

# **BORING LAVA DOMES**

## **Supplement To The Johnson Creek Basin Protection Plan**

**AND MINOR AMENDMENTS TO ENVIRONMENTAL REGULATIONS**

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**Adopted by City Council November 5, 1997  
Zone Changes Effective November 5, 1997  
Code Changes Effective November 14, 1997**

**Ordinance No. 171740**

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**Bureau of Planning**

**Portland, Oregon  
November 1997**



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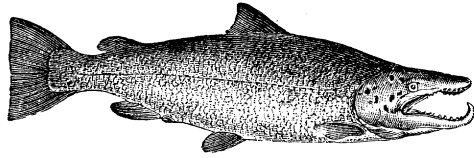
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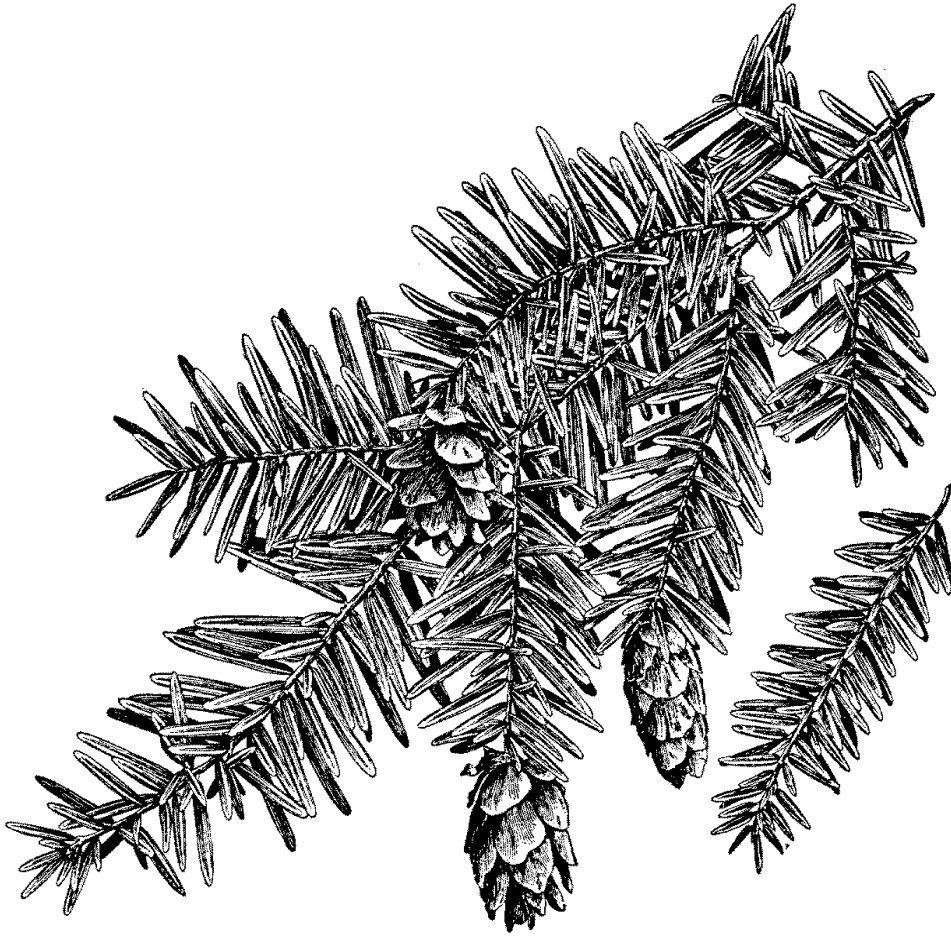
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## **PART I**

### **BORING LAVA DOMES SUPPLEMENT**

**PLAN BACKGROUND**

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## Plan Background

This report updates the resource inventory, analysis and protection program for City of Portland Resource Site 30, Boring Lava Domes, (Lava Domes). This site was initially reviewed in 1991 as part of the *Johnson Creek Basin Protection Plan* (JCBPP). The JCBPP is one of eight plans developed by the City to comply with Statewide Planning Goal 5, which requires all cities and counties in Oregon to “conserve open space and protect natural and scenic resources.” The JCBPP was acknowledged by the Oregon Land Conservation and Development Commission on July 25, 1995 (Periodic Review Order #95-PR/00447). The purpose of the present study is to provide supplemental resource inventories, analyze conflicting uses and refine the Goal 5 protection plan as appropriate within the site.

This study was initiated to implement Action Item EC7 of the Outer Southeast Community Plan, which reads: "Conduct a new study within the next three years to consider the refinement of environmental zoning in the Johnson Creek basin."<sup>1</sup> The Portland City Planning Commission asked for this study in response to concerns raised by local citizens and City bureaus, which called attention to the significance of the Lava Domes and the need for particular study and refinement in that part of the basin.

## Supplemental Inventory

This section presents supplemental Goal 5 inventory information for the Boring Lava Domes. City staff and consultants conducted field visits throughout the site in October and November 1996 to document current natural resource conditions. This inventory supplements previous City surveys of the site in 1986-1987 and 1990-1991. Characteristic vegetation, wildlife habitat, riparian corridors, streams and other physical features were documented using the City's Wildlife Habitat Assessment (WHA) form. This information, combined with existing inventory data, recent topographic maps and aerial photographs, was used to evaluate resource significance based on the functions and values described in the JCBPP.

Resource values identified by the City (JCBPP, as amended April 19, 1995) include: fish and wildlife habitat, water purification, storm drainage, groundwater recharge and discharge, aesthetics, scenic, flood storage, pollution and nutrient retention/removal, sediment trapping and erosion control, education and recreation.

## Site Location

This site is located in the southeast corner of the City of Portland. The eastern site boundary follows the city limits in the vicinity of SE 162nd Avenue. The southern site boundary follows the city limits in the vicinity of SE Clatsop Street but extends outside of

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<sup>1</sup> Adopted by Ordinance #169763, Resolution #35491, on January 31, 1996.

the current city limits in three areas to include potential future urban lands located within the City's Urban Services Boundary. The western boundary generally follows Interstate 205 (I-205). The northern boundary borders other city resource sites along the Johnson Creek lowlands south of SE Foster Road. The general location of the study area is shown in Figure 1.

Figure 1: Site Area Map



Land uses within the Lava Domes site include single-dwelling residences, cemeteries, parks and agricultural areas. There are two primary City of Portland Comprehensive Plan designations for the site: residential and open space. Approximately 90 percent of the site is designated single-dwelling residential land and 10 percent is open space (predominantly cemetery use). The open space land is located at the western end of the site, in the vicinity of SE 112th Avenue and Mt. Scott Boulevard. The remaining land within the site is residential.

The Lava Domes contain similar environmental and land use characteristics, making it possible to treat the entire area as one site. Because of the large area, multiple field inventories were conducted within the site. Inventories generally cover distinct subbasins of the Johnson Creek watershed. This inventory method provides detailed information about the site and permits each of the creek tributaries to be distinguished and their relative resource value to be assessed. Inventories were conducted for 13 such subbasins, or subdistricts, each named for the primary creek tributary or natural feature within it. Where existing tributary names do not exist, a name was created based on a distinguishing characteristic (e.g., "Cottonwood Creek") or a significant named feature (e.g., "Deardorff Creek" along Deardorff Road). Figure 2 shows the location of Lava Domes subdistricts. Table 1 provides a summary of subdistrict size, habitat features and relative values.

### **Resource Quality and Quantity**

Encompassing about 1370 acres, the Lava Domes site is defined by a series of buttes, typically forested and steep, which are divided by perennial and seasonal streams flowing north into Johnson Creek. These buttes are volcanic in origin, formed several hundred thousand years ago when a group of shield and cinder cone volcanoes—the "Lava Domes"—erupted across the lower Willamette Valley. These now dormant volcanoes are comprised mainly of high-alumina basalts, but locally contain ash, cinders and other materials. The basalts are similar to those of Mount Hood and other Cascade mountains and the origin of the Lava Domes is therefore believed to be tied to the uplift of the Cascade Range.

The site's streams are first and second order, generally high gradient streams with low to moderate flows. The streams are generally cool and clear; most of the streams support a healthy macroinvertebrate population, and several support amphibians and fish. Average channel gradients are between 10 and 12 percent, with some high elevation reaches exceeding 25 percent. As they near Johnson Creek, stream gradients drop to 2 or 3 percent. The Lava Dome hillsides, which include the side slopes of the stream ravines, can reach gradients of as much as 65 percent and occasionally more where rock cliffs and outcroppings occur.

The forest that historically covered the gentle sloping Lava Domes ridges and lowlands was partially cleared in the early 1900s for agriculture, timber and cemetery uses. Forest

clearing has increased dramatically in recent years as housing development expanded from the lowlands and ridges onto the hillside slopes. Presently, about one half (700 acres) of the site is forested. Because of the Lava Domes poorly drained clay soils, the recent clearing and development activities have had direct influence on water quality and quantity within the lower Johnson Creek basin, often exacerbating local flooding and increasing sedimentation and turbidity. The important relationship between the Lava Domes and the rest of the Johnson Creek basin was one factor that prompted the City Planning Commission to request a reevaluation of natural resources within the Lava Domes.

**Table 1. Summary of Subdistrict Characteristics**

Sub-area	Name	Acres	WHA Score	Special Features		
				Aquatic Habitat	Terrestrial Habitat	
A	Cottonwood Creek	98/ 56 <sup>1</sup>	65	Intermittent stream; Carex obnupta wetland	Deciduous forest: POBA/URDI <sup>2</sup>	Large cottonwoods
B	Veteran's Creek	401/ 121	79	Perennial stream; Carex obnupta wetland	Mixed forest: ACMA-ALRU/SARA/URDI	100+ year-old cedar and fir
C	Indian Rock Creek	182/ 162	47	Intermittent stream; Phalaris wetland	Mixed forest: ACMA/SYAL-ACCI/POMU	Large wetland, falls
D	Frog Creek	150/ 150	84	Perennial/intermittent stream; permanent pond	Mixed forest: ACMA/COCO/POMU	Red-legged frog
E	Cedar Creek	107/ 107	80	Intermittent stream; Glyceria wetland	Mixed forest: THPL- ACMA/COCO-SYAL/POMU	Salamanders
F	Wahoo Creek	287/ 283	87	Perennial/intermittent streams; Scirpus wetland	Mixed forest: PSME- ACMA/ACCI-OECE/POMU	Red-legged frog, pileated woodpkr.
G	Deardorff Creek	378/ 255	75	Intermittent stream; Scirpus, Carex, Salix, Cornus wetlands	Mixed forest: THPL- ALRU/ACCI/POMU-URDI	Pileated woodpecker
H	Clatsop Butte	86/ 86	72	Intermittent stream	Mixed forest: PSME/ACCI- OECE/POMU	Direct link to Johnson Creek
I	Barbara Welch Creek	221/ 215	68 <sup>3</sup>	Intermittent stream	Mixed forest: THPL-ACMA/ACCI/POMU	Amphibians
J	Cooper Bluff	99/ 99	48	Ephemeral stream	Mixed forest: PSME-ACMA/COCO/POMU	Rock outcrops/ cliffs
K	Clatsop Creek	233/ 129	72	Intermittent stream; Typha wetland	Mixed forest: THPL-ACMA/ACCI/POMU	Pileated woodpecker
L	Mitchell Creek	566/ 96	91	Perennial/intermit. stream; pond	Mixed forest: THPL-TSHE/ACCI/POMU	Cutthroat trout, red-legged frog
M	Kelley Creek (lower reach)	2380/ 144	80	Perennial stream; ponds	Mixed forest: THPL-ALRU/COCO/POMU	Cutthroat and steelhead trout
	<i>Median size/score</i>	<i>221/ 129</i>	<i>75</i>			

1 Two numbers are shown for acreage. The first is the total acreage of the subbasin, including land outside Portland; the second shows acreage within the current City limits of Portland.

2 Each four letter alpha code represents a dominant species within the plant community, as discussed further in the Supplemental Inventory section.

3 Score represents slopes and tributaries; the main stem of Barbara Welch Creek is degraded with score of 23.

The Lava Domes forest straddles the border between the Willamette Valley vegetation zone and the Western Hemlock zone (Franklin and Dyness), see Figure 3. The Lava Domes forest community exhibits characteristics common to both of these zones. The prominent occurrence of western red cedar and the presence of hemlock suggests that the forest is best characterized by the *Thuja plicata/Acer circinatum/Polystichum munitum* (red cedar/vine maple/sword fern) community of the Western Hemlock zone.

The Willamette Valley *Pseudotsuga menziesii/Acer circinatum/Polystichum munitum* (Douglas fir/vine maple/sword fern) community is similar though cedars are less common associates. Both of these communities frequently occur on north slopes such as the those that make up the Lava Domes planning area.

The Lava Domes forest generally ranges from 60 to 100 year old second growth stands in a mid-successional stage referred to as *conifer topping hardwood*. Certain areas of the site, however, contain much older forest with tree diameters reaching five feet or more. As summarized in Table 1, the Lava Dome subdistricts are typically comprised of a mixed conifer/deciduous forest with western red cedar (THPL<sup>2</sup>), bigleaf maple (ACMA) and Douglas fir (PSME) frequently occurring as dominant tree species. Other occasional dominant trees include red alder (ALRU), western hemlock (TSHE) and black cottonwood (POBA). Dominant shrubs in the forest community include vine maple (ACCI), western hazel (COCO), Indian plum (OECE) and snowberry (SYAL). On the ground layer, common herbaceous plants include sword fern (POMU) and stinging nettle (URDI). For a complete list of species detected during the 1996 field reconnaissance, refer to Appendix B. For previous inventories, consult the *Johnson Creek Basin Protection Plan*.

### *Riparian Corridors and Wildlife Habitat*

Riparian systems contain the three critical habitat components: water, cover and food. They also provide important migration corridors and territory (space) for wildlife. Riparian corridors are transitional areas between aquatic and terrestrial ecosystems and as such support a variety of plants and animals common to both environments. The structural diversity of riparian corridors tends to be high, in part due to the corridors position at the low point of the landscape where fallen trees, stumps and other organic debris collect. Due to the range of plant composition and structure, riparian corridors often support a diverse assemblage of wildlife species. Field surveys during the 1980s and 1990s have shown this to be true of riparian corridors throughout the Lava Domes. Uplands within the Lava Domes have a direct influence upon these riparian corridors and provide important habitat and migratory linkages for wildlife including birds, mammals, reptiles and certain amphibian species.

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<sup>2</sup> This alpha code represents a dominant species within the plant community. The first two letters indicate the first two letters of the genus--in this case, TH for *Thuja*--and the last two letters indicate the species--PL for *plicata*. For the scientific names of other species, refer to Appendix H.

The site's habitat classification is as follows<sup>3</sup>:

Riparian Broad-leaved Deciduous Forest  
Palustrine, Forested, Coniferous/Broad-leaved Deciduous,  
Permanent/Semipermanent/Seasonal  
Palustrine, Emergent, Persistent  
Palustrine, Open Water, Permanent, Artificial, Impounded  
Riverine, Upper Perennial, Open Water, Permanent  
Upland Coniferous/Broad-leaved Deciduous Forest

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<sup>3</sup> The classification system is based on Cowardin et al. (1979).

**Figure 3. Pacific Northwest Vegetation Zones**

As discussed previously, the City documented characteristic vegetation, wildlife habitat, riparian corridors, streams and other physical features using the Wildlife Habitat Assessment (WHA) survey forms. This inventory method has been acknowledged by the Oregon Land Conservation and Development Commission as complying with Goal 5 requirements. Field reconnaissance conducted in October and November 1996, supplements previous City surveys of the site in 1986-1987 and 1990-1991. For comparison purposes, the WHA form attributes a habitat "score" to each site so that relative functional values may be determined. From a habitat perspective, a resource with a WHA score of at least 45 is significant; the following section reviews significance criteria for other resource values.

As the following habitat rating summary indicates, the Lava Domes is a significant resource site. A sample of the Wildlife Habitat Assessment form is provided in Appendix C. An explanation of the low to high rankings shown below is provided in Appendix D.

**Habitat Rating:**

<b>Wildlife Habitat Score:</b>	<b>78</b>	<b>Range for City Resource Sites: 6 - 106</b>
Water:	Moderately High	<b>Range for Lava Domes districts: 23 - 91</b>
Food:	High	
Cover:	Moderately High	
Interspersion :	Medium	
Uniqueness :	Medium	
Disturbance :	Medium	

*Sensitive Species*

In response to the City's request, the U.S. Fish and Wildlife Service (USFWS) provided a list of potential threatened and endangered species, and species proposed for listing, within the study area; USFWS also provided a list of candidate species and species of concern. The City also requested and received information on sensitive species occurrence from the Oregon Department of Fish and Wildlife and the Oregon Natural Heritage Program (ONHP) database. In addition, published information on sensitive plants and animals was consulted. A copy of the letter from the USFWS listing potentially occurring species is provided in Appendix F. A detailed review of the requirements and known occurrence of each identified species is contained in Appendix G. Table 2 provides a summary of identified species, their federal and state status, and their known (or expected) occurrence within the study area.

*Resource Significance*

The object of the inventory is to establish the location, quantity and quality of resources within the Lava Domes site. To evaluate the relative significance of a resource, several factors were considered. "Decision factors" and "contributing factors" were established by the City to weigh the significance of individual resources (see Table 3 below). These factors are tied to identified resource values. Depending on the location, quantity and

quality of the particular resource, these values may be important or they may not be important. If the values are important when considering the factors identified in Table 3, the resource was deemed significant. Decision factors are those factors which, on their own, are important and establish the significance of a resource. Contributing factors may have limited or moderate importance on their own, but when two or more contributing factors for the same resource are combined, that resource is deemed significant. Table 3 shows the significance factors established for the Lava Domes inventory, based on similar factors adopted for other City resource sites.



Significance field sheets were completed for each subdistrict as part of the field reconnaissance. A sample field sheet is included in Appendix K. The site's resources provide multiple values that meet the significance factors of Table 3. For example, the resource provides habitat for threatened, endangered or state listed sensitive species and its Wildlife Habitat Assessment score exceeds 45 making it significant in terms of fish and wildlife habitat values. Other significant values include slope/soil stabilization, water purification and flood desynchronization.

The supplemental inventory conducted as part of the present study confirms the City's prior determination (as part of the *Johnson Creek Basin Protection Plan*) that the Lava Domes is a significant Goal 5 resource site.

**Table 2. Status of Potential Sensitive Species within the Lava Domes**

Scientific Name	Common Name	Federal Status	State Status	Presence
<b>Plants</b>				
<i>Aster curtus</i>	white top aster	SOC	LT	P
<i>Castilleja levisecta</i>	golden Indian paintbrush	LT	LE	N
<i>Cimicifuga elata</i>	tall bugbane	SOC	C	Yes
<i>Delphinium leucophaeum</i>	pale larkspur	SOC	LE	P
<i>Delphinium pavonaceum</i>	peacock larkspur	SOC	LE	P
<i>Erigeron decumbens decumbens</i>	Willamette daisy	C	LE	P
<i>Howellia aquatilis</i>	Howellia	LT	-	N
<i>Lomatium bradshawii</i>	Bradshaw's lomatium	LE	LE	N
<i>Lupinus sulphureus</i> v. <i>kincaidii</i>	Kincaid's lupine	SOC	LT	N
<i>Montia howellii</i>	Howell's montia	SOC	C	P
<i>Siladacea nelsoniana</i>	Nelson's checker-mallow	LT	LT	P
<i>Sullivantia oregana</i>	Oregon sullivantia	SOC	C	P
<b>Fish and Wildlife</b>				
<i>Clemmys marmorata marmorata</i>	northwestern pond turtle	SOC	SC	P
<i>Dryocopus pileatus</i>	pileated woodpecker	-	SV	Yes
<i>Empidonax traillii brewsteri</i>	little willow flycatcher	SOC	-	P
<i>Haliaeetus leucocephalus</i>	bald eagle	LT	LT	N*
<i>Myotis evotis</i>	long-eared myotis	SOC	SU	P
<i>Myotis thysanodes</i>	fringed myotis	SOC	SV	P
<i>Myotis volans</i>	long-legged myotis	SOC	SU	P
<i>Myotis yumanensis</i>	yuma myotis	SOC	SU	P
<i>Onchorhynchus clarki clarki</i>	cutthroat trout	-	SC	Yes
<i>Onchorhynchus kisutch</i>	coho salmon	C	SC	P
<i>Plecotus townsendii townsendii</i>	Pacific western big-eared bat	SOC	SC	P
<i>Rana aurora aurora</i>	northern red-legged frog	SOC	SU	Yes

**Legend**

LE = Listed Endangered  
 LT = Listed Threatened  
 PT = Proposed Threatened  
 C = Candidate

SOC = Species of concern

SC = Sensitive-Critical  
 SV = Sensitive-Vulnerable  
 SU = Sensitive-Undetermined  
 Yes = Species detected at site

P = Potential occurrence  
(suitable habitat, range)

N = Not expected based on  
habitat, range

N\* = Not expected though  
reported nearby

**Table 3. Significance Factors**

Resource Value	Decision Factors	Resource
Fish/Wildlife Habitat	<ul style="list-style-type: none"> <li>- habitat for threatened, endangered or state-listed sensitive species; or</li> <li>- Wildlife Habitat Assessment score is 45 points or more; or</li> <li>- resource connects or enhances significant habitats</li> </ul>	Forest/stream/wetland/other
Slope/Soil Stabilization	<ul style="list-style-type: none"> <li>- slopes &gt;50% have minimum 75% woody vegetative cover</li> <li>- slopes 30-50% have 100% woody vegetative cover</li> </ul>	Vegetation, soil
Water Purification	<ul style="list-style-type: none"> <li>- 75% of creek length has &gt;25% riparian cover; or</li> <li>- streamside wetlands filter pollutants, nutrients, sediment</li> </ul>	Vegetation/wetland
Flood Storage & Desynchronization	<ul style="list-style-type: none"> <li>- located within the 100-year floodplain; or</li> <li>- creek channel, floodplain or adjacent wetlands provide measurable reduction of intensity of floods</li> </ul>	Floodplain/wetland/other
Groundwater Recharge & Discharge	<ul style="list-style-type: none"> <li>- uplands allow recharge of groundwater which supplies domestic use or its discharge into creek sustains summer flow</li> <li>- infiltration significantly reduces storm runoff and flood peaks</li> </ul>	Soil/seep/spring
Water Supply	<ul style="list-style-type: none"> <li>- groundwater or surface water use (with water right)</li> </ul>	Stream/groundwater (well)
Heritage	<ul style="list-style-type: none"> <li>- unique cultural, scenic or natural value</li> </ul>	Archeological site/other

Resource Value	Contributing Factors	Resource
Fish/Wildlife Habitat	<ul style="list-style-type: none"> <li>- positive off-site influence on threatened, endangered or state-listed sensitive species habitat; or</li> <li>- Wildlife Habitat Assessment score between 35 and 44</li> </ul>	Forest/stream/wetland/other
Slope/Soil Stabilization	<ul style="list-style-type: none"> <li>- slopes of 30-50% have minimum 75% woody vegetative cover</li> <li>- slopes &gt;20% have 100% herbaceous or mixed herbaceous/woody vegetative cover</li> </ul>	Vegetation/soil
Storm Drainage	<ul style="list-style-type: none"> <li>- watercourse conducts runoff, sediments, nutrients</li> </ul>	Stream
Education	<ul style="list-style-type: none"> <li>- current or potential public educational uses; or</li> <li>- ecologically or scientifically significant area</li> </ul>	Vegetation/wetland/other
Recreation	<ul style="list-style-type: none"> <li>- open space area, public park or right-of-way; and</li> <li>- potential for recreational use without significant impacts</li> </ul>	Forest/stream/wetland/other
Aesthetics/Scenic Amenity	<ul style="list-style-type: none"> <li>- City-identified scenic resource; or</li> <li>- provides amenity value for nearby park, development or road</li> </ul>	Forest/stream/wetland/other
Buffering Land Uses	<ul style="list-style-type: none"> <li>- visual or auditory buffer bet/neighborhoods, land uses</li> </ul>	Forest/other

## **Economic, Social, Environmental, and Energy Consequences**

This section analyzes the consequences of protecting significant natural resources in the Lava Domes, and the consequences of allowing these resources to be degraded or destroyed. The analysis addresses four types of consequences: economic, social, environmental and energy.

As part of this process, local governments must identify conflicting uses within inventoried Goal 5 resource areas. According to the Goal 5 administrative rule, a conflicting use is one that, if allowed, could negatively impact a significant resource site. Such uses are permitted in the Portland base zones as allowed uses, uses subject to limitations, or conditional uses. Conflicting uses not allowed in a base zone may be permitted by recognition of legal nonconforming status or as a temporary activity. Within the Lava Domes, housing and cemetery uses are the most common existing uses, but other uses exist and still other uses are allowed under the zoning code though they do not presently exist. This analysis addresses all conflicting uses whether existing or not. The analysis does not address "revocable uses" because the Lava Domes does not contain properties with existing revocable use permits and new revocable uses are prohibited.

The administrative rule directs local governments to examine the uses allowed within broad zoning categories (e.g., residential, commercial). For the purpose of this analysis, the following zones within the Lava Domes were identified: Open Space (OS), Residential 10,000 (R10), Residential 7,000 (R7), Residential 5,000 (R5), Residential 3,000 (R3), Residential 2,000 (R2), General Commercial (CG), General Employment 2 (EG2) and General Industrial 2 (IG2). Significant resources at the site, however, are located only within areas zoned OS, R10, R7, R5 and R2. Therefore, this analysis addresses uses allowed within these four zones that may conflict with identified significant resources. Table 4 provides a list of allowed uses within each zone.

### **Conflicting Uses Permitted by Zoning**

The following discussion identifies existing and potential conflicting land uses in each zone, including a brief examination of how an existing overlay zone and a plan district affect conflicting uses within the site. The discussion also includes an examination of the uses not assigned to a single zoning category, such as temporary uses. The analysis of economic, social, environmental, and energy consequences of protecting significant resources addresses the existing and the potential conflicting uses allowed within the resource site.

#### **Open Space (OS)**

Open Space zoning applies to five areas within the site, all located at the western end of the site. Two of these areas—Scottsridge Park and the Interstate 205 (I-205) right-of-way—contain no significant resources and are therefore not part of this analysis. The

three areas where conflicting open space uses may occur are at the Willamette National Cemetery, Tenino Park and Council of Portland property. The 205-acre cemetery is located east of SE 112th Avenue and north of Mt. Scott Boulevard. Tenino Park (2 acres) and the Council of Portland property (16 acres) are both undeveloped properties. The park is located east of SE 92nd Avenue on SE Tenino Court. The Council of Portland land is located east of SE 122nd Avenue and south of SE Flavel Street. Conflicting uses and affected site area within OS zones are summarized in Table 5.

The OS zone is intended to preserve public and private open and natural areas identified in the Comprehensive Plan. Agriculture, certain park and open area uses, and certain limited broadcast facilities are allowed by right in the OS zone. Park and open area facilities are generally allowed as conditional uses. Retail sales and service uses are allowed only if they are associated with a park and open area use and then only as conditional uses. Several "institutional" uses are allowed as conditional uses: basic utilities, community service, schools and daycare. Rail lines and utility corridors, mining and certain broadcast facilities are permitted as conditional uses as well.

Temporary activities are permitted in the OS zone subject to certain conditions. The following temporary activities are permitted: fairs, carnivals and other special events; temporary actions to respond to natural disasters and emergencies; and, staging areas for public utility installation. Existing conflicting uses within OS land are limited to the developed facilities and grounds of the Willamette National Cemetery. Other Open Space lands—Tenino Park, Council of Portland and the undeveloped portions of the cemetery—do not presently contain conflicting uses.

### **Low Density Single-dwelling Residential (R10)**

The R10 zone applies to approximately 870 acres or roughly two-thirds of the Lava Domes. While some of this land is developed with housing or in agricultural use, much of it is undeveloped forest land containing significant resources. The entire site east of SE Deardorff Road is zoned R10. Between Deardorff and SE 112th Avenue, the only non-R10 land is the cemetery and Council of Portland open space properties described above. One 5-acre R10 property is located west of 112th at SE 105th and Henderson. Conflicting uses and affected site area within R10 zones are summarized in Table 5.

The R10 zone is intended for areas with public services but which are subject to significant development constraints. The maximum density is generally 4.4 units per acre, although this may be reduced by as much as 75 percent on steep slopes by plan district development standards as described below. Household living, certain park and open area uses and certain broadcast facilities are permitted by right in the R10 zone. Some parks, open areas and broadcast facilities are permitted subject to limitations or as conditional uses. Group living uses, institutional uses, agriculture and rail lines and utility corridors are permitted as conditional uses.

Under certain conditions, the following temporary activities are allowed in the R10 zone: mobile home use during construction; residential sales offices; garage and seasonal outdoor sales; fairs, carnivals and other major public gatherings; show of model homes; temporary actions to respond to natural disasters and emergencies; and, staging areas for public utility installation.

Existing conflicting uses within R10 land include single-dwelling homes (with driveways, yards and accessory uses), agricultural uses, public streets and utilities.

**Table 4. Uses Permitted by City of Portland Zoning within the Lava Domes**

Use Categories	Base Zones				
	OS	R10	R7	R5	R2
<b>Residential Categories</b>					
Household Living	N	Y	Y	Y	Y
Group Living	N	CU	CU	CU	L/CU
<b>Commercial Categories</b>					
Retail Sales and Service	CU	N	N	N	N
Commercial Outdoor Recreation	CU	N	N	N	N
<b>Institutional Categories</b>					
Basic Utilities	CU	CU	CU	CU	CU
Community Service	CU	CU	CU	CU	CU
Parks and Open Areas	L/CU	L/CU	L/CU	L/CU	L/CU
Schools	CU	CU	CU	CU	CU
Colleges	N	CU	CU	CU	CU
Medical Centers	N	CU	CU	CU	CU
Religious Institutions	N	CU	CU	CU	CU
Daycare	CU	L/CU	L/CU	L/CU	L/CU
<b>Other Categories</b>					
Agriculture	Y	CU	CU	N	N
Mining	CU	N	N	N	N
Radio and Television Broadcast Facilities	L/CU	L/CU	L/CU	L/CU	L/CU
Rail Lines and Utility Corridors	CU	CU	CU	CU	CU

**Legend**

Y: Permitted subject to the development standards of zone and other regulations of Title 33

L/CU: Permitted with certain limitations or as Conditional Use

CU: Permitted as Conditional Use

N: Prohibited in this zone

Note: Uses prohibited in all of the above zones are not included in this table.

**Table 5. Conflicting Uses and Area by Zone**

Zone	Area	Existing Conflicting Uses	Potential Conflicting Uses
OS	253 acres	cemetery	commercial, institutional, agriculture, mining, broadcast facilities, rail/utility corridors, temporary uses
R10	867 acres	residential (w/accessory uses), agriculture, streets and utilities	residential, institutional, agriculture, broadcast facilities, rail/utility corridors, temporary uses
R7	225 acres	residential (w/accessory uses), streets and utilities	residential, institutional, agriculture, broadcast facilities, rail/utility corridors, temporary uses
R5	3 acres	residential (w/accessory uses), streets and utilities	residential, institutional, broadcast facilities, rail/utility corridors, temporary uses
R2	25 acres	residential (w/accessory uses), streets and utilities	residential, institutional, broadcast facilities, rail/utility corridors, temporary uses

**Medium Density Single-dwelling Residential (R7)**

The Lava Domes site contains approximately 225 acres of medium density single-dwelling residential (R7) land. This land is located at the west end of the site, generally between SE 112th Avenue and I-205. A small area of R7 land is located west of I-205 at SE Harney Street and 86th Avenue, but this land does not contain significant resources and is not included in the present analysis. Conflicting uses and affected site area within R7 zones are summarized in Table 5.

The R7 zone is intended for areas with adequate public services but minor development constraints. The maximum density is generally 6.2 units per acre, although this may be reduced by as much as 75 percent on steep slopes by plan district development standards as described below. Household living, certain park and open area uses and certain broadcast facilities are permitted by right in the R7 zone. Some parks, open areas and broadcast facilities are permitted subject to limitations or as conditional uses. Group living uses, institutional uses, agriculture and rail lines and utility corridors are permitted as conditional uses.

Under certain conditions, the following temporary activities are allowed in the R7 zone: mobile home use during construction; residential sales offices; garage and seasonal outdoor sales; fairs, carnivals and other major public gatherings; show of model homes; temporary actions to respond to natural disasters and emergencies; and, staging areas for public utility installation.

Existing conflicting uses within R7 land include single-dwelling homes (with driveways, yards and accessory uses), public streets and utilities.

**High Density Single-dwelling Residential (R5)**

Only four R5 lots, totaling 3 acres of land, contain significant resources within the Lava Domes. This land is located at the west end of the site, immediately east of I-205 and north of SE Tenino Court. Conflicting uses and affected site area within R5 zones are summarized in Table 5.

The R5 zone is intended for areas with good public services and no development constraints. The maximum density is generally 8.7 units per acre, although this may be reduced by as much as 75 percent on steep slopes by plan district development standards as described below. Household living, certain park and open area uses and certain broadcast facilities are permitted by right in the R5 zone. Some parks, open areas and broadcast facilities are permitted subject to limitations or as conditional uses. Group living uses, institutional uses, and rail lines and utility corridors are permitted as conditional uses.

Under certain conditions, the following temporary activities are allowed in the R5 zone: mobile home use during construction; residential sales offices; garage and seasonal

outdoor sales; fairs, carnivals and other major public gatherings; show of model homes; temporary actions to respond to natural disasters and emergencies; and, staging areas for public utility installation.

Existing conflicting uses within R5 land are single-dwelling homes (with driveways, yards and accessory uses), public streets and utilities.



**Low Density Multi-dwelling Residential (R2)**

The R2-zoned land is located in four areas at west end of site. Two of these areas, located west of I-205, do not contain significant resources and are therefore not part of this analysis. Of the areas with significant resources, one 7-acre area is located south of SE Knapp Street and east of I-205; this area is part of the Freeway Land site. The other area, of approximately 12 acres, is located south of Mt. Scott Boulevard and immediately east of I-205. Conflicting uses and affected site area within R2 zones are summarized in Table 5.

The R2 zone is a multi-dwelling residential zone that is intended for areas with good public services and no development constraints. The maximum density is generally 21.8 units per acre but may go up to 32 units per acre in some situations. Density may also be reduced by as much as 75 percent on steep slopes by plan district development standards as described below. Household living, certain park and open space uses and certain broadcast facilities are permitted by right in the R2 zone. Some parks, open areas and broadcast facilities are permitted subject to limitations or as conditional uses. Group living uses, institutional uses, and rail lines and utility corridors are permitted as conditional uses. Unlike other zones discussed above, agriculture uses are prohibited in the R2 zone.

Under certain conditions, the following temporary activities are allowed in the R2 zone: mobile home use during construction; residential sales offices; garage and seasonal outdoor sales; fairs, carnivals and other major public gatherings; show of model homes; temporary actions to respond to natural disasters and emergencies; and, staging areas for public utility installation.

Existing conflicting uses are associated with a recent apartment complex development in the R2 area located south of Mt. Scott Boulevard. Conflicting uses are residential (w/accessory uses), streets and utilities.

**Plan District and Overlay Zones**

In addition to the base zones described above, portions of the Lava Domes site are within overlay zones and the entire site is within the Johnson Creek Basin Plan District.

The plan district sets out standards that limit tree removal, stormwater discharge and impervious surfaces. It also contains provisions that limit housing densities and development impacts on steep slopes, and allows for the transfer of development rights from constrained sites.

Three overlay zones apply within the Lava Domes: Environmental Conservation (c), Environmental Protection (p) and Alternative Design Density (a). The Conservation overlay applies to most of the streams, forested slopes and natural resources within the site. This overlay allows development so long as impacts to natural resources can be

controlled and mitigated. The Protection overlay only applies to a stream in the northeast corner of the site near Jenne and Foster Roads that was originally considered part of Site 27. This overlay sets out strict limitations on all development to ensure that affected natural resources are protected. The third overlay is Alternative Design Density zone which applies to residential land generally within one mile of I-205 at the western end of the site. This zone allows increased density in the form of accessory rental units and similar development that meets design compatibility requirements.

## **Consequences of Allowing Conflicting Uses**

The preceding discussion identified existing and potential conflicting uses allowed within the Lava Domes site. If these uses actually occurred at the intensities allowed by zoning, they would diminish or destroy identified values of one or more resources in the site.

This section describes the impacts of permitted uses on resource areas within the plan area. Where the report identifies the same impacts for different conflicting uses, reference is made to the first analysis of these impacts; in other words, the analysis is not repeated. This section analyzes the consequences of limiting or prohibiting these uses within the Lava Domes.

### **Residential Uses**

Residential uses identified in the zoning code include household living and group living. Household living is residential occupancy of a dwelling unit by a household. Group living is different from household living in that it involves occupancy of a structure by a group of people who do not meet the definition of a household. For the purpose of a conflicting uses analysis, both types of residential uses can degrade or destroy natural resources during construction and use of residential structures. This section examines the consequences of housing, for both households and group living situations, on Goal 5 resources.

Housing is permitted in the three residential zones within the site; it is prohibited in the open space zone. In addition to the construction of homes, housing may include the construction of garages and other accessory buildings, access drives, parking areas, landscaped areas, utility connections and related development.

Preparing land for housing commonly includes removal of vegetation. Removal of vegetative cover eliminates habitat for native wildlife. Lost habitat includes feeding, nesting, perching and roosting places for birds, and loss of feeding, breeding and refuge areas for mammals, herptiles and insects. Clearing also removes structural features of the forest such as multiple layered canopies, snags and downed logs, and large trees. These important habitat components are removed and replaced with ecologically barren buildings, fences, lawns, driveways, parking lots and other impervious surfaces.

Forest fragmentation caused by the clearing of vegetation for residential uses increases the isolation of one habitat area from another. This can form barriers to wildlife migration and can limit the flow of genetic material. Roads (and roadway traffic) and fences can also form barriers to wildlife migration. As the range of habitat for indigenous wildlife becomes restricted and isolated, opportunities for recruitment from other areas are limited and wildlife populations become vulnerable to disease, predation and local extinction.

Household lights, loud noises and other outdoor activities disturb the breeding and predator instincts of animals. Activity levels as defined by noise and movement increase from between 10 and 100 times that of normal (natural system) producing disruptions in competition, communication, mating and predation habits of animals, and making it difficult or impossible for native species to exist (Brown 1987). Additionally, household litter and garbage in resource areas degrades habitat values, and household pets can kill or injure native wildlife and compete for limited space.

The steep slopes of the site become susceptible to erosion, slumping and landslides when forest cover is removed and when cuts and fills are made for roads and buildings. Vegetation clearing and site grading activities accelerate soil loss and erosion, and can precipitate landslides and flooding, posing significant hazards to people and property and degrading habitat values. Soil loss and erosion can also result from common construction activities such as vegetation removal, grading and compaction on sites with gentle slopes. These activities can reduce the capacity of soil to support vegetation and effect groundwater recharge by reducing soil fertility, micro-organisms, seeds and root stocks, and damaging soil structure.

The construction of homes, roads and other impervious surfaces has adverse consequences beyond those described above. The adverse impacts of impervious surfaces include the following:

- Increases erosion, flooding and landslides
  - Increased impervious surfaces increase storm runoff and peak flows, resulting in soil loss and erosion, bank undercutting and failure, and potential landslides and floods;
  - These activities can damage soil structure and fertility, degrade or eliminate wildlife habitat, and can result in public safety hazards.
- Alters hydrology
  - Increased impervious surfaces reduce groundwater recharge, alter the volume of water in wetlands and surface drainages contributed by groundwater, form a barrier to plant growth and wildlife movement, and interfere with the transfer of air and gases;
  - This can alter an area's hydrology by lowering surface water levels or groundwater tables and removing a local source of water and moisture essential to the survival of fish, amphibians and aquatic organisms as well as terrestrial animals.
- Increases pollution
  - Leaks (e.g., oil, gas, tar, antifreeze) from vehicles, heating and cooling systems, and roofs degrade habitat and water quality;
  - Pesticides, herbicides and fertilizers applied to landscaped areas can pollute ground and surface waters, and degrade habitat;
  - Dirt and mud eroded from cultivated land or deposited from vehicles can cause sedimentation of wetlands and streams;
  - Septic drain fields can contaminate ground and surface waters;
  - Heated runoff from roads and parking lots can cause thermal pollution and have detrimental effects on local fish runs.

Other detrimental impacts of housing include reduction of open space, an degradation of scenic and recreational values. Common residential landscaping practices also can have detrimental impacts. The removal of native vegetation and the establishment of lawns and non-native landscape features reduce resource values.

Lawns in particular can be ecological deserts. Lawns are maintained as monocultures often with herbicides, fertilizers and pesticides which degrade nearby habitat areas and water quality. They require regular irrigation which reduces drinking water supplies and can exacerbate summer water shortages.

Landscape trees, shrubs and groundcover plants often include invasive, non-native species that escape into natural areas and compete aggressively with natives. Ivy, holly and laurel are commonly used in residential landscaped areas within the Lava Domes.

Higher density housing can have greater detrimental impacts per unit area than lower density housing, but the opposite can also be true depending on the form and layout of the development. For example, a clustered R5 development that sets aside large areas of open space on a site can have fewer impacts than an R10 development that has developed lots covering the entire site.

### **Commercial Uses**

Commercial uses are prohibited within the site except for two types of conditional uses in the open space (OS) zone: commercial outdoor recreation and retail sales and service associated with park and open areas use.

Commercial outdoor recreation includes such uses as amusement and theme parks and zoos. Retail sales and service related to parks and open areas can include gift shops, food sales and associated uses such as parking. These uses have all of the effects described for residential uses above. However, recreation facilities such as amusement parks or zoos are typically designed for large groups of visitors and therefore the detrimental effects of vegetation removal, building construction and human use in general can be dramatically greater than those described for housing above. In addition, parking lots which are not normally a major impact for housing are common with such commercial uses and substantially increase the detrimental impacts of impervious surfaces (e.g., reduced infiltration and higher runoff, lower groundwater levels, interference with the transfer of air and gases from the soil, etc.). Such commercial uses also can significantly diminish or destroy open space, scenic and recreational values.

### **Institutional Uses**

Institutional uses are limited or conditional uses in both residential and open space zones within the site. In residential zones, eight different categories of institutional uses are permitted, ranging from parks and open areas (with relatively few adverse impacts) to colleges and medical centers (with greater impacts). In open space zones, colleges, medical centers and religious institutions are prohibited and five institutional categories are permitted. Because of the wide range of impacts, the impacts of each category are briefly reviewed below.

Basic utilities are infrastructure services such as water and sewer pump stations, electrical substations, and water towers that need to be located in or near the area where the service is provided. Although operation of existing facilities may have few adverse environmental effects, construction and maintenance practices for new basic utilities have a variety of adverse effects. These activities often create cleared corridors which increase wind and light penetration into forest and other habitats providing opportunities for the establishment of invasive, non-native plant species. Construction often fragments wildlife habitat areas, degrades wetlands and streams, increases stormwater runoff and erosion, and reduces forest cover. Basic utility construction generally has the same effects as those described for housing. Certain types of basic utilities, such as stormwater retention areas, sediment traps and constructed wetland pollution treatment facilities can have beneficial environmental effects if located without disruption to existing resources. However, replacement of existing resource areas with these facilities normally has detrimental effects.

Community service uses provide a local service to people of the community (examples include libraries, museums and community centers). These uses have the same effects as those described for commercial uses.

Parks and open area uses focus on natural areas, community gardens or public squares. These lands tend to have few structures and include parks, golf courses, cemeteries, recreational trails and botanical gardens. Willamette National Cemetery is the only developed park and open area use within the site. Parks and open areas construction and maintenance practices can cause erosion and damage vegetation and habitat. Removal of vegetation, creation of impervious surfaces such as roads, parking lots and tennis courts, and construction of buildings are activities commonly associated with development of parks and open areas. The environmental consequences of these activities are similar to those described for housing except that normally a substantially smaller percentage of land area is covered by impervious surfaces. Intensive recreation such as cycling, motoring and equestrian sports also cause erosion, particularly when they occur off maintained trails. Unleashed domestic animals in parks and open areas can injure or kill wildlife.

Schools, colleges, medical centers and religious institutions are separate institutional categories but have similar effects. Schools include public and private schools through high school level. Colleges include universities, colleges and seminaries. Medical centers include hospitals and tend to be on multiple blocks or in campus settings. Religious institutions provide meeting areas for religious activities and include churches, temples, synagogues and mosques. Structures and facilities (including parking areas) associated with these uses have the same effects as commercial uses. Grounds maintenance has the same effects as those described for parks and open areas.

Daycare includes preschools, nursery schools and adult daycare programs. Daycare uses are normally small in size and often are contained within other institutional use buildings (e.g., medical centers, religious institutions and community service providers). When

within such existing buildings, daycare impacts are limited to the additional new parking or building facilities required for the use. These new facilities have the same impervious surface and vegetation clearing effects as housing. Daycare centers independent of other uses have the same effects as housing, except that larger buildings and parking areas increase the effects of impervious surfaces.

### **Agriculture**

Agriculture is allowed in the OS zone and is a conditional use in the R10 and R7 zones. Agriculture is prohibited in the R2 zone.

Clearing vegetation, plowing fields, exposing bare soils and other farm practices cause erosion which degrades water quality and can adversely impact aquatic habitat. The removal of forest cover for farming has the same effects as those for housing. The conversion of forest to farm land replaces diverse forest plant communities with few, cultivated species. Vegetation acts as a filter, cleansing runoff before it reaches streams or wetlands. Removal of vegetation for agricultural uses eliminates these benefits. Agriculture also commonly involves the use of pesticides, herbicides and fertilizers. These chemicals can contaminate surface and groundwater areas and harm wildlife. Animal fecal contamination can occur as a result of pasture use and can have similar environmental effects.

Agriculture often draws irrigation water from wells. Extensive use of groundwater can result in draw down of the water table, which in turn can reduce surface drainage flows and eliminate a water source for wildlife.



## **Mining**

Mining is a conditional use in the open space zone and is prohibited in the site's residential zones. Mining generally has the most severe environmental impacts of all uses within the site. All resources, both above and below ground are eliminated. Once a mining operation is closed, some restoration of soil, vegetation and other resources may be possible but resources will remain permanently degraded.

As a practical matter, open space uses within the site are either committed (i.e., the Willamette National Cemetery) or too small to mine. Furthermore, mineral or aggregate resources are considered Goal 5 resources and no existing or potential mineral or aggregate resource mining operations are identified within this site (see BOP 1988).

## **Radio and TV Broadcast Facilities**

Most low powered transmitters such as cordless telephones and citizen band radios are allowed in all zones. More powerful and larger radio and television broadcast facilities are allowed subject to limitations or as conditional uses within the Lava Domes. Their effects are generally the same as those of basic utilities, but with greater adverse visual effects.

## **Rail Lines and Utility Corridors**

Rail lines and utility corridors are allowed as conditional uses in all Lava Dome zones. Their effects are the same as basic utilities, except that construction of rail lines often requires substantial excavation and fill to meet 0-3 percent slope standards. Generally, the additional grading results in a greater area of resource disturbance and greater degradation of soil, vegetation and both terrestrial and aquatic habitat resources.

## **Consequences of Limiting or Prohibiting Conflicting Uses**

The environmental consequences of limiting or prohibiting conflicting uses are summarized below. Other consequences are discussed in the following sections of the ESEE analysis.

Limiting or prohibiting uses which conflict with identified natural resources clearly has direct benefits for these same resources. The natural resources and values described previously are protected through the control or elimination of conflicting uses. Since these resources are part of an interconnected natural system, protection of one resource normally has beneficial consequences for other resources. Protection of forest vegetation, for example, will maintain food and cover habitat for wildlife, stabilize and protect soils and steep slopes, filter out potential air and water pollutants, and sustain surface and groundwater resources.

Limiting or prohibiting conflicting uses protects forests, soils, geologic features, wildlife habitat, surface drainages, wetlands, groundwater reserves and domestic water supplies. Slope stabilization, erosion control, and flood storage functions would be protected, reducing the area's susceptibility to landslides, floods and similar hazards. Open space, recreation, scenic and heritage resources would also be protected. Limiting or prohibiting conflicting uses also would preserve the site's significant contribution to local neighborhood identity and livability.

## **Economic Consequences**

It is important to carefully separate the economic consequences on conflicting uses that exist due to physical constraints and those associated with protecting significant resources. There are increased costs incurred in the design and construction of any structures and roads where slopes, soils, streams or floodplains are an issue.

It should also be noted that the Johnson Creek Basin Plan District already places constraints on development in the study area. Housing density, lot size, impervious surfaces and stormwater runoff are all limited within the district. The district uses slope categories to guide development (Section 33.535.210). Class I lands are allowed a maximum density that is one-fourth that of the base zone. These lands occur in the FEMA floodways or on slopes with a grade of 30 percent or greater. Class II lands are allowed one-half the maximum density of the base zone. These lands are located on slopes with grades between 20 and 30 percent. Development patterns on both Class I and II lands are approved through Planned Unit Development and/or cluster development.

Both Class I and II lands also have minimum lot sizes for subdivisions and major partitions (Section 33.535.220). Section 33.535.230 calls for the conservation of Class I and II lands through the designation of open space in the locations where these lands occur.

### **Economic Consequences on Resources**

In determining the economic consequences of protecting significant resources, it is first necessary to define value with respect to a significant resource. Many of the benefits of environmental policies are not readily apparent in the form of immediate monetary gains. The benefits are found more in an increase in the quality of life than in any increment to a region's economic output. Environmental features have been shown to increase property values as they provide aesthetic and recreational pleasure and a more livable environment (see Appendix G). As a result, properties next to these features have higher property values and produce greater tax revenues.

Environmental resources have "irreversibility" properties. If the resource is not preserved, it is likely to be eliminated with little or no chance of regeneration. In addition, environmental resources have uncertainty. Since the future is unknown, there is a potential cost if the resource is eliminated and a future choice is foregone. Many environmental resources are considered "positive undepletable externalities" or public goods. If one person increases their consumption of the good, it does not preclude or reduce its availability to others.

Some benefits from significant resources can be found beyond the immediate resource area. For example, the capacity of a wetland to purify and recharge aquifers benefits an entire watershed. When benefits occur off-site, wetland owners cannot capture the value

of these benefits directly. As a result, the market price per acre of wetland area does not fully reflect a true exchange value relative to other goods. In fact, most environmental resources are not priced because they have no direct market where they are bought and sold like other products. This makes the establishment of value very difficult. Therefore, it is necessary to use other methods of identifying value in order to perform economic analysis. Numerous studies and techniques have been used to determine the value of environmental resources in terms of environmental goods (see Appendix H, The Nature of Environmental Goods).

*Intermediate Goods*

When environmental resources provide goods or services that are part of a production process and have commercial value, they are considered intermediate goods. These goods include factors that support commercial fisheries, water storage elements and the assimilation of wastes. Intermediate goods also include environmental resources that contribute to damage prevention such as pollution reduction, water purification, flood control, slope stabilization, and erosion control.

*Final Goods*

Environmental resources also provide final goods. These goods include recreational opportunities such as fishing, camping, boating and bird watching. In addition, the amenities produced by environmental resources (scenic views, proximity to wildlife habitat, educational opportunities, etc.) are reflected in increases in residential property values. Water supply and wildlife habitat are also considered final goods.

*Future Goods*

Environmental resources could potentially provide yet undiscovered benefits and/or provide benefits to future generations in the form of future goods and services. Although there is increased uncertainty for future goods and services, it is important to consider them in determining the value of environmental resources.

Table 6 below, classifies the resource values inventoried for this study into their respective environmental goods categories. The factors used to determine the significance of resources based on these values were identified in Table 3.

**Table 6. Environmental Goods Classifications**

<b>Resource Value</b>	<b>Nature of the Environmental Good</b>	<b>Resource</b>
Fish/Wildlife Habitat	Intermediate Good Final Goods and Services Future Goods and Services	Forest/stream/ wetland/other
Slope/Soil Stabilization	Intermediate Good	Vegetation, soil
Water Purification	Intermediate Good	Vegetation/wetland

Flood Storage and Desynchronization	Intermediate Good	Floodplain/wetland/ other
Groundwater Recharge and Discharge	Intermediate Good	Soil/seep/spring
Water Supply	Final Good	Stream/groundwater (well)
Heritage	Final Goods and Services Future Goods and Services	Archeological site/ other
Storm Drainage	Intermediate Good	Stream
Education	Final Goods and Services Future Goods and Services	Vegetation/wetland/ other
Recreation	Final Goods and Services Future Goods and Services	Forest/stream/ wetland/other
Aesthetics/Scenic Amenity	Final Goods and Services Future Goods and Services	Forest/stream/ wetland/other
Buffering Land Uses	Intermediate Good	Forest/other

## Other Factors Underlying Recommendations

In order to help weigh the respective economic consequences on resources and on conflicting uses, the resource significance factors discussed earlier are used in the evaluation. The significant resources were divided into three groups, A, B and C, referring to highest significance, highly significant and significant, respectively. A-quality resources are the highest rated within the study area, either through the number of decision and contributing factors met, the exceptional value of particular factors, or both. A-quality resources generally meet at least six decision factors. B-quality resources rated lower than A-quality resources but consistently meet three or more decision factors. C-quality resources are significant but may only satisfy one decision factor or two contributing factors. Figure 4 illustrates the location of A, B and C quality resources found in the Boring Lava Domes site.

Another convention employed in the analysis is the notion of a building envelope. Consistent with similar city code definitions, “building envelope” was defined as a 40-foot by 40-foot area in which residential building may occur. This convention aided in the evaluation of relative impacts of limiting or prohibiting conflicting uses; for example, prohibiting such uses within a building envelope would eliminate a site’s development potential.

For larger parcels that contain significant resources, there is an increase in design costs. To accommodate this increase, Planned Unit Developments (PUDs), allow greater site design flexibility than conventional zoning and subdivision regulations. The intent of a PUD is to:

- Provide flexibility in architectural design, placement, and clustering of buildings; use of open areas and outdoor living areas; provision of circulation facilities and parking; and related site and design considerations;
- Encourage the conservation of natural features;
- Provide for efficient use of public services and improvements;
- Encourage and preserve opportunities for energy efficient development;
- Promote an attractive and safe living environment in residential zones.

PUDs have been used successfully throughout the study area. Developers have taken advantage of the marketing opportunities made available by the preservation of natural areas, careful integration of residential uses, and an understanding that amenity values can be capitalized into private land values.

Another factor considered during the analysis of conflicting uses is transfer of development rights (TDR). The Johnson Creek Basin Plan District allows transfers of residential density from protected properties to areas outside of the Lava Domes site. Housing density at eligible receiving sites can be increased by 50 percent (to 0.75 units per acre) and under certain conditions to one unit per acre.

Environmental resources have the characteristics of public goods. However, when resources are located on private property, the full benefit is not retained by the owner. In

this analysis, although public good benefits will be recognized, the evaluation will be done on a watershed basis. Individual property owners within the watershed do benefit directly from the accumulation of resource values, both up and downstream.

**Analysis by Watershed**

This analysis considers the economic consequences of prohibiting, limiting or allowing conflicting uses within the Lava Domes site. The site was analyzed watershed by watershed beginning with Cottonwood Creek, except where noted below. Maps of subdivisions and subdivision phases referenced in this analysis are available for review at the Bureau of Planning.

In this analysis, open space tracts dedicated within approved land divisions, whether “a” or “b” quality resources, are analyzed the same throughout the Lava Domes site, as displayed in Table 7:

**Table 7. Open Space Tract Analysis**

<b>Location</b>	<b>Action</b>	<b>Effect on Conflicting Use</b>	<b>Effect on Resource</b>	<b>Overall</b>
open space tracts*	prohibit	<b>Development Potential:</b> tracts are not developable except for certain utilities. <b>Cost Savings:</b> reduced maintenance & repair costs. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality; preserved wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive
	limit	<b>Development Potential:</b> currently has limited protection; tracts are not developable except for certain utilities. <b>Final Goods:</b> reduction in amenity values.	<b>Intermediate Goods:</b> risk of degradation of resources through clearing and grading activity.	Negative
	allow	<b>Development Potential:</b> utilities may be allowed in designated tracts. <b>Final Goods:</b> loss of amenity values.	<b>Intermediate Goods:</b> potential loss of resources through clearing and grading activity.	Negative

\* Includes land outside city limits but in urban services area. There are no water resources in the urban outside of city limits services area.

Cottonwood Creek Watershed

This watershed is located in the southwestern corner of the Lava Domes site in the vicinity of SE Tenino Ct. The watershed resources include Cottonwood Creek its tributaries, habitat areas, and forested riparian and upland areas. Cottonwood Creek, its tributary and a forested upland slope in the south of the watershed are of "b" quality located on a proposed development site, the back portion of developed lots, and on an undeveloped park with open space zoning. The “b” resources are also located on an open space tract and proposed multi-dwelling site in a recent subdivision in the urban services area. The remaining forested uplands are of "c" quality located on the back portion of developed lots and on a proposed development site. There are approximately 26.07 acres of “b” resources and 5.75 acres of “c” resources within the watershed.





Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
b	open space park	prohibit	<b>Development Potential:</b> precludes intensive park uses. <b>Cost Savings:</b> reduced maintenance & repair costs. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive
		limit	<b>Development Potential:</b> currently has limited protection; limits intensive park uses. <b>Final Goods:</b> moderate contribution to reduction in amenity values.	<b>Intermediate Goods:</b> risk of degradation of resources through clearing and grading for park improvements.	Negative
		allow	<b>Development Potential:</b> limited park options available. <b>Final Goods:</b> loss of amenity values.	<b>Intermediate Goods:</b> potential loss of resources through clearing and grading for park improvements.	Negative
b	developed lots*	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into existing and nearby residential lots.	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, slope stabilization, and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive (except where buildout not feasible)
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, and slope stability; increased risk of soil erosion.	Negative (along stream corridors)
		allow	<b>Development Potential:</b> density and open space limitations continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability and soil erosion.	Negative
b	vacant lots and parcels*	prohibit	<b>Development Potential:</b> potential loss of units if building envelopes affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, slope stabilization and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive along stream corridors outside building envelopes
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, slope stability and soil erosion.	Positive
		allow	<b>Development Potential:</b> density and open space limitations continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential degradation of water quality; loss of wildlife habitat; increased risk of slope instability and soil erosion.	Negative

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
c	developed lots	prohibit	<b>Development Potential:</b> potential loss of units if no possibility for buildable partition. <b>Final Goods:</b> limited amenity values capitalized into residential property.	<b>Intermediate Goods:</b> preserved wildlife habitat/erosion.	Negative (if loss of units)
		limit	<b>Development Potential:</b> currently most of the area has limited protection.	<b>Intermediate Goods:</b> risk of degradation of wildlife habitat /erosion.	Neutral (no unit loss)
		allow	<b>Development Potential:</b> density and open space limitations continue to apply.	<b>Intermediate Goods:</b> loss of wildlife habitat/erosion.	Negative
c	vacant parcels	prohibit	<b>Development Potential:</b> potential loss of units if no building envelope is available. <b>Final Goods:</b> amenity values capitalized into residential property.	<b>Intermediate Goods:</b> preserved wildlife habitat/erosion.	Negative if there is a loss of units
		limit	<b>Development Potential:</b> currently most of the area has limited protection.	<b>Intermediate Goods:</b> risk of degradation of wildlife habitat /erosion.	Neutral (no unit loss)
		allow	<b>Development Potential:</b> density and open space limitations continue to apply.	<b>Intermediate Goods:</b> loss of wildlife habitat/erosion.	Negative

\* Includes land within the urban services boundary that is presently outside the City limit. There are no water resources in the urban services area outside the City.

Veteran's Creek Watershed

This watershed is located on the north slope of Mt. Scott along Mt. Scott Blvd. Resources in the watershed include Veteran's Creek and its tributaries, habitat areas, and forested riparian and upland areas. Veteran's Creek and the steep forested slopes adjacent to it are of "a" quality located on portions of large parcels currently being considered for development, several large sparsely developed parcels, and on cemetery property. A tributary and an isolated reach of lower Veteran's Creek are of "b" quality located on an undeveloped parcel that is currently being considered for development and on an open space tract. The forested uplands and developed areas are of "c" quality adjacent to Mt. Scott Blvd. and on vacant land under consideration for development. There are approximately 34.04 acres of "a" resources, 5.11 acres of "b" resources and 18.79 acres of "c" resources within the watershed.

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	vacant and developed lots*	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if building envelopes affected. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, slope stabilization, and erosion control. <b>Final Goods:</b> water supply. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive outside building envelope

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, slope stability; increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability and soil erosion.	Negative
b	vacant parcels	prohibit	<b>Development Potential:</b> potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, slope stabilization, and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, slope stability and increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability and soil erosion.	Negative
c	vacant parcels	prohibit	<b>Development Potential:</b> potential loss of units if no building envelope is available. <b>Final Goods:</b> amenity values capitalized into residential property.	<b>Intermediate Goods:</b> preserved wildlife habitat.	Negative if there is a loss of units
		limit	<b>Development Potential:</b> currently has limited protection.	<b>Intermediate Goods:</b> risk of degradation of wildlife habitat in building envelope area.	Neutral (no unit loss)
		allow	<b>Development Potential:</b> density and open space limits continue to apply.	<b>Intermediate Goods:</b> loss of wildlife habitat over the entire site.	Negative
c	developed parcels	prohibit	<b>Development Potential:</b> potential loss of units if no building envelope is available. <b>Final Goods:</b> amenity values capitalized into residential property.	<b>Intermediate Goods:</b> preserved wildlife habitat.	Negative if there is a loss of units
		limit	<b>Development Potential:</b> currently most of the area has limited protection.	<b>Intermediate Goods:</b> risk of degradation of wildlife habitat in building envelope area	Neutral (no unit loss)
		allow	<b>Development Potential:</b> density and open space limits continue to apply.	<b>Intermediate Goods:</b> loss of wildlife habitat over the entire site.	Negative

\* Includes land within the urban services boundary that is presently outside the City limit.

Indian Rock Creek Watershed

This watershed is located to the west of SE 112th Ave. The resources in the watershed include Indian Rock Creek, habitat areas, heritage areas, and forested riparian and upland areas. The lower end of the creek contains steep forested slopes of “a” quality located on a vacant parcel. The remainder of the lower end of the watershed and the upper end are of “b” quality also located on a vacant parcel as well as the back portions of developed lots, and an open space tract. The center section of the creek is of “c” quality with resources located on developed lots. There are approximately 3.28 acres of “a” resources, 31.23 acres of “b” resources and 1.03 acres of “c” resources within the watershed.

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	vacant parcels	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties; heritage values for cultural resources.	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity and heritage values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat; slope stability and increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; Increased risk of slope instability and soil erosion.	Negative
b	vacant parcels	prohibit	<b>Development Potential:</b> potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality and wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, slope stability and increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; Increased risk of slope instability and soil erosion.	Negative

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
b	developed lots	prohibit	<b>Development Potential:</b> potential loss of units if no building envelope is available. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality and wildlife habitat; slope stabilization; and erosion control <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive (except where buildout is not feasible)
		limit	<b>Development Potential:</b> currently has limited protection; <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, slope stability and increased risk of soil erosion.	Negative
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability, and soil erosion.	Negative
c	developed lots		<b>Development Potential:</b> currently has limited protection; potential loss of units if there is no building envelope available. <b>Final Goods:</b> amenity values capitalized into residential property.	<b>Intermediate Goods:</b> preserved water quality and wildlife habitat.	Negative (if there is a loss of units otherwise positive)
			<b>Development Potential:</b> currently most of the area has limited protection.	<b>Intermediate Goods:</b> risk of degradation of water quality and wildlife habitat in building envelope.	Neutral (no unit loss)
			<b>Development Potential:</b> density and open space limits continue to apply.	<b>Intermediate Goods:</b> loss of water quality and wildlife habitat over the entire site.	Negative

Frog Creek Watershed

This watershed is located just east of SE 112th Ave. The resources in the watershed include Frog Creek, its tributaries, habitat areas, and forested upland areas. The upper and lower ends of the creek and its steep forested slopes are of “a” quality with resources located on open space tracts, cemetery property, and the back portions of developed lots. Adjacent steep upland slopes are of “b” quality with resources located on vacant lots, open space tracts, and the back portions of developed lots. Developed portions at the upper end of the creek are of “c” quality. There are approximately 29.35 acres of “a” resources, 6.40 acres of “b” resources and 2.05 acres of “c” resources within the watershed.

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	open space zoned land	prohibit	<b>Development Potential:</b> currently has limited protection; cemetery expansion potential reduced. <b>Final Goods:</b>	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, slope stabilization, and erosion control. <b>Final Goods:</b>	Positive

			amenity values capitalized into cemetery property and surrounding residential properties.	recreational uses in open space areas. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	
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Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
		limit	<b>Development Potential:</b> currently subject to development limitations. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> risk of degradation of water quality, wildlife habitat; increased risk of slope destabilization and soil erosion. <b>Final Goods:</b> some loss of recreational area. <b>Future Goods:</b> reduction in scenic area.	Negative
		allow	<b>Development Potential:</b> no expansion limitations. <b>Final Goods:</b> loss of amenity values and subsequent reductions in surrounding residential properties.	<b>Intermediate Goods:</b> loss of water quality and wildlife habitat; risk of slope destabilization & soil erosion. <b>Final Goods;</b> potential loss of recreational area. <b>Future Goods:</b> potential loss of scenic area.	Negative
a	developed lots	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, slope stabilization; and erosion control, ground water recharge and discharge areas. <b>Final Goods:</b> water supply. <b>Future Goods:</b> scenic area preserved for quality of life.	Positive (except where buildout is not feasible)
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, slope stability and increased risk of erosion.	Negative
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability, and soil erosion.	Negative
b	vacant lots	prohibit	<b>Development Potential:</b> potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preservation of wildlife habitat; slope stabilization; erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> some risk of degradation of wildlife habitat; slope instability and increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> currently subject to existing density reductions on sloped lands and potential open space set-aside areas. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> loss of wildlife habitat; increased risk of slope instability, and soil erosion.	Negative



Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
c	developed lots	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if no building envelope is available. <b>Final Goods:</b> amenity values capitalized into residential property.	<b>Intermediate Goods:</b> preserved water features and wildlife habitat.	Negative (if there is a loss of units)
		limit	<b>Development Potential:</b> currently most of the area has limited protection.	<b>Intermediate Goods:</b> risk of degradation of water features and wildlife habitat in building envelope area.	Neutral (no potential unit loss)
		allow	<b>Development Potential:</b> density and open space limits continue to apply.	<b>Intermediate Goods:</b> loss of water features and wildlife habitat over the entire site.	Negative
c	vacant lots	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if no building envelope is available. <b>Final Goods:</b> amenity values capitalized into residential property.	<b>Intermediate Goods:</b> preserved water features and wildlife habitat.	Negative if there is a loss of units
		limit	<b>Development Potential:</b> currently most of the area has limited protection.	<b>Intermediate Goods:</b> risk of degradation of water features and wildlife habitat in building envelope area.	Neutral (no potential unit loss)
		allow	<b>Development Potential:</b> density and open space limits continue to apply.	<b>Intermediate Goods:</b> loss of water features and wildlife habitat over the entire site.	Negative

Cedar Creek Watershed

This watershed is located generally between SE 118th Drive and 122nd Ave. The resources in the watershed include Cedar Creek and its tributaries, habitat areas, and forested upland areas. Cedar Creek and the associated steep forested slopes are of “a” quality and are located on the back portions of developed and vacant lots and on cemetery property. The adjacent forested upland slopes are of “b” quality located on vacant lots and parcels, and the back portions of developed and vacant lots, and cemetery property. There are approximately 9.95 acres of “a” resources and 17.60 acres of “b” resources within the watershed.

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	vacant and developed lots	prohibit	<b>Development Potential:</b> potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality; wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b>	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat; slope stability	Positive inside building

			risk of reduction in amenity values.	and increased risk of erosion.	envelope
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Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability soil erosion.	Negative
a	open space zoned land	prohibit	<b>Development Potential:</b> currently has subject to limited protection; cemetery expansion potential reduced. <b>Final Goods:</b> amenity values capitalized into cemetery property and surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality; wildlife habitat; slope stabilization; and erosion control; <b>Final Goods:</b> recreational uses on cemetery open space areas; <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive
		limit	<b>Development Potential:</b> currently subject to development limitations. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> risk of degradation of water quality; loss of wildlife habitat; increased risk of slope failure and erosion. <b>Final Goods:</b> some loss of recreational area; <b>Future Goods:</b> reduction in scenic area.	Negative
		allow	<b>Development Potential:</b> no expansion limitations. <b>Final Goods:</b> loss of amenity values and subsequent reductions in surrounding residential properties.	<b>Intermediate Goods:</b> loss of water quality and wildlife habitat; risk of slope destabilization & soil erosion. <b>Final Goods:</b> potential loss of recreational area; <b>Future Goods:</b> potential loss of scenic area.	Negative
b	vacant lots	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of wildlife habitat; slope stability and increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of wildlife habitat; increased risk of slope instability, and soil erosion.	Negative

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
b	developed lots	prohibit	<b>Development Potential:</b> potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> preserved wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive (except where buildout is not feasible)
		limit	<b>Development Potential:</b> allows partition with no unit loss. <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of wildlife habitat; slope stability and increased risk of soil erosion.	Positive
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of wildlife habitat; increased risk of slope instability, and soil erosion.	Negative
b	open space zoned land	prohibit	<b>Development Potential:</b> currently has limited protection; cemetery expansion potential reduced. <b>Final Goods:</b> amenity values capitalized into cemetery property and surrounding residential properties.	<b>Intermediate Goods:</b> preserved wildlife habitat; slope stabilization, and erosion control. <b>Final Goods:</b> Recreational opportunities in open space areas. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive
		limit	<b>Development Potential:</b> currently subject to development limitations. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> loss of wildlife habitat; increased risk of slope destabilization and erosion. <b>Final Goods:</b> Potential reduction in recreation areas. <b>Future Goods:</b> reduction in scenic area.	Negative
		allow	<b>Development Potential:</b> no expansion limitations. <b>Final Goods:</b> loss of amenity values and subsequent reductions in surrounding residential properties.	<b>Intermediate Goods:</b> loss of wildlife habitat; risk of slope destabilization & soil erosion. <b>Final Goods:</b> Potential loss of recreational areas. <b>Future Goods:</b> potential loss of scenic area.	Negative

Wahoo Creek Watershed

This watershed is located on the northeast slope of Mt. Scott at the east end of SE Lexington St. and crossing SE Flavel. The watershed resources include Wahoo Creek and its tributaries, habitat areas, and forested upland areas. Wahoo Creek and its tributaries and the forested drainages are of “a” quality and are located on open space tracts, vacant parcels, developed lots and cemetery property. The adjacent forested uplands are of “b” quality and are located on vacant and developed parcels and on cemetery property. There are approximately 115.15 acres of “a” resources and 56.17 acres of “b” resources within the watershed.

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	vacant parcels	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality; wildlife habitat; slope stabilization; and erosion control. <b>Final Goods:</b> water supply. <b>Future Goods:</b> scenic area preserved for quality of life.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat; slope stability and increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water features and quality and wildlife habitat; Increased risk of slope instability, and soil erosion.	Negative
a	developed lots	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality; preserved wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive (except where buildout is not feasible)
		limit	<b>Development Potential:</b> currently has limited protection; <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat; slope stability and increased risk of soil erosion.	Negative
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability, and soil erosion.	Negative

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	open space zoned land	prohibit	<p><b>Development Potential:</b> currently has limited protection; cemetery expansion potential reduced.</p> <p><b>Final Goods:</b> amenity values capitalized into cemetery property and surrounding residential properties; heritage values for unique species.</p>	<p><b>Intermediate Goods:</b> preserved water quality; wildlife habitat; slope stabilization; and erosion control.</p> <p><b>Final Goods:</b> recreational opportunities in open space areas;</p> <p><b>Future Goods:</b> scenic area preserved for quality of life.</p>	Positive
		limit	<p><b>Development Potential:</b> currently subject to development limitations.</p> <p><b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.</p>	<p><b>Intermediate Goods:</b> risk of degradation of water quality; loss of wildlife habitat; increased risk of slope destabilization and erosion.</p> <p><b>Final Goods:</b> potential loss of recreational areas;</p> <p><b>Future Goods:</b> reduction in scenic area.</p>	Negative
		allow	<p><b>Development Potential:</b> no expansion limitations.</p> <p><b>Final Goods:</b> loss of amenity values and subsequent reductions in surrounding residential properties.</p>	<p><b>Intermediate Goods:</b> loss of water quality &amp; wildlife habitat; risk of slope destabilization &amp; soil erosion.</p> <p><b>Final Goods:</b> potential loss of recreational areas;</p> <p><b>Future Goods:</b> potential loss of scenic area.</p>	Negative
b	developed lots	prohibit	<p><b>Development Potential:</b> currently has limited protection; potential loss of units if no possibility for partition.</p> <p><b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.</p>	<p><b>Intermediate Goods:</b> preserved wildlife habitat; slope stabilization; and erosion control.</p> <p><b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.</p>	Positive (except where buildout is not feasible).
		limit	<p><b>Development Potential:</b> allows partition with no unit loss.</p> <p><b>Final Goods:</b> risk of reduction in amenity values.</p>	<p><b>Intermediate Goods:</b> potential risk of degradation of wildlife habitat; slope stability and increased risk of soil erosion.</p>	Positive
		allow	<p><b>Development Potential:</b> density and open space limits apply.</p> <p><b>Final Goods:</b> potential loss of amenity values.</p>	<p><b>Intermediate Goods:</b> potential loss of wildlife habitat; increased risk of slope instability, and soil erosion.</p>	Negative

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
b	vacant parcels	prohibit	<b>Development Potential:</b> potential loss of units if building envelope affected <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preservation of wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Negative
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> some risk of degradation of wildlife habitat; slope instability and increased risk of soil erosion.	Positive
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> loss of wildlife habitat; increased risk of slope instability, and soil erosion.	Negative
b	open space zoned land	prohibit	<b>Development Potential:</b> currently has limited protection; cemetery expansion potential reduced. <b>Final Goods:</b> amenity values capitalized into cemetery property and surrounding residential properties.	<b>Intermediate Goods:</b> preserved wildlife habitat; slope stabilization; and erosion control. <b>Final Goods:</b> recreation opportunities in open space. <b>Future Goods:</b> scenic area preserved for quality of life.	Positive
		limit	<b>Development Potential:</b> currently subject to development limitations. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> loss of wildlife habitat; increased risk of slope destabilization and erosion. <b>Final Goods:</b> potential loss of recreational areas. <b>Future Goods:</b> reduction in scenic area.	Negative
		allow	<b>Development Potential:</b> no expansion limitations. <b>Final Goods:</b> loss of amenity values and subsequent reductions in surrounding residential properties.	<b>Intermediate Goods:</b> loss of wildlife habitat; risk of slope destabilization & soil erosion. <b>Final Goods:</b> potential loss of recreational areas; <b>Future Goods:</b> potential loss of scenic area.	Negative

Deardorff Creek Watershed

This watershed is located east of the Wahoo Creek on either side of Deardorff Road. Resources in the watershed include Deardorff Creek its tributaries, habitat areas, and forested slopes. Deardorff Creek and its tributaries and the forested drainages are of “a” quality and are located on open space tracts, vacant parcels, back portions of developed lots, proposed development areas, and cemetery property. The adjacent forested uplands are of “b” quality and are located on open space tracts, the back portions of developed lots, and on proposed development areas. There are approximately 118.68 acres of “a” resources and 70.95 acres of “b” resources within the watershed.

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	vacant parcels	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality; preserved wildlife habitat; slope stabilization; and erosion control; flood storage; groundwater recharge and discharge. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat; slope stability and increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> density and open space limits apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability, and soil erosion.	Negative
a	developed lots	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality; wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive (except where buildout is not feasible).
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat; slope stability and increased risk of soil erosion.	Negative
		allow	<b>Development Potential:</b> density and open space limits apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality, wildlife habitat, increased risk of slope instability, and soil erosion.	Negative



Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	open space zoned land	prohibit	<b>Development Potential:</b> currently has limited protection; cemetery expansion potential reduced. <b>Final Goods:</b> amenity values capitalized into cemetery property and surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality; wildlife habitat; slope stabilization; and erosion control. <b>Final Goods:</b> Recreation opportunities in open space. <b>Future Goods:</b> scenic area preserved for quality of life.	Positive
		limit	<b>Development Potential:</b> currently subject to development limitations. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> risk of degradation of water quality; loss of wildlife habitat; increased risk of slope destabilization and erosion. <b>Final Goods:</b> potential loss of recreational area. <b>Future Goods:</b> reduction in scenic area.	Negative
		allow	<b>Development Potential:</b> no expansion limitations. <b>Final Goods:</b> loss of amenity values and subsequent reductions in surrounding residential properties.	<b>Intermediate Goods:</b> loss of water quality and wildlife habitat; risk of slope failure, erosion. <b>Final Goods:</b> potential loss of recreational area. <b>Future Goods:</b> potential loss of scenic area.	Negative
b	vacant parcels	prohibit	<b>Development Potential:</b> potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preservation of wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> some risk of degradation of wildlife habitat; slope instability and increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> density and open space limits apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> loss of wildlife habitat; increased risk of slope instability, and soil erosion.	Negative

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
b	developed lots	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> preserved wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive (except where buildout is not feasible).
		limit	<b>Development Potential:</b> allows partition with no unit loss. <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of wildlife habitat; slope stability and increased risk of soil erosion.	Positive
		allow	<b>Development Potential:</b> density and open space limits apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of wildlife habitat; increased risk of slope instability, and soil erosion.	Negative

Clatsop Butte

This area is located along the south side of Johnson Creek between the Deardorff and Barbara Welch Creek watersheds. Resources include creeks, habitat areas, and forested upland areas. The forested drainages are of “a” quality and are located on open space tracts, and vacant parcels. The forested uplands are of “b” quality located on open space tracts, vacant parcels, and on the backs of vacant lots. There are approximately 7.91 acres of “a” resources and 51.24 acres of “b” resources within the watershed.

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	vacant parcels	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality; preserved wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat; slope stability and increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> density and open space limits apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability, and soil erosion.	Negative
b	vacant lots and parcels	prohibit	<b>Development Potential:</b> potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preservation of wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive along stream corridors (outside building envelope)

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> some risk of degradation of wildlife habitat; slope instability and increased risk of soil erosion.	Negative along stream corridors
		allow	<b>Development Potential:</b> density and open space limits apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> loss of wildlife habitat; increased risk of slope instability, and soil erosion.	Negative

Barbara Welch Creek Watershed

This watershed is centered on Barbara Welch Road between Clatsop Butte on the west and Cooper Bluff, Kelley Creek and Clatsop Creek watersheds on the east. The resources in the watershed include Barbara Welch Creek, its tributaries, habitat areas, and forested upland areas. The upper section of Barbara Welch Creek and one upper tributary are of “a” quality and are located on vacant and developed parcels and open space tracts. The remaining tributaries and the steep forested upland slopes are of “b” quality and are located on vacant and developed parcels and open space tracts. The middle and lower sections of Barbara Welch Creek are “c” quality resources and are located on portions of developed parcels. There are approximately 23.96 acres of “a” resources, 130.96 acres of “b” resources and 10.56 acres of “c” resources within the watershed.

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	vacant and developed lots	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality; wildlife habitat; slope stabilization; and erosion control. <b>Final Goods:</b> water supply. <b>Future Goods:</b> scenic area preserved for quality of life.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water features and quality, wildlife habitat; slope stability and increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water features and quality and wildlife habitat; increased risk of slope instability soil erosion.	Negative
b	vacant parcels	prohibit	<b>Development Potential:</b> potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preservation of water quality and wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive along stream corridors (outside building envelope)
		limit	<b>Development Potential:</b>	<b>Intermediate Goods</b>	Negative

			currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	some risk of degradation of water quality, wildlife habitat, slope stability and increased risk of erosion.	along stream corridors
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Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
		allow	<b>Development Potential:</b> density and open space limits apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> loss of water quality and wildlife habitat; increased risk of slope instability, and soil erosion.	Negative
b	developed parcels	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality and wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive (except where buildout is not feasible).
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality and wildlife habitat; increased risk of slope instability & erosion.	Negative
		allow	<b>Development Potential:</b> currently subject to density reductions on sloped lands and open space set-aside requirements. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability & soil erosion.	Negative
c	developed parcels	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if area is large enough to be subdivided and there is no building envelope available. <b>Final Goods:</b> amenity values capitalized into residential property.	<b>Intermediate Goods:</b> preserved water quality and wildlife habitat.	Negative (if there is a loss of units otherwise positive)
		limit	<b>Development Potential:</b> currently most of the area has limited protection.	<b>Intermediate Goods:</b> risk of degradation of water quality and wildlife habitat in building envelope.	Neutral (no potential unit loss)
		allow	<b>Development Potential:</b> currently subject to density reductions on sloped lands and 1 open space set-aside requirements.	<b>Intermediate Goods:</b> loss of water quality and wildlife habitat over the entire site.	Negative

Cooper Bluff

This area is located along Foster Road between the Barbara Welch and Kelley Creek watersheds. The resources include forest habitat, steep slopes and rock cliffs, and Johnson Creek tributaries. One tributary is of “a” quality and is located on two vacant parcels. The remaining tributaries and the steep forested slopes and rock outcrops are of “b” quality on vacant parcels and vacant lots. There are approximately 2.34 acres of “a” resources and 46.32 acres of “b” resources within the watershed.

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	vacant parcels	prohibit	<b>Development Potential:</b> building sites can be readily located outside “a” resource area. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, slope stabilization, and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life.	Positive
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, slope stability and increased risk of soil erosion.	Negative
		allow	<b>Development Potential:</b> currently subject to density and slope restrictions. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability, and soil erosion.	Negative
b	vacant parcels and lots	prohibit	<b>Development Potential:</b> potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preservation of wildlife habitat; slope stabilization; erosion control. <b>Future Goods:</b> scenic area preserved for quality of life values.	Positive (except in building envelope)
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> some risk of degradation of wildlife habitat; slope instability, and increased risk of soil erosion.	Positive (within building envelope)
		allow	<b>Development Potential:</b> currently subject to density reductions on sloped lands and open space set-aside requirements. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> loss of wildlife habitat; increased risk of slope instability, and soil erosion.	Negative

Clatsop Creek Watershed

Clatsop Creek is located just north of SE Clatsop St. and crosses Barbara Welch Road from west to east. It is a tributary to Kelley Creek. Much of the watershed is in unincorporated Multnomah County. The watershed contains Clatsop Creek, creek tributaries, steep ravines and forest habitat. Clatsop Creek watershed resources are of “a” and “b” quality. The “a” quality resources include Clatsop Creek, its tributaries and ravines, and are located on the back portions of vacant and developed parcels. The “b” quality resources include forested uplands and slopes and are located on vacant parcels, portions of developed parcels, backs of vacant lots and cemetery property. There are approximately 53.60 acres of “a” resources and 39.75 acres of “b” resources within the watershed.

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	vacant parcels*	prohibit	<b>Development Potential:</b> potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, slope stabilization, and erosion control values; groundwater discharge and recharge areas. <b>Future Goods:</b> scenic area preserved for quality of life.	Positive outside building envelope
		limit	<b>Development Potential:</b> no effect. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, and slope stability; increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> currently subject to density reductions on sloped lands and open space set-aside requirements. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water features and quality and wildlife habitat; increased risk of slope instability, and soil erosion.	Negative
a	developed lots*	prohibit	<b>Development Potential:</b> potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, and slope stabilization and erosion control values. <b>Future Goods:</b> scenic area preserved for quality of life values.	Positive (except where buildout is not feasible).
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, slope stability; increased risk of erosion.	Negative
		allow	<b>Development Potential:</b> currently subject to density reductions on sloped lands and open space set-aside requirements. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability, and soil erosion.	Negative
b	vacant parcels*	prohibit	<b>Development Potential:</b> potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into	<b>Intermediate Goods:</b> preservation of wildlife habitat, slope stabilization, and erosion control. <b>Future Goods:</b> scenic area preserved for quality of	Positive (outside building envelope)

			surrounding residential properties.	life for the City as a whole.	
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Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> potential reduction in amenity values	<b>Intermediate Goods:</b> some risk of degradation of wildlife habitat, slope stability, and erosion control values.	Positive (in envelope)
		allow	<b>Development Potential:</b> currently subject to density reductions on sloped lands and open space set-aside requirements. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> loss of wildlife habitat; increased risk of slope instability and soil erosion.	Negative
b	developed parcels*	prohibit	<b>Development Potential:</b> potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties.	<b>Intermediate Goods:</b> preserved wildlife habitat, slope stabilization, and erosion control values. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive (except where buildout is not feasible).
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of wildlife habitat; slope stability erosion control values.	Negative
		allow	<b>Development Potential:</b> currently subject to density reductions on sloped lands and open space set-aside requirements. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of wildlife habitat; increased risk of slope instability soil erosion.	Negative

\* Includes land within the urban services boundary that is presently outside the City limit.



Mitchell Creek Watershed

Mitchell Creek is a tributary to Kelley Creek. Approximately 96 acres of the 566-acre watershed are located within the Portland City Limits. The City portion of the watershed contains mixed-age, mixed conifer/deciduous forest with several significant north and east-trending ravines containing Mitchell Creek and its tributaries (including “MacKenzie Creek”). These creeks and ravines support a range of federal “species of concern” and state sensitive species including cutthroat trout, northern red-legged frog and pileated woodpecker. Along the main stem of Mitchell Creek, a significant corridor ranging in width from 200 feet (near 162<sup>nd</sup> Avenue) to 400 feet (near 157<sup>th</sup> Avenue) contains “a” quality resources. Each of the tributary streams to Mitchell Creek also contain “a” resources. The MacKenzie Creek “a” resource corridor extends 100 feet east of the creek and west to the city limits. Three other tributaries, two south of the main stem and one to the north, contain “a”-resource corridors that are 100 feet wide. One lesser tributary south of Mitchell Creek contains an “a”-resource corridor that is 75 feet wide. “A” quality resources consistently meet six or more of the City decision factors set out in Table 3. Forested uplands and habitat areas adjoining these corridors contain “b” quality resources. Lands north of Clatsop Street and near the intersection of Clatsop and 162<sup>nd</sup> Avenue do not contain significant resources.

There are approximately 29.75 acres of “a” resources and 43.25 acres of “b” resources within this watershed. These resources are located on a developed parcel and on an undeveloped parcel.

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	vacant parcels	prohibit	<b>Development Potential:</b> some areas are fully protected; potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties; heritage values associated with wild fish runs.	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, and slope stabilization; groundwater discharge and recharge and flood storage values. <b>Final Goods:</b> water supply; potential fishing opportunities. <b>Future Goods:</b> scenic area preserved for quality of life.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited and full protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, and slope stability; increased risk of soil erosion. <b>Final Goods:</b> reduction in water supply; loss of potential fishing opportunities. <b>Future Goods:</b> reduction in scenic area preserved for quality of life.	Positive inside building envelope
		allow	<b>Development Potential:</b> currently subject to e density reductions on sloped lands and open space set-aside requirements. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water features and quality and wildlife habitat; increased risk of slope instability, and soil erosion. <b>Final Goods:</b> reduction in water supply; loss of	Negative

				potential fishing opportunities. <b>Future Goods:</b> reduction in scenic area preserved for quality of life.	
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Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	developed parcels	prohibit	<b>Development Potential:</b> building sites can be located outside “a” resources area. <b>Final Goods:</b> amenity values capitalized into existing and surrounding residential properties; heritage values include wild fish runs.	<b>Intermediate Goods:</b> preserved water quality, groundwater and flood storage, wildlife habitat, slope stabilization, and erosion control. <b>Final Goods:</b> water supply and fishing opportunity. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive along stream corridors
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, slope stability and erosion control values. <b>Final Goods:</b> reduction in water supply; loss of potential fishing opportunities. <b>Future Goods:</b> reduction in scenic area preserved for quality of life.	Negative along stream corridors
		allow	<b>Development Potential:</b> currently subject to existing density reductions on sloped lands and potential open space set-aside areas. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat, increased risk of slope instability, and soil erosion. <b>Final Goods:</b> reduction in water supply; loss of potential fishing opportunities. <b>Future Goods:</b> reduction in scenic area preserved for quality of life.	Negative
b	vacant parcels	prohibit	<b>Development Potential:</b> some areas currently fully protected; potential building loss if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved wildlife habitat, slope stabilization, and erosion control values. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited and full protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of wildlife habitat; and slope stability increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> currently subject to density reductions on sloped lands and open space set-aside requirements. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of wildlife habitat; Increased risk of slope instability, and soil erosion.	Negative

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
b	developed parcels	prohibit	<b>Development Potential:</b> potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into existing and surrounding properties.	<b>Intermediate Goods:</b> preserved wildlife habitat, slope stabilization, erosion control values. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive (except where buildout is not feasible).
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of wildlife habitat, slope stability, erosion control values.	Neutral (no potential unit loss)
		allow	<b>Development Potential:</b> currently subject to g density reductions on sloped lands and open space set-aside requirements. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of wildlife habitat; increased risk of slope instability, and soil erosion.	Negative

Kelley Creek Watershed

This watershed is located in the northeast corner of the Lava Domes site in the vicinity of Foster Road and 162nd Avenue. The watershed contains Kelley Creek, a creek tributary and forested habitat areas. The “a” resources within the Kelley Creek watershed include the creek, associated tributaries and ravines. The “b” resources include forested uplands. Both “a” and “b” resources are located on vacant parcels and developed lots. There are approximately 19.45 acres of “a” resources and 24.32 acres of “b” resources within the watershed.

Rank	Location	Action	Effect on Conflicting Use	Effect on Resource	Net Effect
a	vacant parcels	prohibit	<b>Development Potential:</b> some areas are fully protected; potential loss of units if building envelope affected. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties; heritage values associated with wild fish runs.	<b>Intermediate Goods:</b> preserved water quality, wildlife habitat, and slope stabilization; groundwater discharge and recharge and flood storage values. <b>Final Goods:</b> water supply; potential fishing opportunities. <b>Future Goods:</b> scenic area preserved for quality of life.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited and full protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat, and slope stability; increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> currently subject to e density reductions on sloped lands and open space set-aside requirements. <b>Final Goods:</b>	<b>Intermediate Goods:</b> potential loss of water features and quality and wildlife habitat; increased risk of slope instability, and soil erosion.	Negative

			potential loss of amenity values.		
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	<b>Location</b>	<b>Action</b>	<b>Effect on Conflicting Use</b>	<b>Effect on Resource</b>	<b>Net Effect</b>
a	developed lots	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into existing and surrounding properties.	<b>Intermediate Goods:</b> preserved water quality; wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive (except where buildout is not feasible)
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality, wildlife habitat; slope stability and increased risk of soil erosion.	Negative
		allow	<b>Development Potential:</b> density and open space limits continue to apply. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality, wildlife habitat, increased risk of slope instability, and soil erosion.	Negative
b	developed parcels	prohibit	<b>Development Potential:</b> currently has limited protection; potential loss of units if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into existing and surrounding properties.	<b>Intermediate Goods:</b> preserved water quality and wildlife habitat; slope stabilization; and erosion control. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive (except where buildout is not feasible).
		limit	<b>Development Potential:</b> currently has limited protection. <b>Final Goods:</b> risk of reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of water quality and wildlife habitat; slope instability & increased risk of erosion.	Negative
		allow	<b>Development Potential:</b> currently subject to density reductions on sloped lands and open space set-aside requirements. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of water quality and wildlife habitat; increased risk of slope instability & soil erosion.	Negative

	<b>Location</b>	<b>Action</b>	<b>Effect on Conflicting Use</b>	<b>Effect on Resource</b>	<b>Net Effect</b>
b	vacant parcels	prohibit	<b>Development Potential:</b> some areas currently fully protected; potential building loss if no possibility for partition. <b>Final Goods:</b> amenity values capitalized into surrounding residential properties.	<b>Intermediate Goods:</b> preserved wildlife habitat, slope stabilization, and erosion control values. <b>Future Goods:</b> scenic area preserved for quality of life for the City as a whole.	Positive outside building envelope
		limit	<b>Development Potential:</b> currently has limited and full protection. <b>Final Goods:</b> potential reduction in amenity values.	<b>Intermediate Goods:</b> potential risk of degradation of wildlife habitat; and slope stability increased risk of soil erosion.	Positive inside building envelope
		allow	<b>Development Potential:</b> currently subject to density reductions on sloped lands and open space set-aside requirements. <b>Final Goods:</b> potential loss of amenity values.	<b>Intermediate Goods:</b> potential loss of wildlife habitat; Increased risk of slope instability, and soil erosion.	Negative

**Recommendations:**

Prohibit conflicting uses along stream corridors and ravines, and on steep forested hillsides outside of building envelopes. Limit conflicting uses on gentle sloping uplands and where prohibiting conflicting uses would result in the loss of units.

## **Social Consequences**

This analysis considers the social consequences of prohibiting, limiting, or allowing conflicting uses within the Boring Lava Domes site. Social consequences considered in this analysis include effects on the socially valued aspects of the Lents and Pleasant Valley neighborhoods as identified in the *Lents Neighborhood Plan* (LNP) and the *Pleasant Valley Neighborhood Plan* (PVNP). In these plans, residents defined the values most important to them. These values include fish and wildlife habitat; recreational and educational opportunities; affordable housing and livability; cultural and scenic values; and water quality, slope stabilization and flood control. These values are significant because they represent benefits to residents of the Johnson Creek basin, the Lents and Pleasant Valley Neighborhoods and to the greater community of Portland.

### **Prohibiting Conflicting Uses**

Prohibiting conflicting uses supports adopted local policies by “protecting environmentally sensitive areas, such as steep slopes, landslide areas, floodways, floodplains and wetlands” (PVNP). Protecting the site’s natural resources will maintain the wooded, rural character of the site, reduce landslide, erosion and flood hazards, and increase air and water quality. Additionally, protection of forest and stream resources supports adopted neighborhood objectives to “protect wildlife, and its habitat, while allowing citizens to visually enjoy these natural resources” (LNP). Protected vegetation will also provide a filter for noise, odors, air and water pollutants within neighborhoods.

Local neighborhoods also desire to preserve the availability of quality, affordable housing while recognizing that the Lava Domes area is significantly constrained by topography and other natural features. The PVNP notes that “high density development may be unsuited to much of the area’s topography.” Prohibiting conflicting uses in certain circumstances may cause a loss of housing opportunities. As is true of the economic analysis, if redistribution of housing to non-resource areas is precluded, consequences are negative. So long as a significant loss of housing is avoided, prohibiting conflicting uses within the Lava Domes resource areas has positive social consequences.

### **Limiting Conflicting Uses**

Limited protection supports adopted local conservation policies and objectives. Nevertheless, there remains a risk that resources and their corresponding social values may be lost. For much of the site, resources currently have limited protection in the form of environmental conservation zones within the Johnson Creek Basin Plan District. In some areas, limited protection is adequate, but in others such as steep ravines, riparian areas, and streams, limited protection will result in resource loss in direct conflict with neighborhood objectives. Neighborhood housing objectives can be achieved if conflicting uses are limited. Limiting protection has positive social consequences although sensitive resource areas with high value social amenities will be at risk.



## **Allowing Conflicting Uses**

1. Fully allowing conflicting uses is inconsistent with adopted local conservation policies and adopted Lents and Pleasant Valley Neighborhood Plans. Flood control, slope stabilization, and natural buffering values of vegetation and other significant natural resources will be lost. Especially susceptible to degradation or loss will be stream corridors and the extremely steep hillsides and ravines that traverse the site. The pastoral nature of much of the site that residents value so highly will be lost. Allowing conflicting uses fully will mean resource degradation and elimination of resource values, possibly resulting in increased desire to move to more rural areas outside the urban growth boundary and adding pressures for rural resource degradation. Housing will remain constrained by physical site conditions and existing density provisions on steep slopes. Fully allowing conflicting uses is inconsistent with adopted neighborhood policies and has negative social consequences.

### ***Recommendations:***

Prohibit conflicting uses where significant water features exist, along associated riparian corridors and ravines, and on steep forested hillsides provided significant housing loss is avoided. Limit conflicting uses on gentle sloping uplands and where prohibiting conflicting uses would preclude housing services.

## **Environmental Consequences**

This analysis considers the environmental consequences of prohibiting, limiting or allowing conflicting uses within the Lava Domes, Lava Domes. Relative environmental values are recorded on the significance field sheets for each watershed as rank “a,” “b,” or “c.” While each ranked resource is considered significant, rank “a” resources satisfy more significance criteria than “b” resources, and “b” resources satisfy more criteria than “c” resources. As shown in the sample significance field sheet in Appendix E, significance criteria are associated with particular resources and the provision of resource values.

### **Prohibiting Conflicting Uses**

This action protects significant environmental resources and resource values identified in the site inventory. The environmental consequences are positive.

### **Limiting Conflicting Uses**

This action conserves some significant environmental resources and resource values identified in the site inventory. The environmental consequences are generally positive, but there is a risk that some resources and values will be lost, particularly higher ranked “a” and “b” resources.

### **Allowing Conflicting Uses**

Fully allowing conflicting uses results in the loss of significant environmental resources and resource values as described in the Consequences of Allowing Conflicting Uses section of this report. The environmental consequences are negative.

#### ***Recommendations:***

Fully protect significant resources.

## **Energy Consequences**

This analysis considers the energy consequences of prohibiting, limiting or allowing conflicting uses within the Lava Domes. Factors considered include energy consequences on transportation and urbanization, infrastructure and services, and heating and cooling of structures.

### **Prohibiting Conflicting Uses**

Prohibiting conflicting uses within the dense forests in the Lava Domes promotes energy conservation by sheltering and shading existing structures. Where significant trees within the Lava Domes site are located adjacent to buildings, protection of those trees reduces energy needs for heating and cooling by tempering the effects of the local climate. Trees provide shelter from winter winds and storms, and shade buildings and absorb heat during the summer. For example, one tree can provide air conditioning benefits totaling \$73 per year (Oregon CommuniTree News 1993). Evergreen trees located close to buildings, however, may also reduce solar access and passive heat gain during the cooler months. Prohibiting conflicting uses on steep slopes and in floodplains can reduce energy consumption by eliminating long, steep or hazardous access for residential services and infrastructure and by reducing energy use related to flooding or slide cleanup. Protecting significant resources promotes compact development forms, common wall construction, and similar energy saving practices. Prohibiting conflicting uses on entire properties risks higher energy costs associated with transportation and infrastructure if housing is pushed outside established urban areas. The energy consequences of full protection are positive provided that housing and infrastructure are not forced into rural areas.

### **Limiting Conflicting Uses**

Limiting conflicting uses will conserve trees that reduce energy needs for heating and cooling by ameliorating the local microclimate. While there is a risk that beneficial vegetation will be lost, some energy savings can still be expected through limited protection of these resources. Energy consumption related to the provision of infrastructure and public services is reduced when development is guided away from steep slopes and floodplains. Limiting conflicting uses also promotes compact development forms with associated energy savings. Where resources exist on entire properties, limiting conflicting uses may decrease the pressure for housing to occur outside established urban boundaries, potentially reducing energy costs associated with transportation and infrastructure. The energy consequences of limited protection are positive.

### **Allowing Conflicting Uses**

Fully allowing conflicting uses in the Lava Domes may result in higher energy consumption associated with residential service and infrastructure inefficiencies through a lack of incentive to build compact developments. Without controls on vegetation

removal, potential energy savings including the cooling of structures in the summer and the shelter from cold winds in the winter may be lost. Allowing conflicting uses fully risks the development of the landslide-prone steep slopes and ravines within the Lava Domes and higher energy use associated with services and infrastructure, and response to flooding and landslides. The energy consequences of no protection are negative.

**Recommendations:**

Prohibit conflicting uses in areas of highly significant resources such as steep ravines and hillside slopes, stream corridors and floodplains. Limit conflicting uses on other upland areas particularly areas close to existing roads, homes and infrastructure. Also limit conflicting uses in highly significant resource areas where entire vacant properties are affected to avoid adding pressure for sprawl outside urban areas.

**Conflict Resolution**

The following table is a summary of the identified conflicts between significant resources and conflicting uses. The recommendations for each of the four ESEE factors considered are listed. “Full” designates full protection, “limit” designates limited protection and “none” indicates no protection. The final column lists the recommended decision on the level of resource protection.

**Table 8. Conflict Resolution Summary**

<b>Watershed</b>	<b>Identified Conflicts</b>	<b>Econ</b>	<b>Social</b>	<b>Environ</b>	<b>Energy</b>	<b>Decision</b>
Cottonwood Creek	"B" in open space park; "B" on developed lots; "B" on vacant lots; "C" on developed lots; "C" on vacant lots	Full Full Full Limit Limit	Full Full Full Limit Limit	Full Full Full Limit Limit	Full Limit Limit Limit Limit	<b>Full</b> <b>Full</b> <b>Full</b> <b>Limit</b> <b>Limit</b>
Veteran’s Creek	"A" in open space tracts; "A" on vacant lots; "A" on developed lots; "B" on vacant lots; "C" on vacant lots; "C" on developed lots.	Full Full Full Limit Limit Limit	Full Full Full Full Limit Limit	Full Full Full Full Limit Limit	Full Full Full Limit Limit Limit	<b>Full*</b> <b>Full*</b> <b>Full</b> <b>Limit</b> <b>Limit</b> <b>Limit</b>
Indian Rock Creek	"A" on vacant lots; "B" on vacant lots; "B" on developed lots; "C" on developed lots.	Full Full Full Limit	Full Full Full Limit	Full Full Full Limit	Full Limit Limit Limit	<b>Full</b> <b>Full</b> <b>Full-100'</b> <b>Limit</b>
Frog Creek	"A" on open space land; "A" on developed lots; "B" in open space tracts; "B" on vacant lots. "C" on developed lots. "C" on vacant lots;	Full Full Full Limit Limit Limit	Full Full Full Full Limit Limit	Full Full Full Full Limit Limit	Full Full Full Limit Limit Limit	<b>Full</b> <b>Full</b> <b>Full</b> <b>Limit</b> <b>Limit</b> <b>Limit</b>
Cedar Creek	"A" on open space land; "A" on vacant lots; "A" on developed lots; "B" on vacant lots; "B" on developed lots; "B" on open space land.	Full Full Full Limit Limit Limit	Full Full Full Full Full Full	Full Full Full Full Full Full	Full Full Full Limit Limit Full	<b>Full</b> <b>Full*</b> <b>Full</b> <b>Limit</b> <b>Limit</b> <b>Limit</b>

<b>Watershed</b>	<b>Identified Conflicts</b>	<b>Econ</b>	<b>Social</b>	<b>Environ</b>	<b>Energy</b>	<b>Decision</b>
Wahoo Creek	"A" on open space land; "A" on vacant lots; "A" on developed lots; "B" on open space land; "B" on vacant lots; "B" on developed lots.	Full Full Full Limit Limit Limit	Full Full Full Full Full Full	Full Full Full Full Full Full	Full Full Full Full Limit Limit	<b>Full</b> <b>Full*</b> <b>Full</b> <b>Limit</b> <b>Limit</b> <b>Limit</b>
Deardorff Creek	"A" in open space tracts; "A" on vacant lots; "A" on developed lots; "B" in open space tracts; "B" on vacant lots; "B" on developed lots.	Full Full Full Full Limit Limit	Full Full Full Full Full Full	Full Full Full Full Full Full	Full Full Full Full Limit Limit	<b>Full</b> <b>Full</b> <b>Full</b> <b>Full</b> <b>Limit</b> <b>Limit</b>
Clatsop Butte	"A" in open space tracts; "A" on vacant lots; "B" in open space tracts; "B" on vacant lots.	Full Full Full Full	Full Full Full Full	Full Full Full Full	Full Full Full Limit	<b>Full</b> <b>Full</b> <b>Full</b> <b>Full*</b>
Barbara Welch Creek	"A" on vacant lots; "A" on developed lots; "B" on developed lots; "B" on vacant lots; "B" in open space tracts; "C" on developed lots.	Full Full Full Limit Full Limit	Full Full Full Full Full Limit	Full Full Full Full Full Limit	Full Full Full Limit Full Limit	<b>Full</b> <b>Full</b> <b>Full</b> <b>Limit</b> <b>Full</b> <b>Limit</b>
Cooper Bluff	"A" on vacant lots; "B" on vacant lots;	Full Full	Full Full	Full Full	Full Limit	<b>Full</b> <b>Full-100'</b>
Clatsop Creek	"A" on vacant lots; "A" on developed lots; "B" in open space tracts; "B" on vacant lots. "B" on developed lots.	Full Full Full Full Full	Full Full Full Full Full	Full Full Full Full Full	Full Full Full Limit Limit	<b>Full</b> <b>Full</b> <b>Full</b> <b>Full*</b> <b>Full*</b>
Mitchell Creek	"A" on vacant lot; "A" on developed parcel; "B" on vacant lot; "B" on developed parcel.	Full Full Limit Limit	Full Full Full Full	Full Full Full Full	Full Full Limit Limit	<b>Full</b> <b>Full</b> <b>Limit</b> <b>Limit</b>
Kelley Creek	"A" on vacant lots; "A" on developed lots; "B" on vacant lots; "B" on developed lots.	Full Full Full Full	Full Full Full Full	Full Full Full Full	Full Full Limit Limit	<b>Full</b> <b>Full</b> <b>Full*</b> <b>Full*</b>

\* Full protection applies to portions of certain lots in which there is a risk of housing unit loss limited protection applies to building envelope areas on these lots.

100' Denotes 100 foot-width centered on stream.

## **Amendments to the Official Zoning Maps**

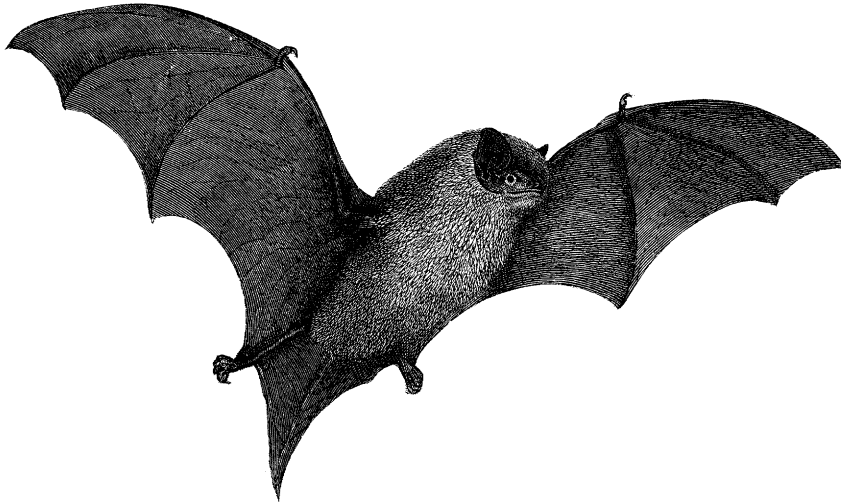
The Boring Lava Domes supplement amends the environmental zones within the Lava Domes site and adjacent resource sites as shown on maps 1 through 21.

The Environmental Protection overlay zone is applied to resource areas with high functional values that are in need of full protection according to the inventory and analysis findings. Generally, the Protection zone is applied to high quality creeks and ravines, as well as ecologically or scientifically significant natural areas, high quality habitat areas for sensitive wildlife, and other resources which provide significant values based on the decision factors described above. The Protection zone will insure the protection of resource values, the continuation of critical plant and wildlife habitat elements, and the preservation of the integrity and viability of the Lava Domes resources as a whole. The application of this zone will also protect area neighborhoods from hazards such as landslides and flooding, and will retain the natural character and identity of the Boring Lava Domes.

The Environmental Conservation zone is applied to areas that, while not as highly rated as Protection zone areas, provide significant values that warrant protection. These areas are generally able to support certain levels of development provided impacts are controlled. The Conservation zone balances resource-use conflicts in these areas. The following maps illustrate the proposed environmental zone amendments.







## **PART II**

### **AMENDMENTS TO CHAPTER 33.430, ENVIRONMENTAL ZONES AND RELATED CHAPTERS**

#### **INTRODUCTION**

#### **DISCUSSION OF PROPOSED CODE AMENDMENTS**

#### **PROPOSED CODE AMENDMENTS TO CHAPTERS 33.430, ENVIRONMENTAL ZONES, 33.515, COLUMBIA SOUTH SHORE PLAN DISTRICT, 33.805, ADJUSTMENTS,**

**33.910, DEFINITIONS  
AND TITLE 34, SUBDIVISION AND PARTITIONING**

## Introduction

The proposed amendments to Chapter 33.430, Environmental Zones, Chapter 33.515, Columbia South Shore Plan District, Chapter 33.805, Adjustments, 33.910 Definitions, and 34.12, Administration are a fine tuning of the Environmental Overlay Chapter and related Chapters. These changes result from the first two years experience using the Environmental Overlay Chapter that was adopted on April 17, 1995.

One of the proposed amendments was initiated in response to the requirements of the State Land Conservation and Development Commission (LCDC) for the completion of the City's Goal 5 work program, specifically Work Task 1.3. Other code amendments related to Work Task 1.3 will incorporate the findings and recommendations of the City's Stormwater Policy Advisory Committee (SPAC) when the SPAC completes its work.

## Discussion of Proposed Code Amendments

### Code Changes related to LCDC Work Task 1.3

One of the proposed Code changes is in response to the requirements of work Task 1.3 of the City's Goal 5 compliance work program. The LCDC ruled that the city needed to do additional work specifically on its utility standards to be fully in compliance with the Goal 5 Administrative Rule.

A Code amendment specifically identified in the LCDC report—which modifies the tree planting standard—is discussed below.

### Modification of Tree Replacement Standard

The LCDC report stated that:

"The City's standards are not adequate with respect to utility lines placed along streams because there is no requirement to replace trees on the stream side of the facility. The city needs to add a standard which requires at least half of the replacement trees on the stream side of the utility easement when the easement runs approximately parallel with a stream."

In response, the following new language has been proposed for the existing utility standards:

*Where a utility line is approximately parallel with the stream channel at least half of the replacement trees must be planted between the utility line and the stream channel.*

Other Code amendments relating to utility standards, outfalls, and water quality standards will be proposed when the City's Stormwater Policy Advisory Committee (SPAC) findings and recommendations are complete. The findings and recommendations of the SPAC will be incorporated into new standards for outfalls, and water quality. These revised standards will then be brought forward to the Planning Commission for consideration sometime in late 1997.

### **Other Amendments**

The remaining environmental zone code amendments are in response to observations of the workings of the new code language over the first two years. The specific changes are discussed below:

#### 1. Exemption C.3 is Changed to be Based on Building Footprint

The exemption 33.430.080.C.3, is currently tied to no increase in building coverage. The intent however, is to exempt only building alterations that do not change the building footprint. As currently written, a substantial portion of a building could be demolished and a new section built in a different location but with the same building coverage as the original. The proposed language would limit the exemption to no change in building footprint. Also, the reference to base zone standards should be changed to site-related development standards. The term "base zone standards" is not all inclusive since there are other site-related standards in the "200s" section of the code.

#### 2. Exemption C.5 is Changed to Remove the Reference to Diseased Trees

The exemption for tree removal is based solely on the potential hazard a tree or portion of a tree may pose. The term diseased was meant to be used as a modifier and is not needed in the exemption. It causes confusion because disease alone is not cause for removing a tree. In fact some amount of disease is perfectly normal in natural tree growth. Also, remove the qualifying sentence referring to when trees pose a danger because it is not necessary and is actually confusing. The previous sentence states that immediate danger is determined by the City Forester or a certified arborist. There is no need for further qualification.

#### 3. The Permit Application Requirements are Modified to Ensure Vegetation Planting

The permit application requirements for the environmental plan check process require a landscape plan but there is no language to ensure that the vegetation is planted. The proposed language requires that the landscape plan show that 90 percent vegetative cover will be achieved within one year.

4. Remove Standard L from the Requirements for Transition Areas

The development standard 33.430.140.L, currently applies to development that is within the Transition Area only. This standard creates a maximum building setback. A maximum setback is not necessary if all of the proposed development is already outside of the resource area. This standard should not apply to cases where the development is solely within the Transition Area.

5. Add Standard E to the Requirements for Transition Areas

The development standard 33.430.140.E, should be added to the list of those that apply to development that is only within the Transition Area. Standard E requires a 5-foot setback from resource areas in a protection zone. Generally protection zones are within conservation zones and do not have a Transition Area. However, there are instances where the protection zone does have a Transition Area and a five foot setback requirement for development within the Transition Area is consistent with the established policy of providing an extra level of restriction near resources in protection zones.

6. In Standards C and F the Term Streams is Changed to Water Body.

The current language in standards 33.430.140.C and .F require setbacks from streams. It was not the intent of the setback regulations in standards C and F to be limited just to stream setbacks. The setbacks should also apply to lakes, sloughs, and ponds as well as streams.

7. Include Cluster Housing Subdivisions in the Standards for Planned Unit Developments (PUDs)

The development standards of 33.430.160 are different for straight land divisions and PUDs. Cluster housing subdivisions are like PUDs and should be encouraged. The proposed language specifies cluster housing subdivisions as well as PUDs in the relevant standards section (33.430.160).

8. Review Criteria for Development in a Transition Area

Staff has found that there is no approval criteria set out specifically for the review of development that is only within the Transition Area and that does not meet the development standards. It is highly unlikely that such criteria would ever be needed since the development standards for Transition Areas are very easy to meet. However, it is a loose end that must be addressed.

Language has been added that would make any Transition Area-only environmental review a Type II procedure that would use the approval criteria of 33.430.250.E, Other Development in the Environmental Conservation Zone. This is a very minor amendment.

#### 9. Clarify Review Procedure and Approval Criteria for Corrections to Violations

There has been much confusion over what procedures apply to the review of corrections to Environmental Zone Code violations and which approval criteria are to be used. The Code is modified so that all violation reviews are a Type III procedure. Clarifying language is also added to make it clear which approval criteria are used to process reviews for corrections to violations. An applicant seeking to correct an environmental zone code violation would have to meet the applicable approval criteria of 33.430.250.A through F, or if those criteria could not be met then they would have to meet criteria 33.430.250.G.

#### 10. Clarify 430.280, Modifications of Site-related Development Standards

Adjustments are allowed through environmental review for site-related development standards. The current language specifically states “base zone” development standards. This reference causes confusion because the 200’s section of the zoning code also contains site-related development standards that are equivalent to and often supersede the base zone standards. The term “base zone” is removed from Section 33.430.280 to eliminate this confusion as there was no intent to limit the modification option to just the base zone standards.

11. Columbia South Shore Plan District Exemption

There is currently no exemption in the Columbia South Shore Plan District for planting native vegetation using hand held equipment. This is an exemption that applies to the general environmental zone regulations throughout the rest of the City. There should be no restrictions on planting native vegetation in any environmental zone in the City so the exemption for planting native vegetation is added to the Columbia South Shore Plan District.

12. Modify Adjustment Criteria

Adjustment review criterion 33.805.040.F requires the consideration of resource impacts and is currently limited to areas within the Columbia South Shore Plan District. Some types of adjustments may have resource impacts that should be considered. This criterion should apply to adjustments within any environmental zone not just the South Shore Plan District.

13. Disturbance Area Definition

The definition for Disturbance Area needs to be further refined to make sure that a proposed new disturbance area is contiguous and is not made up of isolated areas. The calculation of existing disturbance area would still count any disturbance existing on a site contiguous or not.

14. Cluster Housing Added as an Option for Land Division Requirement

The land division code, Title 34, requires that when at least 50 percent of a property is within an Environmental Overlay Zone, a land division application must be processed as a PUD. A Cluster Housing subdivision should also be an option because like a PUD it offers flexibility in layout design. Cluster Housing is an alternative that can avoid resource impacts in a manner similar to a PUD.





**Proposed Code Amendments to  
Title 33, Planning and Zoning and  
Title 34, Subdivision and Partitioning**

New code language is indicated with underline.  
Code language to be removed is indicated with ~~striketrough~~.

Sections: Changes entries as appropriate to reflect the changes in the chapter.

**33.430.080 Items Exempt From These Regulations**

Modifies exception 33.430.080.C.3, so that the exemption is based on no change in building footprint rather than total building coverage. This exemption would still allow for painting and other small modifications as well as second story additions and dormers. Also, the reference to base zone standards is changed to site-related development standards. The term “base zone standards” is not all inclusive since there are other site-related standards in the “200s” section of the code.

Modifies exception 33.430.080.C.5, to clarify that only hazard trees that pose a danger are allowed to be removed without review. It was not the intent of the regulations to allow a tree to be removed simply because it was diseased. The clarifying reference to when a tree poses an immediate danger is also removed.

**CHAPTER 33.430  
ENVIRONMENTAL ZONES**

(Amended by Ord. No. 167293, effective 1/19/94. Amended by Ord. No. 168698, effective 4/17/95.  
Amended by Ord. No. 169375, effective 10/4/95.

Sections:

General [No change]

Development Standards

33.430.110 Purpose

33.430.120 Procedure

33.430.130 Additional Permit Application Requirements

33.430.140 General Development Standards

33.430.150 Standards For Utility Connections

33.430.160 Standards For Land Divisions ~~and~~, PUDs, and Cluster Subdivisions

33.430.170 Standards For Resource Enhancement Projects

Environmental Review [No change]

Natural Resource Management Plans [No change]

Notice and Review Procedure [No change]

Maps 430-1 through 430-12 [No change]

**33.430.080 Items Exempt From These Regulations**

The following items, unless prohibited by Section 33.430.090, below, are exempt from the regulations of this chapter:

**A. and B.** [No change]

**C.** Existing development, operations, and improvements, including the following activities:

1. and 2. [No change]

3. Alterations ~~of~~ to buildings which do not ~~increase building coverage~~ change the building footprint and do not require adjustments ~~of the base zone to~~ site-related development standards.

4. [No change]

5. Removing a tree listed on the Nuisance or Prohibited Plant Lists. Removing other trees or portions of trees when they ~~are diseased or~~ pose an immediate danger, as determined by the City Forester or a certified arborist. ~~Trees pose an immediate danger if they are overhanging or within striking distance of a structure or a developed right-of-way.~~ Removing these portions is exempt only if all sections of wood greater than 12 inches in diameter remain, or are placed, in the resource area of the same ownership on which they are cut;

6. through 8. [No change]

**D.** [No change]

**33.430.130 Permit Application Requirements**

Adds language to ensure that vegetation is planted on disturbed areas in the environmental zone.

**33.430.140 General Development Standards**

Adds a requirement to meet Standard E for development that is within the Transition Area only. This change allows for a five foot setback from resource areas in protection zones in all situations.

Removes the requirement to meet Standard L for development that is within the Transition Area only. This standard is meaningless for development solely within the Transition Area.

Standards C and F are modified so that all references to streams are changed to water body. It was not the intent of the regulation to be limited just to stream setbacks. Water body is defined in Chapter 33.910, Definitions and includes lakes, ponds, and sloughs as well as streams.

**33.430.130 Permit Application Requirements**

A building permit or development permit application that is reviewed for compliance with the standards of this chapter requires more information than a permit not affected by these provisions. The information in Subsections A and B must be submitted with permit application plans. Submission of the information in Subsection C is optional.

- A. [No change]
- B. Proposed development plan including:
  - 1. through 3. [No change]
  - 4. A landscape plan indicating the size, species, and location of all vegetation to be planted in the environmental zone showing that 90 percent vegetative cover will be achieved within one year.
- C. [No change]

**33.430.140 General Development Standards**

The standards below apply to all development in the environmental zones except utilities subject to Section 33.430.150, land divisions subject to Section 33.430.160, and resource enhancement projects subject to Section 33.430.170. Standards A through C and G through P apply to new development. Standards D through P apply to alterations to existing development. Only standards E, J, K, L, N, O, and P apply in Transition areas. All of the applicable standards must be met. Modification of any of these standards requires approval through environmental review described in Sections 33.430.210 to 33.430.280.

- A. and B. [No change]
- C. The disturbance area must be set back at least:
  - 1. Fifty feet from the edge of any identified wetland, from the top-of-bank of any identified ~~stream~~ water body within the Columbia Corridor, or any identified ~~stream~~ water body within a protection zone on lots zoned R10, R20, or RF;
  - 2. Thirty feet from the top-of-bank of any identified ~~streams~~ water body within a protection zone on all lots except those zoned R10, R20 or RF.
  - 3. Thirty feet from the centerline of ~~all any~~ any identified streams water bodies within a conservation zone except those within the Columbia Corridor.

**D. and E.** [No change]

Standards C and F are modified so that all references to streams are changed to water body. It was not the intent of the regulation to be limited just to stream setbacks. Water body is defined in Chapter 33.910, Definitions and includes lakes, ponds, and sloughs as well as streams.

33.430.150 Standards for Utility Lines  
New language is added to Standard F to require tree planting on the stream side of any utility line.

33.430.160 Standards for Land Divisions, PUDs, and Cluster Housing Subdivisions  
Changes the title to include cluster housing subdivisions with PUDs. Changes standards C and D to include cluster housing subdivisions. Cluster housing subdivisions are included with PUDs because they allow variable lot sizes and shapes which can promote conservation of natural resources



- F.** The proposed development must be set back at least:
1. Fifty feet from the edge of any identified wetland, from the top-of-bank of any identified ~~stream~~ water body within the Columbia Corridor, or any identified ~~stream~~ water body within a protection zone on lots zoned R10, R20, or RF;
  2. Thirty feet from the top-of-bank of any identified ~~streams~~ water body within a protection zone on lots zoned R7 through IH; and
  3. Thirty feet from the centerline of ~~all~~ any identified ~~streams~~ water bodies within a conservation zone except those within the Columbia Corridor.

**G. through P.** [No change]

### **33.430.150 Standards for Utility Lines**

The following standards apply to connections to existing utility lines and the upgrade of existing public-utility lines in resource areas. All of the standards must be met. Modification of any of these standards requires approval through environmental review described in Sections 33.430.210 to 33.430.280.

**A. through E.** [No change]

- F.** Each 6 to 10-inch diameter native tree cut must be replaced at a ratio of three trees for each one removed. The replacement trees must be a minimum one-half inch diameter and selected from the Portland Plant List. All trees must be planted on the applicant's site but not within 10 feet of a paved surface. Where a utility line is approximately parallel with the stream channel at least half of the replacement trees must be planted between the utility line and the stream channel.

### **33.430.160 Standards for Land Divisions, ~~and~~ PUDs, and cluster Housing Subdivisions.**

The following standards apply to land divisions, ~~and~~ PUDs, and cluster housing subdivisions in the environmental zones. All of the standards must be met. Modification of any of these standards requires approval through environmental review described in Sections 33.430.210 to 33.430.280.

**A. and B.** [No change]

- C.** Land divisions ~~except~~ which are not also PUDs or cluster housing subdivisions:

1. and 2. [No change]

**D. PUDs and cluster housing subdivisions:** The standards of subsections 33.430.140.B, C, and H through P must be met. The standards of this subsection also must be met:

1. The total amount of disturbance area allowed within the resource area of the environmental conservation zone ~~for the entire PUD~~ is 50 percent of the base zone building coverage or 1 acre, whichever is less, minus the amount of area outside the resource area; and
2. [No change]

**E. through G.** [No change]

**33.430.230 Procedure**

Adds sub-section B.6 to give direction as to what procedure to follow for Environmental Review of projects that are within the Transition Area only and do not meet the development standards.

Adds the term “corrections” to the language of C.2 to make it clear that the environmental review is for the redress of the violation only. The determination of whether or not a violation has occurred is made by the Code Hearings Officer and not the Land Use Hearings Officer. The Land Use Hearings Officer determines—through the environmental review—if a violation has been or will be remediated properly.

Eliminates the reference to permit. This reference has caused much confusion. All violation correction cases should be Type III.

**33.430.250.E Other development in the Environmental Conservation zone or within the Transition Area only.**

Adds language clarifying which set of approval criteria apply to environmental reviews of projects that are within the Transition Area only and do not meet the development standards.

**33.430.250.G Corrections to Violations.**

Adds the term “corrections” to the language of .250.G to make it clear that the environmental review is for the redress of the violation only. Eliminates the reference to permit. This reference has caused confusion.

Also clarifies which approval criteria apply to environmental reviews for the correction of a violation.

**33.430.230 Procedure**

Environmental reviews are processed through the following procedures:

- A.** Resource enhancement activities are processed through the Type I procedure.
- B.** The following are processed through the Type II procedure:
  1. Roads, driveways, walkways, stormwater disposal, and buried connections to existing utility lines;
  2. Public recreational trails, rest points, view points, and interpretative facilities;
  3. Public safety facilities;
  4. Environmental zone boundary modifications; and
  5. All other uses and development in resource areas of Environmental Conservation zones.
  6. Development within the Transition Area only.
- C.** The following are processed through the Type III procedure:
  1. All other uses and development in resource areas of Environmental Protection zones; and
  2. Corrections of ~~Violations of this Chapter that occur when no permit was applied for.~~

**33.430.250 Approval Criteria**

An environmental review application will be approved if the review body finds that the applicant has shown that all of the applicable approval criteria are met. When environmental review is required because a proposal does not meet one or more of the development standards of Section 33.430.140 through .170, then the approval criteria will only be applied to the aspect of the proposal that does not meet the development standard or standards.

**A. through D.** [No change]

**E. Other development in the Environmental Conservation zone or within the Transition Area only.** In Environmental Conservation zones or for development within the Transition Area only, the applicant's impact evaluation must demonstrate that all of the following are met:

**F.** [No change]

**G. Corrections to Violations.** For corrections to violations of this Chapter that occur when no permit was applied for, all of the following must be met, as demonstrated by the applicant's remediation plan: the application must meet all applicable approval criteria stated in subsections A through F above, and paragraphs 1, 2.b and 2.c below. If these criteria cannot be met, then the applicant's remediation plan must demonstrate that all of the following are met:

1. and 2. [No change]

**33.430.280 Modifications Which Will Better Meet Environmental Review Requirements**

Removes the reference to base zones in this paragraph. The intent of this regulation is to allow modifications to all site-related development standards, many of which are found in the 200s section of the zoning code and not just in the base zone chapters.

**33.430.280 Modifications Which Will Better Meet Environmental Review Requirements**

The review body may consider adjustments for site-related ~~base zone~~ development standards as part of the environmental review process. These modifications are done as part of the environmental review process and are not required to go through the adjustment process. Adjustments to use-related development standards (such as floor-area ratios, intensity of use, size of the use, number of units, or concentration of uses) are subject to the adjustment process of Chapter 33.805. In order to approve these modifications, the review body must find that the development will result in greater protection of the resources and functional values identified on the site and will, on balance, be consistent with the purpose of the applicable regulations.



CHAPTER 33.515  
COLUMBIA SOUTH SHORE PLAN DISTRICT

- 33.515.274 Items Exempt From These Regulations  
Adds language that allows planting of native vegetation without a review, as is done throughout all other Environmental Zones within the City.

**33.515.274 Items Exempt From These Regulations**

The following are exempt from the development standards and required reviews stated in this section:

A. through J. [No change]

K. Planting of native vegetation listed on the Portland Plant List when planted with hand held equipment.

CHAPTER 33.805  
ADJUSTMENTS

33.805.040 Approval Criteria

Modifies approval criterion F to remove the limitation of its application to the Columbia South Shore Plan District.

## **CHAPTER 33.805 ADJUSTMENTS**

Sections:

- 33.805.010 Purpose
- 33.805.020 Procedure
- 33.805.030 Regulations Which May and May Not Be Adjusted
- 33.805.040 Approval Criteria

**33.805.010 through .030 [No change]**

**33.805.040 Approval Criteria**

(Amended by Ord. No. 167127, effective 12/17/93. Amended by Ord. No. 169987, effective 7/1/96.) The approval criteria for signs are stated in Chapter 33. 286, Signs. All other adjustment requests will be approved if the review body finds that the applicant has shown that either approval criteria A. through F. or approval criteria G. through I., stated below, have been met. Adjustments to the ground floor window requirements of this Title must also meet the additional requirements stated in the ground floor window sections in the base zones.

- A. through E. [No change]**
- F. If in an environmental zone ~~in the Columbia South Shore Plan District~~, the proposal has as few significant detrimental environmental impacts on the resource and resource values as is practicable;**  
or
- G. through I. [No change]**

**CHAPTER 33.910  
DEFINITIONS**

- **Disturbance Area.**  
Adds language requiring that disturbance areas for new development be contiguous. This will ensure that disturbance areas for new development are compact and connected.
  
- **Remediation.**  
Adds a definition for the term “remediation” to distinguish it from the term “mitigation”.

## CHAPTER 33.910 DEFINITIONS

### Environment-Related Definitions

- **Disturbance Area.** An area which contains all temporary and permanent development, exterior improvements, and staging and storage areas on the site, both existing and proposed. For new development the disturbance area must be contiguous. Native vegetation planted for resource enhancement and agricultural and pasture land is not included. For Section 33.430.150, Standards for Utility Lines, only the proposed development is included.
  
- **Remediation.** The restoration and enhancement of resources and/or functional values lost as the result of a violation of the environmental zone regulations.

Title 34, Subdivision and Partitioning

Chapter 34.12

ADMINISTRATION

- 34.12.050 PUD Required  
Allows for Cluster Housing as option in addition to PUDs. Both Cluster Housing and PUDs allow for clustered development that protects natural resources.

## **Title 34, Subdivision and Partitioning**

### **Chapter 34.12**

#### **ADMINISTRATION**

**Sections:**

- 34.12.010 Enforcement.
- 34.12.020 Conformance and Permits Required.
- 34.12.030 Interpretation.
- 34.12.040 Fees.
- 34.12.050 PUD or Cluster Housing Required.

**34.12.010** through **34.12.040** [No change]

**34.12.050 PUD or Cluster Housing Required**

(added by Ord. No. 164517, July 31, 1991. Either a Planned Unit Development, as regulated by Chapter 33.269, or Cluster Housing Subdivision, as regulated by Chapter 33.216, is required for major land division requests where 50 percent or more of the land area of all lots and/or parcels in common ownership is in an environmental overlay zone.









## **APPENDICIES**

**APPENDIX A** AMENDED INFORMATION FOR ADJACENT JOHNSON CREEK  
RESOURCE SITES

**APPENDIX B** LIST OF PLANTS OBSERVED DURING 1996 FIELD RECONNAISSANCE

**APPENDIX C** WILDLIFE HABITAT ASSESSMENT FORM (sample)

**APPENDIX D** EVALUATION OF HABITAT FEATURES

**APPENDIX E** SIGNIFICANCE FIELD SHEET (sample)

**APPENDIX F** USFWS LETTER ON POTENTIAL SENSITIVE SPECIES OCCURRENCE

**APPENDIX G** SENSITIVE SPECIES

**APPENDIX H THE NATURE OF ENVIRONMENTAL GOODS**

**APPENDIX I REFERENCES**

## **Appendix A**

### **Amended Information for Adjacent Johnson Creek Resource Sites**

**SITE SIZE:** 41 acres

**LOCATION:** Near SE Foster Place (N); SE Brookside Drive and SE 122nd Avenue (S); SE 128th Avenue (E); and SE 117th Avenue (W).

**NEIGHBORHOOD:** Pleasant Valley

**DATE OF INVENTORY:** February 1987, June and September 1990, [October 1996](#)

#### **HABITAT CLASSIFICATION**

- Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded.
- Palustrine, Forested, Deciduous/Conifer, Seasonally Flooded and Saturated.

#### **GENERAL DESCRIPTION**

The entire site, as well as surrounding area, is zoned and developed in single family residential or recreation (Leach Botanical Garden) use. The canyon provides a secluded, forested setting which is taken advantage of in the botanical garden development.

The creek channel is rip-rapped and overgrown with blackberry. Dominant vegetation influencing the channel is a mixed forest of Douglas fir, cedar, alder, cottonwood, maple, willow, and various ornamental trees, as well as lawns and gardens. [Several tributary streams enter Johnson Creek on the south side coming down from the Cedar Creek Watershed in the Lava Domes providing connectivity to Resource Site 30. Just to the west, a broad floodplain bordered by forested slopes occurs at a large s-curve in Johnson creek.](#)

Interspersion of this area is high, lying near large forested areas such as Powell Butte north of the creek, the Lava Boring Hills south, and the developed and undeveloped portions of Leach Botanical Garden and Bunde Park (SE 142nd and Cooper ). This juxtaposition of the creek channel with large forested natural areas and parks provides not only an important source of water to animals that use the larger forested areas, but also serves as a corridor providing cover and food for movements and dispersals between the areas.

Leach Botanical Garden, straddles Johnson Creek and is located in this site area at 6704 SE 122nd Avenue. It is a historic and environmental education resource and designated as a "scenic resource" by the City. It has a Rank 1 status on the City of Portland's, Historic Inventory and is eligible for the National Register. The colonial revival-styled home was built in 1933 by John and Lilla Leach. Mrs. Leach was a nationally known botanist with particular interest in native plants and Mr. Leach was a local pharmacist and civic leader. The property is now owned by the City of Portland and operated by a non-profit organization. Environmental education programs are offered, and the creek and garden are used as outdoor classrooms.

#### **SIGNIFICANT RESOURCE VALUES**

Water, storm drainage, scenic, fish and wildlife habitat, aesthetics, heritage, flood storage, pollution and nutrient retention and removal, sediment trapping, recreation, and education

#### **QUANTITY OF RESOURCES**

This site is made up of half-acre-plus sized lots that are occupied with homes constructed in the 1950's. The oversized lot sizes have allowed for the natural growth of Douglas Fir and Western Red Cedars trees to remain. The forest canopy is intact and the surrounding low-density residential provides a quiet setting that is conducive to wildlife.

Natural understory areas have been replaced with lawns and exotic garden plants. The riparian area on each side of the creek is generally less than 30-foot wide, dominated by blackberries, willows, and alders. Due to the steepness of the canyon walls, the floodway is confined to a narrow strip that is generally 100 feet wide, with the 100-year flood plain somewhat less. [An exception to this is the broad—up to 300 foot-wide—floodplain where the creek makes an s-curve in the vicinity of SE 117th.](#)

From SE 117th Avenue east, Johnson Creek follows the base of the north slope of Mt. Scott. The canyon walls rise 70 feet from the creek channel with 20% slopes. Intersper-sion of this area is high, being near large forested areas such as Powell Butte to the north of the creek, the Lava-Boring Lava Hills to the south, and the developed and undeveloped parks of Leach's Botanical Garden and Bunde Park (SE 142nd Avenue and SE Cooper Street).

**QUALITY OF RESOURCES**

This site received a score of 69, which is a relatively high rating. The forest overstory remains, but the riparian understory has been largely replaced with residential gardens, reducing the quality and amount of habitat area.

<b>Score for Wildlife Habitat Value: 69</b>		<b>Range for All Sites =18 to 83</b>
Vegetation		
Food (variety)		medium
Cover(structural diversity)		medium
Human Disturbance:		high
Interspersion:		medium

**MANAGEMENT RECOMMENDATIONS**

To enhance this site for both wildlife and recreation, native vegetation should be planted along the entire channel in the riparian zone and within the forest canopy area to shade and control the water temperature extremes of Johnson Creek and to replace habitat lost by infill development. Riprapping should be removed to increase the amount of area for plant growth, nesting, and fish spawning. Replacement of lawn with riparian plant species would increase habitat diversity.

**SITE-SPECIFIC ESEE COMMENTS**

**Consequences of allowing Conflicting Uses:** The parcels in this area are characteristically, half-acre lots with over 300 feet of depth making them suitable for partitioning into two lots. Due to the oversized lots, it appears that infill development and resource protection can occur simultaneously. Consideration will need to be given to preventing erosion during site construction and to retention of vegetation. In some cases the location of existing homesites will limit infill development.

Property values in the area would likely drop if the native vegetation, particularly the Douglas fir and western red cedar, were removed as infill development occurs. It is the canyon slopes, creek, and forest cover that creates the unique neighborhood character.

**Consequences of limiting or prohibiting Conflicting Uses:** Protection will reinforce the social and economic value placed on the natural beauty of this neighborhood. Protecting the forest and creek habitat in this area will reinforce the character of Leach Botanical Garden and the public investment made there.

**SITE-SPECIFIC COMPATIBLE USES AND ACTIVITIES**

- Development in conformance with the *Resource Management Plan for Leach Botanical Garden*.

Conclusion and Conflict Resolution

Site 18 is the western end of the 2nd canyon within the study area. The canyon extends between 117th and 145th Avenues. It is a forested, urban wilderness with scenic and habitat value. It is zoned low-density residential and open space; the open space area is Leach Botanical Garden, an 11-acre part of the 41-acre site. The creek corridor, floodplains, and adjacent banks warrant deserve the highest level of protection. The creek is a significant, irreplaceable resource, and major wildlife habitat corridor with City-wide significance. The creek also provides important storm water conveyance and urban design functions.

Decision

The decision for Site 18 is to fully protect the floodway and 100-year flood plain; to allow limited conflicting uses to an adjacent 50 to 400 feet; and to fully allow conflicting uses on the balance of the site.

Prohibit Conflicting Uses

The fully protected area along the creek is a 100-foot wide. The fully protected area covers the essential aspects of the resources; the creek and adjacent banks. The creek is a significant, irreplaceable resource warranting full protection. The fully protected resource values include fish and wildlife, storm drainage, flood storage, pollution and nutrient retention and removal, sediment trapping, recreation, heritage, education, and public access to the creek which is provided at Leach Botanical Garden.

Allow Limited Conflicting Uses ~~(Site 18)~~

The limited conflicting uses (EC zone) area extends 50 to 400 feet from the fully protected area (EP zone) and in a 75 foot-wide area along the two tributaries to the south. The resource and economic benefits of allowing development both have value. Allowing flexibility in development is necessary in order to balance the two objective of protection and development in order to have positive ESEE consequence. The delineation is based on floodway and flood plain (based on F.E.M.A. Hazard maps) locations, topography, tree cover, and conflicting use analysis.

Allow Conflicting Uses Fully\*

The decision to allow conflicting uses fully on about 63% of the 41-acre site will allow in-fill development on the .75 to 1-acre sized parcels. The unprotected area occurs on the developed upland slopes away from the creek where existing development and infrastructure exists. The economic value of the in-fill development outweighs the resource value. This area can be developed without negatively impacting the adjacent resources.

LAND AREA AFFECTED BY ENVIRONMENTAL OVERLAY ZONES:

Zone	Area Affected by EC Zone	Area Affected by EP Zone
R10	<u>45.4</u> acres	<u>38.4</u> acres
OS	6	2

\* Johnson Creek Basin Plan District regulations (Chapter 33.535) apply.



**SITE SIZE:** 34 acres

**LOCATION:** SE 127th Avenue (W); SE SE 131st Avenue (E); North of Flavel St. (S).

**NEIGHBORHOOD:** Pleasant Valley

**DATE OF INVENTORY:** February 1987, September 1990, October 1996

**HABITAT CLASSIFICATION**

- Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded.
- Palustrine, Forested, Deciduous/Conifer, Seasonally Flooded and Saturated.

**GENERAL DESCRIPTION**

The site is a mix of developed and undeveloped single family residential land, surrounded by similar uses. Areas which have not been subdivided are largely open fields or are forested.

**SIGNIFICANT RESOURCE VALUES**

Water, storm drainage, fish and wildlife habitat, aesthetics, scenic, flood storage, pollution and nutrient retention and removal, sediment trapping.

**QUANTITY OF RESOURCES**

The creek and canyon character are the same as the site to the west (Site 198). There are 20%-sloped canyon walls that rise 70 feet above the creek. A significant tributary stream passes through the southern portion of the site and feeds into Johnson Creek. Sixty percent of the 34-acre site has a mixed, deciduous/coniferous forest cover, 30% is open pastureland, and about ten percent is developed with homes. There are no roads through this site to cut-off or disrupt animal access to the creek. Steep slopes may impede animal access to the creek in some areas.

**QUALITY OF RESOURCES**

Other than past logging and conversion of forest land to agricultural land, this site has little disturbance. This mid-section of the (second) Johnson Creek canyon has relatively high quality due to the combinations of habitats that are adjacent to one-another, including riparian strip, open grassland, upland, and mixed forest. No roads and the few homes (five or so) provide a relatively quiet, natural area with cover and food, and where wildlife can move freely.

Interspersion of this area is high, lying near large forested areas such as Powell Butte to the north of the creek, the Lava Boring Hills to the south and the developed and undeveloped parks of Leach Botanical Garden and Bunde Park (SE 142nd and Cooper ). A forested tributary to Johnson Creek provides good connectivity to the adjoining Lave Domes habitats.

<b>Score for Wildlife Habitat Value:</b> 67	<b>Range for All Sites</b> =18 to 83
Vegetation	
Food (variety)	medium
Cover(structural diversity)	medium
Human Disturbance:	medium
Interspersion:	medium

**MANAGEMENT RECOMMENDATIONS**

To enhance this site for both wildlife and recreation, it is suggested that native vegetation be encouraged along the entire channel in the riparian zone and forest canopy be retained and expanded, to shade and control summer water temperature of Johnson Creek.

**SITE-SPECIFIC ESEE COMMENTS**

**Consequences of allowing Conflicting Uses:** The whole site is zoned R10, low density residential. Allowing unchecked residential development would result in continued degradation of the water quality caused by erosion of the highly erodible, clayey soils. Indiscriminate removal of vegetation would reduce habitat area, affect water temperature, and reduce detritus material for fisheries.

**Consequences of limiting or prohibiting Conflicting Uses:** This site is part of the Powell Butte Mt. Scott Plan District area, where consideration is given to protecting more-difficult-to-build-on areas of the site. Planned-unit development is an option where density is transferred from one area of the site(s) to another. Limiting residential development to flatter, more upland areas, away from stream and creek drainages will help keep development costs lowered, thus reducing housing costs while also protect habitat areas and limit soil erosion into Johnson Creek.

#### Conclusion and Conflict Resolution

Site 19 a 34-acre site is one of the least developed sites in the study area. The site has significant scenic value, is rural in character, and primarily wooded with some open pasture land. To the north of the creek the slopes descend 70 feet into a well-defined canyon where Johnson Creek is located. The creek is a significant, irreplaceable resource with City-wide significance for its' function as a major wildlife habitat corridor, drainage system, and contributor to neighborhood identity. Forested slopes and a tributary stream provide good habitat connectivity to the south.

The site has important resource values and conflicting use values. In order to balance providing needed housing and protection of the natural resources, a combination of protection levels have been applied. This site has a housing potential for at least 85 additional units. This amount of units can be achieved on the site by clustering the units.

#### Decision

The decision for Site 19 is to fully protect the Johnson eCreek channel and adjacent banks and the tributary stream to the south that is part of the "Wahoo Creek" watershed contained in Site 30. ~~to partially protect~~ The remainder of the site with tree-cover and/or slopes that exceed 30% warrant directed protection. Developed or improved areas do not warrant protection. ~~and to allow conflicting uses on the remainder of the site where development exist or is planned.~~ This decision is based on the habitat resource inventory, soils, slopes, tree cover, and conflicting use analysis.

#### Prohibit Conflicting Uses

The fully protected area corresponds with the floodway and 100-year flood plain which are uniformly 50-feet wide on the bottom of the deep, well defined canyon. A significant tributary stream south of Johnson Creek also warrants full protection. The resource values fully protected include water purification, storm drainage, flood storage, fish and wildlife habitat, scenic, pollution and nutrient retention and removal, and sediment trapping.

#### Allow Limited Conflicting Uses

The decision to allow limited conflicting uses applies to about 75% of the 34-acre site. The delineation corresponds to areas with tree-cover and/or slopes not associated with the creek that exceed 30%. This decision allows residential development where impacts on the resources are controlled or mitigated. This decision balances resource protection and development opportunities resulting in positive ESEE consequences. The protected resource values include water purification, storm drainage, flood storage, fish and wildlife habitat, scenic, pollution and nutrient retention and removal, and sediment trapping.

#### Allow Conflicting Uses Fully\*

The area where conflicting uses may fully occur are located on the periphery of the site where the resources have been removed and infrastructure exists. Allowing full development of this area will have positive economic consequences. The erosion control regulations implemented through the Building Bureau will adequately protect the creek and site resources without additional environmental protection.

**LAND AREA AFFECTED BY ENVIRONMENTAL OVERLAY ZONES:**

<b>Zone</b>	<b>Area Affected by EC Zone</b>	<b>Area Affected by EP Zone</b>
R10	<del>4 acres</del> actual 14 acres reduced to <u>5.7</u>	<del>3</del> <u>11.3</u> acres
R10 SEC	<del>2</del> <u>1</u>	<del>1</del> <u>2</u>

\* Johnson Creek Basin Plan District regulations (Chapter 33.535) apply.

**SITE SIZE:** 22 acres

**LOCATION:** Near 131st Avenue (W); South of SE Knapp Street (S); SE Deardorf Road (E); and near SE Blackberry Circle (N.)

**NEIGHBORHOOD:** Pleasant Valley

**DATE OF INVENTORY:** February 1987, September 1990, October 1996

**HABITAT CLASSIFICATION**

- Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded.
- Palustrine, Forested, Deciduous/Conifer, Seasonally Flooded and Saturated.

**GENERAL DESCRIPTION**

Most of this site is undeveloped, with single family subdivisions to the north and south. The creek bisects the site in an east-west direction. A tributary stream enters the site from the south (Site 30) at SE Flavel.

**SIGNIFICANT RESOURCE VALUES**

Water, storm drainage, fish and wildlife habitat, aesthetics, flood storage, pollution and nutrient retention and removal, sediment trapping.

**QUANTITY OF RESOURCES**

Two-thirds of this 22 acre site is forested with a mixed deciduous/coniferous forest. On the ~~north~~ south side of the creek there is an intermittent stream that runs through an undeveloped, eight-acre parcel that is parallel and west of Deardorf Rd. The grades are relatively steep on both sides of Johnson Creek, ranging from 10 to 20% and up to 35% along tributaries. The dryer north side appears ready for development. There is a relatively new street surrounded by a four acres of open, grass-covered land.

**QUALITY OF RESOURCES**

The Johnson Creek channel is ripped and overgrown with blackberry. Dominant vegetation influencing the channel is a mixed forest of Douglas-fir, cedar, alder, cottonwood, maple, willow and various ornamental trees, as well as lawns and gardens. The creek is well-shaded throughout this stretch with some pools providing habitat for fish and other aquatic species. Interspersion of this area is high, lying near large forested areas such as Powell Butte to the north of the creek, the Lava Boring Hills to the south and the developed and undeveloped parks of Leach Botanical Garden and Bunde Park (SE 142nd and Cooper). This juxtaposition of the creek channel with large forested natural areas and parks provides not only a potential important source of water to animals that use the larger forested areas, but also acts as a corridor providing cover and food, and movement and dispersal between sites. A forested tributary to the south provides high quality habitat and connectivity to Lava Domes habitats in Site 30.

This site shows the impacts of human use (residential development and riprap) on the stream corridor. A covered bridge along Deardorf Road crosses the creek at this section. There is a lot of garbage along and in the creek on both sides of the road.

<b>Score for Wildlife Habitat Value:</b> 65	<b>Range for All Sites =</b> 18 to 83
Vegetation	
Food (variety)	medium
Cover(structural diversity)	medium
Human Disturbance:	medium
Interspersion:	medium

**MANAGEMENT RECOMMENDATIONS**

To enhance this site for both wildlife and recreation it is suggested that natural vegetation be encouraged along the entire channel in the riparian zone and encourage a forest canopy to shade and control the water temperature extremes of Johnson Creek.

**ESEE COMMENTS**

**Consequences of allowing Conflicting Uses:** The whole site is zoned R10, low density residential. Allowing unchecked, residential development would result in continued degradation of the water quality caused by erosion of the clayey soils. Indiscriminate removal of vegetation would reduce habitat area and adversely impact the temperature and condition of the stream and reduce dietrius material for fisheries.

**Consequences of limiting or prohibiting Conflicting Uses:** The majority of the 22-acres is undeveloped land. R10 density can be achieved while protecting the habitat if there is careful site analysis and construction, and clustering of units. In order to disrupt the least amount of ground and habitat, attached units are the best solution. Attached units would have an energy savings benefit created by common wall construction. There would be a social benefit of providing a housing type other than single-family residential, while also having the enjoyment of natural surroundings.

Conclusion and Conflict Resolution

Site 20 is significant as a highly scenic, well-vegetated part of the study area that has medium to high habitat value. This site extends north and south of the creek. There is a covered bridge over Johnson Creek in Site 20 that is a Goal 5-designated, scenic resource. Adjacent the bridge is an undeveloped, 8-acre wooded parcel that gently slopes north and has a seasonal creek through the middle of it. The site has important resource values and conflicting use values. This residentially-zoned, 22-acre site has housing potential for at least 20 additional units. In order to balance needed housing and resource protection, a combination of protection levels are appropriate.

Decision

The decision for Site 20 is to protect the most valuable site resources that correspond to about half of the site and to allow conflicting uses fully on half the site. See specific descriptions below.

Prohibit Conflicting Uses

The area where conflicting uses are prohibited is uniformly 50-foot wide along the channel that is located in a well-defined canyon. Full protection is necessary in order to ensure protection of the creek, an irreplaceable resource with City-wide environmental value. This level of protection is consistent throughout the study area. Full protection is further warranted along the significant tributary feeding Johnson Creek from the south. The protected values include water purification, fish and wildlife habitat, scenic, recreational, education, and storm and flood storage values.

Allow Limited Conflicting Uses

The area where limited conflicts are allowed (EC zone) is a 40-to-200 foot wide area adjacent the fully protected ~~area (along Johnson Creek)~~ Johnson Creek and its tributary within and over the 8-acre undeveloped, wooded parcel. This level of protection will achieve positive ESEE consequences by balancing natural resource protection and housing potential. The protected resource values include wildlife habitat, scenic, sediment trapping, recreation, and education.

Allow Conflicting Uses Fully\*

On the north side of Johnson Creek only a 50-foot wide area is protected; ~~the area beyond north of this area,~~ conflicting uses may fully occur. This decision is based on the habitat resource inventory and conflicting use analysis; this area has been cleared and a recently constructed street provides access.

**LAND AREA AFFECTED BY ENVIRONMENTAL OVERLAY ZONES:**

Zone	Area Affected by EC Zone	Area Affected by EP Zone
R10	<del>11</del> <u>2</u> acres	<u>10</u> acres

\* Johnson Creek Plan District (Chapter 33.535) regulations apply.

**SITE SIZE:** 13 acres

**LOCATION:** SE Deardorf Rd. (W); 750 feet west of SE Deardorf Rd. (E); City Limits east of SE Glenwood Dr. (N); and north of SE Clatsop Street (N)

**NEIGHBORHOOD:** Pleasant Valley

**DATE OF INVENTORY:** February 1987, September 1990, October 1996

#### **HABITAT CLASSIFICATION**

- Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded.
- Palustrine, Forested, Deciduous/Conifer, Seasonally Flooded and Saturated.

#### **GENERAL DESCRIPTION**

The present condition of the site is undeveloped with only two homes and upland northern and southern halves of the site in agricultural uses. The more severely sloping areas on each side of the creek have at least a 200-foot wide area that is in forest cover. The floodplain widens as you move east across the site.

#### **SIGNIFICANT NATURAL RESOURCES**

Water, storm drainage, fish and wildlife habitat, aesthetics, flood storage, pollution and nutrient retention and removal, sediment trapping.

#### **QUANTITY OF RESOURCE**

This 13-acre site is made up of two parcels that are both occupied with homes and used partially for agricultural uses. Half of the site is in a natural condition with second growth mixed deciduous/coniferous forest, and the rest is open field and pastureland located on the flatter, upland areas away from the creek. The floodplain broadens out to a width of 400 feet at the east end of the site. Land north of the site is in single family residential development, while the other-south sides are-is bordered by forests or agricultural uses.

#### **QUALITY OF RESOURCES**

The channel is rip-rapped and overgrown with blackberry. The dominant vegetation influencing the channel are a mixed forest of Douglas-fir, cedar, alder, cottonwood, maple, willow, and various ornamental trees, as well as lawns and gardens. The creek is shaded throughout this site and has some pools, providing relatively good habitat for fish and other aquatic species. Interspersion of this area is high, lying near the large forested areas of Powell Butte to the north of the creek, the Lava Boring Hills to the south and the developed and undeveloped parks of Leach Botanical Garden and Bunde Park (SE 142nd Avenue and SE Cooper Street). This juxtaposition of the creek channel with large forested natural areas and parks provides not only a potential important source of water to animals that use the larger forested areas but also acts as a corridor providing cover and food, and for movements and dispersals between areas.

The canyon begins to open up allowing a broad floodplain within this stretch of the creek, and adjacent agricultural uses are present. These agricultural uses decrease the habitat quality through chemical runoff, clearing of vegetation, and sedimentation.

The covered bridge crossing Deardorf Road crosses the creek at this section. There is a lot of garbage along and in the creek on either side of the road.

**Score for Wildlife Habitat Value: 63**

**Range for All Sites = 18 to 83**

Vegetation	
Food (variety)	medium
Cover(structural diversity)	medium
Human Disturbance:	low
Interspersion:	medium

### **MANAGEMENT RECOMMENDATIONS**

To enhance this site for both wildlife and recreation, it is suggested that native vegetation be encouraged along the entire channel in the riparian zone and a forest canopy shade Johnson Creek.

### **SITE-SPECIFIC ESEE COMMENT**

**Consequences of allowing Conflicting Uses:** There is a potential for about forty-two additional housing units on this site. Allowing unchecked, residential development would result in continued degradation of the water quality caused by erosion of the clayey soils. Indiscriminate removal of vegetation would reduce habitat area, shading of the creek, and the amount of detritus material for fisheries.

**Consequences of limiting or prohibiting Conflicting Uses:** Residential density can be achieved while protecting the habitat through careful site analysis, construction, and clustering of units. In order to disrupt the least amount of ground and habitat, attached units would be the best solution. Attached units would have an energy savings benefit created by the common-wall construction. There would also be the social benefit of providing a housing type other than single-family residential, while also having the enjoyment of natural surroundings.

#### Conclusion and Conflict Resolution

Site 21 is significant because it contains Johnson Creek, is part of the Boring Lava Hills, and the eastern terminus of a 7,500 foot-long canyon. There are 40% slopes that rise 70 feet above the 400-foot wide flood plain. The slopes are half forested and half in pasture land and there are 2 homes on the site. The habitat value is moderate with a wildlife habitat value of 63 (range for all site is 18 to 83). The site has important resource values and conflicting use values. This residentially-zoned, 13-acre site has housing potential for at least 20 additional units. Based on the habitat inventory and ESEE analysis both housing development and resource protection can be achieved by applying a combination of protection levels.

#### Decision

The decision for Site 21, a 13-acre site is to fully protect the creek corridor (equivalent to 1-acre) **and floodplain**; to allow limited conflicting uses on 5 acres; and to allow full development\* of the outer portions of the site or about 7 acres.

#### Prohibit Conflicting Uses

The fully protected area over the channel is based on the top of bank and is 50 to 100 feet wide. Fully protecting the channel **and floodplain** is commensurate with the protection level for the rest of the channel and the quality, rarity, and City-wide significance of Johnson Creek as a wildlife, storm drainage, and flood storage corridor. The fully protected resource values include water purification, storm drainage, fish and wildlife habitat, scenic, flood storage, pollution and nutrient retention and removal, sediment trapping.

#### Allow Limited Conflicting Uses

The area where limited conflicts are permitted is on the primarily forested slopes adjacent the fully-protected creek channel. This area is primarily forested and covers about 5-acres. This level of protection balances the need for housing and the associated economic benefits with resource protection. The amount of units allowed under the R10 zone is achievable particularly through clustering of the units on lots less than 10,000 square feet. The protected resource values include wildlife habitat, scenic, pollution and nutrient retention and removal, sediment trapping.

#### Allow Conflicting Uses Fully\*

The area where conflicting uses are fully allowed is south of the crest of the slope (400 feet south of the creek) where the forest is no longer contiguous and where some development occurs. This site is best suited for development because it is relatively flat and is where the forest canopy is broken-up (non-contiguous) and therefore, has less habitat value.

LAND AREA AFFECTED BY ENVIRONMENTAL OVERLAY ZONES

Zone	Area Affected by EC Zone	Area Affected by EP Zone
R10	<del>5.2</del> acres	<del>1.4</del> acres

\* The Johnson Creek Plan District (Chapter 33.535) applies which has environmental protection provisions.



**SITE SIZE:** 14 acres

**LOCATION:** Bunde Park and areas east on SE Cooper Street, and Tract C of Eastridge Park Subdivision

**NEIGHBORHOOD:** Pleasant Valley

**DATE OF INVENTORY:** February 1987, June 1990, October 1996

**HABITAT CLASSIFICATION**

- Palustrine, Emergent Persistent Permanently, Semipermanently, and Seasonally Flooded.
- Palustrine, Forested, Semipermanently and Seasonally Flooded.

**GENERAL DESCRIPTION**

Bunde Park , a well-kept secret, is a 3.6-acre City park accessible only by a narrow dirt road (SE 141st Avenue) off SE Foster Road. The rest of the site is open space or undeveloped property abutting the park.

**SIGNIFICANT RESOURCE VALUES**

Water, storm drainage, fish and wildlife habitat, aesthetics, flood storage, pollution and nutrient retention and removal, sediment trapping, recreation, and education values.

**QUANTITY OF RESOURCE**

This site (Bunde Park, Tract C, and privately-held properties) is undeveloped and a remnant of what much of the Johnson Creek riparian corridor looked like prior to alterations and removal of forested vegetation. Structural diversity is high, characterized by a Western Red Cedar and Douglas Fir overstory and a well-developed native shrub and herbaceous layer understory. Plant species diversity is high and primarily comprised of native plants.

Eastridge Subdivision’s Tract C is on a north facing slope above the creek. It is an undeveloped 1.5 acre site that is a part of the Boring Lava Hills and surrounding undeveloped forested area. It has similar vegetative cover and habitat attributes as Bunde Park. Two tributary streams cross the southern portion of the site, draining small basins within the Lava Domes.

**QUALITY OF RESOURCES:**

Bunde Park is one of the few areas of primarily-native riparian vegetation left intact within the Johnson Creek basin. Bunde Park has been chosen as a model site to demonstrate the structure and species diversity of a primarily native riparian forest. This is a high quality habitat site.

<b>Score for Wildlife Habitat Value:</b> 81	<b>Range for All Sites</b> =18 to 83
Vegetation	
Food (variety)	high
Cover(structural diversity)	high
Human Disturbance:	low
Interspersion:	high

**MANAGEMENT RECOMMENDATIONS**

Riparian restoration projects within the Johnson Creek basin should look to Bunde Park as an example of a primarily native riparian forest that has well-defined structure and species diversity. Bunde Park should be developed as a natural area for residents of the area to enjoy rather than as an urban neighborhood park. The small size of the park makes it more suitable for a natural area.

## SITE-SPECIFIC ESEE COMMENT

**Conflicting Uses:** Identified conflicting uses within this site area include urban park development with extensive paved surfaces and removal of trees for park landscaping, play fields, play equipment, or auxiliary park facilities such as parking lots and restrooms. The residential development intended for the portion of the site southeast of the park also presents a conflict.

**Consequences of Allowing Conflicting Uses:** Both Bunde Park and the Tract C could be lost to urban park-type development without some level of protection, resulting in further degradation of the creek corridor through loss of vegetation that provides food, cover and shade.

In order to construct one of the three housing units possible within the resource area it would be necessary to demonstrate that the FEMA regulations were being met. This would likely result in no construction or construction on stilts for one unit. The remaining potential two units (created through land division) would be within 50 feet of the floodway and within 100 feet of the center of the creek channel. This close proximity to the creek would result in a loss of habitat and flood storage area.

**Consequences of limiting or prohibiting Conflicting Uses:** Placing overlay zoning on the two open space sites would limit any park design and function. A likely result of the zoning would be a “natural treatment” of both areas limiting park uses to passive activities.

For the remainder of the site, which is zoned R10 and ~~is formerly~~ part of the Powell Butte/Mt. Scott Plan District (now Johnson Creek Basin Park District), there would be no loss of development potential on privately-held lots, although environmental review to ensure protection of the Johnson Creek corridor would be required.

### Conclusion and Conflict Resolution

~~Site 22 is broken into segments because the property falls in and out of the City of Portland's jurisdiction. This 14-acre conglomerate 14-acre~~ site is zoned low-density residential and open space. This site received the second highest habitat rating in the study area. It is significant as a part of the Boring Lava Hills; it has high habitat quality, excellent habitat interspersions (connection of riparian and coniferous, upland forests). The habitat value outweighs the conflicting use value on portions of the site, particularly around Bunde Park, the area that gave the site such a high habitat rating. However, in-fill development and expansion of the existing homes have value. A combination of resource protection levels have been applied to this site in order to balance resource protection, housing and recreation.

### Decision

The decision for Site 22 is to fully protect the creek corridor and to limit conflicts on the remaining 14-acres with the exception to about 2 acres where the resources have been replaced with residential development.

This fully protected area is based on the top of bank location with exception to one location. This is a 150-foot long strip of land adjacent the creek that is fully protected 70 to 90 feet away from the channel. This area corresponds to the 100-foot wide flood plain (based on F.E.M.A. Flood hazard maps) and is part of a designated, private open space tract. The decision to fully protect this area is based on the high quality habitat resources and need to eliminate conflicting uses which include potential, active recreation.

Site 22 has the second to highest habitat rating in the study area. The two open space tracts are undeveloped and are Bunde Park (3.34 acres) and privately held properties, and a designated, private open space tract ("Tract C"). Bunde Park is nearly 4-acres and is a high quality habitat site because of the plant and structural diversity is high, characterized by a Western Red Cedar and Douglas Fir overstory and a well-developed native shrub layer and herbaceous understory.

Prohibit Conflicting Uses

The fully protected area over the channel is uniformly 50 feet wide. Fully protecting the channel is commensurate with the protection level for the rest of the channel and the quality, rarity, and importance of Johnson Creek as a wildlife, storm drainage, and flood storage corridor. The fully protected resource values include water, storm drainage, fish and wildlife habitat, aesthetics, flood storage, pollution and nutrient retention and removal, sediment trapping. This fully protected area is based on the top of bank location with one exception. This exception is a 150-foot long strip of land adjacent the creek that is fully protected 70 to 90 away from the channel. This area corresponds to the 100-foot flood plain and is part of a designated, private open space tract. The decision to fully protect this area is based on the high quality habitat resources and need to eliminate conflicting uses which include potential, active recreation.

Allow Limited Conflicting Uses

A decision has been made to limit conflicting uses on the undeveloped portions of the site setback 50-feet from Johnson Creek. The undeveloped area has relatively high habitat value because of the well-established vegetative cover, native plant diversity, and connectivity to the Boring Lava Hills. The Boring Lava Hills extend east out of the City and cover over 4,000 acres. The part of the Boring Lava Hills next to this site are primarily undeveloped and provide wildlife habitat. The undeveloped portion of the site also has economic value for housing development. The EC balances needed housing and habitat protection.

This decision allows flexibility to allow mitigation in lieu of prohibiting development and results in no loss of development potential and positive ESEE consequences. This decision permits the development of the two designated open space tracts. Partial protection will be achieved through the application of the environmental conservation zone regulations and Johnson Creek Plan District requirements. The resource values protected include wildlife habitat, scenic, pollution and nutrient retention and removal, sediment trapping, recreation, education.

Allow Conflicting Uses Fully\*

Conflicts may fully occur on about 2 acres where single family development exists.

**LAND AREA AFFECTED BY ENVIRONMENTAL OVERLAY ZONES:**

<b>Zone</b>	<b>Area Affected by EC Zone</b>	<b>Area Affected by EP Zone</b>
R10	<del>1.2</del> acres	<del>2.4</del> acre
OS		4

\* The Johnson Creek Plan District (Chapter 33.535) applies which has environmental protection provisions.

**SITE SIZE:** 70 acres

**LOCATION:** Between Springwater Line and SE Foster Rd, west of Jenneyland Acres, and east of SE 158<sup>th</sup> Avenue

**NEIGHBORHOOD:** Pleasant Valley

**DATE OF INVENTORY:** February 1987, June 1990, October 1996

**HABITAT CLASSIFICATION**

- Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded.
- Palustrine, Forested, Deciduous/Conifer, Permanently Flooded.

**GENERAL DESCRIPTION**

This site is the eastern end of the valley between Powell Butte and the Boring Lava Hills. It is a mixture of low-density residential, agricultural, and undeveloped uses, surrounded by the same.

**SIGNIFICANT RESOURCE VALUES**

Water, storm drainage, fish and wildlife habitat, aesthetics, flood storage, pollution and nutrient retention and removal, sediment trapping.

**QUANTITY OF RESOURCE**

In the western portion of the site, significant natural resources are largely confined to the bed and banks of ~~the creek-~~ Johnson Creek and Kelley Creek, a perennial tributary to Johnson Creek. Toward the east, forested areas away from ~~the creek-~~ Johnson Creek hold significant values.

**QUALITY OF RESOURCES:**

This is a historic, forested floodplain with some present-day wetland. There are occasional small forest stands of cedar/alder (10-60 year old) mixed with low density residences and small farms with seeded pasture and livestock. The site includes the channel of Johnson Creek to the southeast side of Powell Butte and its tributary Kelley Creek. The Johnson Creek and Kelley Creek riparian zones contains blackberries overhanging the channel interspersed with lawns, western red cedar and willow. The stream's flows through an urbanized forest in the central portion of the site. Dense blackberries scattered throughout provide cover and nesting habitat for passerines and small mammals. Large cedar and Douglas fir trees interspersed with willow and alder provide important habitat for many bird species including chickadees, nuthatches, kingfisher, and warblers. This section of ~~ereek-~~ Johnson Creek is an important wildlife travel corridor and link to Powell Butte, upland buttes in Gresham, and to the Boring Lava Hills ~~and other sections of Johnson Creek.~~ along Kelley Creek and buttes to the west.

Human use along ~~the creek-~~ Johnson Creek is high. The western portion is primarily a residential area with more of a rural than urban atmosphere, and a classic pattern of human settlement along waterway bottomlands.

Minus the blackberry and other introduced species, the cedar/alder forest can serve as a model of structural and species diversity of native riparian habitat for future restoration or riparian creation projects.

**Score for Wildlife Habitat Value:** 64

**Range for All Sites** =18 to 83

Vegetation

Food (variety) medium

Cover(structural diversity) medium

Human Disturbance: medium

Interspersion: medium

**MANAGEMENT RECOMMENDATIONS**

R20 zoning should be retained to maintain maximum area for flood storage. Consideration for increase in density to R10 would be more appropriate once a solution for flooding and water quality information is determined as a part of

the Bureau of Environmental Services plan. The riparian strip should be continued or reestablished, and further human intrusion (such as any recreation trail) discouraged.

**SITE-SPECIFIC ESEE COMMENT:**

**Conflicting Uses:** Agricultural, residential.

**SITE-SPECIFIC COMPATIBLE USES**

Rebuilding and replacement of existing bridges to minimum building code requirements if:

- a maximum of 25 feet of riparian vegetation on each side of Johnson Creek ~~the creek~~ is disturbed;
- there is no filling;
- there are no new piers or abutments, or enlargement of existing ones; and
- the bridge will serve only the dwelling or dwellings served at the time of adoption of this plan.

Conclusion and Conflict Resolution

Site 26 is significant because it contributes to the area habitat diversity; links Powell Butte and the Boring Lave Hills (both are significant wildlife areas) and contains Johnson and Kelley Creeks. Sites 24-28 share the same broad flood plain. All 5 sites provide important flood storage and ground water recharge functions. (Ground water is Johnson Creek's primary summer water source). About 2/3rds of Site 26's seventy-acres have tree-cover. The site has moderate habitat value.

This site has 3 parcels that are over 10 acres and many smaller parcels that can be further divided. There is housing potential for at least thirty more units. (This site is not, however, part of the City's buildable lands inventory because it is in a flood plain). The conflicting uses are principally residential and agricultural activities. The ~~channel and immediately adjacent area~~ Johnson and Kelly Creek channels and banks require full protection in order to have positive ESEE consequences. The creek provides functions that are irreplaceable. On the non-creek portions of the site both the natural resources and housing potential have equal value.

Decision

The decision for Site 26 is to fully protect the ~~creek~~ Johnson and Kelley Creek channels, to limit conflicting uses where both resources (other than the creek channel) and housing potential exist, and to fully allow conflicting uses on locations away from the creek where native vegetation has been removed.

The 100-year flood plain is not fully protected. Based on the ESEE analysis and habitat inventory, an EC or EP designation over the flood plain is not justified. However, some protection is provided through Sec. 33.535. 120.D when development occurs. This code provision requires on-site storage for runoff greater than 110% of the existing conditions. Also, included in the Johnson Creek Basin Protection Plan is a recommendation that the R20 zoning not be changed to the R10, comprehensive plan designation on this site until the storm water management and in particular, flooding on Johnson Creek is better resolved.

Prohibit Conflicting Uses

The fully protected area over the Johnson Creek channel is 50 to 70 feet wide. This width protects the main channel and 10 feet of the adjacent banks. The fully protected area of Kelley Creek is approximately 40 feet wide. The fully protected resource values for this portion of the site include water purification, storm drainage, fish and wildlife habitat, aesthetics, flood storage, pollution and nutrient retention and removal, sediment trapping.

Allow Limited Conflicting Uses

Limiting conflicting uses (EC-zoned areas) applies to 19 of the 70-acre site on three distinct locations. One of the EC-zoned areas is the forested lands on each side of the creek. This area extends 100 to 200 feet from the fully protected creek channel. Protection of this area is to help preserve water quality and a small portion of the 100-year flood plain for ground water recharge. The 2nd (EC-zoned) area is 9.5 acre undeveloped, forested flood plain. The resource values protected include wildlife habitat, scenic, ground water recharge and flood storage.

Allow Conflicting Uses Fully\*

Conflicting uses may occur fully on 48 of the 70-acre site. The unprotected resources include part of the 100-year flood plain which extends over most of the site for flood storage and ground water recharge. Also unprotected are the open fields, lawns, and pasture land which have some habitat value.

LAND AFFECTED BY ENVIRONMENTAL OVERLAY ZONES:

Zone	Area Affected by EC Zone	Area Affected by EP Zone
R20(R10)	19 acres	<del>3</del> 4.2 acres

\* Johnson Creek Plan District (Chapter 33.535) regulations apply.

**SITE SIZE:** 40 acres

**LOCATION:** East of SE Jenne Road and north of SE McKinley Road

**NEIGHBORHOOD:** Pleasant Valley

**DATE OF INVENTORY:** February 1987, June 1990, October 1996

#### HABITAT CLASSIFICATION

- Palustrine, Forested, Coniferous/Broadleaved Deciduous, Seasonally Flooded.
- Agricultural

#### GENERAL DESCRIPTION

This ~~is-site includes~~ a large farm, which ~~contributesing~~ to the visual character of the area. Zoning is R20 with a Comprehensive Plan designation of R10.

#### SIGNIFICANT RESOURCE VALUES

Groundwater recharge, aesthetics, pollution and nutrient retention and removal, sediment trapping

#### SITE QUANTITY AND QUALITY

This site holds little resource value, ~~although it except along a tributary to Kelley Creek. Activities at Site 27 also affects~~ nearby creek-related resources such as water quantity and quality.

#### MANAGEMENT RECOMMENDATIONS

Control water quality.

#### SITE-SPECIFIC ESEE COMMENTS

**Conflicting Uses:** Agricultural ~~and~~, housing, commercial use.

##### Conclusion and Conflict Resolution

This 40-acre site is pasture land with only a few scattered trees and little habitat resource value although it provides flood storage and ground water recharge affecting Johnson Creek's water quantity and quality. Johnson Creek is not on this site but about 500 feet of a tributary creek is located on the southeast side of the site near Jenne Road. Activities associated with agricultural, commercial and housing uses are the principle conflicting uses. The zoning is R20 with a Comprehensive Plan designation of R10. The site resources are limited. In order to have positive ESEE consequences conflicting uses should be allowed on most of the site.

##### Decision

The decision for Site 27 is to ~~fully protect~~ provide limited protection for the tributary creek ~~channel~~ on the southeast side of the site and to ~~fully~~ allow conflicting uses to the remainder of the site.

##### Prohibit-Allow Limited Conflicting Uses

As described above, the natural vegetative cover on this site has been removed except for over the tributary creek (located 50-feet east of the Jenne and Foster Road intersection). The tributary creek is an important water source for Kelley/Johnson Creek which provides wildlife habitat, and handles storm drainage. The Johnson Creek Basin Plan District requirements apply which restricts storm drainage affecting the water quality and quantity.

##### Allow-Limited-Prohibit Conflicting Uses

No part of the site ~~has been designated where limited conflicting uses may occur warrants full protection.~~ The economic value of ~~full~~ development except along the tributary creek outweighs the natural resource value. ~~No part of the site has been designated to have the conflicts limited.~~

##### Fully Allow Conflicting Uses

Based on the ESEE analysis and habitat inventory, only the ~~areas of the site with~~ creek corridors deserve warrants protection. There are no other identified resources which warrant protection.

LAND AFFECTED BY ENVIRONMENTAL OVERLAY ZONES:

Zone	Area Affected by EC Zone	Area Affected by EP Zone
CG		>1 acre
R20(R10)	>1 acre	>1 acre

\* Johnson Creek Plan District (Chapter 33.535) regulations apply.



**SITE SIZE:** 600 acres (570 ac. in public ownership)

**LOCATION:** East of SE 136th Avenue, west of SE 174th Avenue, north of the Springwater Line, and south of SE Powell Boulevard

**NEIGHBORHOOD:** Powellhurst

**DATE OF INVENTORY:** February 1987, June 1990, February 1997

#### **HABITAT CLASSIFICATION**

- Palustrine, Forested, Broadleaved Deciduous Intermittent, ~~Conifer~~
- Open meadow

#### **GENERAL DESCRIPTION**

This site is the top and southern portions of Powell Butte, a large part of which was once a dairy but is now owned by the City of Portland. Urban development is on the west, north, and east, while natural resource sites 24-26 are to the south.

#### **SIGNIFICANT RESOURCE VALUES**

Water, storm drainage, aesthetics, scenic, pollution and nutrient retention and removal, sediment trapping, recreation, education, heritage

#### **QUANTITY OF RESOURCES**

This site is a major butte surrounded by residential development at its base to the north, west, and south, but with relatively non-intensive residential development on the east side. This is one of the more unique uplands in southeast Portland and perhaps within the Urban Growth Boundary. This butte consists of primarily two major habitat types: an open grassland (2/3) and a mid-serial stage forest (1/3).

At the base of the butte to the east is a one-acre forested wetland bordering Johnson Creek.

The forest consists of mature deciduous trees (maple, alder) and 30-50 year old conifers (Douglas fir). Snags are common and there is some downed dead wood from windthrow. The grassland is an abandoned ungrazed and unharvested pasture with some invading hawthorne trees. There was a vernal pond noted within this grassland during the time of the first inventory (2/20/87).

#### **QUALITY OF RESOURCES**

Powell Butte provides very important wildlife habitat within Johnson Creek and the Portland metropolitan area. There are very few upland meadows left in the metropolitan area. The large size and combination of upland meadow, forest, and adjacency to Johnson Creek is rare and provides habitat for a large diversity of bird, large and small mammal, and reptile species.

This combination of forest and grassland provides potential for good quality habitat. The forest provides foraging, perching, roosting, and nesting habitat for hawks, falcons, owls, and bats. The grassland provides nesting habitat for birds such as meadowlarks and sparrows. The grass sod and thatch provide high quality habitat for small mammal production. The grassland/forest ecotone provides a valuable edge effect to wildlife, potentially supporting greater densities than other habitat types.

Forested wetland situated along Johnson reek corridor and at the base of Powell Butte provides excellent connectivity as well as nesting forage and cover habitat for birds, amphibians and small mammals.

Powell Butte has very high scenic quality with a panoramic view of the Cascade mountains, Columbia River, and the Portland metropolitan area.

The site also shows signs of historical disturbance in forms of logging and farming; however, it now shows less sign of human use.

<b>Score for Wildlife Habitat Value: 73</b>	<b>Range for All Sites =18 to 83</b>
Vegetation	
Food (variety)	medium
Cover(structural diversity)	medium
Human Disturbance:	high
Interspersion:	high

### MANAGEMENT RECOMMENDATIONS

Retain the variety of habitat, including the meadow and wetlands. Protect the forested perimeter. Develop the Powell park area to take advantage of its natural attributes. As a condition of any future water reservoir expansion, require an alternative or modified practice of water release that is compatible with the goals and objectives of the *Johnson Creek Basin Protection Plan*.

### ESEE COMMENTS

**Conflicting Uses:** Residential development, removal of trees for firewood (or any other reason), some aspects of the park use (both incompatible recreation and overuse of compatible recreation), and Water Bureau operations which discharge water into Johnson Creek in large amounts over short periods of time.

**Consequences of allowing Conflicting Uses:** The Powell Butte Master Plan was adopted in 1987. It gives considerable protection to the natural resource aspects of the park that are in public ownership. The master plan intends that Powell Butte will develop as a natural, regional park providing generally passive activities. The master plan recognizes the value of the natural resources. With the master plan in place, application of the Environmental Zone is less important on the publicly owned lands, which is about 570 acres of Powell Butte.

### SITE-SPECIFIC COMPATIBLE USES

- Park development approved under the 1987 conditional use

### Conclusion and Conflict Resolution

Site 29 is significant because it is Powell Butte which is a major geographic feature of Portland with City-wide significance as wildlife habitat and scenic value. Site 29 has one of the highest habitat ratings in the study area. The combination of upland meadow, forest, wetlands and adjacency to Johnson Creek is rare. In particular, there are few upland meadows left in the metropolitan area. Powell Butte provides habitat for a large diversity of birds, large and small mammals, and reptile species. Powell Butte contributes to the regions' identity plus provides panoramic views of the Cascade mountains, Columbia River, and the Portland metropolitan area.

The conflicting uses are residential development and overuse or incompatible recreational uses. About 570 acres of the 600-acre site is in public park use. The adopted Powell Butte Master Plan gives considerable protection to the natural resource aspects of the parks and directs that Powell Butte be developed as a natural, regional park providing passive activities.

The significant resource values are water purification, storm drainage, scenic, pollution and nutrient retention and removal, sediment trapping, recreation, education, and heritage.

### Decision

The decision for Powell Butte is to fully protect the forested areas and forested wetland; to allow limited conflicting uses on the residentially-zoned areas where habitat resources exist and on the open space designated area where the forest cover has been removed; and to fully allow conflicting uses where habitat resources no longer exist.

### Prohibit Conflicting Uses

The areas where conflicting uses are prohibited correspond to the forested steep slopes and forested wetland. Eliminating conflicting uses is necessary based on the habitat inventory and in order to ensure positive ESEE consequences. This decision is consistent with the master plan for the park and will not result in loss of housing potential at the wetland site because redistribution of units to avoid wetlands is readily accomplished.

Allow Limited Conflicting Uses

The areas where limited conflicting uses may occur are either tree covered and/or steeply sloping residential land (about 30 acres is designated EC-zone) or park land with no tree cover (about 470 acres).

Allow Conflicting Uses Fully\*

The areas where conflicting uses may fully occur are where the resources have been removed. These areas correspond to developed areas located on the northeast corner of the site where several single-family residential and commercial developments exist.

**LAND AREA AFFECTED BY ENVIRONMENTAL OVERLAY ZONES**

Zone	Area Affected by EC Zone	Area Affected by EP Zone
OS	400	170
R20(R10)	30	
<u>R10</u>	<u>1.35 acres</u>	
<u>R5</u>	<u>1.9 acres</u>	<u>4.3 acres</u>



## Appendix B

### List of Plants Observed during 1996 Field Reconnaissance

COMMON NAME	SCIENTIFIC NAME
<b><u>Horsetail</u></b>	<b><u>Equisetaceae</u></b>
Common Horsetail	Equisetum arvense
Ginat Horsetail	Equisetum telmateia
<b><u>Common Fern</u></b>	<b><u>Polypodiaceae</u></b>
N. Maidenhair Fern	Adiantum pedatum
Lady Fern	Athyrium filix-femina
Spreading Wood Fern	Dryopteris austriaca
Licorice Fern	Polypodium glycyrrhiza
Sword Fern	Polystichum munitum
Bracken Fern	Pteridium aquilinum
<b><u>Cypress</u></b>	<b><u>Cupressaceae</u></b>
Western Red Cedar	Thuja plicata
<b><u>Pine</u></b>	<b><u>Pinaceae</u></b>
Grand Fir	Abies grandis
Spruce*	Picea spp.
Douglas Fir	Pseudotsuga menziesii
Western Hemlock	Tsuga heterophylla
<b><u>Holly</u></b>	<b><u>Aquifoliaceae</u></b>
English Holly*	Ilex aquifolium
<b><u>Willow</u></b>	<b><u>Salicaceae</u></b>
Lombardy Poplar*	Populus nigra
Black Cottonwood	Populus trichocarpa
Pacific Willow	Salix lucida lasiandra
Scouler's Willow	Salix scouleriana
Sitka Willow	Salix sitchensis
<b><u>Birch</u></b>	<b><u>Betulaceae</u></b>
Red Alder	Alnus rubra
Western Hazel	Corylus cornuta
<b><u>Nettle</u></b>	<b><u>Urticaceae</u></b>

Stinging Nettle

*Urtica dioica*

**Birthwort**

Wild Ginger

**Aristolochiaceae**

*Asarum caudatum*

**Buckwheat**

Lady's Thumb

Giant Knotweed\*

Western Dock

**Polygonaceae**

*Polygonum persicaria*

*Polygonum sachalinense*

*Rumex occidentalis*

**Purslane**

Siberian Miner's-Lettuce

**Portulacaceae**

*Claytonia sibirica*

**Water-lily**

Water-lily\*

**Nymphaeaceae**

*Nymphaea* spp.

**Buttercup**

Baneberry

Western White Anemone

Western Clematis

Creeping Buttercup\*

Western Meadowrue

**Ranunculaceae**

*Actaea rubra*

*Anemone deltoidea*

*Clematis ligusticifolia*

*Ranunculus repens*

*Thalictrum occidentale*

**Barberry**

Vanillaleaf

Tall Oregon Grape

Dull Oregon Grape

White Inside-out Flower

**Berberidaceae**

*Achlys triphylla*

*Berberis aquifolium*

*Berberis nervosa*

*Vancouveria hexandra*

**Fumitory**

Pacific Bleedingheart

**Fumariaceae**

*Dicentra formosa*

**Mustard**

Lunaria\*

Water Cress\*

**Cruciferae**

*Lunaria annua*

*Rorippa nasturtium-aquaticum*

**Saxifrage**

Mitrewort

Fringecup

Foamflower

Pig-a-back Plant

**Saxifragaceae**

*Mitella pentandra*

*ellima grandiflorum*

*Tiarella trifoliata*

*Tolmiea menziesii*

**Hydrangea**

**Hydrangeaceae**

Mockorange

Philadelphus lewisii

**Rose**

Western Serviceberry

Black Hawthorn

European Hawthorn\*

Wood Strawberry

Large-leaved Avens

Ocean-spray

Indian Plum

Pacific Ninebark

Bitter Cherry

English Laurel\*

Common Chokecherry

Baldhip Rose

Nootka Rose

Swamp Rose

Himalayan Blackberry\*

Evergreen Blackberry\*

Blackcap

Thimbleberry

Salmonberry

Trailing Blackberry

Sitka Mountain-ash\*

Douglas' Spiraea

**Rosaceae**

Amelanchier alnifolia

Crataegus douglasii

Crataegus monogyna

Fragaria vesca

Geum macrophyllum

Holodiscus discolor

Oemleria cerasiformis

Physocarpus capitatus

Prunus emarginata

Prunus laurocerasus

Prunus virginiana

Rosa gymnocarpa

Rosa nutkana

Rosa pisocarpa

Rubus discolor

Rubus laciniatus

Rubus leucodermis

Rubus parviflorus

Rubus spetabilis

Rubus ursinus

Sorbus sitchensis

Spiraea douglasii

**Pea**

Scot's Broom\*

Clover\*

American Vetch

**Leguminosae**

Cytisus scoparius

Trifolium spp.

Vicia americana

**Geranium**

Crane's Bill\*

**Geraniaceae**

Erodium cicutarium

**Oxalis**

Oregon Oxalis

**Oxalidaceae**

Oxalis oregana

**Staff-Tree**

Western wahoo

**Celastraceae**

Euonymus occidentalis

**Maple**

Vine Maple

Big-leaf Maple

**Aceraceae**

Acer circinatum

Acer macrophyllum

**Balsam**

**Balsaminaceae**

Orange Balsam

Impatiens capensis

**Buckthorn**

Cascara

**Rhamnaceae**

Rhamnus purshiana

**St. John's-wort**

Common St. John's-wort

**Hypericaceae**

Hypericum perforatum

**Violet**

Stream Violet

**Violaceae**

Viola glabella

**Evening-Primrose**

Fireweed

Watson's Willow-herb

**Onagraceae**

Epilobium angustifolium

Epilobium watsonii

**Ginseng**

English Ivy\*

**Araliaceae**

Hedera helix

**Parsley**

Cow-parsnip

Pacific Water-parsley

Mountain Sweet-cicely

**Umbelliferae**

Heracleum lanatum

Oenanthe sarmentosa

Osmorhiza chilensis

**Dogwood**

Pacific Dogwood

Red Osier Dogwood

**Cornaceae**

Cornus nuttallii

Cornus sericea sericea

**Heath**

Salal

Red Huckleberry

**Ericaceae**

Gaultheria shallon

Vaccinium parvifolium

**Ash**

Oregon Ash

**Oleacea**

Fraxinus latifolia

**Waterleaf**

Pacific Waterleaf

**Hydrophyllacea**

Hydrophyllum tenuipes

**Mint**

Ground-ivy\*

Cooley's Hedge-nettle

**Labiatae**

Glecoma hederacea

Stachys cooleyae

**Nightshade**

Bittersweet\*

**Solanaceae**

Solanum dulcamara

**Figwort**

Common Mullein\*

**Scrophulariaceae**

Verbascum thapsus



American Brooklime

**Plantain**

Common Plantain\*

**Madder**

Sweetscented Bedstraw

**Honeysuckle**

Trumpet Vine

Blue Elderberry

Red Elderberry

Common Snowberry

Moosewood Viburnum

**Teasel**

Teasel\*

**Aster**

Pathfinder

Common Beggarticks

Canada Thistle\*

Nipplewort\*

Sweet Coltsfoot

**Pondweed**

Pondweed

**Rush**

Jointed Rush

Common Rush

Small-flower Woodrush

**Sedge**

Henderson's Wood Sedge

Dewey's Sedge

Green-sheathed Sedge

Slough Sedge

Small-fruit Bulrush

**Grass**

Colonial Bentgrass\*

Japanese Brome\*

Tall Fescue\*

Tall Mannagrass

Reed Canarygrass\*

Veronica americana

**Plantaginaceae**

Plantago major major

**Rubiaceae**

Galium triflorum

**Caprifoliaceae**

Lonicera ciliosa

Sambucus mexicana

Sambucus racemosa

Symphoricarpos albus

Viburnum edule

**Dipsacaceae**

Dipsacus sylvestris

**Compositae**

Adenocaulon bicolor

Bidens frondosa

Cirsium arvense

Lapsana communis

Petasites frigidus

**Potamogetonaceae**

Potamogeton spp.

**Juncaceae**

Juncus articulatis

Juncus effusus

Luzula parviflora

**Cyperaceae**

Carex hendersonii

Carex deweyana

Carex feta

Carex obnupta

Scirpus microcarpus

**Gramineae**

Agrostis tenuis

Bromus japonicus

Festuca arundinacea

Glyceria elata

Phalaris arundinacea

**Cattail**

Common Cattail

**Typhaceae**

Typha latifolia

**Lily**

Hooker Fairy-bell

W. False Solomon's Seal

Starry False Solomon's S.

Twisted-stalk

Western Trillium

**Liliaceae**

Disporum hookeri

Smilacina racemosa

Smilacina stellata

Streptopus amplexifolius

Trillium ovatum

**Iris**

Yellow-flag\*

**Iridaceae**

Iris pseudacorus

\* Indicates non-native species.

## **Appendix C**

### **Wildlife Habitat Assessment Form (sample)**



## **Appendix D**

### **Evaluation of Habitat Features**

#### **Selection of the Wildlife Habitat Rating System**

The Wildlife Habitat Assessment (WHA) rating system, originally developed for the City of Beaverton in 1983 as part of their Goal 5 update, is acknowledged by the Land Conservation and Development Commission (LCDC) as meeting the Goal 5 inventory requirements. This system is used by many jurisdictions throughout the Portland metropolitan area and by Lane County jurisdictions.

The success of the WHA rating system is due to the participation by biologists from a number of agencies, who developed the system and determined the criteria to be included under each component. The rating system was designed by a technical advisory team consisting of staff from the following agencies:

- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Army Corps of Engineers
- Oregon Department of Fish and Wildlife
- Audubon Society of Portland
- The Wetlands Conservancy
- Beaverton Planning Bureau

The WHA rating system reviews each identified habitat site in terms of its potential for wildlife. The rating system is based on the fact that all wildlife have three basic requirements for survival: food, water and cover. These form the three major components of the assessment. Each site is evaluated in terms of quantity, quality, diversity and seasonality of food, water and cover offered on the site. Also considered is the degree and permanence of physical and human disturbance on the site, whether there are other usable habitats nearby, and the unique features on the site, including wildlife, flora and rarity of habitat. Each of these is discussed in the section, "Discussion of the Rating Sheets."

The rating system is not intended to provide a comprehensive analysis of each site, but to allow relative values between habitat areas to be determined and compared. Should an in-depth study of specific sites be required, a more detailed biological analysis would be appropriate.

The City of Portland has modified the WHA form by dropping two elements originally considered as part of the habitat rating. These elements are "scenic" and "educational potential" values. The presence of these elements has no direct relationship to habitat quality. Scenic and educational values are reviewed in other parts of the Goal 5 inventory for resource sites.

#### **Conducting the Field Inventory**

Biologists from the City of Portland, Planning Bureau staff and occasionally members of the Goal 5 technical advisory committee, inventoried resource sites within the Portland Urban Services Boundary. The original field work was conducted largely in the spring, summer and fall of 1986. Subsequent inventories were conducted between 1989 and 1992. Habitat rating sheets for each site were completed and are on file at the Planning Bureau.

### Discussion of the Rating Sheets

This section is a summary discussion of the Wildlife Habitat Assessment rating sheets. An example of WHA rating sheet is included in this appendix. It needs to be emphasized that this discussion is a summary and not a textbook approach which would allow the reader to duplicate the City's inventory information. For more detailed information on specific procedures, the reader is encouraged to contact the City of Portland. The WHA rating system provides a city-wide basis for comparison of resource sites. The WHA form is one element of the City's Goal 5 resource inventory; other sources of inventory information include published plans, reports and maps, aerial photographs and field sampling.

The WHA rating form is divided into three parts. The first presents general information about the site to facilitate identification. Included here are the unit number, location, size, score and comments.

<b>Unit No.</b>	A space is provided for the observer to label each site with an individual identification number.
<b>Location</b>	This space is to briefly describe the site location.
<b>Sq. Ft.</b>	The approximate size of the site can be noted.
<b>Score</b>	The cumulative score after the rating sheet has been filled out can be noted here. The scoring is done while in the field.
<b>Comments</b>	This space is used for additional remarks on the reasoning behind specific numeric ratings or for potential of the site for rehabilitation, enhancement, etc.

The second section consists of the water, food and covers values (referred to as habitat components). Each of these components is further divided into a number of aspects.

#### Water

Four aspects of the water regime on a site were included on the rating form: quantity and seasonality, quality, proximity to cover, and diversity. All of these factors play an important role in the site's significance to wildlife.

The relative value of these aspects compared to the other components (food and cover) are higher. The total number of possible points from the water component is 30 points, while the highest totals for food and cover are 24 and 28 points, respectively. The reason for this weighting of the relative value of the water component is that it is of critical importance to the function of wetlands and riparian zones and the wildlife species that inhabit them.

Quantity and Seasonality: This aspect refers to the amount of water available on site, and its seasonal variability. Seasonal water sources are given a value of four points, and perennial water sources (available year-round) a value of eight.

Quality: Stagnant water sources were given a value of zero, seasonally flushed a value of three, and continually flushed a value of six. Although desirable to have some value included reflecting the quality of the water on site, actual water quality analysis is not always feasible. Therefore, an indirect measure of quality, "flushing," was selected. In actuality, even stagnant water has some wildlife habitat value, but it was decided to assign it a value of zero, as seasonally or continually-flushed water has a higher value for wildlife, and because the presence of stagnant water indicates the probability of other factors which result in lower wildlife values.

Proximity to Cover: Wildlife will use water more readily if it is close to vegetative cover. This allows escape from predators and protection from weather extremes. The closer and more dense the cover, the more important the water source to many species. Dense cover immediately adjacent to a water source yields a site value of eight, nearby cover a value of four, and no cover a value of zero.

Diversity: A site with a mixture of wetland, stream and open pond or lake resources has higher wildlife value than a site with only one of these features. The ranking ranges from a low of two (one water source only) to eight (three or more water sources present).

### **Food**

Food is a basic requirement for any organism. Wildlife cannot survive in one area for any appreciable period of time without food. The greater the variety and quantity of food, the greater the potential for serving the needs of more wildlife species. The three aspects included under food are variety, quantity and seasonality, and proximity to cover.

Variety: The variety of food on a site is rated from a high of eight points to a low of zero.

Quantity and Seasonality: This aspect measures the amount of food and its availability on an annual basis. Sites having large quantities of food available year-round receive a value of eight, and sites with little or no food available receive a value of zero.

Proximity to Cover: As with water, the presence of adjacent cover from which to forage for food and escape predation by other native wildlife or domestic animals is important. Proximity to cover also ranked from zero to eight points.

### **Cover**

The aspects of cover included here (structure, variety, nesting, escape and seasonality) attempt to describe the physical environment of the site from a number of perspectives that are important to wildlife.

Structural Diversity: What is looked for in this category is the vertical stratification of vegetation on a site, i.e., is there only one layer of vegetative cover (herbaceous, shrub or tree), or are there more? The most diverse structural system expected to be encountered would be multi-layered, with a ground layer of herbaceous vegetation (grasses, forbs, wildflowers, etc.), a second layer consisting of shrubs (snowberry, thimbleberry, Oregon grape, Himalayan blackberry, etc.), perhaps another layer of taller plants (red and blue elderberry, Indian plum, serviceberry), a short



tree layer (flowering dogwood, hazelnut, saplings of taller species), and finally a tall canopy layer (Douglas fir, western hemlock, bigleaf maple, black cottonwood, Oregon ash, Oregon white oak, etc.). Snags and down woody debris also provide structural diversity. The more layers present, the greater the surface area for more feeding, traveling, and breeding available to a wider number of wildlife species. Values range from eight points for high structural diversity, to zero for low or no diversity.

Variety: Within any one layer or when considering all layers, if structural diversity is high, there may be a number of plant species which provide a variety of vegetation characteristics. This is important from the standpoints of cover, feeding and reproduction. The greater the variety of vegetation, the more important the habitat. For example, a forested wetland with a mixture of rushes, sedges, smartweed, spirea and willow provides more valuable wildlife habitat than an area with a monoculture of reed canarygrass. Values range from eight points for high variety, to zero for little or no variety.

Nesting: While there may be both good variety and diversity of vegetative cover, the overall nesting potential may vary from site to site. This aspect was added to address the overall nesting potential of the site for a variety of bird and mammal species. Nesting values range from four to zero points.

Escape: This aspect is primarily a function of density of cover and its ability to afford escape from predation. A value of four points is assigned to sites which offer a high possibility of escape, and zero for those with no or low potential.

Seasonality: As with food and water, a habitat site will be less important to wildlife if cover is not present year-round. Regarding cover, this relates primarily to whether all of the vegetation is deciduous or evergreen. If there is some evergreen vegetation, or the deciduous vegetation retains some of its canopy year-round, the site is more valuable. Vegetative cover available year-round receives a value of four, limited cover a value of two, and seasonal cover a value of zero.

The third part of the form addresses values in addition to food, water and cover. The factors examined include disturbance, interspersion and unique features.

### **Disturbance**

Disturbance is examined from two perspectives: physical and human.

Physical: This category was used to assign a higher value to those sites with little disturbance, to reflect the fact that the removal or disturbance of physical components (food, water, cover) is detrimental to wildlife. However, it is also recognized that such a disturbance could be relatively short-lived (such as placement of a sewer line down a creek channel), while others are long-term or permanent. A relatively undisturbed site receives a maximum value of four points, sites with temporary physical disturbance a value of two, and those with permanent or long-term disturbance a value of zero.

Human: Human and human-related (e.g., domestic animals) disturbances can be very detrimental to wildlife. On the other hand, an area that is highly disturbed from a physical perspective may receive little human use. The values range from four points for low human disturbance, to zero for high impact.

### **Interspersion**

Habitats are important to one another in the sense that a number of different habitats adjacent to one another can provide an overall diversity of vegetative cover, food and often water. Therefore, an isolated site surrounded by pavement, buildings, and human activity would receive a lower interspersion value than a similar site surrounded by other habitat sites, such as wetlands, upland forests, shrubby areas, or meadows. The interspersion score ranges from a high of six points, to a low of zero.

### **Unique Features**

This component is intended to take into account other factors which might make the site unique to plants, animals or humans. Aspects included are unique or locally rare or sensitive flora or fauna, and the rarity of habitat within the City.

Flora and Fauna: If there is a particular species of plant or wildlife which is sensitive or unique in some way, then the site would receive a value ranging from one to four points.

Habitat Type: This refers to whether the site has any plant or animal species considered rare from a regional or national perspective, or in terms of scarcity within the City, or within a particular Management Unit. The highest value which can be received is four points.



## **Appendix E**

### **Significance Field Sheet (sample)**



## **Appendix F**

### **USFWS Letter on Potential Species Occurrence**





## Appendix G

### Sensitive Species

During Fall 1996 and Spring 1997, City staff and project consultants conducted field surveys within the Lava Domes study area. Observations of sensitive species were recorded during the surveys, but a formal sensitive species survey was not completed. The field work supplements prior inventories within the site. A list of plant species recorded within the study area is contained in Appendix B.

In response to the City's request, the U.S. Fish and Wildlife Service (USFWS) identified threatened and endangered species, and species proposed for listing, which may occur within the study area. They also identified candidate species and species of concern. The City also received information on special status species occurrences from the Oregon Natural Heritage Program (ONHP) database. In addition, published information on sensitive plants and animals was consulted prior to the field surveys, and professional experts were consulted.

This appendix provides a review of the requirements and known occurrence of each species identified as having potential to occur within the Lava Domes study area.

### Listed Species

The USFWS has identified the following listed species that may potentially use or inhabit the project area: bald eagle (*Haliaeetus leucocephalus*), howellia (*Howellia aquatilis*), Bradshaw's lomatium (*Lomatium bradshawii*) and Nelson's checker-mallow (*Sidalcea nelsoniana*).

#### Bald Eagle

The bald eagle breeds throughout the Pacific Northwest, Alaska, Canada, the Rocky Mountains, Great Lakes, as well as Florida and Chesapeake Bay. Some birds are year-around residents near their breeding territory, but others migrate in winter. Wintering eagles are found in southern Alaska and Canada, and southward. In 1996 there were 284 known breeding territories in Oregon (Isaacs and Anthony 1996). Bald eagles typically nest in large conifers, generally in close proximity to water. Winter roosts may be as much as 32 kilometers (20 miles) from foraging areas, and are often in stands of mature or old-growth conifers. Bald eagles feed primarily on fish, small mammals, waterfowl, and carrion (Ehrlich et al. 1988). They typically forage from perches or while soaring (Stokes and Stokes 1989, Ehrlich et al. 1988).

The ONHP database contains one record of bald eagle on Powell Butte located approximately one mile north of Clatsop and Cooper Buttes (ONHP 1996). The historic record from 1978 indicates the presence of an active eagle nest. However, the database report notes: "validity of nest site questionable, unable to verify this nesting report, but nesting at this site unlikely" (ONHP 1996). While other raptors such as red tail hawk are relatively common in the study area, no evidence of bald eagles was found at the site during 1996 and previous field inventories.



### Howellia

Howellia is an aquatic annual plant in the bellflower family that is a regional endemic. Although first discovered in Oregon, this species is believed extirpated in Oregon and California; it has, however, been recently documented in Washington, Idaho and Montana, in three widely disjunct areas (Lesica et al. 1988). Howellia occurs in sloughs, ponds, and other marshy areas that are submerged during much of the year. The species occurs only in ponds or sloughs that are dry or nearly dry late in the growing season and is not found in sites that are submerged throughout the entire year (Lesica et al. 1988).

According to ONHP (1995), howellia once occurred in Marion, Clackamas and Multnomah Counties but is presumed to be extirpated. The ONHP database search for this project did not locate records for this species in the vicinity of the Lava Domes (ONHP 1996). No individuals of this species were detected within the study area during field investigations. Wetlands within the study area do not provide suitable habitat for howellia because they are either submerged for short durations during the year or are permanently ponded.

### Bradshaw's Lomatium

Bradshaw's lomatium is a plant endemic to western Oregon and Washington. This species was once widespread in wet prairies of the Willamette and Umpqua Valleys. However much of this habitat has been developed or converted to agricultural lands. The species is now known to occur in only a few sites within Marion, Benton, Linn, and Lane Counties.

According to ONHP, this species is not known to occur in Multnomah County (ONHP 1995). The ONHP database search did not locate records for this species within or near the Lava Domes study. No individuals of this species were detected during field investigations within the study area. In addition, no wet prairie or meadow habitat suitable for this species was found within the study area.

### Nelson's Checker-Mallow

Nelson's checker-mallow, a showy, pink member of the hollyhock family, was once reported to be endemic to the Willamette Valley. Recorded populations of this species have also been reported in the Coast Range and Washington State (ONHP 1995). Nelson's checker-mallow is found in various habitats ranging from open woodlands, to grassy meadows, and sedge-dominated wetlands with soils that dry out in mid-summer. It prefers gravely, well drained soils but also shows tolerance for a range of soil types and levels of human disturbance. This species does not appear to tolerate herbicide sprays, nor will it tolerate substrates that are wet throughout the growing season.

According to ONHP, Nelson's checker-mallow is not known to occur in Multnomah or Clackamas County and the database search for this project did not locate records for this species within or near the study area (ONHP 1995, 1996). In addition, no individuals of this species or any similar *Sidalcea* species were detected during field surveys within the study area during Fall,

1996. Much of the forest within the study area may be too shady for Nelson's checker-mallow to survive. However, grassland populations of the species have been recorded along disturbed, rocky roadsides, and in vegetated ditches (Glad et. al. 1987; CH2MHill 1993) making its presence in the Lava Domes possible.

#### Golden Indian Paintbrush

Golden indian paintbrush was recently listed as a threatened species. The species is a regional endemic plant that occurs in meadows and prairies at low elevations from Vancouver Island, British Columbia throughout the Puget Trough and Willamette Valley (Hitchcock et al. 1973). This species was once common in the Willamette Valley in Linn, Marion and Multnomah Counties, but is believed extirpated in Oregon (Eastman 1990, ONHP 1995). Possible contributions to the decline of this species include loss of habitat due to housing development, grazing, agriculture and park maintenance (WNHP 1981).

The ONHP database did not identify records for this species within the project area (ONHP 1996). This species is thought to exist specifically in open meadows. Much of the Lava Domes study area is densely forested or urbanized and is generally not preferred habitat for golden Indian paintbrush.

## Candidate Species and Species of Concern

Species identified as “candidate” and “species of concern” by the USFWS are currently under review for listing. These species have no protection under the Endangered Species Act, but are included here because they may be listed prior to project completion. Table G-1 shows the name and status of species that may be found within the study area according to the USFWS.

**Table G-1. Candidate Species and Species of Concern that may occur in the Lava Domes**

### Animals

Common Name	Scientific Name	Federal Status
long-eared myotis	<i>Myotis evotis</i>	SOC
fringed myotis	<i>Myotis thysanodes</i>	SOC
long-legged myotis	<i>Myotis volans</i>	SOC
yuma myotis	<i>Myotis yumanensis</i>	SOC
Pacific western big-eared bat	<i>Plecotus townsendii townsendii</i>	SOC
little willow flycatcher	<i>Empidonax traillii brewsteri</i>	SOC
Northwestern pond turtle	<i>Clemmys marmorata marmorata</i>	SOC
northern red-legged frog	<i>Rana aurora aurora</i>	SOC

### Plants

Common Name	Scientific Name	Federal Status
Willamette daisy	<i>Erigeron decumbens decumbens</i>	C
white top aster	<i>Aster curtus</i>	SOC
tall bugbane	<i>Cimicifuga elata</i>	SOC
pale larkspur	<i>Delphinium leucophaeum</i>	SOC
peacock larkspur	<i>Delphinium pavonaceum</i>	SOC
Kincaid’s lupine	<i>Lupinus sulphureus kincaidii</i>	SOC
Howell’s montia	<i>Montia howellii</i>	SOC
Oregon sullivantia	<i>Sullivantia oregana</i>	SOC

C = Candidate

SOC = Species of concern

## Candidate Species

### Willamette Daisy

Willamette daisy (*Erigeron decumbens* var. *decumbens*) is a perennial plant in the composite family that is endemic to the Willamette Valley. Little is known about this subspecies, but it is believed to be endemic to the Willamette Valley prairies and grasslands. Once a very common plant, populations of the species had significantly declined by the 1930’s due to conversion of habitat to agricultural and developed lands (Eastman 1990).

The ONHP database contains one historic (1903) record of Willamette daisy west of the Lava Domes study area near the intersection of Highway 224 and Interstate 205 (ONHP 1996). Freeway construction and urban development have eliminated this historic population. Because

of the proximity of the historic population to the study area and the presence of potentially suitable habitat, occurrence of this species is considered possible.

## Species of Concern

### Long-eared Myotis

Long-eared myotis (*Myotis evotis*) is found from southern British Columbia south to Baja. These bats are known to inhabit coniferous forest and arid grasslands, in a wide elevational range. They feed primarily on moths and beetles. They use buildings, bark and rock crevices for day roosts, and caves and mine entrances for night roosts. Maternity colonies are known to occur in buildings. The single offspring is born in late-June and early-July (van Zyll de Jong 1985; Nagorsen and Brigham 1993).

ONHP (1995) does not identify this species as occurring in Multnomah County. However, other sources do identify the long-eared myotis as occurring in Multnomah County (Marshall et al. 1996). The ONHP database search for this project did not locate records for this species in the study area (ONHP 1996). No bats were observed during the field investigations in the study area, however, survey times and methods were not necessarily optimal for the detection of bats. It is possible that the long-eared myotis may occasionally occupy areas such as the crevices found on bridges or temporarily roost in trees and snags in the forested portions of the Lava Domes. No maternal colonies, hibernacula or permanent roosts are known to occur in the project area.

### Long-legged Myotis

Long-legged myotis (*Myotis volans*) is found from western Canada south through the western United States to Mexico. Coniferous forests are the primary habitat for this bat, but it also occurs in riparian and desert habitats in some areas. It uses rock crevices, buildings, fissures in bark, or the ground for day roosts, and emerge early in the evening to feed. It feeds primarily on moths, but termites, spiders, flies, beetles, and other insects are also part of its diet. Maternity colonies are found in attics, fissures, and under bark. In winter, the long-legged myotis hibernates in caves and mines. Long-legged myotis mate in the fall prior to hibernation, and the single young is born the following summer in June or July (van Zyll de Jong 1985; Nagorsen and Brigham 1993).

ONHP (1995) does not list this species as one that is known to occur in Multnomah or Clackamas Counties. However, other sources do identify the long-legged myotis as occurring in Multnomah County (Marshall et al. 1996). The ONHP database search for this project did not locate records for this species within the Lava Domes study area (ONHP 1996). No bats were observed during the limited field investigations within the study area. It is possible that the long-legged myotis may visit areas such as the crevices found on the area's bridges. No maternal colonies, hibernacula or permanent roosts are known to occur in the project area.

### Yuma Myotis

Yuma myotis (*Myotis yumanensis*) is found from southern British Columbia south through the western United States to Mexico. This bat is closely associated with water. At dusk, they emerge from their day roost sites in a building or other man-made structure to forage over

streams and lakes. Yuma myotis feed on mayflies, caddisflies, midges and other aquatic insects. Large maternity colonies have been found in attics, and smaller colonies found in caves and trees. Young are born in early-summer, and the maternity colony is abandoned by late-summer or early-fall (van Zyll de Jong 1985; Nagorsen and Brigham 1993).

ONHP (1995) identifies this species as occurring in Multnomah County but not in Clackamas County. The ONHP database search did not locate records for this species within the Lava Domes study area (ONHP 1996). No bats were observed during the field investigation. It is possible that the Yuma myotis may occasionally occupy areas such as the crevices found on the area's bridges. No maternal colonies, hibernacula or permanent roosts are known to occur in the project area.

### Fringed Myotis

Fringed myotis (*Myotis thysanodes*) are found from the Okanagan Valley in British Columbia south through the western United States to Mexico. This species is known to roost in caves, mines, snags, rock crevices, bridges, buildings and under bark (Christy and West 1993). It hunts at night, usually between one and two hours after sunset. Young are born in June and July and are attended by several females throughout the night while the majority of females are foraging.

ONHP (1995) identifies this species as occurring in Clackamas County but not in Multnomah County; however, other sources reference Multnomah County (Marshall et al. 1996). The ONHP database search did not locate records for this species within the Lava Domes study area (ONHP 1996). No bats were observed during the field investigations, however, it is possible that the fringed myotis may visit areas such as the crevices found on the area's bridges. No maternal colonies, hibernacula or permanent roosts are known to occur in the project area.

### Pacific Western Big-eared Bat

Pacific western big-eared bats (*Plecotus townsendii townsendii*) are found from British Columbia south through the western United States to Mexico. This species inhabits humid coastal forest as well as arid pine forest and scrub areas where it feeds on moths and other insects. This bat typically uses caves, mines and buildings for its separate day and night roost sites. Caves and mines are known winter hibernacula. They hang free from ceilings and walls and do not enter crevices like other bats. Maternity colonies also tend to be in relatively exposed areas. The young are born in June and July and maternity colonies disperse in August (van Zyll de Jong 1985; Nagorsen and Brigham 1993).

ONHP (1995) lists this species as one that is known to occur in Clackamas and Multnomah Counties but the database search (ONHP 1996) did not locate records for this species within the study area. No bats were observed during the field investigations. Though no caves or mines were found within the study area, there are buildings with exposed walls that could potentially be used by the Pacific western big-eared bat.

### Little Willow Flycatcher



The little willow flycatcher (*Empidonax trailii brewsteri*) is an occasional summer resident west of the Cascade crest in Oregon and inhabits willow thickets bordering streams and lakes, woodland edges, young alder forests, and tall brush at the margins of fields (Gilligan et al. 1994). Migrants typically begin arriving in mid-May, but migration may be as late as early June in some years.

According to ONHP (1995), the little willow flycatcher is known to inhabit Multnomah County but not Clackamas County. No records for this species were identified in the vicinity of the Lava Domes (ONHP 1996) and the bird was not detected during field investigations. Suitable habitat for this species is found along several of the streams within the study area, and it is likely that the species occurs in the area.

### Northwestern Pond Turtle

The northwestern pond turtle (*Clemmys marmorata marmorata*) occurs from Puget Sound, Washington to Baja, California and is found chiefly west of the Sierra-Cascade crest. In Oregon, most records occur in the major drainages of the Klamath, Rogue, Umpqua, Willamette and Columbia River systems. The northwestern pond turtle occurs in a wide variety of both permanent and ephemeral wetlands including lakes, ponds, streams, rivers and altered habitats including reservoirs, stock ponds, and sewage treatment plants (Holland 1994). In most habitats, a variety of basking areas and emergent vegetation are present and refugia which may include undercut banks, submerged vegetation, rocks, or logs. Nearby terrestrial habitats are used for egg laying, overland dispersal, and overwintering (Holland 1991).

According to ONHP (1995), the northwestern pond turtle is known to occur in Multnomah and Clackamas Counties but no records for this species are identified in the vicinity of the Lava Domes (ONHP 1996). No turtles were detected during field investigations within the study area, though several ponds in the area may provide suitable habitat.

### Northern Red-legged Frog

The northern red-legged frog (*Rana aurora* var. *aurora*) is found in wetlands and slow moving streams from southwest British Columbia to northern California (Leonard et al. 1993). Unlike spotted frogs, red-legged frogs are highly terrestrial and forage in forests near water. Egg laying begins in January or February in marshes, ponds, lakes and slow moving streams. Eggs are weakly attached to stems of emergent vegetation or submerged branches below the surface of the water, and float to the surface as eggs mature (Leonard et al. 1993). Tadpoles metamorphose over a period of four to five months.

Two red-legged frogs, one juvenile and one adult, were detected during field investigations within the study area. Additional observations of the frogs have been reported by ODFW along Mitchell Creek in the eastern part of the Lava Domes. Several ponds located near streams in the area provide suitable breeding habitat for this species. These ponds and the forested ravines that traverse the Lava Domes provide important habitat for this species.

### White Top Aster

White top aster (*Aster curtus*), a diminutive member of the composite family, is native to the prairies of western Washington and portions of Oregon (Hitchcock et al. 1973). Eastman (1990) reports that white top aster grew in the native grasslands that were once common from the Willamette Valley to Vancouver Island, British Columbia.

According to ONHP (1995), white top aster occurs in Clackamas and Multnomah County; however, the ONHP database did not identify records for this species in the project vicinity (ONHP 1996). No individuals of this species were detected during field investigations. Nevertheless, potentially suitable grassland habitat may occur within the study area.

### Tall Bugbane

Tall bugbane (*Cimicifuga elata*) is found in mature mixed forests of conifer and deciduous trees at low elevations. It occurs west of the Cascade Mountains, from the Olympic Peninsula to northwest Oregon (Hitchcock et al. 1973). This large (one to two meters tall), woodland plant is a member of the buttercup family. It is a herbaceous perennial that grows from a woody rootstock and flowers from June to August.

This species has been reported on Powell Butte (Brunkow, pers. comm. 1993) and Jenne Butte (Smyth 1994) located on the fringes of the study area. Similar habitat conditions occur on several other buttes within the Lava Domes and the species is expected to occur there.

### Pale Larkspur

Pale larkspur (*Delphinium leucophaeum*), also known as white rock larkspur, is a very rare plant found in only four counties in Oregon, including Multnomah and Clackamas Counties. It grows on cliffs and rock ledges along the lower Willamette and Columbia Rivers (Eastman 1990).

No individuals of this species were detected during field investigations in Fall, 1996; however, rock ledges and dry bluffs that may provide suitable habitat were found in the study area. The ONHP database search did not identify records for this species within the Lava Domes study area (ONHP 1996).

### Peacock Larkspur

Peacock larkspur (*Delphinium pavonaceum*), a showy member of the buttercup family, is endemic to meadowland in the central Willamette Valley (Eastman 1990). Hitchcock et al. (1973) describes the species' habitat as roadsides and dry hillsides, found chiefly near Corvallis, Oregon.

Although peacock larkspur is listed by ONHP as occurring within Multnomah and Clackamas Counties, no records for this species were identified within the study area (ONHP 1996). No individuals of this species were detected during field investigations. Much of the Lava Dome hills is forested and therefore not preferred habitat for this species. However, hillside clearings and roadsides within the study area could provide suitable habitat for the peacock larkspur.

### Kincaid's lupine

Kincaid's lupine (*Lupinus sulphureus* var. *kincaidii*) is one of three varieties of *Lupinus sulphureus* known from Oregon (Eastman 1990). It occurs in dry upland habitat, usually associated with red fescue grasslands.

Kincaid's lupine is not reported to within Multnomah and Clackamas Counties and the database search (ONHP 1996) did not locate records for this species within the study area. No individuals of this species and no red fescue grasslands were detected during field investigations.

Howell's Montia

Howell's montia (*Montia howellii*) is a small annual that has tiny, seldom seen flowers that appear from April to May. This species grows only in moist woods in lowland areas west of the Cascade Crest from British Columbia to northwest California. The most recently documented populations have been found in disturbed areas, however none have been reported in the vicinity of the Lava Domes (ONHP 1996).

Howell's montia is reported to occur within Multnomah and Clackamas Counties (ONHP 1995) and it potentially could occur in the Lava Domes. However, no individuals of this species were detected during field investigations.

### Oregon Sullivantia

Oregon sullivantia (*Sullivantia oregana*), a member of the Saxifrage family, is endemic to the lower Willamette River and the west end of the Columbia Gorge. It grows on wet cliffs in shady, rocky areas near waterfalls at low elevations (Eastman 1990).

Though no individuals of this species were detected during field surveys, Oregon sullivantia is reported to occur within Multnomah and Clackamas Counties (ONHP 1995) and could potentially occur near smaller wet cliffs rock outcroppings within the Lava Domes.

### **Other Sensitive Species**

Three additional sensitive species not identified in the USFWS list of potential species were detected in or near the Lava Domes. These species are coho salmon, cutthroat trout and pileated woodpecker.

### Coho Salmon

Coho salmon (*Oncorhynchus kisutch*) is an anadromous fish that, for part of its life, rears in the Pacific Ocean and spawns in freshwater streams from Alaska to northern California. Adults migrate into freshwater in the fall at 2 to 4 years of age and normally spawn from November through February. Juveniles emerge in the spring and generally spend one year in fresh water before migrating to the ocean. Overwintering habitat, in the form of off-channel areas and pools with cover, is believed to be critical to the survival of juveniles in freshwater. Several factors including habitat loss, passage impacts at dams, excessive harvest and competition with hatchery fish have been linked to the declines of coho salmon populations in Oregon.

Coho salmon has been reported in Johnson Creek in the vicinity of Kelley Creek which enters Johnson Creek at river mile 11.4. Kelley Creek is located at the eastern end of the study area. Recent surveys by fish biologists concluded that Kelley Creek provided “good” habitat complexity and quality for salmonids (Ellis 1994). Steelhead and cutthroat trout have been detected in Kelley Creek, and coho salmon may also be present at least on a seasonal basis.

### Cutthroat Trout

The coastal subspecies of cutthroat trout (*Oncorhynchus clarki clarki*) ranges from Prince William Sound, Alaska to the Eel River, California. Unlike coho and other Pacific salmon, anadromous cutthroat trout do not necessarily die after spawning (spawning may not even occur until their second migration). After spawning, many cutthroat return to the ocean and migrate back into freshwater in subsequent years. Cutthroat generally spawn in small headwater streams and tributaries, usually remaining there for about a year before moving into larger streams (Wydoski et al. 1979). Migration to the Pacific Ocean usually occurs in the spring (April to June) at age 2 to 3, though some individuals may never go to sea. Once at sea, cutthroat spend much time in near-shore marine environments and return to freshwater each winter. Habitat

degradation caused by land use practices and the lack of large woody debris in freshwater streams is believed to have played a major role in the decline of cutthroat populations in Oregon.

In August 1996, ODFW staff conducted spot fishery surveys in Mitchell Creek and found 15 cutthroat trout. Earlier surveys (August 1992) detected cutthroat in Kelley Creek. Mitchell Creek is a tributary to Kelley Creek and both are located at the eastern end of the study area.

### Pileated Woodpecker

The pileated woodpecker (*Dryocopus pileatus*) inhabits both coniferous and deciduous forests containing mature, productive stands. This species is listed as sensitive by the state (vulnerable category) and threatened or endangered listing may be avoided through habitat protection and monitoring. Critical habitat components include large trees and snags, dense forest stands and high snag densities. Stumps, logs and tall shrub cover also are important habitat components. The pileated woodpecker's nest cavity is large and located high in the snag so snags of at least 20 inches in diameter and 31 feet in height are optimum (Marshall et al. 1996). Pileated woodpeckers have the strongest year-round pair bond of any North American woodpecker, and pairs generally occupy the same location (though different snags) each year.

One pileated woodpecker pair and numerous signs (recent excavations) were observed during field investigations within the study area. Certain parts of the Lava Domes forest contain a high density of snags, stumps and downed logs. These areas provide suitable forage, roost and breeding habitat for resident woodpeckers and are located near to water sources such as creeks, ponds and wetlands.

## APPENDIX H

### The Nature of Environmental Goods

#### Intermediate Goods

Environmental goods that function as factors of production of other goods have a commercial value. These goods include factors that support commercial fisheries, water storage elements and the assimilation of wastes. Intermediate goods can contribute to damage prevention such as pollution assimilation/water purification, flood control, slope stabilization, and erosion control.

One method used to establish the value of an intermediate good is the net factor income (NFI) method. It measures the appropriate income attributable to natural resources as factors of production in commercial activities. It requires an economic/engineering model to determine the value of the contribution of the resource to the production process. For example, the model would quantify the contribution of groundwater to the production of the domestic water supply. Another form of NFI uses bioeconomic models that relate the resource services to the production of specific commercial products, such as shellfish.

Information developed from OMSI (Portland) and Mill End Store (Milwaukie) projects indicate that construction costs for the vegetated swale stormwater convergence systems (w/infiltration, biofiltration, conveyance) represent a significant savings over the cost of conventional stormwater pipe system (Liptan 1994). A savings of approximately \$8,000 to \$13,000 per acre was reported for these projects. The value of the wetlands can be computed by estimating the cost of developing a comparable water system. Calculations for other projects indicate a potential cost savings using bioswales rather than conventional storm drainage construction (Liptan and Brown 1996):

Table 1. Cost Savings related to Storm Drainage

Location	Facility type	Cost Factors
Oregon Museum of Science and Industry Portland, Oregon	Storm drainage features	Cost savings over conventional approach was approximately \$78,000.
Flex Alloy Portland, OR	Storm drainage features	Potential cost savings would have been \$10,000.
Liberty Centre Portland, Oregon	Storm drainage features	Potential cost savings of \$24,000.
Portland Community College Training Center, Portland, Oregon	Storm drainage features	Potential cost savings of \$21,000.

In summary, wetlands can provide a significant cost savings over conventional stormwater systems. There is some evidence to suggest that over a certain range of water quality requirements, natural systems are more cost effective than conventional methods. However,



where the more stringent water quality is required, natural methods may be more expensive than conventional systems (Liptan 1997).

A region-wide survey conducted in November of 1992 in the Portland Metropolitan area found that of the 400 residents surveyed, 55 percent wanted to preserve “greenspace” for the maintenance of water quality. According to Metro, preserving greenspaces for improved water quality was viewed as more important than preserving endangered species or providing recreation or tourist activities.

Water features are recognized in public policies as deserving full protection because of the integral part such features play in an ecosystem. Water resources are often ranked highest among natural resources, especially in forested areas where wildlife habitat is enhanced with riparian areas.

One study, conducted in 1991, estimated \$273 worth of environmental benefits for one year for a single tree as follows:

**Table 2. Commercial Services related to Trees**

<b>Type of Environmental Service</b>	<b>Value</b>
Air conditioning	\$73
Erosion control and storm water	\$75
Wildlife shelter	\$75
Air pollution control	\$50

Compounding this amount for 50 years at 5 percent, the value of a single tree was reported to reach \$57,151 in 1991 dollars (Oregon CommuniTree News 1993).

Another approach to establishing the value of natural resources is in terms of the damage prevention services provided. This value can be determined using replacement cost or the cost of property damage which would occur if the natural resource were lost, using the damage costs avoided principle. These approaches are particularly applicable with respect to erosion and slope slippage. In areas with unstable slopes and/or high earthquake potential, the value of the natural resources left in place increases as the preservation of the natural resource prevents society or individuals from making risky investments in developments that are most likely to be destroyed.

According to Mabey and Madin (1993), landslides are an ongoing problem in Oregon. The shaking from an earthquake will tend to cause existing landslides to move and generate forces that create new ones. Therefore, known landslide masses can be identified as areas with potential for severe damage during an earthquake. In addition, the steepness of a slope and soil thickness are indicators of the stability of a slope.

Determining the value of damage cost savings from landslide and earthquake activities has been attempted in several studies. Murdoch, Singh and Thayer (1993) used a hedonic model in their study of the Loma Prieta earthquake to demonstrate that areas designated as earthquake prone had

reduced property values. They found that on average, homes located outside of the risky area were valued at approximately 3.7 percent more than comparable homes inside the area. In their study this value was approximately \$10,770. For homes located on safer soil, the market premium was about 2.5 percent or \$7,250 for an average home.

Brookshire, et al (1985) used an expected utility model of self-insurance, structured as a hedonic model that applied to low-probability, high-loss earthquake hazards. Individuals can self-insure by purchasing a dwelling in areas where the expected earthquake damage is relatively low. In this model, the important variable is safety and due to the nature of earthquakes, it is also random. In their study, the weighted expected damage by frequency of occurrence was \$5,920 per dwelling. Preserving steep slopes and significant resources on these slopes can prevent damage from occurring.

Other studies indicate environmental values reduced damage costs through the direct provision of services:

**Table 3. Damage Costs Avoided**

Location	Impact on property values	Specific evaluations
Charles River Basin, Massachusetts	Wetlands served as a natural valley storage area for floodwaters.	The U. S. Army Corps of Engineers, the Commonwealth of Massachusetts and local government agencies acquired 8,500 acres of wetlands in the Charles River Basin for \$10 million. The cost of the alternative construction of dams and levees would have been \$100 million (Kusler and Larson 1993).
Charles River Basin, Massachusetts	Wetland reduced costs of flood prevention.	Each acre of wetland had a net present value of \$33,370 for flood prevention, \$16,960 for pollution reduction and \$100,730 for water supply (Thibodeau and Ostro 1981).
Minnesota	Value of wetland functions for flood control.	The cost of replacing the natural floodwater storage functions of wetlands was \$300 per acre-foot of water (Floodplain Management Association 1994 as cited in Rivers and Trails Conservation Assistance 1995).

**Final Goods and Services**

Environmental resources provide final goods that include recreational opportunities such as fishing, camping, boating and bird watching. Increases in residential property values attributed to amenities are associated with the final goods aspects of scenic view, proximity to wildlife habitat and educational opportunities. In addition, water supply and wildlife habitat are considered final goods.

The basic idea underlying measurement of value for a resource is that individual preferences form the basis for benefit measurement. A positive preference will be revealed in the form of willingness to pay for it. Each individual’s willingness to pay will differ, so it is necessary to aggregate over all individuals for a total willingness to pay figure. This direct method attempts to elicit preferences for non-market goods by asking individuals to express their views in a simulated market for the goods in question.

The value attributed to a property is the result of a stream of benefits derived from the land. This might include agricultural output, shelter, access to a workplace, commercial amenities, parks and the environmental quality of the neighborhood where the land is located. All these benefits accrue to the person who has the right to use that piece of property. Given that different locations have varied environmental attributes, such variations will result in differences in property values.

The hedonic approach, using this premise, attempts to identify how much difference there is between properties with differing attributes and inferring how much people are willing to pay for a particular attribute, such as an environmental amenity. Using multiple linear regression, the model includes as many variables as are assumed to be contributors to value. These variables are typically classified as property variables, neighborhood variables, accessibility variables and environmental variables (public benefits would not be included).

Brown and Pollakowski (1976) conducted a study in the Green Lake area of Seattle, Washington to examine the impact of water features on housing values, using a hedonic model. They found that previous studies indicated that the contribution of a water resource to property values generally is not significant beyond 4,000 feet from the edge of the water feature.

In their study, they found that a dwelling unit located 200 feet away from a water feature sold for about \$850 (1976 dollars) more than a comparable one located 100 feet away, indicating the desirability of a setback area between the dwelling and the water feature. A dwelling with a 300-foot setback sold for about \$1,350 (1976 dollars) more than one located 100 feet away indicating greater value is generated with an increase in the depth of the setback. In the case of no setback, three-fourths of the location value of proximity to water is lost at a distance of 300 feet from the edge of the water feature. The researchers constructed a optimal open space model that used a land value gradient with an optimal open space of about 100 feet compared to the actual average distance of about 300 feet.

This finding is of importance as most significant resources have been found to increase the value of properties the closer the dwelling is to the resource. However, in the case of water features, a setback area contributes to an increase in property values. The setback area acts as a buffer between the significant resource and the dwelling.

Mahan (1996) used data on wetland areas within the Portland metropolitan area to determine that home buyers preferred to live closer to open water and further away from emergent vegetation and scrub-shrub areas. In addition, he found that there was a positive willingness to pay on the part of home buyers for the land nearest to larger wetland areas.

Garrod and Willis (1992) used a willingness to pay (WTP) methodology based on the notion that individual households express a demand for trees and woods as a housing attribute. They maintained that the total benefits of forests are more accurately captured in property values since the price of a house reflects willingness to pay to live near an environmental amenity. Their study looked at the impact of forest type on housing prices and the demand for particular types of forests.

Morales (1980) performed a study that sampled the value of houses with and without trees in Amherst, Massachusetts and found trees were estimated to add \$2,686, or 6 percent of the total housing value. Anderson and Cordell (1988) found that developers, aware of the increment of value attributable to resources, were able to capture the increase in value by protecting trees in buffer zones in developments.

Other studies have illustrated similar positive effects on property values resulting from parks and natural area protection:

**Table 4. Amenity Values reflected in Property Values**

Location	Impact of property values	Specific evaluations
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Philadelphia, PA	Property values were shown to decrease proportionally with distance from open space.	A 1,294-acre park accounted for 33% of the land value at a 40-foot distance, 9% at 1,000 feet and 4.2% at 2,500 feet (Hammer et al. 1974).
Boulder, CO	Property values near greenbelts were shown to decrease with distance away from the green belt.	Housing prices declined an average \$4.20 for each foot a house was located away from a greenbelt. The average value of property next to the greenbelt was 32% higher than those 3,200 feet away (Correll et al. 1978).
Boise River Greenbelt, Idaho	The greenbelt was shown to be directly responsible for raising appraised property values within the greenbelt.	Increases in appraised value exceeded \$200 million. Property values of undeveloped land were \$26,000 to \$34,000/acre near greenbelt vs \$10,000 to \$17,000 elsewhere (Cooper 1989).

<b>Location</b>	<b>Impact of property values</b>	<b>Specific evaluations</b>
Hunters Brook, New York	Properties adjacent to protected woods had a faster selling time.	A 142-unit cluster development set aside 97 acres of pine forest to be protected in open space. Homes were easier to sell because of their proximity to the protected woods. The site's rural character and acres of habitat were preserved ( <i>New York Times</i> May 8, 1987).
Columbus, Ohio	Residential properties have increased value near park areas.	In a study of five parks, there were positive impacts from 7 to 23% on property values that faced open space areas. Properties facing a park sold for \$1,130 above properties one block away. However, properties backing onto a park had no additional value, while properties facing intensively used recreational facilities sold for approximately \$1,150 less during the period 1965 to 1969 (Weicher and Zeibst 1973).
Chesapeake Bay, MD	Land use restrictions designed to protect Chesapeake Bay increased property values.	Price increases from 14 to 27 percent for houses in the area within 1000 feet from the Bay and between 4 and 11 percent for properties as far as three miles away were associated with the implementation of protective zoning. However, some increases may also be attributed to a limited supply of properties near the resource (Parsons 1992).
Charles River Basin, MA	Properties abutting wetlands were found more valuable than non-abutting properties.	Properties abutting the wetland areas were valued \$400 more than non-abutting properties. Each acre of wetland added \$150 in value to adjacent properties. An additional survey of appraisers and Realtors indicated that each acre of wetland contributed \$480 to the value of adjacent properties (Thibodeau and Ostro 1981).

Concord, MA	Open space in clustered subdivisions influenced property appreciation	Properties in a subdivision in Concord, MA, with open space areas appreciated 167.9% between 1980 and 1988, compared to 146.8% in the nearby areas (Lacy 1990).
Amherst, MA	Open space influences property appreciation.	Similar properties with open space areas in Amherst, MA, appreciated 462% between 1968 and 1989, while properties without open space areas only appreciated 410% (Lacy 1990).
United States	Value of birdwatching activities.	Tens of millions of birders spend over \$20 billion each year on seed, travel and birding equipment. Active members of this activities spend between \$1,500 and \$3,400 each year (Kerlinger 1993).

One method for measuring the increased value attributable to natural resources is to use a contingent valuation method (CVM). Using a survey instrument or personal interviews, a CVM discovers an individual's preference for a good by determining the maximum willingness to pay for changes in the provision of that good. It is used most widely in public goods analysis.

A recent CVM study conducted in Multnomah County evaluated four types of natural resource areas: a natural open space, a permanent wetland, a limited-access forest, and a developed park with full recreational facilities (Manuel 1993). Forest was defined as a site dominated by trees or woody vegetation over 15 feet in height, supporting wildlife and habitat. In absolute terms, the highest valued environmental resource was the forest, with higher-priced homes being more positively affected than lower-priced homes. In general, properties closer to a natural resource have greater value than those further away. Three housing types were used. The study used evaluators with expertise in the field of real estate evaluation, including Realtors, tax assessors and residential property appraisers.

The study also addressed the policy tradeoff between the benefits of natural resource areas and tax revenues that are forgone if development is limited due to natural resource locations. The example compared a hypothetical 20-acre resource area that was developed without protection of natural resources with a 20-acre site that protected forest resources. The researcher stated that if accurate measurements could be made of housing values, the tax revenues from preserving the forest area may, in fact, be greater than those generated if the area is developed.

Schofield (1989) cites the sources of bias due to expectations regarding who actually would pay for amenities as a problem associated with the use of CVM. The concern centers around the possible understating of values by respondents who see themselves as future targets of a charge, while those who expect the goods or services to be provided free would overstate the true value.

Manuel (1993) indicates that it is difficult to quantify in dollars the value of improved water quality. In addition, not all the benefits can be captured using a CVM methodology. When the market price of homes is used as a proxy for benefits accrued due to the natural resources, it captures only the private benefits of natural resources. There are also public benefits, such as the ecological benefits of wetlands for the improvement of water quality, which were not included in the expert evaluations. This would result in an undervalue of the amenities using the CVM.

Stated preference methods also can be used to determine environmental values. This method explicitly models the attributes that are thought to influence choices. Rather than focusing on a single situation, this method presents a variety of "situations" described by attributes. It is based on random utility theory and has a statistical design that isolates the attribute effects. The main advantage of this method is that it allows analysis of an individual amenity feature.

Adamowicz, Louviere, and Williams (1994) conducted a stated preference survey to determine preferences for recreational sites. The respondent was faced with choices of a running water recreation site, a standing water recreation site, and the choice to participate in some other non-water-activity or stay at home. The characteristics of the sites included items such as the distance to the site, the water quality, and the fishing catch rate. The choice made by the individuals

participating in the survey indicated a preference for the attributes of one alternative over another. It is possible to combine the stated preference data with revealed data or actual data. It has been found that the combination of data produces the strongest results.

In summary, the value of amenities such as water features (lakes, streams, and/or creeks) and forested areas close to residential units are capitalized into property values. The increased assessed values result in increased tax revenues. Protecting forested areas near residential developments has been found to increase residential property values.

### **Future Goods and Services**

Environmental resources that contain undiscovered benefits or can be consumed at some future date fall into this category. Endangered species increase in value due to scarcity in the future. People value the preservation of an environmental resource, even if they are not currently using that resource today. These values include existence values and option values. Existence value is the amount that present generations would be willing to pay to preserve a natural resource, even if they never plan to use it. Option value exists when individuals not presently using a service wish to keep the option of using it available for future use. It is a risk premium indicating willingness to pay to preserve an option in the face of uncertainty about the future supply and demand.

Although it can be assumed that people will not be willing to pay for something they do not want, it is not possible to know if "Willingness to Pay" (WTP) as measured by market prices accurately measures the whole benefit to either individuals or society. Some individuals may be willing to pay more, which means the benefit they receive is larger than the price they would have to pay. The excess is considered consumer surplus.

The value of significant resources can be established using "user" values. Those who actively participate in the environment secure a direct benefit from it, such as recreational activities, hiking, picnicking, etc. There are additional values expressed through options to use the environment. This is expressed as a preference or willingness to pay for the preservation of an environment against some probability that the individual will make use of it at a later date.

It is generally assumed that benefits or costs matter more if they are experienced now rather than later (Pearce & Turner 1991). Economists recommend an adjustment be made in values to reflect the lowering or discounting of values in the future. Discounting allows values in different time periods to be compared at one point in time. The principle of discounting assumes that resources invested today will earn a return in years to come.

The practice of discounting is also a means to share costs and benefits between generations. According to Pearce and Turner (1991), counting only the current generation's preferences through the willingness-to-pay method biases the choice against future generations unless there is some built-in mechanism to ensure that current generations choose on behalf of future generations and take their interest into account.



Pearce and Turner (1991) claim that the relative price of significant resources is likely to rise as the natural environment becomes scarcer. This rise in price should not be confused with the effects of inflation when the general price level of all goods and services increases in price. Development value is subject to change due to technological changes which make it less attractive through time.

## Appendix I

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