This Master Forest Stewardship Plan provides a framework for development of individual Forest Stewardship Plans for Non-Industrial Private Forest Landowners (NIPF) located in the Chehalis River Watershed. This plan is intended to provide information pertaining to landscape level issues and guidance to achieve both individual and watershed-wide resource objectives. A landscape stewardship effort ensures coordination of technical assistance and incentives to landowners to retain forest cover, minimize development footprints, implement best management practices to restore or enhance their properties, maximize wood fiber production, enhance and restore fish and wildlife habitat and protect water quality. *This plan meets requirements set forth in the Washington State Integrated Forest Management Plan Guidelines & Template (2017).*

Landowner Name: City of Centralia

Project Location and Size: Chehalis River Watershed
WRIA 22 & 23
Portions of Grays Harbor, Jefferson, Mason, Thurston, Lewis, Cowlitz & Pacific Counties
2,613 square miles

Date Prepared: **2021**

Grays Harbor Conservation District Est. 1941

Washington Department of Natural Resources

Forest Service U.S. Department of Agriculture

Washington State University Extension

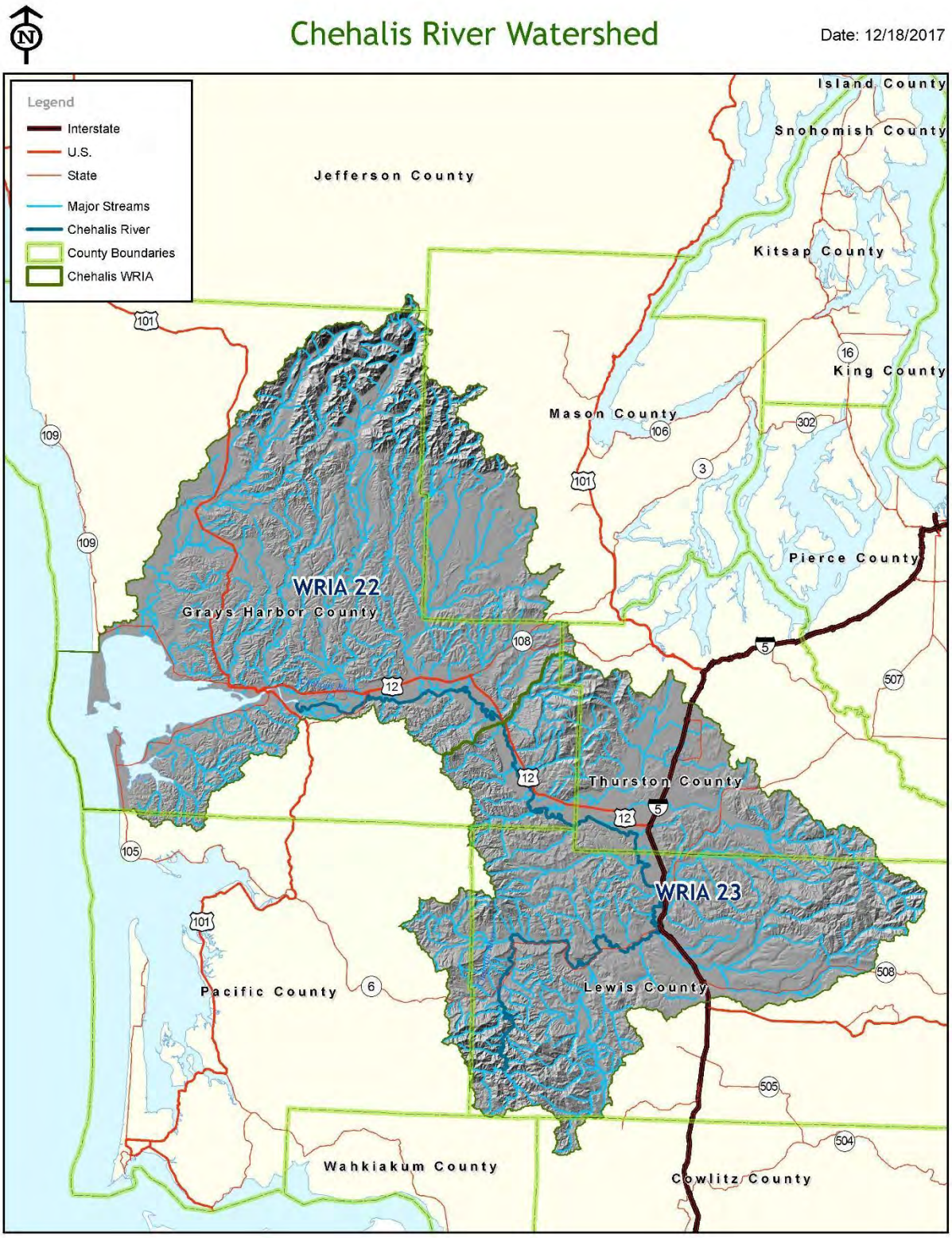

Figure 1: Location of project area, WRIA 22 & 23

Landscape-Based Forest Stewardship Planning - A Regional Approach

The Washington Statewide Forest Resource Assessment and Strategy (Forest Action Plan) identified the Chehalis River Watershed as a high priority area consisting of the highest number of salmonid stocks and greatest number of fish miles in the state. The Forest Action Plans also identified the Upper and Lower Chehalis River Watershed as a high opportunity landscape containing an extensive amount of high priority forestland identified as long-term working forests, areas that provide high ecosystem services and benefits for biodiversity conservation, and where population growth pressures are projected to cause increasing forestland conversion risk. This Landscape-level Master Forest Stewardship Plan* represents a coordinated stewardship effort and systematic approach to address individual landowner and watershed-wide needs, encourage long-term stewardship and conserve working forestland within the Chehalis River Watershed. The Master Plan will serve as a template for individual Forest Stewardship Plans and be shared with other natural resource professionals in the watershed.

**This plan was developed with funding provided by the USDA Forest Service.*

This plan contains four parts:

1) RESOURCE DESCRIPTIONS: Current resource information and conditions across the watershed.

2) MANAGEMENT RECOMMENDATIONS: Guidance to achieve individual and watershed-wide resource objectives.

3) ACTION STEPS: For each participating landowner, site specific information pertaining to the individual property should be included in the space provided. If additional space is required, please attach additional pages where necessary.

4) APPENDIX: Additional details, suggestions, information and references to assist in completing the plan.

Landowner Information:	
Landowner(s):	City of Centralia, Centralia Washington 98531
Address:	118 W Maple St, Centralia, Washington 98531
Phone:	360-330-7674
Email:	Emil Pierson <EPierson@cityofcentralia.com>
Property Information:	
Size:	70+ acres
County:	Lewis
Legal Description:	Seminary Hill Natural Area is protected by a City ordinance. The property is located in Lewis County within Centralia City Limits. The entrance is at Locust Street and Barner Drive South.
Nearest Town/City	Centralia, Washington
Plan Preparer	
Name:	Judy Bell
Title:	Project Coordinator, Friends of Seminary Hill Natural Area
Address:	118 W Maple Street Centralia, Washington 98531
Phone:	360-330-7662
Email:	Emil Pierson <epierson@cityofcentralia.com>
Assisted by	
Name	Patrick Shults
Title	WSU Extension Forester
Organization	Washington State University Extension
Email	patrick.shults@wsu.edu
Phone	360-740-1213
Date Plan Completed	January 2022

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I. SUMMARY OF THE SEMINARY HILL NATURAL AREA FOREST MANAGEMENT PLAN AND HISTORICAL DOCUMENT

Seminary Hill Natural Area is a **Forest of Recognized Importance.** The 70-acre Natural Area is preserved by the City of Centralia by a city ordinance. It is unique and the location is exceptional since no other Natural Areas are present in the immediate region.

It is regionally important because it conserves a large tract of forest in its natural state and serves as a **historical, social, educational, cultural and biological** standard. In 2015 the Friends of Seminary Hill Natural Area received the Urban Forestry Stewardship Award given by the Washington Department of Natural Resources and the Washington Community Forestry Council.

Historical/Cultural: The Natural Area has a long history. It has been used by Native Americans. During the 1930s the WPA built projects. During WWII the military used the area. In the 1950-1960s the Girl Scouts used it as a day camp. All this happened before it was designated as a Natural Area in 1980. The importance of the Natural Area's history and culture was shown by the Cultural and Historical Department of the Washington Military, who designed and installed historical signs at the park entrance. The Natural Area preserves a historical record of second-growth forest, which has not been logged since the late 1800s to early 1900s. It remains a forest island with a distinct diversity of trees, shrubs, and herbaceous plants that is valuable for carbon sequestration, as a wildlife preserve, as a sanctuary for local and migratory birds, as a community environmental education forum, as a recreation area and as a research lab. The Natural Area was also designed to be an aesthetic experience. As visitors enter the main entrance under the large trees, it is a place where they cross the threshold to a world of beauty.

Wildlife/Biological: These diverse conditions attract many species of birds and animals that utilize the plant diversity. Forty bird species have been identified. It is a bird sanctuary for local and migratory birds.

Recreation/Social/Educational: The Natural Area offers a high quality trail experience for walking/hiking/running. The 2.5 miles of trail with 350 feet of elevation gain is used to lead monthly community educational "Walk and Talk" events, to enjoy the quiet and serenity of the forest, to admire the wildflowers, to photograph the exquisiteness, to read on a bench, to watch the seasonal changes, and to access the forest for monitoring and research. Thirteen wooden benches provide places to rest and enjoy the forest.

Overall objectives: The Friends of Seminary Hill Natural Area and its volunteers partner with the City of Centralia to support and maintain the Natural Area in all phases of use, maintenance, protection, and enhancement of the area, including:

· Maintain the second-growth woods and the other stands/areas in their natural state without harvest, within the strictures of the area being a recreational destination for many visitors. Forest succession has occurred naturally and is an uneven aged system.

· Maintain the forest's diversity with a mixture of tree types, size, composition, openings and well-developed layers of shrubs and forbs.

· Manage a healthy and sustainable forest that provides abundant wildlife habitat, biodiversity of plants and shrubs, a forested natural area as a protected enclave for the citizens of Centralia and the nearby communities, and to provide an area to learn conservation of the environment.

· Promote biodiversity and habitat conservation by protecting, maintaining and restoring the biological diversity of native plants and shrubs, and maximizing forest health by controlling and removing non-native English ivy, English holly, Himalayan blackberry and other noxious weed plants, as well as restoring native plant communities by replanting native plants after ivy removal.

· Build, repair/restore and maintain designated trails to facilitate forest management, provide for community education, research, and participation in recreational activities.

· Encourage use and conservation of the Natural Area by providing community education through guided walks, written information, and public events that highlight the plant and animal life and the ecology of the area.

· Protect the forest from harm due to theft of trees, vandalism, fires, campers, off-trail traffic, and trash through monitoring by volunteer efforts and by maintaining designated trails signs.

MANAGEMENT PRACTICES:

The Friends of Seminary Hill Natural Area developed the five-year Forest Management Plan to manage this unique forest and continue its trajectory to becoming an old-growth forest. The forest was divided into six areas or stands. Within the stands, all trees were measured and all trees, shrubs, and plants were counted. The Plan evaluated the health of the forest, its strengths and risk factors, and identified work to be done. The Timetable lays out the work and dates for completion.

See APPENDIX I for Management Plan Implementation Timetable

Risk Factors

· Disturbance from wind, weather including climate change, wildfires, visitors, embankment and trail erosion, and the homeless.
· Climate change The climate will continue to warm especially after 2050. Droughts will become more common, more intense, and last longer. Lewis County has had a serious drought for several years and a record drought period in 2021**. How will climate change affect the distribution, health and species in the Natural Area forest?** It will create more stress on trees, especially tree seedlings, shrubs, and plants. Drought will bring insects and fires will increase in frequency and intensity. Multiple stress factors, not just one, will combine to create the effect or damage we will see in the Natural Area. Some tree species are more tolerant to higher air temperature and low soil moisture. Trees in the natural area that are more tolerant to these conditions are Douglas fir, Western hemlock, and Western redcedar. Hardwoods and conifers that tolerate low soil moisture are Red alder and understory trees: Western redcedar and Grand fir.
These factors (diversity and a healthy stock of trees) should provide considerable resilience as the effects of climate change progress.

Strengths of the Natural Area

- The Natural Area is an intact forest that supports a diverse mixture of tree types, sizes, compositions, openings for wildlife, and well-developed layers of shrubs and forbs. Species diversity occurs within each forest layer, including the tree, shrub, and herbaceous layers. The trees in the stands are healthy. The Natural Area's forest, with its diverse, mature composition of native plants and trees, has stable root systems and the trees are not overcrowded.

- Because of the forest's age and diversity, the Natural Area forest is less susceptible to negative impacts from forest pathogens and insects and is better able to withstand damage from abiotic events such as wind, drought, or fire. This will significantly decrease impacts from common forest health concerns.

- Diversity of the stands with conifers and hardwoods increases its resistance to the stresses of low rainfall, low soil moisture, disease, and increased pathogens. For example, older stock of trees are more resistant to fire. Hardwoods are resistant to conifer diseases. Red alder fixes nitrogen for seedlings to grow. Some understory plants such as Western redcedar and Grand fir have increased protection. The diversity also decreases the risk for wildlife. Some native plants are also drought tolerant: Oregon grape and salal.

- No commercial harvesting is intended for the property. The property will remain in its natural state. Removal of trees will occur if they endanger walkers.

The Natural Area is an intact, healthy forest, and it is on a healthy trajectory toward becoming an old growth forest

II. LANDOWNER OBJECTIVES

Chehalis River Watershed Landscape Level Plan Objectives

- Conserve working forests
- Protect forests from harm
- Enhance and restore fish and wildlife habitat
- Promote biodiversity and habitat conservation
- Enhance public benefits from trees and forests
- Protect water quality and quantity
- Maximize wood fiber production

Landowner's Objectives

The overall objectives for the property are to manage for a healthy and sustainable forest that provides abundant wildlife habitat, biodiversity of plants and shrubs, a forested natural area as a protected enclave for the citizens of Centralia and the surrounding community, and to provide an outdoor educational and research laboratory for educational institutions and other organizations.

Short term (next 5 years)

- The Friends of Seminary Hill Natural Area and Volunteers will support and maintain the Natural Area for the Centralia Parks and Recreation Department in all phases of use, maintenance, protection, and enhancement of the area.

- Promote biodiversity and habitat conservation by protecting, maintaining, and restoring the biological diversity of native plants and shrubs.

- Conserve the forest and maximize forest health to improve and enhance wildlife habitat for birds, mammals, and amphibians by maintaining snags and brush piles and providing designated trails.

- Build, repair/restore and maintain designated trails throughout the property to facilitate forest management, and to provide for community education, research and participation in recreational activities.

- Encourage use and conservation of the Natural Area by providing community education and participation through guided walks, written information, and public events that highlight the plant and animal life and the ecology of the area.

- Provide signage for designated trails to prevent development of undesignated social trails.

- Enhance the accessibility of the forest for walking and quiet enjoyment while making it difficult for wheeled vehicles (bicycles, ATVs, skateboards and other non-foot traffic) to access the property.

- Control and remove non-native English ivy, English holly, Himalayan blackberry and other noxious weed plants.

- Maintain and restore native plant communities by replanting native plants after ivy removal.

- Plant understory trees in Stand 1 (Eastside stand) of property to facilitate growth of sustainable conifers, when the alders' lifespan has ended.

- Protect forests from harm due to theft of trees, vandalism, fires, campers, off trail traffic, and trash through monitoring by volunteer efforts and by maintaining designated trails signs.

- Work with adjacent property owners to promote the goals to protect the area around the Natural Area.

Long term (6 - 20 years):

Update this plan on a periodic basis (at least every 10 years or sooner when a significant event or change occurs necessitating changes to the plan). The President or Project Coordinator of the Friends of Seminary Hill Natural Area will send an updated copy to the City of Centralia's City Manager, Parks and Recreation Department, City Council or any entity required by the City.

See APPENDIX I for Landowner Objectives and Management Plan Implementation Timetable

III. INTRODUCTORY OVERVIEW OF THE PROJECT AREA

The Chehalis River Watershed, with the exception of the Columbia River, is the largest river watershed in Washington, covering an area of approximately 2,613 square miles or 1,672,915 acres. The Chehalis River originates in the Willapa Hills, flowing generally northwest and eventually depositing into Grays Harbor Bay at Aberdeen approximately 125 miles downstream from its headwaters. The terrain ranges from relatively flat lowlands to rolling foothills and steep mountainous bluffs within the southern Olympic range. Elevation ranges from sea level to around 5,000 feet above sea level at its highest point within the Olympic National Forest. The Watershed is home to an estimated 140,000 residents in seven counties (Grays Harbor, Jefferson, Mason, Thurston, Lewis, Cowlitz and Pacific). The watershed has been designated the "wood basket" of Washington and includes the highest number of salmonid stocks along with the greatest number of fish stream miles in the state. Several major river systems occur within its boundaries, including the Chehalis, Humptulips, Hoquiam, Wishkah, Wynoochee, Satsop, Black, Skookumchuck, Newaukum, and Elk rivers.

Forestland is the dominant cover across the watershed. Forestland ownership consists of a mixture of state, private, tribal, and federal lands. Private forestlands consist of both industrial timberland and non-industrial private forestland (NIPF). Industrial timberlands are devoted primarily to commercial timber production while NIPF properties tend to be managed for a variety of objectives including timber production, recreation, wildlife habitat and aesthetics. Agriculture and urban development also occur primarily within and along the watershed's many streams, rivers, and lowland areas. The majority of forests in this region, including those of the Chehalis River Watershed, have undergone some form of management. Stands of virgin timber attracted pioneering loggers from around the globe. Original vegetation consisted primarily of large conifer species including western hemlock, Douglas-fir, western red cedar and Sitka spruce. A series of timber harvests followed by both natural and artificial reforestation have been recorded on most, if not all timberlands within the watershed. Current timber types consist largely of even-aged Douglas-fir plantations, scattered hardwood production, and areas of mixed hardwood and conifer species.

As with much of Western Washington, the climate of the Chehalis River Watershed is influenced heavily by the Pacific Ocean terrain and the semi-permanent high and low-pressure regions located over the North Pacific Ocean. In spring and summer, high-pressure systems dominate the North Pacific Ocean causing air to rotate in a clockwise fashion resulting in prevailing winds from the northwest. In fall and winter, low-pressure systems take over the North Pacific resulting in a counterclockwise flow of air and prevailing winds primarily from the southwest. These prevailing winds shape the climate of this region. In general, temperate conditions result in relatively cool, dry summers and mild, wet winters.

Due to its location close to the coast, the Chehalis River Watershed receives the full force of severe storms moving inland from over the ocean and therefore, can receive heavy precipitation and winds of gale force during the winter season. The last large-scale wind event was the "Great Coastal Gale of 2007". This long-duration wind event produced hurricane-force winds in excess of 120 mph, toppling hundreds of acres of trees which brought devastating flooding to the watershed.

ACTION STEP►

Forest and Property Description

Seminary Hill Natural Area is located five blocks east of downtown on Locust Street in Centralia, Washington. The City of Centralia owns and manages the property, under the Parks and Recreation Department. The Friends of Seminary Natural Area, a volunteer nonprofit group, partners with the City of Centralia and supports all phases of use, maintenance, protection and enhancement of the area.

The property consists of 70+ acres on several hills. The original Natural Area consisted of 54 acres. Over the years, additional parcels have been added. The original property is within City's municipal boundaries. Some of the added parcels are in Lewis County.

See *APPENDIX III for Location Map, Project Area, Property Map, Acreage And Parcel Numbers*

The main entrance and primitive gravel parking lot are located at Locust Street and Barner Drive. It has a small equipment building and a covered picnic table on a concrete slab. Adjacent to the parking lot is a cleared field covered with weeds. An ADA accessible trail is planned for this area.

On the east side of Seminary Hill, the City has a water reservoir. Access is from a small driveway off Seminary Hill Road. An area around the reservoir is fenced and kept clear of trees, shrubs, and plants.

The forest is a wooded natural area with 200 species of trees, shrubs, and non-woody plants. One area (Stand 4) was last logged in the late 1800s and early 1900s. Other areas or stands were disturbed or logged from 1930 to 1980. All areas were replanted by natural regeneration. The forest appears healthy. The forest tree composition includes large Douglas-fir, bigleaf maple, western red cedar, red alder, vine maple, alder, a few scattered hemlock, cascara, bitter cherry, California hazelnut, Pacific dogwood, Red Osier dogwood, Oregon ash, black cottonwood, Garry oak, Indian plum, red elderberry, red flowering currant and a few other types of trees. Evergreen shrubs include: salal, short and tall Oregon grape, thimbleberry, salmonberry, ocean spray, serviceberry, Douglas's spirea. Noxious weeds include: English ivy, English holly and Himalayan blackberry and a few others.

See APPENDIX II for a list of all Trees, Shrubs, Plants and Ferns of the Natural Area

Portions of Seminary Hill are steep and designated trails mediate the steepness with switchbacks to the top where the hills join. The elevation at the parking lot is 180 feet above sea level and 500 feet above sea level at the top along the Ridge Trail. At the top, the trails have gradual steepness depending on which of the 8 designated and 2 undesignated trails are taken.

The property contains six (6) tree stands.

AERIAL VIEW PHOTO OF SEMINARY HILL NATURAL AREA

Land Uses in Vicinity

The Natural Area has a periphery or border of forest on the east and south sides. Beyond the border on the east, three houses reside on significant areas of cleared land. No farming or other types of agriculture is done. Access is from a private dirt road that connects to Seminary Hill Road.

On the west and north sides the Natural Area is bordered by residential houses and city streets and by Washington Elementary school.

On the north side, within the property, is housed the water reservoir that is managed by the City's Water Department. Access is from a small drive coming from Seminary Hill Road. It is fenced and kept clear of trees, shrubs, and plants, as the area is ideal for weeds to grow and spread.

On the south side, 70 acres of forest are adjacent to the Natural Area. It was logged 40 years ago and has regrown. If the current owner chooses to log the upper area adjacent to the Natural Area boundary, this could result in another blowdown of our trees.

Topography, Watershed, Climate Information

Topography: The property's terrain is steep, particularly on the north and west sides, with 30-60% slopes. Slopes are generally north and west facing. The terrain levels off at 3/4s of the elevation to the park boundary at the top of the hills. The boundary is the dividing line between the Seminary Hill Natural Area and private landowner's property. On the east side, the property levels off as it meets Seminary Hill Road.

Designated trails mediate the steepness with switchbacks to the top where the hills converge and the terrain levels off. The trails then have gradual steepness depending

on which of the 8 trails and 2 undesignated trails are taken. The elevation at the parking lot is 180 feet and at the top, along the Ridge Trail, it is 500 feet.

Climate: The City of Centralia, WA, has a warm-summer Mediterranean climate and achieves approximately 47.03 inches of rain on average each year, primarily occurring between the months of October and April. Lowest temperatures occur in January and average 36 degrees Fahrenheit, and highest temperatures occur in August averaging 80 degrees Fahrenheit.

Watershed: The hillside adjacent to the field that is next to the parking lot has two NP streams that has runoff into the field. The water flows to a runoff creek that flows under the entrance to the Natural Area. This will impact the building of the ADA accessible trail and replanting of trees and shrubs.

See APPENDIX V: Water Quality: History of the Building of the Reservoir

Property Boundaries and Access

Property boundaries are currently at 1) the Main entrance on Locust Street 2) the Ridge , Maple and Grand Fir Trails 3) On the Westside by the Indian Pipe and Washington School Trails. Access to the property exists through 1) North: Main entrance at the parking lot. All the designated trails can be accessed from here 2) East: One trail from Seminary Hill Road allows workmen from the City to access the reservoir and other visitors to enter. Two other trails allow owners of the private property homes to enter. 3) South: the Washington School Trail that starts at the school. 4) Many people use the undesignated footpaths through the private forest from Salzer Valley Road. This is a big problem. The footpaths were originally made following an old trail, deer paths, or other intruders.

There are no roads allowed into the Natural Area, as per the City ordinance. Though an emergency access road may be planned in the future.

See Appendix II: Property Map, acreage and Parcel Numbers

Past Land Use Management History

The property has been used many times by different entities over the years. The Friends of Seminary Hill Natural Area was formed to protect the area. The forest was designated a Natural Area in 1981. The Friends have managed all phases of the Natural Area (use, maintenance, protection, and enhancement) to the present time (see the following timeline).

SEMINARY HILL: TIMELINE OF EVENTS AND CONDITIONS THAT BROUGHT CHANGES TO THE NATURAL AREA :

1842: Wilkes mapping expedition map showing trail from Willamette Valley to Fort Nisqually with the future Seminary Hill mentioned in the expedition journal.

1872: First plat for the city by George Washington and subsequent settlement near the hill.

1890 to 1900: Hill areas logged and natural reforestation began.

Early 1900: The land was purchased by the city and called Dry Park or Forest Park.

1914: Building of the first large reservoir on the hill for the water system.

1925: Building of a second large reservoir adjacent to the earlier one.

1935-36: WPA Forest Park (Dry Park) projects built bridle trails, a picnic shelter, an access road, and some clearing.

1940: Temporary military (National Guard) camp. A narrow gravel road was laid from Seminary Hill Road to the central area of the park.

1940-1950s: Deterioration of earlier work through neglect and abuse by ATVs and motorcycles.

1960-1980s: Central area used for Girl Scout summer Day Camp activities and other projects. A water pipe was laid to the central area and the area was mowed by the City for camping. Prior to 1980 the trails had been totally degraded by motorcycles and other wheeled vehicles and were unsuitable for hiking.

1980s: Early area preservation efforts, preservation petition drive and eventual park designation, formation of Friends of Seminary Hill Natural Area group, and early work on trail restoration. The water pipe was plugged and the cleared area was left to be naturally regenerated. It was not replanted with trees or shrubs.

The Friends rebuilt the trails by leveling and installing sets of steps where needed. Some additional trails were developed when it became the Seminary Hill Natural Area. To further protect all trails, all were declared to be for foot traffic only.

1980s and ongoing: Annual educational programs ‘walks and talks’ are sponsored by the Friends of Seminary Hill Natural Area. Topics include: wildlife, flowering plants, bird watching, nature photography, forestry, regional geology, forest poetry, music, etc.

Further, laboratory use of the area is made by botany and engineering faculty of Centralia College and by teachers of local school districts.

1984: Washington School Trail was developed by the Eagle Scouts.

1985: A parcel of land was donated to the Natural Area, the first of several that came later.

1989: Clear-cut of privately owned (Latimer) property on the south side of Seminary Hill changed the old trail network and, subsequently, caused extensive blow-down in the Natural Area.

1991: Collapse of the 1914 reservoir and damage to the 1925 reservoir caused extensive damage to trails, parking area, and nearby private property.

1991-1993: Cleanup and repair, construction of a new reservoir, new parking and entrance area, loss of vehicle entry into the Natural Area.

2000: Two parcels of land were donated, one by Stellajoe Staebler, and a second by co-owners William Conrad and Larry Edinger. These combined donations enlarged the Natural Area by nearly ten percent.

2005: Friends of Seminary Hill Natural Area received a grant from Washington Department of Natural Resources Urban and Community Forestry Assistance Program to do a vegetation management study.

2006: "Seminary Hill Natural Area---An Assessment of Invasive Species and a Management Plan for Their Control" was completed by Forest and Channel Metrics, Inc. It was to be a guideline for future management of invasive species.

2008-10: Three Volunteers removed ground ivy from the Canyon Trail at the Barner Drive Trail following the Invasive Species and Management Plan and using the manual removal technique. A storm created a blow-down in the ivy removal area and the area was abandoned due to difficulty with access.

2009: Lewis County Toxic Weed Control Board had 10 plots on Barner Drive hill using chemical application. Friends of Seminary Hill Natural Area had 5 plots using manual removal. Results after 1 year: following chemical application, the ivy returned but the native plants did not. Following manual removal, the English ivy did not regrow. Native plants remained and were healthier with the removal of the ivy.

2011-2016: Monthly ivy removal on Barner Drive Hill by Lewis County jail crew. The entire hill was cleared of ground and tree ivy. The area is monitored yearly and any ivy detected is removed.

2014: Friends of the Seminary Hill Natural Area received the Urban Forestry Restoration project grant from Washington State Department of Natural Resources to remove tree and ground English ivy and English holly. AmeriCorps workers removed the plants on Indian Pipe Hill. Three years of monitoring followed.

2014: The City purchased the parking lot or parcel # 001358001000 in Nov/Dec of 2014 for approximately $78,000 from Sam Madsen.

2015: Friends of the Seminary Hill Natural Area received the Urban Forestry Restoration project grant from Washington State Department of Natural Resources to remove tree and ground English ivy. AmeriCorps workers removed the plants on Indian Pipe Hill. Three years of monitoring followed.

2015: Received the Urban Forestry Stewardship Award given by the Washington Department of Natural Resources and the Washington Community Forestry Council.

2019: Educational and historic information signs were placed at the entrance to the forest, designed and funded by the Washington Military Department.

2019: Washington School Trail was rebuilt by Boy Scouts.

2020: A portion of the Canyon Trail and a portion of the Grand Fir trail were rebuilt.

2020: Lewis County Noxious Weed Control Installed a "boot brush" station at the entrance to the forest to remove invasive weed seeds and an informational sign to discuss its use and importance.

2000-2020: Donations and acquisitions of several parcels of land to the Natural Area, generally along the Seminary Hill Road and at the Locust Street entrance, enlarged the park area to somewhat more than eighty acres.

2021: Chehalis River Watershed Landscape-Level Master Forest Stewardship Plan was being developed.

2021: An accessible trail was being designed should be constructed in 2022.

See APPENDIX II for more information regarding the project area:

Project Area, Property Map, Acreage and Parcel Numbers
Photos of the Natural Area prior in 1980 and following restoration in 2020
Rufus Kaiser's list of trees, shrubs, and plants

IV. RESOURCE DESCRIPTIONS AND MANAGEMENT PRACTICES
RESOURCE CATEGORY I – FOREST HEALTH/WILDFIRE/INVASIVE SPECIES

Forest Health

Forest health is most often defined as a condition that allows for resilience to change, is biologically diverse over a large area and is able to provide an array of values for many species, including humans (Perleberg, WSU Extension, 2003). Factors affecting forest health are common throughout the Chehalis River Watershed. Factors may be biotic or abiotic in nature and include forest insects, disease, drought, weather events, soil erosion and degradation, invasive species, habitat loss/fragmentation or any other condition that may contribute to an identified forest health concern. In general, most factors affecting forest health are natural components of the forest ecosystem and at low-levels do not significantly impact the health of the forest. Tree mortality at some level is essential for creating diversity, forest resiliency and wildlife habitat. However, an unbalance in factors affecting forest health may negatively impact an otherwise healthy system. Such instances may require assistance and manipulation to begin a path toward a more desirable condition.

Stocking and Stand Density

Overstocking is one of the more common forest health concerns within the watershed. For any forested site, growth potential is based on a finite amount of water, nutrients and light which limit the total volume of wood fiber a stand will produce within a given rotation. As trees grow they eventually occupy all the growing space and begin to compete amongst each other for these essential resources. Competition among trees can slow diameter growth resulting in tall, skinny trees and an increased risk of wind damage. Overstocked stands can also lead to other forest health issues including increased stress and susceptibility to forest insects and disease.

Insects & Disease

Forest insects and disease are naturally occurring “agents of change” that have co-evolved with their hosts and therefore, are common occurrences within many forest ecosystems. These “disturbance agents” generally increase ecosystem diversity by selectively killing susceptible host species thus providing growing space for less susceptible tree and shrub species. Common tree diseases identified within the Chehalis River Watershed include Laminated Root Rot, Armillaria Root Disease, Annosus Root Disease, Red Ring Rot or White Speck, and Swiss Needle Cast. Common forest insects identified within the Chehalis River Watershed include Douglas fir Beetle, Douglas fir Engraver Beetle, Douglas fir Pole Beetle, and the White Pine Tip Weevil on Spruce.

Infected trees fall and create stand openings and increase both vertical and horizontal stand structure, therefore, for some landowners, a “no-treatment” approach may be taken. Within intensively managed forests, however, insects and disease can pose a major challenge to regeneration and production. Because forest insects and disease are strongly associated with trees under stress, enhancing tree/stand vigor is the best management approach to prevent an infection/attack.

Abiotic Factors & Animal Damage

Forest health can be affected by abiotic or non-living factors. Common abiotic factors affecting forest health within the Chehalis River Watershed include snow and ice damage, drought, frost damage, excessive soil moisture/flooding and wind. Without question, semi-frequent wind events are the most common large-scale abiotic factor affecting forest health throughout the region.

A variety of animals live and utilize the forested environment. Many of these animals can cause anywhere from limited to significant damage. Trees which experience the most significant impact are young trees, ranging from newly planted to approximately 30-35 years of age. Some of the more common damage issues associated with trees include browse damage to young seedlings, antler rub damage to young pole size trees, porcupine and/or bear damage to tree boles.

Invasive Species

Invasive exotic species of plants threaten ecosystems by out-competing native plants, replacing native forage, reducing biodiversity, and degrading fish and wildlife habitat. Within the forest, invasive species can be a major competitor to young seedlings. Commonly controlled invasive species affecting forestland within the Chehalis River Watershed include Himalayan blackberry, cutleaf blackberry, scotch broom, knotweed, and reed canary grass.

Wildfire

Normally, the risk of wildfire across Western Washington is relatively low in comparison to Eastern Washington. High average humidity along with a significant amount of annual rainfall put this region at low risk for wildfire. However, over the last several years, Western Washington has experienced above-average drought conditions increasing the potential for a severe wildfire. An easterly flow can significantly lower humidity, creating very dry conditions and increasing the potential for a severe wildfire. An abundance of young plantations, thick understory vegetation, overstocked stands, and forest fuels common of Western Washington also add to this risk.

Management Recommendations

- Address insects and disease.
  - Monitor property for forest insects and disease and evaluate if management action is necessary.
- Practice good silviculture.
  - Evaluate forest stands for signs of tree competition and overstocking. Insect and disease agents are more prevalent in stagnated and stressed trees; therefore, many of the above mentioned forest health concerns can be avoided simply by managing density.
- Control invasive species.
  - Monitor property for invasive exotic species of plants and evaluate if management action is necessary.
- Maintain up-to-date fire emergency contact information
  - Washington DNR Forest Fire Reporting (800) 562-6010
  - Implement Firewise practices.

- **NOTE:**

The following statement is required when submitting a plan for land use classification change to the county – This *property is subject to forest fire protection assessments pursuant to RCW 76.04.610. The Washington State Department of Natural Resources provides fire protection for forestland associated with this parcel.*

ACTION STEP►

FOREST HEALTH CONDITION

Overall the forest is in good health. This is an established forest with trees ranging from 30 to 120 years old. It has adapted to many stressors over its 100+ year history. There is evidence of trees felled or damaged by wind and lightning. Wind damage has opened up the canopy for sun tolerant trees to grow in several areas.

Logging of Douglas fir has also opened up the stands for other native trees to grow. In 1980, Stand 1, Douglas fir was logged. Red alders, bigleaf maple and vine maple regenerated naturally and reforested this stand. The red alders and vine maple will be ending their life span in the near future, creating an area with a lack of canopy and diversity.

In 1990, logging on the adjacent privately owned forest caused extensive blowdown in the Natural Area, especially on the east side (Stands 2C-2D). 40-50 three-year-old Douglas fir trees were replanted but few conifers survived due to competition from older shrubs and slash, allowing bigleaf maples, vine maples, and red alders to grow for over 40+ years.

So far there are no signs of root rot, insect damage, big leaf maples dying, abiotic stress, or other stressors. There are intensive stressors from overgrowth of invasive ground and aerial English Ivy, which is well established throughout the Natural Area, especially on the steep slopes on the west and north side parcels. No removal will be done on the slopes due to difficulty with access and safety concerns. Himalayan blackberry and English holly are also established throughout the Natural Area.

In research areas (Stand 4A-Indian Pipe Hill), English holly was removed chemically and English ivy was removed with manual hand pulling using a specific technique established in the Urban Forest Grant protocol.

There is invasive overgrowth of ground and aerial English ivy in Stands 4E-4D, 6 and 8. Intensive ground and aerial English ivy was removed in Stand 4A-4B (Indian Pipe hill) and (Barner Drive hill) which eliminated the stress and increased wildlife habitat.

Fire is a risk factor: Wildfires: 1) Twice fires have been found, started by people. The Department of Natural Resources (DNR) responded to calls and put out the fires. 2) Lightning: Several trees, observed from the trail, have lightning strikes covering the vertical length of their trunks. 3) Visitors: Two fire risks are people smoking on the trails and in the woods and people illegally building fires for camping, even though a posted city ordinance

states no smoking or camping is allowed. Fire breaks are created by the 8 designated trails and the reservoir. To put out a fire, water must be brought in via the trails by people, i.e. DNR (Dept of Natural Resources).

Overall, the type of trees and the length of time the forest has existed provide some protection from fire. The heterogeneity of species and structure in the parcels contributes to fire resistance. Except in a few areas, the stands do not appear to be overstocked.

Visitor traffic is a high risk factor for forest health: 1) See fire risk above. 2) Visitors leave designated trails and walk into and through the forest, often creating non-designated trails that others follow, damaging the environment. 3) People build huts from tree branches and/or camp in the forest, sometimes building fires. 4) Others vandalize trees by cutting trunks of maple trees down, tearing bark from cedar trees, cutting branches and digging up and stealing native plants. These forest products are used for art projects or making instruments and sold for money. 5) Visitors slide down embankments. Repeated slides create erosion on the embankments leading to crushing, damaging, and killing native plants and trees, leaving the areas barren, decimating the soil, and inviting invasive plants to grow. 6) Others spray trees with graffiti. 7) When signs are posted, if not put in concrete, the signs are removed and destroyed within a week, even signs that read "Restoration Area", with a cross over a picture of a foot. Closure of non-designated trails with logs and branches are usually removed within 2 weeks. 8) Dogs with visitors often are not leashed and chase people and harass wildlife in the forest.

MANAGEMENT PRACTICES

Several steps are currently in place to improve and maintain the health of the forest at the optimal level. Activities have been occurring for 5 years and will continue for 5 years.

INVASIVE SPECIES: overgrown English Ivy - the biggest risk

GOAL: In accessible areas, intensively remove all ground and aerial (tree) English ivy, English holly, other invasive species and non-native blackberries using techniques established through the Seminary Hill Natural Area research protocol.

• Monitor the Urban Forest Grant research areas on Indian Pipe Hill (Stand 4A*)* every 3 years for regrowth of ground and aerial English ivy and remove regrowth. Continual removal of ground and aerial English ivy in the non-research areas. All monitoring will be done by the Friends of Seminary Hill Natural Area and removal of ivy will be done by the Lewis County Work Crew or volunteers, following established protocol from our Urban Forest Grant research.

• Monitor Barner Drive Hill *(*Stand 4B) for regrowth of ground and aerial ivy and remove regrowth. English Ivy has been removed from the entire Barner Drive Hill and the entire hill will be monitored every 3 years. All monitoring will be done by the Friends of Seminary Hill

Natural Area and removal of ivy will be done by the Lewis County Work Crew or volunteers, following established protocol from our Urban Forest Grant research.

• Monitor all other areas of ground and tree English ivy, English holly and non-native blackberries. Yearly, prioritize the removal from the most extensive growth to the least, the type of invasive plant and their regrowth pattern. Develop a specific schedule for removal dependent on the volunteers available and the length of time required. All monitoring will be done by the Friends of Seminary Hill Natural Area and removal of ivy will be done by the Lewis County Work Crew or volunteers, following established protocol from our Urban Forest Grant research.

• Himalayan blackberry patches (Stands 6) are cut back during the 2 annual work parties in April and September.

• Other noxious weeds will be watched for and removed during scheduled work parties in the prioritized area: Herb Robert, tansy, and any new sources identified by the Lewis County Noxious Weed Control Board.

• The Lewis County Noxious Weed Control Board developed and installed the Boot Brush project at the Main trail entrance in June 2020. It was the first in Lewis County. Visitors will wipe their feet on the boot brush to prevent seeds from being carried into and distributed throughout the Natural Area. However, dogs will still carry in seeds. The project is important as the Natural Area is adjacent to the City with all of its plants, weeds and seeds, including ivy.

See APPENDIX III for Invasive Species Management and Research Protocol for the Natural Area

TREES

• Trees are the first priority. English ivy on trees, especially Douglas fir, Western redcedar, other conifers, and bigleaf maple have been identified in the stands. Work parties have removed all aerial ivy from trees in (Stands 4A, 4B). Work parties have removed aerial English ivy from trees on the Kaiser and Pleasant Trails junction (Stand 6). Other identified areas will be prioritized and English ivy will be removed as work parties are available. Trees on the steep slopes will be identified but ivy will not be removed due to difficulty of access and safety concerns.

• An experiment was tried using vinegar, baking soda, water, and dish soap to kill ground and aerial ivy in 8 experimental areas. It was sprayed on the ivy and evaluated after 2 weeks. This was an effort to slow the spread of English ivy until it could be managed with other techniques. The results of the experiment showed that the solution does not kill the English ivy.

• Practice good silviculture. Evaluate forest stands for signs of tree competition and overstocking. Insect and disease agents are more prevalent in stagnated and stressed trees, therefore, many of the above-mentioned forest health concerns can be avoided simply by managing density. The forest trees in the Natural Area appear to have adequate spacing. No trees will be removed or thinned for purposes other than disease or danger to the public. Fallen trees will be left as snags.

• Fallen trees or limbs on the trail will be removed for safety and placed in the forest.

• Trees that are tipping over a trail and creating a safety concern will be evaluated by the Parks and Recreation Department for possible removal.

MONITORING

• Forest health issues will be assessed by those working in the forest. Trees, shrubs, and the environment will be monitored for any disease, wind or fire damage, invasive species, animal or human damage.

• No action will be taken besides monitoring/observation, since it is a Natural Area, unless visitor safety is involved.

NATIVE PLANTS

• Continue replanting of sword fern, Oregon grape, snowberry, and other identified plants native to the Natural Area on a section of denuded Indian Pipe Trail embankment. Plant vine maple and hazelnut above the embankment wall. The Friends and volunteers will follow the Native Plant Society recommendations on the types of plants best suited for this embankment area and the planting methods. The plants will be monitored for water and compost needs and to determine the best time of year for replanting specific native plants.

• Monitor embankments for erosion and replant native plants where feasible. Plants will be taken from the forest.

• Removal of ground and aerial English ivy and English holly allows a variety of native plants to regenerate, provides adequate nutrients in the soil and space to grow, fills the forest floor with a natural ecosystem, and provides habitat for wildlife.

SIGNS

• Signs posted: No Smoking, Dogs Must Be Leashed, No Camping, Hiking Only, Take Litter Out.

• Ground-level marble trail signs are located at the trailheads of the 8 designated trails. However, the signs are difficult to see. Raised trail signs need to be placed and put into concrete.

• Signs recently placed in concrete: Two boundary signs on the Ridge and Grand Fir Trails, two closed trail signs on the Canyon Trail and the parking lot, one directional sign on Waterleaf Trail.

• Additional signs that designate a trail, a closed trail, boundary signs, or other informational signs need to be made and put in concrete as volunteers are available.

Forest Health Management Recommendations

• Obtain educational information on diseases and insects that affect forest health.

• Signs designating a trail will be made and placed in concrete

• Evaluate if management action is working and/or necessary

• Continue to monitor and identify English ivy on trees, especially Douglas fir, Western red cedar, other conifers, bigleaf maple. Prioritize and schedule work parties to remove the English ivy. English ivy on trees on the steep slopes can be identified but due to access difficulty and safety for work parties no work will be done.

• Himalayan blackberries are invasive in specific areas. Work parties will cut back the plants and if possible find a way to manage the blackberries more effectively.

• English holly is invasive throughout the forest. Developing an appropriate plan is difficult. It must be removed by herbicides using people certified in herbicidal techniques. The criteria are limited by time and temperature, a need to notify the community of the use of herbicides, and resources (people).

• English holly: An injectable herbicide will be explored. A research plot will be identified and a protocol will be developed. The Native Plant Society has used the injectable. Their protocol may be used.

• Ideally, plant 40-50 young conifers among the alders in Stand 1. Establish a young cohort of shade tolerant conifers such as hemlock, cedar, and grand fir that will be established when the alders die. This was done in 1990 with excellent 3-year-old Weyerhaeuser trees and knowledgeable planters and all but a few died. If there was a grant with a knowledgeable crew this could be reconsidered.

Figure 1: English ivy

Figure 2: Himalayan blackberry

Figure 3: English holly

DNR Wildland Fire Management Recommendations

1) Maintain up-to-date emergency contact information including awareness of ingress/egress routes for the property/community.
2) WA Department of Natural Resources-reporting a forest fire call 911 or 800-562-6010
3) Stay apprised of the Industrial Fire Precaution Levels by going to https://fortress.wa.gov/dnr/ifpl/ or calling 1-800-527-3305; also fire danger by county call 1-800-323-2876.
4) Read *Reducing Fire Risk on Your Forest Property* - go to http://ext.wsu.edu/forestry/documents/pnw618complete.pdf.
5) Go to National Fire Protection Association's FIREWISE website for additional information on reducing risk of, and preparedness for, wildland fire as well as learning what you can do to improve "defensible space" around your home and other structures on the property.
http://firewise.org/wildfire-preparedness/be-firewise/home-and-landscape.aspx?sso=0.
3) Control invasive/noxious weeds to the extent practical. These weeds can out compete native vegetation, decreasing plant biodiversity, value to wildlife and native pollinators. The weeds posing the greatest challenge to survival of newly planted seedlings are Scotch broom, Himalayan blackberry and reed canary grass. The following links provide detailed info on control of these plants.
4) Stay apprised of the latest information on invasive species by going to
(a) http://www.invasivespecies.wa.gov/priorities.shtml;
(b) http://www.nwcb.wa.gov;
(c) Scotch broom - http://www.invasive.org/gist/moredocs/cytsco01.pdf.
(b) Himalayan blackberry - http://www.invasive.org/gist/moredocs/rubarm01.pdf.
(d) Reed canary grass - http://www. invasive.org/gist/moredocs/phaaru01.pdf.

5) The Pacific Northwest Weed Management Handbook is a good resource if looking for chemical treatment options - see http://pnhandbooks.org/weed/.
(a) If applying chemicals, timing is important; follow all applicable label instructions. Provided it is consistent with chemical label instruction, try to time your noxious weed control so that it minimizes disturbance to native pollinators as well as honey bees. (b) Do your control work in the morning or in the evening when bees are less active
(c) Control as many noxious weeds as you can in early spring, fall, or even winter when plants are not in bloom.

RESOURCE CATEGORY II – SOILS

Soils that make up the Chehalis River Watershed contain some of the most productive sites for growing timber in the world. Soils are derived from a unique history of geologic activity and include several distinct geologic regions. Parent material near the coast for example, is composed primarily of marine volcanic and sedimentary rock, whereas other areas within the watershed are primarily glacially influenced. Understanding soil type and structure plays an important role in the management of the property. Characteristics of the soil that may affect management activities include productivity/site index, erosion potential, compaction resistance, water depth to restrictive layer, wetness, seasonal flooding, drought potential, suitability for roads and trails, equipment operability issues/restrictions, tree species selection and potential for seedling mortality.

Management Recommendations

- Limit compaction/soil disturbance.
  - Schedule forest operations requiring heavy equipment for seasonally dry periods in order to avoid rutting, soil compaction, erosion, and damage to tree roots.
- Monitor roads and open spaces annually for erosion and rutting and treat accordingly.

ACTION STEP►

Soil Health Issues:

According to NRCS data, approximately 55.3% of soil on the property is considered Buckpeak silt loam on 30-65 % slopes. 25.6% of the soil is Centralia loam on 8 to 15% slopes. 10.8% of the soil is Centralia loam on 0-8% slopes. Buckpeak silt loam, Centralia loam and Xerorthents spoils are in group B hydrology. Reed silty clay loam is in group D hydrology. (See definitions below). The soil on all the slopes from 30-65% to 0-8% slopes are Buckpeak silt loam and Centralia loam and are particularly good for growing Douglas fir. The soil comprises 92.4% of the property. The site index range is 133-140. 140 is the top range.

See APPENDIX IV: Charts and Maps: Soil Properties, Management & soil maps Aerial photos for property Sections.

Soil Hydrology B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep and deep, moderately well drained or well drained soils that have modestly fine texture to moderately coarse texture. The soils have a moderate rate of water transmission.

Soil Hydrology D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, impervious material. These soils have a very slow rate of water transmission.

Summary of soil Properties (NRCS Web SoilSurvey)

Soil Type	Acreage	Percent of Property	Drainage	Depth to Restrictive Layer	Depth to Water Table	Site Index
Buckpeak 30-65% slopes	36.6	60.60%	Well drained	80"+	80"+	133
Centralia Loam 8-15% slopes	16	26.60%	Well drained	80"+	80"+	135
Centralia Loam 0-8% slopes	0	5.20%	Well drained	80"+	80"+	140
Reed silty clay loam	0.2	0.30%	Poorly Drained	80"+	18 to 36 "	
Xerorthents, spoils	2.7	4.50%	Well drained	80"+	80"+	100

Figure 1: Location of soil properties

Summary of soil risk assessments (NRCS Web Soil Survey)					
Soil type	Compaction Risk	Displacement Risk	Erosion Risk on trails	Rating reasons (numeric values)	Erosion Risk off-Trails/acres
27-Buckpeak 30-65% slopes	High	Low	Severe	Slope/erodibility (0.95)	Severe 36.6
42-Centralia Loam 8-15% slopes	High	Low	Severe	Slope/erodibility (0.95)	Slight 16.0
43-Centralia Loam 0-8% slopes	High	low	Moderate	Slope/erodibility (0.50)	Slight 3.2
Reed silty clay loam	High	Medium	Slight		Slight 2.7
Xerorthents, spoils	High	Medium	Severe	Slope/erodibility (0.95)	Slight .2

Summary of soil Suitability for management practices (NRCS Web Soil Survey)							
Soil Type	Suitability For	Trail Building	Suitability For Hand planting	Suitability For seedling mortality	Soil Hydrology	Organic Matter Depletion	Suitability for Aerobic Organisms
27-Buck-peak 30-65% slopes	Very Limited due to slopes	58%	Moderately Suited	Low	Group B	Moderate	Somewhat Favorable
43-Centralia Loam 8-15% slopes	Somewhat Limited	23.40%	Well Suited	Low	Group B	Moderate	Somewhat Favorable
42-Centralia Loam 0-8% slopes	Somewhat Limited	9.50%	Well Suited	Low	Group B	Moderate	Somewhat Favorable
Reed silty clay loam	Somewhat Limited	1.50%	Well Suited	Low	Group D	Moderate	Somewhat Favorable
Xerorthents, spoils	Somewhat Limited	3.80%	Moderately Suited	Moderate	Group B	Moderate	Somewhat Favorable

There are no soil health concerns. See Stands description below. The slopes are well vegetated and show no signs of unnatural erosion but are covered with English ivy. There is ample downed wood and woody debris throughout Stands 1-2, 4, 6-8.

Stand 1 soils were disturbed by logging in 1980. The stand has large bigleaf maples, vine maples and red alders and the understory has downed logs and organic matter. No current soil concerns.

Stands 2A,B,C soils are intact. In the 1940s the area was logged, a road built, a slab placed, a structure built and antenna built. 2D,E a blowdown occurred from adjacent private property logging. The soil is intact due to the extensive understory. No current soil concerns.

Stand 4A and 4B (old woods) soil has been disturbed by removing ground and tree English ivy and English holly by teams of workers and by illegal campers. After removal of ground ivy the soil is bare. Native plants are regrowing and the area has organic matter from the tree canopy, shrubs, and plants to rebuild the soil. 4A-4B horse trails, made in 1930s by the WPA, created slumping embankments on 4A (Indian Pipe Trail), 4B Barner Drive Trail and 4C Waterleaf Trail. Other disturbances on the embankment occur, in soil specific areas, by visitors sliding down the embankment which removes the soil, leaving underlying soil compacted. Without replanting of the embankment, the soil will continue to slump to the trails. Weather increases erosion.

Stand 6 (Kaiser Trail area). The WPA built a road to the center of the property. It was expanded by the National Guard, then used continually by the City, which mowed the area until the road was closed in 1980. The disturbance resulted in growth of bigleaf maples, vine maples and alders. The concern is walkers walking off trail and leaving the soil open to invasive plants. The interior of the stand has downed logs and organic matter. No current soil concerns.

Stand 8 Washington School Trail is constantly disturbed by school children using the trail daily. Concerns: people getting off trail and illegal campers disturbing and displacing the soil.

Stand 9 is a field covered with canary grass and lined by conifers and western redcedars. An ADA accessible trail is being developed and the area will be landscaped with native trees and shrubs. The current soil will be dug up and removed for the trail, and the canary grass dug up and removed. Additional soil will be brought in to provide adequate soil conditions for new trees, plants, and shrubs.

Stand 10 (water reservoir area) is managed by the Centralia City Utility Dept. The area adjacent to the water reservoir is kept clear of woods and woody debris by the Utility Dept.

All Stands, except 8, 9 and the embankments on 4A-4B have had subsequent rebuilding of the soil by the growth of various trees, the tree canopy, and composting by natural leaves and forest debris, repairing the soil with organic matter.

See APPENDIX IV for more detailed soil reports

Management practices

The Natural Area will be managed in its natural state. There are also areas of concerns (stated above) that will be monitored and managed by volunteers. Activities to maintain any of the stands will be low-impact and heavy equipment will not be used.

• Portions of the Canyon Trail were rebuilt to prevent soil erosion and prevent harm to native plants. Further sections will be rebuilt.

• A Boot Brush station at the entrance removes soil and seeds from visitors' shoes to prevent contamination of the soil.

• Stand 9: The area has water runoff. A plan for an ADA accessible trail will be developed and the area landscaped with trees and shrubs that grow in moist soil and have a full canopy: bigleaf maple, western redcedar, red alder and western hemlock. The grass will be eliminated by herbicide. The plan will assess erosion with the changes.

• Many areas are identified for soil compaction and erosion and must be monitored: trails, embankments, illegal campers sites, and illegal trails.

• The Trails have compacted soil and are subject to erosion due to weather (rain, water runoff), walkers/hikers/dogs, and other individuals. The trails are inspected semiannually for repair. Runoff can smother the injured native plants.

• Embankment erosion in Stand 4A Indian Pipe Trail. Continued replanting of sword fern, Oregon grape, snowberry, and other identified plants native to the Natural Area on a section of denuded Indian Pipe Trail embankment. Vine maple and hazelnut are planted above the embankment wall. The Friends and volunteers followed the Native Plant Society recommendations on the types of plants best suited for this embankment area and the planting methods. Monitoring for frequency of additional water and compost needs annually and determine the best time of year for replanting specific native plants. The planting for the remainder of the embankment was completed January-February 2022 by Boy Scouts.

• Other specific areas of visitor erosion on embankments (Stand 4) will remain open and monitored to keep other embankment vegetation healthy. Blocking off the erosion areas has been unsuccessful. Keeping several of the visitor slide areas open confines them to these areas, protecting and keeping the remaining embankment vegetation healthy.

• The interior of the stands will be monitored every 3 months by a volunteer for illegal campers building shelters and campsites causing disruption and compaction of the soil and damage to native plants, shrubs and trees. When observed, the shelters will be torn down leaving the wood piles for wildlife. Non-natural materials will be removed (tarps, tents, garbage).

• Interior Plots, stand 4A/B, will be monitored for English ivy every 3-4 years. If found it will be removed. Volunteers will be aware of the soil erosion that can occur while walking in the woods, bringing in seeds on their shoes or trampling over plants and ground cover.

• Walkers follow non-trails and disturb and compact the soil. Several signs have been placed in concrete to prevent entry into the interior of the stands. Monitoring the non-trails to determine if walkers are limiting their walks to the non-trails, will protect the interior of the forest. A consultation with the Washington Trails Association may provide alternatives.

• Other activities that disturb the soil will also be monitored on the 3-month schedule by volunteers. These include people that go into the forest for geocaching, to picnic, to dig up plants, and those who cut off branches and strip redcedar trees.

RESOURCE CATEGORY III – WATER QUALITY/RIPARIAN AND FISH HABITAT/WETLANDS

**A detailed stream/wetland classification should be conducted prior to any forest activities which require a DNR-approved Forest Practices Application.*

The Chehalis River Watershed contains an abundance of aquatic sites ranging from the major saltwater body of Grays Harbor to the various lakes, streams, rivers and wetlands that drain the watershed. Aquatic features, large and small, occur throughout the watershed where average annual rainfall is an estimated 80 inches (Chehalis River Basin Flood Authority, 2010). Low-lying valley areas may average 46-50 inches of rain per year while upland areas of the watershed can receive upwards of 200 inches of rain per year.

The Chehalis River and its tributaries cover more than 3,300 surface miles and span two water resource inventory areas (WRIAs 22 & 23). The Chehalis River originates within the Willapa Hills of Southwest Washington at an elevation of 2,400 - 3,100 feet above sea-level. The main stem Chehalis River flows north then northwest for approximately 125 miles eventually depositing into Grays Harbor at Aberdeen. Major tributary systems of the watershed include the Humptulips, Hoquiam, Wishkah, Wynoochee, Satsop, Mox Chehalis, Black, Skookumchuck, Newaukum and Elk Rivers. Documented salmonid species in the watershed include fall, spring and summer Chinook; coho; fall chum; cutthroat trout; and summer and winter steelhead (Chehalis River Basin Flood Authority, 2010). A variety of other fish species are known to inhabit the Chehalis River Watershed including green sturgeon, shad, sculpin and lamprey.

The majority of the main stem Chehalis River meanders through a flat river valley of cropland and pasture characterized by channel migration and seasonal flooding. Where present, stream adjacent riparian forest cover may contain a mixture of red alder, black cottonwood, willow, western red cedar and Sitka spruce. Large and small tributary systems of the watershed drain uplands dominated by coniferous forests as well as areas of mixed hardwood and conifer species.

Water quality and aquatic habitat concerns identified within the watershed include instream temperature, turbidity and habitat loss. Forestry practices can negatively or positively impact water quality, water quantity and aquatic habitat, therefore, Forest Practices Rules and Regulations provide for retention/protection of forest riparian areas associated with water features large and small. Retaining adequate riparian vegetation improves water quality, water quantity and fish habitat by providing 1) protection from streambank erosion 2) thermal buffering to help stabilize water temperature 3) introduction of large woody debris and leaf litter for fish habitat complexity 4) upland wildlife habitat in the form of food and cover 5) and a means to filter and recycle runoff and trap soil particles before they enter open water. The Chehalis River Watershed contains several 303(d) listed stream segments (WA Department of Ecology). 303(d) listed streams are considered impaired and/or threatened waters due to an identified pollutant causing the impairment. For a list of 303(d) listed streams in the Chehalis River Watershed, recommended management practices and additional information regarding water quality.

Fish Passage

The Chehalis River Watershed has the highest number of salmonid stocks and the greatest number of fish miles in the state. A key to restoring fish populations is removing barriers to fish passage along those streams. A single barrier may keep fish from reaching miles of upstream habitat. Common barriers within the Chehalis River Watershed include undersized or failing culverts. The 1999 Salmon Recovery Act required all forest roads on state and private lands meet current state Forest Practices Rules, including correction of fish passage barriers. Due to unintended financial hardships associated with fish passage correction for small forest landowners, the Family Forest Fish Passage Program (FFFPP) was created in 2003 to assist in correcting fish passage barriers on their land. For additional information on FFFPP as well as other programs and financial assistance opportunities available to assist with fish passage correction see Appendix III.

Upper Chehalis Landscape

The Upper Chehalis River Watershed (WRIA 23) has been identified in the statewide Forest Action Plans as a *Priority Landscape* for opportunities for shared work and investments in water quality and quantity in forests. The Upper Chehalis River Watershed consists of approximately 496,809 acres of forestland with an identified 814 miles of streams with unhealthy salmonid stocks (multiple listed or candidate fish runs present). Small private forestland consists of approximately 21 percent of the total forest land cover within the upper watershed. Opportunities to improve, enhance or restore healthy fish populations within this area must involve an “all lands" approach as many of these stream systems flow through a variety of ownership types including state, private and federal lands. Inventory stream systems on the property for adequate stream adjacent forest cover, invasive species, active erosion/sedimentation and presence of instream habitat features such as large wood. Financial assistance may be available for qualified landowners interested in fish habitat/stream restoration projects.

Management Recommendations

- Follow Forest Practices Rules & Best Management Practices (BMPs).
  - Adequately buffer streams in accordance with Forest Practices Rules and regulations.
  - Avoid the use of heavy equipment in and around riparian areas or on saturated soils in an effort to reduce erosion and sediment delivery.
  - Monitor roads and open spaces for erosion and sedimentation and treat accordingly.
  - Avoid the use of herbicides or other toxic chemicals in riparian areas.
- Restore/enhance stream/wetland conditions
  - Maintain adequate tree, shrub and herbaceous vegetation within riparian areas.
  - Plant additional trees and shrubs in riparian/wetland areas where necessary.
  - Control invasive species.

- Refer to Appendix III for additional information on available programs/assistance for stream/wetland restoration in the Chehalis River Watershed.

- Inventory culverts and other stream crossing structures for barriers to fish passage.
  - Correct fish passage barriers.
  - Refer to Appendix III for additional information on available programs/assistance for correction of fish passage barriers in the Chehalis River Watershed.

ACTION STEP►

Current Stream/Wetlands Condition

Summary

The property is in the Upper Chehalis Water Resource Inventory Area (WRIA). Stand 9, the 2.2 acre parcel, is located on the North side of the 68.4 acre parcel. The stand contains an Np stream (Non Fish-bearing Perennial) that was recently typed and buffered in preparation of creating an ADA accessible nature path in the northwestern half of the stand. This stream enters a manhole on the west side of the parcel and then flows through the City stormwater system into China Creek. On the 68 acre parcel there is a type Np stream that flows south through a series of drainage ditches into Salzer Creek and ultimately into the Chehalis River. (See Lewis County GIS Map below)

Description

Seminary Hill Natural Area land was purchased by the City around 1900 and named Dry Park or Forest Park. It was named Dry Park because of its lack of water sources other than rainfall. Rainfall flows down the hillsides and drains into 2 major but temporary creeks. It drains north and west from the 500 foot elevation into China Creek or it drains south into Salzer Creek. Little water accumulates on Seminary Hill. It accumulates in specific low areas or on depressions on trails. There are no streams, ponds, or other water holding areas. It was called Dry Park until the Park was renamed in 1980 as the Seminary Hill Natural Area.

The exception is Stand 9. It includes the yellow triangle noted below and the area that extends beyond the Np stream. It is an open field covered primarily with canary reed grass and a few western redcedars along the Np stream. This parcel is a bowl or depression that has been reshaped by extensive bulldozing of the land during the construction of the 3 reservoirs in 1914, 1926, and 1991. Because of the depth of the depression, water from the hills drains into this bowl and then flows into the Np stream (Non Fish-bearing Perennial). This stream enters a manhole on the west side of the parcel and then flows through the City stormwater system into China Creek. Because of the runoff, the upper 1/2 of Stand 9 is a seasonally wet, soggy, and muddy.

Figure 1. LEWIS COUNTY GIS MAP

Stand 9 -ADA Trail area

Np stream (Non-fish bearing stream)

current reservoir

1914 and 1926: old reservoirs are filled in

Lower section of Stand 9

In the lower section of Stand 9, an ADA accessible trail has been planned. Aquatic Assessment 2021: "Both Np streams have 75' buffers for development in Lewis County, both will be maintained using a "hands off approach". The Np stream which begins in the south part of the park is not in an area of the heavily used and maintained trail system and will remain isolated. The Np stream located on the north side of the park has an existing footpath located next to the stream that is scheduled to be decommissioned, and the new ADA path has been designed to remain clear of buffers. Additionally, there is a plan to add additional native vegetation in the area of the Np streams and along its banks to provide habitat and slow the flow velocity." See (figure 2: Aquatic Assessment map below).

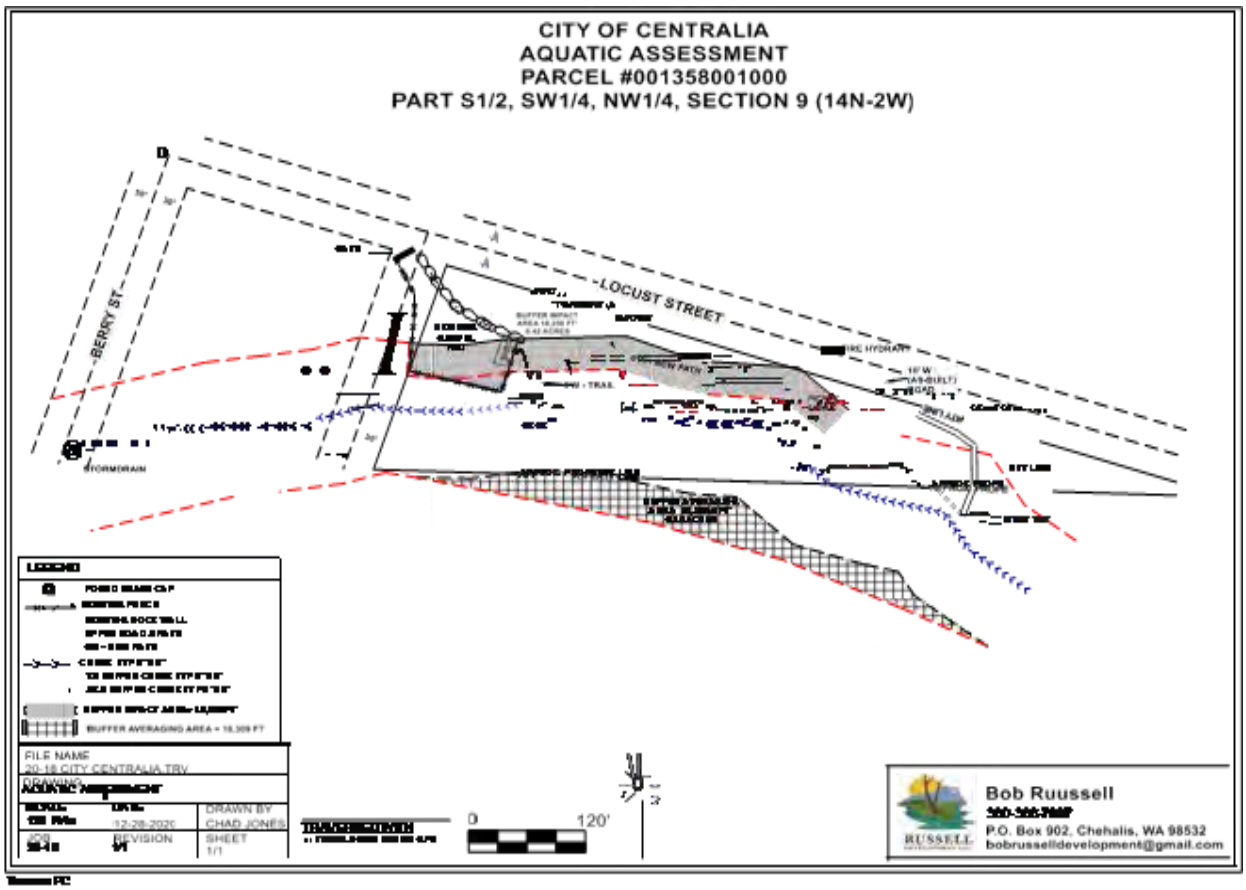

Figure 2: Aquatic Assessment Map

The assessment of water drainage is important in building the ADA trail to alleviate problems with water erosion and to plant appropriate native vegetation along the trail, which will meet the vegetation requirements: types of trees and shrubs, the ability to grow in moist soil and sunlight, size and location.

Upper section of Stand 9

The upper landscape of the parcel has a deeper depression and a steeper slope for drainage. Most of the seasonal run-off is concentrated in this area. The water coalesces into a stream that flows into the Np stream. The stand becomes seasonally wet and muddy.

The water runoff is significant, as a trail from the end of the ADA trail will be built to intersect with the Canyon trail in the future. It is projected that some visitors will walk past the end of the ADA Trail and continue to the Canyon Trail. Without a maintained trail, walkers will degrade and damage the environment. A trail will be built to protect this area. The seasonal outflow and the condition of the soil during different seasons will be assessed when planning and developing the new trail.

Management practices

ADA Trail

• The plan to build the ADA accessible trail is progressing. A consultant has been hired, a Washington State Grant of $50,000 was awarded, an aquatic assessment has been completed and submitted. Further planning and development is progressing.

• Completion of the Trail in October of 2022.

• Consultation with ADA persons to determine the best type of trail surface and other materials that may be needed.

• Consultation and assessment by the Weyerhaeuser Research Center on planting native vegetation when the ADA Trail is completed which includes: types of trees and shrubs , the ability to grow in moist soil and sunlight, size, location, and number needed.

• Development of a timetable to build the trail including: purchasing of materials, obtaining workers, and other essentials.

• Upon completion, the type of monitoring needed to maintain the trail and the native vegetation and a timetable will be developed. The trail will be monitored for problems or repair. Native vegetation will be monitored for their health, for adding any protective measures for the new native plants and to remove invasive species.

• Add ADA signs, designations, and other signs needed.

Trail Extension from the ADA trail to the Canyon Trail

• After completion of the ADA Trail expansion will be considered.

History of the Seminary Hill Natural Area Reservoirs is described to show the significant impact on the Natural Area's environment.

1900 Construction of a private water system: Wells near the Skookumchuck River pumped water to tanks at Seminary Hill Natural Area.

1914-15 Construction of an open reservoir: a typhoid fever epidemic occurred that was tied to the old water system. Centralia bought the water company and planned a new water system. The City decided to construct an open reservoir and to discontinue pumping water from the Skookumchuck River. Instead, a 14-mile line was run from the Newaukum River to Centralia. The reservoirs and trenches, holding wooden pipes, were dug using manpower, horses, and wagons. It was a major excavation which tore up the landscape, uprooting trees and shrubs. Many trees were young developing trees following the extensive logging from the late 1800s through this period. A narrow railroad line was built on Locust street up to the building site to transport equipment.

Figure 3: View of 1st reservoir & absence of trees

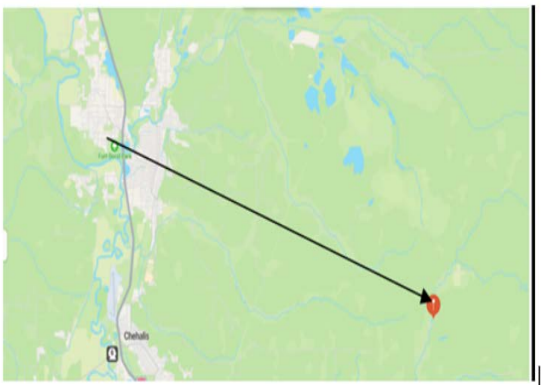

Figure 4: 14-mile pipeline from the Newaukum River to Centralia

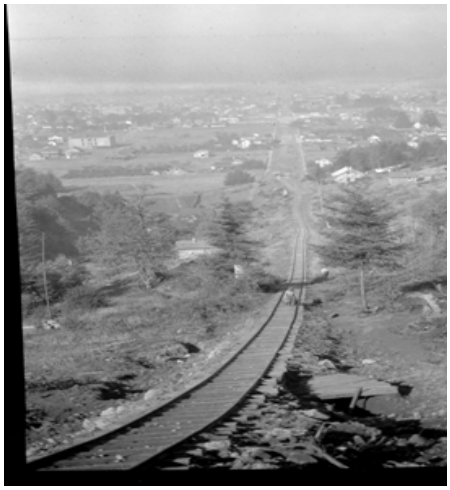

Figure 5: Railroad tracks to the reservoir

1925 Construction of a 2nd reservoir: ten years later Centralia had considerable growth and a 2nd open reservoir was needed and built at the south end of the 1st reservoir, using the earlier construction techniques. This major excavation site was even more extensive, resulting in more damage to the landscape.

1980 Developing Problems: before 1980, a big landslide on the Newaukum River damaged the water's intake site upstream, resulting in the 2 reservoirs being contaminated with silt. This necessitated frequent draining and cleaning which weakened the reservoirs. They began to leak. The city had to build a treatment plant to clean the dirty water or abandon the Newaukum water source.

Oct. 1991 Reservoirs Collapsed: both reservoirs collapsed, opening large sections in both reservoirs. Water ran down the hill like a river, taking out every shrub, tree and plant in the area adjacent to the parking lot. The water ran through the parking lot to Berry Street and then into the storm sewer system.

Figure 6: The section of the collapsed Dam

Figure 7: Entrance strewn with rocks and trees

Dec 20, 1993 Construction of a new, covered reservoir began: a 3rd major construction job was started. There was extensive excavation and bulldozing, which cleared all the trees and shrubs from Seminary Hill Road to Staebler Point, and down the Canyon Trail. New methods were used, including covering the reservoir and a concrete tank was built. Dumping the water down to Berry Street ended. Instead, it drained down Seminary Hill Road in a stormwater line to China Creek.

See APPENDIX V: History of the Building of the Reservoir on the Natural Area

RESOURCE CATEGORY IV – FOREST INVENTORY/TIMBER/WOOD PRODUCTS

Highly productive soils coupled with considerable annual rainfall support excellent tree growth throughout the Chehalis River Watershed. A history of even-aged harvesting followed by artificial reforestation has resulted in a landscape dominated by even-aged plantations. Timber types consist largely of production stands of Douglas-fir, hardwood dominated zones and areas of mixed hardwood and conifer species. Non-industrial private forest lands tend to be located within and around urban areas and along with the watershed's numerous aquatic features including all major tributary systems. In general, these are productive sites ranging from well-drained rolling hilltops and Site Class I to low-lying hydric soils associated with water-tolerant species and Site Class V.

Tree species and their associated vegetative communities vary depending upon ecoregion within the Chehalis River Watershed, however major tree and shrub species identified within this area include (Trees) Douglas-fir, western hemlock, western red cedar, Sitka spruce, grand-fir, red alder, bigleaf maple, black cottonwood, bitter cherry, Oregon ash, cascara, willow and Garry oak; (Shrubs) sword fern, salmonberry, red huckleberry, cascara, vine maple, red elderberry, thimbleberry, Himalayan blackberry, cutleaf blackberry, scotch broom, red osier dogwood, hazelnut, Oregon grape and currant.

Silviculture

Silviculture is defined as the art and science of controlling forest establishment, composition, structure and growth (Dictionary of Forestry, 1998). Utilizing silvicultural techniques, land managers are able to shape and manage the forest to achieve a set of desired future conditions. For some landowners, this may simply be a no-action management approach. For others, management may include techniques to actively manipulate the forest to achieve a set of objectives and/or desired future conditions. Techniques may include but are not limited to site preparation, reforestation, vegetation control and density management.

Timber Harvest

Grays Harbor County and Lewis County, which occupy the majority of the Chehalis River Watershed, consistently contribute the largest volume of timber to Washington's mills (WA DNR Mill Survey, 2014). While small in comparison with commercial timberland harvest, NIPF contributes annually to the statewide harvest. In 2014 for example, small forest landowners supplied 12 percent of the state's total wood fiber harvest at approximately 430 mmbf. For a majority of NIPF, timber harvest may occur only once or twice within their lifetime. Timber harvest may also represent years of work and time invested. For this reason, ensuring an adequate return on investment is essential. Setting up a sale and marketing timber can be an intimidating task. A forestry consultant can help design and manage a timber sale to landowner specifications and objectives.

Management Recommendations

- Practice good silviculture:
  - Ensure adequate stocking of forestland property by monitoring young stands for competing vegetation until trees are free-to-grow (meaning trees have grown above competing vegetation and above where animal damage can take place).
  - Monitor stands for tree competition and thin where necessary. Thin prior to live crown ratio receding beyond 40% of total tree height.
- Manage timber on 40-60 year rotations.
- Avoid unsolicited offers to log your timber. Retain a consulting forester for timber harvesting contract oversight: http://forestry.wsu.edu/consultingdirectory/.

ACTION STEP►

Stand Level Data:

The Forest Property was broken into six individual stands.
Stand 1) Logged in 1980 and the land later donated
Stand 2) Disturbed in 1940. An antenna with an attached building was built. In 1990 a blowdown occurred from logging on adjacent property
Stand 4) Old woods not logged since the late 1890s to early 1900s.
Stand 6) An old road, now a major trail. Pre-1920s it was a wagon road. In the 1930s the WPA built bridle trails, a picnic shelter, an access road, and did some clearing for transport of goods/equipment needed. In 1940 a temporary camp housed the military (National Guard). A narrow gravel road was laid from Seminary Hill Road to the central area of the park. In the 1960-1980s the central area was used for Girl Scout summer Day Camp activities and other projects. A water pipe was laid to the central area and the area was mowed by the City for camping.
Stand 8) Logged for Douglas fir. Date unknown. In 1984 a trail was developed to an adjacent elementary school and used by the students.
Stand 9) A field beside the entrance parking lot was purchased in 2014.
Stands 3 and 7 were eliminated. The terrain is steep, with 30-60% slopes. The steep slopes were too difficult to access and management is improbable. This increased the safety concerns that might occur during data collection. Stand 5 belongs to the City Utility Dept.

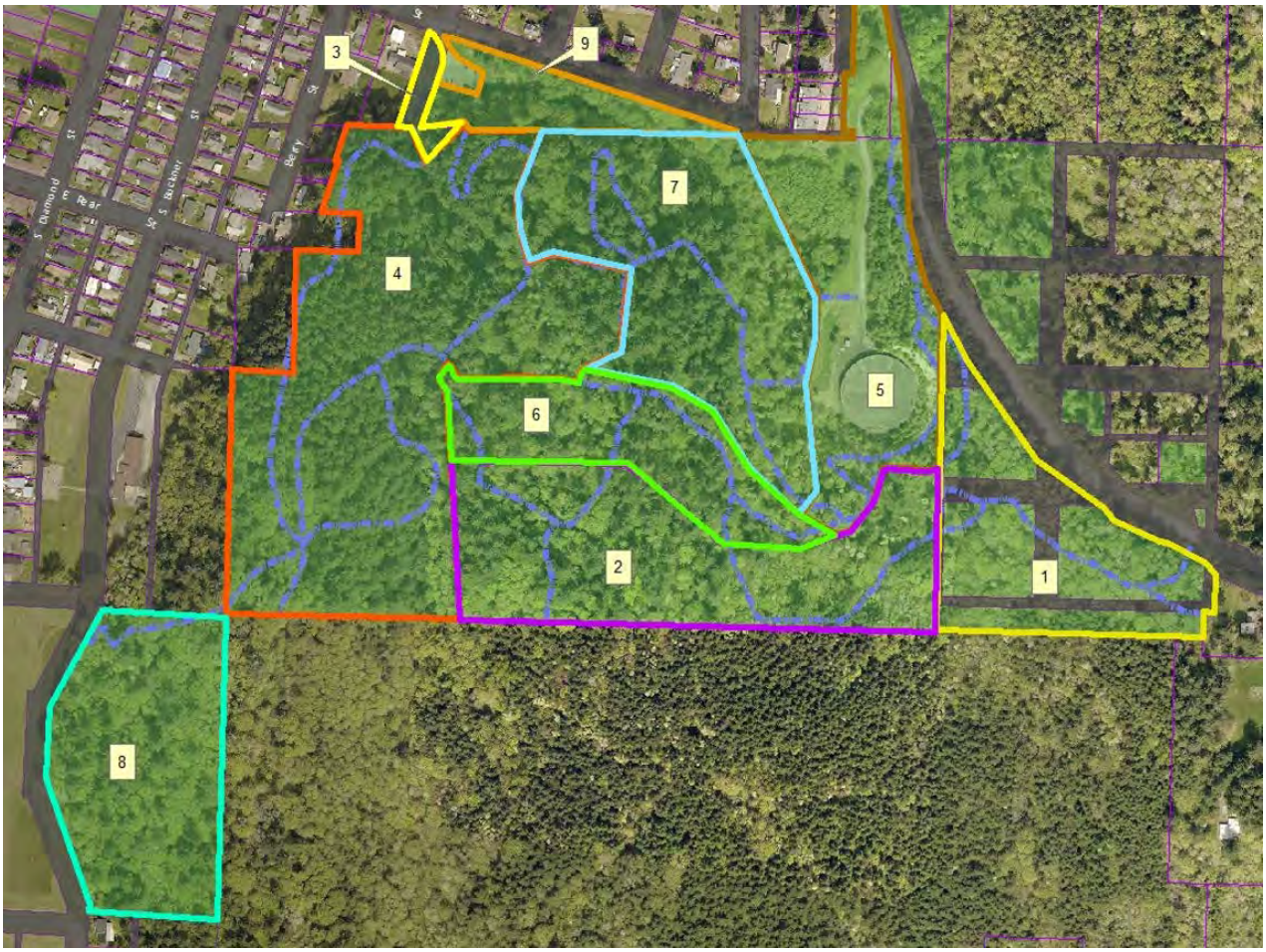

Figure 1: Aerial view of Seminary Hill Natural Area Stands.

Stand 1	**Yellow - east side (right) of park. logged in 1980**
Stand 2	**Purple - Ridge trail and boundary area**
Stand 4	**Red - Old woods**
Stand 6	**Green-blue - Kaiser Trail area**
Stand 8	**Green - Westside (left) of the park. Washington school trail**
Stand 9	**Orange - potential ADA accessible trail**

See Appendix VI for Forest Inventory data: Stand Data, criteria, maps of locations of stands

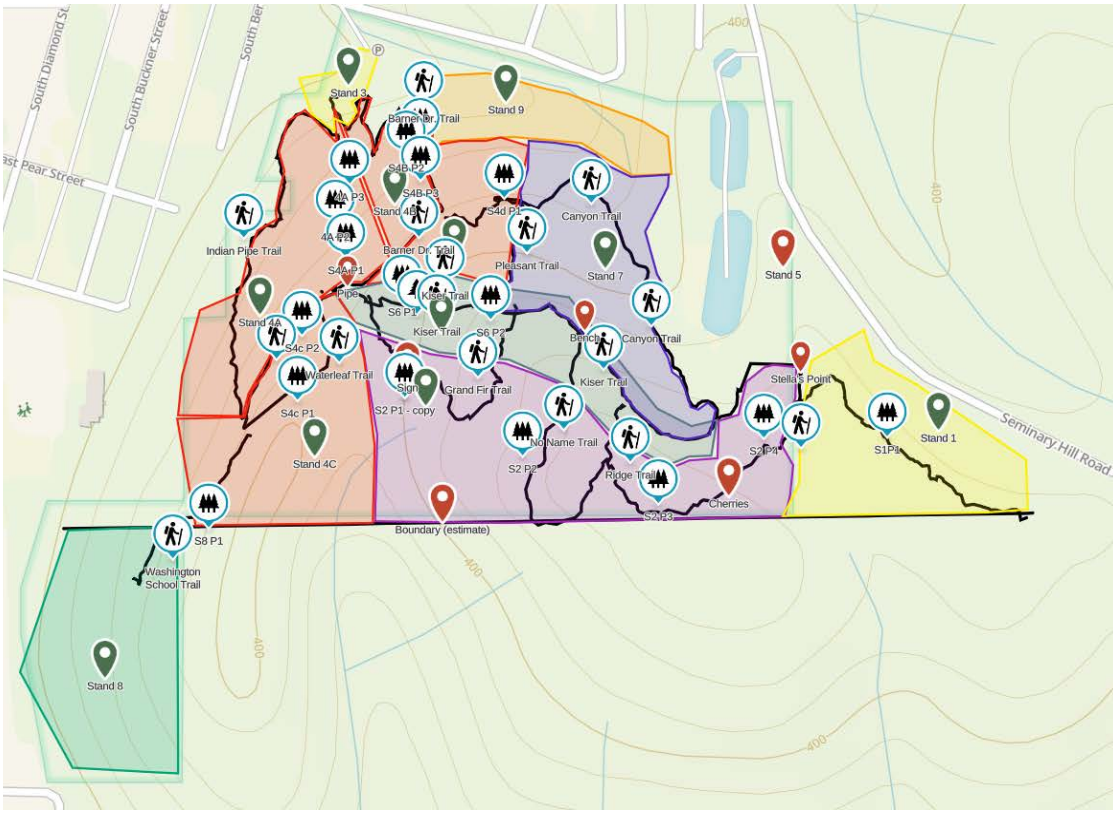

Figure 2: Stands and plots. Marked with GPS points. Stand markings above.

Stand 1 (5.8 acres): This stand encompasses the eastern side of the Natural Area. It was privately owned, logged in 1980 for Douglas fir and sold to a private owner. In 2000, two parcels of land were donated, one by Stellajoe Staebler, and a second by co-owners William Conrad and Larry Edinger. Over 40 years the stand has regenerated from the logging of Douglas fir. The regrowth is predominantly bigleaf maple, red alder, vine maple with 320 trees per acre. In the plot was a multi-trunked (6) maple. The diameter of the tree trunks was 7-13", height was 45 feet. Maples in this area are large. Bigleaf maple, red alder and vine maple are scattered throughout the stand and trees are adequately spaced. Red alders and vine maples are old and likely reaching the end of their lifespan. As red alder continues to die out, bigleaf maple will persist and become the dominant overstory species. A few Grand fir are regenerating along the trail where the ground is free of forest debris and the trees are getting adequate sunlight for the species. Summary of all Plots:

Tree Species	Height	Diameter
Big leaf Maples (6 trunks)	45’	7”-13”
Big Leaf Maples (6 trunks)	45’	7”-13

A healthy understory flora layer consists of high levels of sword fern, salal and Oregon grape, and traces of bracken fern, licorice fern and honeysuckle. Also present are snowberry, foam flowers, star flowers, baneberry, fringe cup, sweet Cecily, false Solomon’s seal, Hooker's fairy, Indian plum and trillium. The understory is dense. Summary of plot.

Site index for soils in this stand is a combination of 120 (167-Prather silty clay loam, 0 to 5 percent slopes), 140 (42-Centralia loam, 0 to 8 percent slopes) and 135 (43-Centralia loam, 8 to 15 percent slopes). No evidence of forest health issues was found in this stand.


Figure 3. Stand 1, plot 1

Stand 2: (8.25 acres) This area has been subjected to many historical events that changed the type of trees and shrubs that have regrown in this stand. It was divided into 5 sections to gather data that would reflect these conditions and determine future management goals.

Plot 1: trees are more indicative of Plot 4 Old Woods (Douglas fir, bigleaf maples, Western redcedar and red alder). Plots 1 & 3: In 1989, a blowdown occurred from logging on the adjacent property. This stand contains a diverse mixture of conifers and hardwoods (Douglas fir, red maple, Grand fir, Western redcedar, vine maple, Pacific dogwood, bitter cherry, and beaked hazelnut). Plot 3, the Ridge Trail, has recovered from a blowdown in 1989 with hardwoods (predominantly red alder, vine maple and bigleaf maple with a few bitter cherry, Pacific dogwood and cascara.

Plot 2: has a mixture of Douglas Fir, Big leaf maple and vine maple. It has recovered from the 1990 blowdown.
Plot 4: in 1940 a road was built to construct an antenna with an adjacent building. Trees and shrubs were removed and other trees and understory disturbed. Subsequent regrowth was primarily red alder, vine maple, a few bitter cherry and Pacific dogwood. Several Grand firs are regenerating. Plot 4: is a mixture of high levels of ground and aerial English ivy and English holly and in other areas trace amounts.
Summary of all Plots:

Tree species	Height	Diameter
Douglas fir	48' - 45'	47" - 8"
Grand fir	100' - 87'	43" - 38"
Big leaf maple	77' - 36'	21" - 7.5"
Western redcedar	65'	19.5"
Hazelnut	25'	4"

Trees per acre: 320. Douglas fir height ranged 48-45', diameters ranged from 47" to 8". Grand fir height range: 100' to 87', diameter 38". Bigleaf maples ranged from 77' to 36'. Diameter 21"-7.5"

No evidence of forest health issues was found in this stand.
Site index: for 1/4 of the area is 140 (42-Centralia Loan 0-8% slopes) , and 3/4 of the area is 135(43-Centralia loam, 8 to 15 % slopes).

In all plots there is a healthy understory layer consisting of high amounts of waterleaf, sword fern, Oregon grape and Vancouveria. Trace to medium Indian plum, trillium, false Solomon's seal and vanilla leaf. Plots 3-5 also contain bedstraw, mountain blackberry, vetch, snowberry and huckleberry. The understory is dense. Non-native plants: Plot 1-2: English holly and ground and aerial English ivy levels are high. Plot 3: ground and aerial English ivy, English holly, grasses contained trace amounts of growth.

Stand 4 (24.6 -acres). Called the "old woods" since it has not been logged since the late 1890s to early 1900s. It encompasses the primary region of the Natural Area. It was divided into 4 sections to gather data and determine future management goals. This stand consists of a relatively undisturbed second growth mixture of Douglas fir, western redcedar, bigleaf maple, vine maple and red alder. Plots 1,2,3 and 4 ranged from 350 to 200 trees per acre, averaging 250 trees per acre. No evidence of forest health issues was found in this stand.

Summary of all Plots. Douglas fir heights ranged from 159' to 19', Diameters ranged from 43" to 15". Bigleaf maple heights ranged from 140' to 40'. Diameters ranged from 43.5" to 8". Western redcedar height was 65'-40'. Diameter ranged from 21"-11.8". Plot 4C had the regeneration of 2 small Grand firs.
Summary of all Plots:

Tree species	Height	Diameter
Douglas fir	159' - 19'	43" - 15"
Red maple	140' - 40'	43.5" - 8"
Western redcedar	65'-40	21"-11.8".8

There is a healthy understory layer consisting of high to moderate levels of sword fern, moderate levels of Oregon grape, waterleaf, licorice fern, trace amounts of rose, Vancouveria, trillium. Also present are Solomon's seal, rose, elderberry, Indian plum, salmonberry and thimble berry. Non-native plants: Plot 4B: the ground and aerial ivy have been removed allowing for regeneration of understory trees, plants and shrubs. Plot 4A: 1/2 of the ground and all of the aerial English ivy has been removed allowing for regeneration potential. In Plots 4C & D: moderate to high levels of ground and aerial English ivy present. Trace to high levels of English holly were found in all 4 plots.

No evidence of forest health issues was found in this stand.
Site index: for 3/4 of the area is 133 (27-Buckpeak silt loam, 30 to 65% slopes), for 1/4 of the area 135 (43-Centralia loam, 8 to 15 % slopes).

There is significant pressure from walkers and homeless people going off trail in Plots 4A/B since the ivy was removed.

Stand 4C, plot 2

Stand 6 (6.7 acres) This stand parallels the Kaiser Trail.
Originally, it was an old road. Now it is the major east-west trail in the Natural Area. Pre-1920s it was a wagon road. In the 1930s the WPA built a road to the center of the Natural Area for transport of goods/equipment. During the 1940s, the road was used by the military to guard the reservoir. In the 1960s, the City of Centralia used the road to mow the center area for Girl Scout camping. The road building removed Douglas firs, other trees, and shrubs. Along the trail, bigleaf maples, vine maples and red alders have regrown. The stand averages 275 trees per acre.
Summary of all PLots

Tree species	Height	Diameter
Douglas fir	87' - 82'	43" - 21"
Red maple	60'	19" - 8"

There is a healthy understory layer consisting of high levels of waterleaf, Oregon grape and sword fern. Trace to medium levels of Indian plum, bedstraw, thimbleberry, Vancouveria, rose, and licorice fern. Non-native plants consist of high to medium levels of ground English ivy and English holly and high levels of aerial English ivy.

No evidence of forest health issues was found in this stand.
Site Index: 1/3 of the eastern stand is 140 **(**42-Centralia loam, 0 to 8% slopes), 2/3 of the center part of the stand is 135 (43-Centralia loam, 8 to 15% slopes).

Stand 6, plot 1

Stand 8: (9.87 acres) This stand was logged for Douglas fir. Date unknown. The trees consist primarily of bigleaf maples, vine maples and Western redcedar. This stand now contains a trail to an elementary school and is used by the students.
Summary of all Plots.

Tree Species	Height	Diameter
Bigleaf maple	75'	29" - 24"
Western redcedar	42'	18”

There is a healthy understory layer consisting of high levels of waterleaf, sword fern and salal. Trace to medium levels of vanilla leaf, mountain blackberry, Indian plum, thimbleberry, Hooker's fairybells, and licorice fern. Non-native plants consist of medium levels of ground English ivy and trace levels of English holly. No evidence of forest health issues was found in this stand.

Site index: 133 (27-Buckpeak silt loam 30-65% slopes)

Stand 9 (.74 acre*)* A field beside the entrance parking lot was purchased in 2014. The field's perimeter has Western redcedar and red alder and one small oak tree. An accessible trail is in the planning stage. The height of Western redcedar is 55'. Diameter 23.3". The plant understory consists of high levels of native horsetail. Trace to medium amounts of moss, bedstraw, sword fern, licorice fern, moss and Western buttercup. Non-native plants included high levels of canary grass, medium levels of bindweed (morning glory). Medium levels of Himalayan blackberry, ground English ivy and English holly.

The field will be cleared for the ADA trail installation.

Tree Species	Height	Diameter
Western redcedar	55"	23.3"

MANAGEMENT PRACTICES:

There are currently no harvest objectives. Any management practices/activities will be to maintain stands in a healthy trajectory towards a mature or old growth forest.

Stand 1: As the red alders and vine maples die out, no conifers will be replanted. Bigleaf maple and Western redcedar will become the predominant tree species. Shade-tolerant Grand fir will also regenerate where possible. Management objectives will be directed toward removing non-native plants (ground and aerial English ivy and English holly). The trail will be maintained. This trail is not used as heavily as other trails. Trees that fall across the trail will be removed and placed in the forest.

Stand 2: Management will require monitoring for invasive species and forest health issues (drought stress, bigleaf maple decline, root rot). The trail will be maintained. This trail is not used as heavily as the other trails. Trees that fall across the trail will be removed and placed in the forest.

Stand 4: Management will require monitoring for invasive species and forest health issues (drought stress, bigleaf maple decline, root rot). 4A: The remainder of the ground ivy will be removed when a crew is allowed to work, respecting Pandemic precautions. Aerial ivy has been removed from most of the trees in this stand. Two acres of English ivy was removed in

2014 and 2015 with DNR grants. Both areas were monitored yearly for 3 years following the protocol established under the grants. Planned monitoring is every 4 years. Last monitored in 2021. Only minimal ivy was present and removed. Also monitored for regeneration of trees, shrubs, and herbaceous plants and other invasive species. The interior of the forest will be monitored for homeless camps, other intruders, fires, bark removal, damage to the trees and other forest health issues.

Removal of English holly with chemicals is necessary and removal must be completed by licensed personnel. EZ chemical injection will be explored. The Indian Pipe Trail will be maintained to keep walkers on the trail. The embankment will be monitored for erosion and replanted with sword fern and Oregon grape to maintain the embankment stability.

4B: The English ground and aerial ivy has been removed. This has allowed for the regeneration of trees, shrubs, and herbaceous plants. It will be monitored for regrowth of English ivy every 4 years as planned. The last monitoring was in 2020. Only minimal ivy was present and removed. Removal of English holly is a 2nd priority. Due to the clearing of the ground ivy, homeless camps and other intruders enter the interior of the forest. The forest is at risk for fires, bark removal, damage to the trees and other forest health issues.

4C-D Little management is required to maintain the objectives. Monitoring is required to maintain the stand components and health.

Stand 6 and 8: Management and monitoring, as stated above, are required to maintain the objectives.

Stand 9: An ADA accessible trail will be built. It is in the planning stages. The field will be cleared before the plan can be implemented. Appropriate trees and shrubs will be planted after the trail is completed. At the eastern end of the ADA trail, there is a primitive trail leading to the Canyon Trail. With the increased use of the trail by disabled and nondisabled visitors, the primitive trail needs to be built as a permanent trail connection to the Canyon Trail.

Site index is .9, which indicates high potential for tree growth.

See APPENDIX VI: TREE STAND DATA. DATA OF NATIVE AND NON-NATIVE PLANT

RESOURCE CATEGORY V – PROPERTY ACCESS/ ROADS AND TRAILS

Forest roads and trails are an important component to a well-managed forest. Properly constructed and maintained roads and trails ensure future access, reduce long-term costs, help minimize soil erosion and protect forest productivity, water quality and fish/wildlife habitat. The Chehalis River Watershed is a highly productive, prime location for growing timber and therefore, contains a high density of forest roads used primarily for logging purposes. Roads occur within all ownership types and at all elevations across the watershed. An extensive forest road system combined with relatively steep slopes and high levels of annual rainfall present an increased risk of erosion, sedimentation and mass wasting (Chehalis River Basin Flood Authority, 2010). Road building within areas of the watershed may require special design and/or additional annual maintenance.

The 1999 Salmon Recovery Act required all forest roads on state and private lands to meet forest road construction, maintenance and abandonment standards of the 2001 Forest Practices Rules and Regulations. In order to assist landowners in meeting these standards, the road maintenance and abandonment checklist (Checklist RMAP) was developed for small forest landowners. The Checklist RMAP is a brief assessment of certain characteristics on roads actively being used for forest practices activities.

Regular inspection and maintenance of forest roads are important to ensure proper function and good working condition. Properly functioning roads reduce the potential for erosion and sedimentation, cut down on long-term costs and ensure future access.

Management Recommendations

- Inventory and monitor roads annually for maintenance needs.
- Manage brush and encroaching vegetation along roadsides. *Daylighting* these areas will help reduce the incidence of ponding water and moisture on the road surface.
- Maintain ditches and other drainage features in good operation at all times.
    - During the rainy season and after significant rain events, inspect drainage structures to make sure they are functioning properly.

ACTION STEP►

PURPOSE OF TRAILS AT THE NATURAL AREA

The purpose of the trails is to offer a high quality trail experience for recreational walking/hiking/running, to provide monthly educational events ("Walks and Talks"), to monitor the forest, to enjoy the forest and its flowers, for photography and art, to access the forest for research, and to be a laboratory for science at Centralia College, as well as other designated uses.

HISTORY

The Seminary Hill Natural Area is designated an Urban Forest.

1935-36: Trails were developed by the WPA in Forest Park (later named Dry Park). Other projects: bridle trails, a picnic shelter, an access road were built and some clearing of trees.

1940: Temporary military (National Guard) camp. A narrow gravel road was laid from Seminary Hill Road to the top of Dry Park (central area).

1940-1950s: Deterioration of earlier work through neglect and abuse by ATVs and motorcycles.

1960-1980s: Central area was used for Girl Scout Summer Day Camp activities and other projects. They utilized the trails already laid down and the gravel road laid by the WPA. The City of Centralia, using the gravel road, accessed the central area and mowed the area for

camping. A water pipe had been laid in this area but was unusable. Deterioration of the trails continued through neglect and abuse by ATVs and motorcycles.

1980: Citizens petitioned the City of Centralia to designate the property as a Natural Area. The Friends of Seminary Hill Natural Area formed, took over management of the Natural Area and have continued to the present time. Preservation efforts were initiated where the trails were eroded or degraded with deep grooves that made them unusable for walking/hiking.

The Friends rebuilt the trails, leveling and installing steps where needed. 16 steps were placed on the slope of the front entrance, using railroad ties. To further protect the Natural Area, all trails were declared "foot traffic only". The trail was closed to motorized and wheeled vehicles such as bikes, though bikes continued to be a problem. The water pipe was capped and the central cleared area was left to regenerate naturally. It was not replanted with trees or other shrubs. Additional trails were developed and added to the Seminary Hill Natural Area as preservation activities continued.

1980s and ongoing: Annual educational programs of “Walks and Talks” were sponsored by the Friends of Seminary Hill Natural Area including: wildlife, flowering plants, bird watching, nature photography, forestry, regional geology, forest poetry, music, etc. Further, laboratory use of the area is made by the botany and engineering faculty of Centralia College and by teachers of local school districts.

1984: Washington School Trail developed to Washington Elementary School by Eagle Scouts.

1989: Clear-cut of privately owned (Latimer) property on the south side of the Natural Areal changed the old trail network.

1990: Rebuilding and restoring trails initiated.

1991: Collapse of the 1914 reservoir and damage to the 1925 reservoir caused extensive damage to trails.

1991-1993: Rebuilding and restoring trails initiated and continues.

2019: Washington School Trail rebuilt by Boy Scouts.

2019: Educational and Historic information signs, designed and funded by the Washington Military Cultural and Historical Departments, were placed at the entrance to the forest trails.

2020: A portion of the Canyon Trail and a portion of the Grand fir trail rebuilt.

2020: Lewis County Noxious Weed Control Board 1) installed a "boot brush" station at the entrance to the forest to remove invasive weed seeds. 2) an informational sign to discuss its use and importance.

2021: A railing was placed adjacent to the steps from the Kaiser Trail leading to Staebler Point.

2021: ADA trail planning. To be built in the field adjacent to the parking area. Estimated completion: December 2022

ACCESS: Access to the property by the public is restricted to maintain the ecology of the forest and to keep the property in the best condition possible.

1) North: Main entrance. A city road, Locust Street, enters the gravel parking area. A big sign indicates the main entrance. No other roads enter the Natural Area. Access is controlled by the 9 formal designated trails that begin from the parking area. The parking area is fenced to restrain visitors from creating their own starting points. The exception: Visitors have created a non-designated trail from the parking area to the Canyon Trail by going behind the fence, causing erosion and landscape degradation. A sign is posted to prevent this, but is ignored.

2) East: a) An old entrance off Seminary Hill Road. There is no sign. Parking for 1 car.
b) 3 landowners have trails into the east side of the Natural Area.

3) South: a) Informal trails from Salzer Valley Rd through 74 acres of private ownership forest. There are no houses on this acreage.
b) Washington School Trail: a designated trail used primarily by elementary school children during the school year.

See APPENDIX VII for more information regarding Property Access/Roads and Trails.

TYPES OF TRAILS

Trail System: Seminary Hill Natural area includes several types of trails. 1) Loop trails permit the user to begin and end at the same location without repeating any part of the trail. 2) Linear trails lead to a destination, such as the Washington School Trail. 3) Stacked loop trails (a series of interconnected loops) permit users options for different distances, routes, or destinations.

Length: 2.5 miles. Elevation: 150 to 500 feet.

Surface: Mostly clay soil, with some gravel embedded on the Kaiser Trail and a section of the Ridge Trail from an old gravel road.

Width: The Kiser, Indian Pipe and Barner Drive trails are sufficient width for multiple people to walk on our Spring/Summer “Walks and Talks.” Other trails have a one-person width.

Signage: A large metal sign indicates the trails at the main entrance. Trail maps are available from a Map box at the entrance. (See signage section below)

TRAIL USAGE

1) Winter: the trails are lightly used due to inclement winter weather conditions. In addition to rain and wind, the rain water puddles on the trails and the clay soil turns to mud causing slippery trails posing a risk factor for safety. The exception: during the school year the

Washington School Trail has heavy usage, Monday through Friday, from the elementary school children. This trail was rebuilt in 2019 to provide safety for the children and to protect the environment.

2) Spring: the trails are used moderately when the wildflowers bloom. In April the Friends of Seminary Hill Natural Area begin their monthly community educational events starting with the Earth Day clean up. Usage depends on air and ground weather conditions such as dryness of the trails.

3) Summer and fall: the heaviest usage occurs due to good weather, drier trails, school is in recess, families and visitors seeking more outdoor activities and the monthly community educational "Walks & Talks" continue.

Thirteen wooden resting benches are at 13 specific locations on the main trails.

RISK FACTORS AND PROBLEMS

1) Inclement Weather Conditions**:** Trails are degraded by the long rainy season, including spring rains and cool temperatures that create water puddling, soil washing away, rivulets created in the trails, leaves and other shrubs on the trails, and steps that become pitted and/or slippery.

2) Informal trails lead up from Salzer Valley Road into the Natural Area. This creates paths that look like Natural Area trails. Risk factors: a) people take the trails and get lost b) the environment is degraded.

3) Informal trails increase in size with usage, leading more people to walk into the forest and damage the forest plants, trees, and shrubs. It also creates barren earth that is open to the growth of non-native plants, grasses, English ivy, English holly, Himalayan blackberry, and other invasive species. Blockage of the trails by tree limbs or signs has not been effective. They are removed by walkers and/or vandals within 2 weeks. A solution has not been found.

4) Embankment erosion occurs by visitors sliding down embankments and denuding the embankment. Others follow and increase the size and amount of soil erosion.

5) Standing signs must be placed to indicate a trail or mark the trail's correct direction to maintain hikers on the designated trails. Current trail markers are marble, placed in the ground at the trailhead, but can be difficult to see. Standing signs must be placed in concrete to prevent removal.

6) Bikes, especially during winter, cut deep grooves into the trail soil. A sign is posted "No bikes" but usually upper elementary, junior and senior high school students will ignore the signs.

7) Other Risk Factors: Some visitors follow informal trails and get lost. Some visitors get lost on the designated trails, even if they have a map. Injuries can occur from: sliding down an embankment, getting tangled in the plants and shrubs, slipping on the steps or trails before

the trails dry out, falling off an embankment, dogs not on a leash, occasional glass on the trails, smokers and smoking that can cause fires.

8) Other factors related to trail access.

- Camping by the homeless
- Other informal structures built inside the forest from tree limbs and other forest material.

See APPENDIX VII: For Trail Maps And Information For Building Trails

MANAGEMENT PRACTICES

- Inventory and monitor trails and the parking area for maintenance needs.
- Manage brush and vegetation encroaching along trails as it occurs.
- Maintain ditches and other drainage features in good operation at all times. During and after the rainy season inspect drainage structures to make sure they are functioning properly.
- Build water bars, boardwalks, or use other techniques that will be effective in draining water off the trails to maintain the integrity and structure of the trails.
- Repair trails to maintain the structure of the trail for visitor safety.
- Build new trails, if needed, using proper construction techniques.

RESOURCE CATEGORY VI – WILDLIFE

The best wildlife habitats are diverse, with a mix of tree size, composition, openings and well-developed layers of shrubs and forbs. The Chehalis River Watershed contains a variety of terrestrial and aquatic habitat types that support healthy populations of wildlife. Common large species found throughout the watershed include Roosevelt elk, Columbian black-tailed deer, black bear and cougar. Smaller species such as bobcat, coyote, raccoon, porcupine, rabbit, opossum and squirrel are also common. Reptiles include garter snakes, salamanders, frogs, and toads. Common bird species of this area include a variety of ducks, raptors, cavity nesters, song birds, owls as well as forest grouse.

The productive forests of the Chehalis River Watershed produce both high quality timber and wildlife habitat simultaneously. Silvicultural treatments can often be tailored to benefit both tree production and wildlife habitat. A key concept in wildlife management is forest succession. Forest succession refers to the process of ecological change in species and vegetative structure of a given location over time. After a disturbance such as logging, fire or wind damage, a series of predictable successional stages occur through the development of a forest. Each stage results in a different habitat for wildlife species. In a region dominated by even-aged Douglas-fir forests, maintaining a mix of successional stage habitats creates landscape-scale diversity. Within individual properties (stand-level), however, diversity may be increased or enhanced by creating small openings, retaining defective or dead trees (snags), leaving or creating down logs (coarse woody debris), retaining legacy structures such as wolf trees (large,broad, limby trees with spreading crown) or large stumps and/or encouraging/establishing mast (fruit and/or seed-bearing) producing vegetation.

To further enhance wildlife habitat, landowners may choose to manage for a multi-age forest or uneven-age forest system. This system manages a forest by selectively removing trees to maintain an uneven-age distribution. Uneven aged forests increase both horizontal (spacing) and vertical (multiple-canopy heights) diversity. These diverse stand conditions attract many species of birds and animals that utilize the increased plant diversity. This type of management, however, is not common in the Pacific Northwest where Douglas-fir shade intolerance requires even-aged reproduction. An uneven-age system may be more applicable and economically viable for small forest landowners in comparison with large commercial timber producers.

See APPENDIX VIII for more information regarding Wildlife and Birds on the Natural Area.

Management Recommendations

- Monitor stand density to ensure a healthy level of shrub and herbaceous understory species. Thin within areas where crown closure may have reduced available light. Monitor young stands for crown closure and thin prior to reductions in understory vegetation.

- Increase coarse woody debris by way of brush piles and/or large down wood. Retain a minimum of 4 down logs per acre with a minimum 12 inches small-end diameter.
- Create additional snag and cavity trees.
- Be cognizant of habitat fragmentation. Avoid forest practices activities that may negatively impact forestland connectivity. For more information about how to attract wildlife to your property go to www.woodlandfishandwildlife.com

ACTION STEP►

Resource Conditions:

The objective of the Friends of Seminary Hill Natural Area, since the formation of the Natural Area, has been to maintain the 2nd growth old woods (Stand 1) and the other stands in their natural state without harvest and within the strictures of the area also being a recreational destination for many visitors.

The forest is diverse, with a mixture of tree types, size, composition, openings and well developed layers of shrubs and forbs. Forest succession has occurred naturally and is an uneven-aged system created by the following factors: Stand 4 consists of 2nd growth Douglas firs, Western redcedar and bigleaf maple with some trees being 120 years old. Stand 1 was logged in 1980 for Douglas fir. In Stand 2C-2D the adjacent private forest property was logged in 1989, followed by a wind storm that blew down conifers and other trees. Stand 6 was logged and shrubs and trees removed to build a road with continued improvement in the 1930s, 1940s, 1960s-80s. Stand 8 was logged sometime in the past.

Except for Stand 4, predicable succession occurred in the other stands. Red alder was the first to grow, followed by vine maples. In Stand 2C, 40-50 three-year-old Douglas fir trees were planted. The starts were difficult to plant due to the slash and thickness of the understory. Few conifers survived. Another factor is the trails and visitor impact.
See Resource Category V: Trails section

The logging and wind damage opened up areas for more sunlight, all of which changed the type of flora growth. This has resulted in different habitats for wildlife species in the different stands.

These diverse stand conditions attract many species of birds and animals that utilize the increased plant diversity. Wildlife sightings are reported from visitors walking the trails, residents on the east side of the Natural Area, and people walking through the private property to the south. At times during the year the following have been identified: black bear, black-tail deer, coyotes, mice, squirrels, and red tail hawk. Forty bird species have been identified by our bird expert, but the Pacific Wren is the

most common bird observed and heard. Second is the woodpecker, though often visitors cannot identify which woodpecker species it is.

Since the park is a large Natural Area, shelter is available in the areas where visitors do not go. Many tree cavities are available throughout the park for birds, squirrels, and other wildlife. Brush piles have been established on Indian Pipe and Barner Drive Hills by piling branches to enable ivy removal. There are many large stumps, defective and dead trees, downed logs and snags available throughout the Natural Area. Many old Douglas fir, Western redcedar and bigleaf maple trees have developed large, broad, limby structures and spreading crowns that provide nesting sites and food.

There is an abundance of seasonal fruit and seed bearing vegetation for food, although water may be limited for some wildlife. During fall, increased bear activity is observed by scat or observation. The Natural Area has a broad variety of berries: snowberries, Oregon grape berries, thimble and salmon berries, cascara berries, wild huckleberry, Indian plum and salal berries. Seed plants include: conifers, bigleaf maple and other trees and shrubs.

Many wildlife corridors are available within the Natural Area and the adjacent private forest (74 acres) without obstruction for a total of 142 total acres. The trails, designated and non-designated, are used by wildlife and additional paths are made by wildlife. There are no roads or hunting in the Natural Area to restrict or cause harm to the wildlife.

Removal of ivy on the Barner Drive and Indian Pipe hills (Stands 4A-4B) has increased the openness of the landscape, increased native plant growth and the number of deer. Current ivy growth in stands 1,2,6 and 8 hampers food collection and mobility for wildlife and native plant regeneration. Wildlife damage in the stands has to be determined.

MANAGEMENT PRACTICES

- Brush piles have been established in the ivy removal areas. Further brush piles will be added when ivy is removed from areas designated in the timetable.
- Trees that provide food and shelter for wildlife will only be removed if the tree is a safety concern for visitors.
- English ivy will continue to be removed to allow wildlife to utilize the forest floor for food and mobility.
- A wildlife motion detection camera may be added for a period of time in a stand, and then rotated to the other stands on a timetable to determine the type of wildlife present and how different types of wildlife utilize the forest.
- There are sufficient tree cavities, large stumps, defective and dead trees, downed logs and snags available throughout the Natural Area.

RESOURCE CATEGORY VII - PROTECTION OF SPECIAL RESOURCES AND BIODIVERSITY.

Unique, Special and/or Important Sites

Unique, special and/or important sites are those identified by the landowner that are deserving of recognition and/or some level of protection (WA Integrated Forest Management Guidelines, 2017). Common sites include but are not limited to a unique tree, grove, large stump, habitat community, trail, water feature or other natural or man-made attribute on the property. These areas often require extra management consideration such as buffering or signage to ensure protection from forest management activities.

Threatened, Endangered, Candidate Species of Concern, Priority Habitat - Animal and/or Plant

The Endangered Species Act (ESA) defines an endangered species as one in danger of extinction and a threatened species as one likely to become endangered in the future. Protected species most likely to be encountered within the Chehalis River Watershed include the marbled murrelet and Northern spotted owl. Bull trout is the only federally listed fish species under the Endangered Species Act in WRIA 22 & 23 (Chehalis River Basin Flood Authority 2010).

Priority Habitats and Species or PHS are identified by the Washington Department of Fish and Wildlife as species and habitats that require protective measures for their survival due to their population, status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. PHS species include State endangered, threatened, sensitive and candidate species. Additional protection measures may be required for certain threatened and endangered species while conducting forest practices requiring an approved Forest Practices Application. The WA DNR Forest Practices Division will assist in identifying the presence of a threatened or endangered species on forestland.

Cultural Resources and/or Historical Sites

The Chehalis River Watershed contains a rich history of indigenous human activity as well as early pioneering settlements and homesteaders. Cultural resources and historical sites include archeological sites and objects; historic sites and objects; as well as traditional sites and objects used by Native Americans (Forest Practices Illustrated 2017). Examples of cultural resources may include human graves, settlement and traditional sites, culturally modified trees, shell middens, tools and fish traps. Examples of historical sites may include cabins, fences, mining/logging camps, roads/trestles, logging equipment, tools, pottery and cans.The WA DNR Forest Practices Division will assist in identifying the presence of a cultural resource or historical site on forestland. Identification of cultural or historical resources does not always mean forest practices must cease. Decisions are based on resource type, location as well as if the proposed activity will disturb the resource.

Biodiversity

Sites within the Chehalis River Watershed are capable of supporting a diverse mixture of vegetation. Species diversity occurs within each forest layer including the tree, shrub and

herbaceous layers. Diverse forests are less susceptible to negative impacts from forest pathogens and insects and are better able to withstand damage from abiotic events such as wind, drought or fire. Maintaining a biodiverse forest may significantly decrease impacts from common forest health concerns within the watershed.

Forests of Recognized Importance (FORI)

Forests of Recognized Importance or FORI represent globally, regionally and nationally significant large landscape areas of exceptional ecological, social, cultural and/or biological values. These forests are evaluated at the landscape level, rather than the stand level and are recognized for the combination of unique values, rather than a single attribute (e.g. National Parks). FORIs can also include such things as natural area preserves and conservation areas managed by government agencies and private conservation groups. Examples of potential FORI within the Chehalis River Watershed include the Olympic National Forest, Olympic National Park, State/County Parks, Natural Area Preserves, Natural Resource Conservation Areas or other identified forested areas of major significance.

Management Recommendations

- Identify and protect special sites pertaining to the property.
- Increase biodiversity via management decisions.
    - Avoid monoculture (single species) stands.
    - Plant a diversity of commercial tree species.
      Plant pollinator & mast producing vegetation.

ACTION STEP►

MANAGEMENT PRACTICES

Unique, Special, and/or important Resources

No unique, Special, and/or Important Sites in the Natural Area have been determined but may be in the future.

Threatened, Endangered, Candidate Species of Concern, and/or Priority Habitat - Animal and/or Plant.

At the time this plan was written (2021-22) there were no known threatened or endangered species or cultural resource protection issues on this property. A formal review to identify these resources, if any, and their potential protection requirements, should be conducted by the State Department of Natural Resources if and when the landowner proposes to conduct significant forestry activities which require a DNR-approved Forest Practices Application.

Cultural Resources and/or Historical Sites

At the time of this plan there were no known archeological and/or historic resource protection issues on this property. A formal review to identify these resources, if any, and their potential protection requirements, should be conducted by the State Department of Natural Resources if and when the landowner proposes to conduct significant forestry activities which require a DNR-approved Forest Practices Application.

The Department of Archeological and Historic Preservation (DAHP) has developed a cultural resource probability model. Essentially, it identifies areas as having a low to moderate risk of discovering a cultural resource. This property is identified as having a moderate to high risk of discovery. When conducting ground disturbing activities (such as road or trail building/improving, tree planting) be vigilant for the possibility of uncovering cultural artifacts. If any artifacts are discovered or suspected, contact DAHP at (360) 586-3065.

Biodiversity

The Natural Area supports a diverse mixture of vegetation. Species diversity occurs within each forest layer including the tree, shrub, and herbaceous layers. Because of the forest age and diversity, the Natural Area forest is less susceptible to negative impacts from forest pathogens and insects and is better able to withstand damage from abiotic events such as wind, drought or fire. This will significantly decrease impacts from common forest health concerns within the watershed.

When stands are assessed, the need for further information and the further need to plant shade tolerant conifers in order to establish a second cohort of trees amid the dense shrub understory and alder overstory will be determined.

Forests of Recognized Importance (FORI)

Seminary Hill Natural Area is a Forest of Recognized Importance (FORI). It is a 70-acre Natural Area preserved by the City of Centralia by a city ordinance. It is unique and the location is special as there are no other Natural Areas in the immediate region. It is surrounded by homes and a privately owned forest.

It is regionally important because it conserves a large tract of forest in its natural state and serves as a historical, social, educational, cultural, and biological standard. In 2015, the Natural Area received the Urban Forestry Stewardship Award given by the Washington Department of Natural Resources and the Washington Community Forestry Council.

Historical/Cultural: The Natural Area has a long history. It has been used by Native Americans. During the 1930s the WPA built projects. During WWII the military used the area. In the 1950-1960s the Girl Scouts used it as a day camp. All this happened before it was designated as a Natural Area in 1980. The importance of the Natural Area's history and culture was shown by the Cultural and Historical Department of the Washington Military, which designed and installed historical signs at the park entrance. The Natural Area preserves a historical record of second-growth forest, which has not been logged since the late 1800s to early 1900s. It remains a forest island with a distinct diversity of trees, shrubs, and

herbaceous plants that is valuable for carbon sequestration, as a wildlife preserve, as a sanctuary for local and migratory birds, as a community environmental education forum, as a recreation area and as a research lab. The Natural Area was also designed to be an aesthetic experience. As visitors enter the main entrance under the large trees, it is a place where they cross the threshold to a world of beauty.

Wildlife/Biological: It remains a forest island with a distinct diversity of trees, shrubs, and herbaceous plants that is valuable for carbon sequestration, wildlife habitat, as a preserve for migratory birds, community environmental education, and as a research lab. These diverse conditions attract many species of birds and animals that utilize the plant diversity. Forty bird species have been identified. It is a bird sanctuary for local and migratory birds.

Recreation/Social/Educational: The Natural Area offers a high quality trail experience for walking/hiking/running. The 2.5 miles of trail with 350 feet of elevation gain is used to lead free monthly community educational "Walk and Talk" events to identify and discuss the biodiversity of the flora and fauna on a variety of topics and to integrate all aspects of the Natural Area: wildlife, flowering plants, bird watching, nature photography, forestry, regional geology, forest poetry, music, etc. Visitors are able to enjoy the quiet and serenity of the forest, to admire the wildflowers, to photograph the exquisiteness, to read on a bench, to watch the seasonal changes, and to access the forest for monitoring and research. Thirteen wooden benches provide places to rest and enjoy the forest. Laboratory use of the area is made by botany and engineering faculty of Centralia College and by teachers of local school districts. It is also a place where visitors can walk by themselves, with friends, or with pets. It is open to everyone in the region.

Biodiversity Recommendations

1) Maintain and/or create distinct forest types into the future (age, species composition, and structure)

2) Protect from future harvest activities any residual unique older conifer trees, relic stumps, safe snags and downed wood, and wildlife-friendly brush species to the extent practical.

3) Important wildlife forage plant species (cascara, elderberry, Indian plum, beaked hazelnut) will be managed in such a way to keep them part of the forest ecosystem

4) The property owners will install several wildlife cameras to enhance their enjoyment of the property and to document the diversity of indigenous animal species.

RESOURCE CATEGORY VIII – AESTHETICS AND RECREATION

Across a range of ownership sizes, aesthetics & recreation consistently rank as the top reasons for owning forestland. Land managers are in a unique position to directly enhance the aesthetic and recreational value of their property. Management activities can simultaneously provide for profit, wildlife habitat, recreation and aesthetics.

Management Recommendations

- Inventory aesthetic and recreational features on the property. Develop a plan to improve, conserve and/or enhance these resources.

ACTION STEP►

Aesthetic/Recreational Resources:

The Natural area was designed to be an aesthetic experience. You walk into the main entrance under the large trees, with its branches overhanging the wood chipped path and steps, and it looks like a cathedral, regardless of the time of year. Whether it is the first bloom of the trees in spring, the grandeur of the trees fully leafed out, the wildflowers blooming in summer, or the yellow fallen leaves carpeting the forest floor in the fall, it is always beautiful and deeply moving. There is beauty even in winter with the barren, leafless trees that can look like a Gothic night.

The trails lead through a variety of trees, shrubs, and plants. From either the Indian Pipe Trail or at the wooden bench at Staebler Point you can view the city and distant hills. There is an opportunity to rest at any of the many benches and enjoy the beauty of the forest in a quiet, serene setting.

The recreational significance of the Natural Area is to offer a high-quality trail experience for recreational walking/hiking/running, for monthly community educational events such as "Walks and Talks" sponsored by the Friends of the Natural Area organization, to enjoy the quiet and serenity of the forest while walking a pet, with family or friends, admiring the wildflowers, photographing the exquisiteness, reading on a bench, or just watching the forest change over the seasons. It is also valuable as a place for forest research and as a laboratory for science students and professors at Centralia College.

MANAGEMENT PRACTICES:

- Inventory and monitor trails for maintenance needs.
- Manage brush and vegetation encroaching along trails.
- See Resource V Trails for Management Practices
- Provide monthly community educational programs ("Walks and Talks") to identify and discuss the biodiversity, flora and fauna in a variety of topics to integrate all aspects of the

Natural area: wildlife, flowering plants, bird watching, nature photography, forestry, regional geology, forest poetry, music, etc.

- To provide an outdoor classroom for children: learning biodiversity by collecting items from the forest and making art projects.

- Have an annual photography contest.

- Have trail maps and information at the trailhead.

- Continue to provide information and projects on the Natural Area website and other communication media outlets.

- Develop an ADA trail so more people can enjoy the Aesthetic/Recreational significance of the Natural Area.

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RESOURCE CATEGORY IX – CARBON SEQUESTRATION AND RESILIENCE TO CLIMATE/WEATHER-RELATED INFLUENCES

Carbon Sequestration

Carbon sequestration is the process by which carbon dioxide is removed from the atmosphere and held in solid or liquid form. Within forests, carbon dioxide is naturally sequestered or captured in trees through photosynthesis thereby reducing atmospheric amounts. Approximately 87 percent of the Chehalis River Watershed is forestland (Chehalis River Basin Flood Authority 2010). This area has been dubbed the "Wood Basket" of Washington and contains vast areas of state, tribal, federal and private forestlands. Opportunities to increase carbon sequestration within the watershed include ensuring adequate stocking after harvest, afforestation of non-forested areas, and enhancement of understocked areas to full stocking and avoidance or reduction of silvicultural burning.

Resilience to Climate/Weather-Related Influences

While the climate has always exhibited variability and major climatic shifts have occurred throughout geological history, warming this century is likely to occur 10 times faster than during any climatic shift in the past 65 million years (NOAA. U.S. Climate Resilience Toolkit 2016). In the coming century, average annual temperatures in Washington are projected to rise at a rate of 0.1 to 0.6 °C (0.2 and 1.0 °F) per decade. Although there is more uncertainty in projected changes in precipitation, in general, winters are projected to be wetter and summers are projected to be drier (Washington Biodiversity Council 2007). These changes will most likely affect forest growth over time. It is expected there will be changes to the length of the growing season, species (plant and animal) composition and distribution, water availability and duration and an increase in drought conditions during the summer/early fall months (Washington Integrated Forest Management Plan Template & Guidelines 2017).

Management Recommendations

- Ensure adequate stocking after harvest ,convert understocked areas to full stocking and avoid or reduce silvicultural burning.
- Afforest feral pastures.
- Manage timber on 40-60 year rotations.

3ACTION STEP►

Droughts were more common before the last 80 years, then became less common after the 1930s. The climate has been changing for the last 20 years. The climate will continue to warm especially after 2050, though in some areas it is warming faster than predicted. Droughts will become more common, more intense and last longer, creating more stress on trees, especially tree seedlings, shrubs and plants.

Some insects and pathogens will take advantage of the increasing stress on trees and plants. Fires will increase in frequency, intensity, the area burned and have a longer fire season. Multiple stress factors, not just one, will combine to create the effect or damage we will see in the Natural Area. One factor will give rise to the other factors. Drought will bring insects and fire.

Lewis County has had a serious drought for several years and a record drought period in 2021. How has this affected the Natural Area? In the fall of 2021 the bigleaf maples and vine maples had fewer leaves turning golden. Instead, the leaves are dying on the trees and then falling to the ground.

In our low elevation, westside forest moisture is limited during the summer. There is virtually no rain. The moisture in the forest soil accumulates during the winter/spring rainfall. Trees have adapted to this rainfall pattern. The Natural Area receives its moisture during the winter/spring months. The soil captures the water and retains it. Water is not captured in ponds and wetlands. Instead, the water runs downhill.

How will climate change affect the distribution, health, and species change in the Natural Area forest: according to studies cited by Dave Peterson, UW, some tree species are more tolerant to higher air temperature and low soil moisture. Trees that are more tolerant to these conditions in the Natural Area are Douglas fir, Western hemlock, Western redcedar. Hardwoods and conifers that tolerate low soil moisture are Red alder and understory trees: Western redcedar and Grand fir.

If trees are deprived of water, sufficient water will be unable to be transported within the tree layer to the crowns of the trees or will be delayed from reaching the top. The connected chains or columns pull up water to the crown. When drought stresses the trees and soil moisture is depleted, the columns break and water cannot be transported. Drought damage is seen from the top (crown) down.

The results will be slower and less vigorous growth for all trees including Douglas fir and Grand fir. They will become weaker. They will produce fewer seeds. Seeds will have more difficulty germinating and seedlings will have more difficulty developing, resulting in a decreased regeneration of trees.

Strengths of Current conditions

* The Natural Area's forest has a diverse composition of native plants/trees that are mature with stable root systems. Douglas fir and Grand fir are more tolerant of low soil moisture and higher temperatures.

* The trees are not overcrowded.

* The trees in the stands are healthy. As climate change weather intensifies, trees will die. This will allow the remaining trees access to the soil moisture that is available. It increases the water supply for those that are left. It will also provide additional habitat for wildlife.

* Diversity of the stands with conifers and hardwoods increases its resistance to the stresses of low rainfall, low soil moisture, disease, and increased pathogens. For example, hardwoods are resistant to conifer diseases. Red alder fixes nitrogen for seedlings to grow, some understory plants such as Western redcedar and Grand fir have increased protection. The diversity also decreases the risk for wildlife.

* Disturbances also decrease the risk from climate change. The last disturbance of the natural area was logging in 1980 in Stand 1 and a blowdown in 1989 in Stand 2. Tree growth for 30-40 years has created mature root systems and diversity. However, there is negative potential for additional disturbance from the adjacent private property logging.

* Older stock of trees are more resistant to fire.

* Some native plants are also drought tolerant: Oregon grape and salal.

* No commercial harvesting is intended for the property. The property will remain in its natural state. Removal of trees will occur if they endanger walkers.

* The Natural Area is an intact forest that enhances carbon sequestration. It is on a health trajectory toward old growth.

Diversity and a healthy stock of trees should provide considerable resilience as the effects of climate change progress. Douglas fir trees and other broadleaf trees such as bigleaf maple are more drought tolerant.

Risk factors:

* Disturbance: there is some danger from a blowdown disturbance in a wind event at the 300-500 foot elevation. This can occur if/when the adjacent private forest is logged.

* Wildfire is another factor that increases with loss of moisture in the trees and soil that promotes diseases. Wildfire is increased when visitors smoke on the hill or camp and build fires. Both are not allowed. Wildfires are increased with non-native plants. English ivy and English holly are highly flammable. Extensive ivy on trees, which is highly flammable, can create crown fires. The Natural Area has a significant number of trees with an extensive quantity of English ivy that put the trees at high risk for fires. Many trees are on steep slopes and pose a safety risk to volunteers who remove the ivy.

* Non-native plants absorb soil moisture which robs trees and native plants of water, keeps rain from striking the ground, prevents seeds from germinating and seedlings from growing, takes moisture from trees and plants that need the moisture to keep the forest healthy. The Natural Area has heavy English ivy and English holly growth that add to the increased risk in the health of the trees and plants that makes them more susceptible to climate change.

* The Natural Area supports a diverse mixture of vegetation particularly in all the stands except Stand 9. Species diversity occurs within each forest layer including the tree, shrub, and herbaceous layers. Because of the age of the forest and its diversity, the Natural Area is less susceptible to negative impacts from forest pathogens and insects and is better able to

withstand damage from abiotic events such as wind, drought, or fire. This will significantly decrease impacts from common forest health concerns within the watershed.

MANAGEMENT PRACTICES:

• At this time, Stands 1,2,4,6, and 8 except for the Risk management indicated above, little management is necessary to maintain a healthy forest during climate change and to enhance carbon sequestration, barring a major disturbance, large wind event or fire event.

• Remove stress on native vegetation by removing toxic non-native vegetation that robs native plants and trees of water and the soil of nutrients.

• Decrease wildfire risk by removing English ivy from trees.

• Monitor trees for increased insects/pathogens, English ivy, English holly and other non-native plants and unhealthy trees.

• If planting, use mulch. For example, add mulch after planting sword fern on an embankment or around tree seedlings.

Carbon Sequestration and Climate Change Management Recommendations.

1) If reforesting, a diversity of commercial tree species that are appropriate for the specific area and are more drought tolerant will grow with the advancing climate change. It is anticipated that the trees will be healthy and sustainable over the next 50-year period.

2) Stands will be maintained at a density level that prevents over-stocked conditions so trees will remain healthy and vigorous in their growth.

3) Forest management activities will minimize the amount of silvicultural burning in order to maintain carbon storage of downed wood.

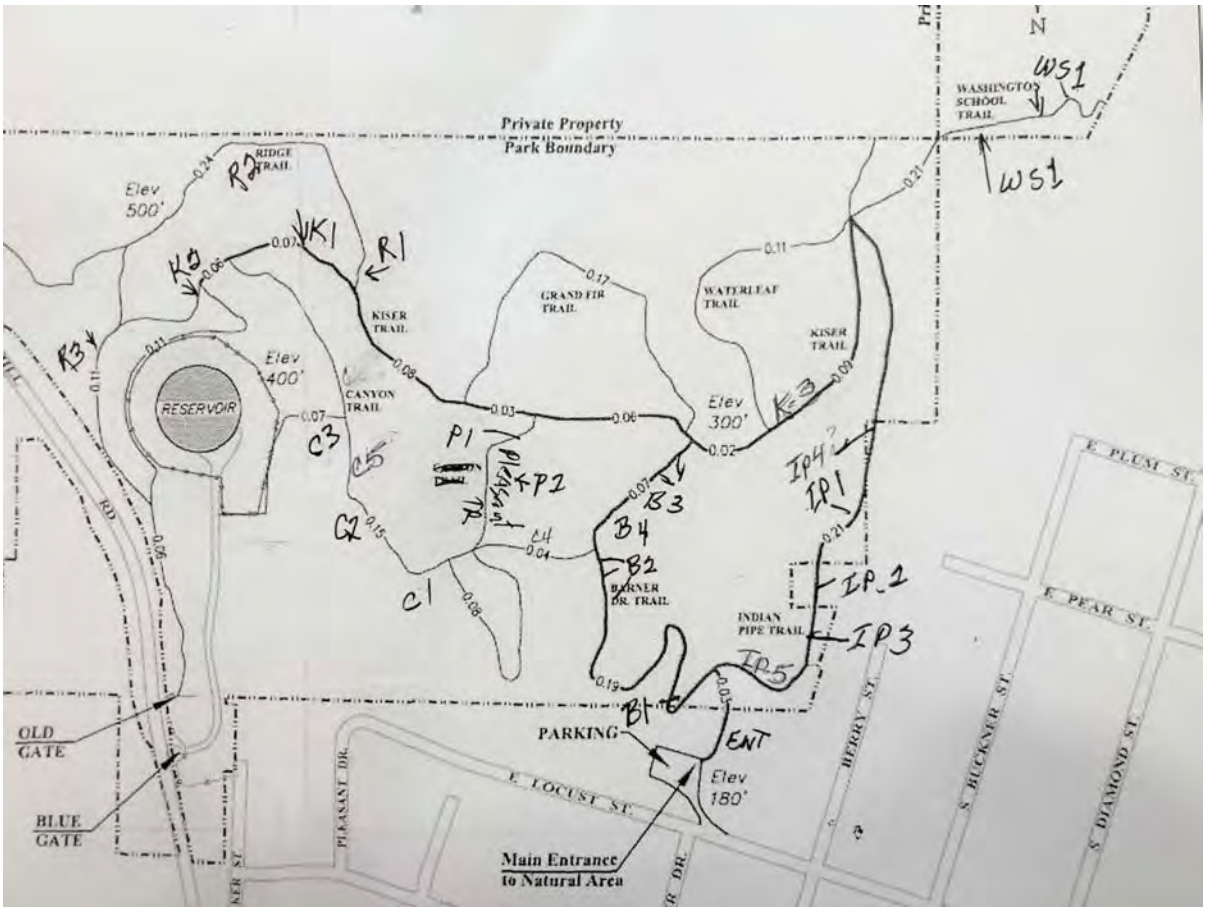
NOTE: *Climate Change and the Future of Biodiversity in Washington*
http://www.rco.wa.gov/documents/biodiversity/WA-climate-BiodiversityReport.pdf

VI. MANAGEMENT PLAN IMPLEMENTATION TIMETABLE

For the next 20 years indicate anticipated management practices/activities and estimated implementation year.

RESOURCE CATEGORY V - TIMETABLES
TRAIL WORK PRIORITY SCHEDULE
APPENDIX I

SEE MAP FOR CODE



ESTIMATED Implementation YEAR	LOCATION (STAND ID)	ACTIVITY	PRIORITY	COMMENTS Who will do the work	Year Completed
Immediate 2021	**Stand 8 Wash. School Trail**	**WS-1 Remove dangerous leaning tree**	**1**	**Work Party**	
Yearly	**Entry**	**Clean and replace bark and gravel**		**Work Party**	
Yearly 2) 2022, 2023	**4A Indian Pipe Trl**	**IP-4 1) Clear Culvert 2) Runoff pipe under trail - On hillside: dig down, hole, below pipe. Fill w/pea gravel, put cloth over pipe hole -prevent debris entering**	**11**	**Work Party**	
Yearly	**Stand 6 Kaiser Trail**	**K-5 Cut blackberries in triangle east of Pipe**	**1**	**Work Party**	
Yearly	**Any steps**	**Replace asphalt sheets on steps, when needed**	**1**	**Work Party**	
2021-2022	**Entry by fence**	**Prevent water running down hill, creating channel/ditch Dig out gravel, insert perforated 4"pipe, 3ft long**	**1**	**City - Dennis**	Dec 2021
2022 - January	**Stand 4A Indian Pipe Trail**	**IP-7 Section of Trail Embankment: Plant sword ferns, other native plants to retain soil. Add compost around plants.**	**1**	**Eagle Scouts**	Jan. 22, 2022

2022 - JUNE	Stand 4A Indian Pipe Trail	IP-6 Put in _____ Waterbars w/gravel on either side @ 30-45 deg. Take dirt from digging H2O trench in fill in runoff trench	1	City will furnish waterbars	
2022 - JUNE	Stand 6 Kaiser Trl	K-3 Put in _____ Waterbars w/gravel on either side @ 30-45 deg. Take dirt from digging H2O trench in fill in runoff trench	1	Eagle Scouts	
2022 - JULY	Stand 6 Kaiser Trl	K-4 "Lake" 2 areas * Dig a trench, put in pea gravel water runoff. OR *Temp: put rounds of logs across lake OR * Build a boardwalk after drainage	1	Eagle Scouts	
2022 APRIL	Canyon Trail	C-4 Cut back ivy from BDr trl to Pleasant trail.	1	WORK PARTY	
2022-2023 6-12 months	4B Barner Dr Trail	B-3 Replace/Repair Steps	1	WORK PARTY	
2022-2023 6-12 months	4B Barner Dr Trail	B-3 Replace/Repair Steps	1	WORK PARTY	
2022-2024 6-12 months	4A Indian Pipe Trl	IP-1 Add Steps. Remove dangerous roots in trail	1	Bruce Craig	
2022-2024 6-17 months	4B Barner Dr Trail	B-2 Add/ Replace Steps	1	WORK PARTY	

2022-2024 1-2 years	Stand 6 Kaiser Trl	K-2 Kaiser to Staebler Pt. Replace 8-10 steps	1	WORK PARTY	
2022-2024 1-2 years	Stand 2 Ridge Tr	R -1 Kaiser Trl & Ridge Trl intersection - Add steps	2	WORK PARTY	
2022-2024 1-2 years	4A Indian Pipe Trl	IP-2 Add height to wood block 2nd 6x6 RR tie. * Put rail on top, keep sliders out * Extend 6x6"- trail washing out	2	WORK PARTY	
2022-2024 1-2 years	Entry-slide area by steps	Place 6"x6" wood or logs crossways to prevent people sliding	2	WORK PARTY	
2022-2025 1-3 years	Canyon Trail	C-2 Add Steps, Add bulkhead. Put in 6x6 RR tie on West side, where trl canyon Trl cont. Prevents trail washing out.	2	WORK PARTY	
2022-2025 1-3 years	Canyon Trail	C-5 Widen trail, rebuild boardwalk	2	WORK PARTY	
2022-2025 1-3 years	Canyon Trail	C-3 Remove dangerous snag & tree	2	WORK PARTY	
2022-2025 2-3 years	Stand 4B Barner Dr Trail	B-1 Add Steps	3	WORK PARTY	
2024-2026 2-4 years	4D Pleasant Trl	P-2 - Add Steps (8-10)	3	WORK PARTY	

2024-202 2-5 years	Canyon Trail	C-1 Add boardwalks @ mud spots	3	WORK PARTY	
2025-2027 3-5 years	4B Barner Dr Trail	B-4 Remove dead/dying firs	4	WORK PARTY	
2025-2027 3-5 years	Stand 6 Kaiser Trail	K-1 Replace boardwalk	4	WORK PARTY	
2025-2027 3-5 years	4A Indian Pipe Trl	IP-3 Add Steps	4	WORK PARTY	
2025-2027 3-5 years	Stand 4D Pleasant Trl	P-1 Add Steps, Remove dangerous trees	4	WORK PARTY	
2025-2028 3-5 years	Stand 2 Ridge Trl	R -2 Add Steps, elevate low spot	4	WORK PARTY	
2025-2028 3-5 years	Stand 2 Ridge Trl	R -3 Ridge to Sem Hill Rd Widen trail, add steps or boardwalk	4	WORK PARTY	*
?	4A Indian Pipe trl	IP - 5 At slide area: * 1st 6x6" RR tie. Put rail on top * Extend 6x6"- trail washing out, keep sliders out		WORK PARTY	
2022 summer	Stand 9 ADA trail	Work on Trail will be initiated	1	WORK PARTY Bob Russell, leader	*
2022	Stand 9 Build new trl	Design new trail from the end of the ADA Trail to the Canyon Trail	2	FSHNA and a consult.	
2023-2024	Stand 9 Build new trl	Construct new trail	3	FSHNA, Work Party	

RESOURCE CATEGORY 1 - TIMETABLES
WORK PRIORITY SCHEDULED
APPENDIX I

FOREST HEALTH/WILDFIRE/INVASIVE SPECIES

ESTIMATED Implementation YEAR	**LOCATION STAND ID**	**ACTIVITY**	**PRIORITY**	**COMMENTS** **WHO WILL DO THE WORK**	**Year Completed**
INVASIVE SPECIES					
Every 3-4 years 2022, 2025, 2029	4B Bar Dr hill	Monitor ground/aerial ivy & remove new growth	1	Work Park-FSHNA -Volunteers	
2025, 2029, 2033	UGF 4A Indian Pipe hill	Monitor ground/aerial ivy & remove new growth	3	Work Park-FSHNA -Volunteers	
2022, 2023,2024	4A Indian Pipe hill	Remove ground/aerial ivy Outside the UGF area.	1	FSHNA-Volunteers LC work crew-if possible	
2022		Explore Holly injectable herbicide	1	FSHNA	
2022, 2023		Establish a holly research area for injectable herbicide & develop protocol	1	FSHNA	
1-2 times/year ??	6-Kaiser triangle	Cut or dig out Himalayan blackberries and other areas	1	Work Party	

2023, 2024	4C waterleaf trail area	Start removal ground/aerial ivy	3	LC work crew-if possible	
2024,2025	6 Kaiser Trl/Pleas- ant trai l	Start removal ground where aerial ivy has been removed	4	LC work crew-if possible	
2022		Research technique to decompose ivy in confined space on hill.		Mike Weigant	
TREES		See Monitoring below			
2023-2024	1	Research planting 50 trees in Stand 1.		FHSNA Consultant	
2022	4B BDTrl & Canyon	Remove Non-native laurel Tree		Work Party	
NATIVE PLANTS					
Yearly: 2022, 2023, 2024 Spring - Summer	4A Indian Pipe Embankment	After planting native plants, Monitor & apply compost yearly.	1	Work Party	
2022-2023		Obtain info on diseases/insects on Forest Health - make pamphlet.	3	FSHNA	
2022-2023		Evaluate forest Mgmt plan	3	FSHNA	
TRAILS					
2022-2023	All Trailheads	Install a sign indicating the trail	*2*	City-make signs City/FSHNA install	

MONITOR Yearly 2022: Form group and Train 2023: Yearly Monitoring	One Stand	Form a group, train to Monitor forest health, disease, dying trees, wind/fire damage, invasive species, human damage, climate change, public safety, illegal campersèsoil compaction, disruption, damage native plants/trees, non-natural materials	1	Volunteers who sign up	
Yearly with work parties	All stands	Educate volunteers/work party Be aware of soil erosion, while walking in woods, bringing seeds in trampling plants	1	Volunteers/work party	
2022-2023		Explore with City Access Rd to the hill from Seminary Hill Rd - for fires/safety		FSHNA	

RESOURCE CATEGORY II - SOILS

ESTIMATED Implementation YEAR	LOCATION (STAND ID)	ACTIVITY	Priority	COMMENTS WHO WILL DO THE WORK	Year Done
Yearly	All trails, embankmt	Educate volunteers - Be aware Of soil erosion, while walking in woods, bringing seeds, trampling plants	1	FSHNA-when starting project/work	

RESOURCE CATEGORY VIII- RECREATION TIMETABLES
WORK PRIORITY SCHEDULED
APPENDIX I

ESTIMATED Implementation YEAR	LOCATION (STAND ID)	ACTIVITY	Priority	COMMENTS WHO WILL DO THE WORK	Year Done
monthly April-Sept Every year community Educational programs "Walks and Talks"	All stands	To identify and discuss the biodiversity, flora and fauna in a variety of topics to integrate all aspects of the Natural area:	1	FSHNA lead event Guest speakers	
2x yearly, Every year. Provide an outdoor classroom for children	All stands	Learn biodiversity by collecting items from the forest and making art projects. Provide access to the trails to learn: stewardship, plant identification, etc	1	FSHNA lead event Guest Leaders	
An annual photography contest	All stands	Photos must be of Seminary Hill Natural Area. Photos used for yearly calendar, cards and hung in participating businesses	1	FSHNA sponsor Wanda Barlow Judging by 1 FSHNA member, 2 independent judges	
Yearly calendar And cards	All stands	Promote the Natural Area and earn funding.	1	FSHNA Sold in local businesses & at events	

Yearly Cups, T-shirts	All stands	Promote the Natural Area and earn funding.	1	FSHNA Sold in local businesses & at events	
As they occur Provide information, photos and projects info on Facebook & Instagram & the Chronicle		Advertise & Provide information on all events, either regular occurring events or intermittent to keep the members and the community informed.	1	FSHNA Megan Berry & Brian Mittge	
Yearly Brochure		Provides the goals of FSHNA. List the Walks/Talks date & topic. Includes a trail map in a Trail Box at the entrance	1	FSHNA Sue Beck	
Annual Meeting January or February		Provide FSHNA members on all aspects of the Natural Area and obtain their feedback.	1	FSHNA	

RESOURCE CATEGORY II - SOILS

ESTIMATED Implementation YEAR	LOCATION (STAND ID)	ACTIVITY	Priority	COMMENTS WHO WILL DO THE WORK	Year Done
Yearly	All trails, embankment	Educate volunteers - Be aware Of soil erosion, while walking in woods, bringing seeds, trampling plants	1	FSHNA-when starting project/work	

VIII. SIGNATURE PAGE

PLAN PREPARED BY (Primary author, if more than one):

_____
Signature Date

Judy Bell_____
Print Name

Project Coordinator: Judy Bell
Title: Project Coordinator

Friends of Seminary Hill Natural Area
Agency/Company

118 W. Maple St., Centralia Washington 98531
Address

360-330-7674
Phone

Plan Preparer Is:

Private Natural Resources Professional

☐ Agency Representative

☐ Landowner who completed Coached Planning Course

☐ Landowner who is a Resources Professional

List other professionals, and their affiliations, who contributed to this plan. If this was a "Coached Plan" list natural resource professionals who serve as "coaches".
Robert Godsey - Friends of Seminary Hill Natural Area
Renae Seegmiller - AAUW
Bob Russell Development

_____-p
LANDOWNER SIGNATURE: The contents of this plan are acceptable to me/us. I/we intend to manage this property in a manner consistent with the objectives of the Forest Stewardship Program and to implement this plan to the best of my/our ability.

_____
Landowner signature(s)
Date

Print Landowner Name(s)

APPROVAL SIGNATURE:
I have reviewed this plan and approve it as meeting the standards for a Forest Stewardship Plan.

_____
Signature of Agency Representative Date

_____
Print Name of Agency Representative Date
Titla

_____
Address Phone

REFERENCES

Chehalis River Basin Flood Authority 2010.*Flood Protection and Ecosystem Services in the Chehalis River Basin*. Earth Economics Tacoma, WA.

Forest Practices Illustrated 20F. WA State Department of Natural Resources Forest Practices Division Olympia, WA.

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Washington State Integrated Forest Management Plan Guidelines and Template 2017. Washington State Department of Natural Resources, USDA Forest Service, Natural Resources Conservation Service, WA Tree Farm Program, WA State Department of Revenue Olympia, WA.

www.woodlandfishandwildlife.com

Pamphlets

Cavity-Nesting Birds and Small Woodlands

Forest Bee Pollinators

Managing Forest Habitats for Migrant Songbirds

Amphibians in Managed Woodlands

Hawk, Eagle, and Osprey Management on Small Woodlands

Climate Change and the Future of Biodiversity in Washington

http://www.rco.wa.gov/documents/biodiversity/WA-climate-BiodiversityReport.pdf

ACKNOWLEDGEMENTS

- Robert Godsey: his wisdom, expertise, and historical knowledge of the history of Centralia and Seminary Hill Natural Area and for being an original “Friend” that helped save the Natural Area. He is a treasure.

- Renae Seegmiller: her invaluable computer skills helped me to put this document on paper.

- Judy Kennedy, Leah Wegener, Marlene and Guy Hodge: invaluable field crew that slogged through undergrowth 17 times to measure trees and document plants and shrubs.

- Judy Kennedy: developed a GPA map of the stands and all the trails.

- Kathy Tennyson: who encouraged me to develop this plan and started me on my way with resources.

- Bruce Craig and Ross Olson: laying out the trail work to be done

- Friends of Seminary Hill Natural Area: Sue Beck, Bruce Craig, Brian Mittge, Ross Olson, Michael Weigant, Ann Tuning, Megan Berry, Wanda Barlow, Evie Shinall

- Patrick Shults: Program Manager, Washington State University Extension, for his help and patience.

APPENDIX TABLE OF CONTENTS

APPENDIX I:

Landowner Objectives and Management Plan Implementation Timetable

_Landowner's Objectives

The overall objectives for the property are to manage for a healthy and sustainable forest that provides abundant wildlife habitat, biodiversity of plants and shrubs, a forested natural area as a protected enclave for the citizens of Centralia and the surrounding community, and provides an outdoor educational and research laboratory for educational institutions and other organizations.

Short term (next 5 years)

- The Friends of Seminary Hill Natural Area and Volunteers will support and maintain the Natural Area for the Centralia Parks and Recreation Department in all phases of use, maintenance, protection, and enhancement of the area
- Promote biodiversity and habitat conservation by protecting, maintaining, and restoring the biological diversity of native plants and shrubs
- Conserve the forest and maximize forest health to improve and enhance wildlife habitat for birds, mammals, and amphibians by maintaining snags and brush piles and providing designated trails
- Build and maintain designated trails throughout the property to facilitate forest management, provide for community education, research and participation in recreational activities
- Encourage use and conservation of the Natural Area by providing community education and participation through guided walks, written information and public events that highlight the plant and animal life and the ecology of the area
- Repair, maintain, and restore identified trails
- Provide signage for designated trails to prevent development of undesignated social trails
- Enhance the accessibility of the forest for walking and quiet enjoyment while making it difficult for wheeled vehicles (bicycles, ATVs, skateboards and other non-foot traffic) to access the property
- Control and remove English ivy, English holly, Himalayan blackberry and other noxious weed plants

- Maintain and restore native plant communities by replanting native plants after ivy removal

- Plant understory trees in Stand 1 (east stand) of property to facilitate growth of sustainable conifers when the alders' lifespan has ended

- Protect forests from harm due to theft of trees, vandalism, fires, campers, off-trail traffic, and trash through monitoring by volunteer efforts and by maintaining designated trails signs

- Work with adjacent property owners to promote the goals to protect the area around the natural area

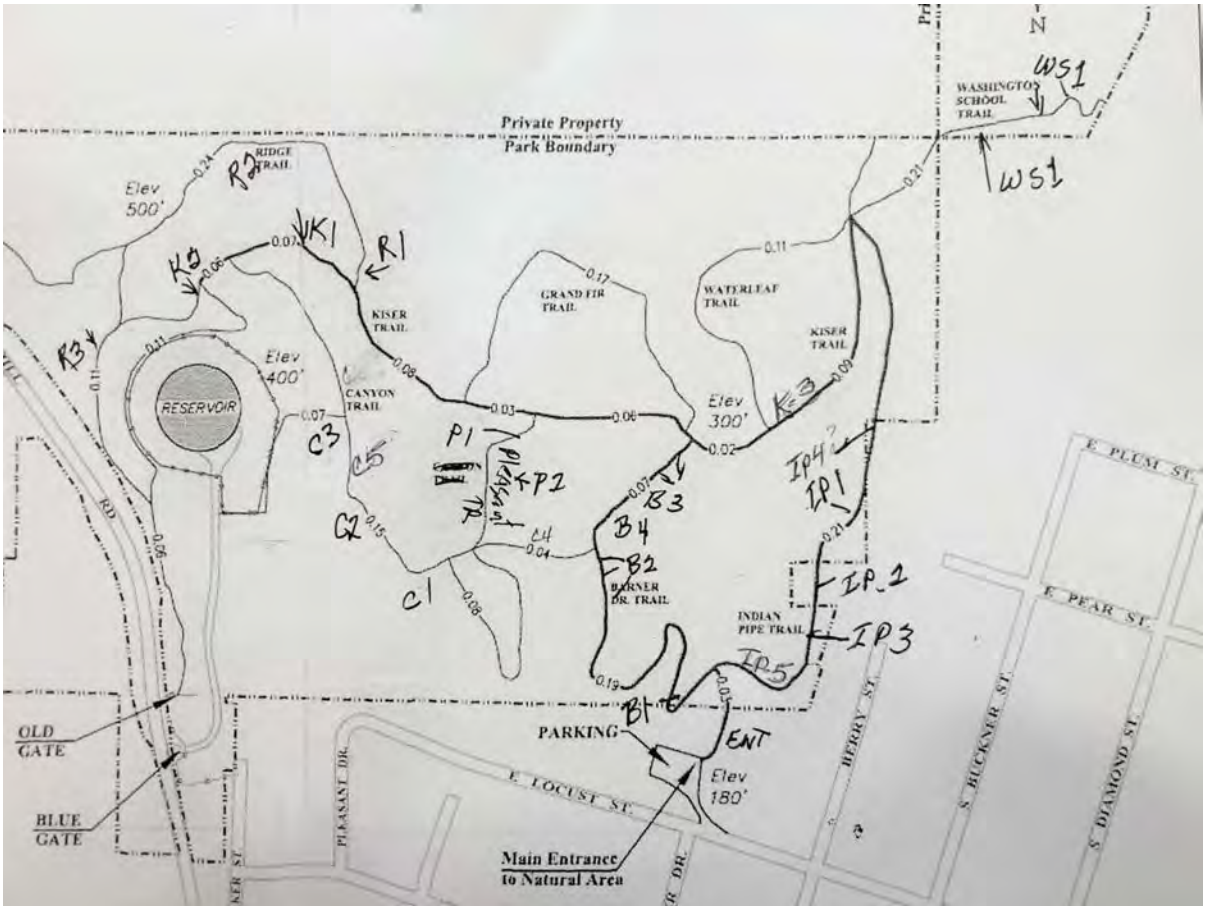
Long term (6 - 20 years):

Update this plan on a periodic basis (at least every 10 years or sooner when a significant event or change occurs necessitating changes to the plan). The President or Project Coordinator of the Friends of Seminary Hill Natural Area will send an updated copy to the City of Centralia's City Manager, Parks and Recreation Department, City Council, or any entity required by the City.

MANAGEMENT PLAN IMPLEMENTATION TIMETABLE

For the next 20 years indicate anticipated management practices/activities and estimated implementation year. ***See also*** **RESOURCE CATEGORY V - TIMETABLES**

RESOURCE CATEGORY V - TIMETABLES
TRAIL WORK PRIORITY SCHEDULE



SEE MAP FOR CODE

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RESOURCE CATEGORY 1 - TIMETABLES
WORK PRIORITY SCHEDULED
APPENDIX I

FOREST HEALTH/WILDFIRE/INVASIVE SPECIES

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2022		Research technique to decompose ivy in confined space on hill.		Mike Weigant	
TREES		See Monitoring below			
2023-2024	1	Research planting 50 trees in Stand 1.		FHSNA Consultant	
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Yearly with work parties	All stands	Educate volunteers/work party Be aware of soil erosion, while walking in woods, bringing seeds in trampling plants	1	Volunteers/work party	
2022-2023		Explore with City Access Rd To the hill From Seminary Hill Rd - for fires/safety		FSHNA	

RESOURCE CATEGORY II - SOILS

ESTIMATED Implementation YEAR	LOCATION (STAND ID)	ACTIVITY	PRIORITIES	COMMENTS WHO WILL DO THE WORK	Year Complete
Yearly	All trails, embankmt	Educate volunteers - Be aware Of soil erosion, while walking in woods, bringing seeds, trampling plants	1	FSHNA-when starting project/work	

APPENDIX II-A

Location Map, Project Area, Property Map, Acreage And Parcel Numbers

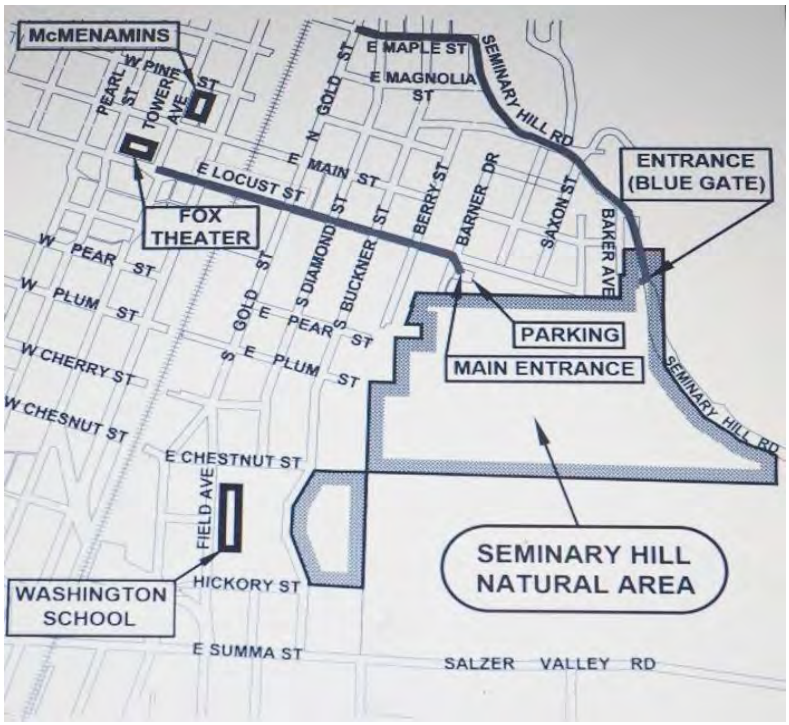


Figure 1: Location Map

Figure 2: Location of property within the section

Figure 3: Aerial photo of Seminary Hill Natural Area

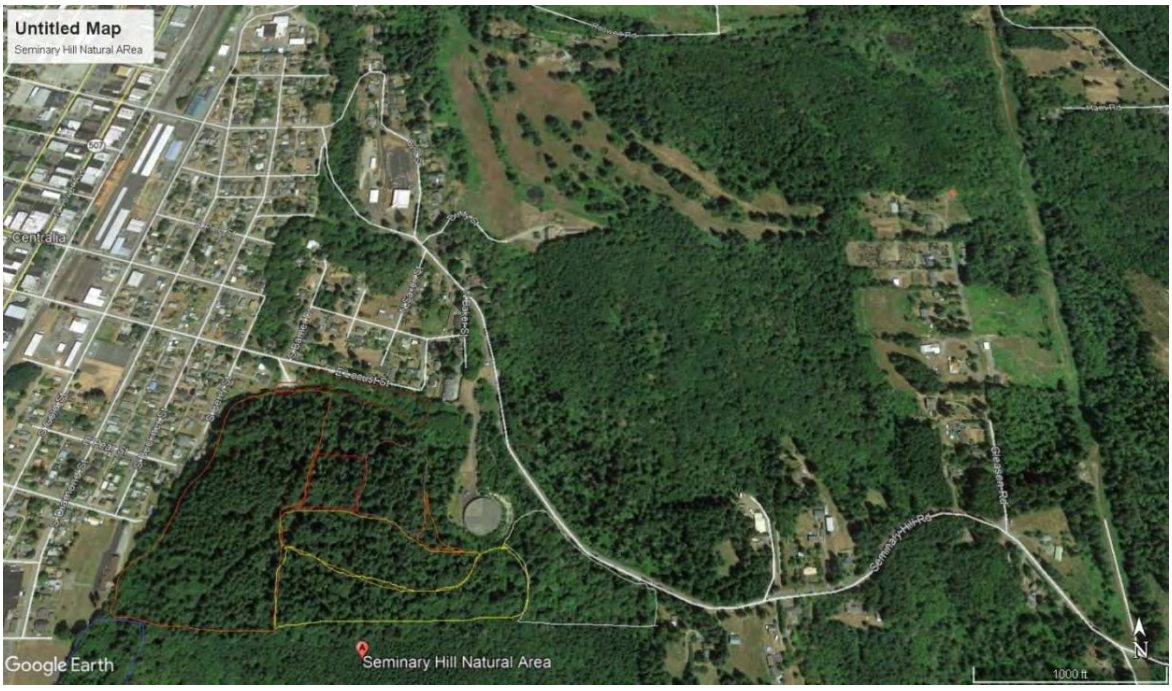


Figure 4: Aerial photo of Seminary Hill Natural Area and surrounding area

Parcel structure and location: The main acreage and parcels numbers

The main acreage and parcel numbers			
SEMINARY HILL Natural Area	Parcel	Acres	We are only including these parcels
Original Seminary Hill Natural Area	002842013003	52.6	
Washington School Parcel	003631001001	9.87	
Old Conrad/Edinger Property donated	8966000000	1.38	The old Conrad/Edinger parcels and the Steabler parcel are one large parcel of
Old Conrad/Edinger Property donated	008967000000	1.15	Property that is part of the park
Old Conrad/Edinger Property donated	008973000000	1.76	
Old Conrad/Edinger Property donated	8968001000	0.14	
Old Staebler property donated	021277005002	1.37	
Old Matson property Purchased by City	1358001000	2.2	2/3 (1.46 acres is parking lot)
			1/3 (.74 acres) A disabled trail will be built
		70.47	**Total in main natural area block**
Donated Property	8969000000	1.93	These donated parcels are across Seminary Hill Rd. They are considered part of the natural area but are non-contiguous to the main natural area, and are not considered in this forest management plan.
Donated Property	008968000000	0.75	
Donated Property	8972000000	0.31	
Donated Property	8973000000	1.76	
		4.75	**Total non-contiguous**
		75.22	**Total acres in Seminary Hill Natural Area**

APPENDIX II-B: TREES, SHRUBS, FLOWERING PLANTS AND FERNS OF THE NATURAL AREA

(From "Walking With Rufus," 1980, revised 1996)

English-Latin Names of Trees, Shrubs, Flowering Plants and Ferns of Seminary Hill Natural Area

Alaska brome	**Bromus sitchensis**
Alaska oniongrass	**Melica subulata**
American brookline	**Veronica americana**
Angled bittercress	**Cardamine angulata**
Annual bluegrass	**Poa annua**
Apple	**Pyrus malus**
Arrowleafed groundsel	**Senecio triangularis**
Avens, large leaf	**Geum macrophyllum**
Baldhip rose	**Rosa gymnocarpa**
Baneberry	**Actaea rubra**
Barnyard-grass, Large	**Echinochloa crusgalli**
Bedstraw, Sweet-scented	**Galium triflorum**
Bigleaf maple	**Acer macrophyllum**
Bitter wintercress	**Barbarea vulgaris**
Bittercherry	**Prunus emarginata**
Bittercress, Little western	**Cardamine oligosperma**
Bittersweet nightshade	**Solanum dulcamara**
Black cottonwood	**Populus trichocarpa**
Black hawthorn	**Crataegus douglasii**
Black locust	**Robinia pseudoacacia**
Black nightshade	**Solanum nigrum**
Black twinberry	**Lonicera ciliosa**
Blackberry, Evergreen	**Rubus laciniatus**
Blackberry, Himalayan	**Rubus discolor**
Blackberry, Pacific	**Rubus ursinus**
Blackcap, Wild	**Rubus leucodermis**
Bleedingheart, Pacific	**Dicentra formosa**
Bluebells, Western	**Mertensia platyphylla**
Bouncing bett	**Saponaria officinalis**
Bracken fern	**Pteridium aquilinum**
Bulbous bluegrass	**Poa bulbosa**
Branching montia	**Montia diffusa**
Broadleaved montia	**Montia diffusa**
Broadleaved peavine	**Lathyrus latifolius**
Bugbane, Tall	**Cimicifuga elata**
Burdock, common	**Arctium minus**
Butter and eggs	**Linaria vulgaris**
Buttercup, Creeping	**Ranunculus repens**
Buttercup, Little	**Ranunculus uncinatus**
Buttercup, variety of Little	**R. uncinatus** var. **parviflorus**
Buttercup, Western	**Ranunculus occidentalis**
California bigtree	**Sequoiadendron giganteum**
California brome	**Bromus carinatus**
California hazel	**Corylus cornuta** var. **californica**
California poppy	**Eschscholzia californica**
Camas, Common	**Camassia quamash**
Camas, Leichtlin's	**Camassia leichtlinii**
Canadian thistle	**Cirsium arvense**
Canterbury bells	**Campanula medium**
Cascara	**Rhamnus purshiana**
Cat-tail, Common	**Typha latifolia**
Cheatgrass, Downy	**Bromus tectorum**
Cheatgrass, Soft	**Bromus mollis**
Chickweed, Common	**Stellaria media**
Chickweed, Field	**Cerastium arvense**
Chickweed, Mouse-ear	**Cerastium vulgatum**
Chilean tarweed	**Madia sativa**
Chocolate lily	**Fritillaria lanceolata**
Cleavers or bedstraw	**Galium aparine**
Clover, Alsike	**Trifolium hybridium**
Clover, Dutch or white	**Trifolium repens**
Clover, Hop	**Trifolium procumbens**
Clover, Least hop	**Trifolium dubium**
Clover, Red	**Trifolium pratense**
Clustered wildrose	**Rosa pisocarpa**
Colt'sfoot, Sweet	**Petasites frigidus**
Columbine, Red	**Aquilegia formosa**
Cooley's hedge nettle	**Stachys cooleya**
Cow parsnip	**Heracleum lanatum**
Crabapple, western	**Pyrus fusca**
Crested wheatgrass	**Agropyron cristatum**
Currant, Red-flowering	**Ribes sanguineum**
Currant, Stink	**Ribes bracteosum**

Damask violet	**Hesperis matronalis**
Dandelion	**Taraxacum officinale**
Day-lily, Common orange	**Hemerocallis fulva**
Deer fern	**Blechnum spicant**
Deptford pink	**Dianthus formosa**
Devil's club	**Oplopanax horridum**
Dock, Broadleaved	**Rumex obtusifolius**
Dock, Patience	**Rumex patientia**
Dock, Western	**Rumex occidentalis**
Doorweed	**Polygonum aviculare**
Douglas spirea	**Spiraea douglasii**
Douglas' aster	**Aster subspicatus**
Douglas-fir	**Pseudotsuga menziesii**
Dutch crocus	**Crocus vernus**
Eastern burnweed	**Erechtites hieracifolia**
Elderberry, Blue	**Sambucus cerulea**
Elderberry, Red	**S. racemosa** var. **arborescens**
Enchanter's nightshade	**Circaea alpina**
English daisy	**Bellis perennis**
English hawthorn	**Crataegus oxyacantha**
English holly	**Ilex aquifolium**
English ivy	**Hedera helix**
English ryegrass	**Lolium perenna**
European mountain-ash	**Sorbus aucuparia**
Evening primrose, Common	**Oenothera biennis**
Fairy latern	**Disporum smithii**
Fairy-bell, Hooker	**Disporum hookeri**
False Solomon's-seal	**Smilacina racemosa**
Fawn-lily	**Erythronium oregonum**
Fescue, California	**Festuca californica**
Fescue, Foxtail	**Festuca megalura**
Fescue, Meadow	**Festuca pratensis**
Fescue, Rat-tail	**Festuca myuros**
Field pussy-toes	**Antennaria neglecta**
Fieldsorrel	**Rumex acetosella**
Firethorn	**Pyracantha coccinea**
Fireweed	**Epilobium angustifolium**
Foam flower	**Tiarella trifoliata**
Forget-me-not, Common	**Mysotis discolor**
Forget-me-not, Small-flowered	**Mysotis laxa**
Foxglove	**Digitalis purpurea**
Foxtail barley	**Hordeum jubatum**
Fringecup, Large	**Tellima grandiflora**
Garry oak (Oregon white oak)	**Quercus garryana**
Geranium, Cut-leaf	**Geranium dissectum**
Geranium, Longstalked	**Geranium columbinum**
Goldenrod, Meadow	**Solidago canadensis**
Gorse	**Ulex europaeus**
Grand fir	**Abies grandis**
Ground-ivy	**Glecoma hederacea**
Groundsel, Arrowleafed	**Senecio triangularis**
Groundsel, Common	**Senecio vulgaris**
Groundsel, Wood	**Senecio sylvaticus**
Hairy cat's-ear	**Hypochaeris radicata**
Hawksbeard, Smooth	**Crepis capillaris**
Hawkweed, White-flowered	**Hieracium albiflorum**
Heal-all or self-heal	**Prunella vulgaris**
Hedge mustard	**Sisymbrium officinale**
Honeysuckle, Orange	**Lonicera ciliosa**
Horse chestnut	**Aesculus hippocastanum**
Horsetail, Field	**Equisetum arvense**
Horsetail, Giant	**Equisetum telmateia**
Horseweed	**Conzya canadensis**
Huckleberry, Red	**Vaccinium parvifolium**
Indian-pipe	**Monotropa uniflora**
Indian plum	**Oemleria cerasiformis**
Inside-out-flower	**Vancouveria hexandra**
Japanese knotwood	**Polygonum cuspidatum**
Jointed charlock	**Raphanus raphanistrum**
Kentucky bluegrass	**Poa pratensis**
Lady-fern	**Athyrium filix-femina**
Laurel, Common	**Prunus laurocerasus**
Leafy bishop's-cap	**Mitella caulescens**
Lettuce, Tall blue	**Lactuca biennis**
Lettuce, Wall	**Lactuca muralis**
Licorice-fern	**Polypodium glycyrrhiza**
Lily-of-the-valley	**Convallaria majalis**
Lupine, Large-leaved	**Lupinus polyphyllus**
Lupine, Two-color	**Lupinus bicolor**
Maidenhair fern, Northern	**Adiantum pedatum**

Mallow, Round-leaved	**Malva rotundifolia**
Mannagrass, Western	**Glyceria occidentalis**
Manroot	**Marah oreganus**
Mayweed chamomile	**Anthemis cotula**
Meadow foxtail	**Alopecurus pratensis**
Meadow foxtail, Little	**Alopecurus aequalis**
Milk-thistle, Field	**Sonchus arvensis**
Mint, Field	**Mentha arvensis**
Mockorange	**Philadelphus lewisii**
Mole plant	**Euphorbia lathyrus**
Montia, Small-leafted	**Montia parviflora**
Morning-glory, Field	**Convolvulus arvensis**
Morning-glory, Hedge	**Convolvulus sepium**
Mullein, Common	**Verbascum thapsus**
Musk-mallow	**Malva moschata**
Mustard, Field	**Brassica campestris**
Narcissus	**Narcissus pseudonarcissus**
Narrow flowered brome	**Bromus vulgaris**
Nemophila, Small-flowered	**Nemophila parviflora**
Nemophila, Spreading	**Nemophila pedunculata**
Ninebark, Pacific	**Physocarpus capitatus**
Nipplewort	**Lapsana communis**
Oatgrass, Tall	**Arrhenatherum elatius**
Oats, Common	**Avena sativa**
Ocean spray	**Holodiscus discolor**
Old witch grass	**Panicum capillare**
Orchard-grass	**Dactylis glomerata**
Oregon ash	**Fraxinus latifolia**
Oregon beaked moss	**Kindbergia oregana**
Oregon grape, Dull	**Berberis nervosa**
Oregon grape, Tall	**Berberis aquifolium**
Oregon iris	**Iris tenax**
Ox-eye daisy	**Chrysanthemum leucanthemum**
Pacific brome	**Bromus pacificus**
Pacific dogwood	**Cornus nuttallii**
Pacific hound's-tongue	**Cynoglossum grande**
Paper birch	**Betula papyrifera**
Pea, Cream-flowered	**Lathyrus ochroleucus**
Pea, Few-flowered	**Lathyrus pauciflorus**
Pea, Leafy	**Lathyrus polyphyllus**
Pea, Pacific	**Lathyrus vestitus**
Pear, Common	**Pyrus communis**
Pearly-everlasting	**Anaphalis margaritacea**
Periwinkle	**Vinca major**
Phacelia, variety of Yellow	**Phacelia lutea** v. **purpurascens**
Phacelia, Woodland	**Phacelia nemoralis**
Phantom-orchid	**Eburophyton austiniae**
Pigweed, Rough	**Amaranthus retroflexus**
Pineapple weed	**Matricaria matricarioides**
Plantain, Common	**Plantago major**
Plantain, English	**Plantago laceolata**
Plantain, Succulent	**Plantago major** v. **pachyphylla**
Plum	**Prunus domestica**
Poison hemlock	**Conium maculatum**
Port-Orford-cedar	**Chamaecyparis lawsoniana**
Prickly lettuce	**Lactuca serriola**
Prickly lettuce, Lobeless variety of	**Lactuca serriola** v. **integrata**
Privet	**Ligustrum vulgare**
Quack grass	**Agropyron repens**
Queen Anne's lace	**Daucus carota**
Radish, Wild	**Raphanus sativus**
Rattlesnake-plantain	**Goodyera oblongifolia**
Reed canarygrass	**Phalaris arundinacea**
Reed grass	**Calamagrostis** sp.
Red alder	**Alnus rubra**
Red dead-nettle	**Lamium purpureum**
Red-osier dogwood	**Cornus stolonifera** var. **occidentalis**
Redstem buckbrush	**Ceanothus sanguineus**
Redtop grass	**Agrostis alba**
Ripgut brome	**Bromus rigidus**
Rose, Baldhip	**Rosa gymnocarpa**
Rose, Nootka	**Rosa nutkana**
Rose, Wild, Clustered	**Rosa pisocarpa**
Rush, Common	**Juncus effusus**
Rush, Dagger-leaved	**Juncus ensifolius**
Rush, Toad	**Juncus bufonius**
Rye-grass, Western	**Elymus glaucus**
Salal	**Gaultheria shallon**
Salmonberry	**Rubus spectabilis**

Salsify, Common	**Tragopogon porrifolius**
Sanicle, Pacific	**Sanicula crassicaulis**
Scot's broom	**Cytisus scoparius**
Scouler's corydalis	**Corydalis scouleri**
Scouler's harebell	**Campanula scouleri**
Sedge, Dewey's	**Carex deweyana**
Sedge, Henderson's	**Carex hendersonii**
Sedge, Slough	**Carex obnupta**
Serviceberry	**Amelanchier alnifolia**
Serviceberry variety	**A. alnifolia v.humtulipensis**
Shepherd's cress	**Teesdalia nudicaulis**
Shepherd's purse	**Capsella bursa-pastoris**
Silver hairgrass	**Aira caryophyllea**
Simcoe mountain starwort	**Stellaria simcoei**
Sitka valerian	**Valeriana sitchensis**
Skunk cabbage	**Lysichitum americanum**
Slender toothwort	**Cardamine pulcherrima** var. **tenella**
Small-fruited bulrush	**Scirpus microcarpus**
Small-flowered crane's bill	**Geranium pusillum**
Sneezeweed	**Helenium autumnale**
Snowberry, Common	**Symphoricarpus albus**
Snow-queen	**Synthyris reniformis**
Solomon's-seal, False	**Smilacina racemosa**
Solomon's-seal, Star-flowered	**Smilacina stellata**
Sour dock	**Rumex crispus**
Sow-thistle, Marsh	**Sonchus uliginosus**
Sow-thistle, Prickly	**Sonchus asper**
Spearmint	**Mentha spicata**
Speedwell, Common	**Veronica officinalis**
Speedwell, Marsh	**Veronica scutellata**
Speedwell, Purslane	**Veronica peregrina**
Speedwell, Thyme-leaved	**Veronica serpyllifolia**
Spotted coralroot	**Corallorhiza maculata**
Spanish bluebell	**Endymion hispanicus**
Spreading wood-fern	**Dryopteris austriaca**
Spring whitlow-grass	**Draba verna**
Springbeauty, Western	**Montia sibirica**
St. John's-wort	**Hypericum perforatum**
Starflower	**Trientalis latifolia**
Stinging nettle	**Urtica dioca**
Stork's-bill, Common	**Erodium cicutarium**
Strawberry, Woods	**Fragaria vesca**
Striped coralroot	**Corallorhiza striata**
Sweet cicely	**Osmorhiza chilensis**
Sweet vernalgrass	**Anthoxanthum odoratum**
Sweetbriar	**Rosa eglanteria**
Sweet-clover, White	**Melilotus alba**
Sword fern	**Polystichum munitum**
Tall butterweed	**Senecio serra**
Tansy, Common	**Tanacetum vulgare**
Tansy ragwort	**Senecio jacobaea**
Teasel	**Dipsacus sylvestris**
Thimbleberry	**Rubus parviflorus**
Thistle, Indian or edible	**Cirsium edule**
Thistle, Common	**Cirsium vulgare**
Thistle, Weak	**Cirsium remotifolium**
Tiger lily	**Lilium columbianum**
Timothy, Common	**Phleum pratense**
Towermustard	**Arabis glabra**
Trail plant or pathfinder	**Adenocaulon bicolor**
Trillium	**Trillium ovatum**
Trillium, Sessile	**Trillium chloropeta**
Twinflower	**Linnaea borealis**
Twisted-stalk, Rosy	**Streptopus roseus** v.curvipes
Vanilla leaf	**Achlys triphylla**
Velvet-grass, Common	**Holcus lanatus**
Vetch, American	**Vicia americana**
Vetch, Bird	**Vicia cracca**
Vetch, Common	**Vicia sativa**
Vetch, Giant	**Vicia gigantea**
Vetch, Tiny or hairy	**Vicia hirsuta**
Vetch, Slender	**Vicia tetrasperma**
Vetch, Small-flowered common	**Vicia sativa** v. **angustifolium**
Vine maple	**Acer circinatum**
Violet, Early blue	**Viola adunca**
Violet, Evergreen	**Viola sempervirens**
Violet, Pioneer	**Viola glabella**
Wall cress, Common	**Arabidopsis thaliana**
Water hemlock, Western	**Cicuta douglasii**

APPENDIX II-C: SEMINARY HILL NATURAL AREAS PHOTOS

1980: The destruction of the environment

2020: Regeneration after 40 years

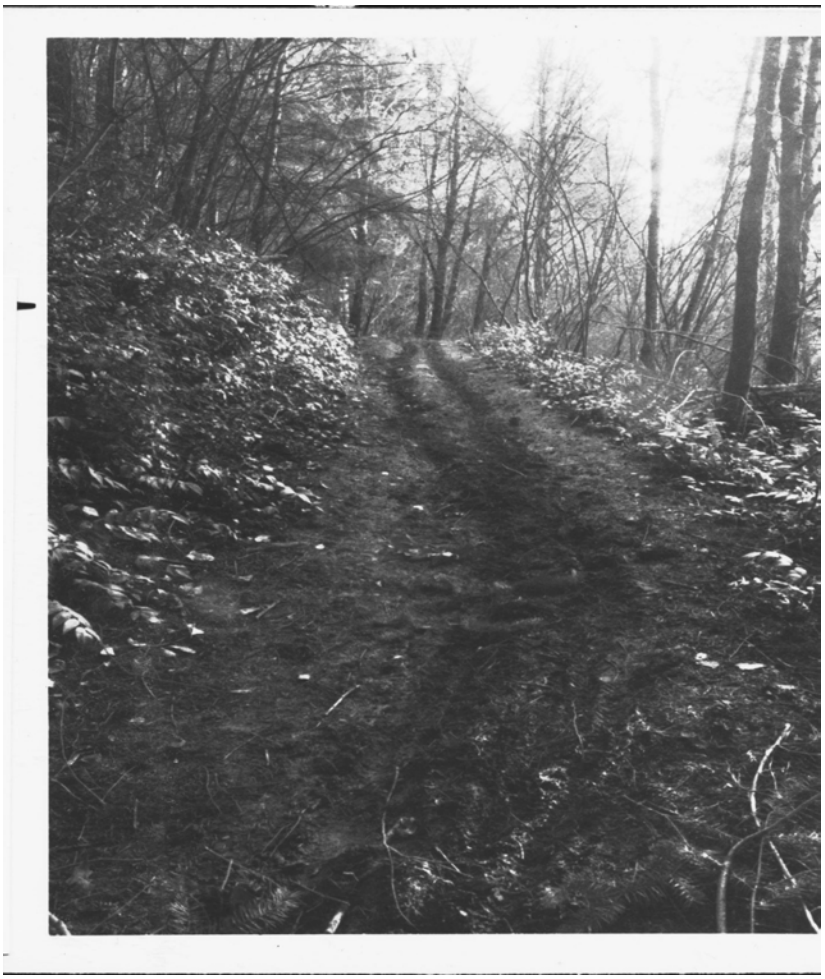
1980 Photos by Stellajoe Staebler, 2020 Photos by Judy Bell

1980 Natural Area Entrance
Damage to entrance

2020 Natural Area entrance
Restored Entrance

1980 Natural Area
Upper Entrance.
Damage to entrance

2020 Natural Area
Upper Entrance
Restored entrance



1980 Indian Pipe Trail
Damage to trail

2020 Indian Pipe Trail.
Restored trail

1980 Kaiser Trail
Damage to area and trail

2020 Restoration of
Kaiser trail and area

1980 Kaiser Trail at Pipe. Damage to area

2020 Kaiser Trail at Pipe

Restoration of trail and area

APPENDIX III- FOREST HEALTH

INVASIVE SPECIES MANAGEMENT ON SHNA

Invasive Species Management for the Natural Area

1) English ivy: Follow the protocol from the Seminary Hill Natural Area research for DNR Urban Forest Grant.

2) English holly: Follow the protocol for chemical application, established by the City of Centralia.

PROTOCOL

* REMOVAL OF ENGLISH GROUND IVY. The ivy will be removed by hand pulling. The ivy will be removed by pulling as much of the roots as possible. The ground will be examined to determine that the major part of the root system has been removed. It will be bagged and disposed of by the City of Centralia

* REMOVAL OF AERIAL ENGLISH IVY. Ivy will be pulled away from the tree for 6 feet and removed. The area at the base of the tree usually has extensive ivy development and will be removed. Ivy on the tree will be removed up the tree as far as possible. The tree will be examined for ivy growing under the bark and removed, if possible. It will be bagged and disposed of by the City of Centralia

* REMOVAL OF ENGLISH HOLLY. The City of Centralia has a protocol.

+ The holly is sprayed with a pesticide. The user must be licensed by the City.

+ The user must use all safety precautions.

+ A notification of a pesticide must be posted at the entrance of the Natural Area with the date of spraying the holly.

+ The English holly seedlings and saplings will be cut and the stumps will be sprayed with Triclopyr to prevent re-sprouting.

APPENDIX IV - SOILS

TABLES TAKEN FROM THE CUSTOM RESOURCE SOIL REPORT FOR LEWIS COUNTY FOR SEMINARY HILL NATURAL AREA. USDA, NRCS (NATURAL RESOURCES CONSERVATION SERVICE)

TABLES DESCRIBING THE SOIL CHARACTERISTICS ON THE NATURAL AREA PER NRCS DATA.-

Summary of soil Properties (NRCS Web Soil Survey)						
Soil Type	**Acreage**	**Percent of Property**	**Drainage**	**Depth to Restrictive Layer**	**Depth to Water Table**	**Site Index**
27 - Buckpeak 30-65% slopes	36.6	60.60%	Well drained	80"+	80"+	133
43 - Centralia Loam 8-15% slopes	16	26.60%	Well drained	80"+	80"+	135
42 - Centralia Loam 0-8% slopes	0	5.20%	Well drained	80"+	80"+	140
167 - Reed silty clay loam -	0.2	0.30%	Poorly Drained	80"+	18 to 36 "	
247 - Xerorthents, spoils	2.7	4.50%	Well drained	80"+	80"+	100

Figure 1: Site aerial photos of the location of the soil areas

Map Unit Setting

National map unit symbol: 2hfl
Elevation: 200 to 1,800 feet
Mean annual precipitation: 60 to 75 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 150 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Buckpeak and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Buckpeak

Setting

Landform: Mountain slopes
Parent material: Residuum and colluvium from sandstone

Typical profile

H1 - 0 to 19 inches: silt loam
H2 - 19 to 44 inches: silty clay loam
H3 - 44 to 60 inches: silty clay loam

Properties and qualities

Slope: 30 to 65 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 11.7 inches)

Summary of soil risk assessments (NRCS Web Soil Survey)					
Soil type	Compaction Risk	Displacement Risk	Erosion Risk on trails	Rating reasons (numeric values)	Erosion Risk off-Trails/acres
27-Buckpeak 30-65% slopes	High	Low	Severe	Slope/erodibility (0.95)	Severe 36.6
43-Centralia Loam 8-15% slopes	High	Low	Severe	Slope/erodibility (0.95)	Slight 16.0
44-Centralia Loam 0-8% slopes	High	low	Moderate	Slope/erodibility (0.50)	Slight 3.2
167-Reed silty clay loam	High	Medium	Slight		Slight 2.7
247-Xerorthents, spoils	High	Medium	Severe	Slope/erodibility (0.95)	Slight .2

Summary of soil Suitability for management practices (NRCS Web Soil Survey)							
Soil Type	Suitability For	Trail Building	Suitability For Hand planting	Suitability For seedling mortality	Soil Hydrology	Organic Matter Depletion	Suitability for Aerobic Organisms
Buckpeak 30-65% slopes	Very Limited	58%	Moderately Suited	Low	Group B	Moderate	Somewhat Favorable
	Due to slopes						
Centralia Loam 8-15% slopes	Somewhat Limited	23.40%	Well Suited	Low	Group B	Moderate	Somewhat Favorable
Centralia Loam 0-8% slopes	Somewhat Limited	9.50%	Well Suited	Low	Group B	Moderate	Somewhat Favorable
Reed silty clay loam	Somewhat Limited	1.50%	Well Suited	Low	Group D	Moderate	Somewhat Favorable
Xerorthents, spoils	Somewhat Limited	3.80%	Moderately Suited	Moderate	Group B	Moderate	Somewhat Favorable

— Organic Matter Depletion — Summary by Rating Value		
Collapse Summary by Rating Value		
Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
OM depletion moderate	61.7	98.20%
Null or Not Rated	1.2	1.80%
Totals for Area of Interest	62.9	100.00%

APPENDIX V:

WATER QUALITY: History of the building of the reservoir

1841 Early Mention: Indian trails formed the first travel routes through Seminary Hill to avoid winter floods.

Charles Wilkes, an American naval officer, in his survey of this region, mapped a trail from Willamette Valley to Fort Nisqually with the future Seminary Hill mentioned in the expedition journal. He wrote that this trail, which climbed the southern slopes of Seminary Hill, went up a grade so steep that steps had to be cut in the hillside so the horses could get up and down the muddy incline.

Capt. Wiles Map. Enlargement of Wilkes Trail, passing by a bump which is Seminary Hill

1855-56 Early Ownership: George Washington owned the property, later known as Seminary Hill. (P18 "Centralia the First Fifty Years")

HISTORY OF THE BUILDING OF THE RESERVOIR

1900 Early Water System: Construction of private water system. Wells near the Skookumchuck River pumped water to tanks to Seminary Hill. Water from these tanks was fed down Locust St. to Centralia's water system. The City bought the water company and planned a new water system.

1914-15 Construction of a City water system: a typhoid fever epidemic occurred around 1914 and was tied to the old water system. Centralia decided to construct an open reservoir and to discontinue pumping water from the Skookumchuck River. Instead, a 14-mile line was run from the Newaukum River to Centralia. Wooden pipes were built like a barrel and tied together with tightly wrapped wire then covered on the outside with a layer of asphalt or tar paper. Next each end was fitted with a collar. It was built by a factory in Chehalis for both cities. Trenches were dug for 14 miles and a large opening dug for the reservoir, then lined w/ concrete. The reservoirs were dug using manpower, horses, and wagons. It was a major excavation which uprooted the trees and shrubs and tore up the landscape down to bare earth. Many trees were in the young developing stage following the extensive logging from the late 1800s through this period. A narrow railroad line was built along Locust Street up to the building site to transport materials.

Figure 4: 14 mile pipeline from the Newaukum River to Centralia

Figure 3: View of 1st reservoir & absence of trees

Figure 4: Railroad tracks to reservoir

Figure 8: View absence of trees on Seminary Hill

1925 Construction of a 2nd reservoir: Ten years later, Centralia had considerable growth. A 2nd open reservoir was built at the south end of the 1st reservoir. Essentially, the earlier construction plans were used. It was another and bigger major excavation which uprooted the trees and shrubs and tore up the landscape down to bare earth, including 2nd growth trees that had grown following the extensive logging with the 1914 reservoir.

1980 Developing Problems: Before 1980, a big landslide on the Newaukum River damaged the water's intake upstream resulting in water filled with silt. Water for the 2 reservoirs was silty and frequently had to be drained and cleaned. This weakened the reservoirs and they began to leak. When drained, the water ran down and emptied into China creek. The reservoirs began leaking so badly it became a year-round creek.

This caused the City to address the problem by sinking wells in Ford's Prairie. The City discontinued Newaukum River by the time of the collapse. They also had to build a treatment plant to clean the dirty water and/or build more wells.

Oct 1991 Reservoirs Collapsed: Both reservoirs collapsed, opening large sections in both reservoirs. Water ran down the hill like a river taking out every shrub, tree, and plant in the area adjacent to the parking lot. The water ran through the parking lot to Berry Street and then into the storm sewer system.


Disaster is
now official
10/9/91
A large section of a Centralia city reservoir on Seminary Hill collapsed Saturday, sending water rushing down into a residential area. The city has now been declared a disaster area in order to attain eligibility for emergency money.

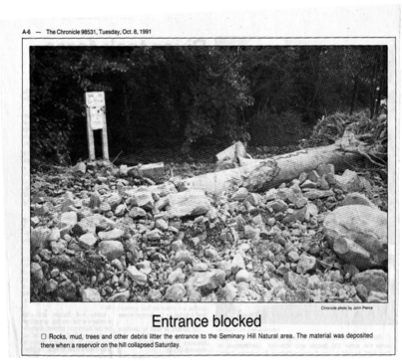

A4 — The Chronicle 98531, Tuesday, Oct. 8, 1991
Entrance blocked
Rocks, mud, trees and other debris litter the entrance to the Seminary Hill Natural area. The material was deposited there when a reservoir on the hill collapsed Saturday.

Figure 6: The section of the collapsed dam

Figure 7: Entrance strewn with rocks and trees

1991-92: The city initiated clean up and repair work and did a geology study to determine the stability of the hill and land.

Dec 20, 1993 Construction of a new, covered reservoir system began: A 3rd major construction job was started. New methods were used, including covering the reservoir. A concrete tank was built, wrapped with stretched cable and the concrete was squeezed together. Inside, a forest of vertical posts was placed to hold up the covered roof. There was no more dumping the water down to Berry Street but changed to drain down Seminary Hill Road to a stormwater line to China Creek

Effect on the landscape.

There was extensive excavation and bulldozing which took out the bottom of the ravine, Canyon Trail to the west, and a big stand of alders downstream from the 1st old open tank. The west side of the canyon was logged in 1925 and trees had grown up again on the other side of the new tank. These old trees were bulldozed. Bulldozing cut up the slope and down to Staebler Point, stripping all the trees, then down to a terrace from Staebler Point to the tank. It left the land bare up to the ridge above Seminary Hill Road. A metal fence was placed around the Reservoir.

What grew back? The trees on the ridge surrounding the excavation provided the natural seeding for the Douglas fir and red alders we see today. Douglas firs and red alders have grown up around the reservoirs and up to Staebler Point. The ravine dividing the Canyon Trail and the reservoir and the hillside has regenerated naturally with vine maples, bigleaf maples, western redcedars and red alders.

The Canyon Trail and the trail to Staebler Point were rebuilt. The old road leading to Staebler Point was closed to walking only and the trees and shrubs have reclaimed the open land.

The area not used for the 3rd reservoir was rebuilt and planted with grass.

Photos of the building of the 1st reservoir.

Figure 1: Inside the 1st reservoir

Figure 2: Locust Street torn up to transport equipment to the site and workers digging trenches for pipe.

Figure 3: Railroad track laid to reservoir site

Figure 4: Pipe being transported

Figure 5: Workers moving pipe up railroad tracks.

Figures 6 and 7: Workers digging trench for laying the pipe

Figure 8: Workers laying 14-mile pipeline from the Newaukum River. Figure 9: 14-mile pipeline

APPENDIX VI

TREE STAND DATA. DATA OF NATIVE AND NON-NATIVE PLANTS

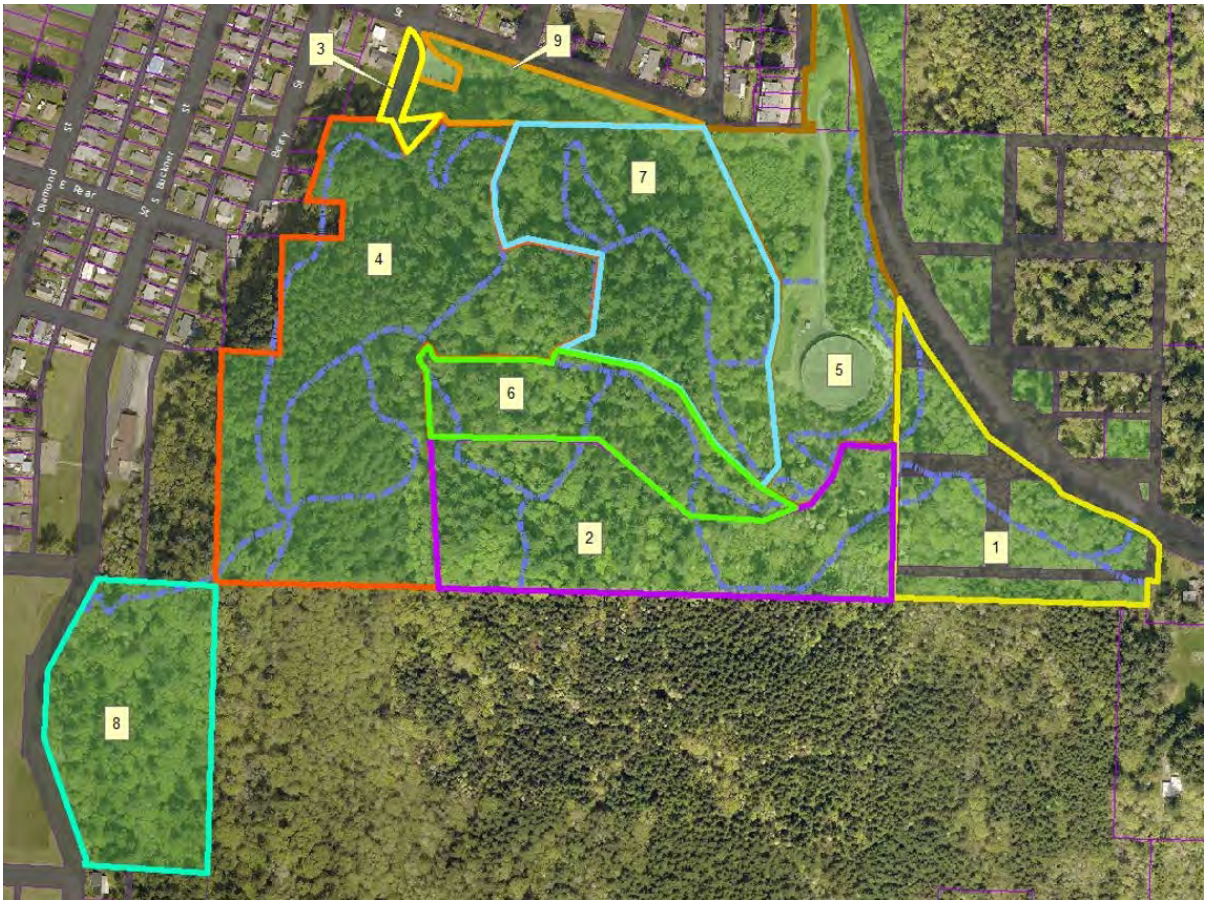


Figure 1: Aerial photo of stands

Stand color markings

Stand 1	**Yellow - east side (right) of park. logged in 1980**
Stand 2	**Purple - Ridge trail and boundary area**
Stand 4	**Red - Old woods**
Stand 6	**Green-blue - Kaiser Trail stand**
Stand 8	**Green - Westside (left) of park. Washington school trail**
Stand 9	**Orange - potential ADA trail**

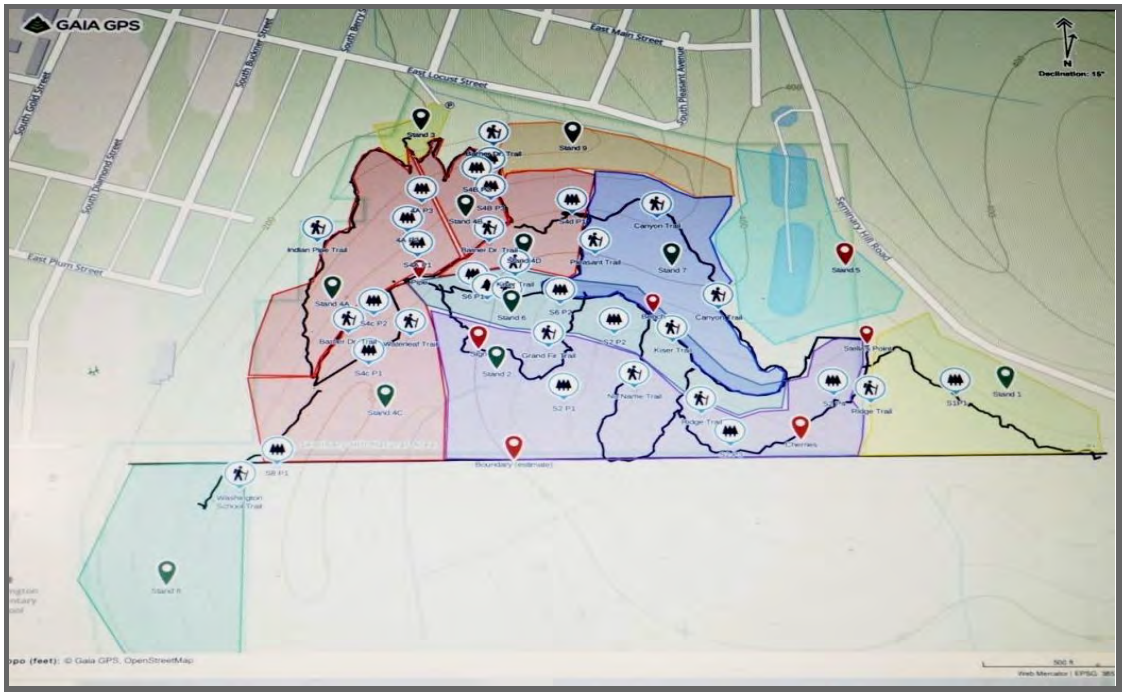


Figure 2: GPS and trail delineations. Stand color markings see above

CRITERIA FOR COLLECTING DATA

CRITERIA
NON-NATIVE SPECIES: GROUND IVY, HOLLY, H. BLACKBERRY
T - TRACE - < 5%
M -MEDIUM - 5-50%
H - HIGH > 50%
AER IAL IVY N (NEW), E (MED/ESTABLISHED)
O (OLD-CLEAR TO TOP OF TREE)
NATIVE PLANT SPECIES:
T - TRACE - < 5%
M -MEDIUM - 5-50%
H - HIGH > 50%
SNAGS - COUNT IF
> 6 FEET, 8 INCHES
PERIMETER: 16.7 - 1/50 ACRE

DETERMINING TREES IN A PLOT

◇ FIND the Center Tree of the Plot
- Assess and pick out the center of the plot

◇ Marking the Plot Perimeter
- Walk out 16 feet from the center tree and mark the tree or shrub.
- Do this in 6 directions or more if needed to define the plot
- Use a measure tape or rope

◇ Determining the Trees in the Plot
- A tree is considered "IN" if the center of the tree falls within the plot boundary
  (diagram)
- Systematically work your way around the plot in a clockwise direction and identify your "in" trees.
- Mark the "IN" trees with a ribbon or tree paint
- You can number the trees as you go with paint to count the perimeter tree
- Minimum tree size: 4" ate DBH (54" or 4'5"). Can count but not measure.

◇ Measuring the Trees in the Plot
- Identify the species of each "IN" tree. Measure the diameter of the tree at DBH
  (54" or 4'5")
- Estimate the Crown Ratio of each tree
- Select a couple of trees or more per plot representing different species and diameter and measure for height.

TREE DATA FROM PLOTS

STAND PLOT	TREE SPECIES	HEIGHT	DIAM-ETER	# SMALL TREES SNAGS	REGEN	PLANT SPECIES LIST	%				
								IVY	HOLLY	H. BLK BERRY	OTHER
1 - PLOT 1	MAPLE (6)	45'	7"-13"	0		Sword Fern	H	T			
ROBERTS TRAIL	MAPLE (6)	45'	7"-13"			Salal	H				
						Oregon Grape	H				
						Bracken Fern	T				
						Licorice Fern	T				
						Honeysuckle	T				
2 - PLOT 1	GRAND FIR	100'	38"			Waterleaf	H				
GRAND FIR TRL	MAPLE 1	62'	13"			Sword Fern	M				
	MAPLE 2	55'	13"			Indian Plum	T				
	MAPLE 3	62'	16"			Trillium	T				
	CEDAR	65'	19.5"			False Solomon's Seal	T				
	VINE MAPLES			5							
				1							
2 - PLOT 2	DOUGLAS FIR 1	45'	47"	3		Sword Fern	H		T		

STAND PLOT	TREE SPECIES	HEIGHT	DIAM-ETER	# SMALL TREES SNAGS	REGEN	PLANT SPECIES LIST	%				
								IVY	HOLLY	H. BLK BERRY	OTHER
NEW TRAIL	DOUGLAS FIR 2	48'	8"			Oregon Grape	H				
OFF KAISER TRL	DOUGLAS FIR 3		14"			Vancouveria	M				
	MAPLE 1	55'	7.5"			Vanilla Leaf	T				
	MAPLE 2	60'	11.5"			Waterleaf	M				
	MAPLE 3	77'	14"			False Solomon's Seal	T				
	VINE MAPLE					Indian Plum	T				
						Trillium	T				
2- PLOT 3	DOUGLAS FIR	45'	8"		1	Sword Fern	H		T		
RIDGE TRAIL	ALDER - 40					Salal	T				
	VINE MAPLE - 3					Trillium	M				
						Snowberry	T				
						Indian Plum	T				
2-PLOT 4	DOUGLAS FIR 1				2	Orange Honeysuckle					
ANTENNA AREA	DOUGLAS FIR 2					Bed straw	H				
	MAPLE 1	36"	6-9"			Mountain Blackberry	M				

STAND PLOT	TREE SPECIES	HEIGHT	DIAM-ETER	# SMALL TREES SNAGS	REGEN	PLANT SPECIES LIST	%				
								IVY	HOLLY	H. BLK BERRY	OTHER
	MAPLE 2	6 ARMS	EACH ARM			False Solomon's Seal	M				GRASS - 6 sprigs
	MAPLE 3					Sword Fern	M				
	MAPLE 4					Snowberry	T				
	MAPLE 5					Vetch	H				
	MAPLE 6										
	PACIFIC DOGWOOD -2										
	BITTER CHERRY-3										
2 -PLOT 5	GRAND FIR	87'	43"			Waterleaf	H				
KAISER TRAIL @	MAPLE 1	60'	19"			Indian Plum	M				
PLESANT TRAIL	MAPLE 2		8"			Bedstraw	T				
	MAPLE 3	60'	21"			Thimble Berry	T				
	VINE MAPLE					Vancouveria	T				
	HAZELNUT	25'	4"			Sword Fern	M				
						Rose	T				
						Licorice Fern	T				

STAND PLOT	TREE SPECIES	HEIGHT	DIAM-ETER	# SMALL TREES SNAGS	REGEN	PLANT SPECIES LIST	%				
								IVY	HOLLY	H. BLK BERRY	OTHER
4A - PLOT 1	DOUGLAS FIR 1	130'	25"			Oregon Grape	M	H	M		
INDIAN PIPE	DOUGLAS FIR 2	140'	19"			Licorice Fern	M	E -aerial ivy			
TRAIL	DOUGLAS FIR 3		15"	1		Rose	T				
	DOUGLAS FIR 4			1		Sword Fern	M				
	DOUGLAS FIR 5					Waterleaf	M				
	MAPLE					Vancouveria	T				
	VINE MAPLE			4							
				2							
4A - PLOT 2	DOUGLAS FIR 1	90'	13"			Sword Fern	H	T	T		
INDIAN PIPE	DOUGLAS FIR 2	159'	34"			Trillium	T	E			
TRAIL	DOUGLAS FIR 3	85'	28"			Waterleaf	T				
	VINE MAPLE			8							
4A - PLOT 3	DOUGLAS FIR 1	110'	33"			Sword Fern	H	H	M		
INDIAN PIPE	DOUGLAS FIR 2	80'	17"								
TRAIL	MAPLE	40'	10"								
	VINE MAPLES			8							

STAND PLOT	TREE SPECIES	HEIGHT	DIAM-ETER	# SMALL TREES SNAGS	REGEN	PLANT SPECIES LIST	%				
								IVY	HOLLY	H. BLK BERRY	OTHER
4B- PLOT 1	CEDAR		40"	3				T			
BARNER DR TRL	CEDAR		11.8"								
	MAPLE 1		15.3"								
	MAPLE 2		11.5"								
	MAPLE 3		14.7"								
4B - PLOT 2	MAPLE	140'	17.5"			Lady Fern	H	T			
BARNER DR TRL	VINE MAPLE			15		Oregon Grape	T				
	INDIAN PLUM			3		Sword Fern	H				
						Salmon Berry	T				
						Licorice Fern	T				
						Waterleaf	H				
						Trillium	T				
4B - PLOT 3	CEDAR	65'	21"	1		Licorice Fern	T	T			
BARNER DR TRL	DOUGLAS FIR	150'	20'			Oregon Grape	T				
	MAPLE	130'	43.5"			Salmon Berry	T				
	VINE MAPLES					Trillium	T	H(E)	T		
	INDIAN PLUM					Salmon Berry	T				

STAND PLOT	TREE SPECIES	HEIGHT	DIAM-ETER	# SMALL TREES SNAGS	REGEN	PLANT SPECIES LIST	%				
								IVY	HOLLY	H. BLK BERRY	OTHER
						Waterleaf	H				
4C-PLOT 1	DOUGLAS FIR 1	108'	38"			Waterleaf	H		T		
WATER-LEAF	DOUGLAS FIR 2	110'	43"			Sword Fern	M				
TRAIL	VINE MAPLE			2		Salal	M				
	MAPLE	50'	9.5"			Vancouveria	T				
	DOUGLAS FIR 2					Licorice Fern	T				
	GRAND FIR			Too small							
	GRAND FIR			Too small							
4C-PLOT 2	DOUGLAS FIR 1	88'	29"			Waterleaf	H	H (E)	T		
WATER-LEAF	DOUGLAS FIR 2	56'	16."			Sword Fern	H				
TRAIL	DOUGLAS FIR 3	88'	33"			Oregon Grape	T				
	HAZEL NUT			8		Thimble Berry	M				
						Trillium	T				
						Solomon's Seal	T				
						Vancouveria	T				
						Rose	T				

STAND PLOT	TREE SPECIES	HEIGHT	DIAM-ETER	# SMALL TREES SNAGS	REGEN	PLANT SPECIES LIST	%				
								IVY	HOLLY	H. BLK BERRY	OTHER
4D-PLOT 1	DOUGLAS FIR 1	145'	37"			Sword Fern	M	H (E)	H		
PLEASANT TRL	DOUGLAS FIR 2	135'	23"			Oregon Grape	T				
& CANYON TRL	DOUGLAS FIR 3	140'	38"			Trillium	T				
	DOUGLAS FIR 4			X		Solomon's Seal	T				
	DOUGLAS FIR 5	140'	37"			Elderberry	T				
	MAPLE			2 Small							
	VINE MAPLE			5 Small							
6 - PLOT 1	DOUGLAS FIR	87'	43"			Waterleaf	H				
KAISER TRAIL	MAPLE 1	60'	19"			Indian Plum	T				
	MAPLE 2		8"			Bedstraw	T				
	MAPLE 3	60'	21"			Thimble Berry	T				
	VINE MAPLE					Vancouveria	T				
	HAZELNUT	25'	4"			Sword Fern	M				
						Rose	T				
						Licorice Fern	T				

STAND PLOT	TREE SPECIES	HEIGHT	DIAM-ETER	# SMALL TREES SNAGS	REGEN	PLANT SPECIES LIST	%				
								IVY	HOLLY	H. BLKBERRY	OTHER
6- PLOT 2	DOUGLAS FIR 1	82'	22"			Waterleaf	H	H			
KAISER TRAIL	DOUGLAS FIR 2	84'	41"			Sword Fern	T	aerial E			
	MAPLE	60'	17"			Indian Plum 2	T				
	MAPLE			X		Oregon Grape	H				
	VINE MAPLES			X		Bed Straw	T				
7-CANYON TRAIL	not done										
	difficult to access										
8-PLOT 1	CEDAR	42'	18"			Sword Fern	H	M	T		
WASH SCHOOL TRAIL	MAPLE 1	75'	29"			Vanilla Leaf	T				
	MAPLE 2	75'	25"			Salal	H				
	MAPLE 3	75'	25"			Waterleaf	M				
	MAPLE 4	75'	24"			Trillium	T				
	VINE MAPLE					Mountain Blackberry	T				
						Indian Plum	T				
						Licorice Fern	T				

STAND PLOT	TREE SPECIES	HEIGHT	DIAM-ETER	# SMALL TREES SNAGS	REGEN	PLANT SPECIES LIST	%				
								IVY	HOLLY	H. BLK BERRY	OTHER
						Hooker's Fairybells	T				
						Vancouveria	T				
9-PLOT 1	DOUGLAS FIR			Fallen		Horsetail	H	T	T	M	
ADA AREA						Canary Grass	H				
						Bindweed (Morn Gly)	M				
						Western Buttercup	T				
						Moss	T				
						Bedstraw	T				
9-PLOT 2	CEDAR	55'	23.3"			Western Buttercup	M	T		M	
ADA AREA	OAK SAPLING			Too small		Horsetail	H				
						Canary Grass	H				
						Sword Fern	T				
						Lady Fern	M				
						Morning Glory	M				
						Moss	T				

APPENDIX VII

TRAIL MAP, INFORMATION FOR BUILDING TRAILS

Figure 1: Trail Map of Seminary Hill Natural Area - 2022

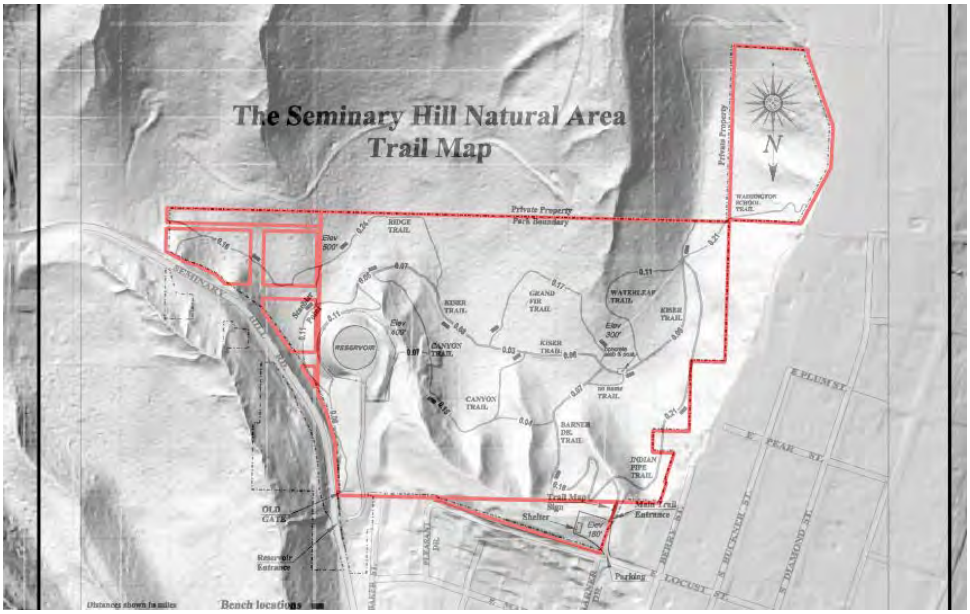


Figure 2: Lidar Trail map within the Boundaries of Seminary Hill Natural Are

Soil information for building trails

Soil Type	Suitability For	Trail Building
27-Buckpeak 30-65% slopes	Very Limited	58%
	Due to slopes	
43-Centralia Loam 8-15% slopes	Somewhat Limited	23.40%
42-Centralia Loam 0-8% slopes	Somewhat Limited	9.50%
Reed silty clay loam	Somewhat Limited	1.50%
Xerorthents, spoils	Somewhat Limited	3.80%

RECOMMENDED TRAIL DESIGN STANDARDS						
TRAIL USE	CONFIGURATION	LENGTH	TREAD	WIDTH	HEIGHT	GRADE
HIKING	Hiking Loop	5–15 mi	Surface	Clearing	Clearing	1-7% preferred
			Mineral soil, bedrock		Height	10% maximum sustained
			embedded rocks	4–6 ft heavy use o	8 ft	40% - short distance
			asphalt, or concrete	2-way 4–6 ft light use or 1-way,		
				6–10 ft heavy use or 2-way		

APPENDIX VIII

Appendix VIII-A: LIST OF LOCAL AND MIGRATORY BIRDS on Seminary Hill Natural Area

BIRDS	LOCAL	MIGRATORY	NESTING CAVITIES
Chickadee Black cap	X		Primary
Chickadee Chestnut	X		Primary
Creeper, Brown	X		Secondary
Finch, Purple	X		
Flicker, Northern	X		Primary
Goldfinch, American	X		Secondary
Grosbeak Black-headed		XS	
Grosbeak Evening	X		
Hawk, Sharp-shinned	X		
Hummingbird, Ann	X		
Hummingbird, Rufus		XS	
Jay, Stellar	X		Secondary
Junco, Dark-eyed	X		
Kinglet, Golden-crown	X		
Kinglet Ruby crown	X		
Nuthatch - red breasted	X		Primary
Pine Siskin	X		
Robin, American		XS	
Sapsucker-red breasted	X	XW	Primary
Sparrow- fox		XW	
Sparrow - White Crown			
Sparrow - gold crown		XW	
Sparrow - song			
Tanager-western		XS	
Thrush-Swainsons			
Thrush-Varied			
Towhee-spotted	X		
Warbler - black throated		XS	
Warbler - Orange crown		XS	
Warbler - Townsend		XW	
Warbler - Wilsons		XS	
Waxwing		XW	
Woodpecker-Downy	X		Primary
Woodpecker-Hairy	X		Primary
Woodpecker-Pileated	X		Primary
Wren - Pacific	X		Secondary

APPENDIX VIII- B:

Birds of Seminary HillNatural Area

This list includes birds that have been seen in the Natural Area and in the Godsey's neighboring yard.

Birds of the forest are often difficult to see. They can hide behind foliage or stay high in tree top canopies. Patience often brings rewards. Another key to success is to practice birding by ear so that you can tell which bird is just behind that tree trunk or up in the canopy.

Photo credits: Sharp-shinned Hawk, Red-breasted Sapsucker, Rufous Hummingbird, Purple Finch, Evening Grosbeak, Chestnut-backed Chickadee, American Goldfinch photographed by Sandy Godsey. All other photos are from Cornell Lab of Ornithology All About Birds website.

Compiled by Henry and Leah Wegener for the Friends of Seminary Hill Natural Area, June 2015

L = Length
W S= Wing Span
Males of the species are pictured.

American Goldfinch *(Spinus tristis)*

L 5" WS 9"

☐ SEEN

☐ HEARD

The state bird of Washington, the Goldfinch has a conical beak and notched tail. Female is a dull yellow overall. Listen for flight call that sounds like the bird is saying "po-ta-to-chip" quietly.

American Robin *(Turdus migratorius)*

L 10"
WS 17"

☐ SEEN

☐ HEARD

This early bird can often be seen tugging worms from the ground. Because they are common, Robins can be useful as a reference point for comparing sizes and shapes of other birds. Note white eye ring and red breast, listen for cheery song.

Anna's Hummingbird *(Calypte anna)*

☐ SEEN

☐ HEARD

Green and white body with pink throat and crown. Male's pink coloring can look black depending on the light. Female dull green and white with red central spot on throat. This hummingbird species lives in Washington year-round.

Barred Owl *(Strix varia)*

L 21"
WS 42"

☐ SEEN

☐ HEARD

Listen for the hooting call "Who cooks for you? Who cooks for you-all?"

Black-capped Chickadee *(Poecile atricapillus)* L 5.25" WS 8"

Black-headed Grosbeak *(Pheucticus melanocephalus)* L 8.25" WS 12.5"

☐ SEEN

☐ HEARD

Usually seen singing high in treetops. Thick silvery bill distinguishable. Song similar to American Robin and Western Tanager, but with more energy and a more clear whistling quality.

Cedar Waxwing *(Bombycilla cedrorum)*

L 7.25"
WS 12"

SEEN

HEARD

Song is a simple series of high "sree" notes. Note its crest, yellow tail tip, red wing tips, and black-masked face. Often in groups.

Common Raven *(Corvus corax)*

L 24"
WS 53"

SEEN

HEARD

Noticeably larger than a crow. Voice a rough low pitched "quark." Large bill, shaggy throat. Ravens tend to be seen alone or in pairs. They are among the smartest of all birds.

Downy Woodpecker *(Picoides pubescens)*

L 6.75"
WS 12"

SEEN

HEARD

Our smallest woodpecker. Similar in appearance to Hairy Woodpecker, but much smaller, including the size of bill. Call note is a short "pik" similar to Hairy, but softer. Only male Downy and Hairy Woodpeckers have a red patch on the back of their head.

Mourning Dove *(Zenaida macroura)*

L 12"
WS 18"

SEEN

HEARD

Listen for the soft sound "ooAUH cooo cooo cooo." Small, grayish-brown, black spot on head.

Orange-crowned Warbler *(Oreothlypis celata)* L 5" WS 7.25"

SEEN

HEARD

Most Orange-crowned Warblers nest on the ground. The male's song is more varied than that of other wood warblers, and males can be told apart by their distinctive song patterns. Often sounds like a playground whistle.

Pacific Wren *(Troglodytes pacificus)*

L 4"
WS 5.5"

SEEN

HEARD

A very common bird of Seminary Hill, the Pacific Wren is a small dark brown bird that is usually seen hopping around in low brush. Tail is usually sticking up. Song is a very long complex warble of trills and buzzes.

Band-tailed Pigeon *(Patagioenas fasciata)*

L 14.5"
WS 26"

SEEN

HEARD

Unlike your average city pigeon, Rock Pigeon, Band-tailed Pigeons can be distinguished by their yellow bill with a black tip on the end, yellow legs, white collar and mostly gray body.

SEEN

HEARD

This common feeder bird is easily recognized by its black cap, throat, and white cheek. Very small bill. Easily recognizable song sounds like "chickadee-dee-dee-dee."

Black-throated Gray Warbler *(Setophaga nigrescens)* L 5" WS 7.75"

SEEN

HEARD

Song is a fast, rising, buzzy series of notes sounding like "zeeda zeeda zeeda ZEE." Feather patterns similar to Townsend's Warbler, color consists of only black and white with the exception of one yellow spot by each eye.

Eurasian Collared-Dove *(Streptopelia decaocto)* L 13" WS 22"

☐ SEEN
☐ HEARD

Larger than Mourning Doves. Collar a narrow black crescent at nape of neck. Sits on telephone wires in Parking Area. Song a repeated, rhythmic "coo COOO cup." Also a harsh, nasal "krreew." They arrived in Florida in the 1980's and have since expanded into most of North America.

Golden-crowned Sparrow *(Zonotrichia atricapilla)* L 7.25" WS 9.5"

☐ SEEN
☐ HEARD

Black head with yellow crown. Song consists of usually three long whistled notes "seeeea seeeew soooo."

Fox Sparrow *(Passerella iliaca)*

L 7"
WS 10.5"

☐ SEEN
☐ HEARD

Fox Sparrows are ground foragers. They uncover food with a "double scratch" of one hop forward and a quick hop back. There are four types of Fox Sparrows, but in this area we have the Sooty Fox Sparrow.

Northern Flicker *(Colaptes auratus)*

L 12.5"
WS 20"

☐ SEEN
☐ HEARD

A large, brown woodpecker, the Flicker can often be found on the ground foraging for ants and beetles. Red-shafted Flickers are common here, while Yellow-shafted Flickers are common in the East.

Pacific-slope Flycatcher *(Empidonax difficilis)* L 5.5" WS 8"

☐ SEEN
☐ HEARD

A small, yellowish flycatcher that lives in shaded forests and streamlands. Song is high-pitched, squeaky, with three parts, "ps-SEET, ptsick, seet!" Call is a sharp "seet!"

Pileated Woodpecker *(Dryocopus pileatus)*

L 16.5"
WS 29"

☐ SEEN
☐ HEARD

Our largest woodpecker, the Pileated Woodpecker is unmistakable. Males have red crest that goes down to bill, while females have red crest with dark forehead. Large holes made are relied upon by other animals for shelter and nesting. Call is a loud "keh keh ke ke ke ke ke ke ke ke ke kah." Listen for loud slow drumming lasting 3 seconds.

Purple Finch *(Haemorhous purpureus)*

L 5.7"
WS 10"

☐ SEEN
☐ HEARD

Males are almost entirely purple or reddish. Triangular bill. Notched tail. Female is a drab brownish color with a faint brown and white head pattern.

Rufous Hummingbird *(Selasphorus rufus)*

L 3.75"
WS 4.5"

☐ SEEN
☐ HEARD

This migratory hummingbird can be seen in North America during Spring and Summer. Males an overall pale orange color with bright red gorget. Females mostly green, white on front of body with small red central spot on throat.

Red-breasted Sapsucker *(Sphyrapicus ruber)* L 8.5" WS 16"

☐ SEEN
☐ HEARD

Almost completely red head and breast. White wing bar. The Rufous Hummingbird is often found nesting near sap wells and feeds at the wells that the Sapsucker keeps flowing.

Pine Siskin *(Spinus pinus)*

L 5"
WS 9"

SEEN ☐
HEARD ☐

A little smaller than a Goldfinch with yellow-striped wings, streaky breast, and pointy bill. Often seen in large flocks.

Red-breasted Nuthatch *(Sitta canadensis)*

L 4.5"
WS 8.5"

SEEN ☐
HEARD ☐

Song is a series of nasal calls sounding a bit like "aank aank aank aank." Comes to feeders, often seen inching down tree trunks.

Ruby-crowned Kinglet *(Regulus calendula)*

L 4.25"
WS 7.5"

SEEN ☐
HEARD ☐

Very high pitched voice. Song varies, sometimes long and complex. Ruby crown not always visible. Full of energy, hopping from place to place.

Sharp-shinned Hawk *(Accipiter striatus)*

L 11"
WS 23"

SEEN ☐
HEARD ☐

Similar to Cooper's Hawk, but much smaller. If you see a raptor zooming through the forest, chances are it will be a Sharp-shinned Hawk.

Spotted Towhee *(Pipilo maculatus)*

L 8.5"
WS 10.5"

SEEN ☐
HEARD ☐

Larger than an average sparrow. Red eye, orange/brown sides, white spots on wings. Voice is a buzzy trill "che zheeee."

Swainson's Thrush *(Catharus ustulatus)*

L 7"
WS 12"

SEEN ☐
HEARD ☐

Listen for an upward-spiraling, flutelike song. The call note sounds something like a water drip.

Song Sparrow *(Melospiza melodia)*

L 6.25"
WS 8.25"

SEEN ☐
HEARD ☐

One of our most common sparrows, the Song Sparrow is usually found in low brush or seen perched singing. Dark brown, bold streaks on breast, thick gray stripes on head. Song begins with several short, sharp notes followed by a long variable series of trills and clear notes.

Steller's Jay *(Cyanocitta stelleri)*

L 11.5"
WS 19"

SEEN ☐
HEARD ☐

Unmistakable. Blue body, black head, tall crest. Voice is a varied unmusical "shek shek shek shek shek."

Townsend's Warbler *(Setophaga townsendi)*

L 5"
WS 8"

SEEN ☐
HEARD ☐

Forages high in trees. Sometimes difficult to see. Feather pattern similar to Black-throated Gray Warbler, but with bright yellow color.

Varied Thrush *(Ixoreus naevius)*

L 9.5"
WS 16"

☐ SEEN

☐ HEARD

Similar in size and behavior to American Robin. Orange eyebrow, black breastband, patterned wings. Song a long single buzzy whistle. This bird can be found on Seminary Hill during the winter.

Western Wood-Pewee *(Contopus sordidulus)* L 6.25" WS 10.5"

☐ SEEN

☐ HEARD

A medium-sized, drab flycatcher. Listen for song, a harsh "pee-eer" descending in pitch. Call sounds like "bzew." Often forages for insects from an exposed branch mid-way up a tree. Flies out to catch insect in air and returns to perch.

Wilson's Warbler *(Cardellina pusilla)*

L 4.75"
WS 7"

☐ SEEN

☐ HEARD

Song is a series of short whistled squeaky notes, slower than Orange-crowned Warbler. Overall yellow and olive color. Only males have black cap.

Hairy Woodpecker *(Picoides villosus)*

L 9.25"
WS 15"

☐ SEEN

☐ HEARD

Very similar in appearance to Downy Woodpecker, but noticeably larger. Bill is nearly the same length as head. Call note a high sharp "peek," louder than Downy.

Western Tanager *(Piranga ludoviciana)*

L 7.25"
WS
11.5"

☐ SEEN

☐ HEARD

These birds spend lots of their time high in treetops. Song similar to American Robin, slightly raspier. Call is a quick, rising "pridídik." Females are dull yellow with no red on head.

White-crowned Sparrow *(Zonotrichia leucophrys)* L 7" WS 9.5"

☐ SEEN

☐ HEARD

The Oreo cookie markings on its head make this sparrow one of the easiest to identify. Listen for a call of "See me, pretty, pretty me."

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