Forest Management Plan

Stemilt Squilchuck Community Forest, February 2020

Abstract

A Forest Management Plan serves as the basis for developing stand treatments that consider not only the timber resource but also wildlife habitat, soils, noxious weeds, sensitive species, and cultural factors. This plan will provide the landowner with guidelines on the timing of recommended treatments that will meet the desired objectives. Although this plan identifies recommended treatments, the recommendations are flexible. Changing needs, markets, environmental conditions or regulatory laws may require alterations of the schedules or treatments.

NORTHWEST MANAGEMENT, INC

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INTRODUCTION

BACKGROUND

Commencing in 2015, Northwest Management Inc. was engaged by the County of Chelan (hereinafter, the "Landowner") to perform forest consulting tasks on several parcels of forestland that they had recently acquired. As part of that evolving assignment, NMI was asked to prepare a Forest Management Plan that would assist the County with planning and implementation of silvicultural practices consistent with certain management goals. This document is that Plan.

Purpose and intent of this Plan. This Plan outlines forestry guidelines to aid the County in performing sound silvicultural management practices on their forestlands in furtherance of the County's Goals (see below). The Plan is also intended to qualify as a forest management plan as codified by the USDA Forest Service as administered by the Forest Stewardship Program and their Washington State agents. We further believe that this Plan can also meet the requirements of a Forest Management Plan as currently administered by the USDA Natural Resources Conservation Service in Washington; as a Tree Farm Plan as administered by the American Forest Foundation Tree Farm System if needed.

PROPERTY DESCRIPTION

Total property Acres: 3,388 acres (approximate).

Total forested Acres: 3,114 acres (approximate)

Legal Descriptions for the subject planning area are approximately as follows:

Section 1, Township 21N, R19E, WM, and the W½, W½E½ Section 7, S½, and parts NW¼ Section 23, E½, E½W½, W½NW¼, NW¼SW¼ Section 26, Section 27, E½, E½W½, W½SW¼, SW¼NW¼ Section 29, Township 21N, Range 20 East WM.

Latitude: 47° 18' 44.86" N, Longitude: 120° 21' 40.49" W to the estimated center of the region.

Watersheds:

The project area primarily falls within the Water Resources Inventory Area (WRIA) 40A and portions of WRIA 45 and includes Stemilt Creek, Squilchuck Creek, with a small portion in East Fork Mission Creek and Colockum Creek watersheds.

Chelan County, Washington

Fire Protection:

- Chelan County Fire District 1 and Washington Department of Natural Resources (WDNR)

Driving Directions:

The Chelan County, Stemilt-Squilchuck property is located in the southeastern portion of Chelan County. Access to the property, depending on the particular sections, is via the Stemilt Loop Road or Squilchuck Road, south of the City of Wenatchee as follows:

General access to the Stemilt-Squilchuck Section 1 and 7 parcels begins in Wenatchee Washington. Starting in downtown Wenatchee, at the corner of South Chelan Ave. and Orondo Ave., travel south on South Chelan Avenue approximately 1 mile to S. Mission St. Continue straight on S. Mission St.

approximately 1 mile, the road changes to Squilchuck Rd (Chelan Co. Hwy. 711). Continue onto Squilchuck Road approximately 7 miles to the entrance to Squilchuck State Park. From this point, Section 1 and 7 parcels lay north of the park and are accessed by developed USFS roads.

Analogously, general access to the Chelan County, Stemilt-Squilchuck Sections 23, 26, 27 and 29 parcels begins in Wenatchee Washington. Starting in downtown Wenatchee, at the corner of S. Chelan Ave and Orondo Ave, travel south on S. Chelan Avenue approximately 1 mile to S. Mission St. Continue straight on S. Mission St. approximately 1 mile, the road changes to Squilchuck Rd (Chelan Co Hwy 711). Continue on Squilchuck rd. for approximately 4.5 miles. Turn left on Wenatchee Heights rd. and continue for 2.1 miles. When you reach the ridge, the road turns into Loop Rd., continue south for about 3.4 miles. At that point you will have the option to turn right on Orr Creek Rd. which will access Section 29 or continue on loop road to access Sections 23, 26, and 27. Access throughout the parcels is possible via developed logging roads from these main access routes.

PROPERTY OVERVIEW

The Stemilt-Squilchuck Community Forest property is in southeast Chelan County approximately 6 air miles south of Wenatchee, Washington, in the central-east Cascade Mountains with an elevation range of 2500-5100 feet. The lands that are the subject of this Plan are represented by six (6) non-contiguous sections of land, or portions thereof, laying along the eastern slope of Beehive Mountain, and western slope of Jump-off Ridge, in the Stemilt Basin. The property contains approximately 3,380 acres of diverse forest land, wetlands, lakes, montane forest, rock outcrops, and rocky cliffs.

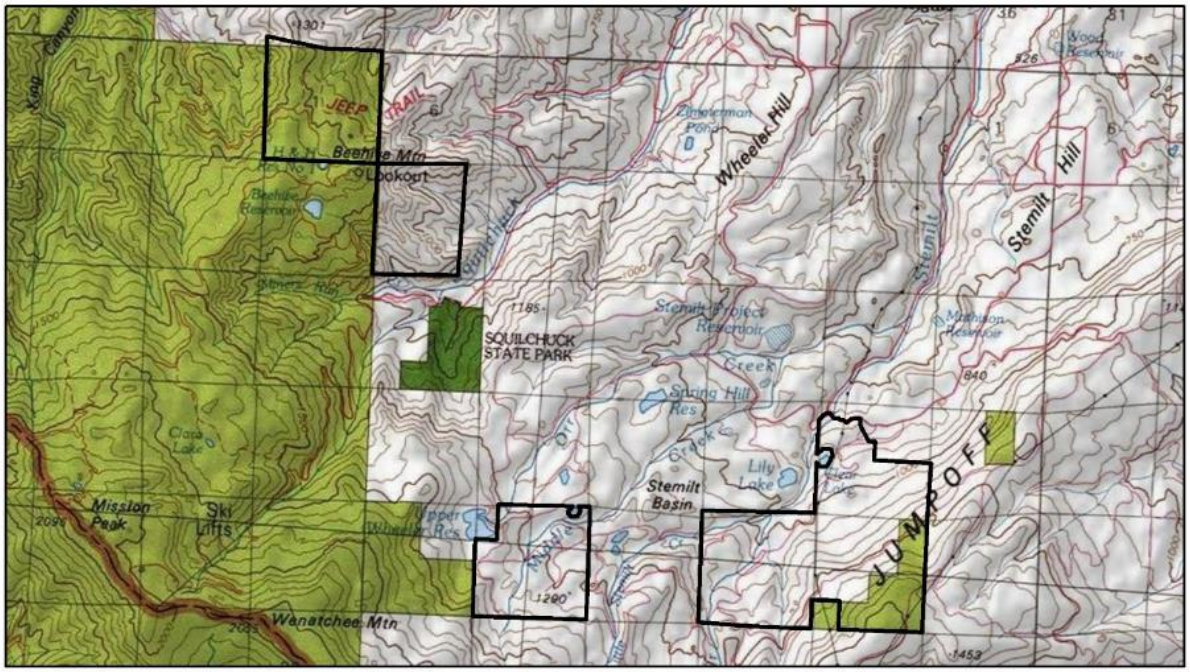
Property ownership and forest-management history.

Chelan County Department of Natural Resources acquired these parcels from Weyerhaeuser in 2014. Funding for the acquisition was made possible through grants from United States Forest Service (USFS) Community Forest Program, RCO WWRP, and a variety of donations from local organizations and individuals. The subject property has been industrial timberland for several decades and was formerly owned by Longview Fiber Company prior to being acquired by Weyerhaeuser in 2013. The property has undergone intensive forest management under these previous industrial owners, although the silvicultural management-regimes differed. Several even-aged harvests were performed by Weyerhaeuser within the six years prior to the Chelan County acquisition, and no post-harvest management activities were completed by Weyerhaeuser prior to the sale.

The public has had access to recreated on these lands for most of the past century. The outdoor recreation opportunities and the irrigation uses provide by the reservoirs found in and around these lands create significant value for local economy and residents. The timber resource on the property is similar across all the sections, with some variability due, in part, to changes in aspect, slope and soils. Coniferous forest-types characterize the wooded acreage, and Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*) predominate with lesser amounts of true firs, western larch (*Larix occidentalis*), Engelmann spruce (*Picea engelmannii*)and lodgepole pine (*Pinus contorta*) depending on past harvest activity, seed sources and exposure. Over the past two decades, the property has been intensively managed as commercial forestland under both even- and uneven aged management regimes. Overall, the interaction of innate site conditions with these historic management practices has resulted in a wide distribution of second-growth timber with varied amounts of natural regeneration and plantations across the ownership.

Historic forest management actions also have incorporated minimal fuel treatments after harvest leaving a legacy of slash piles and excessive amounts of ground slash within certain harvest units. Overall, the health of the timber resource on the property is good with minor occurrences of forest health issues which include dwarf mistletoe (*Arceuthobium abietinum*), Armillaria root rot (*Armillaria ostoyae*), bark beetles and other infestations causing pockets of mortality or areas of visibly declining forest-health. Forest management over the next two decades should address improving stand stocking, slash treatment, preservation of large trees and introduction of fire into the ecosystem as a tool to help return stands to a more natural fire-regime thereby promoting better stand dynamics and forest health.

Stemilt-Squilchuck Community Forest
Chelan County, Washington



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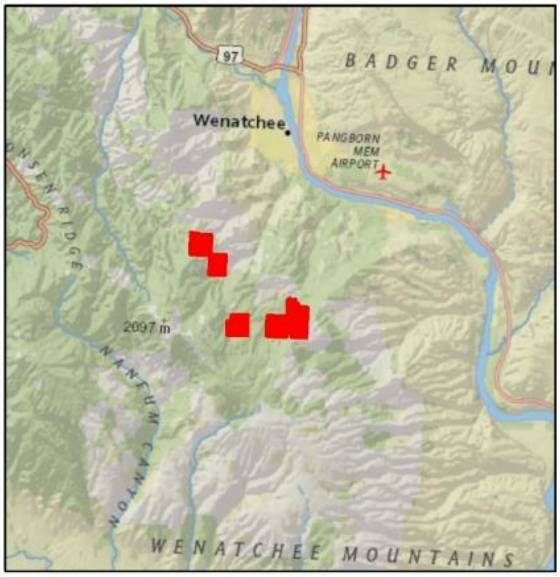

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Figure 1 Location Map

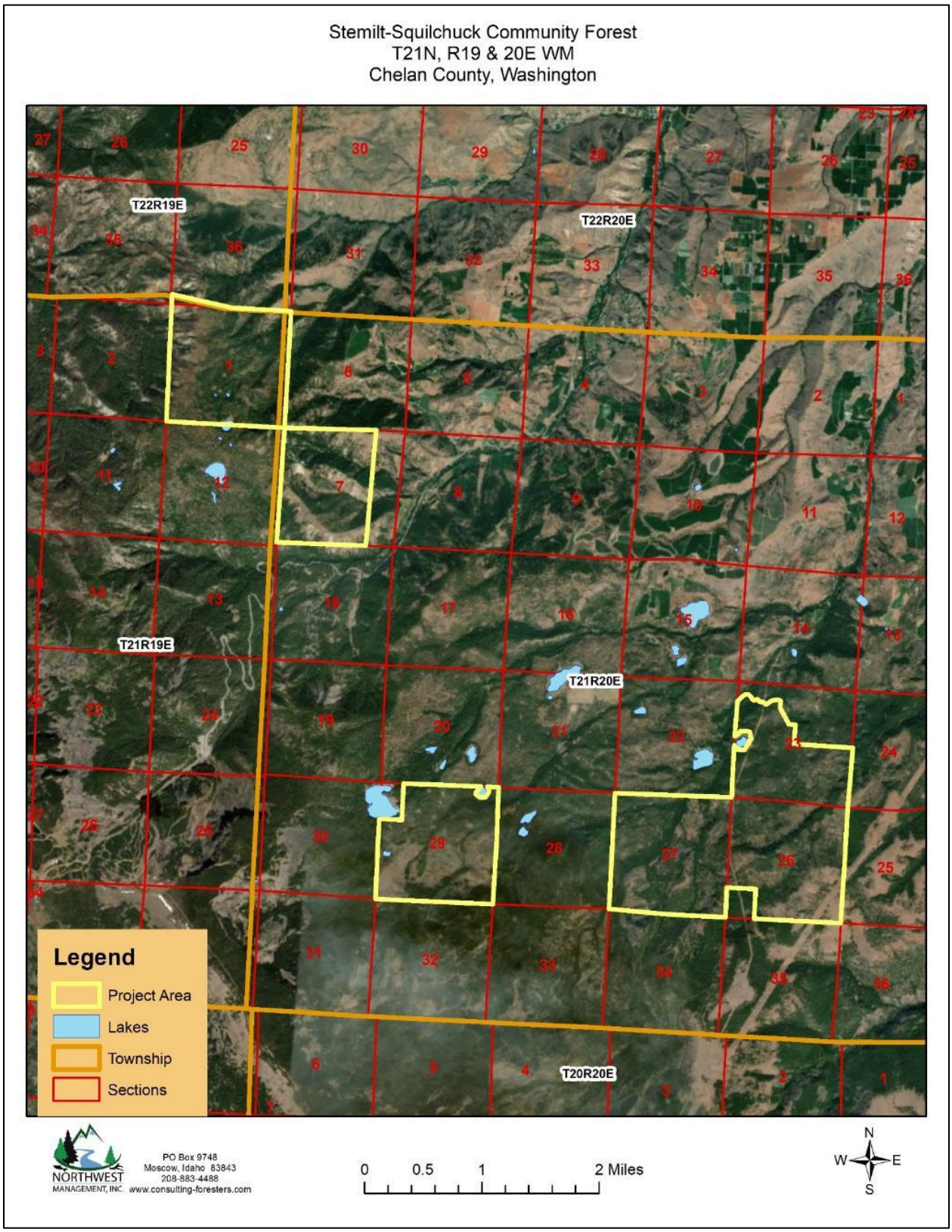


Figure 2 Property Map

GOALS AND OBJECTIVES

Overall, the Goals of this Forest Management Plan (FMP) are to:

- assess the biological and ecological conditions of the forest types and stands,
- manipulate present conditions towards those of the desired Historical Range of Variability for the subject forest types in the region,
- promote forest conditions that are healthier and more resilient to catastrophic landscape-disturbances such as wildland fire and wide-spread insect & disease losses,
- design and prescribe a series of silvicultural activities designed to meet stand treatment objectives that are consistent with the County goals.

In addition, the County has identified several primary management goals for the property. These goals and management objectives have been identified as:

- manipulate forest stand composition to increase prevalence of dry-site forest types, as well as their resilience to anticipated changes in moisture, wildland fire and climate regimes,
- modify spatial patterns of residuals stands, over time, in order to more mimic historical stand structure,
- restore abundance of large, old trees as well as stand spatial heterogeneity,
- improve forest health by prescribing stand treatments to reduce the prevalence and severity of forest health issues,
- implement forest management recommendations in planned phases that can be carried out by Chelan County staff or contractors within the County's financial means,
- improve wildlife habitat, particularly for the Colockum elk herd, by conducting forest management projects,
- protect, improve, and maintain the recreational experience and opportunity by limiting impacts from forest management projects,
- protect natural resources including water quality, soils, and the forest, and
- work with other regional land managers on implementing landscape-scale restoration efforts.

FOREST MANAGEMENT

Forest management is the practice of providing a forest the proper care so that it remains healthy and vigorous and provides the products, recreation opportunities, and the amenities the landowner desires. Forest management activities must comply with relevant federal, state, and local laws regulations and ordinances. Landowners need to be aware of the Washington State Forest Practices Rules. Notification and compliance procedures are necessary when a landowner elects to undertake a forest practice on their property. The administration of forestry permitting is conducted in this region by the Southeast Regional Office, located in Ellensburg, Washington. Questions can be directed to the DNR office or by contacting a local forestry consultant.

To accomplish the objectives outlined above, both passive and active forest management treatments are projected over the next two decades. Unfortunately, forest ecosystems are dynamic, they change when humans disturb them, and they change when humans eliminate disturbance (Hessburg et al.

2015). Active management provides opportunities for multi-use objectives that focus on long-term sustainable timber management and includes timber harvesting. Active management techniques in a general sense, utilize silvicultural systems such as variable retention harvests, tree planting, pre-commercial thinning, variable density commercial thinning, prescribed burning, retention of legacy trees and coarse woody debris, and road decommissioning, upgrading and construction. Passive management provides the same opportunities with a greater emphasis on maintenance and preservation of current conditions without timber harvesting being prescribed for the projected management period. Passive management is a choice to let nature take its course on forestland. The landowners choose as a conscious management decision to not actively manipulate the vegetation. Passive management is not considered a silvicultural system since it does not involve the manipulation of vegetation. Passive management does require monitoring, and certain events may trigger some short-term active management practices such as weed control, fire management, insect and disease mitigation, etc.

In this Management Plan, prescriptions developed for each stand are designed to begin a process of returning the area to a condition that is within the historic natural range of variability by improving timber stocking with seral tree species, mitigate excessive fuel loads in areas of past harvest activity, and promote a healthy forest resilient to wildfire, insects, and disease.

MANAGEMENT UNIT DESCRIPTIONS

Field reconnaissance of the Chelan County, Stemilt-Squilchuck Community Forest property was conducted in 2018 by Northwest Management Inc. for this Management Plan. The reconnaissance entailed evaluation of Chelan County lands in the Stemilt Basin, which included all or portions of Sections 1, T21N, R19E and Sections 7, 23, 26, 27 and 29, T21N, R20E WM. The property was divided into stands for assessment and management recommendations. A stand shapefile previously developed by Weyerhaeuser was used to separate vegetation cover into manageable units across the ownership. This stand layer was edited to meet the goals of the assessment, targeting an average stand size of approximately 50 acres and adjusting boundaries based on major roads, timber type, timber density, and topography. Each stand was assessed independently in the field through reconnaissance and a timber cruise. Digital photographs were collected that best represented the general nature and overall condition or special features of representative stands in each section. For organization and communication of results, data on timber characteristics management recommendations, and implementation timelines for each stand were entered into a GIS database. This database is used extensively to communicate the proposed management actions over the next 20 years through maps and tables. Although data was collected, and management prescriptions were developed at the stand level, prescriptions are common to many stands due to similarities of cover vegetation and past management practices, resulting in landscape-wide projections within the individual sections owned by Chelan County.

General Vegetation and Timber Types

Ponderosa pine, Douglas-fir, and dry grand fir plant associations are the predominant forest cover type present on Chelan County, Stemilt-Squilchuck Community Forest property. This forest cover type is dominated by ponderosa pine, Douglas-fir, grand fir and western larch, with minor amounts of lodgepole pine and Engelmann spruce. Douglas-fir, western larch, grand fir (*Abies grandis*), and ponderosa pine are present across the entire ownership in variable amounts depending on aspect,

elevation, and soil. Pure clusters of ponderosa pine are common on the drier aspects and open exposed sites. Douglas-fir is present wherever soil moisture is not limited due to aspect. Grand fir is found on the northern aspects and cooler wet aspects and draw bottoms and is a common understory regeneration tree. Lodgepole pine and Engelmann spruce are found mostly on the cool moist northerly aspects and in the draws and along streams and frost pocket areas of poor air drainage.

Historic Fire Regime

The lands in and around Chelan County, Stemilt-Squilchuck Community Forest property are subject to a variety of natural, introduced, and altered fire regimes. A fire regime refers to the general pattern that fires naturally occur in an ecosystem over an extended period of time. Fire regimes are characterized by a variety of factors including vegetation composition, fuel structure, climate and weather patterns, and topography. Human influence over vegetation through land management has altered the natural fire regimes in many places through fire exclusion, livestock grazing, and timber harvesting (Hessburg et al. 2015). Fire regimes I and II are the predominant historic regimes in the Stemilt Basin. Fire Regime I is characterized as forest areas with natural non-lethal ground fires with return intervals less than 35 years. This naturally reoccurring fire frequency maintains an open stand structure dominated by seral, fire-resistant shade-intolerant tree species. Fire Regime II is characterized as grassland and scrubland steppe community areas with natural stand-replacing fires with return intervals less than 35 years. This fire regime is generally found at lower elevations or as small inclusions within the Fire Regime I area and is usually related to topographic changes. A few conifer trees may exist in isolated areas within this fire regime. The naturally reoccurring fire frequency maintains an open stand structure dominated by seral, fire-resistant shade-intolerant tree species. The general historic frequency of fires within the Stemilt Basin was frequent, low-intensity ground fires of natural origin. These fires kept fuel levels low, prevented the establishment and growth of shade-tolerant species and promoted early seral tree species, i.e. ponderosa pine and western larch. The frequent cool under burns kept the forest in an open park-like structure dominated by large widely spaced trees (Hessburg et al. 2015).

Forest Stand Inventory and Evaluation

To determine an estimate of the timber characteristics of the Chelan County, Stemilt-Squilchuck Community Forest, a timber inventory or cruise was performed. The timbered areas of the property were divided into stands based on contiguous similarities in timber cover type. A variable-radius cruise design was chosen as the sampling procedure to use for estimating the timber volume and other characteristics in each stand. Cruise sample plots were located on a systematic grid throughout the timber stands by pacing or GPS from reference points located on the ground. A Spiegel Relaskop using an appropriate Basal Area Factor (BAF) was used to determine merchantable sample trees on each plot. Merchantable trees are all trees containing at least one 12-foot log with a minimum small end diameter of 5.5 inches. Sample trees were measured or estimated for diameter to the nearest inch, height to the nearest foot and defect to the nearest 10% by 1/3rd tree segments. An estimate of stand regeneration and sub merchantable tree stocking was determined with a nested 1/100th acre fixed area plot established at each cruise plot center. Data collected in the cruise was compiled with a computerized cruise processing system to calculate the average volume per acre, species composition, stocking, and log quality makeup of the stand. A Geographical Information System (GIS) was used with digital maps and recent aerial photography to delineate stand boundaries and calculate acres. The property boundaries used for this evaluation are based on parcel boundaries delineated by the Chelan

County assessor's office. Mapped property boundaries, and therefore stand boundaries may vary slightly from the actual location on the ground.

Stand numbering in the cruise design relates to cruise intensity, and this numbering scheme is used on the maps and tables developed and displayed in this plan. Higher volume stands were labeled 1xx (xx representing a consecutive number within each section) and were cruised at an intensity of 1 plot per 5 acres. Lower volume stands were labeled 2xx and were cruised at an intensity of 1 plot per 10 acres. Stands labeled 3xx are stands that would generally be passively managed and primarily consisted of riparian zones and rocky non-commercial areas. 3xx stands were not cruised for this plan. In all, there were 37 High Volume (1xx) stands covering 1876 acres, 15 lower volume (2xx) stands covering 806 acres and 69 non-commercial (3xx) stands covering 706 acres identified for this plan on the Chelan County, Stemilt-Squilchuck Community Forest. Of the total 3,388 acre ownership, 2,683 acres, or ~80% of the ownership was physically cruised and assessed for this plan.

The following table summarizes the total timber volume determined from the timber inventory for the entire ownership. Timber inventory information for each section can be found in the individual Section Descriptions that follow.

Table 1 Total Ownership Inventory Data

Chelan County, Stemilt-Squilchuck Community Forest Management Plan
Timber Inventory Summary (Conifer Species)
Entire Ownership
Total Volume by Species

Species	Ave DBH (in)	Trees/ ac	Basal Area (SqFt)	Net Mbf/ac	Total Gross Mbf	Total Net Mbf	% Defect
Douglas fir	5.0	168	23	1.44	4,282	3,864	9.8%
Englemann Spruce	3.3	3	3	0.005	16	14	12.5%
Grand fir	2.5	132	132	0.232	774	622	19.6%
Lodgepole pine	2.4	11	11	0.008	23	21	8.7%
Ponderosa pine	7.0	98	98	1.893	5,578	5,079	8.9%
Western Larch	4.7	22	22	0.149	441	399	9.5%
	4.9	435	56	3.727	11,114	9,999	10.0%

Total Volume by Section

Section #	Township	No. Stands	Cruise Acres	Ave DBH (in)	Trees/ ac	Basal Area (SqFt)	Net Mbf/ac	Total Gross Mbf	Total Net Mbf
1	21NR19E	13	633	5.6	322	55	3.92	2,786	2,480
7	21NR20E	7	325	7.4	251	74	4.49	1,665	1,459
23	21NR20E	6	354	5.6	393	67	5.28	2,007	1,867
26	21NR20E	10	472	4.0	533	46	2.90	1,504	1,369
27	21NR20E	9	505	4.4	532	55	3.48	1,937	1,753
29	21NR20E	7	395	4.0	562	49	2.71	1,215	1,071
Total			2,683					11,114	9,999

PRESCRIBED SILVICULTURAL TREATMENTS

Past timber harvesting on the Chelan County, Stemilt-Squilchuck Community Forest property, has created extensive areas with similar forest cover vegetation and management needs. Several management regimes are necessary over the next 15-20 years to bring ownership into a condition that meets the landowners identified goals and objectives. Stands designated for passive management will be left to grow without immediate treatment. Stands designated for active management have an identified silvicultural prescription intended to help restore the site to a condition that promotes forest growth that is resistant to insects, disease and devastating wildfires. Due to the similarity of the stands that will be managed on this ownership, targeted treatments or combinations of treatments are prescribed over the next two decades in 5-year time frames or intervals. The targeted prescriptions include prescribed burning alone, or pre-treatment of the current forest cover vegetation followed by prescribed burning or piling and burning. Pre-treatment includes thinning by hand or mechanical methods either pre-commercially, or commercially, depending on the stand structure. Pre-treatment is necessary prior to burning to reduce stocking and fire severity. Where fuels are excessive and/or

thinning will increase the fuel load, piling and burning is the recommended treatment. In stands with low accumulations of fuels from thinning or past logging activities, underburning via broadcast or pile burning will be utilized. The following is a brief description of the silvicultural treatments that may be included in the targeted prescriptions.

Cutting Treatment Types

Pre-commercial Thinning (PCT)

Pre-commercial thinning (PCT) occurs in young stands that are growing with very high stocking levels. An ideal stand to thin would be one where the trees are less than 15 feet tall and in excess of 400 trees per acre. The ideal target stocking level for trees of this size is around 250 trees per acre. Species selection is generally the same as for a commercial thin with an average spacing between trees of approximately 12-15 feet.

Variable Density Thinning (VDT)

Variable density thinning involves the removal of commercial timber with the ultimate goal of improving stand health and forest structure. The resulting spatial distribution of the stand is intended to mimic the pre-fire exclusion condition of the stand. Most often, this will involve “thinning from below” (removing suppressed and intermediate trees), removal of shade-tolerant species and retention of dominant and co-dominant seral species. While basal area ranges may be used as a guideline for VDT treatments, the primary concern is to create a variety of stocking densities across the treatment area to provide for the functions identified above. Understory treatments will often follow a VDT treatment in order to meet the desired future condition of the stand.

ICO Method (ICO)

This method is like VDT and can be applied to pre-commercial and commercial harvests. ICO is most applicable even-aged stands, single cohort stands, uneven-aged stands that were selectively logged, and stands dominated by old trees (Churchill et al. 2016).

Overstory Removal (OSR)

In some instances, it may be necessary to harvest trees in the upper canopy to release advance regeneration that occurs in the understory. Clearcutting the overstory should only occur when the primary source of regeneration is advance reproduction.

Commercial Thinning

The ideal number of crop trees to grow through to the end of a stand's rotation age is approximately 150-180 trees per acre depending on site conditions. This average range applies to more mesic conditions. When an even-aged stand of younger merchantable-sized timber has a significantly greater number of trees per acre, a commercial thinning should occur to lessen the inter-tree competition and to concentrate the growth on the potential crop trees. In a commercial thinning harvest, defective, poorly formed, poor vigor, and suppressed trees should be targeted for removal as well as any additional trees necessary to reach the desired stocking level and species composition.

Salvage Harvest

A salvage harvest is a practice of removing individual trees or clusters of trees from the forest that have been damaged by wildfire, severe weather, insect damage or other natural disturbance in order to

recover the economic value that would otherwise be lost. Although the primary motivation for a salvage harvest is economic, this selective harvest method has been used to reduce the intensity of future wildfires, and the slow buildup of insect infestations.

Prescribed Burning Treatment Types

Prescribed burning is the management practice that aims to remove deadwood and other fuel biomass with the main objective of reducing the fire risk. Prescribed burning is the intentional, controlled application of fire to a forest to accomplish landowner objectives. The primary prescribed burning applications proposed in this plan include one or a combination of the following types.

Underburning

Underburning is a prescribed fire ignited under the forest canopy that focuses on the consumption of surface fuels but not the overstory vegetation. Underburning is generally used following a pre-treatment such as thinning and or pile burning to further reduce the surface fuels, help maintain the desired vegetation conditions and enhance the overall health and resiliency of the stand.

Broadcast Burning

Broadcast burning is a prescribed fire ignited in areas with little or no forest canopy present. Broadcast burning is used in grassland, shrublands, forests, and clear-cuts for habitat restoration and fuel reduction purposes.

Pile Burning

Pile Burning is a prescribed fire used to ignite hand or machine created piles of cut vegetation resulting from vegetation or fuel management activities. Piles are generally burned during the wet season to reduce damage to the residual trees and to confine the fire to the footprint of the pile. Pile burning allows time for the vegetative material to dry out and will produce less overall smoke by burning hot and clean.

Jackpot Burning

Jackpot burning is a modified form of underburn or broadcast burn where the target fuels to be ignited are the concentrations (jackpots) of vegetative fuel. The result is a mosaic burn pattern. This technique works well when surface fuel loading is very high following vegetation treatments such as timber harvest or timber salvage.

Prescription Implementation

Singly or in combination, the silvicultural treatments identified above are intended to be implemented at various times within the next 20 years on the Chelan County, Stemilt-Squilchuck Community Forest property to meet the goals and objectives of this forest management plan. The specific treatment or combination of treatments within each stand will be laid out and implemented by a qualified professional forester following the Washington State Forest Practices Rules and in communication with the DNR. Following is the description and recommended management prescriptions and schedule for the individual sections of the Chelan County, Stemilt-Squilchuck Community Forest property.

ICO prescription is a method of tree marking that allows land managers to mimic the historic mosaic variability of individual trees and clumps of trees across a landscape. There is no per acre average tree

density to aim for with the ICO method unlike more conventional tree marking methods which are based off spacing or basal area prescriptions (Churchill et al. 2016).

Section Descriptions

SECTION 1

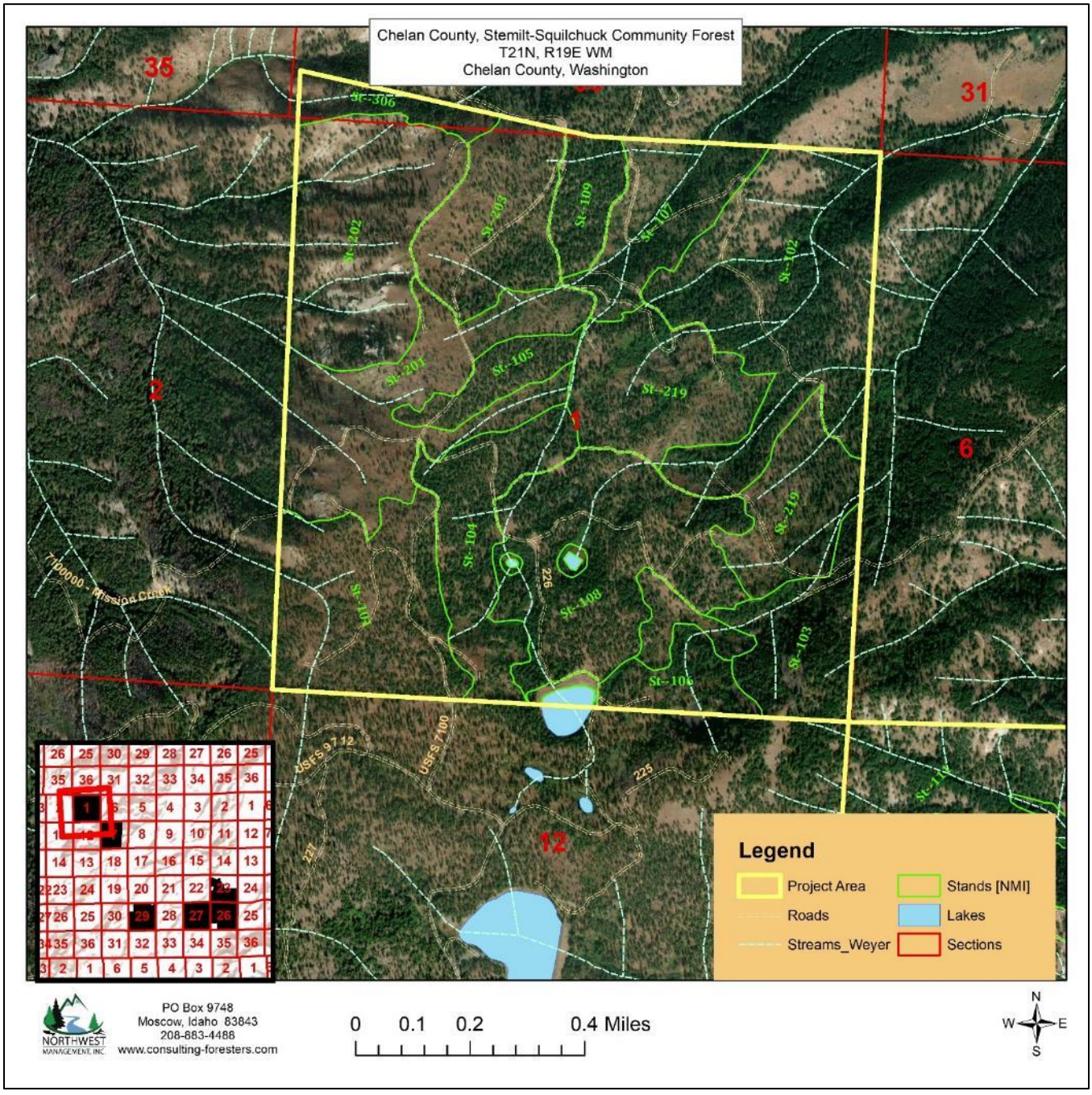


Figure 3 Section 1 Area Map

Section 1 consists of 633 acres of varying terrain from; gentle slopes in the south, steep rocky terrain along the western line, and steep broken terrain consisting of multiple draws in the northeast. It is generally a northern exposure with eastern and western aspects. Soils found in this Section are sandy, mixed in among large rock outcroppings and scree fields in areas. Road access within this Section

allows for active management throughout. Currently, many of the roads are grown in with brush, allowing ATV and foot traffic but restricting vehicle access to the main loop only. The Section is dominated by Douglas-fir and ponderosa pine with a very small amount of grand fir and western larch. Timber stocking averages 322 trees per acre, and timber defect averages 11% with an average net saw log volume of 3.9 mbf/ac.

This Section was thoroughly harvested by the previous landowner in the last 15 years, with most cuts removing much of the volume. Natural regeneration has grown in well in many of the cuts, however, brush and old slash have provided competition in many areas. In addition to harvest, a moderate-intensity fire burned in the northwest corner sometime after the last harvest. Timber health is generally good, with a minor presence of mistletoe, root disease and low beetle activity observed. Outside of fire, there are no major threats to this Section.

Several small wetlands exist in the south that provides good wildlife habitat, in addition to a lake that has a couple of channels associated with it. The water in these channels goes sub-surface rather than running into another waterbody.

This Section has a very high fuel load in the northeast primarily attributed to untreated harvest slash. Moderate to high amounts of brush occur throughout most of this area, contributing to the fuel load. A low-intensity underburn under cool moist conditions would be effective to clean up activity fuels and clear out brush. There is an opportunity to commercially harvest portions of Stands 203, 109, 107, and 102. This harvest would most importantly open the road system and the units to effectively pile slash that should have been treated by the previous landowner, in addition to the newly created slash. Portions of this area will not be possible to mechanically pile due to slopes. However, following the initial harvest and slash piling, the area should be re-evaluated for a potential broadcast burn. The goal of a broadcast burn would be to reduce fuel loads on the steeper slopes, reduce grand fir regeneration, and disrupt the duff layer throughout to allow natural reseeding. PCT opportunity exists in Stand 104 and a commercial thinning in Stand 108 could help supplement the project in the northeast. Piling or ground fire would in Stand 108 would serve to reduce fuel loads and reduce grand fire regeneration.

This Section has several different recreation opportunities as fisherman, atvs, bicycles, and hikers were all observed during field reconnaissance in 2018.

The following are representative pictures of Section 1.

Stand 101

Stand 105

Stand 107

Stand 201

Timber Characteristics

Chelan County, Stemilt-Squilchuck Community Forest Section 1 AverageTimber Characteristics 633 Acres	
Stocking (T/Ac.)	322
Diameter (Inches)	5.6
Basal Area (sq ft/ac	55
Net Volume / Ac. (mbf)	3.92
Defect (%)	10.98

Saw Log Volume Section 1 633 Acres mbf = one thousand board feet				
Species	Gross mbf	Net mbf	Defect	Net mbf/Acre
Douglas fir	1,097	969	11.7%	1.532
Grand fir	217	147	32.3%	0.233
Ponderosa Pine	1,398	1,297	7.2%	2.050
Western larch	74	67	9.5%	0.106
Total	**2,786**	**2,480**	**11.0%**	**3.921**

Fuels Characteristics

Stand	Acres	<3" fuels (tons/acre)	>3" fuels (tons/acre)	Total (tons/acre)	Total (tons/stand)	Canopy Base Height	Photo Series
101	61.23	0.5	4.5	5	306.2	15	2
104	40.59	3	29	32	1,298.9	8	2
105	14.08	1.5	12	13.5	190.1	10	2
106	16.42	5	20	25	410.5	7	2
107	33.17	3	18	21	696.6	8	3
108	75.71	5	20	25	1,892.8	7	2
109	15.31	1	10	11	168.4	10	2
203	40.17	1	9	10	401.7	10	1
219	74.59	5	20	25	1,864.8	10	2
102	95.43	3	12	15	1,431.5	15	2
103	32.37	5	35	40	1,294.8	10	2
201	67.6	1.4	4.5	5.9	398.8	20	2
202	65.94	0.5	6	6.5	428.6	10	2
306	11.97	5	10	15	179.6	15	4

The following table illustrates the recommended treatments by stand over the next 2 decades in this Section.

Recommended Treatments

Table 2 Section 1 Treatment Recommendations

Stand ID	Trees/Acre (2019)	Basal Area (2019)	Canopy Base Height (2019)	Pre-Treatment Type	Pre-commercial Thin Target (Trees/Ac.)	Commercial Harvest Trigger (BA)	Commercial Harvest Target (BA)	Initial Fuels Treatment
101	214	45	15	PCT	150	80	40	Lop & Scatter
102	208	60	15	Harvest	N/A	60	40	Underburn
103	132	104	10	PCT	150	N/A	N/A	Pile & Burn
104	525	70	8	Harv_PCT	150	70	40	Pile & Burn
105	232	60	10	None	N/A	100	40	Underburn
106	509	23	7	PCT	150	100	40	Pile & Burn
107	492	38	8	PCT	150	100	60	Pile & Burn
108	722	94	7	Harvest	150	90	40	Pile & Burn
109	285	101	10	Harv_PCT	100	100	60	Underburn
201	297	33	20	None	N/A	N/A	N/A	None
202	84	30	10	None	N/A	N/A	N/A	None
203	151	45	10	PCT	150	100	40	Pile & Burn
219	358	42	10	PCT	150	80	40	Pile & Burn
305				None	N/A	N/A	N/A	None
306			15	None	N/A	N/A	N/A	None

SECTION 7

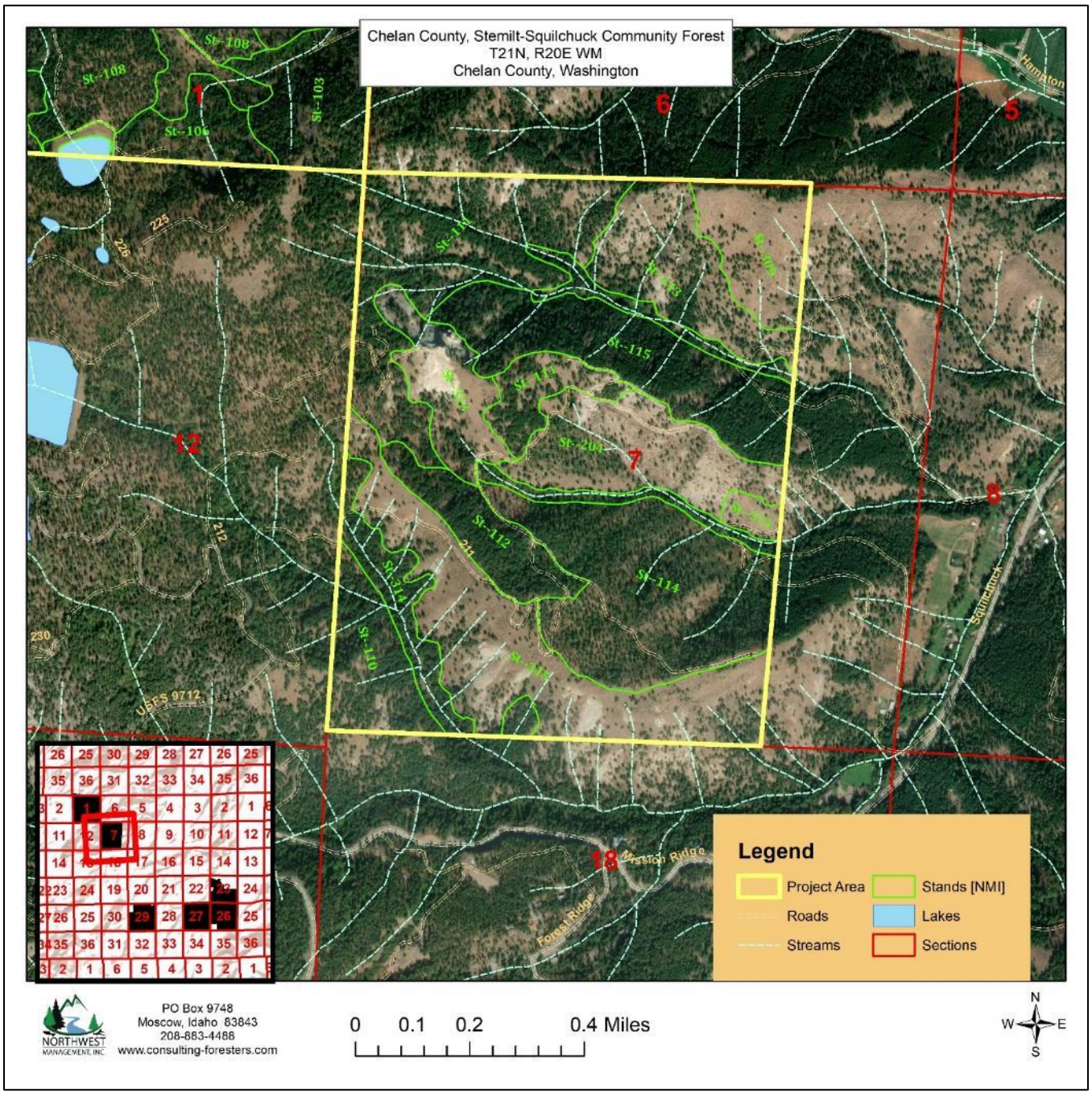


Figure 4 Section 7 Area Map

Section 7 is approximately 325 acres and consists of three major draws running from the northwest to the southeast. It is the steepest Section in the ownership, with slopes consistently over 50 percent, and a large sheer face in the northwest corner. Aspects are mostly northeast or southwest. There is a road system that accesses the southern two-thirds of the Section; however, it is currently limited to hiking only. Unstable slopes exist above and below this road system, which was carved into faces as steep as 70 percent. End hauling did not occur during the original construction. This is sandy soil with

coarse rock mixed in, leading to difficult road maintenance conditions. Vehicular road use in this Section should be restricted to harvest and fire use only and closed when not used for management.

The previous landowner harvested Stands that lay on gentle terrain with good access approximately 15 years ago, removing most of the timber volume in these units. Timber health is variable with the northeastern aspects typically overstocked with smaller diameter Douglas-fir and pockets of heavy mistletoe infestations. The southwestern faces are generally healthier, with widely spaced pine of good quality growing at a slow rate. Overall, the Section is dominated by Douglas-fir and ponderosa pine with a small amount of grand fir. Timber stocking averages 251 trees per acre and timber defect averages 12% with an average net saw log volume of 4.5 mbf/ac.

Active management opportunities do exist in this Section in the southern portion of Stands 111 and all Stands 112, 114, and 115. Stand 114 is a seedtree/shelterwood harvest unit that has established saplings and poles throughout and is ready for an overstory removal harvest (OSR). The remaining stands are heavily timbered and need to be thinned. The logging within this Section is primarily limited to a cable yarding system. Treating the fuels in Stands 112 and 115 will require pullback from the leave trees and quite a bit of fire line construction by hand to secure the perimeter for broadcast burning.

Horseback riding was an observed recreation opportunity observed during field reconnaissance in Section 7.

	
Stand 110	Stand 111

	
Stand 113	Stand 115

Timber Characteristics

Chelan County, Stemilt-Squilchuck Community Forest Section 7 AverageTimber Characteristics 325 Acres	
Stocking (T/Ac.)	251
Diameter (Inches)	7.4
Basal Area (sq ft/ac	74
Net Volume / Ac. (mbf)	4.49
Defect (%)	12.37

Saw Log Volume Section 7
325 Acres
mbf = one thousand board feet

Species	Gross mbf	Net mbf	Defect	Net mbf/Acre
Douglas fir	1,033	919	11.0%	2.831
Grand fir	12	11	8.3%	0.033
Ponderosa pine	619	528	14.7%	1.627
Total	**1,664**	**1,458**	**12.4%**	**4.491**

Fuels Characteristics

Stand	Acres	<3" fuels (tons/acre)	>3" fuels (tons/acre)	Total (tons/acre)	Total (tons/stand)	Canopy Base Height	Photo Series
112	20.5	3	15	18	369.0	8	2
114	72.15	2	12	14	1,010.1	10	2
315	73.85	2	5	7	517.0	10	2
111	82.4	1	10	11	906.4	7	2
113	34.26	0.5	3	3.5	119.9	7	2
115	49.92	3	20	23	1,148.2	5	2
204	39.44	0.5	5	5.5	216.9	8	1
310	7.48	5	10	15	112.2	15	4
312	8.53	5	10	15	128.0	15	4
314	16.84	5	10	15	252.6	15	4
110	26.08	2	8	10	260.8	10	2

The following table illustrates the recommended treatments by stand over the next 2 decades in this Section.

Recommended Treatments

Table 3 Section 7 Treatment Recommendations

Stand ID	Trees/Acre (2019)	Basal Area (2019)	Canopy Base Height (2019)	Pre-Treatment Type	Pre-commercial Thin Target (Trees/Ac.)	Commercial Harvest Trigger (BA)	Commercial Harvest Target (BA)	Initial Fuels Treatment
110	174	87	10	None	N/A	N/A	N/A	None
111	132	100	7	PCT	100	N/A	N/A	Underburn
112	336	98	8	Harv_PCT	125	90	40	Underburn
113	50	46	7	None	N/A	N/A	N/A	Underburn
114	457	45	10	PCT	200	100	40	Lop & Scatter
115	429	115	5	PCT	100	N/A	N/A	Pile & Burn
204	79	27	8	None	N/A	N/A	N/A	Underburn
309				None	N/A	N/A	N/A	None
310			15	None	N/A	N/A	N/A	None
311			15	None	N/A	N/A	N/A	Underburn
312			15	None	N/A	N/A	N/A	Underburn
313				None	N/A	N/A	N/A	None
314			15	None	N/A	N/A	N/A	None
315			10	None	N/A	N/A	N/A	Underburn

SECTION 23

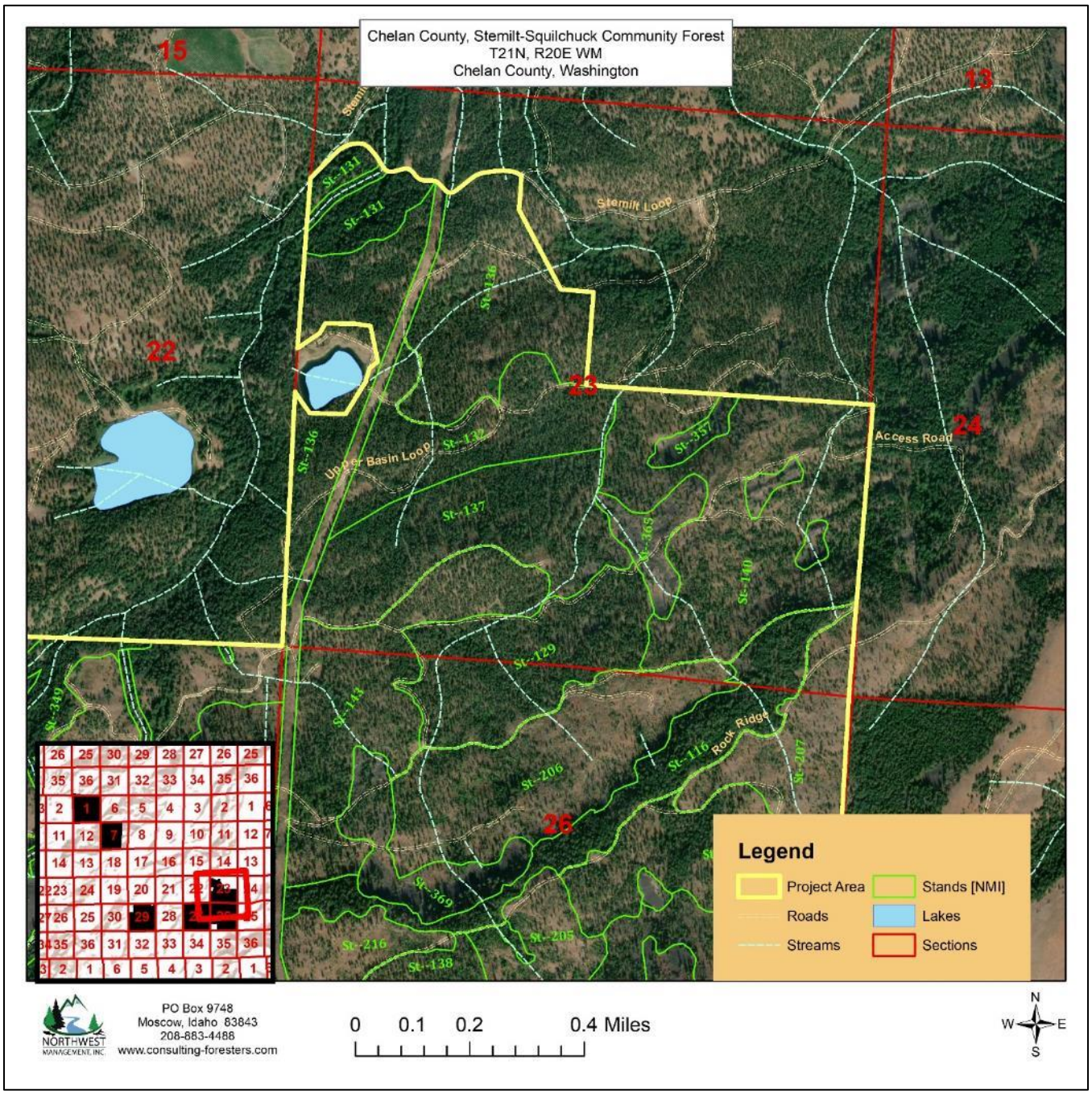


Figure 5 Section 23 Area Map

Section 23 is a generally continuous northern face with mostly gentle slopes. Road locations provide great access to this Section, road conditions are poor.

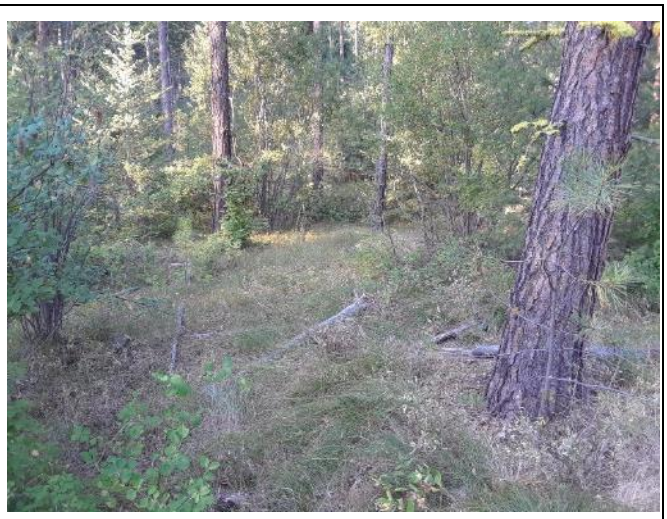
Much of this Section was commercially harvested, leaving an approximate average basal area of 80 square feet. Basal area averages, depending on stand, tend to vary from 20 to 100 square feet. When the logging occurred, lots of small-diameter trees were slashed creating an excessive understory fuel load. There is mistletoe in light to moderate amounts throughout this Section in the ponderosa pine.

The Section is dominated by Douglas-fir and ponderosa pine with a small amount of grand fir and western larch. Timber stocking averages 393 trees per acre, and timber defect is averaging 7%, with an average net saw log volume of 5.3 mbf/ac.

This Section would benefit from a light timber harvest targeting mistletoe infested trees, followed by a broadcast burn. Predominantly gentle terrain makes the Section ideal for a mechanical harvest operation. The roads currently present can easily be reconstructed for management with little impact. There are many areas in this Section and Section 26 where a rock pit for road gravel can be developed.

This Section has a lot of camping and fishing recreational opportunities.

The following are representative pictures of Section 23.

	
Stand 131	Stand 132

	
Stand 137	Stand 140

Timber Characteristics

Chelan County, Stemilt-Squilchuck Community Forest Section 23 AverageTimber Characteristics 354 Acres	
Stocking (T/Ac.)	393
Diameter (Inches)	5.6
Basal Area (sq ft/ac	67
Net Volume / Ac. (mbf)	5.28
Defect (%)	6.97

Saw Log Volume Section 23
354 Acres
mbf = one thousand board feet

Species	Gross mbf	Net mbf	Defect	Net mbf/Acre
Douglas fir	935	865	7.5%	2.446
Grand fir	24	22	8.3%	0.063
Ponderosa pine	957	899	6.1%	2.541
Western larch	91	81	11.0%	0.229
Total	**2,007**	**1,867**	**7.0%**	**5.279**

Fuels Characteristics

Stand	Acres	<3" fuels (tons/acre)	>3" fuels (tons/acre)	Total (tons/acre)	Total (tons/stand)	Canopy Base Height	Photo Series
129	51.37	1.5	5	6.5	333.9	20	2
131	15.92	2	10	12	191.0	10	2
132	43.04	1	6	7	301.3	18	2
136	91.53	1	7	8	732.2	22	2
137	59.04	1	8	9	531.4	25	2
140	92.71	1	5	6	556.3	25	2
348	2.07	5	10	15	31.1	15	4

The following table illustrates the recommended treatments by stand over the next 2 decades in this Section.

Recommended Treatments

Table 4 Section 23 Treatment Recommendations

Stand ID	Trees/Acre (2019)	Basal Area (2019)	Canopy Base Height (2019)	Pre-Treatment Type	Pre-commercial Thin Target (Trees/Ac.)	Commercial Harvest Trigger (BA)	Commercial Harvest Target (BA)	Initial Fuels Treatment
129	457	66	20	PCT	100	80	40	Pile & Burn
131	324	155	10	Harv_PCT	100	100	60	Underburn
132	822	81	18	Harv_PCT	100	80	40	Pile & Burn
136	336	80	22	Harv_PCT	75	80	40	Underburn
137	403	71	25	PCT	100	80	40	Pile & Burn
140	222	31	25	PCT	175	N/A	N/A	Underburn
348			15	PCT	75	N/A	N/A	Pile & Burn

SECTION 26

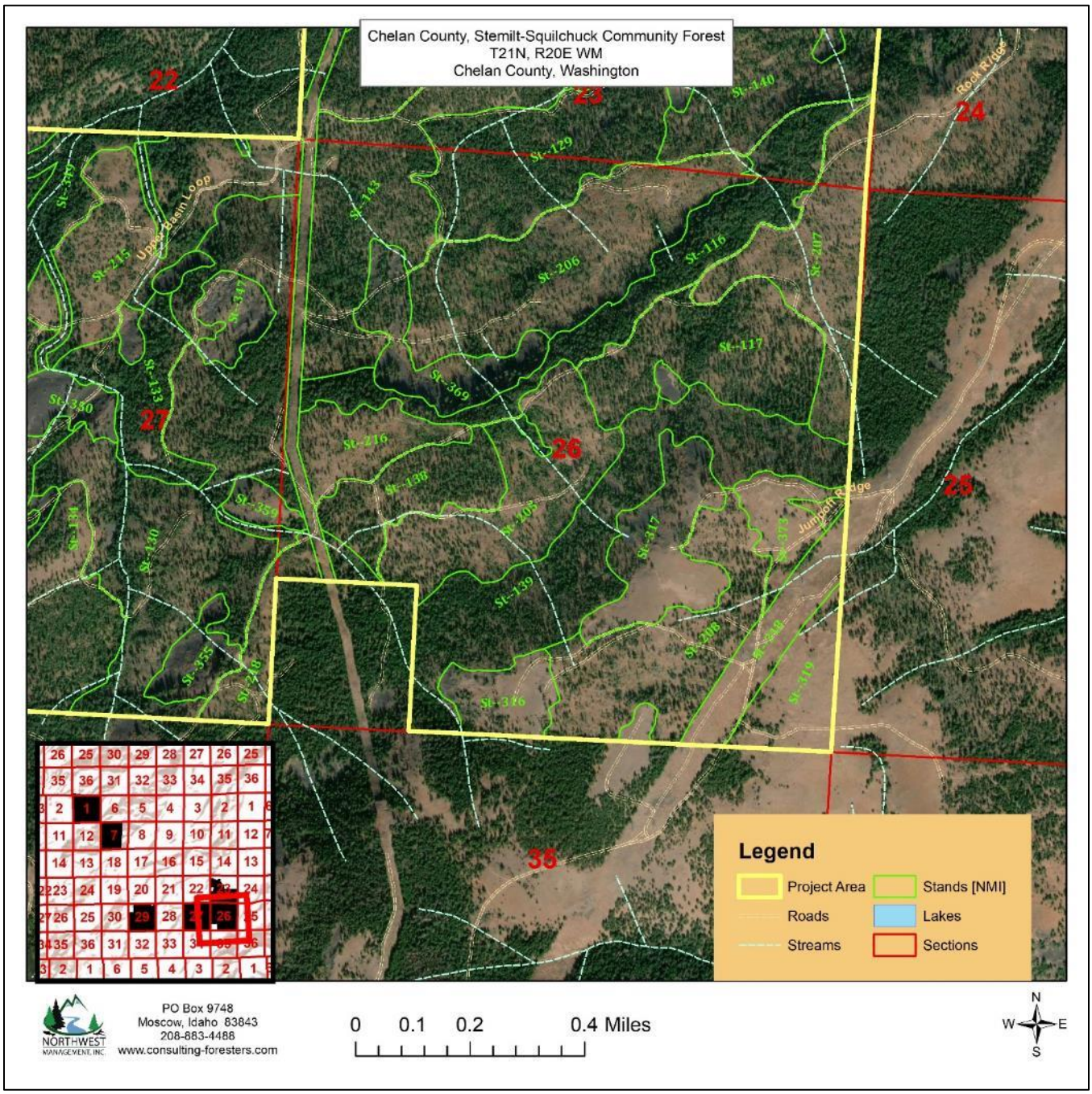


Figure 6 Section 26 Area Map

Section 26 is 472 acres in size and is a continuation of the northern slopes found in Section 23. The slopes become more broken and begin to include steep pitches and scree fields as they rise in elevation. A high knob and powerline right-of-way are present in the southeast corner of the Section.

This Section was harvested within the same timeframe as Section 23, mostly ground-based with a cable yarding system implemented on the steeper slopes. The timber harvesting appears to be heavier in this Section than was performed in Section 23. Past timber harvesting left this Section with a general

seedtree or light shelterwood structure throughout most of the area. Dense cover remains in the steeper slopes found in Stand 116. Small diameter poles were slashed and left on the ground during the last harvest, contributing to moderate to high fuel loads in places. This Section is dominated by Douglas-fir and ponderosa pine with a small amount of grand fir and western larch. Timber stocking averages 533 trees per acre, and timber defect averages 9% with an average net saw log volume of 2.9 mbf/ac.

Portions of Stands 129 (Sec. 23) and 143 may be commercially thinned in conjunction with the operations in Section 23. Additionally, a harvest opportunity exists, in the form of an OSR in Stand 117, where good regeneration has become established. There is a small band of good quality timber along the southern edge of Stand 116 that may be incorporated into this harvest as well. All commercial harvests over the next 20 years will be ground-based in this Section. The steep terrain is marginally stocked with no harvest anticipated for several years.

A good PCT candidate is present in the western half of Stand 206. Stand 206 also has several large slash piles that should be burned, and decks of pulp logs that should be removed or cut for firewood. Stands 129 and 143 have the same ground fuel conditions and similar timber stocking as the adjoining stands in Section 23 and could be treated with an underburn at the same time. There are suitable roads that will serve as fire control lines for prescribed fire/fuel treatments. Spotted knapweed (*Centaurea stoebe*) is present along roads, in landings, and in heavily logged areas.

Recreation includes hiking and hunting among other activities

The following are representative pictures of Section 26.

	
Stand 117	Stand 129

	
Stand 143	Stand 207

Timber Characteristics

Chelan County, Stemilt-Squilchuck Community Forest Section 26 AverageTimber Characteristics 472 Acres	
Stocking (T/Ac.)	533
Diameter (Inches)	4.0
Basal Area (sq ft/ac	46
Net Volume / Ac. (mbf)	2.90
Defect (%)	8.98

Saw Log Volume Section 26 472 Acres mbf = one thousand board feet				
Species	Gross mbf	Net mbf	Defect	Net mbf/Acre
Douglas fir	495	457	7.7%	0.969
Grand fir	53	42	20.8%	0.090
Lodgepole pine	0	0	0.0%	0.000
Ponderosa pine	892	813	8.9%	1.723
Western larch	64	57	10.9%	0.121
Total	**1,504**	**1,369**	**9.0%**	**2.903**

Fuels Characteristics

Stand	Acres	0" to 2.99" fuels (tons/acre)	>3" fuels (tons/acre)	Canopy Base Height	Photo Series
143	62.87	1.5	2.5	20	2
206	67.44	1.5	9	15	2
117	44.55	1.5	7	8	2
138	24.07	6	5	15	2
139	72.39	6	15	15	2
205	46.37	1	6	10	2
207	40.68	1	6	9	2
208	49.69	1.5	7	7	2
216	18.21	1.5	7	8	2
316	14.35	1	3	10	2
317	28.96	1	3	10	2
318	19.8	1	3	10	2
319	19.36	1	3	10	2
320	1.92	1	3	10	2
363	1.07	5	10	15	4
373	13.17	1	3	10	2
116	45.5	2	14	8	2

The following table illustrates the recommended treatments by stand over the next 2 decades in this Section.

Recommended Treatments

Table 5 Section 26 Treatment Recommendations

Stand ID	Trees/Acre (2019)	Basal Area (2019)	Canopy Base Height (2019)	Pre-Treatment Type	Pre-commercial Thin Target (Trees/Ac.)	Commercial Harvest Trigger (BA)	Commercial Harvest Target (BA)	Initial Fuels Treatment
116	267	88	8	None	N/A	N/A	N/A	None
117	535	58	8	PCT	150	80	40	Underburn
138	1027	49	15	PCT	200	80	40	Pile & Burn
139	629	48	15	PCT	150	100	40	Underburn
143	366	75	20	PCT	150	80	40	Pile & Burn
205	1176	22	10	PCT	250	80	40	Pile & Burn
206	725	15	15	PCT	250	80	40	Pile & Burn
207	202	32	9	None	N/A	80	40	Underburn
208	98	29	7	None	N/A	80	40	Underburn
216	305	37	8	None	N/A	80	40	Underburn
316			10	None	N/A	N/A	N/A	Underburn
317			10	None	N/A	N/A	N/A	Underburn
318			10	None	N/A	N/A	N/A	Underburn
319			10	None	N/A	N/A	N/A	Underburn
320			10	None	N/A	N/A	N/A	Underburn
363			15	PCT	N/A	N/A	N/A	Pile & Burn
373			10	None	N/A	N/A	N/A	Underburn

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SECTION 27

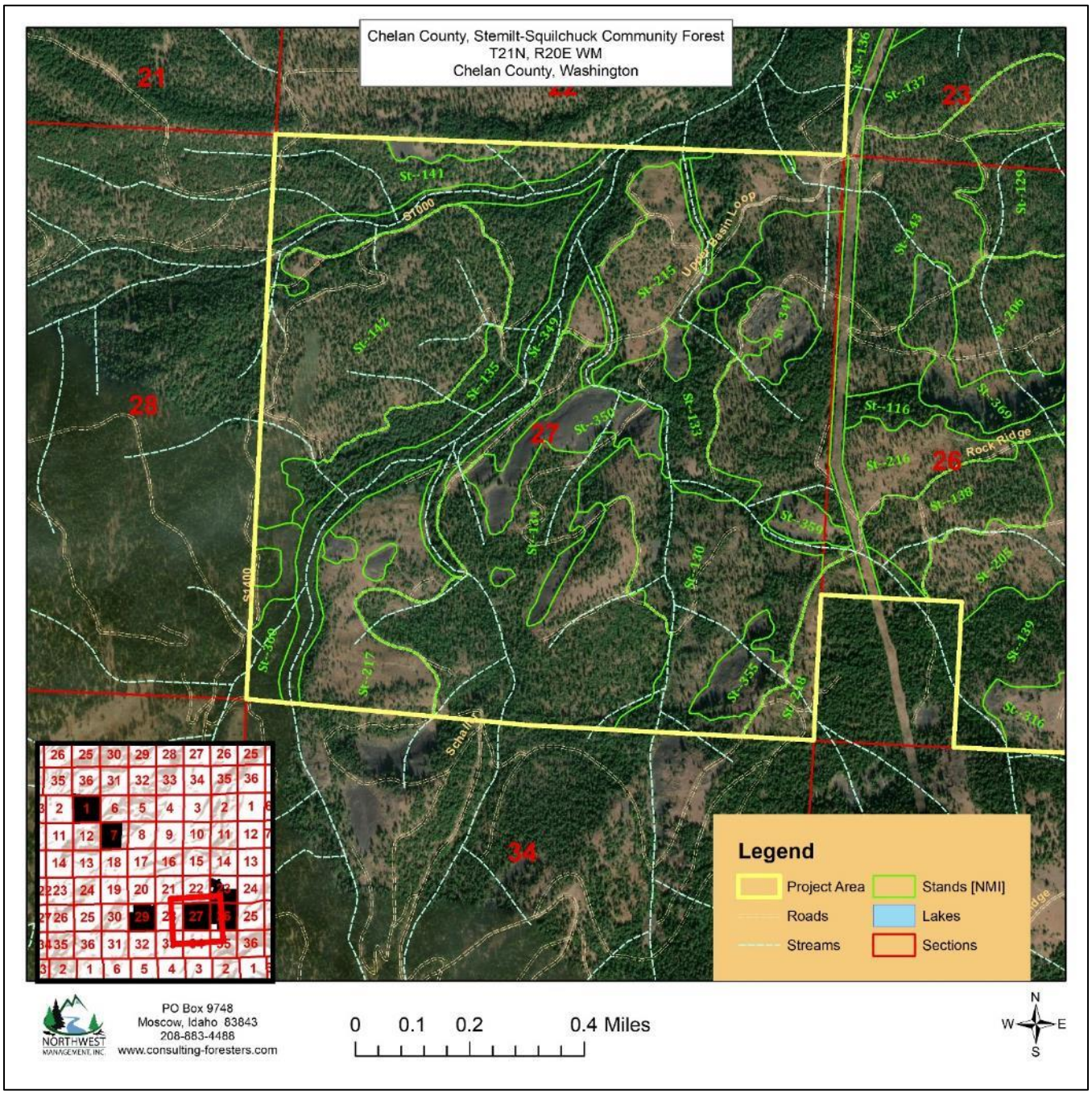

Figure 7 Section 27 Area Map

Section 27 is 505 acres and represents a diverse section of forest land dominated by gentle to moderately steep terrain with a few areas of slopes exceeding 50%. This primarily forested Section is broken up in places by shallow rocky exclusions, scree outcrops and thin soil slopes that are too harsh for timber production. Nearly this entire Section was logged within the last two decades except for the timber adjacent to major stream channels where timber has been maintained for stream protective zones (SPZ). Past logging was performed exclusively by a ground-based harvest system using tractors

or a feller buncher type operation. Areas of steep terrain were generally avoided unless adverse skidding or short downhill skids to roads was possible. The predominant harvest prescription utilized across most of this Section was commercial thinning of the overstory to an open canopy structure exhibiting a seed tree or shelterwood appearance. There are also two large areas of clear cuts in this Section, Stands 215 and 217.

The timber in this Section is composed of ponderosa pine, Douglas-fir and widely scattered western larch on the upper slopes and dry aspects, transitioning into Douglas-fir and grand fir in the draws and northern aspects. Past timber harvesting left a healthy mix of large trees scattered throughout the stands, many appear to be in good shape with very little defect and good crowns. Natural regeneration is variable but good in all the commercially thinned areas. Regeneration is low to moderately low in the clear cuts and in harvested areas that have an extreme southern exposure. Timber stocking averages 532 trees per acre, and timber defect averages 9.5% with an average net saw log volume of 3.5 mbf/ac.

Dwarf mistletoe is common across the area in the Douglas-fir and will always be a pest if it exists in the overstory, continuing to infest the younger susceptible species as the stand develops. Additionally, small pockets of bark beetle damage were reported in the more heavily stocked timber but do not appear to be a widespread problem. Understory regeneration is very thick in many areas and should be thinned to prevent tree stress and predisposition to insect damage.

Ground fuels are variable throughout this Section. Activity fuels from timber harvesting are common throughout the more heavily logged stands. Time has increased the amount of grass and regeneration growing in the stand and is mixed with the slash accumulation in many areas. Slash piles and roadside slash are still present in places and should be treated soon. Widespread cool prescribed burns are the ideal mechanism to treat the fuels and understory vegetation in the future. Past harvesting in this Section has left a good mix of seral species with broad structural diversity. Introducing low-intensity ground fire into the stands over the next decade will clean up a lot of the scattered activity fuels, maintain stocking density and help return the area to its historical range of variability.

The following are representative pictures of Section 27.

Stand 130

Stand 215

Stand 142	Stand 201

Timber Characteristics

Chelan County, Stemilt-Squilchuck Community Forest Section 27 AverageTimber Characteristics 505 Acres	
Stocking (T/Ac.)	532
Diameter (Inches)	4.4
Basal Area (sq ft/ac	55
Net Volume / Ac. (mbf)	3.46
Defect (%)	9.50

Saw Log Volume Section 27 505 Acres mbf = one thousand board feet				
Species	Gross mbf	Net mbf	Defect	Net mbf/Acre
Douglas fir	557	504	9.5%	1.000
Englemann spruce	0	0	0.0%	0.000
Grand fir	167	150	10.2%	0.297
Lodgepole pine	0	0	0.0%	0.000
Ponderosa pine	1,142	1,034	9.5%	2.049
Western larch	71	65	8.5%	0.130
Total	**1,937**	**1,753**	**9.5%**	**3.476**

Fuels Characteristics

Stand	Acres	0" to 2.99" fuels (tons/acre)	>3" fuels (tons/acre)	Canopy Base Height	Photo Series
349	66.09	5	10	15	2
135	34.79	4	8	30	2
141	32.28	3	5	15	2
142	88.42	3	3	20	2
215	52.92	4	5	15	4
134	108.25	3	3	5	2
217	39.39	3	6	15	2
130	112.37	4	6	25	2
133	22.8	2	4	15	2
218	13.35	3	4	10	2
358	2.48	5	10	15	4
372	0.38	5	10	15	4

The following table illustrates the recommended treatments by stand over the next 2 decades in this Section.

Recommended Treatments

Table 6 Section 27 Treatment Recommendations

Stand ID	Trees/Acre (2019)	Basal Area (2019)	Canopy Base Height (2019)	Pre-Treatment Type	Pre-commercial Thin Target (Trees/Ac.)	Commercial Harvest Trigger (BA)	Commercial Harvest Target (BA)	Initial Fuels Treatment
130	768	65	25	PCT	200	100	40	Underburn
133	687	128	15	Harv_PCT	200	150	40	Pile & Burn
134	227	31	5	PCT	200	100	60	Pile & Burn
135	464	126	30	PCT	150	150	60	Underburn
141	1175	150	15	Harv_PCT	150	100	40	Pile & Burn
142	424	39	20	PCT	200	100	40	Underburn
215	554	13	15	PCT	250	100	40	Underburn
217	215	6	15	None	N/A	N/A	N/A	Underburn
218	956	35	10	PCT	200	100	40	Pile & Burn
345				None	N/A	N/A	N/A	None
346				None	N/A	N/A	N/A	None
347				None	N/A	N/A	N/A	None
347				None	N/A	N/A	N/A	None
349			15	PCT	100	N/A	N/A	Pile & Burn
350				None	N/A	N/A	N/A	None
352				None	N/A	N/A	N/A	None
353				None	N/A	N/A	N/A	None
354				None	N/A	N/A	N/A	None
355				None	N/A	N/A	N/A	None
358			15	None	N/A	N/A	N/A	None
359				None	N/A	N/A	N/A	None
361				None	N/A	N/A	N/A	None
362				None	N/A	N/A	N/A	None
368				None	N/A	N/A	N/A	None
371			15	None	N/A	N/A	N/A	None
372			15	PCT	250	N/A	N/A	Pile & Burn

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SECTION 29

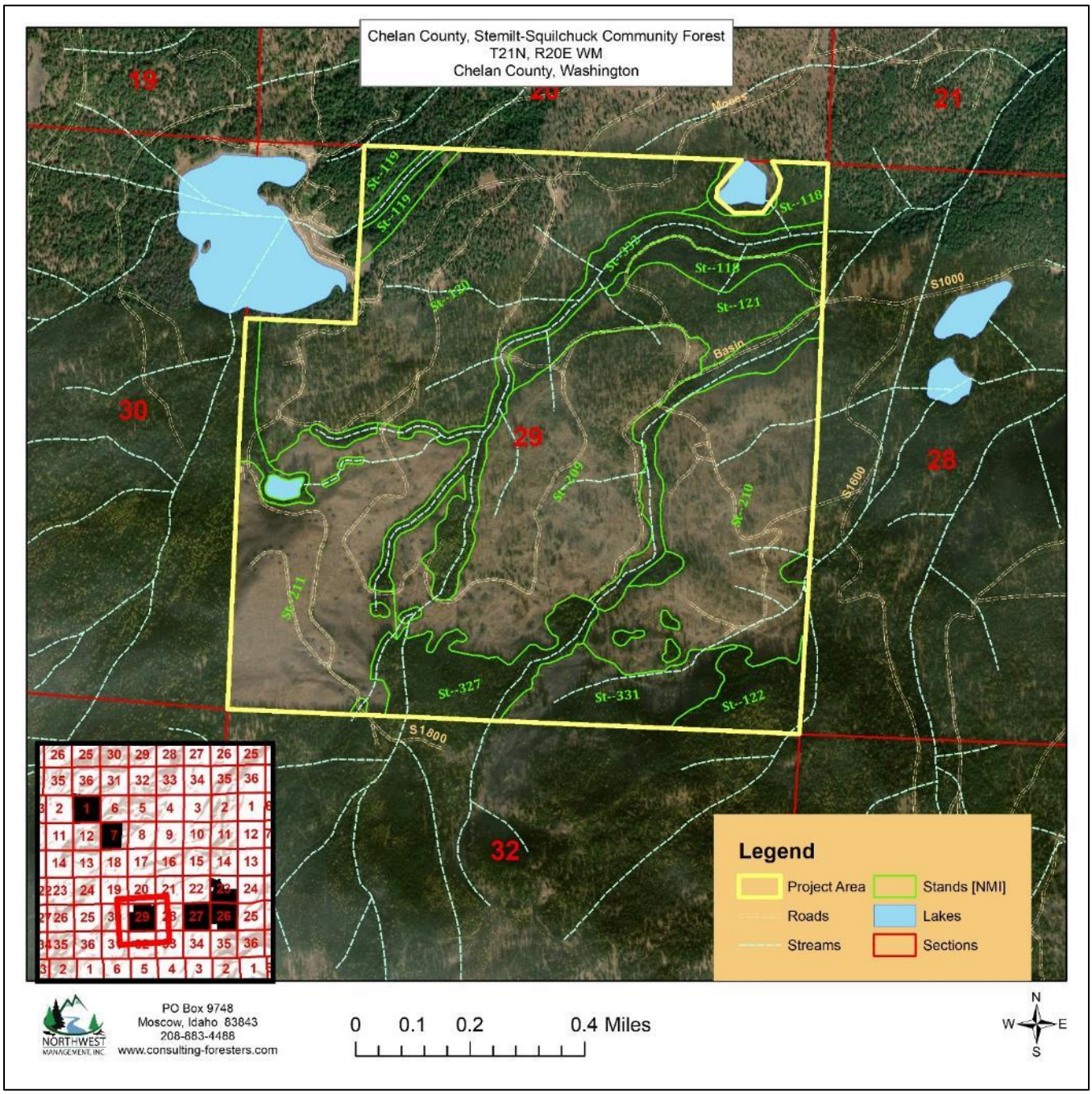

Figure 8 Section 29 Area Map

Section 29 is 395 acres in size and has gentle slopes throughout most of the acreage with a small area of steep terrain in the southwest corner. Soils found in this Section are a deep sandy mixed silt loam with areas of rock outcropping and scree fields along the southern boundary.

The southern half of this Section was heavily logged during the last entry and consists primarily of regeneration with widely scattered leave trees. There are several heavily stocked riparian areas that would benefit from a thinning and fuel reduction. The northern half of the Section is more heavily

stocked with merchantable timber. Although all this Section was harvested in the last 20 years, natural regeneration is common throughout. This Section is dominated by ponderosa pine, grand fir and Douglas-fir with a small amount of western larch, Engelmann spruce, and lodgepole pine. Timber stocking averages 562 trees per acre, and timber defect averages almost 12% with an average net saw log volume of 2.7 mbf/ac.

Due to the gentle terrain in this Section, timber harvesting would occur with a ground-based feller buncher or tractor logging system. Access is more than adequate throughout the Section due to a well-developed road system created for timber harvesting and access to the lake located in the northwest corner. Slash is common throughout all the previously harvested units. Large jackpots exist throughout Stands 209 and 210. Piling and burning would be the most effective method to reduce the fuels in these two stands. Cheatgrass (*Bromus tectorum*) and spotted knapweed are a very common invasive weed observed along roads and in landing areas in this Section.

The following are representative pictures of Section 29.

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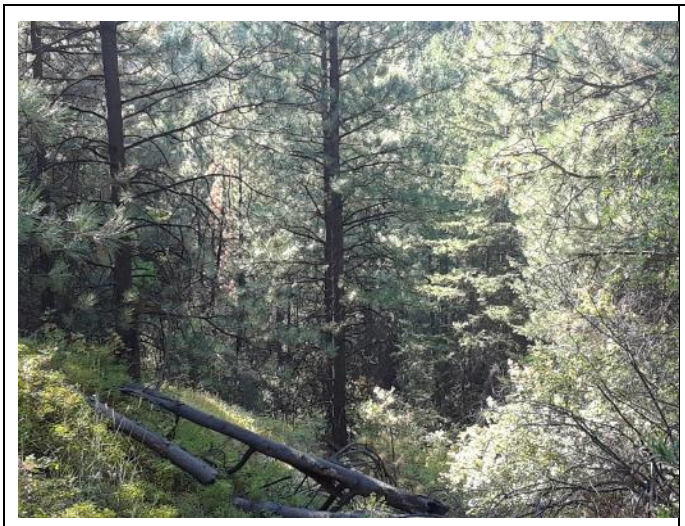
<tr><td>  </td><td>  </td></tr>
<tr><td>Stand 118</td><td>Stand 119</td></tr>
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Stand 210	Stand 209

Timber Characteristics

Chelan County, Stemilt-Squilchuck Community Forest Section 29 AverageTimber Characteristics 395 Acres	
Stocking (T/Ac.)	562
Diameter (Inches)	4.0
Basal Area (sq ft/ac	49
Net Volume / Ac. (mbf)	2.71
Defect (%)	11.85

Saw Log Volume Section 29 395 acres mbf = one thousand board feet				
Species	Gross mbf	Net mbf	Defect	Net mbf/Acre
Alpine fir	0	0	0.0%	0.000
Douglas fir	165	149	9.7%	0.377
Englemann spruce	16	14	12.5%	0.036
Grand fir	301	250	16.9%	0.632
Lodgepole pine	23	21	8.7%	0.053
Ponderosa pine	570	509	10.7%	1.287
Quaking aspen	0	0	0.0%	0.000
Western larch	140	129	7.9%	0.326
Total	**1,215**	**1,072**	**11.8%**	**2.711**

Fuels Characteristics

Stand	Acres	0" to 2.99" fuels (tons/acre)	>3" fuels (tons/acre)	Canopy Base Height	Photo Series
118	19.57	2	13	5	2
120	130.75	2	12	5	2
121	30.09	2	12	7	2
321	1.71	5	10	15	4
332	32.68	5	10	15	4
333	6.59	5	10	15	4
209	102.12	3	8	8	2
210	88.95	3	8	8	2
330	15.94	5	10	15	4
119	9.45	2	25	20	2
211	83.92	5	6	8	2
325	2.28	5	10	15	4
122	14.23	1	8	10	2

The following table illustrates the recommended treatments by stand over the next 2 decades in this Section.

Recommended Treatments

Table 7 Section 29 Treatment Recommendations

Stand ID	Trees/Acre (2019)	Basal Area (2019)	Canopy Base Height (2019)	Pre-Treatment Type	Pre-commercial Thin Target (Trees/Ac.)	Commercial Harvest Trigger (BA)	Commercial Harvest Target (BA)	Initial Fuels Treatment
118	598	121	5	Harv_PCT	150	100	40	Underburn
119	192	137	20	PCT	100	150	60	Pile & Burn
120	639	66	5	PCT	150	100	60	Underburn
121	2091	110	7	Harv_PCT	150	100	20	Underburn
122	496	147	10	None	N/A	N/A	N/A	None
209	325	8	8	None	N/A	N/A	N/A	Underburn
210	249	8	8	None	N/A	N/A	N/A	Underburn
211			8	PCT	250	100	40	Underburn
321			15	PCT	100	N/A	N/A	Pile & Burn
321				None	N/A	N/A	N/A	None
322				None	N/A	N/A	N/A	None
323				None	N/A	N/A	N/A	None
325			15	PCT	100	N/A	N/A	Pile & Burn
327				None	N/A	N/A	N/A	None
328				None	N/A	N/A	N/A	None
330			15	PCT	150	N/A	N/A	Pile & Burn
331				None	N/A	N/A	N/A	None
332			15	PCT	150	N/A	N/A	Pile & Burn
333			15	PCT	200	N/A	N/A	Pile & Burn
334				None	N/A	N/A	N/A	None
335				None	N/A	N/A	N/A	None
336				None	N/A	N/A	N/A	None
337				None	N/A	N/A	N/A	None
338				None	N/A	N/A	N/A	None
339				None	N/A	N/A	N/A	None

Broadcast Burn Map (Entire Ownership)

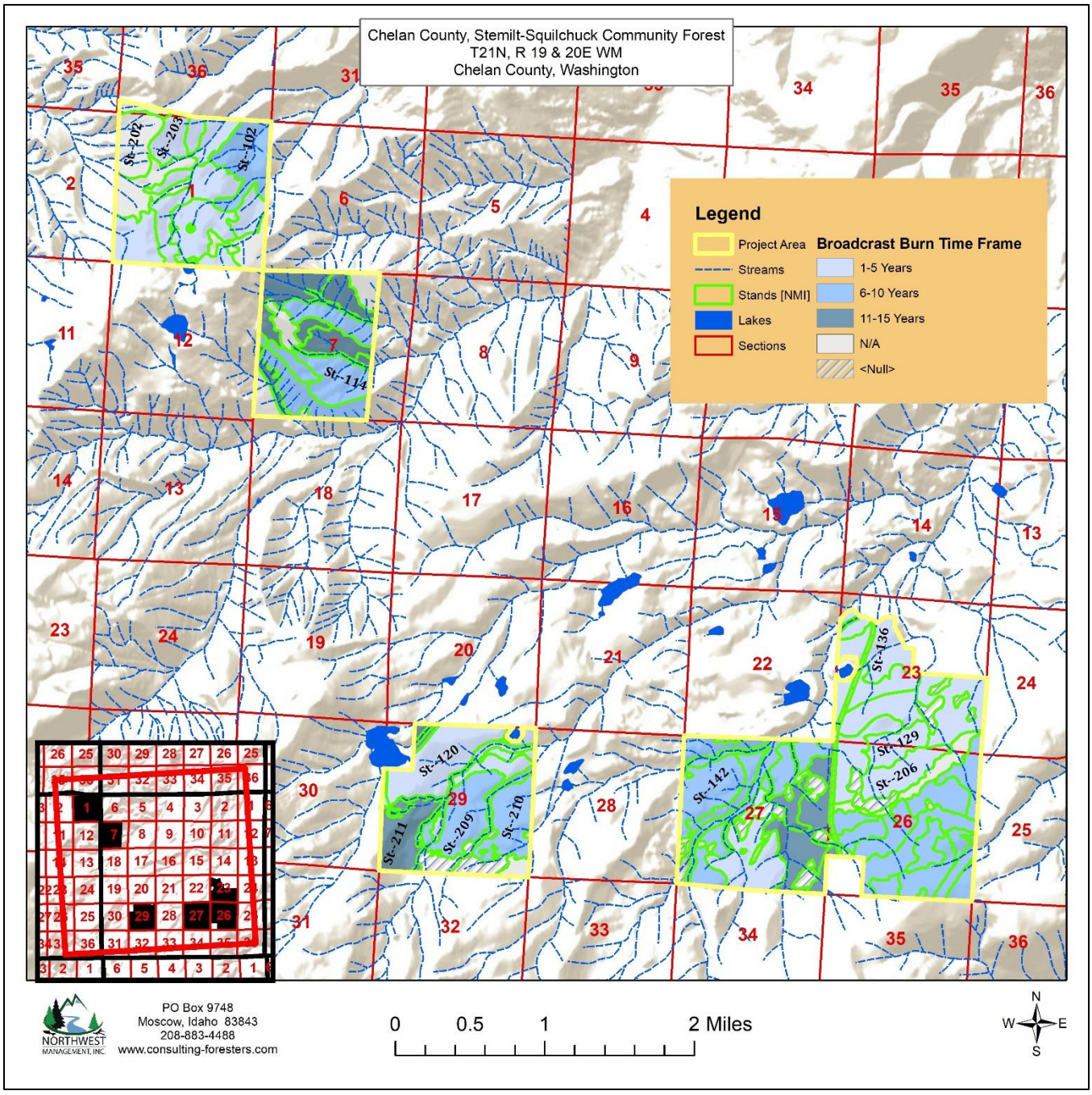

Figure 9 Overall Broadcast Burn Timeline Map

MONITORING

Monitoring the health and condition of all stands should be carried out periodically on a continuous basis. The stands should be monitored for insect and disease outbreaks, invasive plant species and the survival, distribution, and abundance of conifer regeneration on an annual basis. Controlling forest pests is one of the most important aspects of managing a healthy forest. When an occurrence or issue is discovered on the property, it should be treated responsibly to suppress and possibly eradicate the problem. In managing and attempting to mitigate the effects of forest health issues, prevention is an important tool.

SPECIAL SITES AND SOCIAL CONSIDERATIONS

ARCHEOLOGICAL, CULTURAL AND HISTORIC SITES

There are no known cultural or historic resources on the Stemilt-Squilchuck Community Forest Property. Certain government and other programs have policies and procedures for the consideration of cultural resources. Various laws, regulations, and directives require that certain State private and federal agencies ensure their actions do not jeopardize cultural resources or result in the destruction or adverse impacts of the resource. As a consultant and Technical Service Provider (TSP) for the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), Northwest Management, Inc. is required to follow policy and comply with the laws and regulations as well.

The effects of state, private, and federal actions on cultural resources must be assessed. This requires an awareness of the location of known cultural resources and training in the identification of cultural resource indicators.

The policy requires state, private, and federal organizations to routinely determine if a given action may affect a cultural resource as part of an environmental evaluation process. Potential impacts to cultural resources are recorded and included with correspondence to the State Historic Preservation Officer (SHPO).

An emphasis on the identification of cultural and historic resources has come to the forefront in conservation planning on privately owned property in the last 10 years. Management of one resource can and often does affect the other resources present on the property. Cultural and historic resources are the link to the past and identifying and protecting these resources will ensure they are made available for future generations to learn from and enjoy.

The landowner and contractors should look for cultural and historic resources when on the property. If these very important resources are found to be present during pre-work activities such as assessment and unit layout or any course of a project, work in that area should halt and the area should be flagged with ribbon and the appropriate agency should be contacted to evaluate the site before work continues in the immediate area.

AESTHETICS

The Stemilt-Squilchuck Community Forest property has a high aesthetic value because of its natural setting, an abundance of wildlife, and position in the Stemilt Basin. This area of Chelan County is characterized by state, private, and industrial forested areas interspersed with lakes, orchards, and

fertile river valleys. The scenic beauty of the property blends well with the surrounding countryside by having a mix of forest types, lakes, and open areas. Managing the timber, wildlife, and water resources on the property will enhance and maintain the aesthetics in the local area.

RECREATION

Recreational opportunities on the property include hiking, biking, hunting, horseback riding, foraging, wildlife viewing, and off-highway vehicle (OHV) travel. Activities that would enhance the recreational resource include developing additional hiking and biking trails, planting vegetation that promotes wildlife, managing erosion, and controlling noxious weeds. Measures that help stabilize the soil and prevent runoff will also enhance the aesthetic, recreational, and soil resources. The landowner wishes to maintain and enhance the current aesthetic condition of the property through good forest management and land stewardship.

SOIL, WATER, and AIR

Soil, water, and air are natural resources that should be monitored and assessed to ensure their ability to continue supporting life. These three natural resources are crucial in supporting all forms of life from microorganisms to humans. Understanding these resources and the role they play in the environment is critical for proper forest management.

SOIL

The elevation range for the Stemilt-Squilchuck Community Forest property ranges from 2,500 feet to 5,100 feet above sea level. The soil present on the property is a stony loam mix weathered from basalt, sandstone, schist, or conglomerates with minor amounts of loess and volcanic ash residing on hills and mountain slopes. The soil types dominating the property are mixed in depth and level of rock and gravel/sand content and are generally well-drained. This varies widely due to position on the slope, steepness of the terrain and exposure. Two soil types present on the property (Stemilt silt loam, 0-25%, and Nard silt loam, 8-25% slopes) are classified as Prime Farmland or Farmland of Statewide Importance if irrigated or drained, due to soil depth organic matter rock content and water holding capacity (NRCS Soils Report). These Prime Farmland soil types make up approximately 16% of the ownership.

For a table that identifies the significant characteristics of each soil type found on the property refer to Appendix G. A map depicting the location and extent of each soil type is provided below. This information was compiled from the Soil Survey for the Cashmere Mountain Area, and Chelan County, WA. area using a web-based application to produce a full NRCS soil report that describes the characteristics and capabilities of the soil types and soil complexes for the entire ownership.

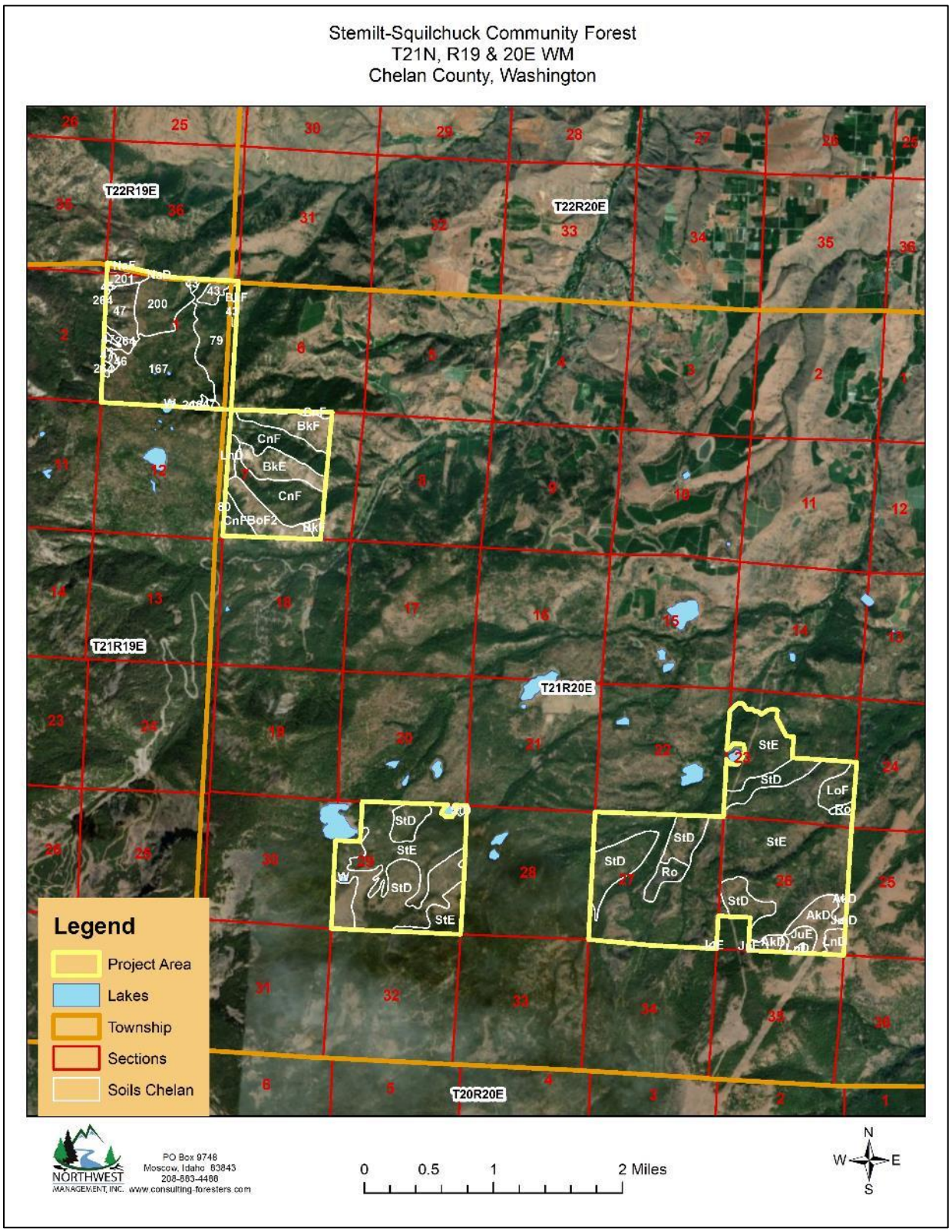

Figure 10 Soils Map

Forest Productivity

The potential productivity of merchantable or common trees on a soil is expressed as a site index and as a volume growth rate value. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. Site index on this property ranges from 46-69 feet for Douglas-fir in 50 years and 65-99 feet for ponderosa pine in 50 years depending on soil type. The site index applies to fully stocked, even-aged, unmanaged stands. Common trees are those that forest land managers generally favor in intermediate or improvement cuttings. They are selected based on growth rate, quality, value, and marketability. Potential forest productivity on the property ranges from 14-57 cubic feet per acre per year growth for Douglas-fir and 14-100 cubic feet per acre per year growth for ponderosa pine depending on soil type. Forest growth and site index information for each specific soil was compiled from the Soil Survey of Chelan County, WA. derived from a full NRCS Soil Report generated from the NRCS Web Soil Survey that describes the characteristics and capabilities of the soil types and soil complexes and forest site productivity for the entire ownership.

The main concern of producing and harvesting timber on any soil type is water erosion, slope, and plant competition. All forest soil types on the property, except for the Blewett-Rock outcrop complex, Loneridge stony loam, Nard sandy loam, Anatone-Rock outcrop, Jumpe stony loam, and Stemilt silt loam, are rated as severe for erosion hazard on unsurfaced roads and trails based on slope, soil erosion K factor, and an index of rainfall erosivity. A severe rating indicates that significant erosion is expected that the roads and trails require frequent maintenance, and that costly erosion-control measures are needed. Soil types formed by loess tend to have rapid runoff and are prone to severe erosion. Compaction is another concern as loess soils are easily compacted under moist soil conditions. For these reasons, the timing of harvest and other treatments by ground-based equipment should be carefully planned. To reduce the potential impact, equipment use should occur only when soils are dry or frozen. Following harvest activities, reforestation must be carefully managed to reduce competition from undesirable understory plants. Soil disturbance from harvest operations can lead to a total occupancy of tall shrubs and the introduction of unwanted invasive species. Minimizing the amount of soil disturbance is important to avoid excessive shrub competition. To help minimize soil erosion, some logging slash should be left on the forest floor to recycle nutrients and provide micro-sites for seedling establishment.

Topography

The Stemilt-Squilchuck Community Forest property lays on gently rolling to steep terrain on the foothills between Beehive Mountain and Jumpoff Ridge. Slopes on the property range from nearly flat in areas of the Stemilt Basin, to steep hillsides and rocky slopes over 60%. Steep slopes occur on the upper ridgelines of Beehive Mountain and Jumpoff Ridge, in addition to those areas dropping sharply into the upper reaches and tributaries of Stemilt Creek and Big Stemilt Creek in Section 27. Elevation of the property ranges from 2,100 feet near Clear Lake in Section 23 to 5,100 feet on the hilltop knob in Section 26 along Jumpoff Ridge. The following is a USGS topographic map of the property showing elevation contours and general topographical characteristics of the property identified in this plan.

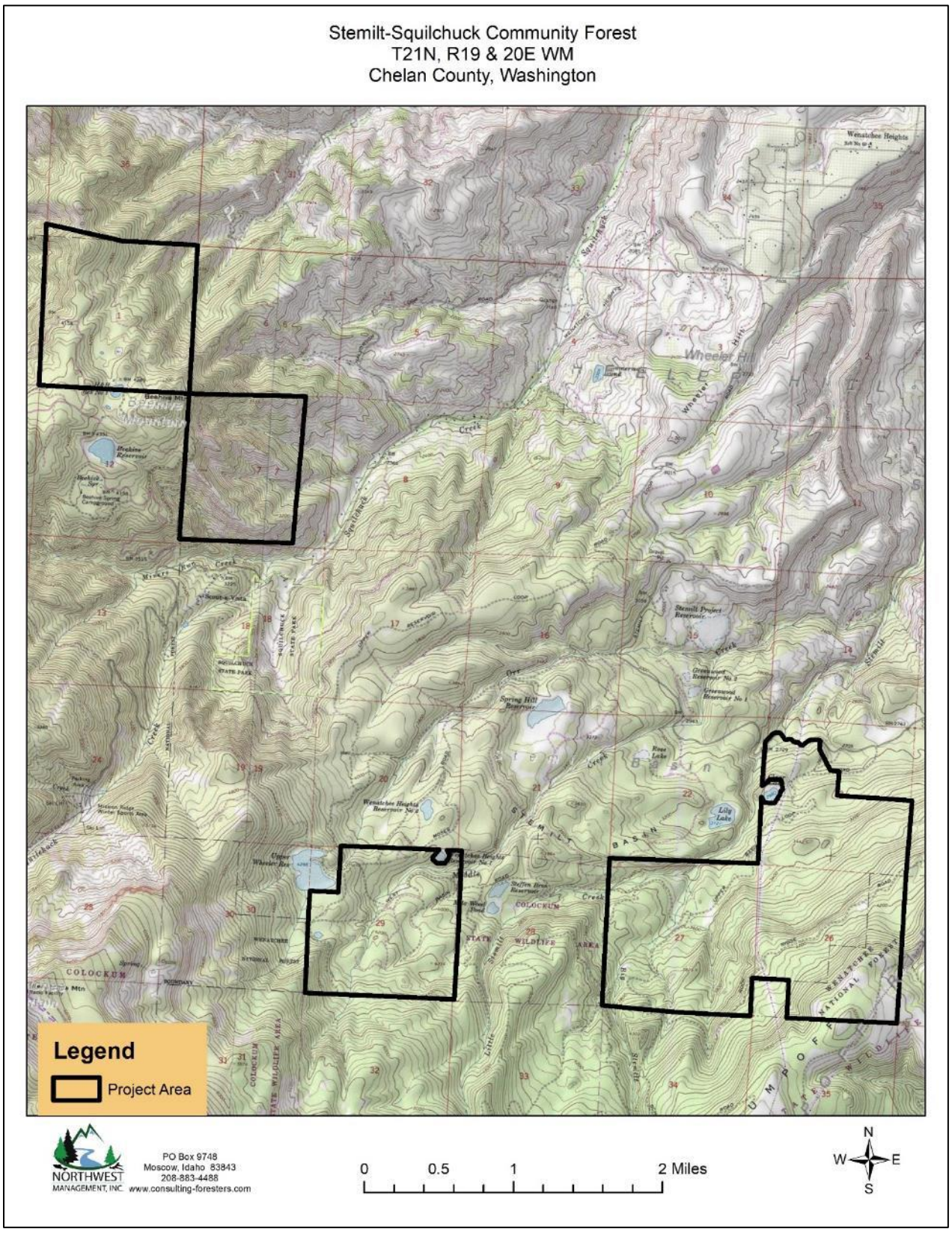

Figure 11 Topographic Map

WATER

There are many streams and several small lakes/reservoirs on the Stemilt-Squilchuck Community Forest property that are classified as having high fish, wildlife, or human use. Little Stemilt Creek and Big Stemilt Creek pass through Section 27 and Middle Creek passes through the northern portion of Section 29. These streams are classified as type F streams by the DNR. Type F waters include streams, lakes, and ponds that are used by fish, amphibians, wildlife, and drinking water. All other watercourses on the property are classified as either Type Np, Ns or U streams. Type Np (perennial) streams are non-fish streams that have flow year-round and may have spatially intermittent dry reaches downstream of perennial flow. Type Np streams do not meet the physical criteria of the Type F stream. Type Ns (seasonal) streams are non-fish streams that do not have surface flow during at least some portion of the year and do not meet the physical criteria of a Type F stream. Type U streams are untyped water features that have not been verified or the typing is unknown (DNR Forest Practices Manual). All typed waters on forest land have specific characteristics and restrictions that define the riparian management zone for conducting forest management activities.

Episodic weather such as rain-on-snow events and isolated heavy rainstorms can produce high runoff and flooding. High runoff occurs primarily from February to April and can significantly increase erosion and sediment transport in unprotected drainages. It is important that depressions and intermitted drainages within any property be protected from sedimentation and pollution. This is accomplished by limiting intensive ranching, farming, recreation, and logging activities directly adjacent to the stream and by preserving or restoring natural riparian habitat.

The following map identifies the major roads and water resources within the management area of the Stemilt-Squilchuck Community Forest property.

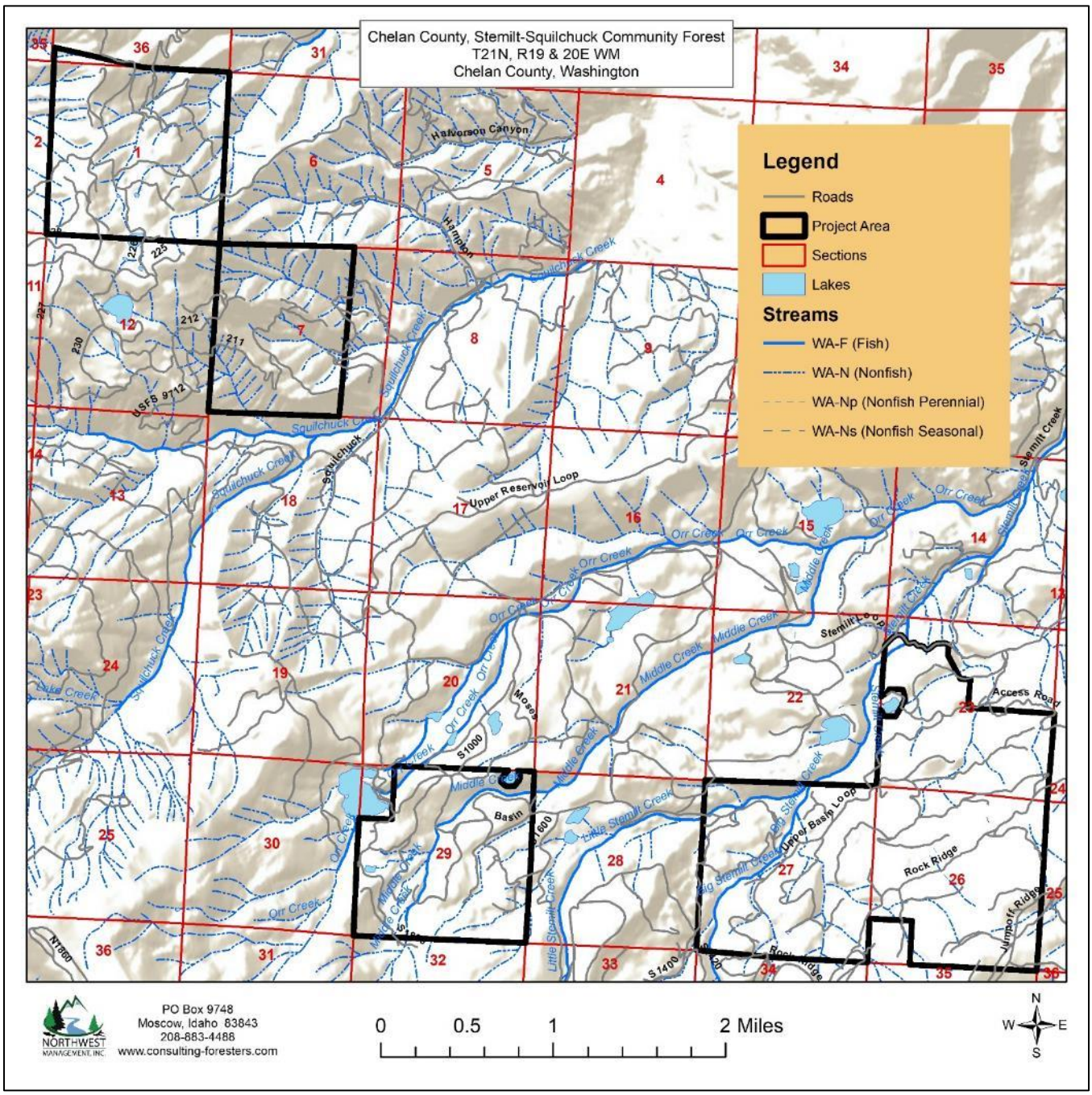

Figure 12 Water Resource Map

WETLANDS AND RIPARIAN AREAS

There are several significant wetlands and riparian areas on the Stemilt-Squilchuck Community Forest property in the form of small lakes/reservoirs, ponds, bogs, and slow-moving water on flat terrain. Wetlands and riparian zones provide some of the most important wildlife habitats in the forest. Wetlands are land areas saturated with water permanently or seasonally creating a distinct type of vegetation adapted to the saturated soils. The vegetation along the wetland area has a wider diversity of cover vegetation than is present in the adjoining stands. A riparian zone or riparian area is the interface between land and a stream or river where the vegetation is distinctly different than the upland area creating a green belt containing more vegetation that is adapted to and dependent on wet soil conditions. Riparian and wetland areas are important for water quality, stream stability, and fisheries habitat. Riparian and wetland areas typically occupy a small percentage of the forested landscape but are important islands of biological diversity and ecological significance. Grazing, timber harvesting, lawn fertilization, and road construction can drastically disturb riparian plant communities. Healthy riparian and wetland areas reduce water velocity and the impact of downstream flooding. They also filter and spread water and stabilize stream banks during high water events. Grasses, shrubs, and trees in the riparian areas catch and hold sediments and attached pollutants before they flow into larger water bodies downstream. Healthy riparian and wetland sites provide critical habitat for many wildlife species. The density and diversity of species are higher in riparian and wetland areas than in range and forest lands.

General management guidelines for a healthy stream and riparian corridor include:

- ensure the stream follows a natural stream channel and has access to a floodplain. Sinuous channels reduce the velocity of the water reducing erosion/sedimentation and reducing the effects of floods,
- maintain a shrub understory in all riparian areas. Understory plants provide food and cover for numerous wildlife species. Shrub species provide excellent erosion control along streams,
- maintain a buffer strip of riparian vegetation adjacent to streams and wetlands. Buffer strips reduce sedimentation, stabilize stream banks and slow floodwaters,
- retain snags and broken top trees for cavity-nesting wildlife where they do not present a safety hazard,
- avoid locating structures and roads in riparian and wetland areas, and
- retain streamside trees and shrubs for thermal cover, debris recruitment and stream bank stability.

Special attention to riparian buffer zones is of the utmost importance when conducting timber harvest activities. A Riparian Management Zone (RMZ), as defined by the Washington Forest Practices Rules, has specific guidelines for identifying the RMZ and must be followed when conducting harvest operations near streams. Washington required BMPs and rules pertaining to timber harvesting within a RMZs will be followed when a stream is encountered on or adjacent to the property during a timber harvest operation. RMZ buffers need to be flagged in by a qualified forester before any timber harvest can take place. RMZ buffers meeting DNR requirements were previously established along major streams by the current landowner's predecessor prior to timber harvest on this property.

Lush, intact riparian plant communities are present along the streams on the Stemilt-Squilchuck Community Forest property. Dense grass, shrubs, and large woody debris of variable size are present

within the forested draws and small runoff channels that drain the property. It is important to maintain woody debris in seasonal draws and typed stream channels wherever possible to minimize soil erosion, slow water movement, and to maintain the natural functions of potential riparian habitats which in turn will enhance wildlife habitat and water quality. Large woody debris, dead standing trees, and large diameter trees should be retained when possible within RMZs. Building skid trails and access roads near typed streams and seasonally wet areas should be avoided. Any logging or recreation trails that approach the RMZs should be seeded to site specific cover vegetation after disturbance and properly maintained with water diversion structures to reduce the potential for erosion and sedimentation. Any future access roads developed on the property should use culverts when crossing stream channels and water bars or rolling dips on roads to divert water flow where necessary to mitigate soil erosions and potential sedimentation.

AIR QUALITY

The primary means by which the protection and enhancement of air quality is accomplished is through implementation of National Ambient Air Quality Standards (NAAQS). These standards address six pollutants known to harm human health including ozone, carbon monoxide, particulate matter, sulfur dioxide, lead, and nitrogen oxides (USFS, 2000).

The Clean Air Act, passed in 1963 and amended in 1977, is the primary legal authority governing air resource management. The Clean Air Act provides the principal framework for national, state, and local efforts to protect air quality. Under the Clean Air Act, OAQPS (Office for Air Quality Planning and Standards) is responsible for setting standards, also known as national ambient air quality standards (NAAQS), for pollutants which are considered harmful to people and the environment. OAQPS is also responsible for ensuring these air quality standards are met, or attained (in cooperation with state, Tribal, and local governments) through national standards and strategies to control pollutant emissions from automobiles, factories, and other sources (Louks, 2001).

Smoke emissions from fires potentially affect an area and the airsheds that surround it. Climatic conditions affecting air quality in northeast Washington are governed by a combination of factors. Large-scale influences include latitude, altitude, prevailing hemispheric wind patterns, and mountain barriers. At a smaller scale, topography and vegetation cover also affect air movement patterns. Air quality in the area is generally moderate to good. However, locally adverse conditions can result from occasional wildland fires in the summer and fall, and prescribed fire and agricultural burning in the spring and fall. All major river drainages are subject to temperature inversions which trap smoke and affect dispersion, causing local air quality problems. This occurs most often during the summer and fall months and would potentially affect all communities in Chelan County. Wintertime inversions are less frequent, but are more apt to trap smoke from heating, winter silvicultural burning, and pollution from other sources.

Washington Department of Ecology

The Washington Department of Ecology Air Quality Program protects public health and the environment from pollutants caused by vehicles, outdoor and indoor burning, and industry. The DOE oversees permitting for non-forested (i.e. agriculture and rangeland) burning. Chelan County falls under the jurisdiction of the Central Regional Office (CRO). The CRO can be reached at: 509-575-2490.

Washington State Smoke Management Plan

The Department of Natural Resources (DNR), Department of Ecology (DOE), U.S. Forest Service (USDA), National Park Service (NPS), Bureau of Land Management (BLM), U.S Fish and Wildlife Service (USDI), participating Indian nations, military installations (DOD), and small and large forest landowners have worked together to deal with the effect of outdoor burning on air.

Protection of public health and preservation of the natural attractions of the state are high priorities and can be accomplished along with a limited, but necessary, outdoor burning program. Public health, public safety, and forest health can all be served through the application of the provisions of Washington State law and this plan, and with the willingness of those who do outdoor burning on forest lands to further reduce the negative effects of their burning.

The Washington State Smoke Management Plan pertains to DNR-regulated silvicultural outdoor burning only and does not include agricultural outdoor burning or outdoor burning that occurs on improved property. Although the portion of total outdoor burning covered by this plan is less than 10 percent of the total air pollution in Washington, it remains a significant and visible source.

The purpose of the Washington State Smoke Management Plan is to coordinate and facilitate the statewide regulation of prescribed outdoor burning on lands protected by the DNR and on unimproved, federally managed forest lands and participating tribal lands. The plan is designed to meet the requirements of the Washington Clean Air Act.

The plan provides regulatory direction, operating procedures, and advisory information regarding the management of smoke and fuels on the forest lands of Washington State. It applies to all persons, landowners, companies, state and federal land management agencies, and others who do outdoor burning in Washington State on lands where the DNR provides fire protection, or where such burning occurs on federally-managed, unimproved forest lands and tribal lands of participating Indian nations in the state.

The plan does not apply to agricultural outdoor burning and open burning as defined by Washington Administrative Code (WAC) 173-425-030 (1) and (2), nor to burning done "by rule" under WAC 332-24 or on non-forested wildlands (e.g., range lands). All future reference to burning in this plan will refer only to silvicultural burning unless otherwise indicated.

ROADS AND ACCESS

Access to the Stemilt-Squilchuck Community Forest property is via Upper Basin Loop Road, Squilchuck and Upper Reservoir Loop road. The Upper Basin Loop Road is part of the Green Dot Road System, a road cooperative established in the early 1980s managed by Washington DNR, private landowners and the WDFW to provide public access across a landscape of checkerboard ownerships. Green Dot roads provide limited recreational access into an area for motorized vehicles

Secondary and old logging roads are common throughout the area in variable condition depending on soil type, recent management activity, and whether or not roads are closed or barricaded. On the Stemilt-Squilchuck Community Forest property, roads that lead off the Green Dot system should have access restrictions to prevent unwanted use. To restrict access and limit the impact to road and trail surface, roads should be gated, ditched or fenced at primary access points leading onto the property and at various points along the boundary between adjoining owners. Old grown over roadbeds from

past logging are still present in many areas of the property that can be reopened and used for temporary management access as needed.

Road systems provide numerous benefits such as access for timber harvesting, recreation, fire control, and land management. Roads provide access that can increase the efficiency of fire suppression and can act as linear fire breaks that reduce fire spread.

Detrimental effects associated with roads include sedimentation, habitat fragmentation, and losses in soil productivity, invasion of noxious weeds, use conflicts and destructive human actions such as trash dumping, illegal hunting, and wildfires. Weed species that disperse along roadsides can spread to adjacent native plant communities. Actively controlling access--when and how people are permitted to use roads--is important to mitigate detrimental effects.

The following map identifies the roads on and around the Stemilt-Squilchuck Community Forest property. Individual road maintenance section maps can be found in Appendix F.

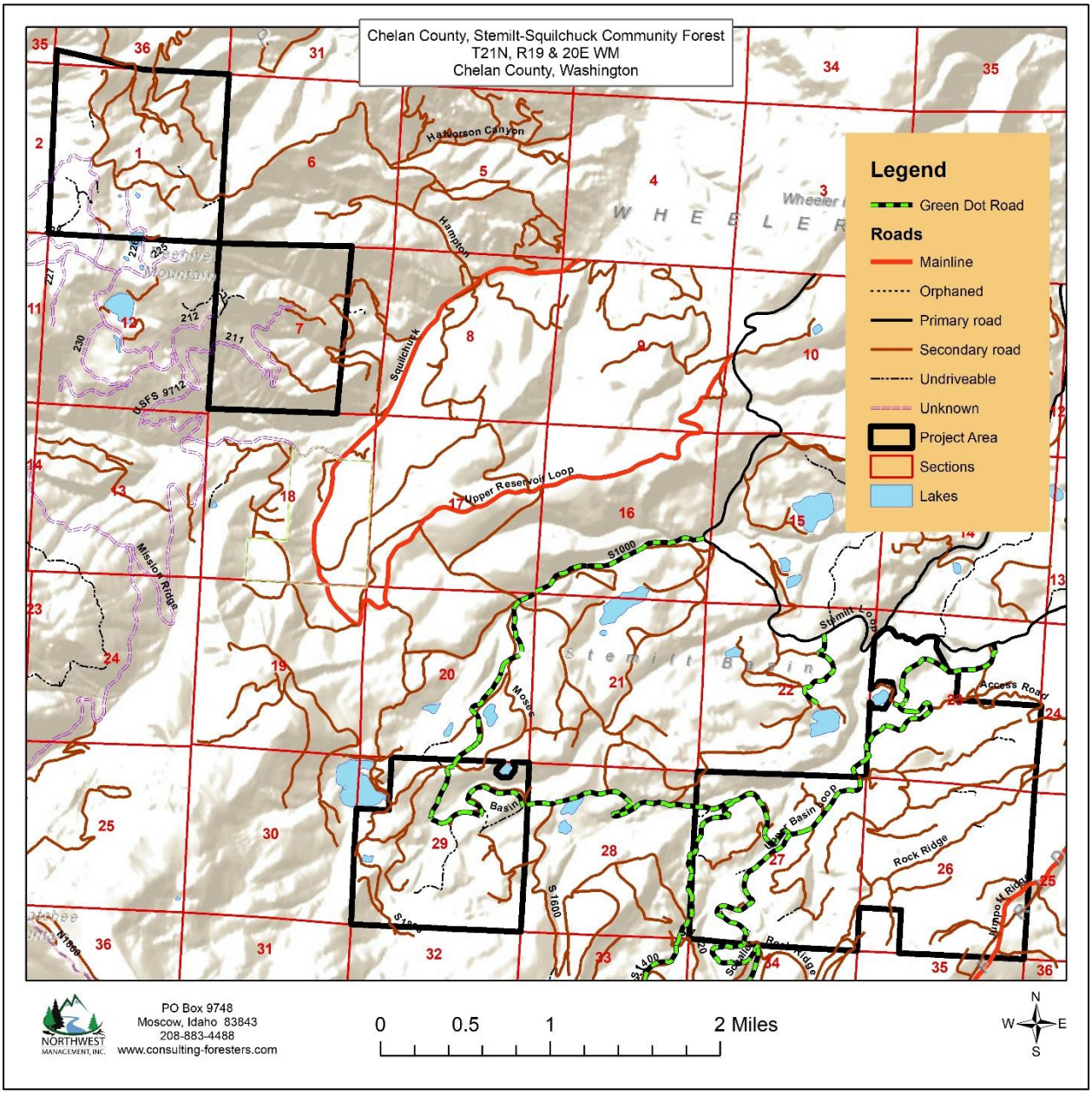

Figure 13 Property Road and Access Map

Soils on the property are moderately suited for natural surface roads. The main factors that influence road building and heavy equipment use are the strength and slope of the soil. Surface erosion from road surfaces, cut banks and ditches can be a significant source of sediment in streams. Rates of sediment delivery are highest in the first five years following road construction and can be closely related to traffic volume on unsurfaced roads. Surface erosion problems are worse where roads are constructed on highly erodible soils. Lack of road maintenance or poorly timed maintenance can contribute to increases in sediment production from existing roads. Implementing improved road construction standards and actively maintaining roads will reduce road-related surface erosion. Road location, design, construction, and maintenance are especially critical near streams. Placement of

surfacing material (gravel), installation of proper drainage structures and the prompt establishment of vegetation on road surfaces are actions that will reduce sediment production from roads.

Controlling erosion from forest road systems directly affects water quality and sedimentation deposits. Active road management will enhance the benefits received from a road system. Many of the detrimental effects associated with roads can be mitigated through planning, access control, maintenance, and restricting how and when roads are utilized by people and vehicles. Roads with chronic sedimentation or erosion problems can be rehabilitated, relocated, or decommissioned.

Poorly vegetated roadways and trails are vulnerable to weed infestation and soil erosion. Disturbed soils along roadways also provide excellent seedbeds for most weed species. Motor vehicles, equipment, and animals moving along the roadway disperse weed seeds picked up from other locations. Motor traffic also digs ruts that channel water increasing soil erosion. For these reasons, trails and roadways should be monitored on an annual basis and weeds found along the route should be promptly controlled by spraying or hand pulling/mowing. Grass seeding roads and trails as well as restricting access to motor vehicles and cattle are effective methods of controlling weed establishment and reducing the potential for soil erosion.

ROAD MAINTENANCE AND PLANNING

Approximately 98% (3,350 acres) of the soil types on the Stemilt-Squilchuck Community Forest property is rated as moderate to severe for erosion hazard (NRCS Soils Report). A severe rating indicates “that erosion is very likely, and that erosion control measures, including revegetation of bare areas, are advised”. A moderate rating indicates “that some erosion is likely, and that erosion control measure may be needed”. Both ratings indicate that the soils are easily rutted from use during wet periods, limiting access at certain times of the year.

Road maintenance on a routine basis is necessary to minimize degradation of the road surface and to prevent soil erosion and damage from weather and vehicle use. From a planning aspect, road work is categorized into 3 groups: 1) routine maintenance 2) reconstruction 3) new construction. Definitions for each classification are below.

Routine Maintenance – maintenance (re-shaping) of road surface and drainage features (rolling dips, ditch lines, etc.) which should be performed with a road grader. This may also include other work, such as road brushing, cleaning of catch basins/culvert inlets, and heavy ditch line cleaning. This does not include any road surfacing (rock) that may be needed or culvert maintenance.

Re-construction – involves working the road sub-grade, running surface and all drainage features (of an existing road prism) to bring the road into an operational and maintainable status. This may include all components of normal road construction, including subgrade improvements, culvert installation/replacement, installation/maintenance of rolling dips, grading, ditch line construction/maintenance, etc. Re-construction is quite variable, and is normally performed on an hourly basis, unless the project scope is small and concise.

New Construction – building forest roads in an area where no road prism currently exists. This includes all aspects of road construction, which will depend upon the type (or classification) of the road being built and the soil conditions. New construction may be performed on a fixed rate ($/foot) or hourly basis, depending on the complexity and size of the project.

The most significant need for road reconstruction is on the portion of the Green Dot Road that passes through portions of the Stemilt-Squilchuck Community Forest property because there is no control over ORV and other vehicle traffic throughout the year. Unrestricted use has created a significant amount of rutting and soil erosion. Generally, the road systems that are off the Green Dot road are in good to fair condition due to limited public use, but should be gated to prevent unwanted use, currently most of these roads are not gated. The existing roads that are not part of the Green Dot road network should be left intact for future management use and fire access. Following are general guidelines for road work, followed by maps of each section of the ownership showing road work maintenance needs.

Production Rate & Cost Assumptions

General guidelines to consider when planning road improvement and maintenance production and costing are as follows:

Routine Maintenance – 3 miles per day (8 operating hours); $347/mile or $0.07/foot.

Re-Construction – Highly variable and depends on scope/size of project but will typically range from $3/foot to $6/foot (not including any rock surfacing).

New Construction – Highly variable, depends on road classification and construction conditions. A balanced road (equal cut and fill) will typically range from $4.50/foot to $8.00/foot (not including any rock surfacing or drilling/blasting).

Table 8 Equipment Hourly Rate

Machine	**Size/Wt**	**Rate/Hr***
Excavator	120/<30,000 lb	$130
Excavator	250/<60,000 lb	$190
Excavator	350/<90,000lb	$250
Road grader	-	$130
Brush mower	Excavator mount	$150
Dozer	D7	$165
Dump truck	-	$90

*Does not included mobilization costs

CARBON

Forests play a key role in the global carbon cycle by capturing, storing and cycling carbon. Forests can be either a “carbon sink” or a “carbon source”. Trees capture carbon dioxide from the atmosphere during photosynthesis and emit oxygen while building sugars to form new growth. The trees are collectively acting as a “carbon sink”, effectively storing carbon. Trees release carbon dioxide, acting as a “carbon source”, during respiration and after they die, through decomposition and burning. In general, the combined effect of photosynthesis and respiration enables the tree to absorb more carbon dioxide from the atmosphere than it releases. Young, vigorous forests store carbon faster than mature forests, although mature forests store more carbon overall due to their larger biomass. In very old forests, respiration and decomposition exceed photosynthesis and the trees begin to expel more carbon than they absorb.

Increased use of wood products and wood energy represents part of the solution to reduce greenhouse gases. When trees are harvested, carbon is removed from the forest environment but not released into the atmosphere. If the trees are used for lumber, the carbon can be stored for many decades in solid form. If the wood is used for energy or heating, carbon is released into the atmosphere.

Forest management can help meet the world’s energy and material needs and limit atmospheric carbon dioxide. Using sustainably harvested timber as a building material releases significantly less carbon dioxide into the atmosphere than using other materials such as concrete or steel. The carbon pool stored in wood products more than makes up for the carbon dioxide released during the harvest and manufacture of those products. Additionally, increasing and maintaining the forested area and limiting wildfires keeps carbon sequestered in the forest. Managing current forests to withstand disturbances such as disease, insects, windstorms, and wildfire is essential to limit the loss of forested areas. For example, a commercially thinned stand of trees, where the unhealthiest trees were harvested, can withstand an insect outbreak or wildfire more readily than that same stand of trees if it had not been harvested. In a managed stand, the carbon is transferred from the forest into wood products whereas if a stand was overstocked or otherwise stressed, subsequent mortality from insects, disease or wildfire would release the carbon into the atmosphere. Increasing forested areas through afforestation (planting trees on non-forested sites) is another way to sequester carbon and create biological diversity.

CLIMATE RESILIENCE

Climate warming is expected to trigger major changes in disturbance processes, plant and animal species dynamics, and hydrological responses to create new plant communities and alter landscapes that may be quite different from historical conditions. A lack of diverse forest structure and species composition can contribute to more severe forest health and wildfire impact issues than would have occurred historically under changing climate conditions. Silvicultural treatments/prescriptions are designed to improve forest health and fire resilience and move forest stands towards a more diverse historic range of variability. The efficacy of treatments provides more opportunity for ecosystem response to changing climate conditions by providing a broad range of habitats that may have elements that will thrive under the changing conditions.

FISH, WILDLIFE HABITAT, and BIODIVERSITY

FISH & WILDLIFE

Many wildlife species use the Stemilt-Squilchuck Community Forest property for food, shelter, and security. The property has a wide distribution of cover vegetation along with areas that provide winter and summer food sources. Some of the mammals that are commonly known to inhabit the mixed conifer forest type present on and near the property include; snowshoe hare (*Lepus americanus*), Red-tailed chipmunk (*Tamias ruficaudus*), Douglas squirrel (*Tamiasciurus douglasii*), raccoon (*Procyon lotor*), porcupine (*Erethizon dorsatum*), skunk (*Mephitis mephitis*), weasel (*Mustela sp*.), white-tailed deer (*Odocoileus virginianus*), deer mouse (*Peromyscus maniculatus*), bats (various), shrews/voles (various), black bear (*Ursus americanus*), coyotes (*Canis latrans*), bobcat (*Lynx rufus*), grouse (various), cougar (*Puma concolor*), elk (*Cervus elaphus nelson*) and moose (*Alces alces*). There are a few species of reptiles and amphibians found in the area. Diverse and persistent forest, shrub, and herbaceous plants arranged with consideration to special habitat features such as water, edge, snags, openings, and other features will increase year-round wildlife use of the property. While the property already exhibits many of these attributes, protecting and enhancing cover vegetation and riparian areas will increase usage by wildlife. Wildlife abundance, the total number of individuals of a species in the area, could be increased with additional management of cover vegetation, maintenance of openings, and protection of sensitive habitats.

BIODIVERSITY

All forest-dependent wildlife require water, food, shelter from inclement weather (both summer and winter), and cover from predators for breeding, rearing of young and feeding. The mixture of forest vegetation types and landforms determines the suitability of habitat for each type of wildlife species. A diverse mixture of tree and shrub species, sizes and age classes, as well as dead and dying trees in the form of snags and coarse woody debris (fallen trees and large logging debris) will increase wildlife species diversity and abundance. The presence of water and associated vegetation (riparian and wetland areas) in proximity to diverse forest habitats enhances biological diversity.

In order to produce high-quality wildlife habitat in a forest land setting, managers manipulate the type and arrangement of tree cover present on the property. Generally, wildlife habitat management is intended to promote different forest cover types to provide the necessary food, cover and water requirements for a broad spectrum of wildlife species. A mosaic of forest age classes and types, interspersed with adequate edge habitat, is a feasible way of enhancing the wildlife populations in an area.

It is important to consider habitats (or lack thereof) located around the subject property; this is often called the landscape matrix. This offers an overall picture of how a parcel could be managed in comparison to adjacent habitats. The matrix can impact how animals use patches of habitat. Land uses within a matrix can differ in their impact on related wildlife. Conversion of forests to residential development or agriculture is often regarded as permanent habitat loss, while silvicultural disturbances tend to provide a more heterogeneous structure and often provide quality habitat for wildlife. The landscape matrix may provide clues to a land manager of the potential wildlife uses of a particular property and thus, how to manage it.

As previously mentioned, wildlife species have a set of specialized requirements, including food, water, and cover. If one of these requirements is in short supply, the overall effectiveness of the habitat is reduced. A requirement in short supply is referred to as a limiting factor. Limiting factors are comparable to the staves in a barrel - if one of the barrel staves reaches only part-way to the top, then the barrel will only hold water up to that level. The barrel staves represent different habitat aspects of food, water, and cover. A habitat's effectiveness or ability to support wildlife is based on its most limiting factor. These three factors - cover, food, and water - can be further broken down into sub-factors.

For more information on the status of currently existing wildlife requirements refer to the Stemilt-Squilchuck Landscape Evaluation.

Cover

High plant diversity across a landscape provides cover requirements for many species. Cover requirements also differ within a species depending on the time of year and the activity of the animal. The cover can be broken down into sub-components of thermal and security cover; these differ in their functions but may occupy the same site.

The vegetation that provides thermal cover is generally denser than security cover. The thermal cover provides animals protection from the elements by providing them with warmer conditions in winter and cooler conditions in summer. Thermal cover requirements vary with species and range from conifer thickets for larger mammals, such as deer and elk, to grass cover used by smaller mammals, such as mice and voles.

Security cover provides animals protection from predators. Uses include resting, loafing, bedding and feeding areas, as well as travel corridors and areas for rearing young.

The most effective habitat includes components of thermal and security cover in proximity to the other main habitat components of food and water. The interspersion of the important components increases an animal's ability to travel between and use the various areas for feeding, security, and reproduction. A local area may be improved for wildlife without increasing the amount of any food or cover resource if the interspersion of the needed resources is increased. In addition, the interspersion of the various habitat components can produce an "edge habitat."

Food

High plant diversity also offers a broad variety of foods needed by different species. Deer, moose, and elk vary in their food choices. White-tailed deer commonly browse the tips of woody trees and shrubs and forage on broad-leaved forbs when they are available. Elk grazes herbaceous plants such as grasses, and clover, feeding on browse when it is readily available. Moose are primarily browsers, preferring the tips of woody trees and shrubs, especially willows and red-osier dogwood. They will also consume a variety of broad-leaved forbs and aquatic plants, depending on availability.

Water

The need for water varies between species and ranges from the strong association and absolute water requirement of amphibians and aquatic mammals to species that require only minimal amounts for drinking. Waterfowl, including migratory ducks and geese, use open water for escape areas from

predators and feed on aquatic insects, crustaceans, and plants. Shorebirds, such as snipe and herons, use shallow water areas for feeding and will nest along the shorelines.

Wildlife habitat can be protected, enhanced and even created with appropriate management in conjunction with other forest activities. A brief explanation of some of the important habitat components follows along with management recommendations.

Snags and Coarse Woody Debris

About one-third of forest wildlife species are dependent on snags (standing dead trees) and coarse woody debris (down logs and trees). More than 60 of these species use cavities (holes excavated in trees) created primarily by woodpeckers for nesting and shelter. Most cavity nesters prefer the harder and larger diameter snags; those that are in the earlier stages of decay. The taller and larger diameter snags benefit more species for a longer period than the smaller snags. However, small diameter and shorter snags (including stumps at least 3 feet in height) are also utilized for feeding and cover. Snag dependent wildlife also use live trees with substantial amounts of decay. This includes broken tops, large dead and/or broken branches, cracked or damaged boles, heart rot, and mistletoe and rust brooms. Brooms (clumps of deformed branches) caused by these pathogens and parasites are readily used by platform nesters such as hawks, owls, eagles, and ospreys and as a shelter for mammals such as squirrels and pine martens. Most wildlife species that use snags will use trees with substantial decay. Many of these defective trees will last for long periods of time and although they have little economic value, they have excellent value to snag-dependent wildlife.

Coarse woody debris goes through a similar decay cycle and usage pattern as snags. The larger diameter and longer length hard logs last longer and are used by more wildlife species than the smaller and softer pieces of coarse woody debris.

Understory Vegetation

This consists primarily of grasses and forbs in sunnier locations and berry-producing shrubs where sufficient sunlight and moisture are present. Some shade-tolerant understory conifers also comprise this habitat category. Ground-nesting and foraging birds and the majority of mammals that use this habitat feature for food, shelter, and cover. In this region and on the habitat types present on the Stemilt-Squilchuck Community Forest property, dense understory vegetation is consistent and ever-present under all of the forest stands.

Pollinators

Flowering plants, including many fruits and vegetables, require pollination in order to become fertilized. Pollination is the process of pollen making its way from where the male gametes are found on a flowering plant (anthers) to where the female gametes are found on a flowering plant (ovules). Pollen is a powdery substance that can be transferred between the anther and the ovules in a number of ways, including wind, inadvertent transfer by animals and insects and direct transfer by animals and insects. Direct transfer is made by animals and insects that have evolved in a symbiotic relationship with the flowering plants. These animals and insects include birds such as hummingbirds, bees, as well as butterflies like the monarch butterfly. The plants provide the animals with sustenance (nectar) while the pollinator assists the plant in reproduction.

In the last decade, bee colonies have been in decline. As a primary source of pollination for many flowering plant species, this population decline has a direct impact on many plant species. This includes crop plants that humans rely on as well as plant species that other animal species rely on for browsing and grazing.

Threatened and Endangered Species

This section summarizes responsibilities regarding consideration of threatened and endangered species and State and Tribal Species of Concern during all conservation planning and technical assistance activities. Policy regarding Endangered and Threatened Species and Species of Concern requires planners to determine if a given action may affect these species as part of the environmental evaluation process. Government agencies and conservation groups may conduct an environmental evaluation to determine if the implementation of one or more conservation practices will have an effect on species listed or proposed as threatened and endangered, candidate species for listing and State and Tribal Species of Concern.

Species Identification

According to the U.S. Fish & Wildlife Service there are three known endangered species and several species listed as threatened as of January 2020 in Chelan County. The Yellow-billed Cuckoo (*Coccyzus americanus*), Northern Spotted Owl (*Strix occidentalis caurina*), Bull Trout (*Salvelinus confluentus*), Ute ladies'-tresses (*Spiranthes diluvialis*), Canadian Lynx (*Lynx Canadensis*), Grizzly bear (*Ursus arctos horribilis*), and Canada Lynx (*Lynx canadensis*) are listed as threatened. The Showy stickseed (*Hackelia venusta*), Wenatchee Mountains checker-mallow (*Sidalcea oregana var. calva*) and Gray wolf (*Canis lupus*) are listed as Endangered in the County. The following is a brief description of each species.


Yellow-billed Cuckoo

In November 2014, the Yellow-billed Cuckoo was listed as a **Threatened** species. Yellow-billed Cuckoos are slender, long-tailed birds that manage to stay hidden in deciduous woodlands. The yellow-billed cuckoo breeds from southern Canada south to the Greater Antilles and Mexico. While the yellow-billed cuckoo is common east of the Continental Divide,


Northern Spotted Owl

biologists estimate that more than 90 percent of the bird's riparian habitat in the West has been lost or degraded as a result of conversion to agriculture, dams and river flow management, bank protection, overgrazing, and competition from exotic plants such as tamarisk.

The Northern spotted owl was listed as **Threatened** in June 1990. Northern spotted owls are a medium-sized, dark brown owl with a barred tail, white spots on the head and breast, and

dark brown eyes surrounded by prominent facial disks. It is believed to have historically inhabited most of the dense closed-canopy old-growth forests throughout western Washington and Oregon. Loss and adverse modification of nesting, roosting, and foraging habitat due to timber harvesting, land conversions, natural disturbances such as fire and windstorms, and competition with other owls have led to a decline of spotted owls throughout much of their historic range.

Found to be in peril by the U.S. Fish and Wildlife Service, Bull trout were listed as a **Threatened** species throughout their range in 1999. They are protected under the Endangered Species Act. Bull trout are a cold-water fish of relatively pristine stream and lake habitats in western North America. Bull trout have exacting habitat demands, requiring water temperatures generally below 55 °F (13 °C). Bull Trout occupy many streams within the region. Bull trout reproduction requires cold water and very low amounts of silt, both of which are negatively impacted by road building and logging. Additionally, its need to migrate throughout river systems may be hindered by impassible fish barriers, such as dams.


Bull Trout


Ute Ladies'-Tresses

Ute Ladies'-Tresses is a perennial, terrestrial orchid with one main stem running 12-50 cm tall, arising from tuberous thickened roots. This plant is a showy, perennial flowering orchid that has not been successfully propagated. In 1992, it was designated as **Threatened** by the U.S. Fish and Wildlife Service. The species is considered to be threatened throughout its range by many forms of water development, intense domestic livestock grazing, haying, exotic species invasion and loss of pollinators. Seed predation by voles poses a potentially serious threat to long term viability, however, this appears only to be a problem in agricultural areas, not in more pristine riparian areas. Wetland and riparian area modification is possibly the largest threat to this plant species.


Grizzly Bear

The Grizzly Bear was listed as **Threatened** in July 1975 within the conterminous United States except where listed as an experimental population. Grizzly Bears reach weights of 180-680 kg (400-1,500 lb.); the male is on average 1.8 times as heavy as the female. Their coloring ranges widely across geographic areas, from blond to deep brown or black. These differences are thought to be primarily due to the different environments these bears inhabit, particularly with regard to diet and temperature. The Grizzly has a large hump over the shoulders which is a muscle mass used to power the forelimbs in digging. The head is large and

round with a concave facial profile. Despite their massive size, these bears can run at speeds of up to 55 km/h (35 mph).

The Canada lynx was listed as **Threatened** in March 2000. In the Pacific Northwest, lynx almost always occurs in the coniferous forest above 4,000 feet in elevation. Lynx uses Engelmann spruce, subalpine fir and lodgepole pine habitats that provide a mosaic of forest age classes. They also use rocky areas, bogs, and swamps. There are no known occurrences of this species on the property and lynx are not common in the immediate area due to a lack of suitable habitat and few areas over 4,000 feet.


Showy stickseed

Canada Lynx

The Showy stickseed is a rare species of flowing plant in the borage family that was listed as **Endangered** in February 2002. Showy stickseed is endemic to Washington State where it is known from only one canyon in Chelan County. There is only one small population with the global distribution of less than one hectare. This is a perennial herb producing several leafy stems up to 20-40 centimeters tall from a taproot. The plant flowers from April to May, bearing clusters of white or blue-tinged flowers. The species is threatened by its small size, lack of suitable habitat, and competition with invasive and introduced species. Its single population could be easily eliminated by a single large event. In 2010 the total population of this species was estimated to be no more than 772 individuals.


Wenatchee Mountains checker-mallow

Wenatchee Mountains checker-mallow is a very rare flowing plant variety that occurs in wet meadows and open coniferous forests and along the edge of shrub and hardwood thickets in only five locations in the Wenatchee Mountains of Chelan County. The populations are generally small in terms of both the number of plants and the amount of area covered by each population. The plant was placed on the **Endangered** species list in December 1999. This herbaceous perennial wildflower grows from a stout taproot to a height of about 20-150 centimeters and has thick fleshy leaves. Much of the original habitat of the Wenatchee Mountains checker-mallow has been lost to land conversion, agricultural land uses and invasive non-native plants. Other possible threats to the plants' growth and persistence include seed predation by weevils, succession in meadow habitats due to fire suppression, and loss of pollinator populations.


Gray Wolf

The Gray Wolf was listed as **Endangered** in March 1978. The historic range of the gray wolf covered over two-thirds of the United States. Wolves are carnivores—they prefer to eat large hoofed mammals such as deer, elk, bison, and moose. They also hunt smaller mammals such as beavers, rodents, and hares. Adults can eat 20 pounds of meat in a single meal. Once, the wolf was widespread across most of North America, but it was hunted ruthlessly and eradicated over most of its range. Today the wolf is making a successful comeback in some of its former habitats due to strong conservation efforts. The gray wolf plays a vital role in the health and proper functioning of ecosystems.

FOREST HEALTH and FIRE RISKS

The primary forest health concerns on the Stemilt-Squilchuck Community Forest property include localized disease, parasites, and insect outbreaks, areas of overstocked trees and susceptibility to wildfire. The Forest Management section above identifies the specific forest health and fire risk issues identified within each stand. The treatments prescribed in this management plan focus on controlling tree stocking and targeting desired conifer species in order to improve long-term forest health on the property.

FOREST HEALTH

A healthy forest is:

- Resilient to natural and human disturbance.
- Biologically diverse.
- Able to provide a sustained habitat for vegetation, wildlife, and humans.

Several forest health agents common to the property include dwarf mistletoe, Armillaria root disease, laminated root rot, bark beetles, as well as physical damage from wildlife and weather. All agents that could potentially affect the Stemilt-Squilchuck Community Forest property are native to the area. Eliminating impacts on individual trees is nearly impossible but minimizing their scope and impact throughout a forest area is achievable. A brief description of common forest health agents common in the area follows, as well as management recommendations for each forest health issue. A more detailed description of common forest pests found in the area can be found in the Appendix section at the back of this report.

Overstocking

Trees require adequate light, water, and nutrients to maintain their health and grow to their biologic potential. If one or more of these elements are missing or insufficient, the tree experiences stress. Stressed trees are vulnerable to insect pests, disease problems, and reduced growth rates.

The abundance of sunlight in the forest is managed by controlling the number, size, and density of trees. The optimal amount of sunlight varies with individual tree species present and management goals for the property. For example, ponderosa pine requires full sunlight to reproduce successfully

whereas grand fir can reproduce in heavy shade. Douglas-fir and western white pine can reproduce in partial shade. Tree thinning is the primary method used to control forest density, species composition, and tree growth. Pre-commercial thinning is applied in young forests before trees have commercial value. The objective is to cut less-desirable trees and create additional growing space for the remaining trees. Cut trees are often left in the forest to decompose. Commercial thinning is implemented when trees are larger, older and have commercial value. Cut trees are removed and sold to wood products manufacturers. Before tree thinning is implemented, a forester prepares a silvicultural prescription. The prescription details the goals of the thinning project and describes how, where, and when the work will be accomplished.

The east slopes of the Cascades typically experience hot and dry summers. During this period, trees depend on moisture stored in the soil to maintain their growth. Deeper soils and cooler aspects (north and east) benefit tree growth because they store greater amounts of water than is available later in the growing season. Where soils are shallow or the aspect is hot and dry (south and west), tree growth slows during drought periods due to a lack of soil moisture. Shade-intolerant (light-loving) species are adapted to grow in hot, sunny areas (south and west aspects) and are more resistant to drought. Shade-tolerant species grow in cool, moist forests found on north and east aspects and adjacent to riparian areas. Shade-tolerant species are less resistant to drought. Thinning reduces the total number of trees competing for water allowing residual trees to obtain soil moisture for a longer period during the growing season. Forest productivity is often enhanced when dense (overstocked) forests are thinned to reduce competition for soil water.

The availability of nutrients in the soil will influence the potential for tree growth. Nutrient availability is influenced by soil type and the abundance of organic material present in the soil. Fertilizer can provide an added boost to the health and growth of a forest on some soil types. Forestry activities such as slash disposal, prescribed burning, and erosion controls are implemented to maintain or improve nutrient availability.

Invasive Species

Noxious weeds degrade wildlife habitat, deteriorate streams and waterways, create fire hazards and poison or injure livestock. Noxious weeds are plant species that are harmful to the environment. Noxious weeds are invader species and do not succumb to eradication, prevention, or restoration easily. Controlling noxious weeds can be expensive and time consuming for a small landowner. For a complete list of noxious weeds recognized by Chelan County Noxious Weed Control Board refer to Appendix D.

There is not an invasive weed problem on the Stemilt-Squilchuck Community Forest property, however extensive areas of weeds are present along roads and trails. Areas away from human activity are relatively weed-free. Humans, vehicles, cattle, and wind are all vectors for transporting weed seed to new areas. Noxious weeds can have an impact on vegetation type and productivity in any given area. The potential for the establishment of noxious weeds should be taken into consideration when implementing management practices. Additionally, special consideration should be given to areas of high disturbance such as heavily used trails or other disturbed sites. Noxious weeds are common in all disturbed areas, and their presence eventually subsides with time as disturbance recovers and is occupied by surrounding cover vegetation. Scattered populations of noxious weeds including Canada thistle (*Cirsium arvense*) and spotted knapweed is common along roads and trails. These invasive

species should be treated to maintain the natural cover vegetation in those areas. The following are representative pictures of these weeds commonly observed on the property.

Canadian Thistle

Spotted Knapweed

Chelan County is encouraged to monitor and eradicate invasive weeds through manual, mechanical and cultural treatment. Other invasive weed management options include livestock grazing or biological controls such as insects that control specific plant species. If noxious weed outbreaks are discovered, it is important to prevent spread through a multi-year, targeted management program. It should be noted that there are few options that will achieve the complete eradication of these species. However, containment (managing infestation perimeters) or control (managing entire populations) is effective in preventing or greatly limiting seed dispersal into adjacent areas. The goal is to re-establish healthy plant communities with naturally occurring species. This process begins with shifting the competitive balance from the infestation to the desired plants through regeneration after the infestation has been successfully weakened by:

- Mechanical controls such as mowing,
- Manual controls such as pulling,
- Chemical controls such as herbicide treatments,
- Cultural controls such as grazing and encouraging the growth of desired vegetation,
- Biological controls such as weed-damaging insects.

Wildfire Hazard Reduction and Fire Resilience

In order to reduce the risk of a catastrophic wildfire, providing adequate access for emergency equipment, constructing fuel breaks, pruning, pre-commercial thinning and commercial thinning overstocked stands can greatly reduce the risk to the forest from the negative impacts of wildland fire.

A more “fire-safe” forest will result from management activities that reduce surface and ladder fuels. The property is composed of dense patches of tall timber with a mixed understory. Ladder fuels are a risk in many parts of the property because the understory is composed of grass, young trees and brush which will enable a surface fire to extend into the canopy. The areas of greatest risk are where the young trees have full crowns and the branches nearly touch the ground. Dense patches of overstocked timber with an abundance of dead and dying trees are also at high risk of wildfire. This along with years of accumulated ground fuels could potentially cause a surface fire to become a crown fire under the influence of extreme weather conditions. While torching of individual or groups of trees may still occur, silvicultural treatments such as thinning dense overstocked patches, and creating fuel breaks will create space between crowns and lessen the crown fire potential and rate of fire spread.

Reducing the amount of fuel build-up, and ladder fuels, and creating fuel breaks should keep most fires to low intensity. In areas where fuel has naturally accumulated to an extreme level, slash and woody debris on the forest floor may be chipped or piled and burned. Burning piles, broadcast burning, or mastication is the most cost-effective way to reduce woody material buildup. Removing brush, mowing, and pre-commercial thinning dense patches of sub-merchantable trees would reduce the intensity of a fire if one were to start or burn through the property.

The amount of time between fire ignition and the arrival of fire suppression equipment and personnel have an effect on the success level of suppression activities. Access for fire suppression should not be an issue on the Stemilt-Squilchuck Community Forest property due to past management activity roads (see Roads Section). Most of the management area is well road by roads developed for timber harvesting operations, however many roads are grown over or have limited vehicle access. Road improvements are needed in many areas to enable proper access of emergency firefighting and suppression equipment.

FOREST MANAGEMENT PLAN SUMMARY

This Forest Management Plan identifies and evaluates a set program and identifies goals and objectives for the subject lands. It outlines a management regime, which will help the landowners meet their described goals and objectives. A management plan is designed to be a tool that provides a pathway for meeting specific goals and objectives; it is not to be a burden to a landowner. As environmental and market conditions change so may the management regime change.

This Plan has been developed for the purposes of reaching a specific set of goals set forth by the landowner. This plan evaluates the Chelan County Stemilt-Squilchuck Community Forest property. In this Plan, a regime has been set forth that attempts to accomplish the goals of maintaining and improving the health and aesthetics of the property. The management regimes describe a plan which projects activity over the next 15 to 20 years. This is a feasible planning time frame for forestry. At the end of this period, the property should be re-evaluated and a new cruise (inventory) is recommended.

Doing so will allow the landowner and a forester to reaffirm the landowner's goals, past management practices, and changing environmental regulations.

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Appendices

Appendix A. Sensitive Species of Washington

Appendix B. Snag Guidelines

Appendix C. Common Forest Health Agents

Appendix D. Chelan County Noxious Weed List

Appendix E. Cruise Compilation Tables

Appendix F. Road Maintenance Maps

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APPENDIX A. THREATENED AND ENDANGERED SPECIES LIST

Table 9 Washington State Listed Species

Washington Department of FISH and WILDLIFE

The Washington Fish and Wildlife Commission has classified the following 45 species as Endangered, Threatened, or Sensitive. The federal status of species under the Endangered Species Act differs in some cases from state status; federal status is indicated by: Federal Endangered (FE), Threatened (FT), Candidate (FC), or Species of Concern (FSC).

STATE ENDANGERED

A species native to the State of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.

The 32 State Endangered species are designated in Washington Administrative Code 220-610-010

MAMMALS (14)

Pygmy Rabbit	FE
Fin Whale	FE
Sei Whale	FE
Blue Whale	FE
Humpback Whale	FT/FE#
#*Mexico DPS=T; Central America DPS=E*	
North Pacific Right Whale	FE
Sperm Whale	FE
Killer Whale	FE#
#*Southern Residents only*	
Gray Wolf	FE#
#*Federally listed west of north-south line following Highways 97, 17, and 395.*	
Grizzly Bear	FT
Lynx	FT
Fisher	FC
Columbian White-tailed Deer	FT
Woodland Caribou	FE

BIRDS (9)

Sandhill Crane	-
Snowy Plover	FT
Upland Sandpiper	-
Marbled Murrelet	FT
Tufted Puffin	-
Columbian Sharp-tailed Grouse	-
Northern Spotted Owl	FT
Yellow-billed Cuckoo	FT
Streaked Horned Lark	FT

REPTILES (3)

Western Pond Turtle	-
Leatherback Sea Turtle	FE
Loggerhead Sea Turtle	FE

AMPHIBIANS (2)

Oregon Spotted Frog	FT
Northern Leopard Frog	-

INVERTEBRATES (4)

Oregon Silverspot Butterfly	FT
Taylor's Checkerspot	FE
Mardon Skipper	-
Pinto Abalone	FSC

STATE THREATENED

A species native to the state of Washington that is likely to become endangered within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.

The 7 State Threatened species are designated in Washington Administrative Code 220-200-100

MAMMALS (3)

Sea Otter	FSC
Western Gray Squirrel	-
Mazama Pocket Gopher	
subsp. *glacialis, pugetensis, tumuli, yelmensis*	FT
...subsp. *couchi, louiei, melanops*	-

BIRDS (3)

American White Pelican	-
Greater Sage-Grouse	FSC
Ferruginous Hawk	-

REPTILES (1)

Green Sea Turtle	FT

For more information, check our website:
http://wdfw.wa.gov/conservation/species/

Or contact us at:
Wildlife Program (360) 902-2515
Fish Program (360) 902-2700

For more information on federal status, check the US Fish and Wildlife Service or the National Marine Fisheries Service

STATE SENSITIVE

A species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats.

The 6 State Sensitive species are designated in Washington Administrative Code 220-200-100

MAMMALS (1)

Gray Whale	FE#
#*Western North Pacific Stock*	

BIRDS (1)

Common Loon	-

FISH (3)

Pygmy Whitefish	-
Margined Sculpin	-
Olympic Mudminnow	-

AMPHIBIAN (1)

Larch Mountain Salamander	-

STATE CANDIDATE SPECIES

Revised June 2019

Washington Department of FISH and WILDLIFE

The Washington Department of Fish and Wildlife has designated the following 102 species as Candidates for listing in Washington as State Endangered, Threatened, or Sensitive. The Department reviews species for listing following procedures in Washington Administrative Code 220-610-110. The federal status of species under the Endangered Species Act differs in some cases from state status; federal status is indicated by: Federal Endangered (FE), Threatened (FT), Candidate (FC), or Species of Concern (FSC).

MAMMALS (10)

Townsend's Big-eared Bat	-
Keen's Myotis Bat	-
White-tailed Jackrabbit	-
Black-tailed Jackrabbit	-
Washington Ground Squirrel	-
Townsend's Ground Squirrel	
South of the Yakima River	-
Olympic Marmot	-
Cascade Red Fox	-
Wolverine	FC
Pacific Harbor Porpoise	-

BIRDS (17)

Western Grebe	-
Clark's Grebe	-
Short-tailed Albatross	FE
Northern Goshawk	-
Golden Eagle	-
Cassin's Auklet	-
Flammulated Owl	-
Burrowing Owl	-
Vaux's Swift	-
White-headed Woodpecker	-
Black-backed Woodpecker	-
Pileated Woodpecker	-
Loggerhead Shrike	-
Slender-billed White-breasted Nuthatch	-
Sage Thrasher	-
Oregon Vesper Sparrow	-
Sagebrush Sparrow	-

REPTILES and AMPHIBIANS (10)

Sagebrush Lizard	-
Common Sharp-tailed Snake	-
California Mountain Kingsnake	-
Striped Whipsnake	-
Dunn's Salamander	-
Van Dyke's Salamander	-
Cascade Torrent Salamander	-
Western Toad	-
Columbia Spotted Frog	-
Rocky Mountain Tailed Frog	-

FISH (37)

Mountain Sucker	-
Lake Chub	-
Leopard Dace	-
Umatilla Dace	-
River Lamprey	-
Pacific Herring	-
Eulachon –Southern DPS	FT
Pacific Cod	
South and Central Puget Sound	FSC
Walleye Pollock	
South Puget Sound	-
Pacific Hake (Whiting) Georgia Basin	FSC
Black Rockfish#	-
Brown Rockfish#	-
Copper Rockfish#	-
Quillback Rockfish#	-
Tiger Rockfish#	-
Bocaccio Rockfish#	FE
Canary Rockfish	-
Yelloweye Rockfish#	FT
Yellowtail Rockfish#	-
Greenstriped Rockfish#	-
Widow Rockfish#	-
Redstripe Rockfish#	-
China Rockfish#	-

#Puget Sound, the San Juan Islands, and the Strait of Juan de Fuca east of the Sekiu R.

Chinook Salmon	
Snake River Fall	FT
Snake River Spring/Summer	FT
Puget Sound	FT
Upper Columbia Spring	FE
Lower Columbia	FT
Chum Salmon	
Hood Canal Summer (includes Strait of Juan de Fuca, not Puget Sound)	FT
Columbia River	FT
Sockeye Salmon	
Snake River	FE
Ozette Lake	FT
Steelhead	
Snake River	FT
Upper Columbia	FT
Middle Columbia	FT
Lower Columbia	FT
Bull Trout	FT

NOT STATE CANDIDATES

Fish stocks that have been the subjects of federal register notices, but have not yet been added to the state candidate list.

Coho Salmon	
Puget Sound/Strait of Georgia	FSC
Lower Columbia	FT
Steelhead, Puget Sound	FT
Green Sturgeon	FT

MOLLUSKS (9)

Shortface Lanx	-
Ashy (Columbia) Pebblesnail	-
California Floater	-
Olympia Oyster	-
Columbia Oregonian (snail)	-
Poplar Oregonian (snail)	-
Dalles Sideband (snail)	-
Blue-gray Taildropper (slug)	-

INSECTS (18)

Beller's Ground Beetle	-
Mann's Mollusk-eating Ground Beetle	-
Columbia River Tiger Beetle	-
Hatch's Click Beetle	-
Columbia Clubtail (dragonfly)	-
Pacific Clubtail	-
Sand-verbena Moth	-
Yuma Skipper	-
Shepard's Parnassian	-
Makah Copper	-
Chinquapin Hairstreak	-
Johnson's Hairstreak	-
Juniper Hairstreak	-
Puget Blue	-
Valley Silverspot	-
Silver-bordered Fritillary	-
Great Arctic	-
Island Marble	FC

OTHER INVERTEBRATES (2)

Giant Palouse Earthworm	-
Leschi's Millipede	-

Many species of uncertain conservation need are listed in our State Wildlife Action Plan:
https://wdfw.wa.gov/conservation/cwcs/

For more information, check our website:
http://wdfw.wa.gov/conservation/species/
Or contact us:
Wildlife Program (360) 902-2515
Fish Program (360) 902-2700

APPENDIX B. SNAG GUIDELINES

Table 10 Snag Requirements by Species

Species	Snag Type	Snag Size	
		minimum nesting height (feet)	minimum dbh (inches)
Primary Cavity Nesters			
Black-capped chickadee	soft	6	4
Mountain chickadee	soft	6	4
Chestnut-backed chickadee	soft	6	4
Downy woodpecker	hard	15	6
Hairy woodpecker	hard	15	10
Yellow-bellied sapsucker	hard	15	10
Pileated woodpecker	hard	31	20
Common flicker	hard	6	12
Red-breasted nuthatch	soft	15	12
Secondary Cavity Nesters *			
Black-capped chickadee	–	6	4
Mountain chickadee	–	6	4
Chestnut-backed chickadee	–	6	4
Tree swallow	–	15	10
Brown creeper **	–	15	10
Red-breasted nuthatch	–	15	12
Common flicker	–	6	12
Mountain bluebird	–	6	10
American kestrel	–	15	12
Pygmy owl	–	30	12
Barred owl	–	30	20
Big brown bat **	–	15	12
Common merganser	–	6	20
Wood duck	–	6	20
Marten	–	15	15
Fisher	–	30	20
Short-tailed weasel	–	6	10

* Uses both natural cavities and those made by other species
**May also use space underneath loose bark

Ponderosa Pine/Mixed Conifer Community

If Snag DBH is > 10 in^2		If Snag DBH is > 20 in^2	
Potential population	Number of snags per 100 acres*	Potential population	Number of snags per 100 acres*
20%	15	20%	3
40%	30	40%	5
60%	45	60%	8
80%	60	80%	11
100%	75	100%	14

Riparian (Cottonwood/Alder) Community

If Snag DBH is > 6 in^2		If Snag DBH is > 12 in^2	
Potential population	Number of snags per 100 acres*	Potential population	Number of snags per 100 acres *
20%	30	20%	20
40%	60	40%	40
60%	90	60%	60
80%	120	80%	80
100%	150	100%	101

* For areas less than 100 acres, number of snags/acres may be calculated proportionately.

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APPENDIX C. COMMON FOREST HEALTH AGENTS

Forest health agents common to the area in and around the property include root disease, dwarf mistletoe, bark beetles, rusts, stem decays and physical damage from weather and animals. All agents affecting this property are native to the area. Eliminating impacts on individual trees is nearly impossible but minimizing their scope and impact throughout a forest area is achievable. For more information, a brief description and management suggestions of these agents can be found at this Washington Department of Natural Resources Forest Health and Resiliency web site https://www.dnr.wa.gov/ForestHealth

Following is a detailed description of the more common forest pests found in the area.

Dwarf Mistletoe

Dwarf mistletoes are small, leafless, parasitic plants that grow on branches and stems of conifers. They are usually 1 to 5 inches tall and mostly green, yellow, brown or orange in color. A host tree is typically infected by only one species of mistletoe. Bunched growths of branches (witches' brooms) and swollen branches are frequency caused by mistletoe making them good indicators for mistletoe presences. Female plants produce seeds that spread the disease, but both sexes' damage trees. Seeds are produced in small berries. During late summer, the berries burst leading seeds to travel horizontal distances of 10 to 40 feet. The sticky seeds attach to branches and infect the trees. Birds can distribute seeds, but most infection spreads from nearby infected trees. Several factors influence the time it takes mistletoe to kill a tree. Damage tends to develop slowly until the tree is heavily infected. Trees are usually killed within 10 to 15 years once they become heavily infected throughout the crown.

Ex

Control of dwarf mistletoe involves reducing the amount of mistletoe to a low level. Heavily infected trees are cut or girdled to kill the tree and the parasitic plant. Lightly infected trees can have branches pruned. All live branches up to the highest infected branch should be cut off. Infected trees can be retained if they are isolated from healthy trees or surrounded by resistant tree species within 40 feet. Each dwarf mistletoe species infect only one species of tree but more than one species of dwarf mistletoe may be present in a stand. If the disease is so advanced that most trees need to be cut, planting mistletoe resistant trees is a good alternative. For example, Douglas-fir can be replaced with ponderosa pine.

Mistletoe control is generally a long-term process with activities focused on harvest or thinning operations to reduce cost. The first step is to select heavily infected trees for removal during current or future harvests. Second, remove infected young trees during pre-commercial thinning operations. Third, prune infected branches off trees that have light infections. Lastly, monitor for mistletoe outbreaks every three to five years.

Mistletoe levels on the Stemilt-Squilchuck Community Forest property are very low. Monitoring dwarf mistletoe populations will be important for the health of the forest. Some ponderosa pine and western

larch with dwarf mistletoe can be left if desired in the overstory; as they are isolated, they can provide wildlife habitat and there are non-susceptible trees in the understory nearby.

Western Gall Rust/White Pine Blister Rust

Western gall rust is a fungus that infects lodgepole and ponderosa pine. White pine blister rust infects five-needle pines although western white pine is the species most affected in north Idaho and eastern Washington. The fungi can be identified by looking for galls (round swellings), cankers (deformities), or blisters on the branches and bole of infected trees. These diseases mainly cause stem malformation, breakage, reduced growth and sometimes mortality (particularly in younger trees). White pine is especially susceptible to white pine blister rust and in some cases experienced 90% mortality in historic pure western white pine stands. In large trees, the fungi may persist for 50 years or more before death. Western gall rust is windborne and may travel several miles to infect other pines. While white pine blister rust is unable to spread from pine tree to pine tree and instead must alternate between pine and *Ribes* spp. (currants and gooseberries) to complete its life cycle. Due to these high spread potentials, complete elimination of this disease is unlikely. To combat western gall rust, when performing a pre-commercial thin, an infected tree should be cut. To combat white pine blister rust, manage the amounts of *Ribes* spp. shrubs present and use rust-resistant planting stock following a harvest. Also for both western gall rust and white pine blister rust, pruning the lowest branches and/or isolated infected branches on the bole of a tree is an effective management tool. A minor amount of ponderosa pine regeneration on the Stemilt-Squilchuck Community Forest property has gall rust. Western gall rust is not a forest health risk at this time but it should be monitored.

Example photo of western gall rust

Stem Decay

There are several types of stem decays found in northern Rocky Mountain forests. The most damaging and common stem decays found in the inland northwest are Indian paint fungus and red ring rot. These diseases can be very harmful, affecting the usable volume in the infected trees. Conks are the fruiting bodies of fungi found on the bole of trees and provide a conspicuous clue of heartwood or sapwood

decay. The diseases are spread by wind-borne spores. The spores gain entry to the tree through injuries and knotholes. The occurrence of Indian paint fungus was not observed on the property.

Indian paint fungus is tan and water-soaked at first, becoming yellow to orange and stringy. Stems are often almost completely hollowed by this decay. Conks, which can reach a foot in diameter, typically develop under branches or branch stubs. There are woody, hoof-shaped and toothed on the underside. The upper surface is dark brown or black, the lower surface is grassy and the interior is brick red. Punk knots also have brick red tissue within.

Red ring rot conks are woody with a dark, ridged upper surface with a tan or cinnamon pore layer on the underside. They vary from hoof-shaped to appressed on the bark with little or no upper surface. They are usually 2-4 inches in diameter and the inside is tan or brown. The rot first appears as a red or brown stain in the heartwood. The stain often forms concentric rings or crescents in cross-sections. In later stages, white pockets are distinct from the surrounding dark red or brown wood. In late stages, the decay is stringy and mostly white. Swollen knots may be the only outward sign of infection. These knots have a spongy texture and are filled with brown mycelium.

Other common fungi that affect the stem of conifers are red belt fungus and pouch fungus. These fungi decay the stems of dead trees that were killed by other forest pathogens. Stem decay is also common in western red cedar, especially near the base. The most common cedar rots in North Idaho and eastern Washington are cedar laminated butt rot and cedar brown pocket rot.

It is extremely important to minimize wound damage when entering a stand to implement silvicultural treatments. As no chemical or biological method will protect a tree, wound prevention is the only effective way to keep from reactivating dormant infections. The following actions should minimize heartwood rot or stem decay:

1. Manage susceptible species on short rotations.
2. Thin trees early to increase growth and maintain stand vigor,
3. When partial cutting, select crop or leave trees with at least 50% live crown ratio, at least 8 inches of current leader growth and the best form and height.
4. Minimize wounding in thinning operations, prescribed burning, slash disposal. Wounds should be prevented by not logging in spring or early summer when trees are more susceptible to injury, marking “leave” trees rather than “cut” trees and pre-planning skid trails.

Root Disease

Root diseases are the most damaging group of tree diseases. Three of the most common root diseases found in the Inland Northwest include laminated root rot, Armillaria root disease, and annosus root and butt disease. The following table displays the primary, intermediate and seldom hosts for each species of root disease.

Root Disease	Primary Hosts	Intermediate Hosts	Seldom Hosts
Laminated	DF, GF, MH,	SA, WH, ES	PP, LP, WP, WL
Armillaria	DF, GF	PP, LP, WP, SA, WH, ES, WRC	WL
Annosus	GF, SA	ES, DF, LP, PP, WRC	WL
Species key: DF=Douglas-fir, GF=grand fir, MH=mountain hemlock, SA=subalpine fir, WH=western hemlock, ES=Engelmann spruce, PP=ponderosa pine, LP=lodgepole pine, WP=white pine, WRC=western red cedar, WL=western larch			

Armillaria is the most common root disease in the Pacific Northwest and is highly pathogenic and able to kill otherwise healthy, vigorous trees. Most commonly, trees are infected by rhizomorphs or by root contact with a diseased individual. Rhizomorphs grow out through the soil from an established infection and penetrate directly into the root surface of uninfected trees to spread the disease. When roots from a healthy tree touch an infected root or stump, a new infection occurs.

Typically, young trees are quickly killed, while older trees may be able to slow the progress of the fungus to the root collar and thus survive for many years, albeit in a weakened state, leaving the tree predisposed to windthrow, other diseases, and bark beetle attack. Over time, rotted stumps accumulate in the area and may retain viable inoculum for decades.

Diagnosis and identification of root diseases are based on:

1. Circular groups of dead and dying trees. Root diseases tend to kill a few trees each year. Look for dying trees at the edge of a group of dead trees towards the center.
2. Thinning tree crowns. Crowns of root diseased trees fade in color, thin from the inside of the tree crown towards the edge. Diseased trees may produce a cone crop, though much of the seed is not viable.
3. Young trees are killed more quickly than older ones.
4. Symptoms and signs in roots and root crowns. Trees with advanced root disease may have basal resin flow, wood discoloration and decay and presence of fungal tissue.

Armillaria root disease and laminated root rot were not observed on the property, however, they may be a concern in isolated pockets of grand fir. Management of this disease is essential for the overall health of the forest.

The most effective management action to control root disease is to harvest the trees affected by the disease and replace them with species that are resistant to root diseases such as ponderosa pine and western larch. Armillaria root disease can remain in the root system for up to 50 years even after the affected tree is dead. When identifying root rot pockets to be harvested, it is best to expand the area outside of the perimeter of the visible dead/dying to contain the root disease from spreading.

Pine Bark Beetles

Four different pine bark beetles affect the pine trees in the Inland Northwest area. The four beetles are western pine beetle, mountain pine beetle (MPB), red turpentine beetle and pine engraver beetle. The beetles generally favor trees that are stressed. Trees can become stressed during a drought or by having too many trees in an area (overstocked). The bark beetle bores through the bark and lays its eggs in the cambium layer between the bark and the wood; the cambium is full of sugar and nutrients that feed the larvae.

Trees killed by bark beetles can be recognized as red trees in the stand that appears suddenly. A tree can turn from green to red within weeks. However, other indicators would have been present for months. These indicators are things such as pitch tubes, boring dust or frass on the bark. Red trees themselves are usually not a forest health risk. They are an indicator of what has happened in the stand and what may happen in the future. The western and mountain pine beetles are considered major tree killers in Idaho and eastern Washington. Both prefer trees greater than 8 inches in diameter. Trees that they attack often die.

The red turpentine beetle generally attacks only the bottom six feet of the tree. It usually attacks a tree that is under stress or has already been attacked by another beetle. The exception is if a timber harvest has recently occurred the turpentine beetle will attack the stump of the harvested tree and sometimes trees near those stumps. A tree attacked by only the red turpentine beetle will normally not die unless attacked several years in a row.

Pine engraver beetles are slash-breeding insects. The beetles primarily attack fresh, green material on the ground greater than 2 inches in diameter. Examples would be logging slash, tops of trees broken during wind or ice storms and pre-commercial thinning debris (trees cleared around new homes or developments is a prime example). Once green material hits the ground, it is a food source for 3-6 months. After the 3-6 months, the sugary layer under the bark turns sour. The pine engraver beetle generally attacks slash in April or May during its first flight. Another flight will occur 8 weeks later. This second flight will look for green slash; if it is not available, they will look for stressed trees and attack the top of the tree. If the tree is less than 20 feet tall it will likely die. However, larger trees will most likely survive although their tops may be attacked. Usually, another beetle species will come in and kill these weakened trees.

To minimize pine engraver attacks, do not create logging or thinning slash greater than 2 inches in diameter between January and June. If logging is conducted during these times the following suggestions should minimize a pine engraver problem:

1. Proper utilization of all material down to two inches in diameter.
2. Pile and burn material greater than two inches within 6 weeks if possible.
3. Chip or remove material greater than two inches in diameter within 6 weeks.
4. Form a green chain of fresh slash; this option provides a continuous supply of food for the beetle through their entire breeding season, keeping them out of standing trees.

The best methodology for preventing bark beetle attacks (namely western and mountain pine beetle) is maintaining proper stand densities throughout the development of a forest – an indirect control method. In partial cut situations, commercial “pine” stands should generally be thinned to levels between 40 and 70 square feet of basal area per acre. Creating small “patch” or clear cuts (5 to 10 acres in size) across a landscape or large timber ownership will mimic natural disturbance events, creating a forest of multiple age classes. This stratification is very effective in creating non-suitable bark beetle habitat.

Currently, there is no evidence of pine beetle problems on the Stemilt-Squilchuck Community Forest property. Stocking density management will help to prevent future pine beetle outbreaks and promote favorable stand conditions.

Douglas-fir Beetle

Douglas-fir beetle outbreaks are usually initiated by catastrophic events such as blowdown or winter breakage. Downed or weakened trees are attacked and beetles build up large populations. The next year, new generations emerge and attack susceptible trees in surrounding stands. Damage to standing trees is greatest in dense stands containing a high percentage of large, mature Douglas-fir. No Douglas-fir beetle damage was observed on the property.

Salvage of down or weakened Douglas-fir is a primary tool in preventing Douglas-fir beetle outbreaks. When attacks have already occurred removing standing green or faded infested trees will help reduce or prevent further damage in the area. The risk of Douglas-fir beetle damage is reduced when dense mature stands are commercially thinned.

Fir Engraver Beetle

This beetle can have a significant impact on mature and pole-sized grand fir. Long-term losses may be greater since attacks not causing tree mortality provide entrance points for decay organisms. True firs weakened by disease and stand disturbance, such as drought, defoliator outbreaks, and logging activity, are particularly susceptible to beetle attacks.

A tree under attack displays reddish-brown or white boring dust in bark crevices and is typically located near the branch collar on the tree. Another indicator is streams of clear pitch flow down the bark from the point of beetle attack. Trees with more than ten pitch streams on the main bole have a high probability of mortality.

Individual branches or the entire crown of trees under attack turn yellow-green and eventually red. A portion of recently attacked trees may show signs of a fading crown in the fall with the remainder fading the next spring. Removing patches of bark to find the beetle or its distinctive gallery can confirm fir engraver attacks on dead trees.

The fir engraver beetle attacks host trees from June–September with the most activity occurring from July-August. Unlike other bark beetles, the fir engraver needs only to kill a strip of cambium near its gallery to successfully reproduce. Because it doesn't necessarily kill the tree, fir engraver attacks result in a variety of tree symptoms: (1) dead branches, (2) top kill and (3) complete tree mortality.

Endemic fir engraver populations maintain themselves by attacking trees weakened by root disease or killing patches of bark on otherwise healthy trees. Beetle outbreaks often occur in the years following a period of subnormal or too much precipitation or logging activity. Logging operations can contribute to outbreaks due to the shock of opening the stand which can temporarily lower the vigor of residual trees. Outbreaks of defoliating insects such as the western spruce budworm and Douglas-fir tussock moth may be followed by fir engraver beetle outbreaks that peak one to three years later. A sustained drought event can result in the entire fir stands being killed by the fir engraver beetle rather than a few individual trees.

Fir engraver attacks that do not produce tree mortality cause scars clearly visible on the outer bark. Various defects such as stain, ring-shake, and decay are associated with old attack scars. These defects can reduce the value of the trees.

Beetle populations can be reduced by removing recently killed trees, those still holding yellow or red needles, from the stand before the beetle flight in June. If fir engraver attacks are associated with a root disease pocket, the best strategy is to follow root disease management guidelines. Remove injured or decadent true fir that might provide breeding material for the fir engraver beetle. Poor crown condition and crown ratios have been associated with susceptibility to engraver beetle attacks in the grand fir. The fir engraver beetle can breed in fresh slash with a diameter >4 inches. Avoid creating large pieces of true fir slash from January-July. Overstocked fir stands should be thinned to reduce competition and increase tree vigor.

Insect Defoliators

Primarily, two native insects, the western spruce budworm, and Douglas-fir tussock moth cause widespread defoliation of Douglas-fir and grand fir timber types in Idaho and eastern Washington. The western spruce budworm also affects Engelmann spruce. Young larvae feed on new foliage as it grows in the spring while later in the season older needles are fed upon. Branch kill, top kill, and mortality can result after several years of attack.

These native forest defoliators are major components of the forest ecosystem in which they are found. They add to the biological diversity of the system, serve as food for other animals and function in the release and recycling of nutrients. Outbreaks of the insects are cyclic and can cause mortality when other tree stressing factors, such as drought, occur in conjunction with defoliation. In general, dense, uneven-aged, mature stands of Douglas-fir and/or grand fir are at

high risk to future outbreaks. Particularly vulnerable are those stands growing on warm, dry sites.

Heavy outbreaks are typically treated by aerial spraying with chemical pesticides. Other more long-term stand management practices that reduce the impact of defoliators include favoring non-hosts such as pine species and western larch. Timber harvesting and thinning can also reduce the risk and increase resistance by altering the composition and structure of susceptible forest stands. No significant outbreaks of insect defoliation were observed on the property.

Physical Damage

The physical damage found on the Stemilt-Squilchuck Community Forest property is primarily due to animal damage and physical damage. Animal damage includes rodents killing seedlings, ungulates creating rubs/scrapes and ungulate browsing on small trees. Deer browsing can create a high mortality rate among plant communities and should be considered when reforestation or afforestation occurs. Physical damage includes abrasion from past logging which creates scars or cankers on the bole of trees that are healed over by bark and sap. Some abrasions are entry points for a disease that will eventually kill the tree or create a weak spot allowing breakage or entry by insects.

Other physical damage includes weather events. Isolated strong gusts of the wind and more prolonged windstorms can cause broken tops and windthrow. Shallow-rooted species and trees along exposed ridgelines are particularly vulnerable to damage from the wind. Snow damage can occur when temperatures stay low enough that snow cannot melt and slough from the tree crowns. The trees become brittle from cold temperatures and the weight of a significant snowfall can fracture the main stem of the tree. The number of trees damaged by these weather events in an area can be significantly higher where the overstory is sparse or widely spaced.

APPENDIX D. CHELAN COUNTY NOXIOUS WEED LIST

Table 11 Chelan County Noxious Weed List

2019 Chelan County Noxious Weed List

The following noxious weeds have been adopted from the Washington State Noxious Weed List contained in chapter 16-750 WAC for 2019 (++ denotes name changes effective in 2019)

Class A Weeds: Non-native species whose distribution in Washington is still limited. Preventing new infestations and eradicating existing infestations are the highest priority. **Eradication of all Class A weeds in required by law**.

Class A - Eradication Required

Common Name	**Scientific Name**
broom, French	*Genista monspessulana*
broom, Spanish	*Spartium junceum*
common crupina	*Crupina vulgaris*
cordgrass, common	*Spartina anglica*
cordgrass, dense-flowered	*Spartina densiflora*
cordgrass, salt meadow	*Spartina patens*
cordgrass, smooth	*Spartina alterniflora*
dyer's woad	*Isatis tinctoria*
eggleaf spurge	*Euphorbia oblongata*
false brome	*Brachypodium sylvaticum*
floating primrose-willow	*Ludwigia peploides*
flowering rush	*Butomus umbellatus*
garlic mustard	*Alliaria petiolata*
giant hogweed	*Heracleum mantegazzianum*
goatsrue	*Galega officinalis*
hydrilla	*Hydrilla verticillata*
Johnsongrass	*Sorghum halepense*
knapweed, bighead	*Centaurea macrocephala*
knapweed, Vochin	*Centaurea nigrescens*
kudzu	*Pueraria montana* var. *lobata*
meadow clary	*Salvia pratensis*
oriental clematis	*Clematis orientalis*
purple starthistle	*Centaurea calcitrapa*
reed sweetgrass	*Glyceria maxima*
ricefield bulrush	*Schoenoplectus mucronatus*
sage, clary	*Salvia sclarea*
sage, Mediterranean	*Salvia aethiopis*
silverleaf nightshade	*Solanum elaeagnifolium*
small-flowered jewelweed	*Impatiens parviflora*
Syrian bean-caper	*Zygophyllum fabago*
Texas blueweed	*Helianthus ciliaris*
thistle, Italian	*Carduus pycnocephalus*
thistle, milk	*Silybum marianum*
thistle, slenderflower	*Carduus tenuiflorus*
variable-leaf milfoil	*Myriophyllum heterophyllum*
wild four o'clock	*Mirabilis nyctaginea*

Class B County Designated Weeds: Non-native species presently limited to portions of the State. Species are designated for control in regions where they are not yet widespread. Preventing new infestations in these areas is a high priority. In regions where a Class B species is already abundant, control is decided at the local level, with containment as the primary goal.

Class B Designated - Control Required for Chelan County	
blueweed	*Echium vulgare*
Brazilian elodea	*Egeria densa*
bugloss, annual	*Anchusa arvensis*
bugloss, common	*Anchusa officinalis (except in a portion of Entiat Valley)*
camelthorn	*Alhagi maurorum*
common fennel, (except bulbing fennel)	*Foeniculum vulgare (* except *F. vulgare var. azoricum)*
common reed (nonnative genotypes only)	*Phragmites australis*
Eurasian watermilfoil	*Myriophyllum spicatum*
European coltsfoot	*Tussilago farfara*
fanwort	*Cabomba caroliniana*
gorse	*Ulex europaeus*
grass-leaved arrowhead	*Sagittaria graminea*
hairy willowherb	*Epilobium hirsutum*
hawkweed oxtongue	*Picris hieracioides*
hawkweed, orange	*Hieracium aurantiacum*
hawkweeds: All nonnative species and hybrids of the meadow subgenus	*Hieracium, subgenus Pilosella*
hawkweeds: All nonnative species and hybrids of the wall subgenus	*Hieracium, subgenus Hieracium*
herb-Robert	*Geranium robertianum*
hoary alyssum	*Berteroa incana*
houndstongue	*Cynoglossum officinale*
indigobush	*Amorpha fruticosa*
knapweed, black	*Centaurea nigra*
knapweed, brown	*Centaurea jacea*
knapweed, meadow	*Centaurea x moncktonii (changed from Centaurea jacea x nigra)*
knotweed, Bohemian	*Polygonum x bohemicum*
knotweed, giant	*Polygonum sachalinense*
knotweed, Himalayan	*Persicaria wallichii++*
knotweed, Japanese	*Polygonum cuspidatum*
loosestrife, garden	*Lysimachia vulgaris*
loosestrife, purple	*Lythrum salicaria*
loosestrife, wand	*Lythrum virgatum*
Malta starthistle	*Centaurea melitensis*
parrotfeather	*Myriophyllum aquaticum*
perennial pepperweed	*Lepidium latifolium*
poison hemlock	*Conium maculatum*
policeman's helmet	*Impatiens glandulifera*
rush skeletonweed	*Chondrilla juncea*
saltcedar	*Tamarix ramosissima*
Scotch broom	*Cytisus scoparius*

shiny geranium	*Geranium lucidum*
spurge flax	*Thymelaea passerina*
spurge laurel	*Daphne laureola*
spurge, leafy	*Euphorbia virgata++*
spurge, myrtle	*Euphorbia myrsinites*
tansy ragwort	*Jacobaea vulgaris++*
thistle, musk	*Carduus nutans*
thistle, plumeless	*Carduus acanthoides*
thistle, Scotch	*Onopordum acanthium*
velvetleaf	*Abutilon theophrasti*
water primrose	*Ludwigia hexapetala*
white bryony	*Bryonia alba*
wild chervil	*Anthriscus sylvestris*
yellow archangel	*Lamiastrum galeobdolon*
yellow floatingheart	*Nymphoides peltata*
yellow nutsedge	*Cyperus esculentus*
yellow starthistle	*Centaurea solstitialis*
Class B and C Selected - Control Required for Chelan County	
*Class B non-designate selected for control in Chelan County	
**Class C selected for control in Chelan County	
Canada thistle**	*Cirsium arvense*
Common St. Johnswort **	*Hypericum perforatum*
Dalmation toadflax*	*Linaria dalmatica*
Kochia*	*Bassia scoparia++*
Oxeye daisy**	*Leucanthemum vulgare*
Medusahead grass**	*Taeniatherum caput-medusae*
Puncturevine*	*Tribulus terrestris*
Ravenna grass*	*Saccharum ravennae*
Russian knapweed*	*Rhaponticum repens++*
Spotted knapweed*	*Centaurea stoebe*
Ventenata grass**	*Ventenata dubia*

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APPENDIX E. CRUISE COMPILATION TABLES

Table 12 Inventory Cruise Compilation

Project Species Summary

Stemilt Community Forest

Net of Buffers Acreage

Section	(#Stds)	Acres	Spp	Per Acre Dbh	Trees	Basal	Htt	NetCub	NetBrd	Total Stand (1,000s) GrsCub	NetCub	GrsBrd	NetBrd
1													
		Species:	DF	6.3	94	21	35	323	1,532	232	205	1,097	969
		Species:	GF	2.7	130	5	15	53	233	50	33	217	147
		Species:	PP	7.6	88	27	34	426	2,050	292	270	1,398	1,297
		Species:	RA	5.0	2	0	37	0	0	0	0	0	0
		Species:	WL	6.3	7	2	34	22	106	15	14	74	67
1	**(13)**	**632.6**		5.6	322	55	28	824	3,920	**589**	**521**	**2,786**	**2,480**
7													
		Species:	DF	6.8	195	49	38	639	2,831	236	207	1,033	919
		Species:	GF	10.1	1	1	51	7	33	3	2	12	11
		Species:	PP	9.2	55	25	41	364	1,627	139	118	619	528
7	**(7)**	**324.7**		7.4	251	74	39	1,010	4,491	**378**	**328**	**1,665**	**1,459**
23													
		Species:	DF	4.9	252	33	28	554	2,446	213	196	935	865
		Species:	GF	2.3	17	1	17	13	63	5	5	24	22
		Species:	PP	7.1	109	30	34	541	2,541	204	191	957	899
		Species:	WL	6.2	15	3	37	48	229	19	17	91	81
23	**(6)**	**353.6**		5.6	393	67	30	1,157	5,278	**441**	**409**	**2,007**	**1,867**
26													

Project Species Summary

Stemilt Community Forest

Net of Buffers Acreage

Section	(#Stds)	Acres	Spp	Per Acre Dbh	Trees	Basal	Htt	NetCub	NetBrd	Total Stand (1,000s) GrsCub	NetCub	GrsBrd	NetBrd
		Species:	DF	3.3	261	16	19	209	969	**107**	**99**	**495**	**457**
		Species:	GF	1.9	108	2	8	22	90	**13**	**10**	**53**	**42**
		Species:	LP	3.0	7	0	12	0	0	**0**	**0**	**0**	**0**
		Species:	PP	6.2	118	24	28	373	1,723	**193**	**176**	**892**	**813**
		Species:	WL	3.8	39	3	23	26	121	**14**	**12**	**64**	**57**
26	**(10)**	**471.8**		4.0	533	46	20	630	2,903	**328**	**297**	**1,504**	**1,369**
27													
		Species:	DF	4.6	162	18	25	227	1,000	**127**	**114**	**557**	**504**
		Species:	ES	0.9	5	0	6	0	0	**0**	**0**	**0**	**0**
		Species:	GF	2.2	211	6	13	62	297	**36**	**32**	**167**	**150**
		Species:	LP	1.8	7	0	11	0	0	**0**	**0**	**0**	**0**
		Species:	PP	6.9	108	28	37	432	2,049	**242**	**218**	**1,142**	**1,034**
		Species:	WL	3.4	39	2	21	27	130	**15**	**14**	**71**	**65**
27	**(9)**	**504.6**		4.4	532	55	24	749	3,475	**420**	**378**	**1,937**	**1,753**
29													
		Species:	AF	0.0	1	0	2	0	0	**0**	**0**	**0**	**0**
		Species:	DF	4.4	87	9	26	86	377	**38**	**34**	**165**	**149**
		Species:	ES	3.8	17	1	17	10	36	**4**	**4**	**16**	**14**
		Species:	GF	2.7	273	11	15	139	632	**66**	**55**	**301**	**250**
		Species:	LP	2.5	56	2	13	14	53	**6**	**5**	**23**	**21**

Project Species Summary

Stemilt Community Forest

Net of Buffers Acreage

Section	(#Stds)	Acres	Spp	Per Acre Dbh	Trees	Basal	Htt	NetCub	NetBrd	Total Stand (1,000s) GrsCub	NetCub	GrsBrd	NetBrd
		Species:	PP	5.8	100	18	29	271	1,287	**119**	**107**	**570**	**509**
		Species:	QA	7.0	4	1	38	0	0	**0**	**0**	**0**	**0**
		Species:	WL	6.5	26	6	38	71	326	**31**	**28**	**140**	**129**
29	**(7)**	**395.2**		4.0	562	49	22	590	2,711	**264**	**233**	**1,215**	**1,071**
Sum:		**52**	**2,682.5**							**2,420**	**2,166**	**11,113**	**9,999**

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APPENDIX F ROAD MAINTENANCE MAPS.

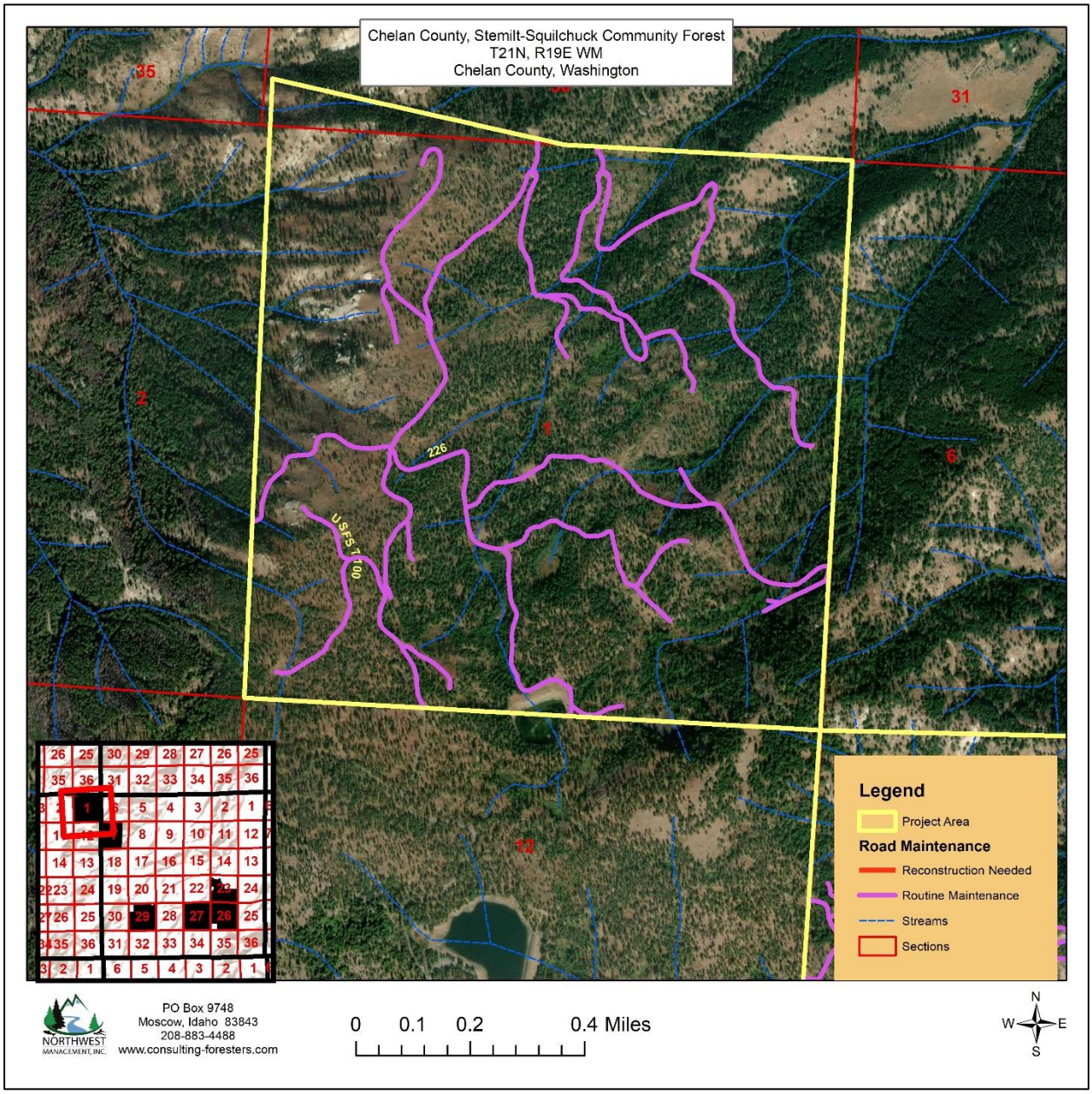

Figure 14 Section 1 Road Maintenance Map

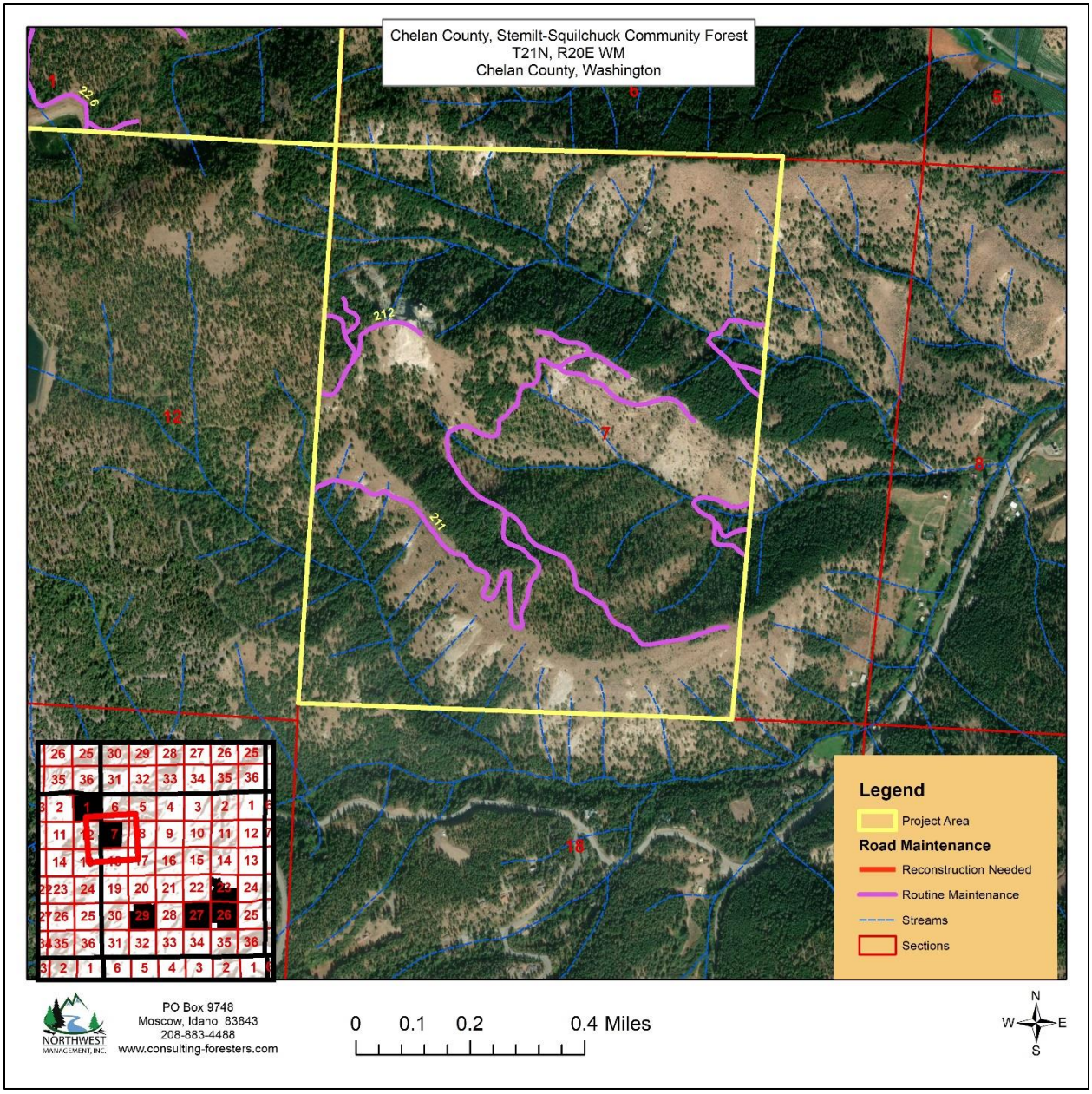

Figure 15 Section 7 Road Maintenance Map

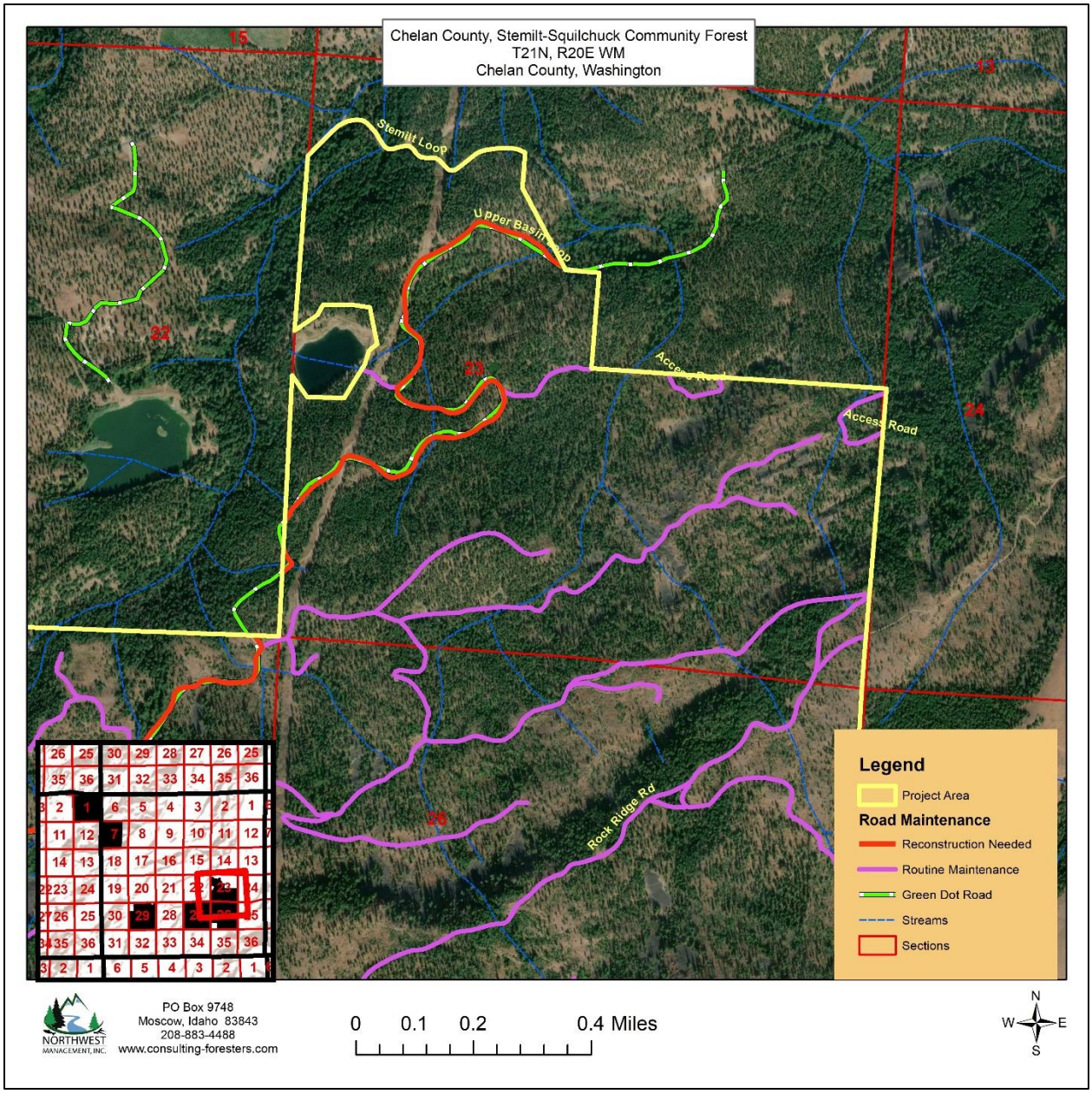

Figure 16 Section 23 Road Maintenance Map

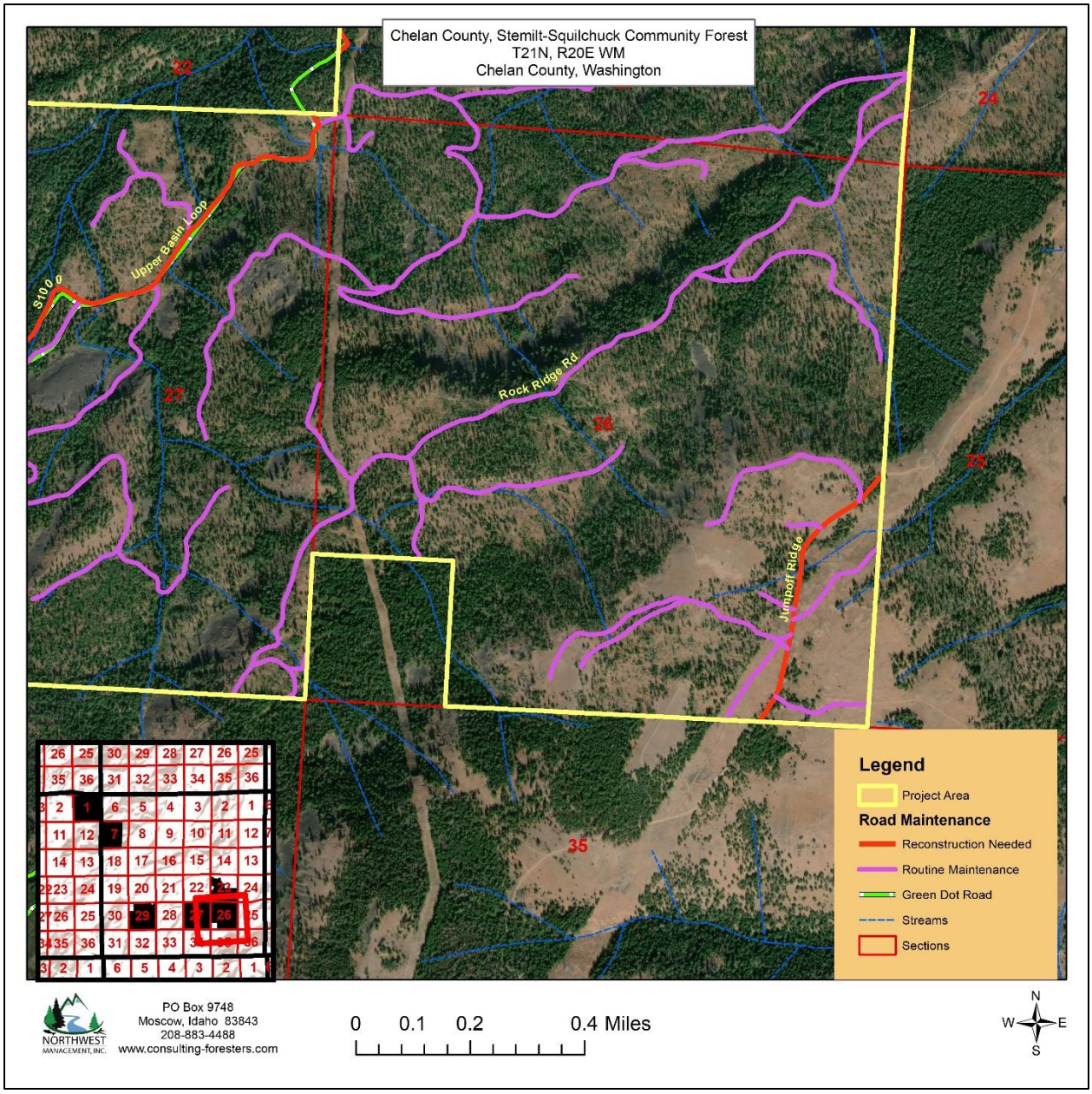

Figure 17 Section 26 Road Maintenance Map

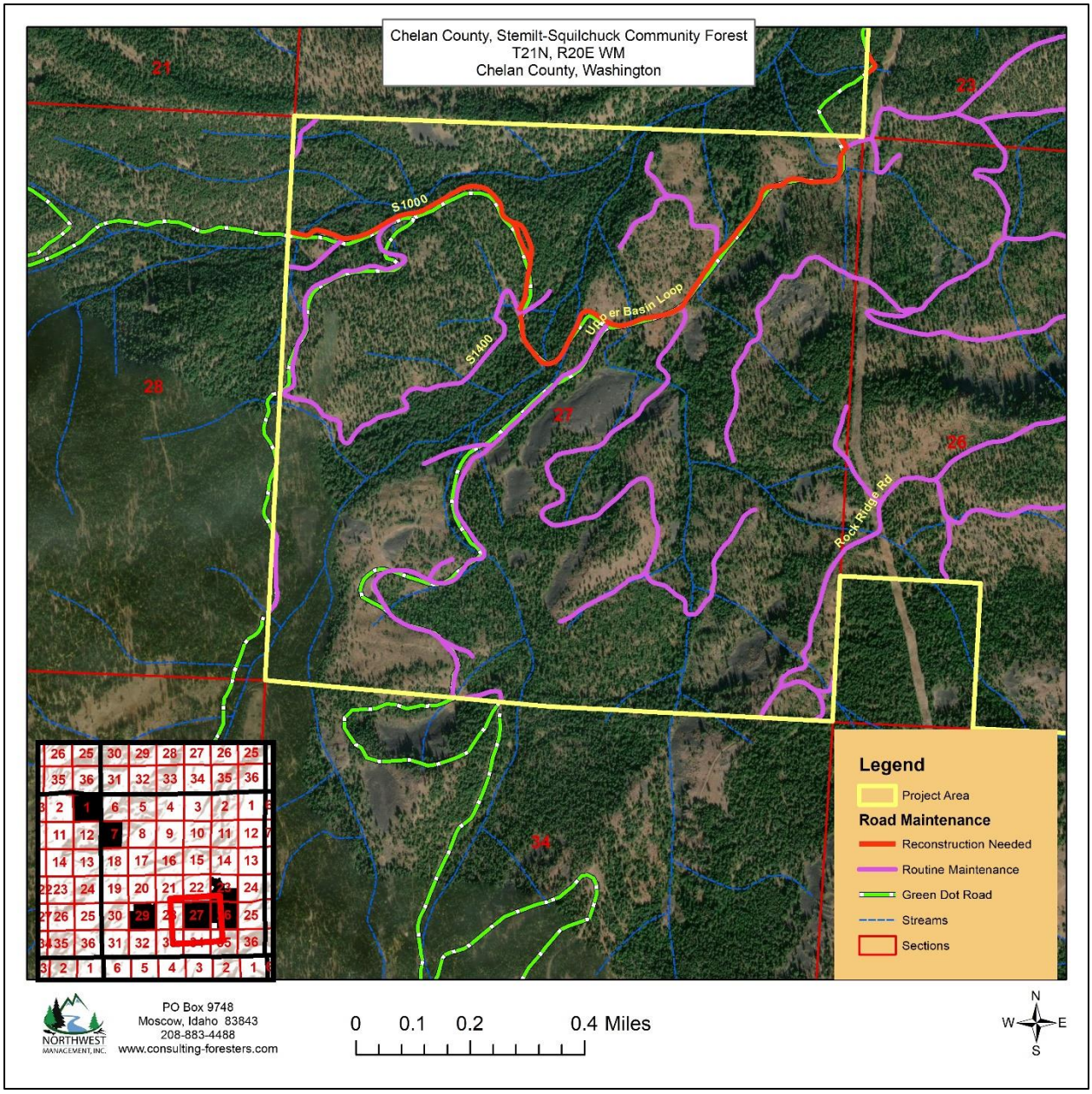

Figure 18 Section 27 Road Maintenance Map

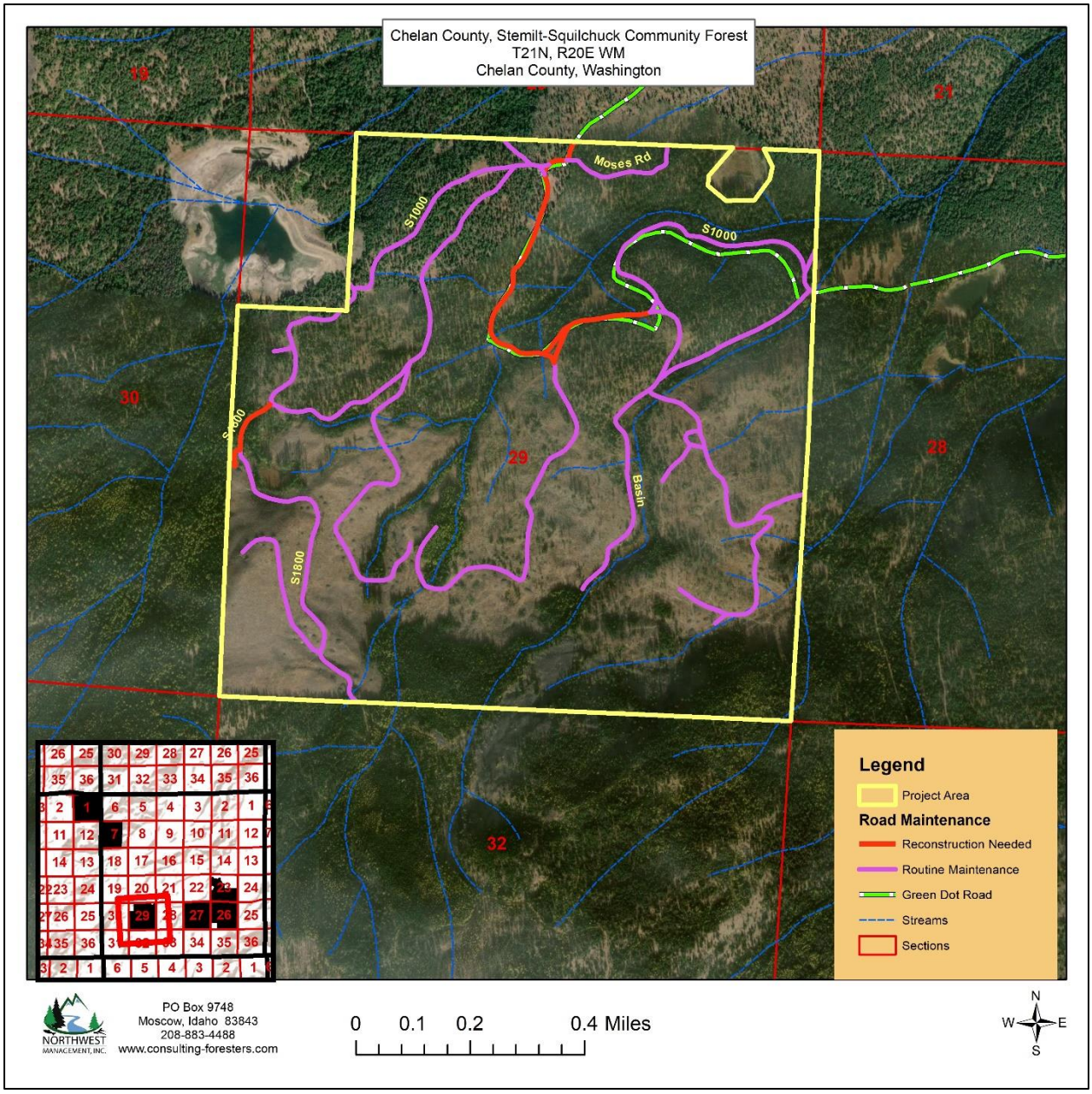

Figure 19 Section 29 Road Maintenance Map

APPENDIX G. SOILS CHARACTERISTICS TABLE

Table 13 Soil Characteristics

Map Unit Symbol	Soil Type	Erosion Hazard	Landform	Parent Material	Depth to Restrictive Feature	Natural Drainage Class	Available water storage in profile
43, BkE, BkF	Bjork silt loam	Severe	Hills, mountains, hillslopes, mountain slopes	Loess mixed with residuum and colluvium weathered from sandstone, schist, or conglomerate	20 to 40 inches to paralithic bedrock	Well-drained	Low (about 4.8inches)
45, 46	Blag-Cle Elum-Rock outcrop complex	Severe	Ridges, mountain slopes	Colluvium and residuum weathered from sandstone	10 to 20 inches to lithic bedrock	Well-drained	Very low (about 1.3 inches)
47	Blewett-Rock outcrop complex	Moderate	Mountain slopes	Residuum and colluvium from sandstone mixed with volcanic ash and loess	10 to 20 inches to lithic bedrock	Well-drained	Low (about 0.6 inches)

Map Unit Symbol	Soil Type	Erosion Hazard	Landform	Parent Material	Depth to Restrictive Feature	Natural Drainage Class	Available water storage in profile
79, 80, CnF	Cle Elum loam	Severe	Mountain slopes	Residuum and colluvium from sandstone mixed with minor amounts of loess and volcanic ash	20 to 40 inches to paralithic bedrock	Well-drained	Moderate (about 6.9 inches)
167,	Loneridge stony loam	Moderate	Plateaus, structural benches	Residuum and colluvium from basalt or andesite mixed with loess and volcanic ash	6 to 16 inches to abrupt textural change	Well-drained	Very low (about 1.5 inches)
168,	Loneridge stony loam, north slopes	Slight	Plateaus, mountain slopes	Residuum and colluvium from basalt or andesite mixed with loess and volcanic ash	20 to 40 inches to abrupt textural change	Well-drained	High (about 9.2 inches)
LnD,	Loneridge stony loam 0-65	Slight	Mountain slopes	Residuum and colluvium from basalt with loess and	More than 80 inches	Well-drained	Moderate (about 6.2 inches)

Map Unit Symbol	Soil Type	Erosion Hazard	Landform	Parent Material	Depth to Restrictive Feature	Natural Drainage Class	Available water storage in profile
	percent slopes			volcanic ash in the upper part			
LoF	Loneridge stony loam 0-65 percent slopes	Moderate	Mountain slopes	Residuum and colluvium from basalt with loess and volcanic ash in the upper part	More than 80 inches	Well-drained	Moderate (about 6.2 inches
200	Nard sandy loam, 3-30% slopes	Moderate	Mountains. Mountain slopes	Residuum and colluvium from sandstone mixed with volcanic ash and loess	More than 80 inches	Well-drained	High (about 10.8 inches)
201	Nard sandy loam, 30-60% slopes	Severe	Mountains. Mountain slopes	Residuum and colluvium from sandstone mixed with volcanic ash and loess	More than 80 inches	Well-drained	High (about 10.8 inches)

Map Unit Symbol	Soil Type	Erosion Hazard	Landform	Parent Material	Depth to Restrictive Feature	Natural Drainage Class	Available water storage in profile
NaD	Nard silt loam, 8-25% slopes	Moderate	Mountains. Mountain slopes	Residuum and colluvium from sandstone mixed with volcanic ash and loess	More than 80 inches	Well-drained	High (about 10.8 inches)
NaF	Nard silt loam, 45-65% slopes	Severe	Severe	Residuum and colluvium from sandstone mixed with volcanic ash and loess	More than 80 inches	More than 80 inches	High (about 10.8 inches)
246, Ro	Rubble land-Rock outcrop complex	N/A	N/A	Fragmental material	0 inches to lithic bedrock	Well-drained	N/A
264	Scotties gravelly loam	Severe	Mountain slopes	Colluvium and residuum from sandstone, with a thin mantle of volcanic ash and loess	40 to 60 inches to lithic bedrock	Well-drained	Low (about 4.3 inches)

Map Unit Symbol	Soil Type	Erosion Hazard	Landform	Parent Material	Depth to Restrictive Feature	Natural Drainage Class	Available water storage in profile
275	Shaser-Chapot complex	Severe	Mountain slopes	Volcanic ash over residuum and colluvium from sandstone	More than 80 inches	Well-drained	Moderate (about 6.8 inches)
AkD	Anatone-Rock outcrop	Moderate	Hills	Volcanic ash and loess mixed with colluvium and residuum from basalt, andesite or tuff	10 to 20 inches to lithic bedrock 10 to 20 inches to lithic bedrock	Well-drained	Very low (about 1.7 inches)
BoF2	Bjork-Rock outcrop complex	Severe	Hillslopes	Residuum from schist, gneiss or sandstone with loess in the upper part	20 to 40 inches to paralithic bedrock	Well-drained	Low (about 4.8 inches)
JmD	Jumpe stony silt loam	Slight	Mountain slopes	Residuum and colluvium from basalt with minor amounts of volcanic ash	More than 80 inches	Well-drained	Low to Moderate (about 4.7-8.3 inches)

Map Unit Symbol	Soil Type	Erosion Hazard	Landform	Parent Material	Depth to Restrictive Feature	Natural Drainage Class	Available water storage in profile
JmE	Jumpe stony silt loam, red variant	Moderate	Mountain slopes	Residuum and colluvium from basalt with minor amounts of volcanic ash	Residuum and colluvium from basalt with minor amounts of volcanic ash	Well-drained	Well-drained
StE	Stemilt silt loam, 0-25% slopes	Well-drained	Mountain slopes	Residuum and colluvium from basalt or andesite with a component of volcanic ash	More than 80 inches	Well-drained	Moderate (about 6.4 inches)
StE	Stemilt silt loam, 25-40 % Slopes	Well-drained	Mountain slopes	Residuum and colluvium from basalt or andesite with a component of volcanic ash	More than 80 inches	Well-drained	Well-drained
W	Water	N/A	Alluvial cones	N/A	N/A	N/A	N/A

APPENDIX H. INDIVIDUAL SECTION BROADCAST BURN TIMELINE MAPS

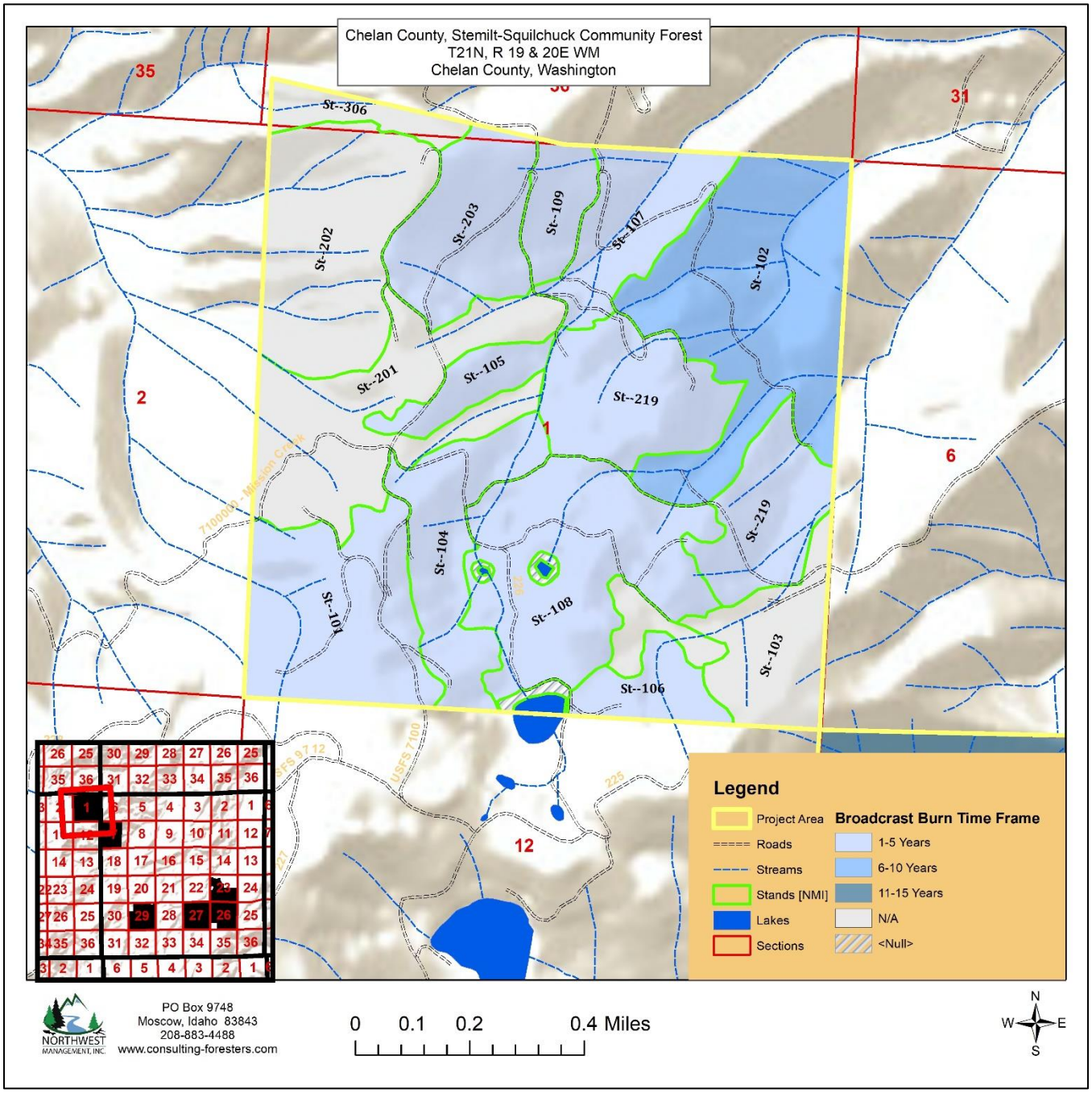

Figure 20 Section 1 Broadcast Burn Timeline Map

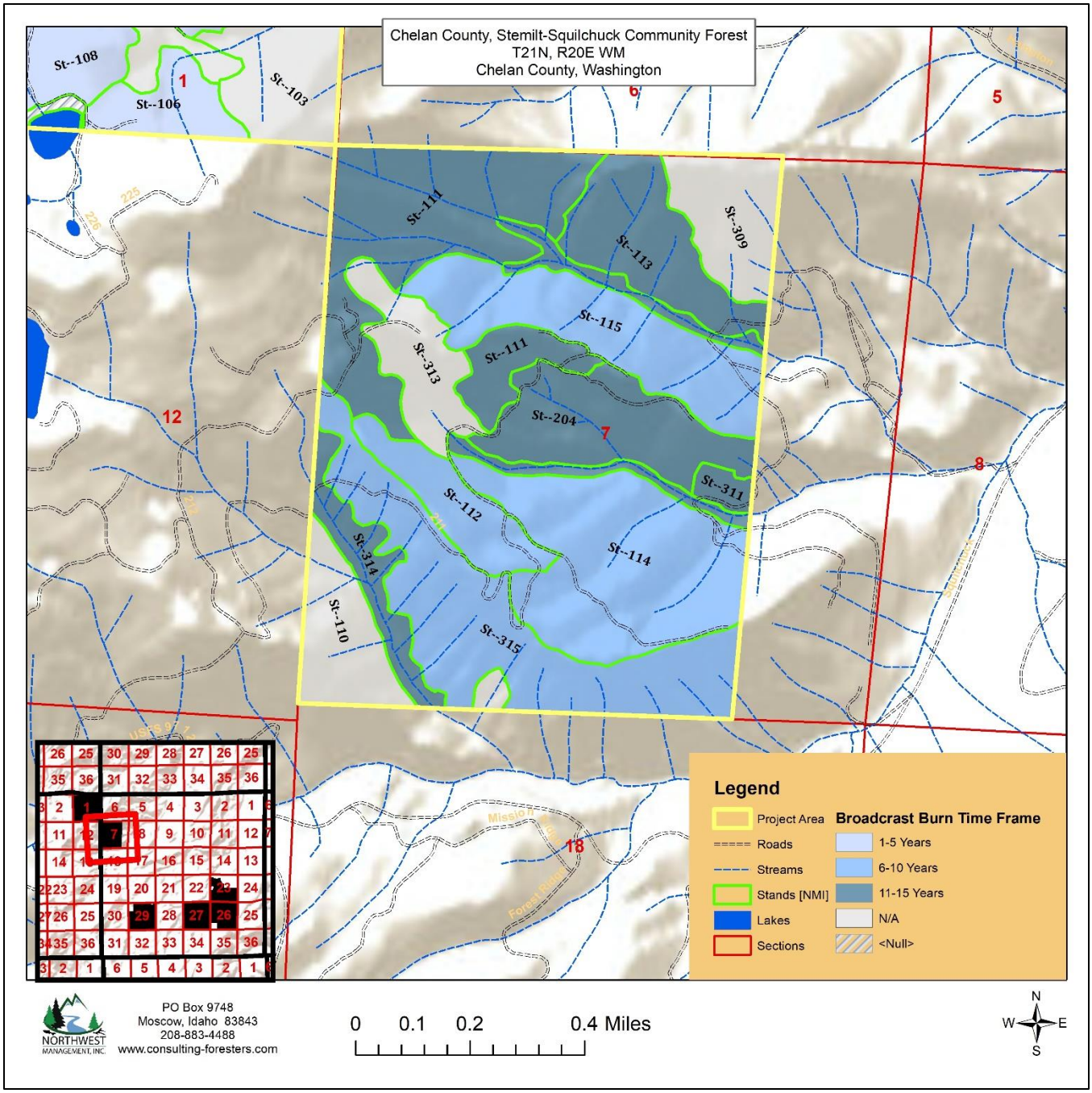

Figure 21 Section 7 Broadcast Burn Timeline Map

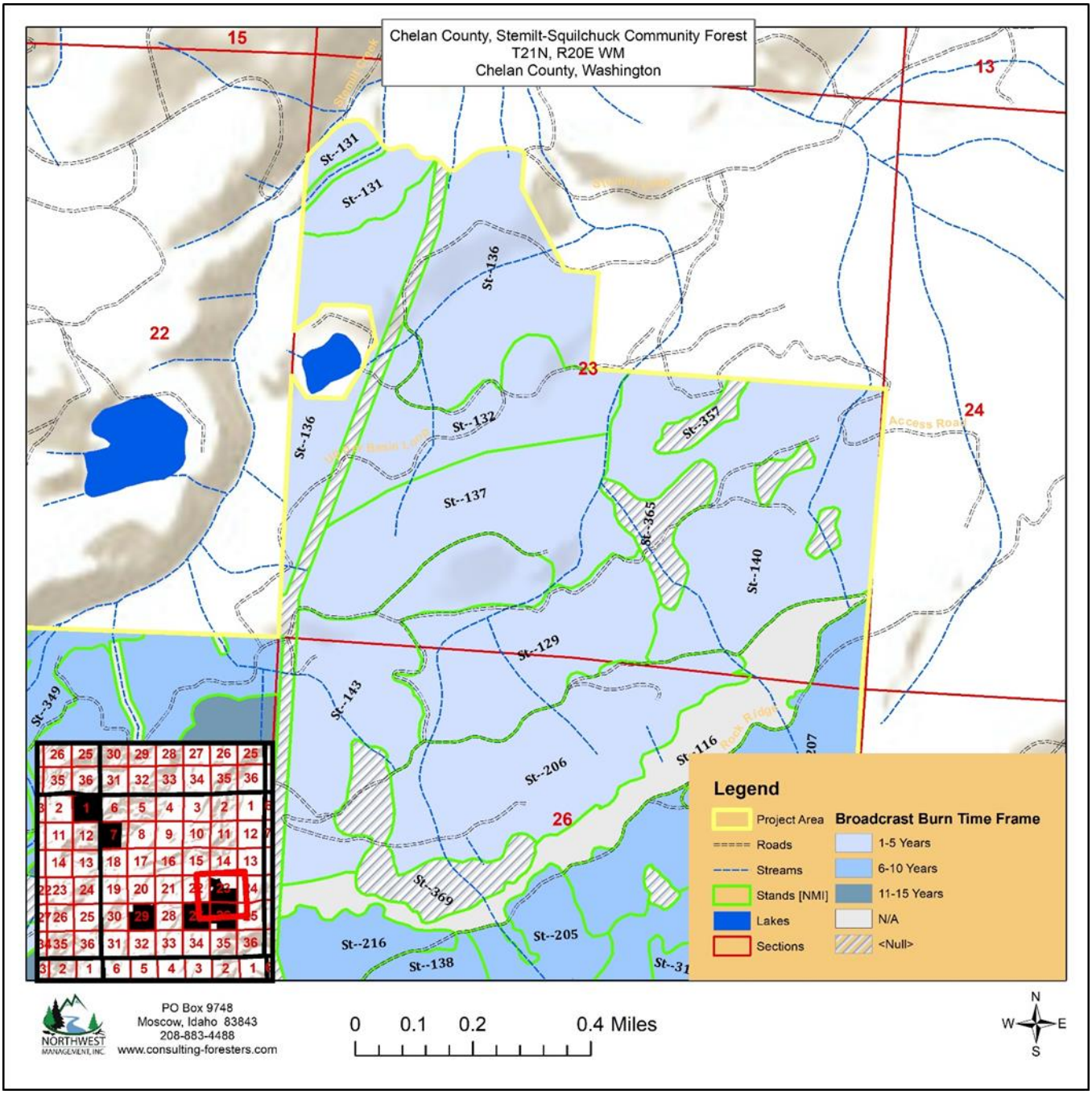

Figure 22 Section 26 Broadcast Burn Timeline Map

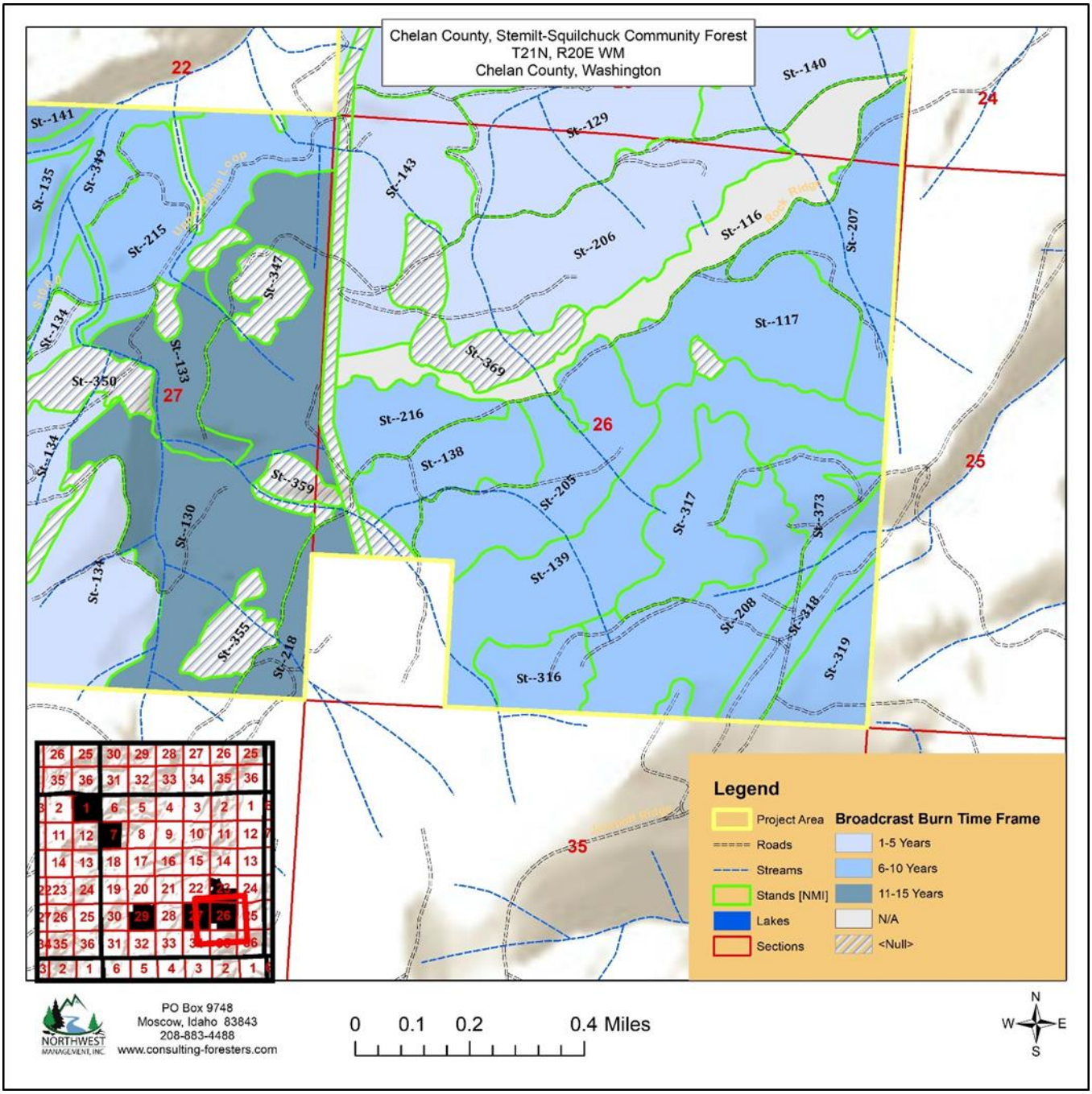

Figure 23 Section 26 Broadcast Burn Timeline Map

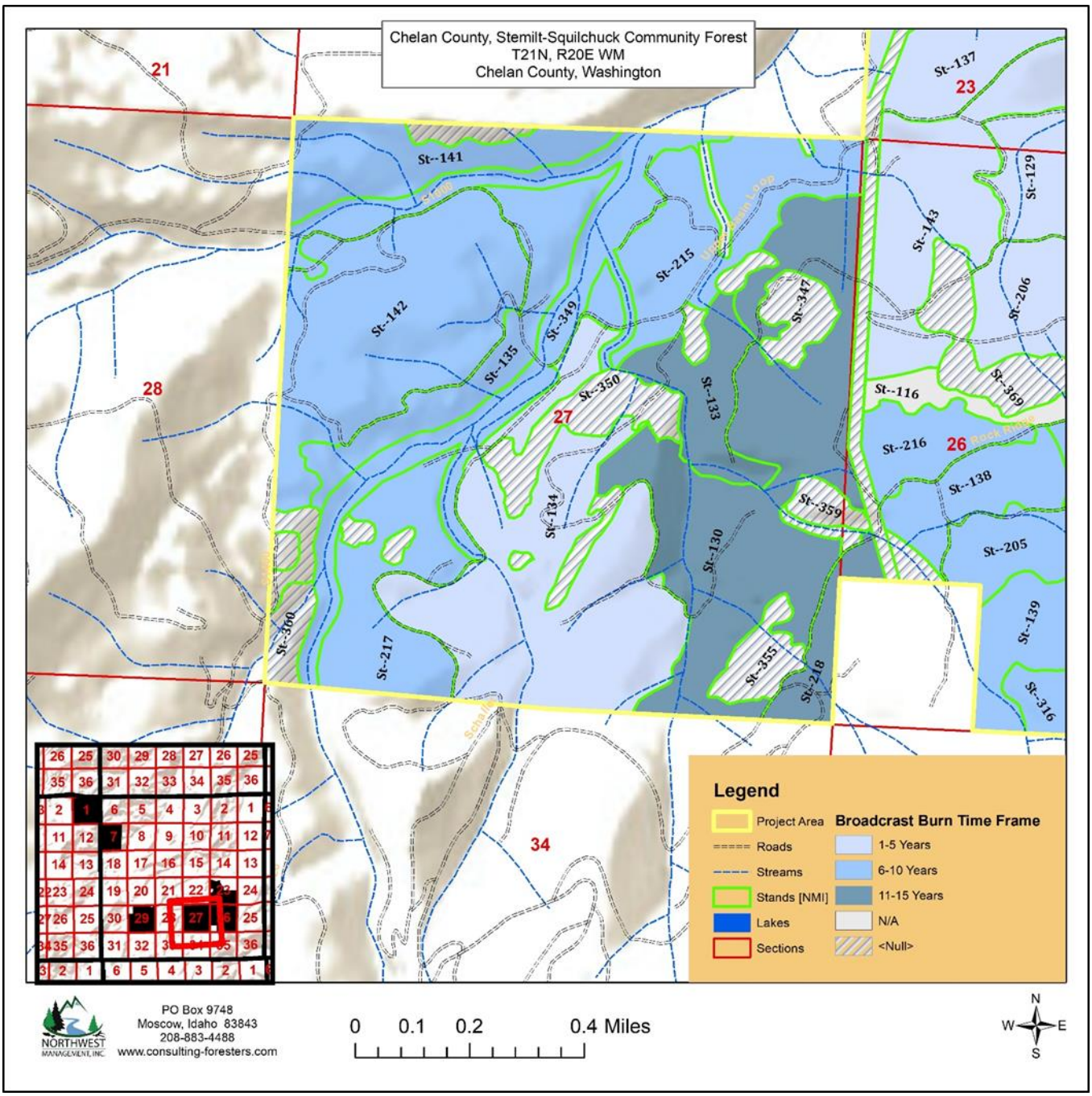

Figure 24 Section 27 Broadcast Burn Timeline Map

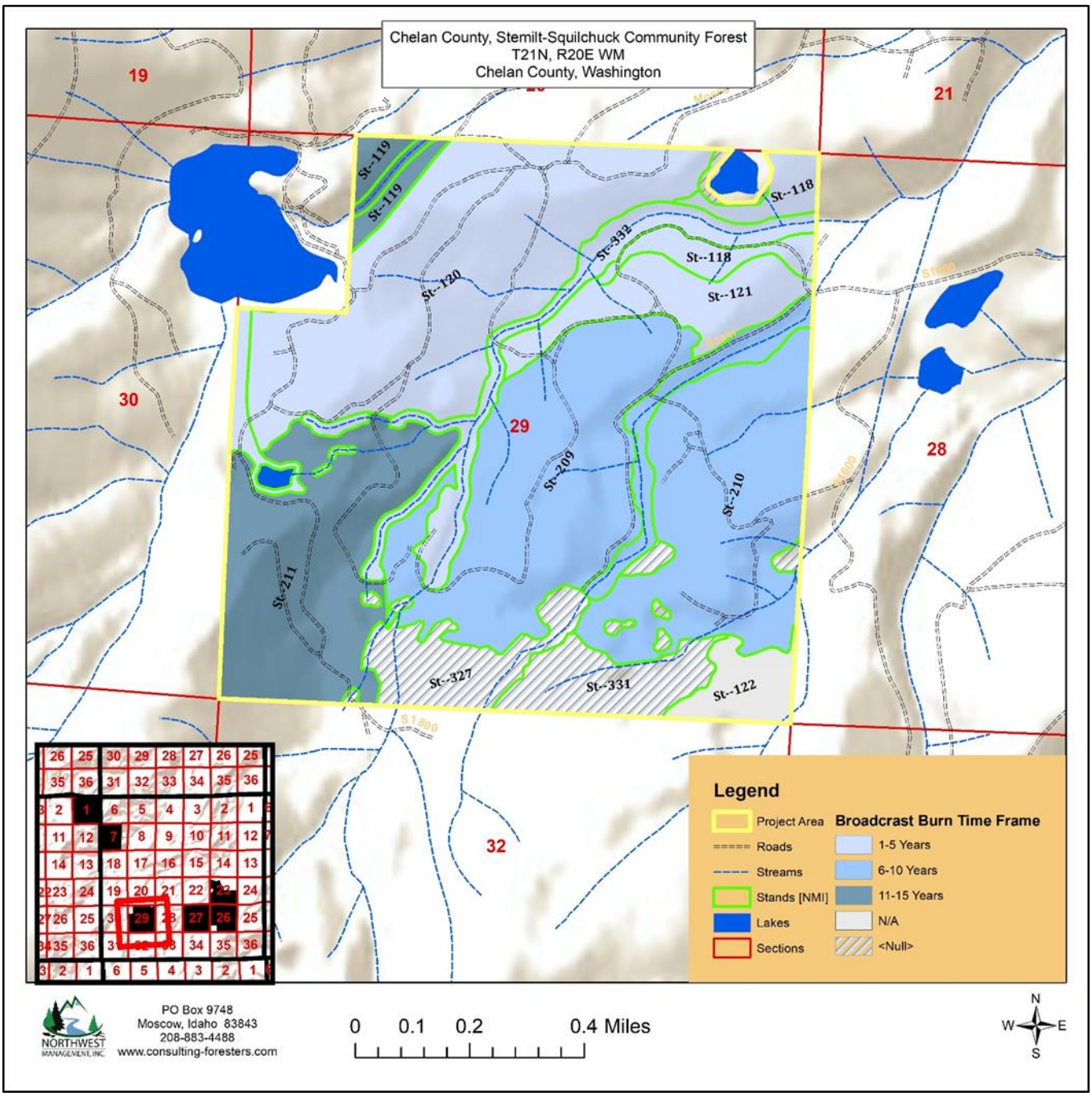

Figure 25 Section 29 Broadcast Burn Timeline Map