
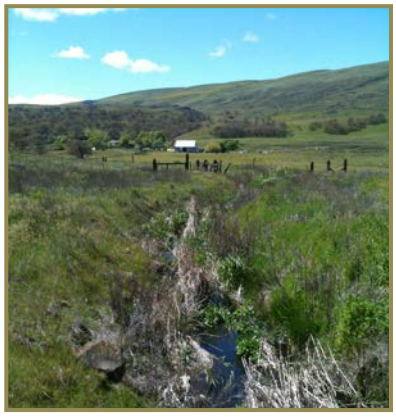


CITY OF THE DALLES
NATURAL RESOURCE INVENTORY

Prepared for:

CITY OF THE DALLES

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INTRODUCTION

In 2010, the City of The Dalles, supported in part by a DLCD grant, retained Winterbrook Planning to inventory wetlands, streams, ponds and lakes, riparian areas, sensitive plans and animals, wildlife habitats, and natural areas within The Dalles Study Area (Study Area). The Natural Resources Inventory should be reviewed with companion studies addressing Resources (WillametteCRA, May 2011) and Scenic Resources (Ecotrust, May 2011). The purpose of these three studies is to assist the City, Wasco County, the Department of Land Conservation and Development (DLCD) and the Columbia River Gorge Commission (CRGC) in evaluating the relative effects of alternative urban growth area expansion options. The three studies share a common study area, which includes land that *potentiall*y could be added to The Dalles Urban Growth Boundary (UGB) to meet 20-year population and employment growth needs. The Study Area extends about a quarter mile north from the existing UGB where high value orchard lands predominate. The Study Area extends further to the east and west into non-irrigated lands along the Columbia River.

The Natural Resources Inventory begins by accessing existing sources of information (Oregon Natural Biodiversity Center (ORBIC) at OSU, Wasco County inventories, and the Oregon Department of Fish and Wildlife, and Gorge Commission staff resources), and is supplemented by field inventories for wetlands, riparian corridors, sensitive plant species, wildlife habitat, resource-based recreational areas, and natural areas as defined in the Columbia River Gorge National Scenic Area (NSA) Management Plan. The product is a reconnaissance level report detailing methods and results of the study, as well as Geographic Information System (GIS) overlay maps that are scaled to allow for meaningful comparison with scenic and cultural resource values. Once a decision has been made on the direction of growth, more detailed and site specific studies will be required to ensure an adequate level of resource protection.

Fifteenmile Creek corridor at east edge of study area

Prior Planning Work

In 2006-07, the City prepared residential and employment studies and a buildable lands inventory which demonstrated that 20-year land needs could not be met within the existing UGB. The UGB was established in 1983, was originally intended to accommodate 20 year growth demands, and has not been substantially amended for almost 40 years.

In coordination with DLCD and CRGC staff, the City prepared a UGB Alternatives Analysis consistent with Goal 14, ORS 197.298 priorities, and the Urban Growth Boundary administrative rule (OAR Chapter 16, Division 24). The Dalles applied the buildable lands methodology used inside the UGB to four study areas on the Oregon side of the Columbia River to determine the capacity of each study area to meet identified land needs. The City avoided high value orchard and wheat land north and northeast of the existing UGB in its UGB proposal. The City analyzed public facilities costs for serving alternative growth areas. Consistent with applicable Statewide Planning Goals, the City tentatively adopted an ordinance that directed growth to adjacent rural exception areas and "Hidden Valley" – and area with relatively poor agricultural soils that is not highly visible from key viewing areas in the Columbia River Gorge.

Although DLCD staff found that the City's work to be consistent with applicable Statewide Planning Goals, the CRGC staff recommended that additional work be conducted to address the Columbia River Gorge National Scenic Area Act requirements. The City worked with DLCD and CRGC staff to prepare a grant request to provide the requested information necessary to allow for a comparative analysis of natural, scenic and cultural resources in potential UGB expansion areas.

INVENTORY METHODS

The Dalles Natural Resource Inventory includes nine subareas based primarily on local watersheds (Figure 1). The six main watersheds in the study area are, from west to east:

- Gooseberry Creek,
- Chenoweth Creek,
- Mill Creek,
- Threemile Creek,
- Dry Hollow, and
- Fifteenmile Creek.

The three remaining subareas are smaller, drain directly to the Columbia River, and include the:

- The Rowena Watershed in the northwest corner of the study area;
- Chenoweth Table bordering the western edge of the UGB; and
- The Columbia River Watershed in northeast corner of the study area.

Inventory findings for each subarea are presented in the following section of this report.

Review of Existing Information

Winterbrook reviewed of existing literature, maps, and other source materials to identify natural resources within the study area. The document review included the following sources of information:

<u>Data and Sources</u>

- Project Study Area (Winterbrook, 2010)
- CRG National Scenic Area documents (Columbia River Gorge Commission)

- UGB (City of The Dalles, 2010)
- Parcels (Wasco County, 2005)
- Highways (Oregon Spatial Data Library, 2007)
- Rivers (Oregon Spatial Data Library, 2007)
- Streams (Oregon Spatial Data Library, 2007)
- Stream classification maps (Oregon Department of Forestry and Oregon Department of Fish and Wildlife, 2010)
- Fish and critical habitat data (ODFW and StreamNet, 2010)
- Fish barriers (Oregon Department of Fish and Wildlife, 2010)
- Floodplains (Federal Emergency Management Act, 1987)
- Color ortho photography (Oregon Imagery Explorer, 2005)
- Sensitive species data (Oregon Biodiversity Information Center, 2011)
- Big game winter range (ODFW, 2011)
- Soils, including Hydric Soils (U.S.D.A. Natural Resource Conservation Service (NRCS), *Soil Survey of Wasco County, Oregon, Northern Part*, 1982)
- Salmon Resource and Sensitive Area Mapping Survey (ODOT, 2004)
- *Hydric Soils List, Wasco County, Oregon, Northern Part* (NRCS, 2006)
- Hydrologic Unit Boundaries – 6th Field (Oregon Spatial Data Library, 2007)
- Steep Slopes (City of The Dalles, 2010)
- *The Dalles Watershed Assessment* (Wasco County Soil and Water Conservation District, 2003)
- Topography (State of Oregon Hillshade, 2009)
- Topography (USGS 7.5-minute quads: The Dalles North, The Dalles South, Petersburg)
- Wetland determination files for The Dalles (Department of State Lands, 2011 review)
- Wetlands (U.S. Fish and Wildlife Service, National Wetland Inventory, 1991)
- Wetlands (Pacific Northwest Hydrography Framework, 2006)

Winterbrook also contacted the following public agencies as part of this review:

- City of The Dalles (Planning);
- Columbia River Gorge Commission staff;
- Oregon Biodiversity Information Center (ORBIC);
- Oregon Department of Fish and Wildlife (ODFW);
- Oregon Department of Forestry (DOF);
- Oregon Department of State Lands (DSL);
- USDA Natural Resources Conservation Service;
- US Forest Service, CRG Scenic Area office;
- Wasco County Soil and Water Conservation District.

Field Inventory

Winterbrook prepared natural resource field maps that show available data such as GIS shapefiles, aerial imagery, hydric soils, wetlands, streams, fish passage barriers, sensitive species, wildlife habitats and natural areas. These maps also identify rights-of-way and public properties. Winterbrook also consulted additional resource data and maps (e.g., those not available in GIS) during field inventories. The City Planning Department contacted landowners

within the study area to request property access permission. Property and contact information for owners who granted access was compiled for use in the field.

Winterbrook conducted field surveys of streams, ponds, lakes, riparian areas, wetlands, and sensitive animal and plant species within the study area. Two field methods were employed depending on whether property access was granted:

1. Where property access is granted, Winterbrook planned survey routes and made follow up contacts with owners for access. The on-site field inventory focused on areas with documented resources or with potential resources based on suitable habitats or other indicators. For example, lands with wetland indicators (vegetation, soils and/or hydrology) were field checked where accessible and as authorized by the landowner. Developed lands or land used for orchards or large-scale cereal grain or row crop production are less likely to contain sensitive natural resources; however, these lands were examined where mapped data indicates resources exist in the area. Natural resource features were notated on field maps and related data compiled in field notebooks. When appropriate, Winterbrook took Global Positioning Systems (GPS) waypoints of resource locations. Existing mapped resources were confirmed and adjusted on field maps as necessary to reflect current conditions. Winterbrook digitized this data following completion of field work.

2. Where property access was not granted, off-site observations was made from public rights-of-way, parks, and other public lands. Field maps and other mapped or published data were consulted and visible natural resources or resource indicators noted. Observed characteristics such as vegetation communities, hydrology, stream and riparian conditions, and habitat features were noted in the field. For example, where visible from public streets, wetlands and hydric soils identified on field maps were observed for wetland indicators such as wetland hydrology[1] or dominant hydrophytic vegetation[2]. Natural resource features were notated on field maps and related data compiled in field notebooks. Existing mapped resources were confirmed and adjusted on field maps as necessary to reflect current conditions. Winterbrook digitized this data following completion of field work.

Additional information on inventory methods for specific types of resources is provided below:

Sensitive Plant and Animal Species

Data on sensitive plants and animals was obtained from multiple sources. Winterbrook requested a record search for sensitive species from the Oregon Biodiversity Information Center (ORBIC). The record search area included the study area plus a two-mile buffer around the study area. The

[1] Indicators of wetland hydrology include visual observation of ponding or soil saturation, visual evidence of previous water inundation such as dry algae on bare soil or water marks on soils or leaves, sediment deposition and drainage patterns. To date, no soil sampling has been permitted at identified wetland sites, but vegetation, surface water, or other site characteristics have been sufficient to establish wetland presence or absence.

[2] The wetland indicator status of the dominant species within each vegetative strata (e.g., herb, shrub, tree) is used to determine if the plant community may be characterized as hydrophytic and thereby serve as a wetland indicator.

ORBIC data report was reviewed and a separate (confidential) map was created from GIS shapefiles provided by ORBIC staff. This map included buffer areas for sensitive species populations which were used as a field reference. Winterbrook contacted Gorge Commission staff for any additional data they might have; staff confirmed that the ORBIC data is the original source for the sensitive species data maintained by the Commission.


Slim-leaf onion, a rare plant

Additional sources of sensitive plant information included plants identified in the NSA Management Plan (e.g., the list of Columbia Gorge and Vicinity Endemic Plant Species), state and federal ESA-listed species, and ORBIC-listed species. Willamette Cultural Resources Associates provided information on potential culturally significant plants in the study area, after consultation with the Warm Springs Tribe. Many of these plants, such as the Lomatiums, are common in The Dalles area; they were noted in the field but Winterbrook concluded that greater property access would be needed in order to reach any meaningful conclusions about plant distribution. During field surveys, Winterbrook utilized data on the cultural requirements of these plants to identify suitable areas (habitats) for the plants. Due to sensitivity of the plant data, field survey maps will be kept confidential though survey findings will be reported.

Field surveys for sensitive or culturally significant plants were planned during flowering seasons to the extent practical, or during times when the plants are otherwise identifiable. Similar to other natural resource surveys, plant surveys were only conducted on private lands where access was granted. Private land access was a major constraint for these surveys since many of the target plants are herbaceous and generally do not grow in public rights-of-way. Additionally, these are reconnaissance-level surveys; a formal sensitive species survey was not conducted due to the constraints of the project work scope. Field personnel documented the presence, number of plants, general condition of the plant community, evident threats, and other information in field notebooks. The location and extent of the population was plotted on field maps and GPS waypoints were taken where populations are accessible. These plots were transferred to GIS maps in the office.

Field surveys for sensitive animal species were integrated with other natural resource surveys. These, too, are reconnaissance-level surveys designed to supplement data obtained from ORBIC. Additional data on sensitive species was obtained from the Rare, Threatened and Endangered Species of Oregon (ORBIC, 2010). In addition to the sensitive fish and wildlife data provided by ORBIC, ODFW was contacted for information on sensitive fish and wildlife in the study area, including data on fish presence in local streams, fish passage barriers, critical habitats, bird nest sites, and big game winter ranges. Observations of sensitive species within the study area were recorded in the field. The location of these observations was plotted on field maps and noted in the field notebook. These plots were transferred to GIS maps in the office.

Data from new populations of sensitive plants or animals was provided to ORBIC to update their database.

Streams, Ponds, Lakes and Riparian Areas


Lower Fifteenmile Creek riparian area

Six main stream corridors cross the study area. From west to east, these streams are: Gooseberry Creek, Chenoweth Creek, Mill Creek, Dry Hollow, Threemile Creek, and Fifteenmile Creek. Field maps include these stream channels and their watershed boundaries overlain on aerial photography. As noted earlier, three subareas fall outside of these six watersheds: the northwest corner of the study area (Rowena Watershed), Chenoweth Table, and the northeast corner of the study area (Columbia River).

Field surveys are organized by watershed subarea. Natural resource sites within each of these subareas are assigned a code based on the watershed. For example, riparian areas (R) within the Chenoweth Creek ("CC") watershed will be coded CC-R-01, CC-R-02, etc. Winterbrook collected information on the physical and biological characteristics of streams, ponds, lakes and riparian areas. Information collected included field observations of vegetation (plant community composition and condition) and riparian characteristics (e.g., channel habitat types, extent of channel alteration, stream gradient, associated floodplains or wetlands, fish barriers). Existing stream and riparian data from The Dalles Watershed Assessment and other sources was incorporated into the survey. Opportunities for enhancement of streams, ponds, lakes and riparian areas were also noted as appropriate.

Each subarea was assessed from public rights-of-way or from private properties where access permission was granted. Multiple observation points were generally used for large subareas.

An ecological function assessment was completed in the field. Among the functions evaluated are water quality protection, streamflow moderation and water storage, provision of fish and wildlife habitat. These parameters are based on NSA Management Plan goals (e.g., "protect water quality, natural drainage, and fish and wildlife habitat of streams, ponds, lakes, and riparian areas") and a review of the scientific literature on riparian assessment methods. The assessment results indicate whether specific functions are high, medium, or low for a given subarea. Overall ratings for each subarea were based on the functional ratings: riparian subareas with two or more high values received a high rating, two or more medium or one high value received a medium rating, and all other subareas received at low rating. The factors evaluated are summarized below:

- Water quality protection. Water quality factors assess the potential of the riparian corridor to protect water quality in streams and other water features associated with the corridor. These factors include the density and type of vegetation cover, width of vegetation cover along the water feature, extent of impervious surfaces, extent of shade cover, and erosion potential of soils. The highest rated sites have dense woody vegetation, wide vegetated corridors, minimal impervious surfaces, high shade cover, and slight erosion potential.

- Streamflow moderation/water storage. Streamflow moderation/water storage factors assess the potential of the riparian corridor to moderate streamflow by intercepting, absorbing and storing rainfall, and to provide water storage and conveyance during flood events. These factors include the presence of floodplains and stream-associated wetlands, extent of woody vegetation cover, degree of streambank alteration, location of the corridor within the basin, and connectivity to forested uplands. The highest rated riparian corridors have large floodplains or associated wetlands, dense woody vegetation, low bank alteration, are located in upper part of the basin, and are well-connected to forested uplands.
- Fish habitat. Evaluation factors assess the potential of the riparian corridor to provide habitat and migration opportunities for fish. They include the presence of fish (ODFW or other sources), degree of channel alteration, degree of channel shade, potential for large woody debris recruitment, and presence of barriers to fish migration. The highest rated habitat are fish-bearing streams that have low channel alteration, a high degree of shade, high recruitment potential, and no fish barriers.
- Wildlife habitat. Evaluation factors assess the potential of the riparian corridor to provide important habitat values for wildlife. These factors include habitat patch size, extent and seasonality of surface water, habitat diversity, degree of human-caused disturbance, and habitat connectivity. The highest rated habitat have contiguous habitat size of greater than 10 acres, multiple water types including permanent water sources, high habitat diversity, low human disturbance, and high connectivity to other habitat areas.

The riparian functional assessment was recorded in the field notebook.

Wetlands

Wetland data was compiled from a variety of sources and incorporated onto maps for the field inventory. Winterbrook collected available wetland delineation and determination files from the Department of State Lands (DSL)[3] and requested available wetland data or maps from Gorge Commission staff. Two general data sources referenced in the NSA Management Plan – National Wetland Inventory and hydric soils maps – were also be compiled. Additional data sources include:

Wetland in Gooseberry Creek headwaters

- The State Wetland Inventory (Oregon Wetlands Explorer)
- Oregon Department of Transportation (ODOT) Salmon Resource and Sensitive Area Mapping Survey data

[3] Of the 22 DSL files found to cover The Dalles area, only one was located within the study area. DSL staff confirmed that this file, WD96-0500, contained no data sheets or wetlands maps.

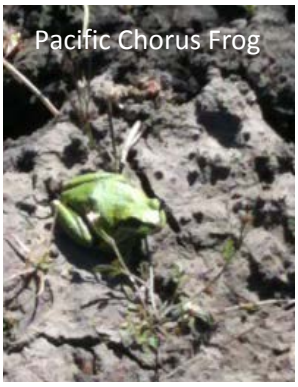
- Watershed data from *The Dalles Watershed Assessment* (Wasco County SWCS)
- Aerial photography (orthophotos, Google Earth, Bing maps, and other sources, for photo-interpretation of vegetation signatures and other visual evidence of wetlands).

During field investigations, Winterbrook field staff observed wetlands viewable from public rights-of-way, other public lands, and where access was granted using a methodology derived from DSL's Offsite Wetland Determination methodology which relies on observation of those habitat elements that can be observed without subsurface investigation,[4] including the following:

- Cowardin classifications
- Landscape position
- Surface hydrology connections
- Vegetation community composition and condition
- Soil characteristics where apparent at the surface from land disturbing activities

Field staff also noted the general condition of the wetland and historic or ongoing land uses that have changed the vegetation community. The extent of the wetland was plotted on field maps. These plots were transferred to GIS wetland maps. Consistent with the treatment of riparian areas, each inventoried wetland was assigned a unique code based on the subarea in which it was located. For example, wetlands (W) within the Chenoweth Creek watershed were coded CC-W-01, CC-W-02, etc.

To help guide future planning efforts, a functional assessment of identified wetlands was completed. Wetland quality was assessed using the Oregon Freshwater Wetland Assessment Methodology (OFWAM) developed by DSL. The OFWAM is the primary assessment method used for Local Wetland Inventories. It evaluates the extent to which a wetland performs certain functions based on specific characteristics. It assesses a variety of key functional characteristics including water quality, hydrologic control, wildlife habitat and fish habitat. Winterbrook used an OFWAM field form to characterize wetlands and address specific functions that required field observation. Data collected in the field included information on Cowardin classes, vegetative cover, wetland hydrology (source, storage, and discharge), character of adjacent water bodies, and other field data essential to the OFWAM assessment. The OFWAM assessments were completed using field data, aerial photographs, maps, and information gathered from public agencies. The assessment resulted in a determination "high," "moderate," or "low" wetland function.



Wildlife Habitat

Documentation of wildlife habitats focused on the sensitive wildlife areas and sites identified in the NSA Management Plan. While there may be some overlap with the Sensitive Plant and Animal Species criteria, this category focuses on habitats of particular interest in the NSA Management Plan rather than species documentation (i.e., records of sensitive or listed species). Wildlife sites include nest or roost sites for golden eagle, great blue heron, Larch Mountain salamander,

[4] Limitations of project scope did not permit subsurface investigations or boundary delineations.

northern spotted owl, osprey, peregrine falcon, purple martin, and western pond turtle.

Sensitive wildlife areas are also listed in Table 2 and include a list of Priority Habitats (page I-3-39) in the NSA Management Plan. State and federal ESA-listed species and species listed by the Oregon Fish and Wildlife Commission were also reviewed. Field surveys focus on these habitat areas and make use of USFS vegetation information, ODFW deer and elk winter range maps, and other available data. Field staff surveyed and mapped areas of known or high probability habitat areas and sites. This information was plotted on field maps and transferred to GIS wildlife habitat maps in the office. Consistent with the treatment of riparian and wetland areas, each inventoried habitat area was assigned a unique code based on the watershed subarea in which it was located. For example, habitats (H) within the Chenoweth Creek watershed will be coded CC-H- 01, CC-H-02, etc.

Natural Areas

Portions of three identified CRG Natural Areas occur within the study area. These are Chenoweth Table, Crates Point, and Squally Point Dunes. Maps obtained from CRGC staff show the boundaries of the Natural Areas. Summary information on the special characteristics of these Natural Areas is provided in Table 4 of the NSA Management Plan.

Where access was granted to Natural Areas, field staff confirmed existing data on significant vegetation, vernal ponds, and other identified natural features. Field staff also noted the general condition of these features and mapped any significant changes to them on field maps. This information was then recorded in field notebooks and transferred to GIS Natural Area maps.

Crates Point Natural Area

FINDINGS

This section describes the results of Winterbrook's review of background information, resource agency contacts and field work completed during Spring, 2011. Additional field work for sensitive plants was completed in 2008.

This section summarizes the location, quantity and quality of natural resources within individual watershed subareas. The subareas range in size from 433 to 1,295 acres. The overall study area encompasses 7,498 acres of land outside of The Dalles UGB (Figure 1).

Watershed subareas are generally reviewed from west to east: Rowena Watershed, Gooseberry Creek, Chenoweth Creek, Chenoweth Table, Mill Creek, Dry Hollow, Threemile Creek, and Fifteenmile Creek. For the purpose of this report, land outside of these areas in the northeast part of the study area is considered part of the Columbia River watershed.

As noted in the Methods section, resources are identified by codes based on watershed subarea and resource type. These watershed codes generally follow state resource mapping practices (e.g., those for Local Wetland Inventories).

Rowena Watershed

The Rowena Watershed subarea is 554 acres in size and its boundaries are shown on Figure 2. Table 1 summarizes the natural resource findings for this subarea.

Basalt cliffs in Rowena subarea

Table 1. Rowena Watershed (RW)

Resource Type	Resource	Location	Quality	Quantity
Wetlands (W)	**RW-W-01** Columbia River bottomland wetlands	Within and south of Mayer State Park, along Columbia River east of I-84.	Mix of broadleaf-deciduous forested, scrub-shrub and emergent wetlands. Seasonally flooded. No access. Est. high wildlife habitat functions; moderate water quality, fish habitat and hydrologic control functions.	8.6 Acres
	RW-W-02 Rowena wetland	North of Dalles Country Club, between Hwy. 30 and I-84.	Mixed broadleaf-deciduous (Oregon ash) forested, scrub-shrub and emergent wetland. Seasonally flooded. Bordered by sumac, maple, pine and oak. No access. Est. high wildlife habitat and hydrologic control functions; moderate water quality and fish habitat functions.	2.6 Acres
	RW-W-03 Tooley Lake wetlands	North side of Tooley Lake near small peninsula. North of Hwy. 30.	Broadleaf-deciduous (ash, willow) forested and scrub-shrub and emergent wetland. Seasonally flooded. Near developed area and cropland. No access. Est. high fish and wildlife habitat functions; moderate water quality and hydrologic control functions.	1.1 Acres
	RW-W-04 Discovery Center wetlands	At Discovery Center, west and north of main building.	Mosaic of broadleaf-deciduous forested, scrub-shrub, emergent wetlands connected to excavated pond. Cottonwood, willow, ash with cattail and bulrush dominant emergent. Includes Frantz Spring (PNHF data). High wildlife habitat functions and hydrologic control functions; moderate water quality function .	1.7 Acres
Streams, Ponds, Lakes and Riparian Areas (R)	**RW-R-01** Tooley Lake	NW corner of study area, between Hwy. 30 and I-84.	Two small, eastern sections of 20-acre lake fall within study area. Lake bordered by maple and ash, with oak and pine at higher elevations. No access. High water quality and wildlife habitat functions; moderate fish habitat and water storage functions.	3.0 Acres

Resource Type	Resource	Location	Quality	Quantity
	RW-R-02 Columbia River and riparian area	Northern edge of subarea; Mayer State Park south to Taylor Lake.	Variety of habitats includes Squally Point dunes, wetlands, cliffs, riparian forest, and critical habitat for listed salmon species. Columbia is a water-quality limited river; riparian area provides moderate water quality function. High fish and wildlife habitat, water quality functions; moderate water storage function.	101 Acres
Sensitive Species* (S)	**RW-S-01** Salmon and trout	Columbia River.	Main migration corridor for Coho, Chinook (spring, summer, fall runs), steelhead (winter, summer runs), sockeye salmon, coastal cutthroat trout. High value.	51 Acres
	RW-S-02 Bald eagle	Near western edge of subarea.	Nesting eagles tracked until 2006. Eagle was federally delisted in 2007 but remains listed as Threatened by State of Oregon. Potential high value.	One nest
	RW-S-03 California mountain kingsnake	Generally, open wooded areas near streams.	Potential habitat for this species is present. Specimen found in 1980s outside study area on Sevenmile Hill. Gopher and garter snakes detected in 2011 but no kingsnakes. Potential high value.	Unknown
Wildlife Habitats (H)	**RW-H-01** Oak woodland habitat	Central and southern part of subarea, on slopes below Crates Point rim.	A priority habitat important to migratory songbirds and a range of oak-associated species incl. Lewis' woodpecker, white-breasted nuthatch, western grey squirrel. Patches of mod. high to high value.	54 acres
	RW-H-02 Cliffs	Northern rim of Crates Point and Columbia River cliffs (east of Discovery Center).	Prominent cliffs at western edge of study area. Potential breeding sites for cliff-dwelling species incl. falcons. High potential habitat value.	7 Acres
Natural Areas (N)	**RW-N-01** Crates Point	Major ridge extending into SW corner of subarea.	Grassland and pine-oak savanna. Towering cliffs. High value.	23 Acres
	RW-N-02 Squally Point Dunes	NW corner of study area, along Columbia River, in Mayer State Park.	Remnant sand dune with diverse plants, native grasses. On Register of Oregon Natural Heritage Resources. High value.	69 Acres

* The location of sensitive species is not mapped and is only described in general terms due to confidentiality requirements.

Gooseberry Creek

The Gooseberry Creek Subarea is 1,214 acres in size and its boundaries are shown on Figure 3. Table 2 summarizes the natural resource findings for this subarea.

Northeast view of Gooseberry subarea

Table 2. Gooseberry Creek (GC)

Resource Type	Resource	Location	Quality	Quantity
Wetlands	**GC-W-01** Bottomland wetland complex	Borders Lake Dalles. North of NW corner of UGB, between I-84 and Columbia River.	Broadleaf-deciduous forested and scrub-shrub wetlands, emergent wetlands, seasonally flooded. Wetland complex encircles Lake Dalles and follows drainageway to Taylor Lake. Taylor Spring feeds lower (northern) part of wetland. Access limited. High wildlife habitat and hydrologic control functions; moderate fish habitat and water quality functions.	23.5 Acres
	GC-W-02 Gooseberry confluence wetlands	Hidden Valley, near confluence of north and south forks of Gooseberry Creek.	Palustrine emergent wetlands. Seasonally flooded. Access limited. Moderate water quality, habitat and hydrologic control functions.	3.9 Acres
	GC-W-03 Gooseberry headwaters wetland complex	Series of wetlands north of Foley Lakes.	Palustrine emergent wetlands, seasonally flooded. Headwaters of south fork of Gooseberry Creek. One wetland connected to Foley Lakes; chorus and bull frogs noted in this wetland. Includes Marsh Spring (PNHF data). Access limited. Moderate water quality, habitat and hydrologic control functions.	18.3 Acres
	GC-W-04 Vernal pool	On slope north of Gooseberry Creek.	Rain-fed, seasonal wetland on hardpan soils. Previously mapped, no access. Moderate wildlife habitat, water quality and hydrologic control functions.	0.2 Acres
Streams, Ponds, Lakes and Riparian Areas	**GC-R-01** Columbia River and riparian area	East edge of subarea, east of I-84; includes Rocky Island.	Variety of habitats includes wetlands, lakes, critical habitat for listed salmon species. High water quality, fish and wildlife habitat functions; moderate water storage function.	52 Acres

Resource Type	Resource	Location	Quality	Quantity
	GC-R-02 Taylor Lake	Along Columbia River north of Lake Dalles and south of Discovery Center.	This "lake" is a small embayment along the Columbia River, located at the outfall of Lake Dalles and Gooseberry Creek. Sensitive painted turtles and Oregon floaters (mussels) are recorded in lake. High fish and wildlife habitat, water quality and water storage functions.	5.8 Acres
	GC-R-03 Lake Dalles	East of I-84 at north end of UGB.	Lake fed by Gooseberry Creek; discharges to Taylor Lake. Lake perimeter is bordered by Wetland GC-W-01. High water quality and wildlife habitat functions; moderate fish habitat and water storage functions.	18.6 Acres
	GC-R-04 Gooseberry Creek and riparian area	In Hidden Valley, passes through central portion of subarea. North of Foley Lakes.	Small, highly impacted stream system through farmland, fed by springs, wetlands, precipitation. Portions of stream are intermittent (e.g., north fork was dry in early May). Fish presence unlikely between Foley Lakes and Lake Dalles. Riparian vegetation very limited: patches of reed canarygrass, poison oak, and locust. Oak woodlands linked to upper reaches of stream. Marsh Spring is located between the two main forks. Gooseberry Spring feeds a lower branch of the stream near I-84. Moderate water quality and conveyance functions; other functions low.	44.8 Acres
	GC-R-05 Farm Ponds	Ponds near south fork of stream and south of the mainstem.	Excavated farm ponds used for irrigation and/or livestock. Low functions.	1.3 Acres
	GC-R-06 Foley Lakes (aka Foley Lakes Reservoir)	Southern tip of subarea near Fullen Way; part of Foley Lakes Mobile Home Park.	Two partially tree- and residence-lined lakes. The lakes are permanently flooded and impounded. Sumac, cottonwood, ash trees along with rushes, cattails and reed canarygrass border the lakes. Moderate water quality and habitat functions.	9.2 Acres
Sensitive Species*	**GC-S-01** Painted turtle	Taylor Lake area.	Year-round site for this species, state listed as Sensitive-Critical. High value.	5.9 Acres
	GC-S-02 Oregon floater (mussel)	Taylor Lake area.	This freshwater mussel (recorded in 2005) is not listed but on state watch lists. Moderately high to high value.	5.9 Acres

Resource Type	Resource	Location	Quality	Quantity
	GC-S-03 Salmon and trout	Columbia River.	Main migration corridor for Coho, Chinook, steelhead, sockeye salmon, coastal cutthroat trout. High value.	26 Acres
	GC-S-04 California mountain kingsnake	Generally, open wooded areas near streams.	Potential habitat for this species is present. Specimen found in 1980s outside study area on Sevenmile Hill. Potential high value.	Unknown
Wildlife Habitats	**GC-H-01** Oak woodland habitat	On Crates Point rim and in central part of subarea.	A priority habitat important to migratory songbirds and a range of oak-associated species. Patches of moderately high to high value.	51 acres
Natural Areas	**GC-N-01** Crates Point	Major ridge extending into NW corner of subarea.	Grassland and oak savanna. Prominent ridge. High value.	101 Acres

* The location of sensitive species is not mapped and is only described in general terms due to confidentiality requirements.

Chenoweth Creek

The Chenoweth Creek Subarea is 1,295 acres in size and its boundaries are shown on Figure 4. Table 3 summarizes the natural resource findings for this subarea.

Lower Chenoweth Creek

Table 3. Chenoweth Creek (CC)

Resource Type	Resource	Location	Quality	Quantity
Wetlands	**CC-W-01** Lower Chenoweth wetlands	North of Chenoweth Creek near Hwy. 30.	Palustrine emergent wetlands. Teasel with pasture grasses, oaks at edges. Seasonally flooded. Previously mapped wetlands (SRSAM Survey). No access. Est. moderate water quality, wildlife habitat and hydrologic control functions.	6.4 Acres
	CC-W-02 Hillside wetlands	On hill north of Chenoweth Creek east of Foley Lakes.	Palustrine emergent wetlands. Seasonally flooded. Access limited. Est. moderate water quality, wildlife habitat and hydrologic control functions.	2.4 Acres
	CC-W-03 Vernal pools	On Chenoweth Table, northwest of Sandlin Road.	Cluster of approx. ten vernal pools on top of Chenoweth Table. These rain-fed, seasonal wetlands represent a unique ecosystem with high habitat function. Est. moderate water quality and hydrologic control functions.	1.5 Acres
Streams, Ponds, Lakes and Riparian Areas	**CC-R-01** Chenoweth Creek and tributaries, riparian area	Follows north UGB boundary at east end; follows south side of Chenoweth Road to west.	Fish-bearing mainstem reach through deep, natural canyon (upstream) and open, partially farmed/developed valley (downstream). Red alder, Oregon ash and bigleaf maple in corridor, oak/pine and oak woodlands at higher elevations. Himalayan blackberry becomes common downstream. Mainstem provides Coho salmon and steelhead spawning and rearing habitat. Mainstem corridor provides high quality fish and wildlife habitat, water quality functions; moderate water storage function. Badger Creek tributary near Sevenmile Hill Road provides mod. to high water quality, wildlife habitat functions; no recorded fish presence.	67.5 Acres

Resource Type	Resource	Location	Quality	Quantity
Sensitive Species*	**CC-S-01** Slim-leaf onion	East of Foley Lakes.	Species is not listed but on ORBIC List 2, meaning it is threatened with extirpation from the state of Oregon. High value.	0.15 ac. (Population of approx. 200 plants)
	CC-S-02 Hood River milk vetch	Northeast of Seven Mile Hill Road.	Species is not listed but on ORBIC List 3, meaning it may be threatened or endangered in Oregon or throughout their range. High value.	0.75 ac. (Population of approx. 100 plants)
	CC-S-03 Winter steelhead	Mainstem Chenoweth Creek.	Spawning and rearing habitat. Federally listed Threatened. High value.	3.4 Acres
	CC-S-04 Coho salmon	Mainstem Chenoweth Creek.	Spawning and rearing habitat. Federally listed Threatened; State listed Endangered. High value.	3.4 Acres
	CC-S-05 California mountain kingsnake	Generally, open wooded areas near streams.	Potential habitat for this species is present. Specimen found in 1980s outside study area on Sevenmile Hill. Potential high value.	Unknown
Wildlife Habitats	**CC-H-01** Oak woodland habitat	A dominant feature of north slope below Chenoweth Table. Mixes with ponderosa pine north of Chenoweth Creek.	A priority habitat important to migratory songbirds and a range of oak-associated species. High value.	186 acres
	CC-H-02 Cliffs	West rim of Chenoweth Table, east of Chenoweth Road.	Prominent cliffs at the western edge of Chenoweth Table, above Chenoweth Creek . Potential breeding sites for cliff-dwelling species incl. falcons. High potential habitat value.	2.2 acres
	CC-H-03 Deer and elk winter range	SW of where Badger Creek joins Chenoweth Creek and south across Chenoweth Table.	Big game winter range boundary provided by ODFW. No specific data on deer or elk populations reported, and no big game observed in field. Moderate to high value.	360 acres
Natural Areas	**CC-N-01** Chenoweth Table	Northwest of Sandlin Road; west of W. 10th Street.	Grassland with bitterbrush, vernal ponds. Mound/swale topography. High value.	197 Acres

* The location of sensitive species is not mapped and is only described in general terms due to confidentiality requirements.

Chenoweth Table

The Chenoweth Table Subarea is 500 acres in size and its boundaries are shown on Figure 5. Table 4 summarizes the natural resource findings for this subarea.

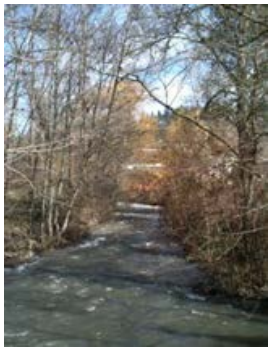
Northwest Chenoweth Table

Table 4. Chenoweth Table (CT)

Resource Type	Resource	Location	Quality	Quantity
Wetlands	No records; vernal pools are present to west, potential occurrence here. Access limited.	-	-	-
Streams, Ponds, Lakes and Riparian Areas	None.	-	-	-
Sensitive Species	None reported or detected.	-	-	-
Wildlife Habitats	**CT-H-01** Oak woodland habitat	A dominant feature of northeast slope below Chenoweth Table.	A priority habitat important to migratory songbirds and a range of oak-associated species. Largest contiguous oak woodland within study area. High value.	313 acres
	CT-H-02 Cliffs	Northeast rim of Chenoweth Table, above W. 13th St.	The most prominent cliffs in the southwest part of study area, forming a backdrop to this part of the City. Potential breeding sites for cliff-dwelling species incl. falcons. Adjacent slopes support oaks noted above. High potential habitat value.	23 Acres
Natural Areas	**CT-N-01** Chenoweth Table	Northwest of Sandlin Road; west of W. 10th Street.	Grassland with bitterbrush, vernal ponds. Mound/swale topography. High value.	210 Acres

Mill Creek

The Mill Creek Subarea is 807 acres in size and its boundaries are shown on Figure 6. Table 5 summarizes the natural resource findings for this subarea.



Lower Mill Creek

Table 5. Mill Creek (MC)

Resource Type	Resource	Location	Quality	Quantity
Wetlands	**MC-W-01** Mill Creek wetland	Along Mill Creek near Wright Drive.	Broadleaf-deciduous forested and scrub-shrub wetland. Some ponded areas, otherwise seasonally flooded. In riparian corridor. No access. Est. high fish habitat function; moderate water quality, wildlife habitat, hydrologic control functions.	6.9 Acres
Streams, Ponds, Lakes and Riparian Areas	**MC-R-01** Mill Creek and tributaries, riparian area	North of Mill Creek road; north tributary extends to Cherry Heights Road, and south parallels Skyline Road on west side.	Mainstem reach with Coho salmon, steelhead and cutthroat trout. Chinook salmon downstream. Narrow corridor of alder/ash/ cottonwood. Constrained by buildings, roads, cropland. Tribs similarly constrained, though north trib. has healthy oak/pine cover. High quality fish habitat functions; other functions moderate.	29.7 Acres
Sensitive Species*	**MC-S-01** Coastal cutthroat trout	Mainstem Mill Creek.	Spawning and rearing habitat. Federal species of concern; State Sensitive-vulnerable. High value.	1.6 Acres
	MC-S-02 Winter steelhead	Mainstem Mill Creek.	Spawning and rearing habitat. Federally listed Threatened. High value.	1.6 Acres
	MC-S-03 Coho salmon	Mainstem Mill Creek.	Spawning and rearing habitat. Federally listed Threatened; State listed Endangered. High value.	1.6 Acres
	MC-S-04 Bald Eagle	Near eastern edge of subarea.	Active bald eagle nest last reported in 2003. Eagle is state-listed as Threatened. Potential high value.	One nest
	MC-S-05 California mountain kingsnake	Found in oak, brush grass, near stream.	Potential habitat for this species is present. Specimen found in 1982 outside along Mill Creek. Potential high value.	Unknown
Wildlife Habitats	**MC-H-01** Oak woodland habitat	South of Mill Creek Road near Skyline and at NE edge of subarea.	A priority habitat important to migratory songbirds and oak-associated species. Fragmented patches of mod. high value.	55 acres
Natural Areas	None.	-	-	-

* The location of sensitive species is not mapped and is only described in general terms due to confidentiality requirements.

Dry Hollow

The Dry Hollow Subarea is 433 acres in size and its boundaries are shown on Figure 7. Table 6 summarizes the natural resource findings for this subarea.

Table 6. Dry Hollow (DH)

Resource Type	Resource	Location	Quality	Quantity
Wetlands	**DH-W-01** Dry Hollow wetland	Along Dry Hollow Creek on the west side of Dry Hollow Road. South of Three Mile Road intersection.	Palustrine emergent wetland dominated by cattails. Within riparian corridor. Moderate water quality function, fish and wildlife habitat and hydrologic control functions.	0.2 Acres
Streams, Ponds, Lakes and Riparian Areas	**DH-R-01** Dry Hollow Creek and riparian area	Along Dry Hollow Road, north of E. 19th Street.	This short reach of approx. 3,000 lineal feet has a highly altered and impacted channel and riparian area. Buildings, roads, paved areas, and cropland constrain the stream, which is piped in areas. The upper end of the reach was dry in early April, with minimal flow at the lower (north) end. No fish are documented in the reach. Low functions.	7.1 Acres
Sensitive Species	None reported or detected.	-	-	-
Wildlife Habitats	**DH-H-01** Oak woodland habitat	Small patch south of CG Community College. NW corner of subarea.	A priority habitat important to migratory songbirds and a range of oak-associated species. Smaller, fragmented patch of mod. high value.	13 acres
Natural Areas	None.	-	-	-

Threemile Creek

The Threemile Creek Subarea is 774 acres in size and its boundaries are shown on Figure 8. Table 7 summarizes the natural resource findings for this subarea.

Threemile Creek

Table 7. Threemile Creek (TC)

Resource Type	Resource	Location	Quality	Quantity
Wetlands	**TC-W-01** Threemile Creek wetlands	Along southern tributary south of Old Dufur Road.	Broadleaf-deciduous forested and emergent wetlands. Within riparian corridor. High fish habitat function; moderate water quality, wildlife habitat and hydrologic control functions.	0.8 Acres
Streams, Ponds, Lakes and Riparian Areas	**TC-R-01** Threemile Creek and tributaries, riparian area	Generally parallels Old Dufur Road.	Fish-bearing mainstem reach with steelhead and cutthroat trout. Narrow corridor of red alder, Oregon white oak. Constrained by roads, cropland. High quality fish habitat functions; moderate water quality function; low wildlife habitat and streamflow moderation functions. Tributaries are more constrained, do not support fish, and generally provide low functions.	43.9 Acres
Sensitive Species*	**TC-S-01** Coastal cutthroat trout	Threemile Creek	Spawning and rearing habitat. Federal species of concern; State Sensitive-vulnerable. High value.	1.5 Acres
	TC-S-02 Winter steelhead	Threemile Creek	Spawning and rearing habitat. Federally listed Threatened. High value.	1.5 Acres
	TC-S-03 Lewis' woodpecker	Along Threemile Creek, near Threemile Road, 2+ miles upstream from subarea.	Large breeding population with some winter populations at lower elevations. Federal species of concern; State Sensitive-critical. High value.	Multiple nest sites
Wildlife Habitats	See Threemile Creek riparian area, above.			
Natural Areas	None.	-	-	-

* The location of sensitive species is not mapped and is only described in general terms due to confidentiality requirements.

Fifteenmile Creek

The Fifteenmile Creek Subarea is 1,092 acres in size and its boundaries are shown on Figure 9. Table 8 summarizes the natural resource findings for this subarea.

Fifteenmile Creek braided channels

Table 8. Fifteenmile Creek Watershed (FC)

Resource Type	Resource	Location	Quality	Quantity
Wetlands	**FC-W-01** Fifteenmile Creek wetlands	North of Fifteen Mile Road along Fifteenmile Creek.	Mosaic of broadleaf-deciduous scrub-shrub and emergent wetlands along stream margins and braided channels. High fish and wildlife habitat and hydrologic control functions; moderate water quality function.	26.6 Acres
Streams, Ponds, Lakes and Riparian Areas	**FC-R-01** Fifteenmile Creek and tributaries, riparian area	North of Fifteen Mile Road.	Highly diverse and complex riparian corridor with braided stream channels, islands, riffles, pools and falls. Alder-ash-oak riparian forest. Fish-bearing reach with steelhead and cutthroat trout, Chinook and Coho salmon (up to Seufert's Dam). High quality fish and wildlife habitat, streamflow moderation functions. Fifteenmile Creek is a water-quality limited stream but riparian wetlands and vegetation in this reach provide high water quality function.	63.2 Acres
Sensitive Species*	**FC-S-01** Coastal cutthroat trout	Fifteenmile Creek	Spawning and rearing habitat. Federal species of concern; State Sensitive-vulnerable. High value.	7.4 Acres
	FC-S-02 Winter steelhead	Fifteenmile Creek	Spawning and rearing habitat. Federally listed Threatened. High value.	7.4 Acres
	FC-S-03 Coho salmon	Fifteenmile Creek	Spawning and rearing habitat. Federally listed Threatened; State listed Endangered. Reported to Seufert's Dam (lower 1,800') but dam breaches potentially allow upstream access. High value.	1.24 acres
	FC-S-04 Spring Chinook salmon	Fifteenmile Creek	Migration. Federally listed Threatened. State Sensitive-critical. High value.	7.4 Acres
Wildlife Habitats	**FC-H-01** Oak woodland habitat	Patch at upstream (east) end of subarea.	A priority habitat important to migratory songbirds and a range of oak-associated species. High value.	11 acres
Natural Areas	None.	-	-	-

* The location of sensitive species is not mapped and is only described in general terms due to confidentiality requirements.

Columbia River

The Columbia River Subarea is 830 acres in size and its boundaries are shown on Figure 10. Table 9 summarizes the natural resource findings for this subarea.

Table 9. Columbia River (CR)

Resource Type	Resource	Location	Quality	Quantity
Wetlands (W)	**CR-W-01** Columbia River lowland wetlands	Small wetlands along south side of I-84.	Two roadside emergent wetlands and two roadside broadleaf-deciduous forested and scrub-shrub wetlands. Access limited. Moderate water quality, wildlife habitat and hydrologic control functions.	0.7 Acres
Streams, Ponds, Lakes and Riparian Areas (R)	**CR-R-01** Columbia River and riparian area	Borders northern edge of study area.	River is habitat for listed salmon species. Shoreline and riparian area impacted by I-84 and railroad embankments. Access limited. Columbia is a water-quality limited river. Some wetlands and riparian vegetation provide limited water quality benefits. Moderate fish habitat and water storage functions.	Borders study area
Sensitive Species* (S)	**CR-S-01** Salmon and trout	Columbia River (borders study area).	Main migration corridor for Coho, Chinook (spring, summer, fall runs), steelhead (winter, summer runs), sockeye salmon, coastal cutthroat trout. Spawning and rearing habitat for while sturgeon in mile-long reach below dam. High value.	Borders study area
Wildlife Habitats (H)	See Columbia River riparian area, above.			
Natural Areas	None.	-	-	-

* The location of sensitive species is not mapped and is only described in general terms due to confidentiality requirements.

CONCLUSION

Using the methodology described in this report, Winterbrook identified a wide variety of wetlands, streams, ponds and lakes, riparian areas, sensitive plants and animals, wildlife habitats, and natural areas within The Dalles study area. Table 10 summarizes the inventory findings for each resource type.

Table 10: Summary of Natural Resources within Study Area

Resource Type	# Resource units*	Combined Size**	% of Study Area	High Valued*** Resources	High Valued as % of Total
Wetlands	16	105.3	1%	10	63%
Streams and Riparian Areas	9	409.2	6%	7	78%
Ponds	1	1.3	< 1%	0	0%
Lakes	4	36.7	1%	2	50%
Sensitive Species	13	N/A	N/A	13	100%
Wildlife Habitats	11	688	9%	9	82%
Natural Areas	3	598	8%	3	100%
Total	**57**	**1,532**	**21%**	**44**	**77%**

* Some resource units may include multiple resources (e.g., one unit may contain a group of wetlands in proximity to each other and/or with similar characteristics).
** Some overlap exists among resource areas.
*** Includes resources with potentially high values.

Seventy-two percent of the resource units surveyed have high or potentially high values, which generally mean that they provide one or more high ecological functions. All 13 of the sensitive species and all 3 of the identified Natural Areas received high values.

Table 11 shows the acreage of resources within each subarea, and the corresponding percentage of the subarea covered by resources. The combined area of these resources is approximately 1,538 acres, or 20.5% of the 7,497-acre study area.

Table 11: Summary of Natural Resources within Study Area

Subarea	Resource Acres	Subarea Acres	Resource Acres as % of Subarea
Rowena Watershed	213	554	38%
Gooseberry Creek	303	1213	25%
Chenoweth Creek	416	1295	32%
Chenoweth Table	389	500	78%
Mill Creek	86	807	11%
Dry Hollow	20	433	5%
Threemile Creek	44	774	6%

Subarea	Resource Acres	Subarea Acres	Resource Acres as % of Subarea
Fifteenmile Creek	66	1091	6%
Columbia River	1	830	0%
Total	**1538**	**7497**	**20.5%**

Special Protection and Management Recommendations

There are three areas within the study area that stand out as high quality resource lands warranting special protection.

Vernal pool atop Chenoweth Table

First, in terms of the relative quantity and quality of natural resources, the Chenoweth Creek and Chenoweth Table subareas together contain the largest group of high quality resources. Together, the combined resources cover more than 800 acres. The Chenoweth Creek subarea includes 414 resource acres (32% of the subarea), including a free-flowing salmon stream with a forested riparian corridor, part of the Chenoweth Table Natural Area with vernal pools, cliffs and widespread oak woodland habitats, deer and elk winter range, and a variety of sensitive species including two rare plants. Connected to this area is the Chenoweth Table subarea, which is the northern part of the Chenoweth Table Natural Area and contains 391 acres (78% of the subarea) of oak woodland and cliff habitats. This unique cluster of high quality resources deserves special consideration and a high level of protection.

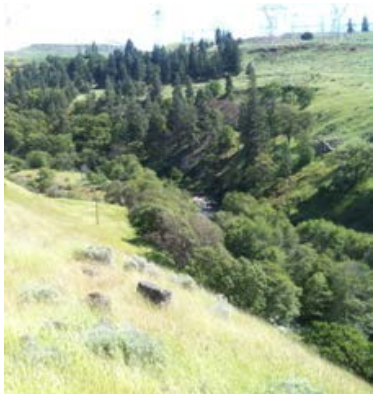
Second, the northwestern edge of the study area extending south from Mayer State Park contains a mix of important natural resources. These include the Columbia River riparian corridor, connected lowland wetlands, three lakes, cliff and oak habitats, and a variety of sensitive fish and wildlife species. Along the river corridor lies the Squally Point Dunes Natural Area, listed on the Oregon Register of Heritage Resources. Towering above it is the Crates Point Natural Area. This cluster of resources totals approximately 414 acres. It, too, warrants a high level of protection.

Wildflowers on Crates Point

Third, the most notable resource area in the eastern part of the study area is Fifteenmile Creek. This complex riparian corridor contains braided stream channels, islands, riffles, pools and falls. It is bordered by an alder/ash/oak forest and steep canyon walls on both sides. Fifteenmile Creek supports steelhead and cutthroat trout, Chinook and Coho salmon and warrants a high level of protection.

These special resource areas can be effectively protected and managed through a combination of conservation tools. These tools include:

- Establish buffers around rivers, streams, wetlands, lakes and riparian areas.
- Protect the steep canyons bordering Chenoweth Creek and Fifteenmile Creek.
- Preserve and restore native oak woodland and savanna habitats; prevent fragmentation of these sensitive habitats.
- Limit off-site impacts to sensitive resources, such as upstream water quality impacts caused by development or farming activities.
- Buffer Natural Areas from urban development and manage public access to these sensitive sites



Fifteenmile Creek Canyon

Growth Management Considerations

In addition to natural resource constraints, the study area is constrained by existing rural residential development patterns, steep slopes, quarries and federally-owned lands (see Figure 11). For example, the study area includes several rural residential "exception areas" (areas not subject to agricultural or forest land protection due to previous development) in the Fifteenmile Creek, Threemile Creek, Dry Hollow, Mill Creek and Chenoweth Creek Subareas. Some of these rural residential areas have oak woodlands, but for the most part are located outside of riparian corridors. These areas would be appropriate to urbanize first, before considering expansion into other rural lands.

Much of the eastern part of the study area is located within the "Starr Complex" managed by the Bonneville Power Administration. This federal land is unavailable for urban expansion; however, land outside the Fifteenmile Creek riparian corridor potentially could meet identified urban growth needs and could eventually connect to buildable land outside the Columbia River Gorge NSA.

In the area north of Chenoweth Creek, steep slopes and an active quarry add to the natural resource constraints such as the Gooseberry Creek riparian corridor, wetlands, and oak woodlands. Similar to the lands to the east, however, there are larger blocks of unconstrained land that potentially could meet identified urban growth needs.

REFERENCES

Carson, Robert, Kirkman, Robert, & Neil, Jason. (2001). *ODOT's salmon resource and sensitive area mapping project: a high-tech procedure for obtaining biological resource data for resource protection and regulatory compliance.* UC Davis: Road Ecology Center. Retrieved from: http://escholarship.ucop.edu/uc/item/1qw1x0rm

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service. Publ. # FWS/OBS-79/31. 131 p.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Environmental Laboratory, 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0). Technical Report ERDC/EL TR-08-28. U.S. Army Corps of Engineers Engineer Research and Development Center.

Hitchcock and Cronquist. 1973. *Flora of the Pacific Northwest.* University of Washington Press. Seattle, Washington.

Natural Resources Conservation Service (NRCS). 1999. *National Soil Survey Handbook.* Section 622-4.

Reed, P.B., Jr. 1997. *Revision of the National List of Plant Species that Occur in Wetlands*: National Summary. U.S. Fish and Wildlife Service, Washington, D.C. 253 pages.

Reppert, R.T., W. Sigles, E. Stakhiv, L. Messman, and C. Meyers. 1979. *Wetlands Values: Concepts and Methods for Wetlands Evaluation*. Inst. for Water Resources, U.S. Army Corps of Engineers, Fort Belvoir, VA. Res. rpt. 79-R1.

U.S. Fish and Wildlife Service. 1981. National Wetlands Inventory Maps. The Dalles North, The Dalles South, and Petersburg Quadrangles. USFWS Region 1, Portland, Oregon.

Additional references are listed in the Methods section.