

Chapter 4 Environmental Consequences – Effects on Ecosystems

What is addressed in this chapter?

This chapter describes the existing natural environment and how the alternatives may impact natural resources. This chapter specifically addresses the following elements:

- Earth
- Hazardous Materials
- Water
- Plants and Animals
- Climate Change

Several exhibits within this chapter identify the locations and/or conditions of natural resources. The mapping information used to create these exhibits came from a variety of sources, are intended only as general depictions, and may not be accurate to the parcel level. During the MPD process, natural resources will be analyzed parcel level detail will be analyzed accordingly.

Plants and Animals

Wetlands, Wetland Habitat, and Vegetation

1 What wetlands and water bodies are present in the study area?

The Villages contains 97 individual wetlands; 12 on the North Property and 85 on the Main Property. Streams and lakes are also found in The Villages, most notably Rock Creek and Black Diamond Lake. There are also several small drainages and natural watercourses associated with Jones Lake and Black Diamond Lake on the Main Property. One short, isolated water course is located within the North Property, which connects two wetlands on its upper and lower terraces.

Rock Creek is part of an extensive wetland system extending from Jones Lake to Lake Sawyer. Jones Lake functions as the headwaters of Rock Creek, having good to fair water quality and relatively high concentrations of acidic organic materials in solution. Jones Lake is a unique environment where the acidity of the water, in association with related wetlands, impedes the processes of bacterial breakdown that would otherwise recycle nutrients. Black Diamond Lake is also part of a large wetland system; the open water component of the lake is approximately 10 acres in size. The Black Diamond Lake wetland complex is also unique in that it contains a bog component.

The small drainage on the North Property and two small drainages on the Main Property are seasonal water bodies and flow intermittently. Streams S4 and S5, which are associated with Jones Lake and Black Diamond Lake respectively, are perennial streams having headwaters in wetlands.

The on-site wetlands range from 0.003 acre to 47.4 acres in size, and all together measure approximately 180 acres. The North Property contains approximately 10.32 acres of wetland, with the remainder existing on the Main Property (Exhibit 4-10). The source of hydrology for some wetlands is surface water recharge via stormwater runoff and precipitation; others are recharged or fed by groundwater/high water tables.

What topics are included in “Plants and Animals”?

- Vegetation
 - Wetlands
 - Fish and Habitat
 - Wildlife and Habitat
 - Endangered Species
-

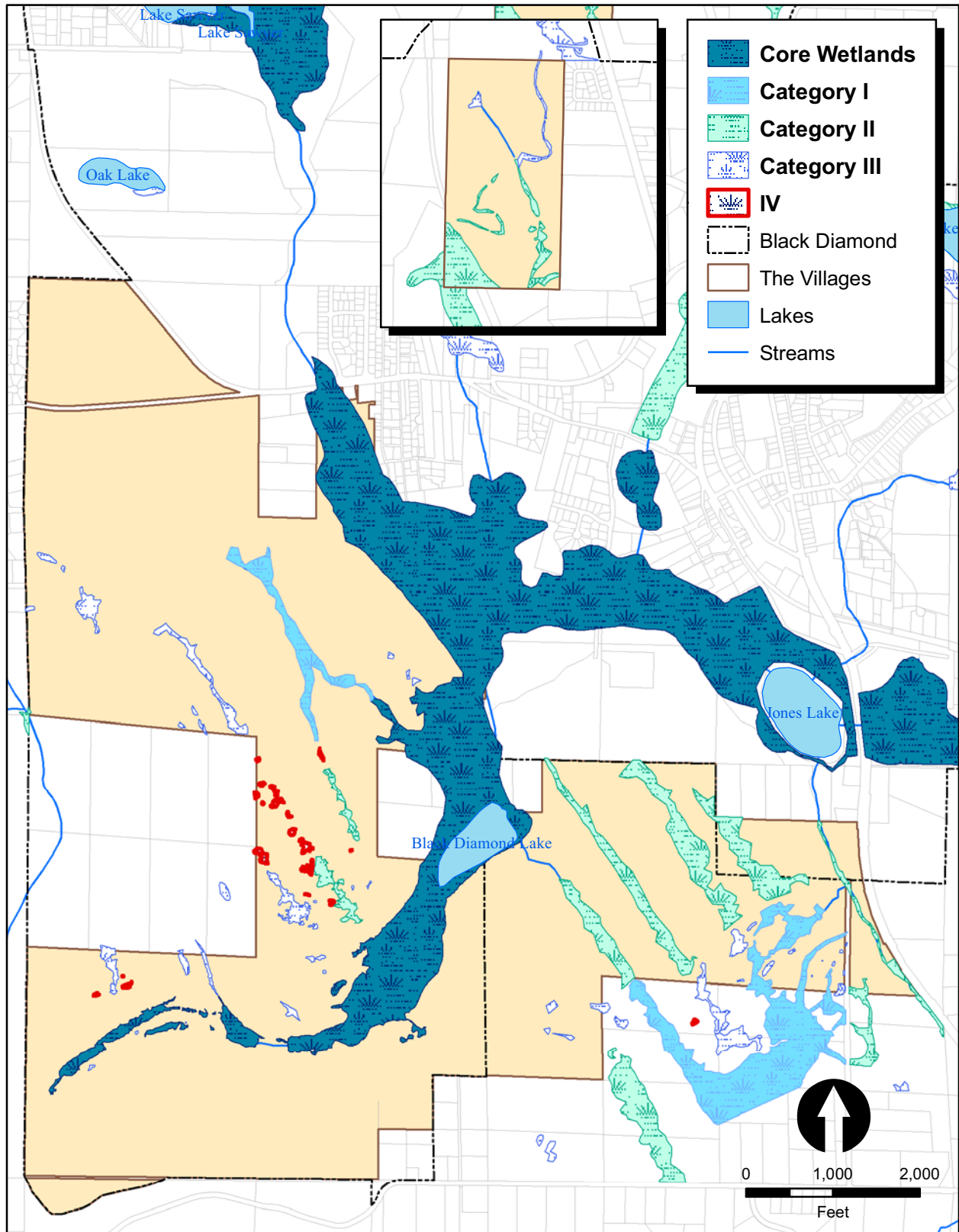
What are wetlands?

For an area to be classified as a wetland, three characteristics must be present under normal conditions:

- Plants with certain adaptations that allow them to thrive in inundated or saturated soils where upland plants cannot.
 - The presence of water at or near the ground surface for a designated amount of time.
 - Soils with characteristics indicating they were developed in conditions where oxygen in the soil is limited by the presence of water in the soil for long periods of time during the growing season.
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Exhibit 4-10

Wetlands



Exhibits in this EIS are intended to provide a general graphical depiction of built and natural environment conditions and may not be accurate to the parcel level.

Based on available King County and National Wetland Inventory mapping, off-site wetlands may be located in the vicinity of both the Main Property and North Property. On the North Property, wetlands located on-site extend off-site to the south and southwest, as well as off-site to the north into the North Triangle of the Lawson Hills properties. Ravensdale Creek is located off-site northwest of the North Property.

Off-site wetlands are indicated around the boundary of the Main Property, many of which are associated with the wetlands delineated inside of the boundaries of the Main Property. There may also be small wetlands west of the Main Property, north/northeast of the Main Property (associated with the Black Diamond Lake and Rock Creek corridors), and southeast of the Main Property.

What are perennial streams?

A perennial stream has continuous flowing water within its stream channel in years with at least average rainfall.

Appendix O

A complete discussion on wetlands can be found in Appendix O.



Wetland associated with Rock Creek just south of Auburn-Black Diamond Road

2 What policies and standards pertain to vegetation and wetlands?

Policies and standards pertaining to vegetation and wetlands exist at the local, state, and federal level. The Washington State Growth Management Act requires counties and cities to adopt development regulations that protect the functions and values of critical areas, including wetlands.

At the local level, cities and counties have the authority to regulate wetlands and buffers located within their jurisdiction. In Black Diamond, the City regulates wetlands, buffers, and vegetation through two ordinances, the SAO, and the Tree Preservation Ordinance.

Section 19.10.200 of the City’s SAO pertains to wetlands and wetland buffers. The SAO defines which wetlands the City regulates, how wetlands shall be evaluated, and sets forth uses and activities that are allowed within wetlands and their buffers. The SAO also outlines requirements for mitigation should alterations or unavoidable adverse impacts to wetland functions and values occur as a result of a project.

In the State of Washington, the Department of Ecology also has authority over wetlands. State and local agencies also use the SEPA process to identify potential wetland related concerns early in the permitting process. At the federal level, the United States Army Corps of Engineers (ACOE) has been given the authority to regulate wetlands.

“No net loss” has been the key policy in wetlands protection at both the state and federal level. This policy is a principal by which agencies and governments strive to balance unavoidable losses of wetland functions and values with replacement of those functions and values on a project-by-project or watershed basis.

What are wetland functions and values?

Wetlands provide functions such as flood control, groundwater recharge, water filtration and purification, erosion control, wildlife habitat, and recreation, and education.

The function that an individual wetland performs depends on its location, surrounding topography, subsurface geology, amount and duration of water, and the types of vegetation present (Ecology 2009).

Black Diamond SAO Key Wetland Concepts:

- The wetland complex associated with Rock Creek, Jones Lake, Jones Lake Creek, Black Diamond Lake, Black Diamond Lake Creek, and Ravensdale Creek is designated as the Core Wetland Complex.
 - Wetland complexes associated with the headwaters of Ginder Creek, Lawson Creek and Ravensdale Creek are designated as Headwater Wetlands.
 - All other wetlands in the City are rated based on the Washington State Rating System for Western Washington, in accordance with the functions and values that each provides.
 - Regulated activities resulting in impacts to wetlands and their buffers require mitigation that achieves equivalent or greater biological functions than those that are impacted.
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The City of Black Diamond’s Tree Preservation Ordinance recognizes the importance of vegetation and trees in particular, for the benefits provided to property values and to the environment. Trees stabilize soil and control water pollution, conserve energy, reduce stormwater runoff, improve air quality, provide habitat to wildlife, and preserve the forested character of the Pacific Northwest.

The City of Black Diamond’s Municipal Code (BDMC), Chapter 15.28, also contains provisions relating to land clearing and grading. Under this chapter, any person seeking to grade, excavate, or clear any site of trees or vegetation within the City is required to first obtain a clearing permit. The intent of this process and associated review is to minimize adverse stormwater impacts, protect water quality, minimize habitat loss, protect environmentally sensitive areas, and prevent damage to persons and property.

3 How will the alternatives impact vegetation and wetlands?

Human activities can have both positive and negative effects on wetland functions and values. Human activities that may have negative effects on wetland functions and values include forestry, agriculture, and construction of utilities, in-water structures (dams, levees, bank armoring, and others), mining, road building, and urban development. Some human activities have greater impacts than others and different activities affect wetland functions in different ways. Human activities with beneficial effects on wetlands include restoration, enhancement, dam removal, reconnection of wetlands to historical floodplains, and control of invasive species. Impacts can also be separated into direct and indirect impacts.

Many species depend on wetlands for food, shelter, and breeding sites. On a landscape scale, wetlands contribute to increased biodiversity both locally and regionally. Many wetland-dependent species; including turtles, amphibians, waterfowl, beaver, and mink; need not only the wetland but also the adjacent upland to meet essential life needs. A wetland may be preserved, but if the adjacent upland buffer is lost, a component of the wetland’s function is lost.

Tree Preservation Ordinance

Chapter 19.30 of the City of Black Diamond’s Municipal Code includes requirements that minimize tree loss during construction and development, reduce indiscriminate removal and destruction of trees, and mitigates tree loss by requiring replacement trees.

What is a wetland hydroperiod?

The hydroperiod of a wetland can be defined as the seasonal pattern of water levels in a wetland, and the duration and frequency and timing of flooding and soil saturation.

Urbanization has the greatest impact on wetlands, and often results in wetland loss and in the loss of or alteration of wetland functions. Urbanization can result in sedimentation, increased nutrient loading, increased contaminant introduction, and fragmentation of habitat. Even limited urban development can increase surface water runoff to wetlands during rainfall events, thereby altering wetland hydroperiods.

The bog adjacent to Black Diamond Lake is a unique resource; in King County, sphagnum dominated bogs comprise only about 3 percent of the total number of wetlands in the County. There are a number of pathways through which human influences in a watershed can impact bogs; hydrology is one of the most important physical factors that can be altered by human activities in a watershed. Chemical factors can also be altered by humans, primarily through nutrient enrichment. Human influences on biological factors can also affect sphagnum dominated peatlands through alteration of the vegetation communities typical to these systems. Urbanization surrounding this type of system runs the risk of impacting it significantly through the pathways and influences described above.

Alternative 1

Alternative 1 assumes that The Villages properties will develop consistent with current zoning. This type of development would be characterized by residential and commercial development occurring slowly and incrementally, and avoiding impacts to all regulated sensitive areas. In regard to wetlands and vegetation, Alternative 1 assumes that all wetlands and their standard (SAO-assigned) buffers within The Villages will be preserved. Utilizing this assumption, there will be no direct impacts to wetlands or their buffers under Alternative 1.

Despite Alternative 1 involving no direct impacts to wetlands or their buffers, urbanization and development in general can still result in indirect impacts to wetlands. Water that previously sheet flowed into wetlands or recharged groundwater-fed wetlands is often captured and redirected to large stormwater ponds, affecting wetland hydroperiods.

What is a sphagnum bog?

Sphagnum bogs are a type of wetland that accumulates acidic peat, which is a deposit of dead plant materials, in this case sphagnum moss. Bogs occur where the water at the ground surface is acidic, either from acidic ground water or where water is derived entirely from precipitation. Bogs can be challenging environments for other forms of plant life because they are low in nutrients and very acidic.

The removal of trees and other vegetation around wetland buffers can also potentially expose them to direct sun or longer periods of light, affecting the vegetative species composition of the wetland. Changes to wetland hydroperiods can also affect vegetative species because some can tolerate wetter conditions than others. Clearing and development around wetland buffers also has the potential to introduce non-native or invasive vegetative species.

The introduction of domesticated animals such as cats and dogs can also affect wetland vegetation, and animals like songbirds and small mammals that may utilize wetlands. Because individual landowners could potentially clear or disturb vegetation outside of buffers under this alternative (because there is no coordinated open space concept), this alternative may result in ‘patchier’ fragments of retained vegetation and less continuous habitat corridors than Alternatives 2 and 3.

Under Alternative 1, it is also assumed that development would occur in accordance with the City’s tree preservation ordinance, and that some of the existing trees on the property would be retained on individual lots and in subdivision open and natural spaces.

Alternative 2

Alternative 2 involves permanent filling of approximately 1/2 acre of wetland. Impacts are proposed within both the Main Property and the North Property. Filling is proposed for roads, utilities, and stormwater facilities. Under Alternative 2 approximately five acres of buffers for on-site wetlands will be permanently impacted. Impacts to off-site buffers may occur from development on both the Main Property and the North Property.

The majority of the wetland area proposed to be filled is relatively low functioning and geographically isolated from other wetlands. Nevertheless, without mitigation Alternative 2 would reduce the ability of or level to which existing wetlands can function to improve water quality and provide quality wildlife habitat. Small, isolated wetlands may be displaced in

accordance with the standards outlined in the City’s SAO. Direct impacts to wetlands will require mitigation under the City’s codes, and a mitigation plan will be required to be submitted and approved prior to any disturbance taking place. Indirect wetland impacts as outlined above under Alternative 1 also have the potential to occur under Alternative 2.

With regard to wetland buffers, there is a system of wetlands extending west from the Core Wetland Complex southwest of Black Diamond Lake across the Main Property. The MPD application submitted in support of Alternative 2 does not characterize all of these wetlands as Core Complex wetlands. City maps and codes indicate they are Core Complex wetlands. As designated Core Complex wetlands, under City codes these wetlands require 225 –foot-wide buffers. There are exceptions for Category III and IV wetlands that fall in the outer 50 percent of the buffer of a wetland designated as part of the Core Complex. The application materials assign smaller buffers than City codes require to some of the wetlands in this system. The Applicant will be required to provide justification in accordance with City codes and Best Available Science to support any request for reducing buffers on these wetlands. If a buffer averaging proposal is submitted for Alternative 2, the five acre impact area cited above may change, and such plan would need to be evaluated in accordance with City codes prior to approval. At this time, the City does not recommend buffer reductions, as there is ample developable acreage outside of sensitive areas and their buffers.

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Development under Alternative 2 will result in large tracts of contiguous, preserved open space (approximately 42 percent of the total MPD area). This pattern of development will result in less fragmented open space corridors than development under Alternative 1. On both the Main Property and the North Property, proposed open space areas generally align with streams, wetlands, and their buffers. However continuous connections between many of these systems (some of which are also designated wildlife corridors) are bisected by proposed roads and development areas.

The application materials submitted to the City in support of Alternative 2 indicate that the Applicant intends to seek relief from standards in the City's tree preservation ordinance. This is on the grounds that the proposal preserves substantial areas in a natural state where no trees would be disturbed and because numerous trees will be planted within active open spaces, parks, and common areas within the project. No determination has been made as to the acceptability of this proposal.

Jones Lake/Rock Creek/Black Diamond Lake and Wetland Complexes

The stormwater concept for Alternative 2 involves release of stormwater to surface waters, including Jones Lake/Rock Creek. Stormwater from two stormwater management zones (zones two and four) will be collected conveyed to these water bodies. The stormwater concept also calls for utilizing roof runoff from zone three to recharge the Black Diamond Lake complex in an effort to maintain the bog hydrology.

Jones Lake has been characterized as having relatively high concentrations of naturally occurring acidic organic materials, including sphagnum peat. Sphagnum peatlands (bogs) act as a sponge, soaking up rainwater and allowing it to filter slowly through upper layers and therefore helping regulate hydrological flood pulses. Peatlands also protect downstream lakes from excess nutrients by acting as sinks; conditions that increase the rate of decomposition of peat in these wetlands allows release of historical stores of nutrients resulting in changes in the biochemistry of downstream water bodies. King County has specific water quality treatment requirements for discharges to bogs contained within their Surface Water Design Manual.

Lake Sawyer is susceptible to eutrophication. Lake Sawyer currently has a 303(d) listing for phosphorus, based on past water quality problems. Jones Lake is not currently listed, but is a likely candidate for potential biochemical impacts from increased inputs of nutrients as the watershed transitions from primarily undeveloped to more urban.

As part of the development of Alternative 2, the Applicant investigated a portion of the Jones Lake wetland area with the purpose of determining whether the area met the criteria of a sphagnum bog system. The Applicant's investigation found very poorly drained organic soils that formed primarily in sedges versus sphagnum mosses, and that therefore the wetland complex did not meet the criteria of a sphagnum bog.

Potential impacts to Black Diamond Lake bear special consideration in the development of all of the alternatives. Given that Black Diamond Lake is a bog with low biological productivity, low nutrient availability, and depressed pH, it is especially sensitive to changes in hydrology and water quality.

There is a significant risk of impacts to the hydroperiods and biochemical composition of Black Diamond Lake and Jones Lake/Rock Creek and their associated wetland complexes under any of the alternatives, resulting from runoff generated by development around wetland systems. Alterations to site hydrology and the introduction of nutrients such as phosphorous and nitrogen disturb the balance unique to sphagnum bogs in these systems. If the bogs are disturbed, there is also risk to this balance in downstream waters such as Lake Sawyer.

Alternative 3

Alternative 3 would also follow a master planned approach, but would include greater acreages of open space areas and more dense residential development clustered away from sensitive areas. In order to provide the residential acreage as depicted, some wetland or stream impacts could occur, but only at existing disturbed areas. Access to those areas could also be achieved through bridging, which would avoid filling or other disturbance. Alternatively, residential acreage could be reduced in these areas, and cluster the same number of units more densely in areas that do not require any encroachment of sensitive areas, existing or otherwise. Impacts to vegetation would be less (in acres) than those anticipated under either Alternative 1 or 2 because Alternative 3 involves preservation of more acres in open space and clustering higher density development in smaller areas.

Indirect wetland impacts as outlined above under Alternatives 1 and 2 also have the potential to occur under Alternative 3. However, ‘proximity’ impacts (impacts such as domestic animals and invasive vegetation, which occur because of the close proximity of development to the wetlands) are less likely to occur (or at lesser magnitude) under this alternative because development will be clustered further away from sensitive areas. In addition, Alternative 3 involves employment of various Low Impact Development strategies, which are anticipated to further reduce the potential for indirect impacts to wetlands (primarily in regard to wetland hydroperiods).

**Exhibit 4-11
Wetlands – Summary of Impacts**

Alternative	Acreage of Direct Wetland Impacts
1	0
2	0.50
3	0

Under all of the alternatives, development would be subject to the City of Black Diamond’s Sensitive Areas Ordinance and Tree Preservation Ordinance, resulting in minimum restrictions on buildable area and buffer requirements that are consistent across the alternatives. However, landowners could seek permits to individually impact wetlands and buffers in the future under Alternative 1, the likelihood or results of which cannot be estimated at this time. Incremental future loss of wetlands and buffers under Alternatives 2 and 3 is not expected, because most of the wetlands and buffers will be protected within permanent open space areas under those alternatives.

What is sequencing?

- Avoid
 - Minimize
 - Mitigate
-

4 What measures can reduce or avoid permanent impacts to vegetation and wetlands?

In most regions in the United States, “sequencing” is a process that is conducted to ensure that permanent impacts to wetlands and other critical areas are avoided. The first step in applying this policy involves avoiding impacts. If impacts cannot be

avoided, effects can be reduced by limiting the scope or size of a proposed action in order to minimize temporary or permanent impacts. Once impacts have been minimized to the extent possible, impacts that remain unavoidable can be allowed as long as the results of the impacts are mitigated.

Under Alternative 2, which is the only alternative involving direct impacts to wetlands and their buffers, direct impacts have been avoided by locating roads and development parcels outside of wetland and buffer areas wherever possible. When unavoidable impacts must occur, application materials state that a number of measures have been employed to minimize or limit them. Under Alternative 2 unavoidable direct impacts will also be mitigated through the creation of new wetlands.

Approximately 2 acres of new wetland will be created and 3 acres of existing wetland will be enhanced in and adjacent to wetlands M, J, and O on the Main Property. Approximately 4 acres of new wetland buffer area will be created to mitigate for unavoidable direct impacts to existing buffers.

Approximately 1.7 acres of new wetland and 20 acres of new wetland buffer area will be created to mitigate for unavoidable direct impacts to existing wetlands and buffers. Where applicable, wetland creation will involve the removal of existing logging roads in an effort to restore connectivity to historically bisected wetlands.

In addition to evaluating direct wetland impacts in square feet or acres, mitigation typically focuses on replacing the functions and values of wetlands or wetland systems that may be impacted by a proposal. This approach strives to ensure the policy of “no net loss” is achieved. The specific objective of the mitigation plan for Alternative 2 is to replace the functions and values lost through direct wetland impacts, specifically wildlife habitat, flood control, and water quality functions. Three goals have been established to meet this objective:

1. Improve the overall level of wildlife habitat and wetland functions on the site;
2. Protect existing wildlife habitat; and
3. Reduce invasive species within the mitigation areas.

Because this approach requires knowledge of the unique functions and values that specific wetlands and systems provide, as well as detailed impacts associated with a particular proposal, implementation of this mitigation approach requires field-level knowledge of each specific wetland. For this reason, it is difficult to evaluate the mitigation proposals associated with Alternative 2 and compare it to other mitigation approaches. In general, the MPD pattern of development provides the opportunity to employ a system-wide or landscape-level mitigation approach, which may be more successful than a parcel-by-parcel mitigation approach that could result from less coordination patterns of development.

Other actions and measures exist to discourage or avoid permanent impacts to wetlands and vegetation. Some of these actions specifically aim to avoid impacts, such as restricting construction to the dry season to avoid erosion. Utilizing structural measures such as silt fences and temporary sediment ponds avoids discharging sediment into wetlands and other critical areas. “On the ground” protection measures such as wetland buffers, or root protection zones for significant trees, also serve to reduce or avoid permanent impacts to vegetation and wetlands. Indirect impacts can be discouraged or avoided generally by maintaining adequate buffers, clustering development away from critical areas, and utilizing low impact development approaches outlined in previous sections of this chapter to minimize hydrologic and hydroperiod effects.



Black Diamond Lake

In regard to sphagnum bogs the King County *Surface Water Design Manual* contains a sphagnum bog protection menu which seeks to reduce or avoid impacts to these types of systems in Western Washington. The requirements will be followed to mitigate for potential impacts to sphagnum bogs. Additionally, King County has developed a number of preliminary management guidelines, which include maintaining the existing forested cover in the entire watershed, and if that is not possible, keeping flow volumes reaching the bog at predevelopment levels. Stormwater modeling can be used to estimate flow volumes. If surface runoff will be

increased, attempts should be made to infiltrate as much flow as possible back into the ground. Excess flows should be routed downstream of the bog areas. Other guidelines to maintaining stable hydrology include dispersing flows to the extent possible (avoiding piped discharge), avoiding routing of roads through the watersheds, and avoiding compaction from human and other access impacts.

In regard to chemical factors, in general nitrogen may be the critical limiting nutrient for sphagnum growth and health; nitrogen over-enrichment causes sphagnum to die. Maintaining the chemistry of key constituents within a bog at very low natural concentrations is important. Guidelines to maintaining stable chemistry include treating any runoff, avoiding the use of calcium containing materials in the watershed, avoiding fertilization in the watershed, and avoiding land disturbing activities in the watershed during the rainy season. To review the full discussion of preliminary management guidelines, please see Appendix O.

The Applicant investigated a portion of the Jones Lake wetland area with the purpose of determining whether the area met the criteria of a sphagnum bog system. The Applicant's investigation found that the area investigated did not meet the criteria of a sphagnum bog. The remainder of the wetland complex should also be evaluated to determine if the findings are applicable across the complex and to determine the potential for impacts to wetland hydrology and water levels as a result of discharging stormwater to Jones Lake and the wetland complex. Stormwater modeling should also be conducted to ensure that summer water levels are not decreased by more than 12 cm below base winter water levels.

The stormwater concept for Stormwater Management Zone 3 that has been developed for Alternative 2 involves utilizing water balance calculations to match post-development stormwater runoff volumes to the existing (pre-development) volume of stormwater conveyed to Black Diamond Lake. Rooftop runoff is proposed to be used to match volumes to ensure there is no impact to the hydrology of Black Diamond

Lake. The use of rooftop runoff is proposed specifically to ensure clean water is being conveyed to Black Diamond Lake, to minimize the potential for increased nutrient levels and changes to the pH.

Within stormwater management zone 3, land along the southwest border of the zone is underlain by outwash soils where stormwater runoff infiltrates under existing conditions. The remainder of the zone is underlain with till soils, where infiltration does not occur and portions of the runoff flows to wetlands. In addition to maintaining hydrology to Black Diamond Lake, the stormwater concept for Alternative 2 intends to maintain the volume of water infiltrating in outwash soils throughout the basin, and to maintain the volume of water recharging wetlands in or over till soils.

Fish, Wildlife, and Habitat

1 What vegetation is presently found in the study area?

Based on site investigations, habitat can be divided into a variety of units based on dominant plant communities and site conditions. Exhibit 4-12 contains a list of the habitat units found in the study area and Exhibit 4-13 shows their location.

Is more information available on vegetation and habitat?

A complete discussion of Plants and Animals can be found in the report prepared for this project by Wetland Resources Inc. in July 2008 (Appendix N).

Exhibit 4-12

Habitat Units Comprising The Villages

Habitat Unit	
Upland	<ul style="list-style-type: none"> • Coniferous Forest • Mixed Forest • Shrub/Sapling Forest Succession
Wetlands/Streams/Ponds	<ul style="list-style-type: none"> • Forested Wetland • Shrub Wetland • Bog • Open Water

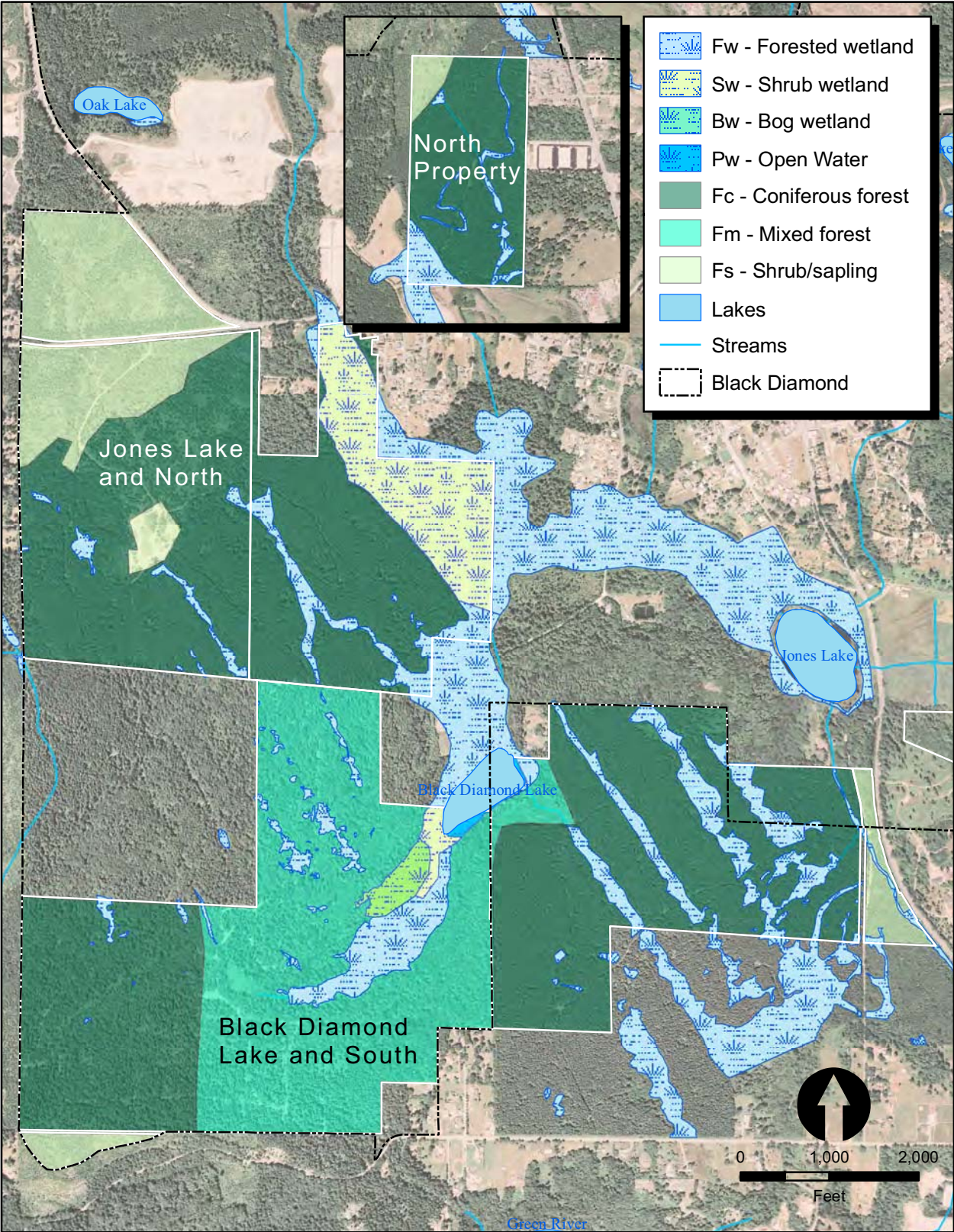
North Property

The North Property is generally undulating, sloping to the northwest in the northwest corner of the property. The area contains several gravel logging roads and many mountain bike trails throughout. A review of aerial photos indicates the area was clear-cut at some point during the 1990s, while the majority of the parcel appears to have been cut during the late 1970s and early 1980s. Both portions appear to have been replanted with Douglas fir.

Main Property

For the purposes of describing vegetative cover, the Main Property can be divided into two sections; Jones Lake and North, and Black Diamond Lake and South.

Exhibit 4-13
Habitat Units



Exhibits in this EIS are intended to provide a general graphical depiction of built and natural environment conditions and may not be accurate to the parcel level.

Jones Lake and North

This section ranges in elevation, with the lowest area in the northwest corner and the highest point along the southwest. This area is comprised of primarily Douglas fir dominated forests of varying ages. There is a large, shrub scrub wetland in the northeast portion of the area near Rock Creek, and several other wetland systems running southeast to northwest. This section contains many dirt and gravel logging roads.

Black Diamond Lake and South

This section also ranges in elevation, with the lowest point along its western edge and the highest point just south of Black Diamond Lake. Vegetation is variable within this section, consisting of a mixed forest of medium, mature age, and many wetlands. The mixed forest contains trees of varying ages, with larger trees estimated at 60 to 80 years of age. The western edge of this section is primarily vegetated with even aged Douglas fir of young to medium age, approximately 30 years old. The easternmost tip of this section contains a young forest, approximately 14 years of age.

The City has designated a wildlife corridor in the SAO, which corresponds to the Core Stream and Wetland Complex on the Main Property. In the Jones Lake and North section, the Core Complex generally follows Rock Creek. In the Black Diamond Lake and South section, the Core Complex generally aligns with Black Diamond Lake and its associated wetland complex and extends to the southwest boundary of the City's Urban Growth Area, following wetlands. The corridor in this section measures 300 feet in width.

Special Habitat Features

Special habitat features are landscape elements that have unique value to wildlife, including, but not limited to, standing dead or partially dead trees (snags), downed woody debris, and edges between habitat types.

Snags provide many wildlife species with feeding, roosting, or nesting sites. Small snags are located throughout all of the forested habitat units in The Villages. Many of the snags are small (less than 12 inches DBH) red alder in various stages of decay. Areas southwest of Black Diamond Lake contain the largest size and greatest abundance of snags within The Villages properties.

Downed woody debris includes downed logs, large fallen dead limbs, and stumps. Downed woody debris provides cover, foraging, and resting areas for many wildlife species. Downed woody debris is found throughout all of the forested habitat units on The Villages properties. As with snags, the most significant concentration of woody debris is located southwest of Black Diamond Lake.

Edge habitats provide birds and mammals with a mix of cover and feeding opportunities. The most prominent edge habitats on The Villages properties occur where forests meet shrub wetland, bog, and open water. Less distinct edge habitats occur where forests of different ages meet, between wetland and upland forests, and between different wetland types.

2 Are any endangered, threatened, or state sensitive plant species presently found in the study area?

According to the Washington State Department of Natural Resources (DNR) Natural Heritage Program Database, there are no Federal or State listed endangered, threatened, or sensitive plant species known to exist on The Villages properties. In addition, no Federal or State listed endangered, threatened, or sensitive plant species were found during field surveys.

Based on habitat preferences and the results of field surveys, it is unlikely that the site contains any of the endangered, threatened, or sensitive plants on the DNR rare plants list for King County.

What is DBH?

“DBH,” or diameter at breast height, is a standard method of expressing the diameter of the trunk of a tree. The trunk diameter is measured at the height of an average adult’s breast, approximately 1.3 meters above the ground.

What about high quality native ecosystems?

According to the Washington Natural Heritage Program Database, two high quality ecosystems are located adjacent to Black Diamond Lake. These include the low elevation riparian wetland and forested sphagnum bog discussed in this section.

3 What types of fish species and habitat are present in the study area?

Only coho salmon, steelhead, cutthroat trout, and other resident trout species are known to occur above the outlet of Lake Sawyer (Covington Creek). Coho salmon and cutthroat trout have been reported upstream as far as Jones Lake in Rock Creek. Steelhead travel past Lake Sawyer into Rock Creek but have not been reported as far upstream as Jones Lake. Coho and cutthroat trout have also been reported in Ravensdale Creek.

Local, county, state, and federal reports and databases were reviewed to identify fish usage of any of the waterbodies within The Villages. Resident cutthroat trout and coho salmon are the dominant native fish species found in streams and lakes in the study area, including stream S4, S5, Black Diamond Lake/Black Diamond Lake Creek, and Rock Creek. These and other watercourses are described below.

Within the study area, numerous non-native fish species have been stocked by the Washington State Department of Fish and Wildlife, and others. Stocked species include rainbow trout, largemouth and smallmouth bass, yellow perch, eastern brook trout, kokanee, crappie, and bullhead. The only federally listed fish species known to occur within The Villages is a winter run of steelhead salmon. Though only reported in Rock Creek, steelhead and may be present in other fish bearing streams.

On-Site Surface Waters

Stream S2 is located on the North Property and only exists on the steep slope between the upper and lower terraces.

Stream S2 is isolated and does not connect with any other surface water body. The channel is intermittent and non-fish bearing. As Stream S2 reaches the lower terrace, all flow quickly infiltrates into the recessional outwash soils and ultimately provides baseflow to Ravensdale Creek.

What are anadromous versus resident fish?

Anadromous fishes are those that are born in freshwater, migrate into the ocean to spend all or part of their adult life in salt water, and return to their natal freshwater streams and rivers to spawn.

Resident fish do not migrate out to the ocean but remain in fresh water.



Steelhead (Oncorhynchus mykiss) is the anadromous version of resident rainbow trout.

Stream S4 is located on the eastern edge of The Villages and parallels SR 169 before discharging to Jones Lake. Flow in this watercourse is in a northwesterly direction, in a well defined channel through densely vegetated young forest. No natural barriers to fish passage were noted between Jones Lake and the southern edge of The Villages.

Stream S5 is located southeast of Black Diamond Lake, and connects wetlands within the study area directly to the lake. Portions of the channel are overgrown by dense blackberry bushes, making detailed survey of the channel difficult. On average, the channel is more than 2 feet wide with a slope of about 10 percent. No natural fish barriers were noted in the portion of the channel observed.

Black Diamond Lake Creek has a channel that ranges from approximately 5 to 6 feet wide and with an average water depth of approximately 0.5 feet. Black Diamond Lake has been stocked with native and non-native fish species on a number of occasions. Fish access from Rock Creek was improved when Black Diamond Creek (the channel between the two water bodies) was cleared and cleaned. Fishing for warm water and salmonid species still occurs at the Lake.

Rock Creek is part of an extensive wetland system extending between Jones Lake and Lake Sawyer. The active channel averages 10 feet in width with average water depths ranging from about 6 inches to over 1 foot. Channel slope is approximately 1 percent. Riparian vegetation is comprised of red alder, bigleaf maple, salmonberry, Indian plum, red elderberry, and skunk cabbage. Fish rearing habitat in Rock Creek is good; there are abundant on- and off-channel refuge locations, deep pools, and overhanging vegetation.

Is more information available on fish issues?

The complete fisheries report for this project, prepared by Cedarock Consultants in May 2008, can be found in Appendix P.

Off-Site Surface Waters

Off-site surface waters receiving flow from The Villages include Jones Lake, Black Diamond Creek, Horseshoe Lake, Ravensdale Creek, Lake Sawyer, Crisp Creek, and the Green River Spring.

Jones Lake has bog-like characteristics, including high concentrations of acidic organic materials and having bottom deposits of unrated organic material that accumulates as peat. Jones Lake provides good overwintering habitat potential for salmonids utilizing the Rock Creek drainage, including coho and cutthroat trout.

Black Diamond Creek exits Black Diamond Lake's northern edge, flows through a wetland with beaver dams, and combines with Rock Creek. Salmonid habitat suitability in the creek is generally poor. No gravels suitable for spawning by resident trout or anadromous salmonids were observed. No large woody debris, pools, or other habitat features of value to salmonid habitat were noted. However, some salmonid use is possible as this system may be utilized as rearing habitat for coho and by resident salmonids, especially during the winter when flows are higher. The cool summer water temperatures may also provide a summer refuge for fish.

Horseshoe Lake is located west of the project site in a depression with no outlet. Water levels in the lake are sensitive to the effects of both overland runoff and ground water inflows. Horseshoe Lake is generally unsuitable for salmonids. Habitat is suitable for warm-water fish species and there are reports of bass, sunfish, and catfish being caught in the lake. However, Horseshoe Lake is a kettle lake, with no clear surface inlet or outlet, and fish do not naturally occur there.

Ravensdale Creek passes within a few hundred feet of the North Property. No surface water drains from the site to Ravensdale Creek, but water infiltrating into the recessional outwash on the lower portion of the site (including flow from Stream S2) ultimately provides flow to Ravensdale Creek. Ravensdale Creek is a major salmon-bearing stream recognized for very high fish use.

What is overwintering?

To overwinter is to pass through or wait out the winter season when normal activity and survival may be difficult. Overwintering habitat for salmonids primarily provides areas of refuge.

Lake Sawyer is the fourth largest lake in King County, and Rock Creek and Ravensdale Creek both discharge to Lake Sawyer near its south end. Lake Sawyer is utilized as a migration corridor and for rearing by coho salmon. The lake also contains native cutthroat trout, stocked rainbow trout, and a warm water fishery.

Crisp Creek, also known as Keta Creek or Keta Springs, is generally regarded as one of the most important small streams draining into the Green River within this area of the Green River Watershed. Crisp Creek is located approximately three-quarters of a mile west of The Villages and does not receive any surface water runoff from the site. However, groundwater that infiltrates on portions of the site travels south and west to feed springs that discharge to Crisp Creek.

The Keta Creek Hatchery operated by the Muckleshoot Indian Tribe is located near Crisp Creek river mile 1.1. Crisp Creek is the primary water supply for the hatchery, and is dominated by ground water recharge that enters the creek as springs approximately one-half mile upstream of the hatchery. Crisp Creek supports runs of coho, Chinook, and chum salmon and winter steelhead. Resident and anadromous cutthroat have also been observed.

The **Green River Spring** is located near the southwest corner of The Villages. Flow from the spring enters into the Green River at river mile 40. Little is known about salmonid use of the stream emanating from the spring. A very steep chute runs downhill from near the spring to the Green River floodplain. It is likely that fish make use of the stream on the floodplain, and the spring influences water quality in the Green River itself.

4 What types of wildlife and habitat are present in the study area?

The Villages area includes habitats suitable for a diversity of wildlife species common to Puget Sound lowland second-growth forests, wetlands, and lakes. These habitats are relatively common in the region, with the exception of the sphagnum bog adjacent to Black Diamond Lake. A list of wildlife species expected to be present within The Villages is included in Exhibit 4-14. Many of the species likely to be present in The Villages would be expected in similar habitats throughout the Puget Sound lowlands.

Exhibit 4-14

Wildlife Species Likely to Use Habitats Within The Villages

Group of Wildlife	Species Likely to Inhabit The Villages
Amphibians	Pacific tree frogs, northwestern salamander, long-toed salamander, pacific giant salamander, roughskin newt, ensatina, western redback salamander, western toad, red-legged frog, and bullfrog.
Reptiles	Northern alligator lizard, western fence lizard, rubber boa, common garter snake, western terrestrial garter snake, northwestern garter snake, and painted turtle.
Birds	<ul style="list-style-type: none"> • Associated with Aquatic Habitats: American bittern, killdeer, common snipe, and great blue heron. • Raptors: Sharp-shinned, cooper's, and red-tail hawk. • Owl: Barred owl, great horned owl, northern saw whet owl, northern pygmy owl, western screech owl, and barn owl. • Upland Game Bird Species: California quail, ruffed grouse, band-tailed pigeon, and mourning dove. • Woodpecker Species: Downy woodpecker, northern flicker, pileated woodpecker, hairy woodpecker, and red-breasted sapsucker. • Perching Birds/Songbirds: Steller's jay, American crow, raven, black-capped chickadee, brown creeper, winter wren, golden-crowned kinglet, American robin, spotted towhee, song sparrow, dark eyed junco, red-breasted nuthatch, red-winged blackbird, Bewick's wren, varied thrush, European starling, house finch, pacific slope flycatcher, common yellowthroat, Swainson's thrush, evening grosbeak, western tanager, cedar waxwing, and American goldfinch.
Mammals	<ul style="list-style-type: none"> • Marsupial: Virginia opossum. • Insectivores: Townsend's mole, pacific mole, and shrew species. • Bat species. • Carnivore Species: Raccoon, black bear, coyote, bobcat, striped skunk, spotted skunk, ermine, long-tailed weasel, mink, and mountain lion. • Rodent Species: Mountain beaver, Douglas squirrel, eastern gray squirrel, deer mouse, vole species, Townsend's chipmunk, pacific jumping mouse, Norway rat, and house mouse. • Rabbit Species: Eastern cottontails and snowshoe hares. • Hoofed Mammals: Black tailed deer and elk.

5 What Federally listed species or habitat occurs in the study area?

Federally listed species are those species placed on the Federal list of endangered and threatened wildlife and plants. Plant or animal species listed on the Federal list are afforded protection under the Endangered Species Act (ESA). Habitat critical to the conservation of a species is also protected under the ESA. Two Federally listed Pacific salmon species are reported in the City of Black Diamond UGA: the Puget Sound Evolutionarily Significant Unit (ESU) of steelhead and the Puget Sound ESU of Chinook salmon. One additional listed fish species, the Coastal-Puget Sound bull trout Distinct Population Segment (DPS), is found in the area (in the Middle Green/Duwamish River subwatershed), but not within city limits. The only federally listed fish species known to occur within The Villages is a winter run of steelhead salmon. Steelhead have been reported in Rock Creek and could be present in the other fish-bearing streams in The Villages.

What are an Evolutionarily Significant Unit (ESU) and a Distinct Population Segment (DPS)?

An ESU or DPS is considered to be a “species” under the Endangered Species Act.

6 What state-listed species or habitats occur in The Villages?

Priority Habitats and Species (PHS) maps and information for the study area were obtained from the WDFW. WDFW defines a priority habitat as “a habitat type with unique or significant value to many species,” and priority species as “fish and wildlife species requiring protective measures and/or management guidelines to ensure their perpetuation.”

PHS maps illustrate the location of priority habitats and species on The Villages properties, per current WDFW records. Priority habitats found within The Villages on PHS maps include several small wetland areas. PHS maps do not indicate that any endangered, threatened, or sensitive amphibian, reptile, bird, or mammal species occur in The Villages.

Bald eagles are a state listed threatened species. WDFW records indicate the presence of one bald eagle nesting site in the vicinity, near Lake Sawyer. Spotted frogs and the Western pond turtle are also state listed endangered species; both of these species have been nearly completely eliminated from Washington State, and it is unlikely that either exist in The Villages.

WDFW designates additional species as “priority” for conservation and management beyond those listed as endangered, threatened, or sensitive. Additional priority designations include “Candidate,” “Monitor,” and “Game” species. State Candidate Species are those fish and wildlife species that will be reviewed by WDFW for possible listing as Endangered, Threatened, or Sensitive according to state law. State Monitor Species are species that are monitored for status and distribution. State Game Species include native and non-native wildlife species of recreational importance, commercial importance, or recognized species used for tribal ceremonial and subsistence purposes, which are vulnerable to habitat loss or degradation.



Photo of an Elk, courtesy of Washington State Department of Fish and Wildlife Image Gallery

The Candidate, Monitor, and Game Species that could occur on The Villages properties are listed in Exhibit 4-15. Wood duck, bufflehead, black-tailed deer, and elk were detected during field surveys.

Exhibit 4-15

State Candidate, Monitor, and Game Species Possibly Occurring Within The Villages

State Status	Species
Candidate (9 species)	Western toad, cascade frog, northern goshawk, golden eagle, merlin, Vaux’s swift, pileated woodpecker, purple martin, and Townsend’s big eared bat.
Monitor (5 species)	Osprey, great blue heron, black crowned night heron, western bluebird, and pacific water shrew.
Game (10 species)	Trumpeter swan, wood duck, common goldeneye, Barrow’s goldeneye, bufflehead, hooded merganser, band-tailed pigeon, mink, elk, and black-tailed deer.

The Villages properties provide large scale landscape corridors for wide ranging mammals such as elk, black bear, and cougar. The Black Diamond Lake and South section of the Main Property contribute to an east/west travel corridor for elk up and down the Green River drainage, which connects wintering habitat with higher elevation habitats utilized during warmer months. All of the properties connect and extend existing habitats on adjacent lands.

On a smaller scale, many of the properties provide connectivity between onsite wetland systems utilized by a variety of species such as beaver, river otter, mink, and raccoon.

7 What policies and standards apply to fish, wildlife, and their habitat?

Policies and standards pertaining to fish and wildlife and their habitat exist at the local, state, and federal level. In Washington State, “fish and wildlife habitat conservation” is defined as land management for maintaining species in suitable habitats within their natural geographic distribution, so that isolated subpopulations are not created.

At the local level, cities and counties have the authority to regulate some habitats and species within their jurisdictions. In Black Diamond, the City regulates fish and wildlife conservation areas and wildlife corridors through the SAO.

The SAO defines which Fish and Wildlife Conservation Areas (FWCAs) the City regulates, how they shall be classified, what buffer widths are appropriate, and sets forth uses and activities that are allowed through various permitting processes. The SAO also outlines requirements for mitigation for impacts to FWCAs.

As outlined above, the City has designated a wildlife corridor in the SAO corresponding to the Core Complex on the Main Property. The Core Complex generally follows Rock Creek, Black Diamond Lake and its associated wetland complex, and extends to the southwest boundary of the City’s Urban Growth Area. The corridor measures 300 feet in width. The Core Complex is a designated FWCA.

Black Diamond SAO Fish and Wildlife Conservation Area (FWCA) Standards:

- The “Core” stream and wetland complex described previously is a regulated FWCA under the SAO.
 - Other regulated FWCAs include areas within the City with which state or federally designated endangered, threatened, or sensitive species have a primary association.
 - Buffers are established from the edge of streams, the size of which depends on the State Department of Natural Resources (DNR) water type classification for that stream, or if the stream is part of the Core complex.
 - Buffers for FWCAs other than lakes and streams are based on the State’s PHS recommendations and are evaluated on a case by case basis.
 - Wildlife corridors that have been designated to provide for migration to and from areas outside of the City and its UGA are provided in the Core complex.
 - Unavoidable activities that adversely affect FWCAs and/or their buffers are required to be compensated for through mitigation.
-

At the state and federal level, various agencies are involved in managing fish and wildlife species and their habitat, and tasked with ensuring negative impacts to these resources are avoided. These agencies include WDFW, the United States Fish and Wildlife Service (USFWS), and the National Marine Fisheries Services (NMFS) branch of the National Oceanic and Atmospheric Administration (NOAA). Many of these agencies prepare management and recovery plans and habitat conservation plans for various species and habitat within their jurisdiction. In addition, the Muckleshoot Indian Tribe is a co-manager of fish and wildlife resources with the State of Washington and has treaty rights for these and other natural resources. Black Diamond is within the Tribe's Usual and Accustomed Fishing Area.

8 How will the alternatives impact fish and wildlife and their habitat?

Puget Sound streams and rivers once flowed through dense forested areas in broad floodplains. These streams had natural flow cycles, excellent water quality, and varied types of vegetative cover. Today, healthy riparian areas are scarce or inadequate, and streams and rivers are frequently confined, controlled, or are realigned to accommodate agricultural or development activities. Human activities have had similar effects on lakes, nearshore habitats, and estuaries. The effects of human activities on aquatic habitats are summarized in Exhibit 4-16.

Exhibit 4-16

General Effects of Different Human Activities on Aquatic Habitats

Activities	Effects
Removing riparian vegetation	Reduced channel complexity, simplified channel morphology, increased stream velocities, loss of pools for holding and rearing, loss of spawning gravel, loss of side channels, loss of wood recruitment, loss of connectivity with floodplain and riparian zone, reduced shade and cover, increased solar radiation, increased erosion and sedimentation, elevated water temperatures, and reduced leaf litter.
Introducing invasive non-native vegetation	Alters native riparian habitat functions including associated wildlife refuge, insect litter, replacement of coniferous shade-producing trees, etc.
Creating impervious surfaces, filling and draining of wetlands, and increasing water allocations	Altered flow regimes (timing and magnitude of flows), degraded water quality/increased stream temperatures, increased stormwater runoff, and altered in-stream habitat.
Stream bank modifications	Loss of natural meander/habitat-forming processes, disconnected floodplains, and subsequent loss of floodplain processes.
Discharging sewage effluent	Degraded water quality, altered water temperatures, reduced dissolved oxygen (DO) concentrations, and increased contaminant levels.
Agricultural runoff	Degraded water quality including increased nitrogen and fecal coliform, and reduced DO levels.
Livestock access	Degraded water quality, loss of riparian vegetation, and stream bank instability.
Constructing culverts, pipes, and ditches	Obstructed upstream passage of fish and reduced the downstream movement of wood and gravel.
Construction activities	Increased erosion, turbidity, and inputs of fine sediment during construction and prior to revegetation.
Recreational activities	Degraded water quality and increased contact with listed species.

In relation to wildlife and its habitat, major habitat-related features of urbanization include loss of vegetation; isolation or fragmentation of remaining vegetation patches; replacement of native vegetation with ornamental species; removal of snags and downed logs; an increase in the use of pesticides, insecticides, and herbicides; the presence of domestic dogs and cats as predators; and increased noise and other disturbance factors.

Alternative 1

Alternative 1 assumes that The Villages properties will develop consistent with current zoning. This type of development would be characterized by residential development occurring slowly and incrementally, and avoiding impacts to all regulated sensitive areas. The regulated FWCA and sensitive areas in The Villages are wetlands, streams and creeks, lakes, and the wildlife corridor extending southwest from Black Diamond Lake.

In regard to fish, wildlife, and habitat, Alternative 1 assumes that all FWCAs, sensitive areas and their standard (SAO-assigned) buffers within The Villages will be preserved. Utilizing this assumption, there will be no direct impacts to fish or riparian habitat under Alternative 1. Under this alternative it is also assumed that there will be no stream crossings. Stormwater outfalls will likely be necessary and may involve some impact; however their locations and therefore associated impacts cannot be determined or quantified.

Despite Alternative 1 involving no direct impacts to streams or their buffers, human activities like urbanization and development can still result in indirect impacts to aquatic habitats of the type outlined in Exhibit 4-16.

In addition, under any large scale development scenario, there will be little suitable habitat left for most terrestrial wildlife species. Habitat that does remain will be fragmented, in most cases will offer limited accessibility, and will be of relatively low quality.

Habitat fragmentation caused by development, in combination with increased human use of active open spaces, will also affect animal movement patterns by causing animals to avoid areas of high human activity. Road crossings through retained areas of natural open space could create barriers for small mammals and some amphibians. Species that are sensitive to habitat changes will likely be eliminated from the properties. However, many species will continue to use remaining natural open space.

The risk for indirect impacts increases with human presence near wildlife and their habitat (proximity impacts). Such impacts can include increased noise and light, increases in introduced invasive vegetative and predator species such as dogs and cats, increased injury or mortality from collisions with vehicles, and impacts to predator or prey species. Some proximity impacts can be considered ecological, which includes alteration of the structure and/or vegetative makeup of wildlife habitat. Other impacts can be considered behavioral, and impacts behaviors of animals such as breeding, nesting, courtship, and foraging behaviors.

Development under Alternative 1 has less potential for indirect water quality impacts than Alternatives 2 and 3 during construction, due to less large scale grading and the time over which development is expected to occur. However, Alternative 1's less cohesively planned roadway and stormwater management network, lack of coordinated planning in relation to stormwater and erosion control, and lack of a large, coordinated open space corridor around FWCA's could result in localized sediment introduction or turbidity.

Runoff from all of the North Property and from a portion of the Main Property currently infiltrates back to groundwater, providing baseflow to Ravensdale Creek and Crisp Creek. Ravensdale Creek is a major salmon-bearing stream recognized for very high fish use, and Crisp Creek is generally regarded as one of the most important small streams draining into the Green River in this area. Under all Alternatives it will be essential to ensure infiltration functions and capacities are not negatively affected at the cost of fish and aquatic habitat downstream.

Alternative 2

Under Alternative 2, a majority of the habitat found on-site would be converted to urban and suburban uses. Existing vegetation would be replaced with roads, driveways, buildings, and landscaped ornamental plantings. Areas of native vegetation that would be retained include riparian areas adjacent to Rock Creek, and many wetlands and other sensitive areas and associated buffers.

Construction activity specific to Alternative 2 includes three road crossings (streams S2, S4, and S5), a road crossing through the Core Complex, installation of one new stormwater outfall, clearing/grading of several hundred acres of the site, and the filling of wetland areas associated with streams. Though development under any alternative would be required to meet all applicable state and local standards, approved development activities may have adverse impacts on fish and fish habitat. The new crossings of streams S4 and S5 have the potential to impact fish bearing waters. Both crossings would

What is turbidity?

Turbidity is the cloudiness or haziness of water caused by suspended solids, In regard to construction or land disturbance activities, suspended solids are often sediments that have entered the water body in stormwater runoff. The measurement of turbidity is a key test of water quality.

consist of full span bridges or bottomless arch-culverts, and each would cover stream lengths of approximately 50 feet. The structures would meet all regulatory requirements for passage of fish, water flow, and storm debris (fallen trees and branches, etc.). Neither affected stream section provides a regionally significant resource or contains unusually rare or sensitive habitat or species. The new crossing of stream S2 occurs over a non-fish bearing water, which may affect riparian vegetation but is not expected to affect fish. As such, the impacts to fish and their habitat associated with new stream crossings are not expected to be significant on a regional scale.

The proposed road crossing through the Core Complex is located southwest of Black Diamond Lake, approximately midway between Black Diamond Lake and the west boundary of The Villages properties. This wildlife corridor is regulated as a FWCA through the City's SAO and provides large scale landscape corridors for wide ranging mammals such as elk, black bear, and cougar. This area also contributes to an east/west travel corridor for elk up and down the Green River drainage, which connects wintering habitat with higher elevation habitats utilized during warmer months. If built at grade, the proposed road crossing represents an interruption in this landscape and travel corridor, which could render the purpose of the corridor ineffective.

The new stormwater outfall is proposed on Stream S4 and would be constructed on the west bank of the channel just upstream (south) of The Villages boundary. The stormwater outfall would be built away from the stream channel in an upland area and then be connected to Stream S4 with a new channel. Some minor hydrologic effects on Stream S4 in the vicinity of the outfall channel connection are possible. The addition of a second flow source at this location could influence habitat type and quality in the connection area.

As also outlined for Alternative 1, development under Alternative 2 would have a significant impact on the abundance, distribution, and composition of the wildlife species found in the study area. Additionally, indirect impacts

to the retained natural open space (native vegetation) will likely make it less suitable for some species of wildlife that currently inhabit the sites. Risks associated with habitat fragmentation and proximity impacts are very similar to those associated with Alternative 1. However, because Alternative 2 includes a contiguous open space area and larger corridors of preserved vegetation, these risks may be slightly less under Alternative 2 than Alternative 1, with the exception of the interruption of the designated wildlife corridor southwest of Black Diamond Lake.

Alternative 3

Alternative 3 would also follow a master planned approach, and though it shares some of the same impacts as Alternative 2, overall it has lesser impacts. Alternative 3 includes greater acreages of open space areas and more dense residential development clustered away from sensitive areas. In regard to fish and aquatic habitat, Alternative 3 assumes that there will be fewer direct impacts to streams and their buffers. Though Alternative 3 will likely include new stormwater outfalls in the same or similar locations as in Alternative 2, the stormwater flows and duration of flows at these new outfalls will likely have lesser impacts. Lower flows of shorter duration are anticipated under Alternative 3, based on Alternative 3's lower overall acreage of impervious cover. Alternative 3 also anticipates fewer new stream road crossings compared to Alternative 2.

Impacts to terrestrial wildlife habitat would be less (in acres) than those anticipated under either Alternative 1 or 2 because Alternative 3 involves preservation of more acres in open space and clustering higher density development in smaller areas. In addition, Alternative 3 preserves the integrity and function of the designated wildlife corridor regulated as a FWCA under the City's SAO.

Indirect impacts as outlined above under Alternatives 1 and 2 also have the potential to occur under Alternative 3. However, "proximity" impacts (impacts such as domestic animals and invasive vegetation, which occur because of the close

Black Diamond SAO Fish and Wildlife Conservation Area (FWCA) Mitigation Requirements:

- Activities that adversely impact FWCA's or their buffers should be avoided through site design.
 - Unavoidable impacts to designated species or habitats shall be compensated for through habitat creation, restoration, or enhancement (compensatory mitigation).
 - Any compensatory mitigation shall achieve no net loss of habitat functions and values.
 - Mitigation plans are required for any proposed FWCA alteration or to mitigate for unavoidable impacts to habitat functions and values resulting from a proposal.
 - Mitigation for impacts to FWCA's is required to achieve equivalent or greater biologic and hydrologic functions and shall include mitigation for adverse impacts upstream or downstream of the proposed development site.
 - Mitigation sites are required to be located to preserve or achieve contiguous fish and wildlife habitat corridors.
-

proximity of development to FWCAs) are less likely to occur (or at lesser magnitude) under this alternative because development will be clustered further away from sensitive areas and leave larger corridors of uninterrupted open space. In addition, Alternative 3 involves employment of various Low Impact Development strategies, which are anticipated to further reduce the potential for indirect impacts to streams (primarily in regard to recharging baseflow and minimizing variations in flow from discharge rates and velocities).

As previously referenced, development under Alternative 1 may have less potential for indirect water quality impacts than Alternatives 2 and 3 during construction, due to less large scale grading and the pace at which development is expected to occur. However, a more comprehensive approach to roadway networks and stormwater management under Alternatives 2 and 3, and larger, coordinated open space corridors around FWCAs under these alternatives could result in less risk of localized sediment introduction or turbidity.

9 What measures can reduce or avoid impacts to fish and wildlife species and habitat?

Measures that can reduce or avoid impacts to fish and wildlife species and their habitats vary greatly, depending on the activity. Alternative 2 currently involves connecting a new stormwater outfall to Stream S4, which will be completed by installing the new outfall in adjacent upland and providing a new outfall channel. The final step includes removing the bank between the natural channel and the new outfall channel. Installing and connecting the outfalls in this manner under any development scenario, rather than constructing the outfall within the existing natural watercourse, avoids the potential for construction impacts to the channel and to some degree riparian vegetation. Even if this type of connection can be achieved, Best Management Practices (BMPs) should be utilized during construction under Alternative 2 to assist in avoiding significant adverse impacts to any stream.

In regard to streams, Alternative 2 has the most direct impacts anticipated. This alternative proposes to construct or replace a stream crossing on Stream S5 at or near the site of an existing logging road crossing. Alternative 2 also includes a new stream crossing of Stream S4. As part of this alternative both crossings represent a disturbance at their proposed locations. If the crossing of Stream S5 cannot occur in the same location as the existing crossing, removal of the existing crossing and restoration of the riparian corridor in this area is the proposed strategy for mitigating impacts from a new crossing.

New stormwater outfalls to any stream should only be sited after consideration of potential disturbance to adjacent wetlands, riparian buffers, unstable slopes, significant trees, and in-stream habitat. Mitigation in the form of diffusing flows, bioengineering to prevent continued bank erosion, and monitoring to track any changes and evaluate the effectiveness of installed erosion protection measures can help avoid impacts to fish and wildlife species.

Runoff from both the Main Property and the North Property currently infiltrate and provide baseflow to Ravensdale Creek and Crisp Creek, among other sensitive areas. Under all alternatives it will be essential to ensure infiltration functions and capacities are not negatively affected at the cost of fish and other types of aquatic habitat downstream.

In regards to wildlife and terrestrial habitat, elk are a state-listed Game Species that are utilizing The Villages properties, predominantly the Main Property. Maintaining connections between the designated FWCAs on-site (Black Diamond Lake to Rock Creek and that extending southwest from Black Diamond Lake) is vital to preserving east-west and north-south travel corridors that connect to additional off-site habitat. Protecting large, uninterrupted corridors of wetlands and their buffers in open space could also benefit elk by preserving significant amounts of elk habitat.

Mitigation for stream and buffer impacts related to Alternative 2 should include enhancement of adjacent sensitive areas with native plants. Wildlife forage preferences could be considered in plant species selection for enhancement areas.

Mast-producing species (such as hazelnut) could help mitigate for reduced food sources resulting from habitat reductions.

Landscape plans for any proposal can include planting with native plants, including mast-producing shrubs and trees. The use of native plants, using BMPs for weed and disease control, can help eliminate the need for pesticides. Several of the priority species that could inhabit the site, or are known to inhabit the site, are cavity-nesters. Reductions in habitat resulting from development will reduce nesting opportunities. As mitigation, nesting boxes of various sizes could be installed, preferably in forested buffers adjacent to wetland areas.

Under any coordinated development proposal, educational and/or interpretive materials that provide information and foster an appreciation of the natural features of the open spaces could be developed and made available through public agencies and/or local conservation groups. These types of materials are aimed to improve public awareness of natural resources and help reduce unnecessary disturbance or destruction of habitat and native vegetation.