Metro Tri-County Region, Multnomah County, and the City of Gresham.

Table 1. Current CODES, Regulatory Guidelines and Policies

Resource	Multnomah County Code and Policies[2]	Metro's Title 3 Water Quality and Flood Management Standards	Metro's Goal 5 Recommendations[1]	City of Gresham Code [3]
Riparian Corridors	Development permit required within 200 feet and requires mitigation for development within that area, allows development as close as 100" of the stream where slopes are <25% implements Metro Title 3	50 feet from top of bank on slopes <25%; up to 200 feet from top of bank on slopes >200%; 15 to 50 feet from top of bank for streams that drain between 50 and 99 acres of land	Class I and II Riparian Habitats are protected with variable regulatory width from 50 to 200 feet from top of bank	50 feet from top of bank on slopes <25%; and up to 200 feet from top of bank with slopes >25%
Trees and Wildlife Habitat	Riparian areas protected as wildlife habitat, standards applicable >200" from stream require development in cleared areas or wildlife conservation plan required, cleared area limit of 1 acre	N/A	Riparian areas are protected as wildlife habitat	One grove of the City's Hogan Cedars is protected
Floodplains and Wetlands	Consistent with Metro Title 3, no increase in fill allowed	Implement FEMA standards and require balanced cut and fill in 100 year floodplains; maintain a 50 foot buffer around wetlands.	Avoid undeveloped floodplains; protect any locally significant wetlands	Consistent with Metro Title 3
Steep Slopes (>25%)	Geotechnical review/development permit on slopes >25%	N/A	Avoid landslide prone areas and geologic hazards such as faults according to the USGS	Hillside Physical Constraint Density 1 DU per acre; Maximum Average = 1 acre; Preserve all areas exhibiting slopes >35%

[1] Source: Metro ESEE Analysis 2003 and Phase II Analysis of program options 2004
[2] Source: West of Sandy River Rural Plan Area Chapter 36.4500 Significant Environmental Concern Overlay Zone
[3] Source: City of Gresham Development Code, Section(s) 4.1300, 5.0103, 5.0200; 5.0600

Planning Steps

The planning process used to determine the Springwater resources that would be protected under the State's Goal 5 rule followed a sequence using similar methods as those used by Metro and Multnomah County, but at a higher level of resolution, pursuant to the Goal 5 process in OAR 660-023. Consistent with the standard Goal 5 process, the team:

- Collected and reviewed existing information
- Determined the adequacy of the information
- Conducted field studies and determined habitat quantity and quality
- Prepared map layers of resources
- Determined the significance of all resources mapped
- Adopted a list of significant resource sites

INVENTORY PROCESS

The basis for the inventory was the Statewide Goal 5 process adopted by Metro, as outlined in the procedures and requirements for complying with Goal 5. The development of the natural resources inventory is the result of the collation of existing data along with fresh analysis of the plan region. The focus is on creek and riparian condition, flow modifications and restrictions at road crossings, wetlands in ponds and riparian forests, wildlife use areas, scenic quality, and topography.

Existing information review

The inventory utilized information from previous studies conducted in the Johnson Creek drainage. Full citations for sources are listed in the bibliography at the end of this chapter.

The natural resource features inventory and needs analysis study began by collecting and reviewing existing data on Johnson Creek. These sources included:

1. Metro's baseline information for riparian and wildlife resources, specifically Metro's adopted regionally significant habitat inventory (Figure 5). The planning team found this inventory for Metro's Goal 5 resources needed refining to better understand the possibilities after future development. The areas that were misinterpreted or in a few cases overlooked in Metro's high-level air photo interpretation evaluation were corrected through ground-level observations (Figure 6). Consistent with Metro's inventory, the project team found most of the riparian areas and waterways are assumed to be regionally significant.

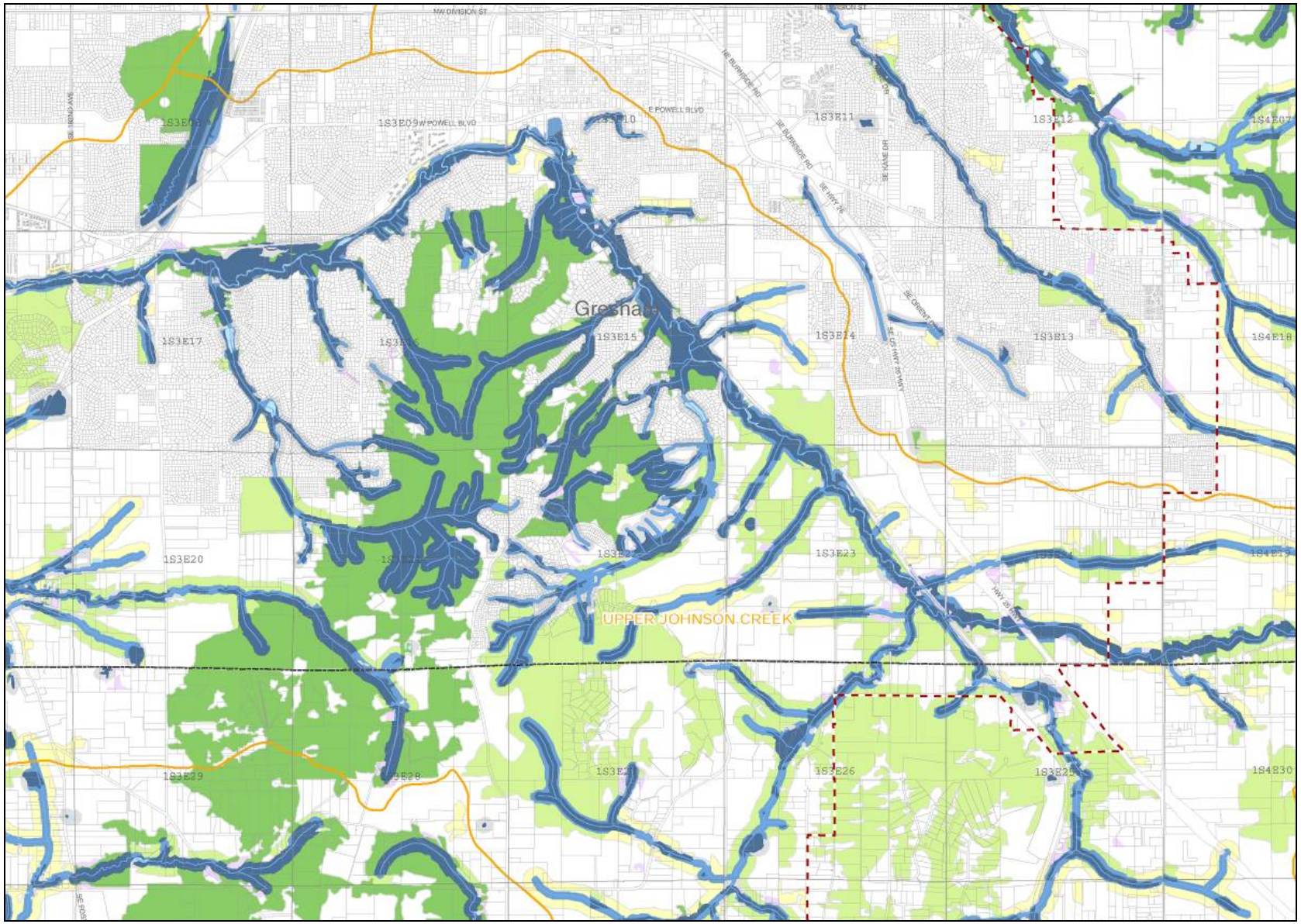

Figure 5. Metro's Resource Areas Map

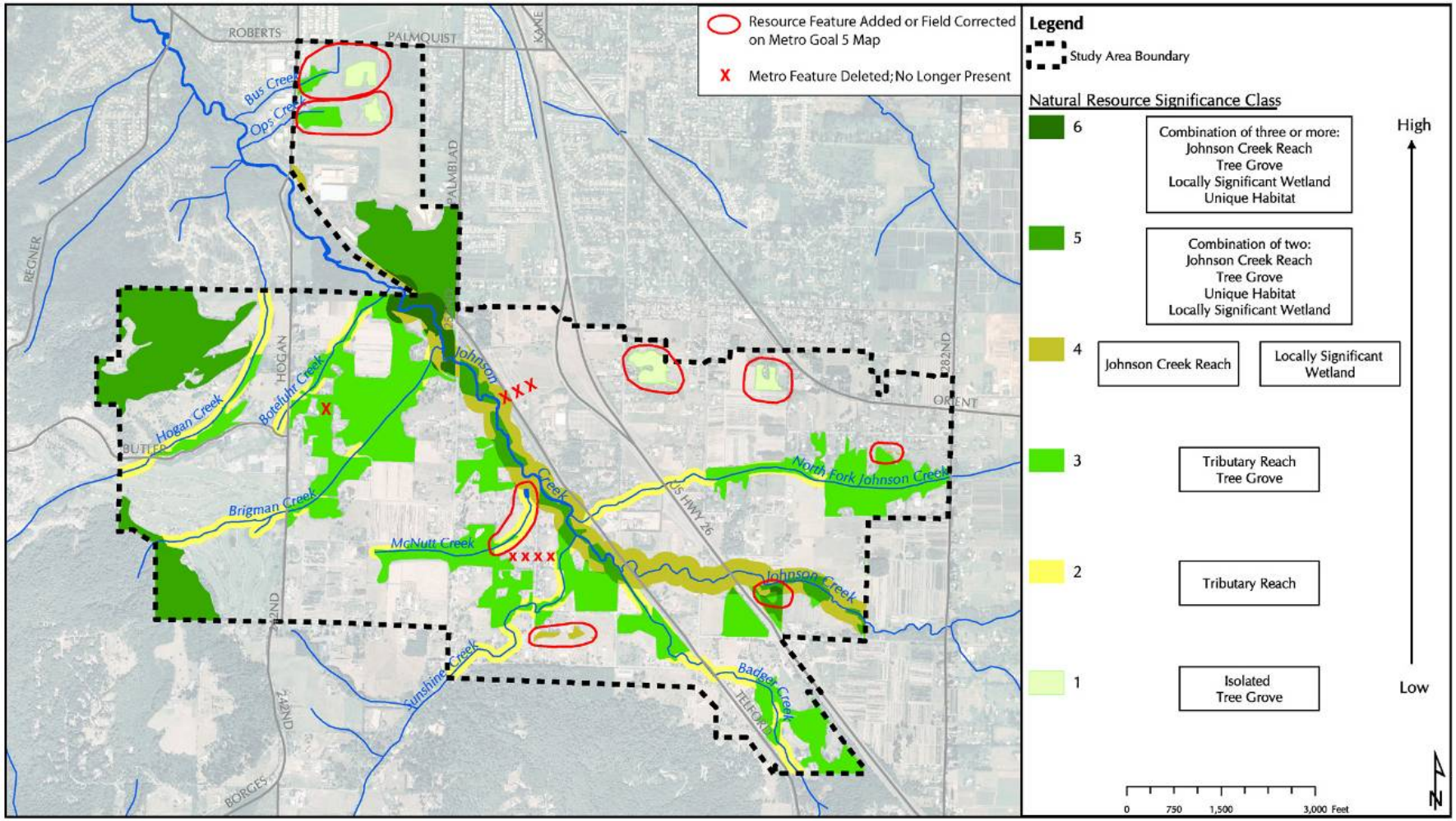

Figure 6. Field Corrections to Metro's Resources Map

2. Multnomah County West of Sandy Rural Transportation Plan Natural Resource Inventory and wildlife habitat protection measures.
3. Oregon Department of Fish and Wildlife (ODFW) stream surveys. Detailed stream survey of the Johnson Creek mainstem conducted by ODFW between1999 and 2000. Reach designations from this inventory including portions of Reach 16, all of Reach 17, 18 and a portion of Reach 19. The entire Johnson Creek contains 39 reaches according to the ODFW nomenclature.
4. Other regional studies coordinated by the Johnson Creek Watershed Council, the City of Portland or Metro Greenspaces Program. Products include the Johnson Creek Restoration Plan by the City of Portland, and the Johnson Creek Watershed Action Plan.

Data Adequacy Review

The availability of these resources meant that the City had enough data on Johnson Creek to aide decisions about protecting resources that it considers significant, which is acceptable under Goal 5 procedures (OAR 660- 023-0000 through 660-023-0250). However the project team and community supported refinements of existing data sets through field analysis where site access could be gained in the planning area. The approach to the field component of the additional natural resource inventory was to create a consistent database to document and compare function and value of the eight tributaries, wetlands, riparian and upland vegetation, and the value of these lands to wildlife.

Field surveys

The data analysis reviewed for baseline information was augmented through field observations and resource mapping conducted by Natural Resource Planning Services, Inc. staff, MDRM LLC, and John Gordon, wetland consultant, in May 2003 and February to April of 2004. Several methodologies were used to document characteristic wetlands, riparian and upland vegetation, wildlife habitat, sensitive species, steep slopes, springs, seeps, viewpoints and other natural features or geologic hazard zones. The Urban Riparian Inventory and Assessment Method (City of Portland 2000), Oregon Freshwater Wetland Assessment Methodology (Oregon Department of State Lands 2001), and Wildlife Habitat Assessment (WHA) (Metro 2003) parts of the Oregon Watershed Assessment Methodology (Watershed Professionals Network, 1999) methods were used to collect and record data on natural features. The Oregon Department of Land Conservation and Development (DLCD) has accepted use of the WHA method for compliance with Goal 5 guidelines. Results of the field surveys were tabulated and are included in the Reference Documents that accompany this report.

The initial study (Upper Springwater Corridor Study, NRPS, Spring 2003) involved outlining four Planning Units based upon the roads and geophysical constraints within the area in south Multnomah County between the Urban Growth Boundary (UGB) and the Clackamas County line. This initial study provided the following for the City:

- A database framework for incorporating detailed channel characteristics by reach sometime in the future
- Eight to ten key observation points with data at a high level of detail comparable to the UGB database (at least one location in each tributary)
- Riparian - Composition of riparian communities and species richness along at least one transect per each tributary of Johnson Creek

- Surface area extent of natural features that were measured using a Geographic Information System (GIS) and tabulated
- Transects of sampling sites located using the Global Positioning System (GPS) and imported into the GIS and mapped
- Wetlands and plants – general vegetative cover type map with open water wetlands and large wetland complexes identified
- Aerial photo mapping of general land uses and natural resources for the entire 1575 acres

Additional field study conducted (NRPS Fall 2003 and Spring 2004) during this inventory period included the Brickworks area, i.e., roughly 160 acres of additional study area north of Telford between Palmblad and Palmquist roads, and 81 acres south of the Clackamas County line between Telford Rd. and Mt. Hood Highway (US-26). It also included a detailed literature review and analysis, agency coordination, additional field observations, GPS data collection, and input to the GIS mapping system. This study provided:

- Identification of potential conflicts with the City's existing transportation network
- Field assessment of forested riparian wetlands, seeps and ponds and emergent marshes
- Analysis of scenic quality and viewsheds
- Identification of geologic hazards, faults, seismic zones
- Hydraulic data analysis and re-evaluation of flood-prone areas

Floodplain Function

The 100-year flood plain extent (Figure 7) shows the Johnson Creek floodplain. Aerial photographs of the1996 flood extent were examined at the U.S. Army Corps of Engineers District office; however, this event was beyond the 500 year level and inappropriate for map comparison for adequate flood protection. The examination of the major flood occurrence in the project study area provides important so that the goals of the project to safeguard or restore wetland function, to minimize flooding in the planning area, and to ensure that Springwater development does not exacerbate flooding downstream after implementation. The riparian zone, wetlands and undeveloped floodplain serve as water infiltration areas that are important for support of base flows within the watershed. Careful management of undeveloped floodplains will help the city and the region to meet water quality standards and provide for water temperatures and flows that allow the resident and anadromous fish species to thrive.

Resource Quantity and Quality

To gain an understanding of the planning area's resource quality, one must comprehend some concepts of landscape ecology. The operation of an ecological system depends upon a number of factors at a number of different scales (USBLM 2002). Each level in this time-space hierarchy has its' own importance. Assessing the watershed and using this assessment in a predictive fashion needs both an understanding and analysis of the natural processes occurring at all relevant spatial and temporal scales.

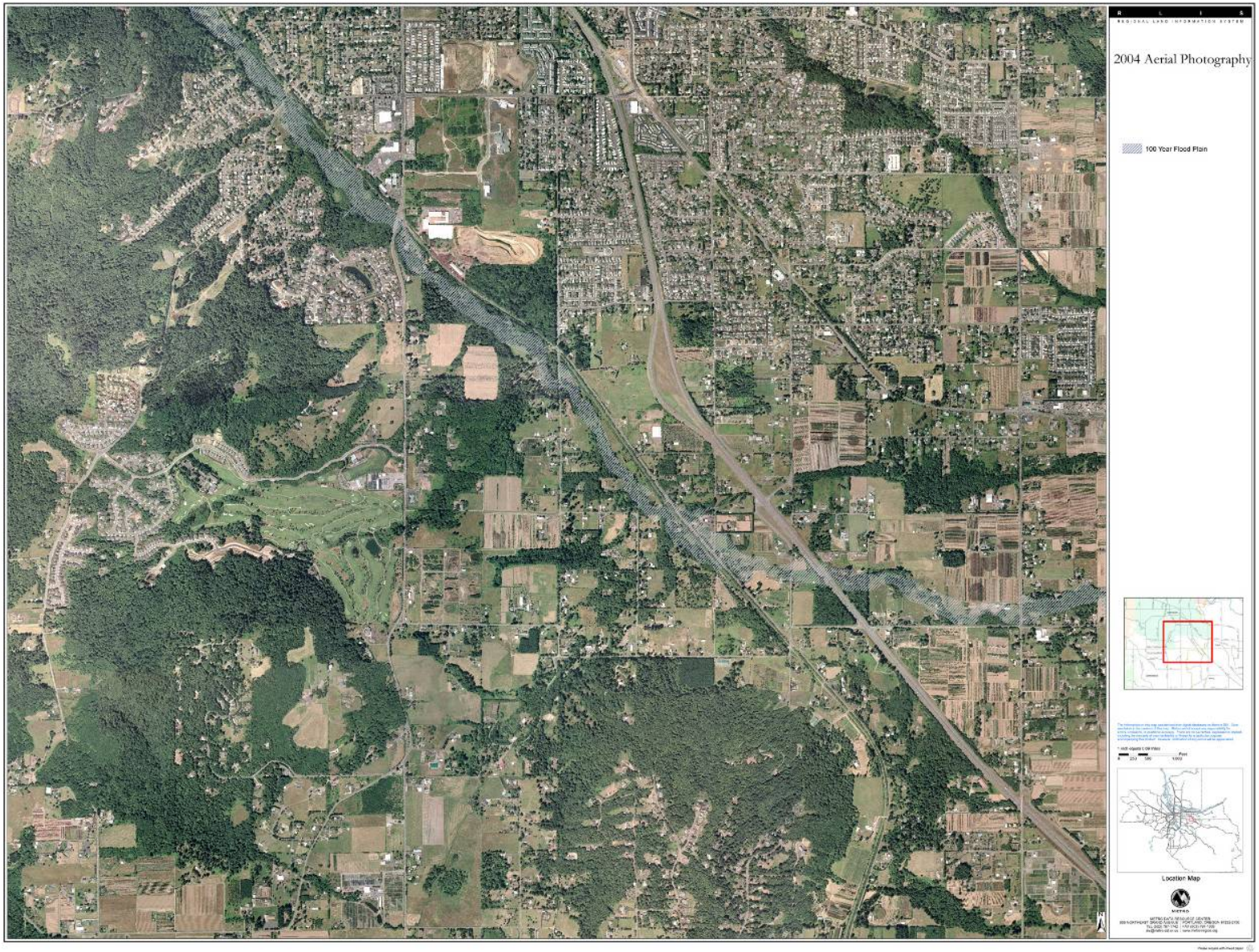

Figure 7. Johnson Creek Floodplain FEMA 100-year extent

A watershed resembles a pyramid with three levels representing scales. The highest scale of assessment of ecosystem function and dynamics contains the control, which describe the ecosystem state variables. They represent ecosystem elements as geology, geography, and climate. All ecosystem control have (varying) degrees of resistance to change, of time it takes to return to steady state, of levels of disturbance from which they will not return to steady state, and of differences between initial and recovered steady states. Identifying the control provides the constraints for determining the resiliency of the system and the prediction of the trajectory of changes that may occur. They also put boundaries on the range of natural variability, and provide some insight into the time frame for these changes to occur (Carlsson and Nilsson 2001, Martin 2001, Martin and Benda 2001).

A watershed's land base controls its processes. Focusing all rehabilitative efforts within the stream channel ignores the effects of land use and riparian vegetation on the supply of water, sediment, shade, and wood to the streams. Past errors, based on doing things thought to be 'good' for the species, eg. placing large wood in any salmonid streams, would be less likely to occur if the restoration goal is to reestablish processes to which most species have adapted. In addition, by looking at watershed processes instead of individual species habitat requirements, actions can be identified that restore habitat for aquatic and terrestrial species. This approach requires analysis of habitat forming processes at the watershed scale in order to identify processes that have been disrupted, as well as the locations and timing of land use effects on those processes.

Field Study Results and Resource Mapping

The key natural resources within the planning area are depicted on Figure 8. The Natural Resource documentation in the Reference Documents contain detailed characteristics and functional values of Springwater's natural features by stream reach or plot of riparian and stream characteristics, tree groves and wetland types, sensitive species, wildlife habitat value, and unique habitat features. A summary of the characteristics by subwatershed is provided in Table 2, with a more detailed description of the stream reaches following the table.

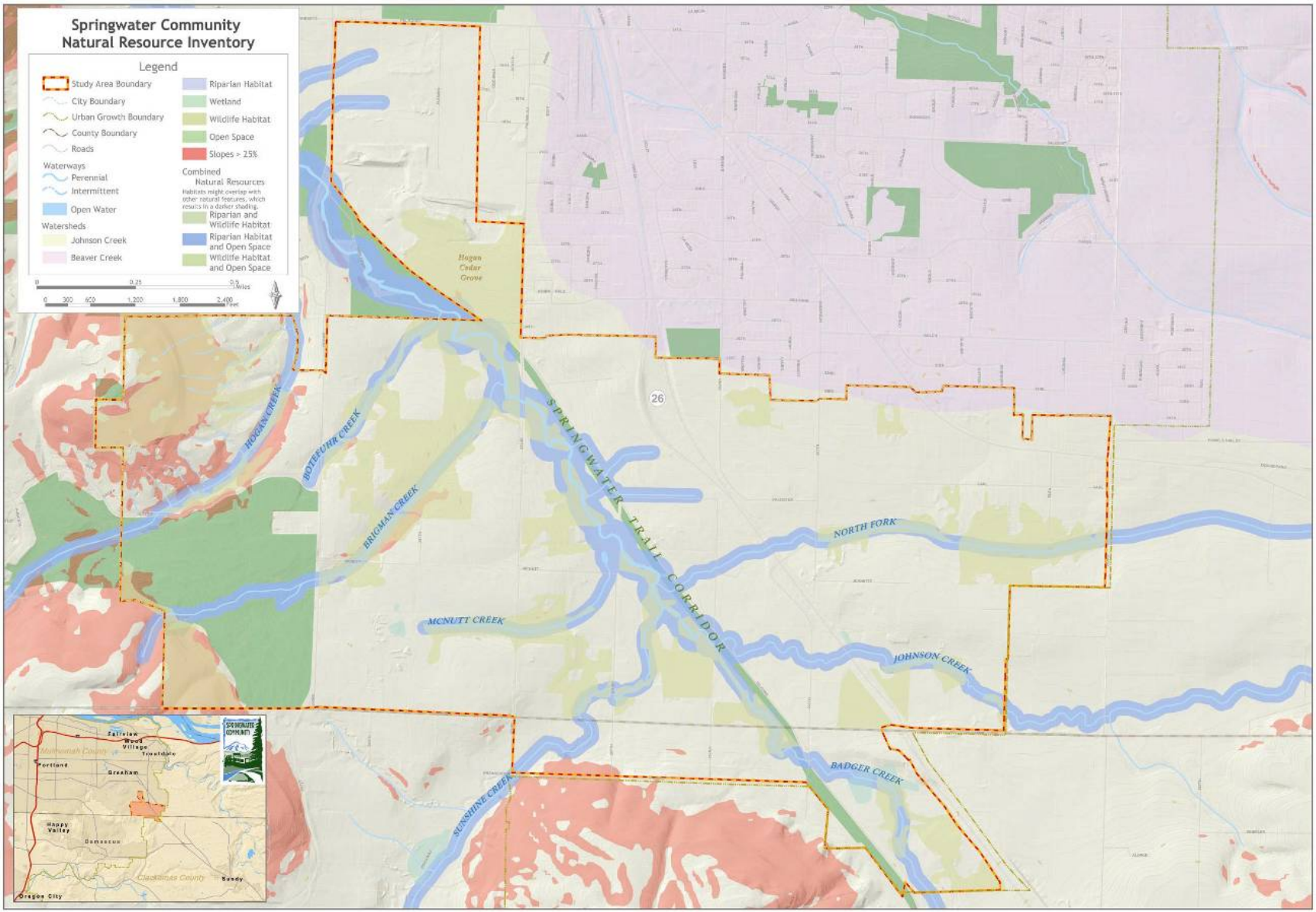

Figure 8. Natural Resource Inventory

Table 2 Natural Features Summary

Basin	Riparian	Wetlands	Wildlife Habitat	Slopes
Hogan Creek	Early to mid successional stage mixed deciduous and conifer (37.3 acres)	A few intermittent seeps and seasonal drainages flow from buttes to Hogan Creek	Good wildlife value on the buttes; good along the creek with mix of tree ages	Buttes > 25% along entire western side of the creek
Bus Creek	Conifer with extensive ivy and other non-native plants (6.9 acres)	None	Limited; development encroaches on all sides; creek is fed through a culvert and pipe	flat
Ops Creek	Conifer with extensive ivy and other non-native plants (8.2 acres)	None	Limited; development encroaches on all sides	flat
Botefuhr Creek	Very high quality reach in study area; Mature mixed deciduous and conifer (26.6 acres)	None	Near pristine condition; wildlife movement corridor	Rolling hills with channels in steep ravines
Brigman Creek	Mature mixed deciduous and conifer (54.2 acres)	Limited due to steep slopes	Good value; slightly disturbed understory; upper reaches poor vegetation is invasives only	Rolling hills with channels in steep ravines
McNutt Creek	Mature mixed deciduous and conifer (29.4 acres)	Small isolated manmade pond at headwaters	Marginal; impacts to understory shrubs reduces value for wildlife	flat
Johnson Creek Reach 16	Highest quality reach in study area; Mature high quality mixed deciduous and conifer. One fifth of reach is within the study area (981 sq. m; 0.2 acres)	Three possible palustrine wetlands	Highest quality conifer stands; near pristine condition and good wildlife movement corridor; Dense Hogan Cedar groves east of creek with lush undergrowth of shrubs, forest ferns and forbs	Variable throughout the reaches; 0.5% gradient

Table 2 Natural Features Summary (Continued)

Basin	Riparian	Wetlands	Wildlife Habitat	Slopes
Johnson Creek Reach 17	Second highest quality reach in study area: Mature mixed deciduous and conifer (4245 Sq. m; 1.0 acres)	Locally Significant Wetland near 252nd and the Springwater Trail and ten possible wetlands mostly on the east side of the creek	Good wildlife movement along reach	Variable throughout the reaches; 0.8% gradient
Johnson Creek Reach 18	Mature mixed deciduous and conifer (3477 sq. m: 0.86 acres)	One Locally Significant Wetland and two possible wetlands west of US Hwy 26 crossing	Poor; land is devoid of wildlife habitat	Variable throughout the reaches; 0.8% gradient
Johnson Creek Reach 19	Mature mixed deciduous and conifer (3010.4 sq. m; 0.74 acres)	Three Locally Significant Wetlands east of US Hwy 26 crossing	Marginal to good, some thick understory provides for bird species and cover for mammals others are surrounded by nurseries	Variable throughout the reaches; 0.9% gradient
Sunshine Creek	Mature mixed deciduous and conifer (34.4 acres)	A two-part Locally Significant Wetland southeast of the creek	Good as patches are connected to mainstem; also wildlife habitat connection between McNutt and Sunshine creeks	Area within the Springwater study area is meandering and mostly flat, the creek is fed by higher gradient upper reaches
Badger Creek	Mature mixed deciduous and conifer (43 acres)	Manmade pond near confluence with Johnson Creek	Marginal due to relatively small patch size but better where it does connect with riparian	Mostly flat
North Fork Johnson	High riparian function except for flood management function; Mature mixed deciduous and conifer (56 acres)	A Locally Significant Wetland and a cluster of possible palustrine emergent wetlands ¼ mi west of 282nd Avenue north of the creek	Good mixture of habitat for all wildlife species; thick understory provides food and cover for birds and mammals	Mostly flat

Johnson Creek and Tributaries

The study area's creek system (Johnson Creek main stem and nine tributaries) create opportunities to achieve multiple benefits in preserving a healthy aquatic habitat combined with meeting stormwater treatment/conveyance needs, restoring riparian or wetland habitats in headwaters, and providing passive recreation areas and natural areas.

Central to the area is the Johnson Creek mainstem (specifically the upper portion of reach 16, all of reaches 17 and 18, and the lower portion of reach 19--see Figure 9 Stream Reach and

Riparian Index), which runs through the entire planning area diagonally. Again, ODFW field surveys called out reach 16 as one of the watershed's most valuable reaches and fieldwork by NRPS staff confirmed the portion of reach 16 within the planning area is in excellent condition. The Springwater section of Johnson Creek has the following qualities:

- Reaches 16 and 17 have shown to be fish-bearing, with high channel complexity and lack of human disturbance. This provides good fish habitat for resident and anadromous fish.
- At time of printing, NOAA Fisheries is considering the main stem of Johnson Creek (including the Springwater section) as critical habitat for Lower Columbia River steelhead and Chinook, and the Magnuson Stevens Act lists it as essential fish habitat (EFH) for Coho and Chinook.
- Johnson Creek is considered by Oregon Department of Environmental Quality as a water quality-limited stream, and is 303(d)-listed for toxins (PCBs, Polynuclear Aromatic Hydrocarbons, dieldrin, and DDT), temperature, and fecal coliform.
- Relatively good riparian condition exists along the main stem.

Within the Springwater planning area, nine creeks are primary tributaries to Johnson Creek. These creeks are:

- Hogan Creek
- Bus Creek
- Ops Creek
- Botefuhr Creek
- Brigman Creek
- McNutt Creek
- Sunshine Creek
- Badger (MacDonald) Creek
- North Fork Johnson Creek

Existing rural development and agricultural practices creates many environmental planning issues for water resources. For example, while North Fork Johnson Creek is surrounded by complexes of tree groves and is not "water quality limited" according to the Oregon State Department of Environmental Quality (DEQ), Badger Creek (otherwise known as MacDonald Creek) has been modified by Telford Road. Coordination and Green Streets design for road improvements are intended to increase functional value and aesthetics of this riparian area. Also, urban development at the headwaters of Botefuhr Creek at Butler Road has changed the flow regime of the creek channel. Opportunity exists to restore the area west of Hogan Road where a Himalayan blackberry monoculture currently exists, and an incised channel has minimized the channel's connectivity to its floodplain. Brigman Creek is currently constrained by the golf course. It is essential that the creek's riparian corridor and headwaters be preserved to maintain the water quality of Brigman Creek.

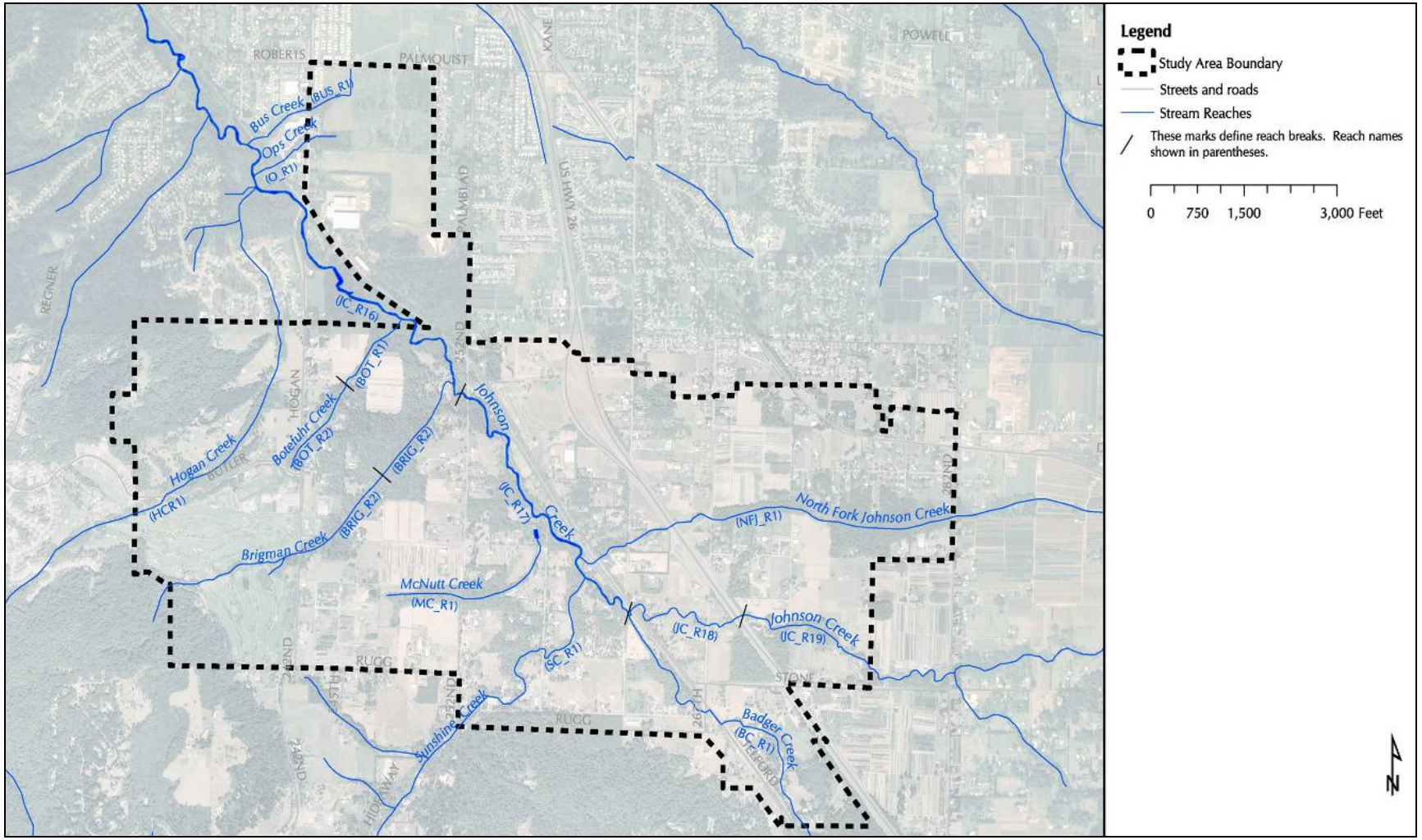

Figure 9. Stream Reach and Riparian Index

Stormwater management, or the lack thereof, has been a major influence on the landscape. Over ninety percent of the site has an open stormwater system, (predominantly ditched), which adds to sediment concerns in Johnson Creek due to erosion. For homes constructed decades ago, occasional septic system failures contribute to the degradation of water quality.

There is currently no treatment of stormwater in the Springwater plan area except at Highway 26 and at Butler Road. The increased direct input to the creek during high precipitation events increases seasonal flooding potential due to the high water table.

Wetlands

Through conducting a Local Wetland Inventory (Gordon, J. 2004), six of the planning areas emergent marsh type complexes were determined to be “locally significant” as defined by the functional and site characterization of the OFWAM (Figure 10). These wetlands totaled no more than six (6) acres across the study area and were recommended for protection usually as part of a larger wetland, floodplain, and forest complex. Restoration of original headwater wetlands should improve the following environmental conditions that were apparent during the resource inventory and needs analysis planning process.

Across the planning area, there are:

- Undulating landscapes that tends to pond water (Figure 11)
- Many roads and manmade linear features that increase surface water runoff to the low areas
- A high percentage of altered wetlands and
- A high water table

Figure 11 Badger Creek near Johnson Creek Confluence Ponded Wetlands

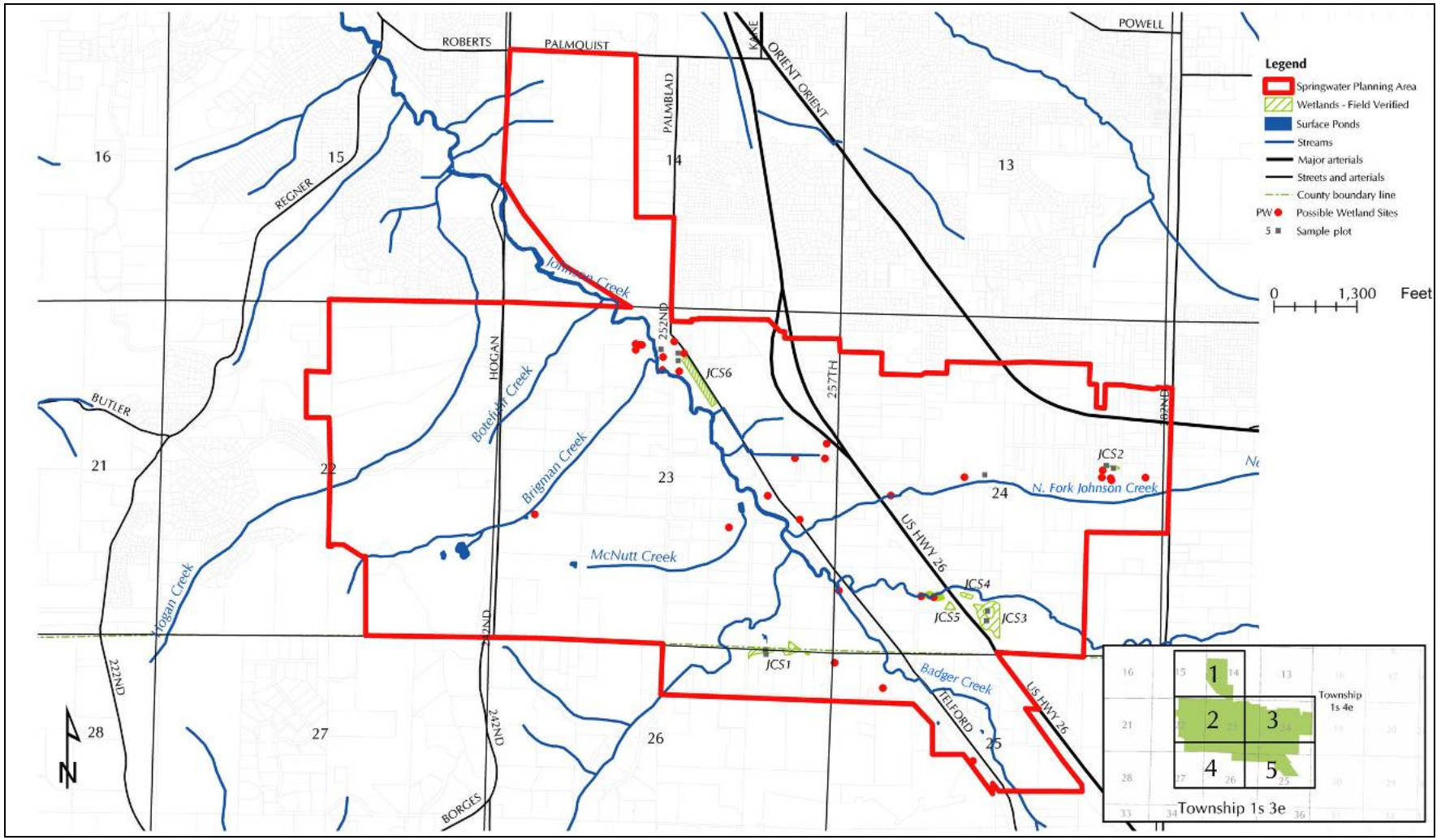

Figure 10 Wetlands Inventory

Riparian Areas

Riparian corridors are essential to wildlife passage, streambank protection and erosion control, and fish and aquatic habitat health, and they perform numerous necessary ecological functions. In Springwater, riparian vegetation has been removed, mowed or cleared throughout much of the planning area. The riparian area of Johnson Creek has been altered due to Telford Road and the Springwater Trail; in some places the riparian area is less than 20 feet wide. However, the intact portions of riparian areas are home to a dense mix of shrubs and mature conifer and deciduous trees. The trees provide shade to the waterway and protect aquatic habitat of this fish-bearing stream. Table 3 shows the riparian corridors that form the green corridors along each creek in the planning area and some results of the condition analysis. Out of 430 acres of riparian habitat approximately 14 percent or 60 acres have been entirely denuded and need to be restored to provide the expected functions of high quality riparian habitat (Figures 12 and 13). Approximately 40% of the riparian area is greatly intact and in comparatively healthy condition. These will be important areas to focus protection and some enhancement efforts. The majority of the riparian area (60%) has experienced varying degrees of alteration 14 percent has been physically mowed or cleared, and will need corresponding degrees of restoration and enhancement activity conducted in order to return the riparian area to a higher quality functional condition.

Table 3 Riparian Habitat with Highest Restoration Needs

Location	Total Riparian Area[1]	Percentage to be Replaced
Hogan Creek	37.3	13%
Bus Creek (Brickworks Ditch 1)	6.9	8%
Ops Creek (Brickworks Ditch)	8.2	0%
Botefuhr Creek	26.2	11%
Brigman Creek	54.2	17%
McNutt Creek	29.4	13%
Johnson Creek	109.6	11%
Badger (MacDonald)) Creek	43.0	16%
Sunshine Creek	34.4	14%
North Fork Johnson Creek	56.0	13%
Totals	429.9	14%

[1] Area within 100 feet of either side of top of bank. Note: There is some variability in calculations (approx. ±1 acre in 632)

Figure 12 Riparian Area North Fork Johnson Creek

Figure 13 Riparian Zone Overgrown with Invasive Plants Bus Creek

Where native vegetation still exists, it varies from riparian shrubs and trees to mature tree groves. This portion of the landscape is characterized by:

- Predominantly mixed deciduous/conifer tree groves
- Large tree groves within Botefuhr, Brigman, and Johnson Creeks
- Landscape, which is predominantly nursery farms (wholesale and public) and rural residential with light grazing
- Predominant tree species of Douglas fir, Western red cedar (and Hogan Cedars), Red alder, Oregon ash, black cottonwood, and big-leaf maple
- Hogan Cedars Grove. This is one of the most valuable natural resource portions of the watershed landscape and certainly the Springwater Community Planning area, because of the relatively pristine and rare nature of vegetation, value to wildlife, and benefits to Johnson Creek riparian and aquatic zones.

Wildlife Habitat
Mid- to late-succession mixed conifer/deciduous tree groves within the study area provide a structurally diverse environment for numerous bird and terrestrial mammals. There are several ponded wetlands associated with these woodlands (Figure 14, Tree Groves and Wildlife Index). Individual plots are described in data sheets in the Reference Documents and depicted on Figure 14. A summary of the wildlife habitat inventory is also given in Table 4.

Wildlife habitats (e.g., woodland and tree groves and riparian wetland complexes) and non-riverine wetlands were examined in surveys conducted by the team in Spring 2004. Metro's fish and wildlife model used quantified data regarding vegetation structure, patch size, water quality/quantity, and other features to determine the value of an area to wildlife.

Incidental sightings of mammals, birds, and fish that use the study area throughout the two-year study revealed numerous deer present as well as migratory songbirds, diving ducks, and raptors. Amphibians and juvenile fish appear to be prevalent within the entire subbasin. The area is so highly disturbed there is very little habitat broad enough to support winter or breeding ranges for large ungulates or carnivores. The wildlife habitat assessment relied primarily on the vegetative structure, diversity, patch size and connections to waterways for determining the relative value of certain portions of the study area for wildlife.

Springwater's mature forests are valuable wildlife use areas within the watershed's landscape because of their relatively pristine nature, large patch size and proximity to the Johnson Creek riparian zone (Figure 15). Forested patches often provide continuous wildlife passages between the major western tributaries to Johnson Creek; i.e., McNutt and Brigman Creeks, Sunshine and MacDonald Creeks, Brigman and Botefuhr Creeks. Tree groves provide contiguous large patches of mature forest habitat that extend to the northeast as far as Johnson Creek and Telford Road. They connect with undeveloped forest habitat in south, northwest, and southeast directions and therefore are likely to be important to the regional wildlife migration or movement (D. Apostel, Personal Communication, June 2004).

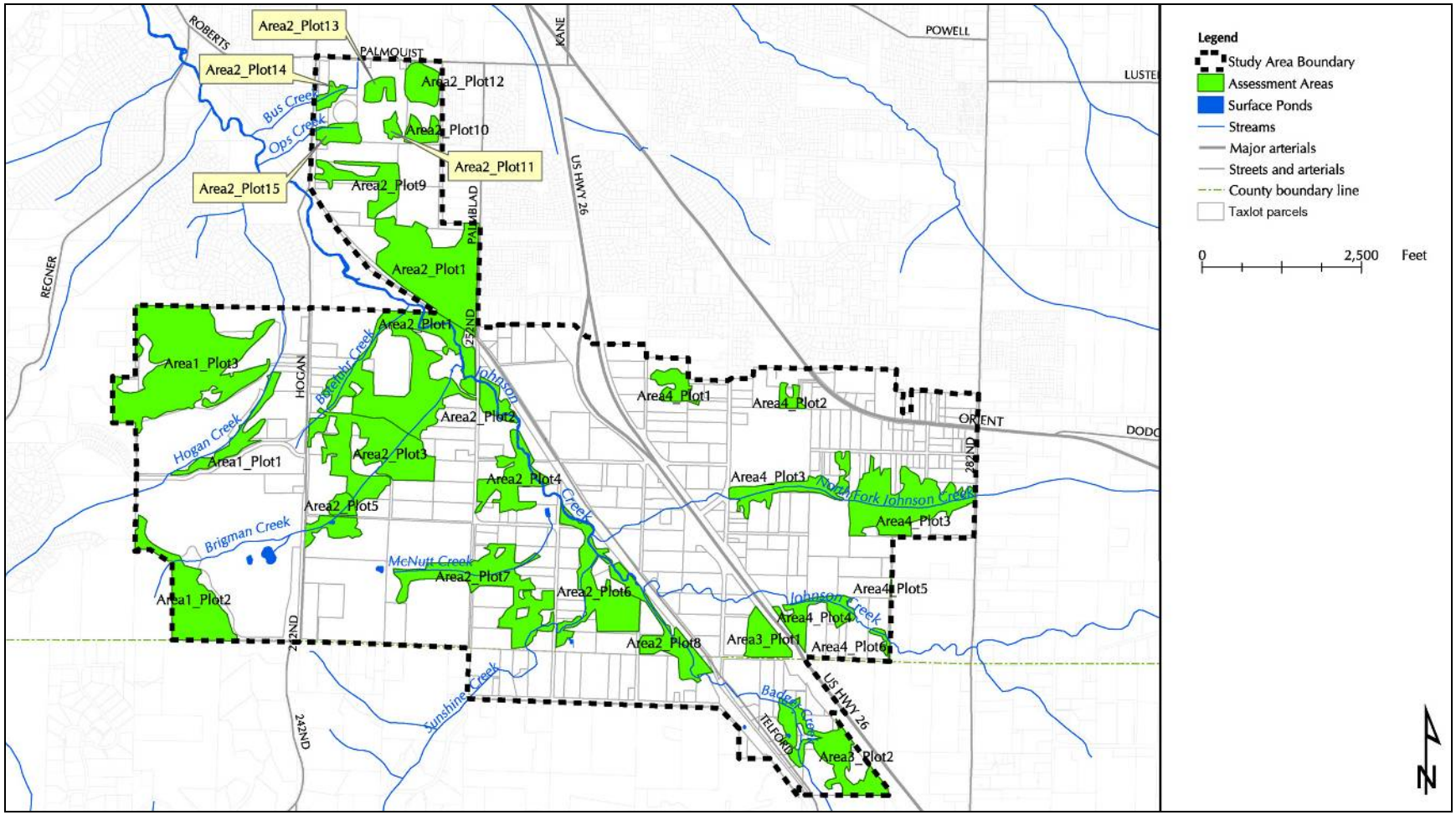

Figure 14 Tree Groves and Wildlife Index

Table 4. Wildlife Habitat Inventory

Planning Area	Plot (Tree Grove #)	Surveyed ((Y)es or (N)o)	Vegetation Type (Vegetation Community Composition)	Seral Stage (Age of the stand)	Wildlife Value	Recreation Value
Area 1	Plot 1	Y	Mixed Deciduous/Conifer	Early to Mid Deciduous/Mid to Late Conifers	Good, as wildlife movement corridor.	Poor, due to existing constraints and steep riparian area.
	Plot 2	N	Mixed Deciduous/Conifer	Mid to Late Deciduous/ Coniferous	Good, mixture of young and old trees. Both deciduous and Evergreen.	Good, view of valley and good mixture of young and old trees.
Area 2	Plot 1	Y	Mixed Conifer/Deciduous	Late Deciduous/ Coniferous	Good, wildlife movement corridor. Undisturbed area.	Marginal, untouched forest. Should be saved as wildlife
	Plot 2	N	Mixed Conifer/Deciduous	Mid to Late Deciduous/ Coniferous	Good, small patch, but provides continued wildlife movement corridor for wildlife along Johnson.	Marginal, trail already exists.
	Plot 3	Y	Predominantly Deciduous	Early to Mid Deciduous	Good, slightly disturbed understory. Connected to plot 1 to form large continous grove.	Marginal, due to lack of scenic value, but a quiet place to see wildlife.
	Plot 4	N	Predominantly Deciduous	Early to Mid	Good	Poor
	Plot 5	N	Mixed Conifer/Deciduous	Mid to Late Conifer/Early to Mid	Marginal, due to himalayan blackberry infestation.	Poor
	Plot 6	N	Predominantly Deciduous	Early to Mid Deciduous	Good, because of connection to the mainstem of johnson.	Poor
	Plot 7	N	Mixed Conifer/Deciduous	Mid to Late Conifer/Early to Mid Deciduous	Marginal, coonection to maintstem Johnson provides movement corridor but impacts to understory and shrub reduce value.	Poor, narrow and steap.
	Plot 8	N	Predominantly Deciduous	Early to Mid Deciduous/Mid to Late Conifers	Marginal, due to relative small size but is of value due to connection to riparian area of creek.	Poor
Area 3	Plot 1	N	Mixed Conifer/Deciduous	Early to Mid Deciduous/Mid to Late Conifers	Good, thick understory provides for bird species and cover for mammals.	Poor, very thick understory.
Area 4	Plot 1	N	Predominantly Deciduous	Early to Mid Deciduous	Marginal, due to surrounding constraints.	Marginal, up on a plateau with possible view of the
	Plot 2	N	Mixed Deciduous/Conifer	Early to Mid Deciduous/Mid to Late Conifers	Marginal, due to surrounding constraints and relative size.	Poor
	Plot 3	N	Mixed Deciduous/Conifer	Early to Mid Deciduous/Mid to Late Conifers	Good, large continous tree grove surrounding creek channel. Provides a good mixture of habitat for all species.	Marginal, due to thick understory and relatively little scenic value but could provide an area for a nice
	Plot 4	N	Mixed Deciduous/Conifer	Early to Mid Deciduous/Early to Mid Conifers	Good, thick understory provides for bird species and cover for mammals. Also connected to Johnson Creek riparian area.	Poor, very thick understory.
	Plot 5	N	Predominantly Conifer	Mid to Late Conifer	Marginal, small grove surronded completely by nursery land.	Marginal, up on a plateau with possible view of the
	Plot 6	N	Predominantly Deciduous	Early to Mid Deciduous	Marginal, provides movement corridor. Rehabilitation to north side could increase value.	Poor, high density of streamside wetlands. Possible flooding concerns.

Figure 15 Wildlife Use Areas Near Springwater Trail

Wildlife certainly uses Johnson Creek and its tributaries' riparian/upland habitats as travel corridors, and for feeding, resting and potentially for denning or nesting, depending on the species and their respective behavior. Mature tree groves give wildlife the protection they need to travel to and from, as well as along, the Johnson Creek riparian area.

SIGNIFICANCE DETERMINATION

Natural resource significance determination used a combination of inventories from NRPS fieldwork and data analysis, as well as Goal 5 resources identified by Multnomah County and Metro for the same planning area. These studies used a set of criteria to evaluate the resources' significance for the regional planning goal for land use. Our study used the same significance criteria as Metro which relies heavily on well-researched, scientifically established, regionally recognize studies that evaluate the function and value of natural and biological resources (see Table 5). We then considered the tolerance or thresholds that each resource has for long term viability within the physical environment and the resources location within the context of the other resources and the landscape. For example, not only was function considered but also position in a spatial hierarchy and size of the area. This enabled us to rate them on the basis of the multiple factors within certain types of landscape forms. The significant natural features of Springwater Community compared favorably with those identified within the West of Sandy River Rural Area Transportation and Land Use Plan, Goal 5 process and with Metro's Goal 5 resource inventory.

The following section details the approach used to evaluate the data and create an accurate description of the baseline conditions. The basis of the analysis recognizes that the dynamic nature of systems in both space and time must be used to inform any determinations of significance for the purposes of planning. Critical to the process is the realization that while each

area deserves and requires protection of some sort, planning must take into account that not all functions exist in all areas, so the “cookie-cutter” approach typically used will fail to recognize the key ecological elements of each area, and the scale at which these elements should be recognized.

This first step occurs at a very broad scale and requires recognition of ecoregion characteristics. These include the geology and terrain as well as any human infrastructure (it tends to constrain processes in a manner similar to geology). For instance, Springwater is positioned between the buttes in the south and west and Mt. Hood foothills toward the east; the Johnson Creek bisects it diagonally draining toward the northwest.

The next step involves a determination of ecosystem processes and habitat effects, or “functions”. Identifying the conditions provides the constraints for determining the resiliency of the system and the prediction of the trajectory of changes that may occur. They also put boundaries on the range of natural variability, and provide some insight into the time frame for these changes to occur. Each individual natural feature within Springwater was examined for the number of functions that were available to it at the observation year and the question was asked, given the area is not manipulated, what would it look like how would it function over time. Many of Springwater’s habitat effects within many of its riparian zones are frequent flooding; streambank erosion due to clearing, poor water quality degraded by fertilizers. Should these stream reaches be left alone with no human influence, the system is resilient and the trajectory of change would be to re-establish the channel migration zone, aggrade the streambed, self seed the riparian vegetation and improve water quality by reducing turbidity and inputs from surrounding land uses.

The third step identifies those elements of the system that demonstrate the least resilience to change, over time; those characteristics modified most. In Springwater several stormwater ditches that drain the existing highways, highways, bridges and culverts, the Springwater Trail and Persimmon Golf Course are fixed and least resilient to the natural process of ecosystem variability and resources in or near these areas would require the most human effort and cost to return them to their natural state. The third step also allows the siting of development features to allow system function to continue along a desired trajectory. On the other hand, those areas where several natural features or ecosystem elements occur in combination at a single location, i.e. backwater wetlands along a low gradient stream with well developed riparian vegetation structure along a gradient to scrub shrub and then mature mixed conifer/deciduous forest are examples of highly functioning natural areas that are relatively unmodified, pristine. All of these elements provide a rating of the “significance” or value to overall function of each of the major ecosystem elements represented in Springwater community.

Using a watershed approach for planning and rehabilitation, therefore, involves understanding the arena in which change occurs (controls), the vehicle for change (processes), and the outcomes, as well as responses to change (disturbance and resilience). Ultimately preserving watershed function, and in the case of the City of Gresham, preserving desired riparian conditions, means allowing these elements, or understanding how they respond to the various changes required to produce the desired result. Natural systems have a dynamic nature that consists of all the above, and that an attempt to draw a circle around the result of control and processes, the effects, will eventually result in the cessation of the more dynamic nature of the environment. This, in turn, will cause the system to assume a stable state not resembling the desired condition, as some its more important elements no longer process inputs as they originally did, or the system overwhelms the attempt at preservation and retains its original dynamism.

By preserving specific areas, and paying attention to processes and inputs, the City of Gresham will achieve its desired result of combining development with maintaining a watershed functioning in a manner they desire. The distances around each natural feature recommended for environmental protection are defined by fitting each to the current control constraining the area, identifying the important processes, understanding the inputs to the systems, and preserving the important features.

The basic resource characteristics inherent in certain natural systems (incorporating the spatial and temporal elements described above) provided the foundation for significance rating criteria (Table 5). These have been evaluated through numerous research studies and used to represent areas of importance to the continued functioning of the natural environment. Table 5 shows the relationship of each resource function to a particular resource or land form. Functions such as: water flow, storage and sources, water quality, channel dynamics and morphology, microclimate, fish and aquatic habitat, riparian habitat, upland vegetated habitat, and provision for sensitive plant or animal species are part of the equation for significance. If none of these functions exist, the site was not identified as significant. If any of these factors exist, the site was identified as significant to ecological system.

Table 5 Significance Criteria

Resource functions	Land features with functional value	Land features	Primary factor	Contributing factor
Water Quality (including sediment filtering, nutrient/pollutant filtering, erosion control, thermal regulation, and stream bank stability)	Vegetation and streambank areas. Vegetation growing from the streambank can help prevent erosion. Roots and fallen tree trunks may also stabilize stream channel banks. Artificial channelization of stream reaches can lead to additional erosion in other downstream reaches. Vegetation growing in the riparian area filters sediment, excess nutrients, and chemical pollutants from stormwater runoff. This functional value occurs where stormwater is allowed to flow through riparian vegetation before entering the stream channel. Riparian vegetation preserves un-compacted topsoil that is rich in organic materials and allows stormwater to infiltrate into the ground rather than flow over the surface (reduced surface erosion). Wetlands and floodplains. Wetlands and vegetated floodplains help to purify water by removing sediments, excess nutrients, and chemical pollutants.	**Vegetation**	– Vegetation within 100' of stream or wetland – Vegetation within 200' of stream or wetland if slope $\geq$ 25%	- Vegetation within 100-200' of strea or wetland[1]
		Water Bodies	- All land within 50' of a stream - All inventoried wetlands	
		Floodplain	- "Undeveloped" floodplain	- "Developed" floodplain

[1] Intact forests contiguous to riparian areas are included out to a maximum of 860 feet.

Table 5 Significance Criteria (Continued)

Resource functions	Land features with functional value	Land features	Primary factor	Contributing factor
Channel Dynamics	Large trees. Stream channels that have complex "structure" support a larger diversity of wildlife (for example, a variety of features, such as pools, areas of white water, meanders). Large wood that falls into the stream channel can create pools and other complex channel habitat features. Side-channels, oxbows, and off-channel wetlands. These areas provide refuge for fish during flooding, when the current in the main channel may be too fast. The Meander Zone. Low gradient streams tend to "snake" across their floodplain in a series of "S"-curves. This is a natural hydrologic process. Altering this natural flow pattern in one location can cause significant change in another location as the stream seeks a new equilibrium. Human structures built in the meander zone can interfere with natural stream hydrology, and lead to decreased in-stream habitat complexity. Streambank Areas. The landscape in close proximity to a stream is a dynamic place. Pools, small backwaters, meanders, and other important stream channel features will not form if the channel is confined to a narrow space.	**Vegetation**	– Vegetation within 100' of a stream, stream meander zone, or wetland connected to a stream – Vegetation within 150' of fish-accessible stream – Vegetation within the floodplain	– Vegetation within 150-200' of fish-accessible stream
		Water Bodies	- Within 50' of a stream - Within wetlands connected to a stream	
		Floodplain	- "Undeveloped" floodplain	- "Developed" floodplain

Table 5 Significance Criteria (Continued)

Resource functions	Land features with functional value	Land features	Primary factor	Contributing factor
Water Quantity: Stream Flow, Sources, and Storage	Springs, seeps, and wetlands. These land features supply water to streams (cold water sources are particularly important in an urban area). Floodplains and wetlands. These areas store floodwaters and reduce "flashy" stream hydrology. Forests. Headwaters and riparian forests act as a sponge to hold water, slow stormwater runoff, and maintain stable flow in streams (baseflow). Un-compacted topsoil rich in organic materials can hold water and slow stormwater runoff.	**Vegetation**		– Vegetation within 98 of stream
		Water bodies	– Within 50' of streams and isolated wetlands. – Within 100' of stream associated wetlands	
		Floodplain	– Within flood prone areas	
Microclimate	Stands of trees and shrubs. Stands of trees and other vegetated areas can impact air temperature and humidity within both upland and riparian areas. The local humidity and air temperature can impact water temperature in small streams and impact localized habitat conditions. Topographic features. Localized topography can also impact air temperature and humidity (for example, habitats on a north slope or within a deep gorge may be cooler).	**Vegetation**	– Woody vegetation within 50' of water body	– Woody vegetation contiguous extent to maximum 525'

Table 5 Significance Criteria (Continued)

Resource functions	Land features with functional value	Land features	Primary factor	Contributing factor
Fish and Aquatic Habitat	In-water habitat structure. Certain configurations of pool and riffle sequences in the stream channel, off-channel wetlands, side channels, oxbows, meanders, backwaters, frequently flooded areas (10-year flood or higher frequency), known spawning gravel.	**Aquatic Habitat**	– Within 100' of high or medium rated stream segment	– Within 100' of low rated stream segment
		Sensitive Species	Within 200' of channel meander zone of a stream containing aquatic sensitive species or potential (high or medium rated) habitat for sensitive species	
		Wetlands	– Within wetlands connected to a stream	
		Floodplain	– Within channel meander zone of accessible reach	– Within channel meander zone of upstream reach – Within flood prone areas
Organic Materials	Vegetation. Trees and other overhanging vegetation are a source of leaf-litter, fallen branches, logs, and other organic matter. This material is an important food source for the organisms that fish eat (aquatic and terrestrial invertebrates). Floodplains. Organic material can enter the aquatic environment by falling into the stream, or when the stream floods and carries away organic material from a vegetated area.	**Vegetation**	– Vegetation within 100' of stream – Vegetation within 50' of a wetland connected to a stream	– Vegetation within 100-200' of strea – Vegetation within 50 - 200' of a wetland

Table 5 Significance Criteria (Continued)

Resource functions	Land features with functional value	Land features	Primary factor	Contributing factor
Terrestrial Wildlife Habitat Quality	Vegetation or land features that provide food and cover for wildlife. Water and food sources, and structure for nesting, dening, rearing, and cover are important indicators of habitat quality. Corridors and connected patches of native vegetation. Wildlife populations that are connected to each other are more likely to survive over the long term than isolated ones. Many species must migrate seasonally to meet basic needs for food, shelter and breeding, and connections between habitat patches allow this migration to occur. Corridors play an important role in urban areas to provide opportunity for migration and movement, including between upland and riparian habitats.	**Vegetation**	– Vegetation within 100' of a stream or wetland	– Vegetation within 100-300' of a stream[4]
		Structure	– Within 50' of wildlife habitat (woody vegetation) with WHA score of 45 or more – Wildlife habitat areas within identified habitat corridors	– Within 50' of wildlife habitat (woody vegetation) with WHA >34 and < 45[4]
		Water bodies	– Within 50' of water body	
		Floodplain		– Within flood prone area
Terrestrial Sensitive Species	Sensitive species habitats. Areas that provide life-history requirements for sensitive animal and plant species are important for maintaining sensitive species populations.	**Vegetation**	– Wildlife habitat areas within 100' of terrestrial sensitive species point	– Wildlife habitat areas within 100'-300' of terrestrial sensitive species point[4]
Upland Interior Habitat	Large intact habitat patches. Long-term trends in wildlife populations are directly related to the area of habitat available—the larger the patch, the longer a population can sustain itself.	**Vegetation Patches**	– Wildlife habitat areas with an acre or more of interior habitat	

The Johnson Creek watershed and its resources are very important to the region and the integrity of the areas outside the urban growth boundary. Approximately 450 acres of significant natural resource areas exist across the 1700-acre planning area. To determine where the most function could be regained, the inventory evaluated the types of land forms or natural features that occur and the total quantity of resources in any particular area within the planning area. For example, if the stream riparian corridor adjoined a mature grove of trees, i.e. upland wildlife habitat or a wetland, it was rated a higher class than if there was only a single resource at that point in the planning area. In this way, the detail of the field observations and GIS mapping were employed to help the planners make informed decisions about the recommendations for protection and enhancement of the green framework of the planned community.

Classification of Protection and Enhancement Sites

More refined significance classes provided the planners with a simple tool to better inform decisions concerning proper levels of site development, or priorities for site protection or restoration. Once the resource inventory was complete, and natural features mapped individually, and discretely, the resource GIS layers were combined (Figure 16). Certain patterns arose that provided a mechanism to discern the difference in condition and resource value, as well as the level of potential for improving natural resource function and value. While the LWI process, the wildlife habitat assessment, and stream survey methodologies all contain this capability, none of them can evaluate the increases in functionality (and therefore, significance) provided when resources combine at a location. The Significance Class map shows the proximity of resources and their relative value and current function (Figure 16). Those functioning well, and/or combining three or more resource features, gained a rating of 6 whereas those isolated and lacking proximity to water were rated low (1). The various classes of significance (shown in Table 6) provide the basis for planning and prioritizing resource protection and restoration activities. Resource data sheets and summary tables for individual factors, evaluated for each resource that combined to create the significance classes, are provided in the Reference Documents.

Table 6. Natural Resource Significance Classification

High Resource Function	
6	Combination of three or more of the following: Johnson Creek Reach Tree Grove Locally Significant Wetland Unique Habitat
5	Combination of two of the following: Johnson Creek Reach Tree Grove Locally Significant Wetland Unique Habitat
4	Johnson Creek Reach or Locally Significant Wetland
3	Tributary Reach with a Tree Grove
2	Tributary Reach
1	Isolated Tree Grove
Low Resource Function	

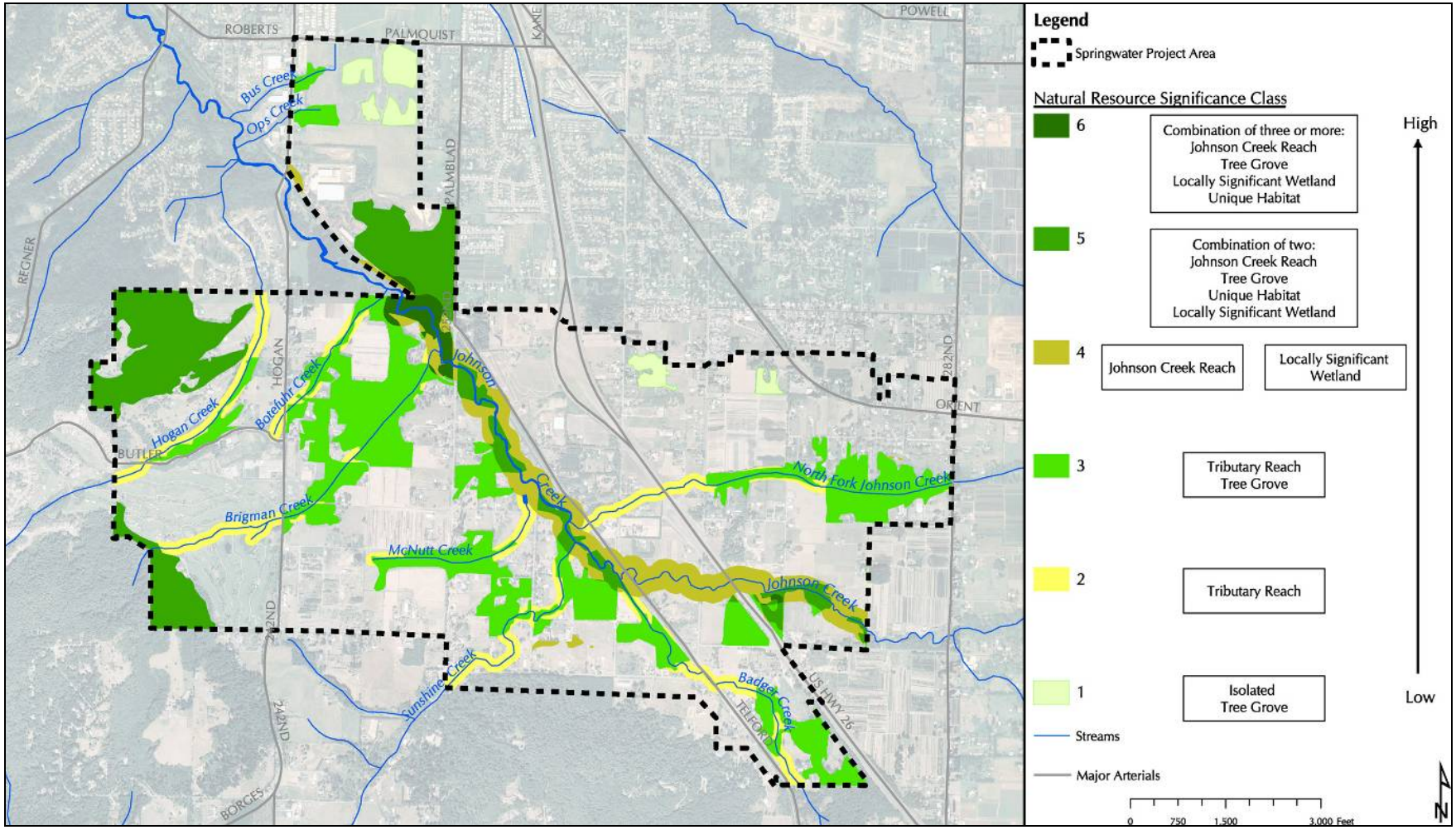

Figure 16. Significant Resource Classifications

The various grouping of resource features and landforms were then evaluated to identify the potential for enhancement and to identify the few areas where the current function and value is so high that it is particularly important to preserve and protect these lands.

Summary of Recommendations

MANAGEMENT PLAN OBJECTIVES

Following the community working group meetings and field observations made by the planning team, priorities emerged for the planning area's natural resources. These priorities are key objective elements in managing the environmentally sensitive resource areas and include:

- Restoring the headwater wetlands of McNutt Creek and riparian habitat along the tributaries of Johnson Creek.
- Retaining undeveloped land as "green" wildlife corridors between the buttes and major tributaries of Johnson Creek.
- Protecting the mature forests and riparian habitat within the five-creek confluence area in the southeastern part of the study area.
- Preserving the integrity of large stands of mature forests such as the Hogan Cedars grove.

Preliminary results suggest that the study area presents many opportunities for increasing watershed health, resource value, and improving water quality. The gentle westerly slopes and rolling terrain is the water source of several creeks and is the location of many disturbed wetland complexes. The headwaters of Botefuhr and Brigman Creeks and the channel of Hogan Creek have all been altered by construction; which results in sedimentation of the waterways. Butler Road is the only treated roadway within the area, leaving many of the roads without stormwater flow detention or treatment before discharging to the creeks.

Protecting the wetlands and forested area complexes at the southeastern boundary of the study area preserves the value of the natural resource and provides a "gateway" to Springwater that reflects the desired character of the community. High-quality, riparian wetlands and wildlife habitats of concern within the study area, if protected, will allow the entire planning area to be more ecologically sustainable. This will include improving the aquatic habitat through cool, clear, healthy streams, promoting Green Streets, and providing and aesthetically pleasing stormwater treatment areas.

REGULATED LANDS

All lands within the Environmentally Sensitive Resource Areas (ESRA) will be protected from urban development. Limited development will be allowed and managed in a way that is compatible with the goals of the natural resource protection. Properly constructed, this development could lend itself to habitat enhancement. The requirements for limited development will be stipulated through the development code.

OPPORTUNITIES FOR RESOURCE PROTECTION AND ENHANCEMENT

The habitat quantity and quality classification created by the Springwater Planning Team serve as the basis for appropriate decisions to protect or enhance natural resource areas, and

determining protection or enhancement priorities. Areas where multiple resources overlapped or existed adjacent to each other, rated highest. Where a solitary resource was isolated from other aspects of the environment that could assist it in functioning viably, these areas rated lowest. Recommendations for areas to protect and preserve as well as enhancement opportunities are shown on Table 7 and located on Figure 17.

FUNDING STRATEGY

As the area develops, environmentally sensitive habitats and natural features will be protected through a combination of public acquisition and regulation.

Several mechanisms have been evaluated for funding the proposed preservation and restoration goals for the project. For those lands that are not fully protected by federal, state or local regulation, but have high resource value, the City would be well advised to attempt to acquire the sites. The Parks and Open Space Plan estimates land acquisition costs to be approximately $48,000 per acre; however, including typical costs for enhancement and maintenance of the site, the cost for the City to acquire and manage a natural resource area is likely to be near $100,000/acre. Table 7 shows the lands that are recommended for incorporation into a land acquisition program. Also, for those projects that would not be required, options are explored for funding mechanisms for enhancement of the natural resources.

Other means to preserve the resource value without direct acquisition would include tax incentives to the property owner. For tax incentives, City Council would create an ordinance, then apply to the County with a certified management plan and in turn the City reduces their tax assessment on the parcel that contains the natural resources. When individual property owners are asked to give something up for the greater good, they often respond well to a long-term reduction of taxes on the land.

Additional programs exist at the city, state, and federal level to assist with natural resource planning efforts. These provide financial and technical assistance and incentives, but require a commitment from the property owners and the communities. Potential funding opportunities are listed below.

1. Reduce stormwater fees in exchange for protection of resources in the form of conservation easements.

2. Encourage and further investigate density and development transfer rights and other transfer mechanisms form properties inside the ESRA to properties outside.

3. Consider a new System Development Charge (SDC) on all development in the study area to purchase conservation easements. This effectively distributes the burden of resource protection to all who benefit.

4. Consider a bond measure to acquire property along streams and wetlands, either region wide or specific to Springwater. The measure could be patterned after Metro’s bond measure that successfully acquired upland habitat in and around the study area.

5. Grants and donations should continue to be used whenever possible. Numerous programs exist at the state and federal level to assist with natural resource related planning efforts, especially if those planning efforts are related to natural hazard mitigation strategies. In addition to opportunities to obtain funding for the protection and

restoration of habitats, opportunities are available to obtain public open space as part of a hazard mitigation/prevention strategy.

6. Landscape Assessment Districts (LADs) could be established as an overlay zone to provide a higher level of design and maintenance standards.

7. Restoration projects could be combined with other public utilities construction projects to minimize total project costs.

Table 7 Natural Resource Management Plan

Project Name	Location	Existing Functions and Values	Expected Outcomes	Natural Resource Plan Objectives Met	Cost, $Million[1]	Potential Funding Source
PROTECTION						
Hogan Cedar Grove	Area 2 Plot 1	scored 28 highest for tree grove; scored 103 for wildlife highest value; enhanced score increased by 5	preservation recommended as enhanced score increased only by 5; future successional stages will be very valuable	opportunity for a natural park; protects a significant patch of forested wildlife habitat	$8.6	consider acquisition as the parcel is within City limits and has tremendous development pressure
Springwater Gateway Wetlands (Stone Rd/Hwy 26)	Area 3 Plot 1 Area 4 Plot 4	Area 3 Plot 1 has poor recreation value and scores 17 average for tree grove and 71 for wildlife; Area 4 Plot 4 contains a significant wetland; scores 18 for tree groves; 79 for wildlife	Area 3 Plot 1 enhanced score increased only 9 whereas Area 4 Plot 4 enhanced score increased 17 for wildlife value if the wetland is protected	protects the areas most significant wetland and provides a natural beauty for the southern gateway to the community	$1.6	may be partially within the highway right-of-way and riparian corridor of Johnson Creek; consider acquiring the remainder of parcel
Buttes with Slopes > 25%	Area 1 Plot 3	unique habitat with tree groves; landslide and uncertain geologic hazard	high development pressure for single family residential to capture views	protects forested areas and open space amenities with views	$6.0	density requirements and developers fees for mitigation on slopes greater than 20%

1. Based on $100,000/acre for acquisition and enhancement projects. Cost for acquisition only is $48,000/acre.

Table 7 Natural Resource Management Plan (Continued)

Project Name	Location	Existing Functions and Values	Expected Outcomes	Natural Resource Plan Objectives Met	Cost, $Million[1]	Potential Funding Source
WILDLIFE PASSAGE						
Reserve a corridor between Hogan and Botefuhr creeks for wildlife passage	connects BOT R2 with HC R1	Botefuhr Creek is a deep channel with dense high value riparian; steep area containing springs are excellent wildlife habitat with poor recreation potential	Locating this corridor somewhere between the two creek channels would provide east-west route for wildlife to pass from Johnson Creek through to the buttes	increases opportunities for wildlife movement east and west through the community to buttes in the west	$0.6	most of this corridor should be included as either setbacks from creeks or "green street" redesign of Butler Road
Sunshine and McNutt Wildlife Corridor	Area 2_ Plot 7	this channel has been degraded score is 69 for wildlife habitat and the understory has been modified by residents' activities and there are three existing houses	protection of this corridor will allow understory to grow back and the wildlife a choice to use this as an alternate route to the Sunshine Valley	increases passageways for wildlife movement south to the buttes	$2.8	preservation through including these lands in the green infrastructure
RESTORATION – WETLAND RIPARIAN COMPLEX						
Brigman Pond Removal and Restoration	BRIG_R2	the creek riparian has been removed; golf course filled in the headwaters and caused down cutting and poor water quality	restore the flood control function and water quality of Brigman Creek; will improve riparian condition	long term water quality improvement and sustainable development	$0.9	encourage private property owner; otherwise not likely to be completed
McNutt Headwater Wetland Complex	MC_R1	Wetlands filled; riparian degraded as the channel has been ditched	improved water quality; aesthetically pleasing area for local residents	long term water quality improvement and sustainable development	$0.4	reserve as environmentally sensitive and engage volunteer efforts
Johnson Creek Hwy 26 Wetland Complex and Floodplain Reconnection	Area 4 Plot 5 Area 4 Plot 4 JC R19	poor quality habitat due to surrounding nursery activities and poorly functioning culvert	reconnect floodplain and flood storage function; enhance wetlands and riparian	improves aesthetic quality, water quality, riparian and wildlife habitats	$0.9	some of this site is within right-of-way for Hwy 26; consider acquiring the wetland site

1. Based on $100,000/acre for acquisition and enhancement projects. Cost for acquisition only is $48,000/acre.

Table 7 Natural Resource Management Plan (Continued)

Project Name	Location	Existing Functions and Values	Expected Outcomes	Natural Resource Plan Objectives Met	Cost, $Million[1]	Potential Funding Source
RIPARIAN REHABILITATION						
North Fork Johnson Creek Riparian Restoration	NF_R1	riparian quality is low as vegetation is cleared or mowed on one or both banks of the creek	improved aquatic habitat, water quality, culvert should be upgraded	provides natural corridor for wildlife movement east to west	$0.75	consider volunteer riparian planting
Johnson Creek (Telford - Hwy 26) Riparian Floodplain Reconnection	JC_R18	riparian quality is low as vegetation has been altered by logging and land practices	culvert should be replaced with a bridge; channel should be allowed to meander and riparian vegetation replaced	confluence of the five creeks is of high aesthetic value for public and recreationists	$0.1	consider acquiring the corridor and designing a bridge that reconnects floodplain or integrate with stormwater facilities
Badger Creek Culvert Removal and Channel Rehabilitation	BC_R1 at Telford Rd.	riparian quality is low as vegetation is invasive species; stream channel has been moved and displaced riparian and altered flow	culvert should be replaced with a bridge	provides natural corridor for wildlife movement to southeast and buttes	$0.67	culvert may be included in the highway improvements program; consider volunteer riparian planting

1. Based on $100,000/acre for acquisition and enhancement projects. Cost for acquisition only is $48,000/acre.

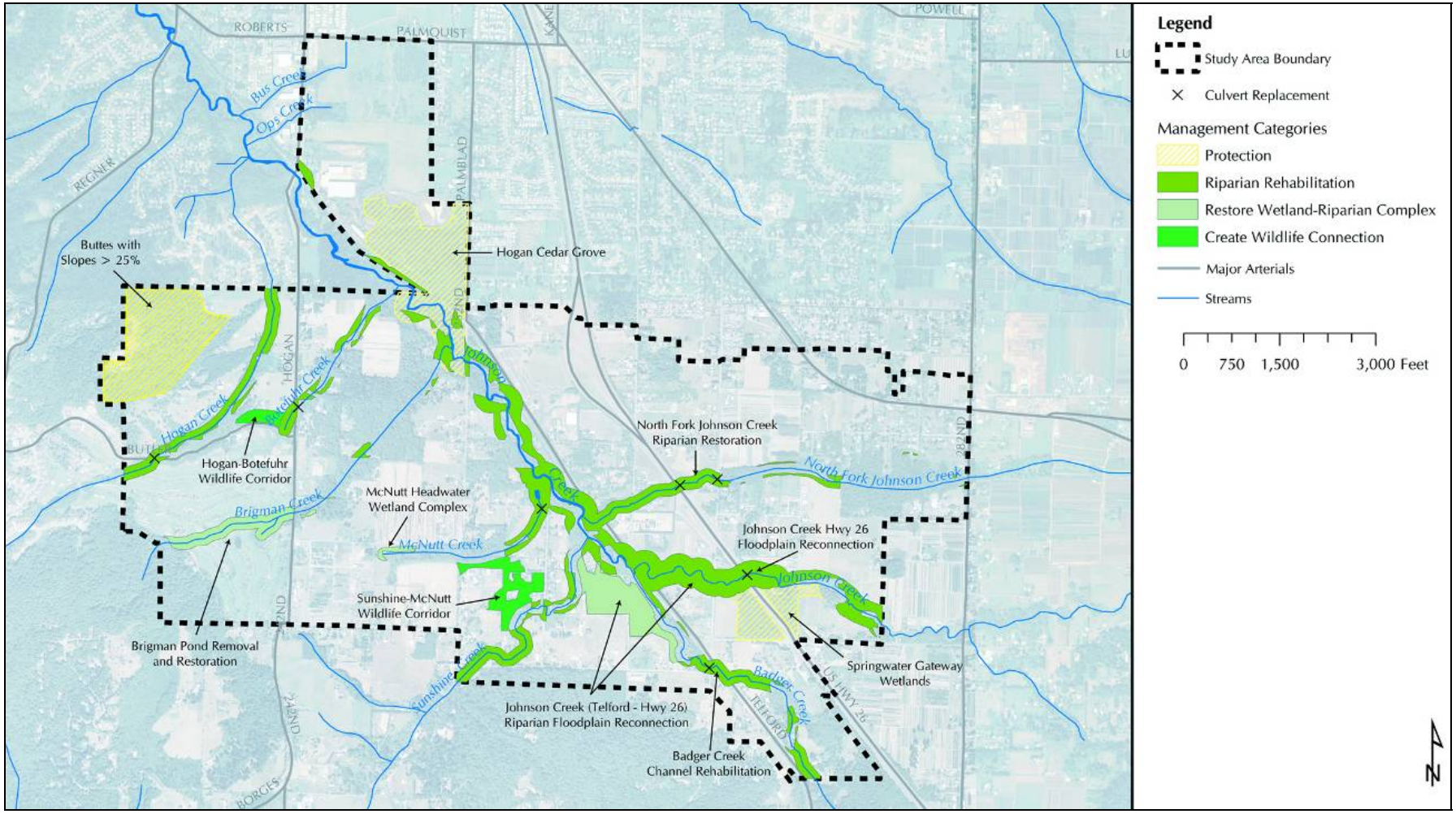

Figure 17 Natural Resource Protection and Restoration Plan

ABBREVIATIONS AND ACRONYMS

CWA – Clean Water Act
ESRA – Environmentally Sensitive Resource Areas
ESRA-SW – Environmentally Sensitivie Resource Areas - Springwater
ESA – Endangered Species Act
ESU – Evolutionary Significant Unit
FEMA – Federal Emergency Management Agency
GIS – Geographic Information Systems
GPS – Global Positioning System
LWD – large woody debris
NMFS – National Marine Fisheries Service
NRCS – Natural Resources Conservation Service
NWI – National Wetland Inventory
ODFW – Oregon Department of Fish and Wildlife
SEC – Significant Environmental Concern
WDFW – Washington Department of Fish and Wildlife

GLOSSARY

Allow - Decision to permit land-use activities regardless of the impacts on *fish and wildlife habitat*. Under an allow decision, habitat areas would be protected only by existing regulations and *non-regulatory tools*. This option offers the lowest level of protection for regionally significant habitat.

Anadromous - Moving from sea to freshwater for reproduction.

Anthropogenic - Relating to, or resulting from the influence of human beings on nature.

Assessment - A thorough documentation of existing conditions within a watershed. Identifies the actions needed to get from baseline conditions to the conditions implied in the vision and goals for a watershed. Refines objectives by identifying where and to what extent existing conditions diverge from the vision, and identifying appropriate targets for an objective given existing conditions.

Bankfull width – Channel width between the tops of the most pronounced banks on either side of a stream reach.

Baseline – Reference point for comparison of subsequent measurements or observations

Basin – A topographical area of a watershed or geological land area that slopes toward a common center or depression where all surface and subsurface water drains

Bedrock type – The parent rock (e.g., granite or sandstone) in a channel

Biodiversity - The variety of plants and animals in a particular area.

Conflicting uses - As defined by the Goal 5 planning guidelines, a land-use practice or development activity that is harmful to *fish and wildlife habitat.* Two major conflicting uses are removing plants and increasing *impervious* surfaces such as roads.

Edge effects - The negative impacts on wildlife that occur along the border of a *fish and wildlife habitat* area such as greater vulnerability to predators, *nonnative* plants, traffic and noise.

ESEE analysis - The second step of Metro's fish and wildlife habitat protection program which entails assessing the potential economic, social, environmental and energy (ESEE) impacts of protecting and not protecting regionally significant fish and wildlife habitat.

Fish and wildlife habitat - An area upon which fish and wildlife depend in order to meet their requirements for food, water, shelter and reproduction.

Goal 5 - One of 19 statewide planning objectives (adopted in 1973) that establishes standards for protecting natural resources, open spaces, and scenic and historic areas. Metro is currently working to address Goal 5 by developing a program to protect the region's significant natural resources, specifically *fish and wildlife habitat*.

Habitat fragmentation - The breaking up of a single large habitat area such that the remaining *habitat* patches are smaller and farther apart from each other. This results in a lack of

connections among different habitat areas, which makes movement between areas difficult for wildlife and reduces habitat quality (for example, by increasing *edge effects* and decreasing important *interior habitat*).

Habitat inventory - The first step of Metro's fish and wildlife habitat protection program that involved identifying the significant *fish and wildlife habitat* in the region. The result of the inventory is a map of regionally significant habitat classified from low to high value based on each area's importance for fish and wildlife.

Impervious/impermeable surface - A surface that does not allow water to seep into the ground and, therefore, increases *stormwater runoff*. Roads, parking lots and standard building roofs are all impervious surfaces.

Interior habitat - The area in the center of a *fish and wildlife habitat* patch that is higher quality habitat than areas along the edge of patches, since areas along the border are more prone to *edge effects*. Some species need interior habitat to survive.

Impact area - Land next to regionally significant habitat that may significantly affect the condition and value of the habitat area. Certain land-use and development activities within impact areas may have a substantial adverse effect on nearby habitats, and thus are worthy of special consideration.

Limit - Decision to apply some restrictions to land use activities that harm *fish and wildlife habitat*, but not *allow* or *prohibit* development entirely. This is the "middle-of-the-road" option for protecting regionally significant habitat.

Metro - A regional government that serves the 1.3 million people who live in 24 cities and three counties in the Portland metropolitan area. Metro works on land-use, transportation, natural resources, parks and greenspaces planning and waste management issues that cross local boundaries.

Non-native species - A type of plant or animal that is not local to an area, but rather originates from a another place. Also called "exotic" or "alien" species.

Non-regulatory tool - A way of achieving *fish and wildlife habitat* protection that does not rely on legal standards and restrictions, but instead relies on other methods such as education and outreach, financial and other incentives, and land acquisition from willing sellers.

Program development - The third step of Metro's fish and wildlife habitat protection program which entails determining how to protect various habitat lands identified in the inventory (step 1) while balancing the economic, social, environmental and energy (ESEE) impacts of protecting and not protecting *fish and wildlife habitat* (identified in step 2). Program development will entail deciding which policy tools – incentives, education, regulation or land acquisition – to apply to various lands throughout the region.

Prohibit - Decision to not *allow* a conflicting use because of the negative impacts on *fish and wildlife habitat*. This option offers the highest level of regulatory protection for *regionally significant habitat*.

Regionally significant habitat - Habitat areas Metro has identified as important at the regional

level based on a resource inventory undertaken in the first step of Metro's *fish and wildlife habitat* protection program. Regionally significant habitat includes habitat in riparian areas near water and drier upland areas away from water.

Regulatory tool - A way of achieving *fish and wildlife habitat* protection that relies on legal standards and restrictions on such things as vegetation removal and development activities.

Riparian area - The vegetated land near water bodies such as streams, rivers, wetlands and lakes that provides important benefits to wildlife and humans including clean water, reduced flooding and healthy habitat.

Soil erosion - The action of soil being worn away by water or wind.

Stormwater runoff - Water that flows off *impervious surfaces* such as roads, parking lots and roofs of buildings because it cannot enter and soak into the ground.

Title 3 - An ordinance adopted by Metro Council in 1998 to meet standards for statewide planning goals that deal with water quality (Goal 6) and flood management (Goal 7). Title 3 also establishes a plan to address the *fish and wildlife habitat* protection aspects of *Goal 5* within the metro region.

Upland area - Land located at a higher elevation than *riparian areas* that stays relatively dry.

Urban growth boundary (UGB) - The line that marks the separation between rural and urban land. The UGB is updated every five years so that the land within the boundary can accommodate 20 years of expected growth in the region. *Metro's* jurisdiction covers the land within the UGB plus some additional lands outside the UGB.

Watershed - All the land and streams that drain to a particular water body or point in a stream. Since water flows downhill, points of high elevation generally determine watershed boundaries.

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