LUMMI NATION

FOREST MANAGEMENT PLAN

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EXECUTIVE SUMMARY

Mission Statement: *"to enhance, utilize, and protect forest resources within the boundaries of the Lummi Reservation, Madrona Point, Portage Island, and the Arlecho Creek Watershed into perpetuity for the benefit of the Lummi people"*.

The purpose of the Lummi Nation Forest Management Plan is to establish management policies, objectives, and direction for the Lummi Nation's forestlands with particular emphasis on trust lands within the boundaries of the Lummi Reservation. Currently, the Lummi Nation holds approximately 5,360 acres of forested trust land within the boundaries of the Reservation, 703 forested acres on Portage Island, 26 forested acres on Madrona Point, and 1,771 forested acres in the Arlecho Creek Watershed. These forestlands provide significant cultural, environmental, and economic value to the Lummi people. Accordingly, the Forestry Division manages these resources in an environmentally and economically responsible and sustainable manner so that the benefits they provide are available for future generations.

The Lummi Forest Management Plan has been designed to serve four primary functions.

1. To provide a useful description of the physical, environmental, and land use conditions of the Lummi Reservation.
2. To provide guidance to the Forestry Division in determining how annual harvest units and other management units should be selected to maintain economic viability while protecting environmental and cultural resources.
3. To be a comprehensive procedural, technical, and educational resource for the Forestry Division by providing pertinent information about the Forestry program, silvicultural tools, best management practices and guidelines, and permit and contract templates used in the planning and performance of forest management activities.
4. To function as an educational tool for relevant departments within the Lummi Indian Business Council, landowners, and other interested Tribal members.

Since the majority of forested trust land ownership on the Lummi Reservation is individual trust land, the Forest Management Plan has been designed to provide useful information that will assist the Forestry Division in meeting the varying management objectives of assignment landowners while protecting environmental and cultural resources in accordance with all federal and tribal regulations.

The management plan is comprised of 8 sections: Reservation Setting, Forest Inventory, Timber Harvesting, Forest Roads, Site Preparation, Reforestation, Vegetation Management, and Thinning. Forest management goals and objectives are represented in their respective sections as guidelines and best management practices. Each section has a corresponding appendix that contains supplemental technical information for reference. The Forestry Division's Forestry Permits and Timber Sale Contracts Handbook is also provided as an appendix to the plan. In this regard, the management plan also functions as a programmatic handbook.

1. Reservation Setting

This section provides a comprehensive overview of the physical, environmental, and land use conditions present on the Lummi Reservation. It includes information on the tribal population, climate, geology, topography, soil resources, forest and vegetation resources, forest health, water resources, wildlife resources, cultural resources, air quality, wildfire, ownership status, zoning, housing and community development, transportation corridors, agricultural commitments, sand and gravel mining, recreational use, conservation areas, and relevant information on the Lummi Forestry Program.

2. Forest Inventory

This section provides an overview of the reservation-wide forest inventory completed in 2007 and the forest inventory analysis completed in 2009. Information provided in this section includes the inventory methodology used, the inventory reports and maps produced, and details of the forest inventory analysis including forest condition, age class distribution, site index, forest growth/year, optimal rotation age, and sustainable annual allowable cut.

3. Timber Harvesting

This section provides an overview of timber harvesting practices, harvest equipment, and resource protection requirements. It includes information and guidelines on management systems; harvest scheduling; harvest unit design; silvicultural prescriptions; logging season; harvest systems and equipment; skid trail and forwarding corridor construction, use, and maintenance; landing design, construction, and maintenance; timber harvest requirements within forested wetlands; resource protection; trespass; forestland conversion; and a brief overview of timber sale contracting and logging costs.

4. Forest Roads

This section provides an overview on forest road management and resource protection requirements. It includes information and guidelines on forest road location and design, forest road construction, wetland forest road design and construction, forest road drainage structures, stream crossing structures, forest road maintenance, forest road abandonment, access, and a brief overview of forest road construction costs.

5. Site Preparation

This section provides an overview of site preparation practices after timber harvest to prepare a site for tree planting. It includes information on mechanical and chemical site preparation, prescribed fire, and chipping. It also provides information on the treatment method and equipment, treatment season, contracting, and costs.

6. Reforestation

This section provides an overview of reforestation practices to ensure that sites are properly reforested after timber harvest. It includes information on planting season and density; seedling selection, cost, pick-up, transport, and storage; planting care and handling guidelines; contracting and planting costs; reforestation surveys; natural regeneration; and wildlife damage protection.

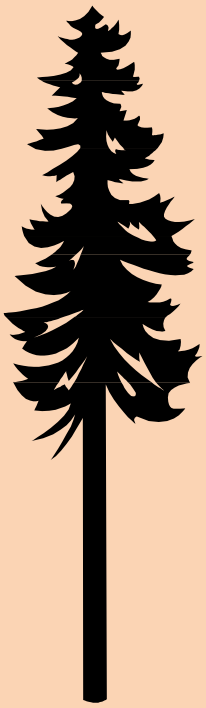
7. Vegetation Management

This section provides an overview of vegetation management practices to ensure that sites are properly maintained after tree planting. It includes information on problem vegetation in forestry plantations, a description of integrated pest management principles, manual control methods, herbicide control methods, post treatment surveys, contracting, and costs.

8. Thinning

This section provides an overview of thinning practices to maintain desirable stocking levels. It includes information on thinning factors; thinning season; stand density measures; pre-commercial thinning density guidelines, prioritization, contracting, and costs; commercial thinning density guidelines, operational guidelines, prioritization, contracting, and costs; and forest health benefits.

Reservation Setting



RESERVATION SETTING

- **1.0 Overview**

  The Lummi Reservation is located in Whatcom County in the northwest portion of Washington State. The Reservation is approximately 8 miles west of Bellingham, Washington, 90 miles north of Seattle, Washington, and 60 south of Vancouver, British Columbia (Figure 1).

  The Lummi Reservation is approximately 12,624 acres in size. The mainland of the Lummi Reservation is approximately 11,652 acres and Portage Island is approximately 971 acres. The Reservation also includes around 7,000 acres of tidelands. The Lummi Reservation is bordered by Lummi Bay and the Strait of Georgia to the west; Bellingham Bay, the Nooksack River Delta, and Ferndale Road to the east; Hales Passage to the south; and Slater Road to the north. Of the Reservation's 12,624 acres, 5,360 acres on the mainland are forested and 703 acres on Portage Island are forested.

- **1.1 Population and Demographics**

  There are currently around 3,200 enrolled tribal members of the Lummi Nation. Nearly 2,400 enrolled members live on the Reservation with the remaining members living elsewhere in the region. Since 1960, there has been a significant increase in both the number of Lummi tribal members living on the Reservation and in the total population on the Reservation. For the 10-year planning period represented in the Forest Management Plan, the tribal population living on the Lummi Reservation is expected to grow approximately 58% to 3,800 (Northwest Economic Associates, 2003).

  - **1.1.1 Education**

    According to the 2005 "Lummi Nation Workforce Skills Inventory & Analysis: Final Report" prepared by Northern Economics, Inc., approximately 9% of enrolled tribal members obtained a bachelor's degree or above, 15% obtained an associate's degree, 27% attended some college, 34% obtained a high school diploma or a GED, and 15% have no high school diploma or GED.

  - **1.1.2 Employment**

    In 2004, 74.6 percent of enrolled Lummi in Whatcom County ages 18 through 64 were employed and 15.9 percent were unemployed. "Fishing and Forestry" was the most commonly listed occupation for Whatcom County Lummi (17.2 percent) although this may be overstated since the survey occurred during a fishing season (Northern Economics, 2005). In addition, there are not a significant number of tribal members involved in forestry and many selected this category due to their involvement in fisheries. "Office and Administrative Assistance" and "Management" made up 13.6 percent and 7.2 percent, respectively. Both of these occupations account for a high percentage of Tribal Administration workers. "Personal Care and Service", which includes casino workers, was the third most common occupation (11.3 percent) and "Construction" (5.8 percent) was the fifth most common occupation (Northern Economics, 2005).

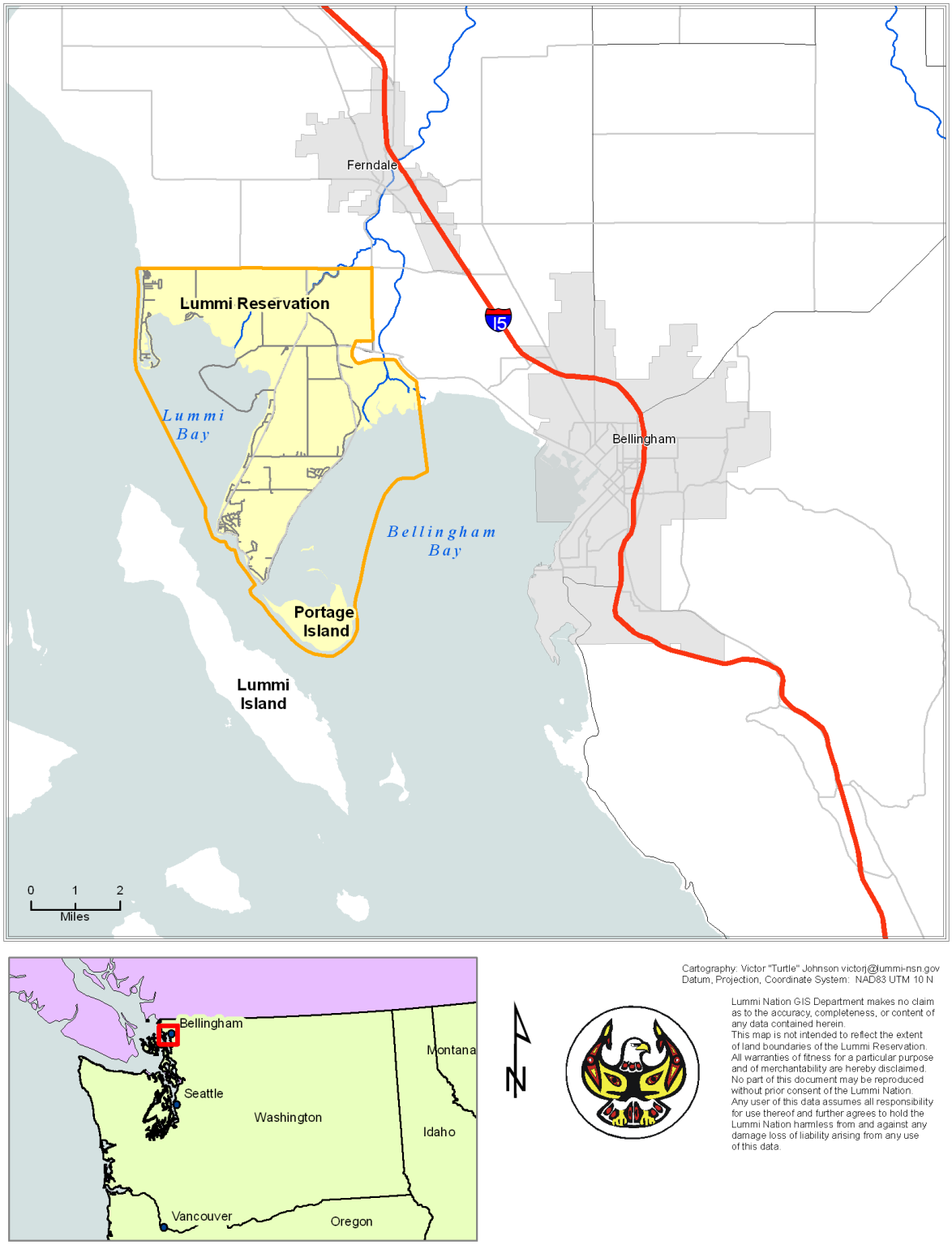


Figure 1. Regional Map of the Lummi Reservation

- **1.2 Climate**

  The Lummi Reservation has a mild, marine climate. The influence of the Pacific Ocean modifies summer and winter temperatures and eliminates periods of extreme cold and heat. Temperatures historically vary between a low of – 4 degrees Fahrenheit and a high of 96 degrees Fahrenheit, with a mean annual temperature of 49 degrees Fahrenheit. During the mild winter, precipitation is largely in the form of rain. The average annual precipitation is approximately 35 inches (WRRC, 2009). On average, most precipitation occurs during November, December, and January. June, July, and August are the driest months. A few light, short duration snowfalls between 9 to 12 inches typically occur each winter often accompanied by very cold northeastern winds. The prevailing winds are from the south or southwest during the winter months and from the northwest during the summer months. The average wind velocity is less than 10 m.p.h. The average frost-free season is about 180 days a year (WRCC, 2009).

- **1.3 Geology**

  The Lummi Reservation is comprised of Pleistocene (Ice Age) ocean and river deposits covered by more recent deposits from the Nooksack River. During the Pleistocene, sea level rose and fell dramatically as the climate changed. Inundation by the seawater caused glaciers to float and deposit layers of fine silt and clay along with sand, gravel, and larger rocks. As sea level dropped and the glaciers receded, the water from the melting ice flowed across western Whatcom County and carried sand, silt, and gravel to the ocean. After the glaciers had melted far enough, the Nooksack River occupied an old channel formed by the glacial melt-water and began depositing material on either side of the Lummi Peninsula, which was an island at that time. As the river delta grew from sediment deposits, it connected the Lummi Peninsula to the mainland resulting in the physical geography we see today (LWRD, 1997).

- **1.4 Topography**

  The Lummi Reservation has two relatively large upland areas known as the Lummi Peninsula and the Northwest Upland. These two upland areas are separated by the floodplain of the Nooksack and Lummi Rivers, which is known as the Lummi Flats. A smaller upland area is also present on Portage Island. A topographic map of the Lummi Reservation depicting the 5 major geographic units is provided in Figure 2.

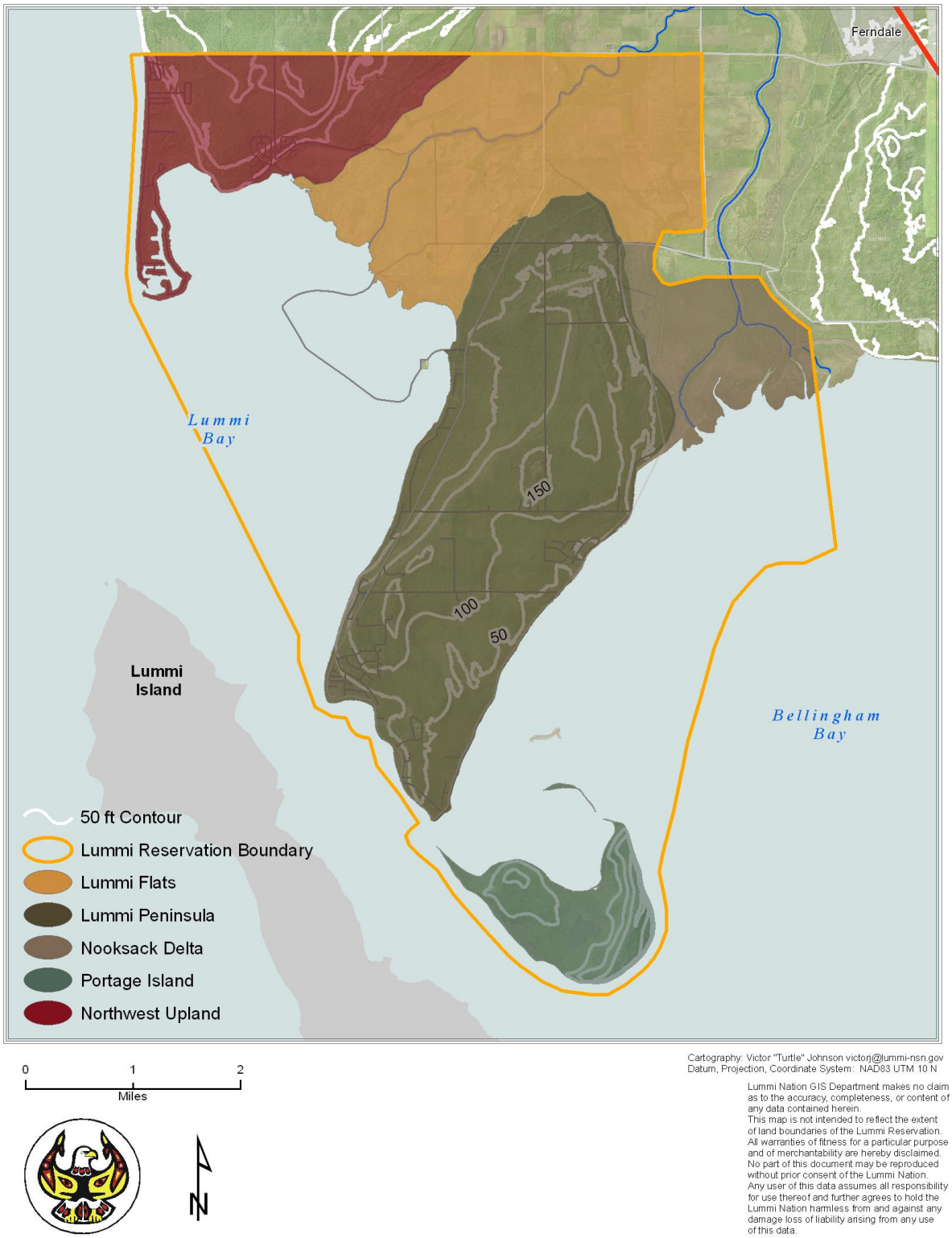


Figure 2. Geographic Units and Topography of the Lummi Reservation

- **Lummi Peninsula**

  The Lummi Peninsula is the central geographic area of the Lummi Reservation. It approximately extends from the intersection of Haxton Way and Lummi Shore Road to the north to Portage Island in the south. The Lummi Peninsula is surrounded by marine waters to the east, west, and south and is comprised of gentle rolling hills reaching a maximum elevation of 180 feet above mean sea level along the central ridge of the peninsula.

- **Northwest Upland**

  The Northwest Upland is located in the northwest corner of the Reservation and extends to Slater Road in the north, to Lummi Bay in the south, to the Straight of Georgia to the west, and to Lummi Flats to the east. The Northwest Upland includes Sandy Point Peninsula and is comprised of moderately rolling topography with a maximum elevation of 220 feet above mean sea level.

- **Lummi Flats**

  The Lummi Flats are located in the northern portion of the Reservation and extend north to Slater Road, east to Ferndale Road, southeast to Marine Drive and Lummi Shore Drive, southwest to Haxton Way and Lummi Bay, and northwest to Sandy Point Heights. The Lummi Flats are a floodplain and the maximum elevation is estimated to be 10 feet above mean sea level (LWRD, 1998).

- **Nooksack Delta**

  The Nooksack Delta is located around the forked riverine courses of the Nooksack River. It extends to Marine Drive to the north and east, Lummi Shore Drive to Fish Point to the west, and to Bellingham Bay to the south. The maximum elevation of the Nooksack Delta is estimated to be 10 feet above mean sea level (LWRD, 1998).

- **Portage Island**

  Portage Island is located south of the Lummi Peninsula and is not accessible from the mainland except at low tides when the tombolo connecting the island with the mainland becomes exposed. Like most Reservation lands, the topography on Portage Island is comprised of gentle rolling hills and the maximum elevation on Portage Island is about 200 feet above mean sea level.

1.5 Soil Resources

The USDA Natural Resource Conservation Service (NRCS) has identified six general soil units on the Lummi Reservation (Figure 3). These six general soil units are often associated with one of the following topographic features: floodplains, tidelands, glacial outwash terraces, and glaciomarine drift plains (LIBC, 1996). Each of these six soil units has been further divided into forty different soil types (USDA, 1992). A description of the six general soil units and their distribution on the Lummi Reservation is provided in Table 1.

A table listing the 19 most prevalent soil types found on forested sites of the Lummi Reservation is provided in Appendix 1. The table identifies the erosion hazard, equipment limitations, seedling mortality, blowdown hazard, plant competition, common tree species, 50-year site index, and provides species recommendations for tree planting. These factors will be considered in selecting appropriate harvest equipment and in developing silvicultural prescriptions. Soil resources will be protected from erosion and compaction by employing relevant best management practices identified in subsequent sections of this document.

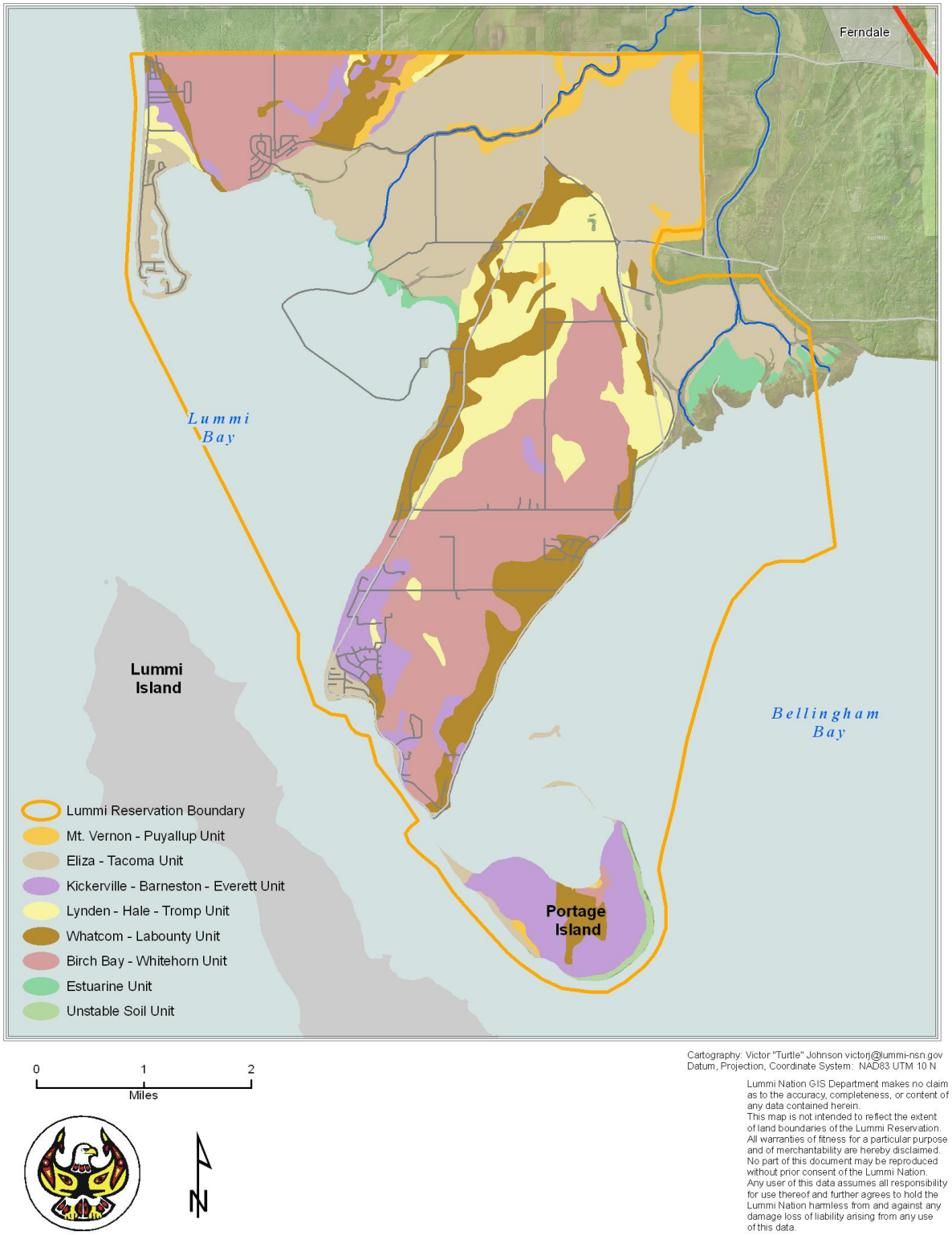


Figure 3. General Soil Units of the Lummi Reservation

Table 1. Six General Soil Units of the Lummi Reservation		
Soil Unit	**Description**	**Distribution**
Mt. Vernon, Puyallup	This soil is very deep, moderately well drained, and has a sandy loam texture. It is used mainly for agricultural production and is found on river terraces and floodplains covered with shrubs or conifers.	This soil unit is generally found on portions of the floodplain of the Nooksack river and along the course of the Lummi river and comprises approximately 522 acres.
Eliza, Tacoma	This soil is very deep, very poorly drained, and has a texture that ranges from fine-grained silts to gravely, sandy loam. It is used mainly for agricultural production and is found on flood plains, deltas, and tidal flats lower than twenty feet in elevation. Most of the Eliza-Tacoma soils exhibit hydric characteristics normally associated with wetlands.	This soil unit occurs extensively throughout the floodplain of the Nooksack and Lummi rivers. It is also found at Sandy Point, Gooseberry Point, and on Portage Island and comprises approximately 4,200 acres.
Kickerville, Barneston, Everett	This soil is very deep, well drained and somewhat excessively drained, level to very steep, and is composed of silt loam and gravels. It is used mainly as forestland and is found on outwash terraces and glacial moraines.	This soil unit is found in upland and forested areas near Neptune Beach, Gooseberry Point, and on Portage Island and comprises approximately 1,100 acres.
Lynden, Hale, Tromp	This soil is very deep, well drained to somewhat poorly drained, level to gently sloping, and is composed of silts and loams. It is used mainly as forestland and is found on outwash terraces at 50 to 300 feet in elevation.	This soil unit is found in upland and forested areas along the north, northeastern, and northwestern portions of the Lummi Peninsula and comprises approximately 1,500 acres.
Whatcom, Labounty	This soil is very deep, moderately well drained and poorly drained, level to very steep with a loamy texture. It is used mainly as forestland and is found on glaciomarine drift plains. A major portion (approximately 1,000 acres) is associated with hydric conditions typical of wetlands.	This soil unit is found on the lower slopes in the northwestern portion and along the southwestern portion of the Lummi Peninsula and on portions of Portage Island and comprises approximately 1,600 acres.
Birch Bay, Whitehorn	This soil unit is very deep, moderately well drained and poorly drained, level to gently sloping with a silty loam texture. It is used mainly as forestland and is found on glaciomarine drift plains.	This soil unit is found on the central part of the Lummi Peninsula and the Northwest Upland and comprises approximately 3,700 acres.
Adapted from USDA, 1992.		

- **1.6 Forest and Vegetation Resources**

The Lummi Reservation is located within the upper portion of the Puget Sound Area (PSA) in the western hemlock zone, which is the most extensive vegetation zone in western Washington and Oregon (Franklin and Dyrness, 1973). The PSA is considered a "special type" in the western hemlock zone and significant portions of it are located in the rain shadow of the Olympic Mountains. On the Lummi Reservation, historic and current timber species include Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), Sitka spruce (*Picea sitchensis*), grand fir (*Abies grandis*), red alder (*Alnus rubra*), black cottonwood (*Populus trichocarpa*), paper birch (*Betula papyrifera*), and bigleaf maple (*Acer macrophyllum*).

Before 1850, the Lummi Reservation was comprised of old growth forests of large Douglas-fir, western hemlock, western red cedar, and Sitka spruce trees. Red alder, black cottonwood, paper birch, and bigleaf maple were also present, especially around rivers, stream, wetlands, and in open areas (LIBC, 1996). Forests now present on the Lummi Reservation are the result of historical logging practices and forest fires. In 1881, twenty-six years after the Point Elliot Treaty established the Lummi Indian Reservation, the forests on the Reservation were described as being one-third fir, one-third cedar, and one-third alder (Caplow, 1994). In the 1880's "fir" could have meant Douglas-fir, grand fir, western hemlock, or Sitka spruce. Sometime between 1850 and 1900, one or more very large, stand-replacing fires took place, which burned most of the Reservation except for Gooseberry Point. The proportions of fir, cedar, and alder reported in 1881 may reflect successional stages as a result of the fires or may reflect the wet soil conditions, which are still common on the Reservation (Caplow, 1994). Selective logging of the largest and most valuable trees (commonly known as high-grading) was the primary cutting practice during this early period. Like elsewhere in the western United States, reforestation was not practiced. As a result, harvested sites on the Reservation regenerated naturally with fast-growing hardwoods.

Adequate reforestation and stand maintenance efforts continued to be inadequate prior to 1980 contributing to present stand conditions. The young conifer plantations present on the Reservation are the result of tree planting efforts that began after 1980. In 2009, the Forestry Division determined the sustainable annual allowable cut (AAC) for trust lands of the Lummi Reservation, which is identified in the Forest Inventory section of this document. The sustainable AAC will be implemented to protect trust timberlands on the Reservation from overharvest. Aggressive reforestation and plantation maintenance will also be practiced as described in subsequent sections of this document to ensure that a desired forested condition is restored after timber harvest.

- **1.6.1 Major Forest Cover Types**

In its current state, the forest on the Lummi Reservation can be grouped into five broad cover types, which are described below. These five cover types have been further delineated into 125 distinct stand types as part of the Reservation-wide forest inventory conducted in 2007.

- **1.6.1.1 Red Alder (*Alnus rubra*) Type**

The Red Alder cover type is present in areas that were harvested and not reforested properly. As these stands age, they become more diverse and can include bigleaf maple (*Acer macrophyllum*) and paper birch (*Betula papyrifera*) in drier areas and black cottonwood (*Populus trichocarpa*) in wetter areas. Common understory species on drier sites include thimbleberry (*Rubus parviflorus*), vine maple (*Acer circinatum*), and snowberry (*Symphoricarpos albus*). Common understory species on wetter sites include salmonberry (*Rubus spectabilis*), red-osier dogwood (*Cornus stolonifera*), and lady fern (*Athyrium filix-femina*). On drier sites, bigleaf maple will occasionally form nearly pure stands with similar understory species (Caplow, 1994). Scattered conifers may occur individually or in patches in areas that were replanted with conifers but received little to no plantation maintenance and were overtaken by faster growing hardwoods.

On some sites, western red cedar can become more dominant 50 to 60 years after harvest unless the soils are seasonally saturated or inundated. These wetter areas tend to remain as

a red alder/salmonberry disclimax and are described as a separate forest type (Caplow, 1994).

- **1.6.1.2 Red Alder (*Alnus rubra*) - Western Red Cedar (*Thuja plicata*) Type**

  The Red Alder-Western Red Cedar cover type is generally a mature forest type that represents a later stage of successional development from the red alder type described above. Depending on the site, this cover type may represent a successional stage towards a western red cedar or mixed conifer forest type or it may be a more long-term forest type, particularly in wet areas or areas subject to blowdown. Although red alder and western red cedar are the most common tree species, Douglas-fir, grand fir, western hemlock, Sitka spruce, bigleaf maple, and paper birch may also be present (Caplow, 1994).

  The deciduous trees in this forest type are more likely to be nearing the end of their lifespan. As the canopy opens, the understory can become dominated by dense stands of shrubs, including vine maple, salmonberry, thimbleberry, snowberry, and red elderberry (*Sambucus racemosa*). Ferns also tend to be better developed in this forest type, particularly sword fern (*Polystichum munitum*) (Caplow, 1994). This forest type is fairly common on the Lummi Reservation and is found in slightly wet areas.

- **1.6.1.3 Western Red Cedar (*Thuja plicata*) Type**

  The Western Red Cedar cover type is relatively uncommon on the Reservation. A few nearly pure western red cedar stands can be found but most are comprised of a mixture of conifers with western red cedar as a dominant or co-dominant species. In the absence of disturbance, this forest type will tend to be stable since conifers have lifespans measured in centuries rather than decades (Caplow, 1994).

  Most forest stands of this type have a greater degree of crown closure than the mixed coniferous-deciduous forests so the understory vegetation is less dense. In some particularly well-developed stands, little or no understory vegetation is present. Sword fern tends to be the most common understory species in this forest cover type. This cover type can be seen on Portage Island, portions of Gooseberry Point, and in the Northwest Upland area (Caplow, 1994).

- **1.6.1.4 Red Alder (*Alnus rubra*) - Salmonberry (*Rubus spectabilis*) Type**

  The Red Alder – Salmonberry cover type occurs on sites that are too wet for easy regeneration of conifers. In many cases these forests are considered forested wetlands. Occasionally, this forest type may develop on sites occupied by conifers after harvesting due to changes in the soil hydrology resulting from tree removal.

  This red alder type tends to persist for longer periods than the red alder type found on drier sites due to the slow rate of conifer regeneration in wet areas. Blowdown and disease are also more common due to the wet soils. The salmonberry understory is often mixed with red-osier dogwood and Douglas spirea (*Spirea douglasii*), which can create a virtually impenetrable understory. Slough sedge (*Carex obnupta*) and skunk cabbage (*Lysichitum americanum*) occur beneath the shrub layer on the very wettest sites. Western red cedar or other conifers that can withstand seasonal flooding will eventually colonize some of these stands but others will remain deciduous (Caplow, 1994).

  This forest type can be seen along the margins of the Nooksack Delta and within some of the forested wetlands that occur in the center of the Lummi Peninsula. At its wettest extreme, this cover type grades into a scrub-shrub wetland community, which can be seen on Portage Island and along Scott Road (Caplow, 1994).

- **1.6.1.5 Black Cottonwood (*Populus trichocarpa*) Type**

  Although black cottonwood can be found in mixed deciduous forests, it can also form pure stands on the Lummi Reservation after timber harvest. The black cottonwood cover type is a

distinctive landscape feature, since these rapidly growing trees quickly overtop surrounding forest types. Black cottonwood can tolerate seasonally wet soils and some cottonwood forests are considered forested wetlands. Black cottonwood lives longer than red alder (200 years vs. 100 years), so this forest type is less likely to be replaced by conifers.

In wet areas, the understory species are likely to be salmonberry, nettle (*Urtica dioica*), skunk cabbage, and other species that are adapted to saturated soil conditions. On drier sites, red elderberry is sometimes a dominant understory species. Small to moderately sized black cottonwood stands are scattered throughout the Reservation. Several occur near Gooseberry Point, and another large stand can be seen north of the Lummi Delta (Caplow, 1994).

- **1.6.2 Understory Vegetation**

  Understory vegetation typically observed pre and post-harvest on the Lummi Reservation include salmonberry, thimbleberry, red elderberry, vine maple, ocean spray (*Holodiscus discolor*), snowberry, nettle, and Himalayan blackberry (*Rubus discolor*). The presence and density of each species depends on site characteristics including moisture, sunlight, and soil type.

- **1.6.3 Threatened or Endangered Plant Species**

  Based on a review of the most recent list of rare and sensitive plants in Whatcom County obtained from the Washington State Department of Natural Resource's Natural Heritage Program's website, there are no known threatened or endangered plants located within the boundaries of the Lummi Reservation.

- **1.6.4 Noxious Weeds**

  Nine noxious weeds are known to occur on the Lummi Reservation although the presence of more noxious weeds is likely. These include spotted knapweed (*Centaurea maculosa*), tansy ragwort (*Senecio jacobea*), Japanese knotweed (*Polygonum cuspidatum*), English ivy (*Hedera helix*), reed canary grass (*Phalaris arundinacea*), Himalayan blackberry (*Rubus discolor*), Canadian thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), and yellow iris (*Iris pseudacorus*).

  Spotted knapweed occurs in open areas on Sandy Point and does not tend to persist in forested areas (Caplow, 1994). Tansy ragwort occurs in openings and along roadsides throughout the Reservation and is commonly seen in clearcuts. Japanese knotweed has increased significantly over the past decade and can be found along roadsides, in open fields, along watercourse ways, and more frequently in clearcuts. Unlike tansy ragwort, Japanese knotweed can easily out-compete planted seedlings. Japanese knotweed is also very difficult to eradicate. English ivy occurs in isolated patches and can commonly be found along the forest edge. English ivy rarely occurs within the forest interior. Reed canary grass is widespread throughout the Reservation, particularly in old agricultural fields and in and around wetlands. Himalayan blackberry is extensive throughout the Reservation and is frequently a problem in forestry plantations and along the forest edge. Himalayan blackberry is also commonly found growing in the understory of mature hardwood stands. Canadian and bull thistle can be found in recent clearcuts or on other disturbed sites. Yellow iris primarily occurs in wet areas.

A complete species list of vegetation resources of the Lummi Reservation is provided in Appendix 1. This list includes trees, shrubs, forbs, grasses, rushes, and sedges along with each species scientific name and habitat occurrence.

- **1.7 Forest Health**

  Forest health issues are caused by abiotic factors such as drought, excess water, wind damage, ice damage, and snow damage and by biotic factors such as forest insects and diseases. On the Lummi Reservation, most tree damage is attributable to abiotic factors. Due to the geographic setting and geologic history of the Lummi Reservation, forests are very susceptible to wind damage and blowdown. Frost damage has also been noted in pure hardwood stands. Forest insects and diseases

commonly found in western Washington have historically not been a problem on the Lummi Reservation due to the high level of species diversity and high proportion of hardwood species.

- **1.7.1 Insects**

  Insects generally do not pose a direct threat to coastal forests of the Puget Sound. Secondary infestations of boring insects and bark girdlers are observed in trees that have been weakened by disease or mechanical damage (INFO, 1995). Forest insects in western Washington that can cause foliage damage or loss include aphids, adelgids, tent caterpillars, sawflies, leaf beetles, and loopers. Direct control of these insects is rarely necessary since damage is cyclical and most trees recover from these types of insect attacks (WSU Forest & Wildlife Extension, 2009). The hemlock looper attacks forests in the western hemlock zone on a cyclical basis but seldom causes extensive loss of forest (INFO, 1995). The red alder bark beetle has been noted as a problem in red alder plantations in British Columbia but the extent of the damage has yet to be documented. No insect problems were detected during the Reservation-wide forest inventory.

- **1.7.2 Disease**

  Some forest diseases are present on the Lummi Reservation but historically have not been a problem. Forest diseases pose more of a threat to forest health in western Washington than forest insects. Western Washington forests are susceptible to various root rots, fungus rots, needle casts, and stem cankers, particularly in conifer plantations. No disease problems were detected during the Reservation-wide forest inventory. However, notable butt rot (presumed to be pencil rot) is commonly present in the stumps of mature western red cedar trees. Butt rot and heart rot are also commonly observed in red alder and paper birch on the Lummi Reservation. Butt and heart rot typically enter trees through stem or root wounds. They are normally associated with older stands but may also occur in younger trees if they have been damaged by abiotic factors or from commercial thinning operations.

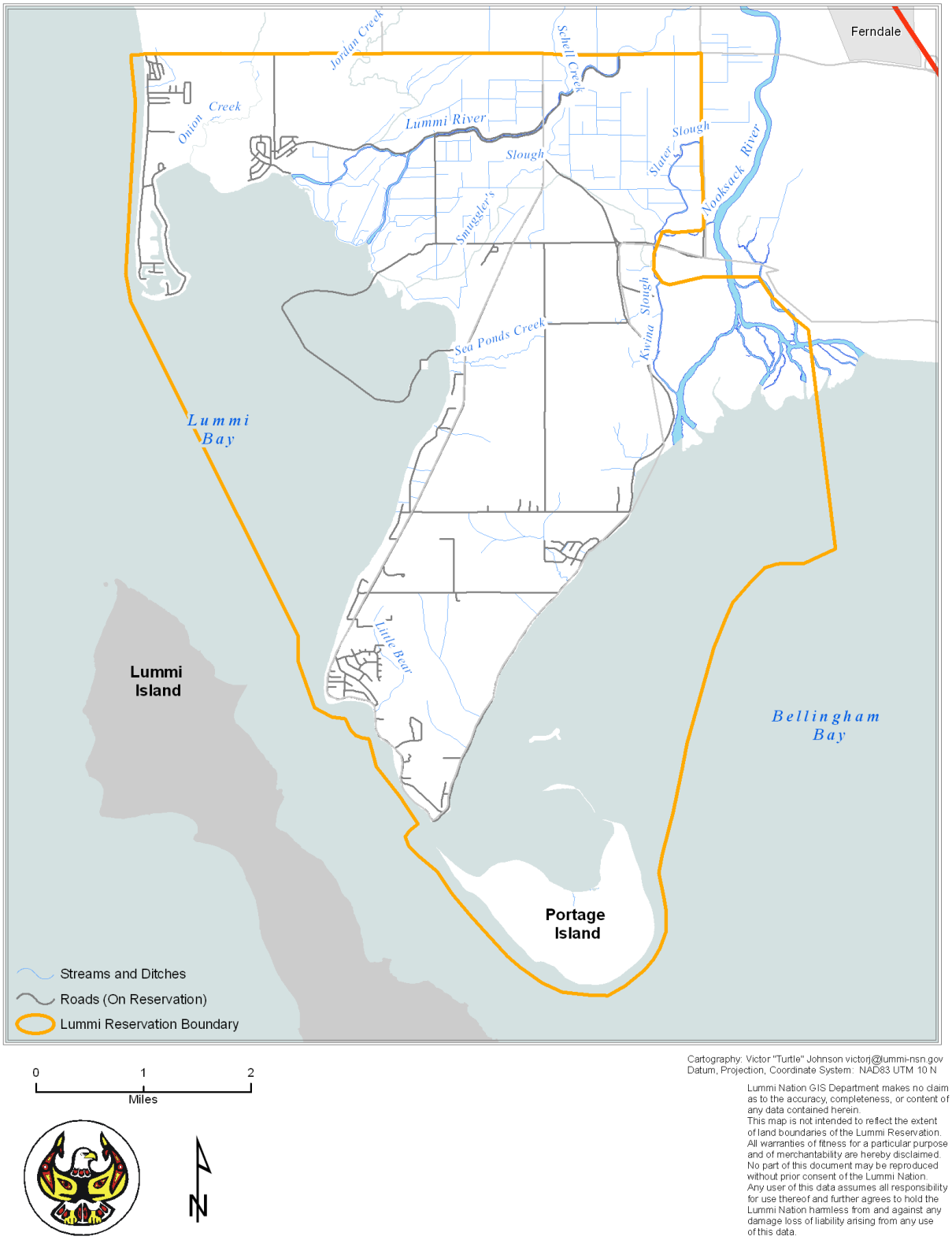
- **1.8 Water Resources**

  Water resources provide a number of benefits to the Lummi Nation including fish and wildlife habitat, aquifer recharge, water quality improvement, and flood attenuation. Streams and wetlands also are a source of traditional cultural plants. In recognition of the importance of the Reservation's water resources, the Lummi Nation has developed and adopted a Water Resources Protection Code, Title 17 in the Lummi Code of Laws (LCL). The Water Resources Protection Code states "it is the intent of the Lummi Nation to achieve no net loss of streams, wetlands, and their functions". In addition to the protections provided under Title 17, water resources will be protected by employing relevant best management practices identified in subsequent sections of this document.

  The majority of the streams and wetland areas on the Reservation are located within the Lummi Flats and the Nooksack River delta. Large wetland areas and some streams have also been identified throughout Reservation uplands.

- **1.8.1 Reservation Streams**

  The Lummi Reservation contains portions of the Nooksack River, the Lummi River, and several sloughs and small streams (Figure 4). Rivers and streams are categorized as either a Category 1 or Category 2 stream. Category 1 streams are defined as streams with perennial flow during normal rainfall years or streams used by salmonids. Category 2 streams are defined as streams with intermittent or ephemeral flow during years of normal rainfall that are not used by salmonids (LIBC, 2008). Category 1 streams are more ecologically important than Category 2 streams and as a result, receive more protection. A listing of Lummi Reservation streams by category is provided in Table 2.



Cartography: Victor "Turtle" Johnson victorj@lummi-nsn.gov
Datum, Projection, Coordinate System: NAD83 UTM 10 N

Lummi Nation GIS Department makes no claim as to the accuracy, completeness, or content of any data contained herein.
This map is not intended to reflect the extent of land boundaries of the Lummi Reservation.
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Figure 4. Streams of the Lummi Reservation

Table 2. Stream Categories of the Lummi Reservation	
Category 1 Streams Fish bearing or potentially fish bearing.	▪ Nooksack River ▪ Lummi River ▪ Jordan's Creek ▪ Schell Creek ▪ Sea Ponds Creek (the portion west of Haxton Way only) ▪ Portage Island Perennial Creek ▪ Kwina Slough ▪ Smuggler's Slough ▪ Slater Slough
Category 2 Streams Non-fish bearing.	▪ Onion Creek ▪ Little Bear Creek ▪ Drainage ditches along Lummi Shore Drive ▪ Drainage ditches along the eastern and northern Reservation boundaries ▪ All other creeks on Portage Island

The Nooksack River drains most of western Whatcom County and currently discharges into the marine waters of Bellingham Bay on the eastern edge of the Lummi Reservation. Flooding of the Nooksack occurs about once every five years but the exact timing and duration is highly variable (LWRD, 2010). In past flood events, portions of Marine Drive and Haxton Way have been inundated isolating the Lummi Peninsula from the mainland.

The Lummi River is a distributary channel of the Nooksack River that is controlled by levees and a culvert structure at its confluence with the Nooksack River near Ferndale. Most of the time, the Lummi River only carries stormwater runoff from the Ferndale upland and a complex system of ditches in the floodplain but water from the Nooksack does enter the Lummi River at flows greater than 9,600 CFS. (LWRD, 1998).

Several major sloughs that are former river channels drain agricultural lands and wetland areas of the Nooksack and Lummi River floodplain. Of the smaller streams on the Lummi Reservation, only Jordan's Creek has been observed to have flows during the driest time of some years (LIBC, 1996). Other smaller streams only have significant flow after storms during the wet months but generally dry up during the summer.

- **1.8.1.1 Stream Buffers**

  Stream buffers are important in preserving water quality and aquatic habitat. The Water Resources Protection Code, Title 17 identifies minimum stream buffer requirements based on stream category (Table 3). These buffer requirements will be observed during all timber harvest operations on the Lummi Reservation.

Table 3. Stream Buffer Requirements by Category on the Lummi Reservation[1]

Category	Description	Buffer Requirement
1	Streams with perennial flow during normal rainfall years or streams used by salmonids.	100 ft.
2	Streams with intermittent or ephemeral flow during years of normal rainfall that are not used by salmonids.	25 ft.

[1]Buffer widths are measured as the horizontal distance from the ordinary high water mark.

1.8.2 Reservation Wetlands

In 1999, a comprehensive inventory of wetlands on the Lummi Reservation indicated that approximately 43% of the Reservation land base is either wetlands or a wetland complex and about 60% of these wetlands are located in the largely un-forested floodplain (Figure 5). Wetland complexes are areas where wetlands form a highly interspersed mosaic with upland hummocks. Because of this, the estimated wetland area in a wetland complex is more than what actually exists. Individual wetlands and wetland complexes range in size from 0.2 acres to 469 acres. About 50% of the wetlands are over 10 acres in size and about 13% are over 50 acres in size (LWRD, 2000).

Wetlands of the Lummi Reservation fall into two categories: forested uplands (palustrine) and emergent wetlands in the floodplains (palustrine/estuarine).

The wetlands in the upland areas are generally forested, contain fresh water, and are often only seasonally wet. Most of the forested wetlands on the Reservation have a canopy dominated by red alder and a salmonberry shrub layer. About 54% of inventoried wetlands on the Reservation have red alder as a dominant tree species (LWRD, 2000). The most frequently occurring forest types in forested wetlands include red alder and salmonberry; red alder, black cottonwood, and salmonberry; and red alder and western red cedar. Red-osier dogwood is often found as a co-dominant with salmonberry. Ground cover species include false lily-of-the-valley (*Maianthemum dilatatum*), slough sedge, and water parsley (*Oenanthe sarmentosa*). Pacific willow (*Salix lucida*), Sitka willow (*Salix sitchensis),* and crabapple (*Malus fusca*) are also commonly found in some forested wetlands (LWRD, 2000).

The wetlands in the lowland areas and in the floodplains may be either palustrine or estuarine depending on their proximity to saltwater. These emergent wetlands are significant for water quality enhancement, flood reduction, storm water attenuation, fish habitat, wildlife habitat, and for traditional plants. The estuarine wetlands provide critical juvenile rearing habitat for migrating salmon, herring, smelt, and other finfish and shellfish (LWRD, 2000). Most of the formerly extensive wetlands of the Lummi River floodplain have been diked, drained, filled and cultivated for agricultural purposes since the mid 1920's (Deardorff, 1992).

1.8.2.1 Wetland Buffers

As with streams, wetland buffers are important in preserving water quality and aquatic habitat. The Water Resources Protection Code, Title 17 identifies minimum wetland buffer requirements based on wetland category (Table 4). These buffer requirements will be observed during all timber harvest operations on the Lummi Reservation unless permission is received from the Water Resources Division to harvest within a wetland or wetland buffer upon approval of a wetland mitigation plan.

Table 4. Wetland Buffer Requirements by Category on the Lummi Reservation[1]

Category	Description	Buffer Requirement
1	Critical Value	100 ft.
2	High Value	75 ft.
3	Moderate Value	50 ft.
4	Low Value	25 ft.

[1]Buffer widths are measured as the horizontal distance from the delineated wetland boundary.

Figure 5. Wetlands of the Lummi Reservation

- **1.8.3 Shoreline Buffers**

  Buffers around shorelines are important to protect the ecological functions provided by the marine-terrestrial interface. The Lummi Coastal Zone Management Plan (CZMP) defines the coastal zone as the "area from the normal high water mark to a point 200 feet landward" (LIBC, 1988). Normal high water mark is defined in the CZMP as "the line of mean higher high tide". The CZMP describes four coastal zone designations: urban resort, suburban, conservancy, and natural. Within the urban resort, suburban, and natural designations, a 200-foot no cut buffer must be observed between the shoreline and a harvest unit boundary. Within the conservancy designation, forest management activities are permitted in the coastal zone. Pursuant to Title 17 – Water Resources Protection Code in the Lummi Code of Laws, a 100-foot no cut buffer must be observed between the shoreline and the harvest unit boundary. Timber harvest may occur between the 100-foot and 200-foot section but harvest activities must meet the five requirements outlined in the CZMP under "Forest Management" and must be approved by the LIBC Water Resources Manager.

- **1.9 Wildlife Resources**

  The Lummi Reservation is comprised of two peninsulas, riverine floodplains, tidelands, and Portage Island, which create a diversity of habitat types for wildlife. The Nooksack River and Lummi River deltas provide a particularly rich diversity of habitat opportunities for both terrestrial and aquatic wildlife. The major wildlife habitat types identified on the Lummi Reservation include red alder dominated forests, low-land coniferous forests and plantations, agricultural fields and hedgerows, wetlands, open water areas, shorelines, riparian areas, and urban areas (Eissinger and Drummond, 1994).

  Wildlife resources will be protected in compliance with all federal and tribal regulations and by employing applicable best management practices identified as part of the Lummi Land Use Application process.

  - **1.9.1 Terrestrial Wildlife**

    In 1994, the Forestry Division contracted with Nahkeeta Northwest to prepare a preliminary list of wildlife on the Lummi Reservation as part of the Environmental Assessment for the first Forest Management Plan. The document was titled "Wildlife and Habitat of the Lummi Reservation" (Eissinger and Drummond, 1994).

    During the informational review process, the general lack of pertinent wildlife data became apparent. Empirical data in particular is nonexistent for most amphibians, reptiles, mammals, and for critical habitats such as forested and non-forested wetlands and riparian areas within the Reservation (Eissinger and Drummond, 1994). In the absence of this information, species occurrence could only be inferred from habitat and distribution associations. Therefore, when no field records were available, species presence and habitat affiliation was applied by referencing appropriate technical sources (Eissinger and Drummond, 1994). 278 vertebrate species were identified as occurring on the Lummi Reservation through a detailed review of existing informational sources and discussions with local wildlife authorities. Of this total, 142 species are associated with conifer forests, 112 species are associated with red alder forests, and 83 species are associated with farmlands (Eissinger and Drummond, 1994). Some species may be associated with more than one habitat type. A general listing of these species is provided Appendix 1.

    - **1.9.1.1 Bald Eagles**

      The Lummi Reservation supports a large resident bald eagle population. Thirty-three bald eagle nests have been identified within the boundaries of the Lummi Reservation (Stark, 2008) (Figure 6). Resident, non-breeding, and wintering bald eagles use the areas around the Lummi Peninsula. Significant amounts of shallow, near-shore habitat provides a large and productive foraging area from the Nooksack River estuary to Sandy Point. Upland

forests and mature shoreline trees such as black cottonwood, grand fir, and Douglas-fir provide suitable nest and perch trees.

In 2007, the bald eagle was delisted from the Endangered Species list. However, the bald eagle is still protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. As a result of the 2007 delisting, the United States Fish and Wildlife Service (USFWS) published the National Bald Eagle Management Guidelines to assist public and private organizations in developing and implementing adequate protections consistent with the requirements outlined in the Bald and Golden Eagle Protection Act. Depending on the location of the nest, the guidelines recommend observing a 330 to 660 foot buffer. In 2008, the Forestry Division developed the Lummi Nation's Bald Eagle Protection Guidelines using the USFWS guidelines as a template and in consultation with a USFWS biologist. These guidelines incorporate all of the protections provided in the USFWS guidelines but address conditions specific to the Lummi Nation and establish residual stand characteristics when selective harvest is permitted in the secondary buffer. To date, these guidelines have not been formally adopted and until such time, the National Bald Eagle Management Guidelines will be used.

Bald eagles are recognized as an important cultural asset to the Lummi people. This recognition is formalized in the Lummi Code of Laws, Title 15.07.030, which mandates the protection of tribal resources and cultural values through compliance with several Federal laws. The commitment to ensure healthy eagle populations is a priority to tribal administrators and is achieved through cooperation with the U.S. Fish and Wildlife Service, the Lummi Natural Resources Department, and Lummi Planning and Development Department (Stark, 2008).

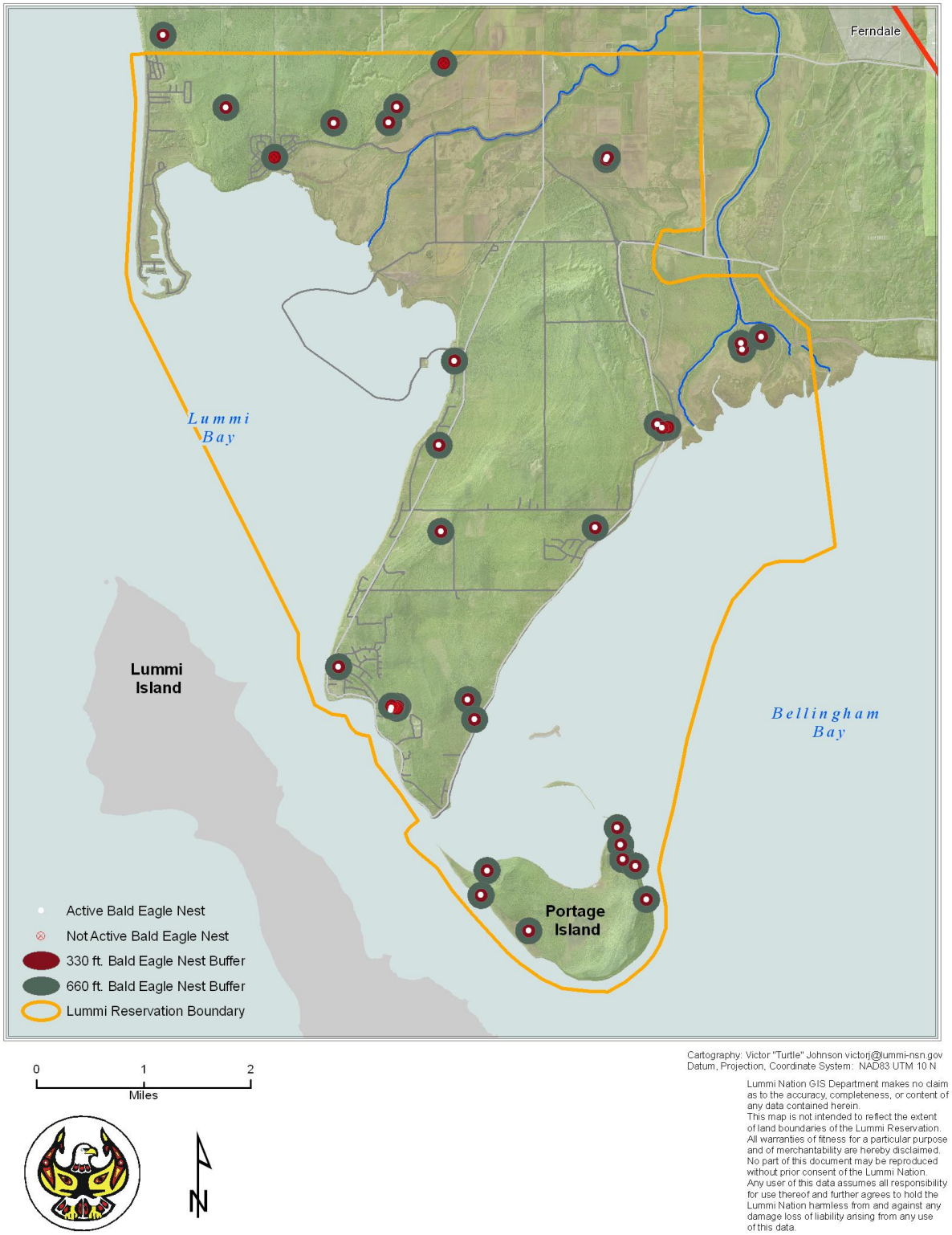


Figure 6. Registered Bald Eagle Nests of the Lummi Reservation

- **1.9.2 Fish Species**

  A number of fish species frequent the near-shore marine waters of the Lummi Reservation and the Nooksack River. Fish species common to these areas on the Lummi Reservation include Chinook salmon, Coho salmon, pink salmon, chum salmon, steelhead, Pacific herring, surf smelt, Pacific sandlance, hooligan, flounders, sole, rockfish, croakers, gunnels, pipefish, stickleback, sculpin, tubesnout, shiner, perch, Dungeness crab and other crab species, oysters, and clams (LIBC, 1996). Aside from marine waters and the Nooksack River, salmonids have been documented in the Lummi River, Jordan's Creek, Schell Creek, Sea Ponds Creek, Kwina Slough, Smuggler's Slough, and Slater Slough. A listing of specific salmonids by stream/slough is provided in Appendix 1.

- **1.9.3 Threatened or Endangered Wildlife Species**

  Based on a review of the most recent list of threatened and endangered wildlife species in Whatcom County, four threatened and one endangered species have been identified as occurring or having the potential to occur on or near the Lummi Reservation. The four threatened species include the Chinook salmon, bull trout (*Salvelinus confluentus*), Puget Sound steelhead trout, and the marbled murrelet (*Brachyrampus marmoratus*). The one endangered species is the southern resident killer whale (*Orcinus orca*).

  Chinook salmon are known to utilize the Nooksack River, Georgia Strait, Hale Passage, Lummi Bay, and Bellingham Bay in varying numbers either as juveniles or adults. Bull trout and Puget Sound steelhead trout are known to utilize the Nooksack River and likely utilize portions of near shore habitat in Bellingham Bay, Lummi Bay, Hale Passage, and Georgia Strait. Marbled murrelets are known to utilize the nearshore marine areas of Hale Passage year-round, including the breeding season (Eissinger 1994). The occurrence of marbled murrelets in this area is common but generally in low numbers. Murrelet nesting on the Lummi Reservation is unlikely due to the lack of suitable nesting habitat. The southern resident killer whale is known to utilize the Strait of Juan de Fuca, Georgia Strait, and Hale Passage principally during the late spring, summer, and fall. Winter and early spring movements and distribution of the population are largely unknown.

- **1.10 Cultural Resources**

  The Lummi Nation wishes to preserve and manage its cultural resources in a manner that contributes to meeting the social, environmental, spiritual, and economic needs of present and future generations. Because cultural resources are a sensitive issue, information pertaining to cultural resources is confidential and only accessible the Lummi Nation Tribal Historic Preservation Office (LNTHPO) staff. Thus no description is provided in this document.

  - **1.10.1 Cultural Resource Management**

    It is the policy of the Lummi Nation to protect cultural resources as identified in the Lummi Code of Laws, Title 40 – Cultural Resources Preservation Code. Consistent with this policy, all land use activities are reviewed by LNTHPO as part of the Lummi Land Use Application review process for cultural resource concerns. Land use permits are conditioned by LNTHPO officers as necessary to meet resource protection requirements consistent with the best cultural resource management practices identified in the Cultural Preservation Plan (CPP) developed for the project. The project CPP is developed jointly by LNTHPO officers and the project manager and must be followed to ensure protection of cultural resources. In the case of inadvertent discovery, LNTHPO requires that all work in the immediate vicinity be stopped, the area secured, and a LNTHPO officer be contacted to determine the appropriate action.

- **1.11 Outdoor Air Quality**

  The main outdoor air quality concerns on the Reservation are related to the use of wood stoves, outside trash burning, and off-Reservation sources. Slash burning is not a significant factor because timber harvesting is not extensive and slash pile chipping is becoming a more economically viable

slash abatement option. Air quality is typically quite good in the summer months. In the winter months, a burn ban may be implemented when stagnant air conditions result in the accumulation of unhealthy air pollutants in the atmosphere. Many residents of the Lummi Reservation depend on wood stoves as their primary source of heat, which can contribute to locally reduced air quality. Outdoor air quality on the Lummi Reservation is regulated by the Federal Air Rules for Reservations (FARR), which is a basic set of air quality regulations established by the Environmental Protection Agency (EPA) under the Clean Air Act.

- **1.12 Wildfire**

  Low severity wildfires are a common ecological disturbance in the Puget Sound bioregion. High severity, stand replacing fires are comparatively rare and have historically occurred on a 200 to 300 year interval (Franklin and Dyrness, 1973). Although the Lummi Reservation receives 35 inches of rain each year, the Reservation is still susceptible to wildfire during the drier summer months, particularly in the dry upland areas. The Lummi Reservation experiences 1 to 4 small wildfires each year, which are typically caused by fireworks or abandoned burn pits. Wildfires have occurred as beach fires, brush fires, and occasionally forest fires. To protect the Lummi Reservation from wildfires, a burn ban is implemented most years that is usually consistent with the Whatcom County burn ban.

  The Lummi Nation and the Bureau of Indian Affairs have a written cooperative fire agreement with the Washington State Department of Natural Resources (DNR) to provide fire protection services on all wildlands within the boundaries of the Lummi Reservation. Additional fire protection services are provided by Whatcom County Fire District #8 (Marietta Fire District), which covers the main part of the Lummi Peninsula south of the Lummi River and Fire District #17, which covers the Northwest Upland (LIBC, 1996). The Lummi Forestry Division also maintains fire fighting equipment and current training to respond to wildfires independently if necessary and to assist the DNR or the Marietta Fire District in fire suppression efforts. If wildfire occurs as the result of timber harvest operations, the purchaser or logging operator is financially and legally responsible for all fire suppression actions necessary to contain wildfires caused by their own activities.

- **1.13 Ownership Status**

  Land ownership on the Lummi Reservation is classified as either trust, fee, or in process. It is further classified into six categories including Individual Native Trust, Individual Native Fee, Tribal Trust, Tribal Fee, Non-Tribal Fee, and In Process (Figure 7). A table listing ownership category by acreage for upland areas of the Lummi Reservation are provided in Appendix 1.

  - **1.13.1 Trust Status**

    Trust status refers to Indian-owned land where the title is held by the United States in trust and protected by the U.S. government for the exclusive use by individual tribal members or the Lummi tribal government. Indians and tribes have user rights to the land but ultimate control of the land remains with the U.S. government. As a result of the extension of treaties, all land within the defined boundaries of Indian Reservations and some of those owned by tribes or individuals outside of the Reservation are held in "trust status". Trust status means that the administration and disposition of an individual or tribe's land base is supervised by the Bureau of Indian Affairs through federal law. Thus even though an individual Indian may own a parcel of land, he or she cannot lease, sell, or mortgage his or her land or products from that land without acknowledgement and permission from the Bureau of Indian Affairs.

  - **1.13.2 Fee Status**

    Fee status affords the most complete type of ownership because the owner holds the title and may exercise control of the property. The owner may make decisions about the most common land use or sale activities without government oversight or restraints on alienation. The Lummi Nation asserts jurisdiction over the activities of their members on all lands within the Reservation, over all persons on lands that belong to the tribe itself, and over the activities of non-members

even on fee lands owned by those non-members where the activity involved "threatens or has some direct effect on the political integrity, the economic security, or the health or welfare of the tribe" (Montana vs. United States, 1981).

- **1.14 Zoning**

Land use zoning was initially established on the Lummi Reservation in 1973 with the adoption of the Interim Zoning Ordinance No. L-39 by the Lummi Indian Business Council (LIBC). This ordinance established several zoning districts, defined set-back requirements, outlined procedures for permit approvals and appeals, and set enforcement and penalties for violations. In 1976, a permanent zoning ordinance was adopted by LIBC under Resolution U-44, replacing the Interim Zoning Ordinance (LIBC, 1996). The permanent zoning ordinance has been refined and updated and is codified in the Lummi Code of Laws, Title 15 – Land Use, Zoning, and Development. The most recent land use zoning on the Reservation was established and approved through LIBC Resolution in 2004. The Lummi Planning Commission and the LIBC have established eight zoning districts: Residential, Commercial, Light Industrial, Forestry, Agriculture, Open Space, Marine, and Mixed-Use (Figure 8). A description of each zoning district and approximate acreage is provided in Appendix 1. Specific legal and technical details about the conditions for land use within each zoning district are provided in the Lummi Code of Laws, Title 15 – Land Use, Zoning, and Development.

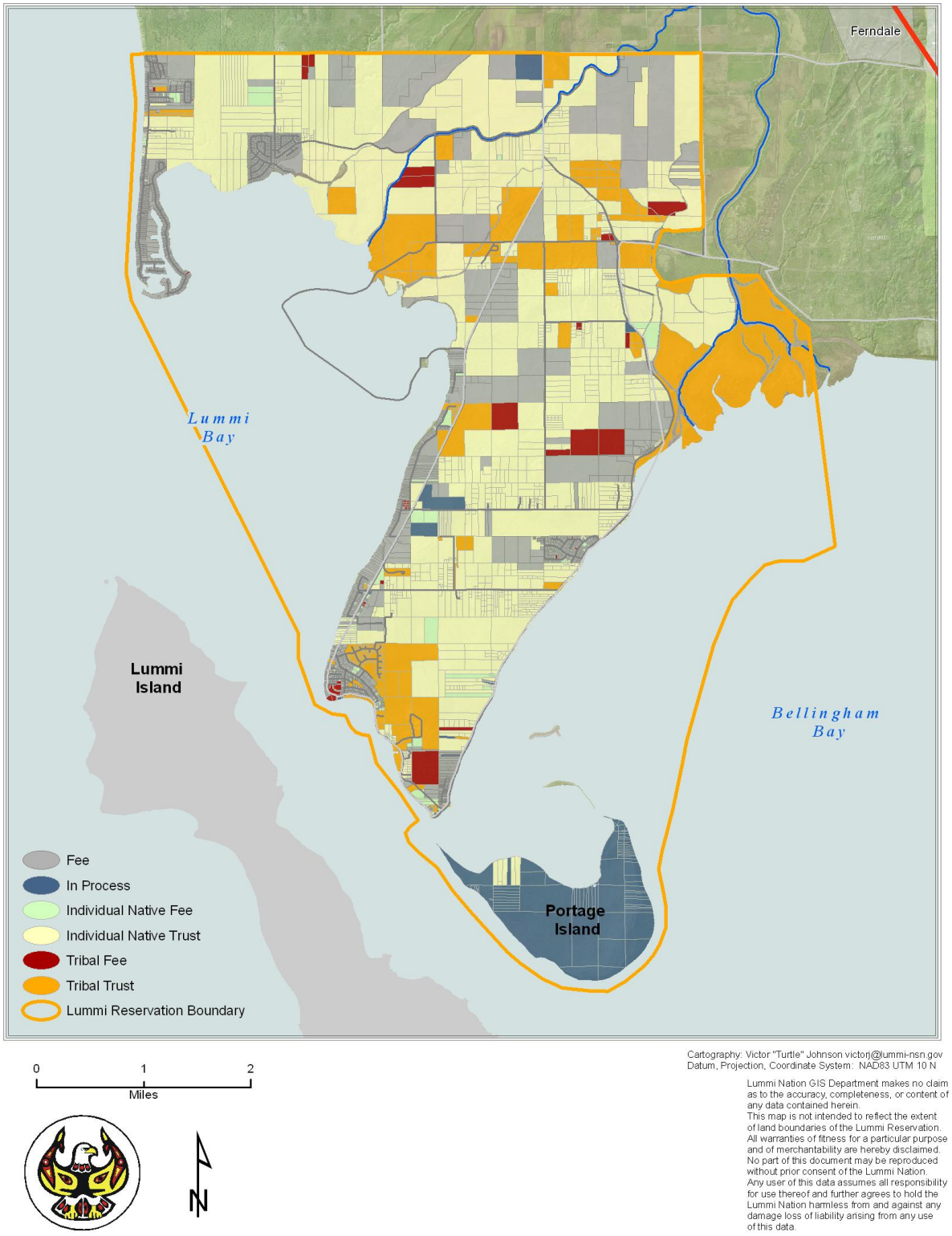


Figure 7. Ownership Status of the Lummi Reservation

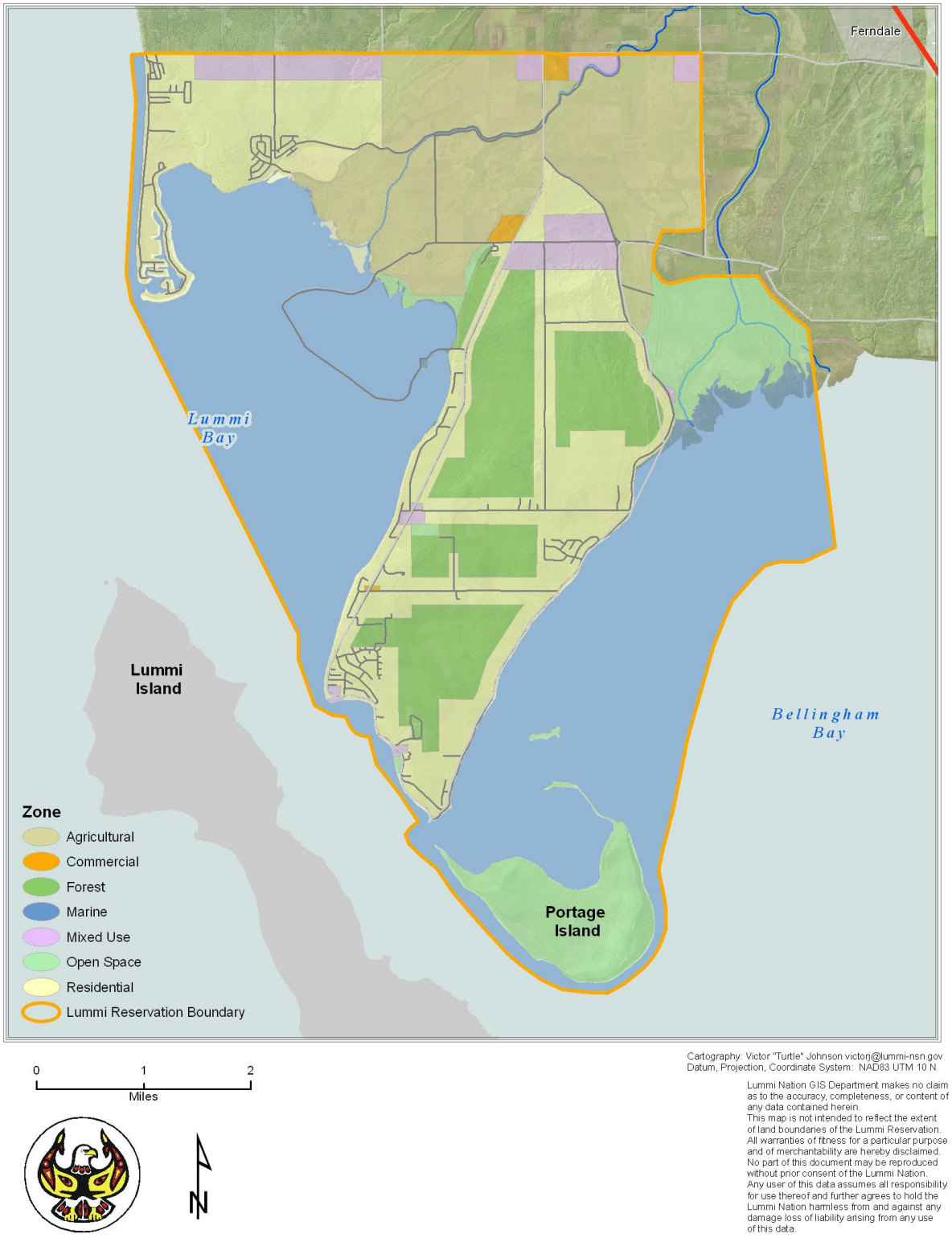


Figure 8. Zoning Districts of the Lummi Reservation

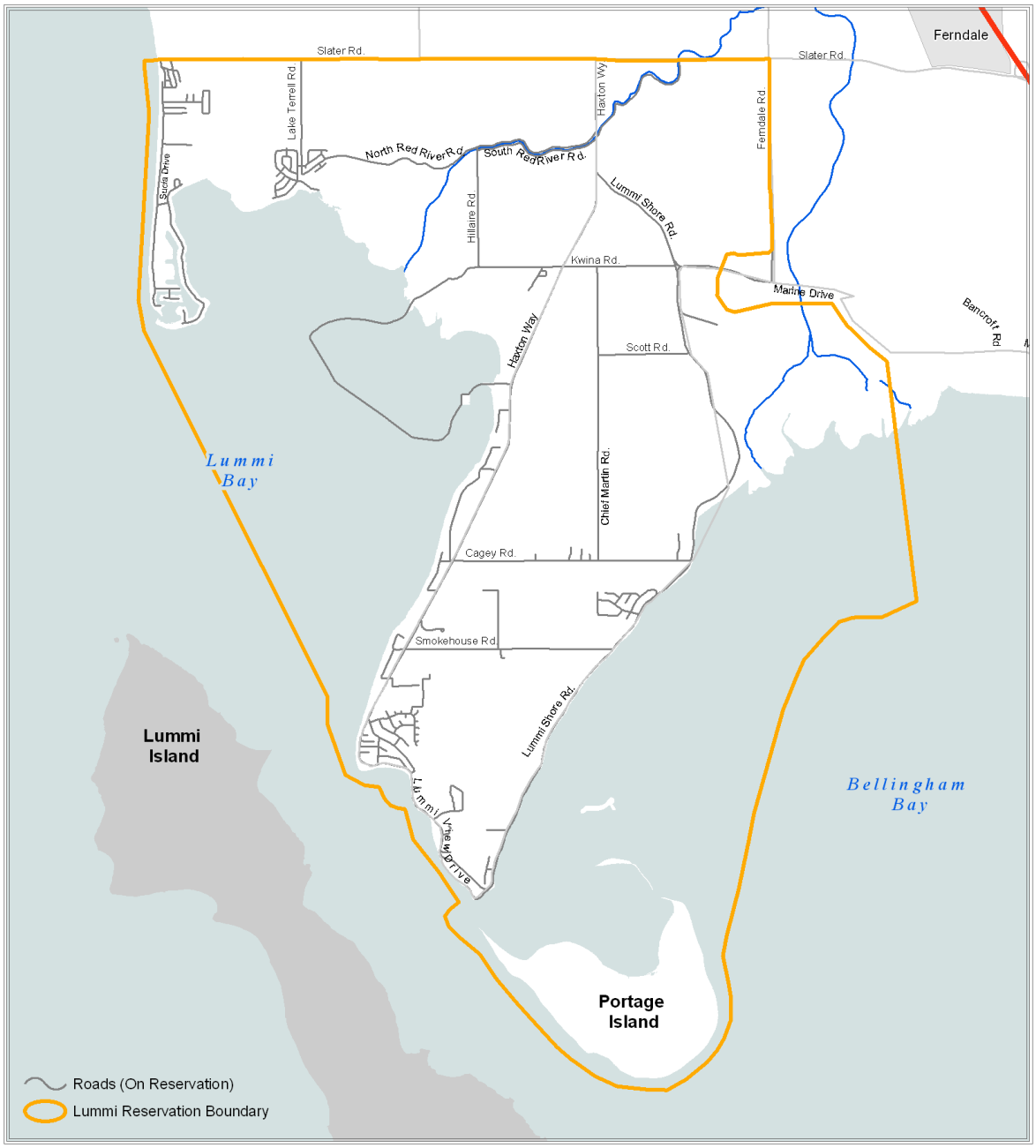
- **1.15 Housing and Community Development**

  The majority of housing and community development is located along the marine shorelines of the Lummi Peninsula, Gooseberry Point, Sandy Point Peninsula, and the Neptune Beach area. The LIBC campus is located along Kwina Road and includes Council Operations, Lummi Tribal Court, Natural Resources, Planning and Development, Lummi Police, Accounting, Human Resources, the Fitness Center, and the Clinic. The Lummi owned Silver Reef Hotel, Casino, and Spa is located on the corner of Haxton Way and Slater Road. Scattered home sites are located throughout upland-forested sections of the Reservation. Substantial residential, municipal, and commercial development is expected in the future to accommodate the rapidly growing tribal population.

- **1.16 Transportation Corridors**

  There are approximately 60 miles of public road within the Lummi Reservation. Slater Road (the northern border of the Reservation) provides east-west access to and from Interstate 5. Haxton Way, Lummi View Drive, and Lummi Shore Road provide major north-south access and form a loop, which services the densely populated neighborhoods near Gooseberry Point and the Lummi Island Ferry Terminal (Southern, 2000) (Figure 9).

  Roads within the Reservation are either Whatcom County Roads or Bureau of Indian Affairs roads and are classified by the organization responsible for the management and maintenance of the road. Ninety-one percent of Reservation roads are classified as county roads and are maintained by Whatcom County. The remaining nine percent are classified as BIA or Lummi roads (approximately 4.8 miles) and are maintained by the Lummi Nation. BIA/Lummi roads are primarily spur roads that provide access to tribal member housing developments, aquaculture, or tribal specific utilities (Southern, 2000). A few non-surfaced roads and trails transect the forested uplands, but most are heavily overgrown and inaccessible for routine management of forestry plantations. A listing of all county and BIA/Lummi roads is provided in Appendix 1.



0 1 2
Miles

Cartography: Victor "Turtle" Johnson victorj@lummi-nsn.gov
Datum, Projection, Coordinate System: NAD83 UTM 10 N

Lummi Nation GIS Department makes no claim as to the accuracy, completeness, or content of any data contained herein.
This map is not intended to reflect the extent of land boundaries of the Lummi Reservation.
All warranties of fitness for a particular purpose and of merchantability are hereby disclaimed.
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Figure 9. Major Roads of the Lummi Reservation

- **1.17 Agricultural Commitments**

  The vast majority of agricultural land on the Reservation is located in the Lummi Flats, which is comprised of the historical floodplains of the Lummi and Nooksack rivers. Much of the land used for farming on the Lummi Reservation is former wetland and floodplain that was reclaimed by diking and draining during the 1920's. Continued maintenance of the drainage systems is necessary to keep the land farmable. The Nooksack delta has largely been preserved to protect the ecological functions provided by the wetlands, estuarine salt marsh, and mud flats.

  Most of the agricultural land is leased to local farmers for production of commodity crops, which provides some income for landowners. Additional agricultural uses include dairy production (1 dairy with a lagoon) and hybrid cottonwood plantations. Many of the hybrid cottonwood plantations on the Reservation have been harvested in the past 2 years and have not been replanted. Hybrid cottonwood plantations that exceed a 10-year rotation may be reclassified from agricultural land to forestland.

- **1.18 Sand and Gravel Mining**

  Historically, numerous sand and gravel mining operations have been permitted on the Lummi Reservation in the forested, natural, and residential zones. In most cases, the sand and gravel was used for the expansion of transportation corridors and as foundation material for housing construction. Federal and Tribal permits that require extensive environmental review and reporting are necessary for new sand and gravel mining operations.

  Due to the explicit definition and restrictive nature of the forest zone designation, a variance is required from the Lummi Planning Commission to allow any proposed mining activity on lands zoned for forest use. Where surface mining is permitted, it typically preempts other uses. Sand and gravel mining has often occurred in the forested zone since this zone is typically located on higher elevation areas of the Reservation that contain sand and gravel soils instead of silt and clay soils. Sand and gravel mines that have been reclaimed are often difficult to successfully reforest and high seedling mortality has been observed on reclaimed areas. The Lummi Natural Resource's GIS Division has developed a data layer depicting historic sand and gravel mines on the Lummi Reservation.

- **1.19 Forest-Based Recreation**

  Although forestland is plentiful on the Reservation, public recreational opportunities within forested areas are limited since individual trust lands are not available to the public. Forested tribal trust land is only available to the tribal public but is typically planned for future development and is not retained for forested recreational opportunities. Portage Island is the most frequently used area for forest recreation on the Reservation and is a designated conservation area. Recreational development in forested areas is not anticipated in the near future.

- **1.20 Conservation Areas**

  The Lummi Nation has worked towards recovering additional lands that hold historical, cultural, and environmental significance to the Lummi people. To date, the Lummi Nation has obtained ownership of significant portions of the Arlecho Creek watershed and Madrona Point. Timber harvest is prohibited in these conservation areas and forest management practices are limited to those deemed necessary to protect the historical, cultural, environmental, aesthetic, and recreational values of these properties from threats such as fire, insects and disease, and invasive species.

1.20.1 Portage Island (Swe'lisen)

Portage Island is a 971-acre island located southeast of the Lummi Peninsula that is historically and culturally significant to the Lummi people. The island has a horseshoe shape and is not accessible from the mainland except at extreme low tides when the tombolo connecting the island with the mainland becomes exposed (Figure 10). Approximately 703 acres are forested and are comprised of a mature, mixed coniferous-deciduous forest of western red cedar, Douglas-fir, grand fir, western hemlock, red alder, bigleaf maple, black cottonwood, and paper birch. Minor amounts of Sitka spruce are also found on the island and other miscellaneous hardwood species are spread throughout. In some areas, western red cedar occurs as pure stands as does younger deciduous stands comprised of red alder. Douglas-fir is dominant in the drier areas, mainly on the southern bluffs. Black cottonwood is present in and around the wetland areas (Caldwell, 1983). Typical understory species include ocean spray, snowberry, lady fern, sword fern, blackberry, huckleberry (*Vaccinium parviflorum*), red current (*Ribes sanguineum*), salmonberry, false lily-of-the-valley, and bedstraw (*Galium spp.*). Nettles occur in the red alder stands, skunk cabbage occurs in forested wetlands, and salal (*Gaultheria shallon*) occurs in drier areas on the bluffs. The forest shows signs of both past logging and forest fires (Caldwell, 1983). Portage Island also contains three large wetlands. The largest wetland is a fresh water wetland that is approximately 75-acres in size and is located in the center of the island. This wetland drains out into Portage Bay by a small, intermittent stream. A brackish water wetland is present along the western edge of the island, which receives minor saltwater intrusions along its southern edge. A 20-acre saltwater wetland is present along the northern edge of the island, which lies adjacent to the shoreline. The remaining acreage is comprised of grasslands, sand spits, and exposed cliffs.

In 1981, the Lummi Nation re-purchased all of the parcels on the island that were in public ownership from Whatcom County for $1,190,000 with a grant from the Washington State Recreation and Conservation Office (LIBC, 2009). The majority of Portage Island was to be designated for development as a public park with the primary goal of protection, preservation, and enhancement of natural ecosystems while allowing limited or controlled public access. Portage Island is still owned by the Lummi Nation but the island has remained relatively undisturbed since the 1981 agreement between the Lummi Nation and the State of Washington (LIBC, 2009). It is maintained in a relatively natural state but is grazed by free ranging cattle, which have grazed on the island for more than 60 years. This extended grazing pressure has had notable impacts on the understory vegetation and natural forest development. Tree seedlings regenerating in the understory are usually eaten, which precludes natural forest succession. In an effort to protect water quality over adjacent shellfish beds, cultural resources, and to restore the natural vegetation and forest development on Portage Island, the Lummi Nation purchased the remaining cattle in 2009 and is currently in the process of removing them.

The Lummi Planning Department developed the Portage Island Management Plan in 2009 to address how the Nation would fulfill its obligations to develop Portage Island into a public park. The plan identifies conditions for use to ensure that the cultural, historical, and natural heritage of the island is preserved for future generations. According to the plan, Portage Island will be renamed Swe'lisen Heritage Park and will allow non-tribal access under controlled conditions. Non-tribal members will be required to obtain an access permit and pay a permit fee.

Figure 10. Portage Island Conservation Area

1.20.2 Arlecho Creek (Ts'eq)

The Arlecho Creek watershed consists of 2,126 acres of forestland and is located 18 aerial miles southeast of Bellingham, WA in Whatcom County within the headwaters of the South Fork Nooksack River basin (Figure 11). The Lummi Nation owns 1,771 acres of the 2,126-acre watershed. 355 acres of the area originally proposed was not purchased due to funding limits. The Nature Conservancy is also a major landowner in the Arlecho Creek watershed.

The Arlecho Creek watershed (known as Ts`eq to the Lummi people) contains numerous archaeological and historic sites and provides one of the few remaining locations still used by the Lummi people for traditional religious practices associated with the Spirit Dancing Society (seyown) (LIBC, 1993). The Arlecho Creek watershed also contains the largest remaining stand of preserved mid-elevation old-growth forest in the Puget Sound bioregion. This old-growth stand is approximately 656 acres in size and includes 250 to 300 year old Douglas-fir, mountain hemlock (*Tsuga mertensiana*), western red cedar, Pacific silver fir (*Abies amabilis*), and western white pine (*Pinus monticola*). Some individual trees exceed 150 feet in height and 8 feet in diameter. The old-growth stand in the Arlecho Creek watershed can be described as an ecological island of priority forest habitat surrounded by managed forestlands (Dunphy, 2009). The island holds populations of species dependent on old-growth forest, which can seed adjacent watersheds as the surrounding forests mature and habitat becomes available for wildlife. The remaining acreage is comprised of 70 acres of maturing forest and 1,400 acres of regenerating conifer, which is comprised of primarily Pacific silver fir and Douglas-fir.

Arlecho creek is also the main tributary to Skookum Creek, which is the primary water source for one of the Lummi Nation's salmon hatcheries and the largest tributary to the South Fork of the Nooksack River. The Lummi Nation relies on this hatchery to sustain their treaty-protected salmon resources, which are an integral part of the Lummi culture, history, and economy. The watershed is also crucial to maintaining downstream spawning habitat for federally listed endangered salmon in the South Fork Nooksack River basin, including one subspecies found only in the South Fork of the Nooksack River (LIBC, 1993).

Arlecho Creek originates in the watershed and terminates at its confluence with Skookum Creek descending from a maximum elevation of 4,575 feet to an elevation of 1,525 feet above mean sea level. The Arlecho watershed is comprised of steep mountainous terrain. Two-thirds of the watershed contains slopes over 40% and there are 13 acres of cliff habitat. Mean annual precipitation is 88 inches, which occurs predominantly as snowfall between October and March (Dunphy, 2009).

- Conservation Easement with the Climate Trust

  In 2007, the Lummi Nation finalized the sale of a 100-year conservation easement to the Climate Trust of Portland, Oregon for all the carbon offsets available on 1,297 acres of the 1,771 acres held by the tribe. The Climate Trust anticipates that this property will sequester 350,000 metric tons of carbon over the next century.

The Lummi Natural Resource Department completed the Arlecho Creek Natural Resources Conservation Area Management Plan (ACNRCA) in 2009.

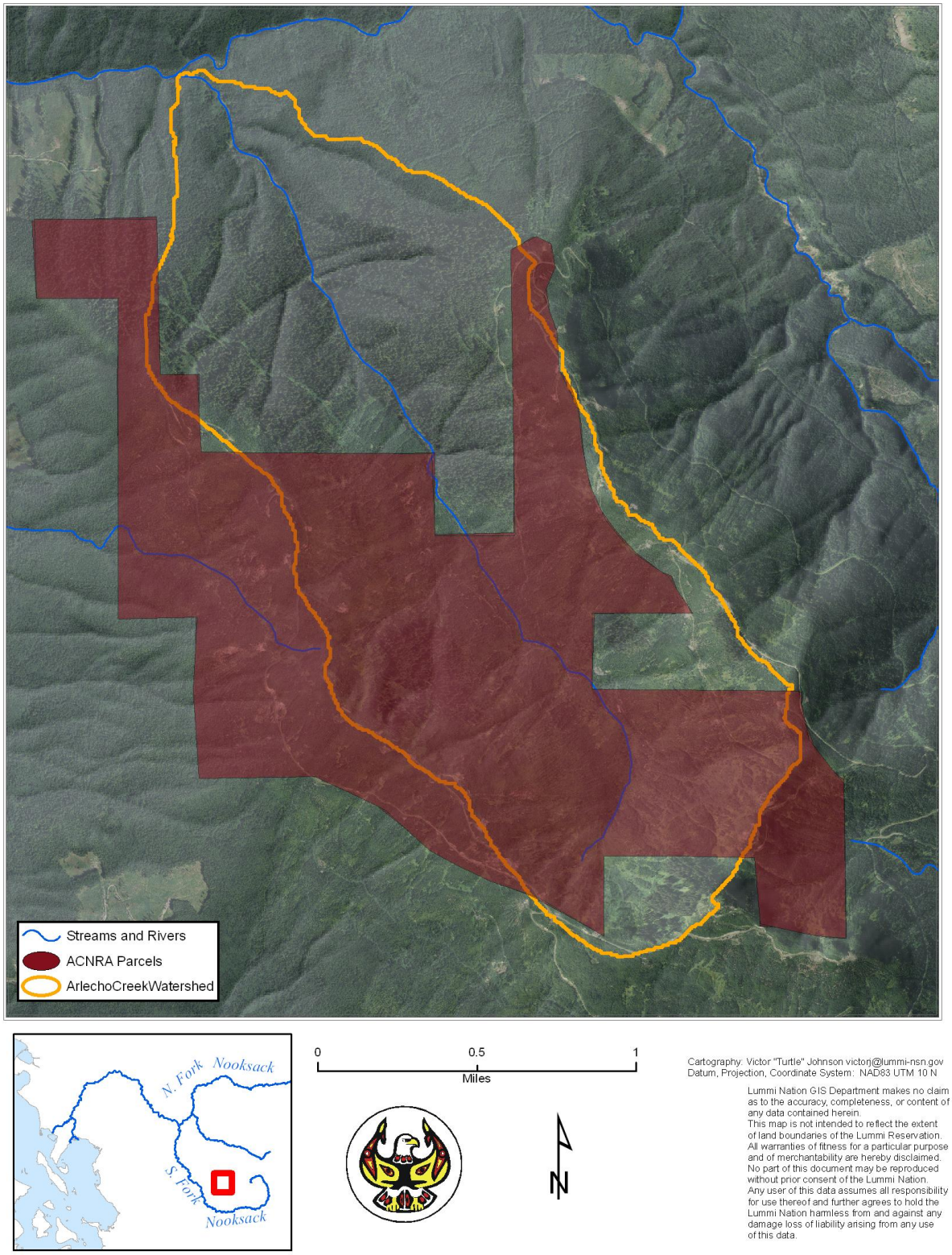


Figure 11. Arlecho Creek Conservation Area

1.20.3 Madrona Point

Madrona Point is a small 26-acre peninsula located adjacent to the town of East Sound on Orcas Island in San Juan County (Figure 12). The property was historically used by the Lummi people as a burial site and is culturally significant. It was purchased in 1988 by the Lummi Nation for $2,250,000 and is to be preserved into perpetuity. Because Madrona Point contains culturally sensitive resources, it is closed to the public. The Tribal Historic Preservation Office and the Planning Department are the primary managers of the property.

Approximately 20 of the 26 acres on Madrona Point are forested. The Forestry Division conducted a stand assessment in 2006 to determine species composition, trees per acre, basal area per acre, and to assess stand health. Douglas-fir is the dominant tree species present and comprised approximately 82% of the total stem count. The remaining tree species consisted of miscellaneous hardwoods including Pacific madrone (*Arbutus menziesii*), bitter cherry (*Prunus emarginata*), bigleaf maple, common juniper (*Juniperus communis*), and Pacific yew (*Taxus brevifolia*). Lesser vegetation was also noted at each plot location during the assessment and included ocean spray, snowberry, Douglas maple (*Acer glabrum var. douglasii*), one-seed hawthorne (*Crataegus monogyna*), Pacific ninebark (*Physocarpus capitatus*), Nootka rose (*Rosa nutkana*), salmonberry, salal, bedstraw, Oregon grape (*Berberis nervosa*), swordfern, and English ivy (*Hedera helix*). Based on the cruise data and lesser vegetation assessment, it was determined that the Douglas-fir-Pacific madrone/ocean spray-snowberry habitat type is present on Madrona Point.

The stand on Madrona Point is well stocked but stand health is moderate to poor. Although an exact age was not obtained during the assessment, the bark on the Douglas-fir trees exhibit the characteristic old-growth appearance and there was no notable evidence of past harvest indicating that the stand may be quite old. Of the trees sampled, 12% were dead and 7% have severe infestations of English ivy, particularly on the perimeter of the stand. Trees along the stand perimeter and located in the saltwater spray zone have a wind-swept appearance, blown out tops, and reduced crowns.

Given the age, location, and current health of the stand, it is assumed that the stand will continue to degenerate. Few seedlings were noted regenerating in the understory. Notable gaps are present where large Douglas-fir trees have been blown down or have died from old age or from succumbing to English ivy. Many of these gaps have filled in with brush species, particularly ocean spray. Without a large-scale disturbance, it is expected that the stand will continue along this development trajectory.

Figure 12. Madrona Point Conservation Area

- **1.21 Lummi Forestry Program**

  Prior to the inception of the 638 Program in 1979, timber sale contracts and timber cutting permits were processed and administered by various offices and field agencies of the Bureau of Indian Affairs (BIA). Beginning in 1980, under the Public Law (PL) 93-638 Contract with the Lummi Nation, timber harvests were administered by field foresters from the BIA, Puget Sound Agency. Harvests were selected on an area control basis to meet 638 Contract requirements. Units were identified first by landowner request and then by stand criteria (i.e., age, accessibility, stand condition, and need for conversion) (INFO, 2009). In 1990, the Lummi Nation entered into an agreement with the United States to carry out a Self-Governance Demonstration Project, which continues today. As part of the Self-Governance Demonstration Project, the Lummi Nation received all funding for the Forestry Program and became responsible for administering the program on trust lands of the Reservation according to the requirements set forth in the National Indian Forest Resource Management Act (NIFRMA). The Tribe receives annual funding from the BIA for this purpose, which pays for professional forest management services that are provided to trust landowners free of charge. Timber sale contracts and timber cutting permits are processed and administered internally by the Forestry Division but are submitted to the BIA for final approval. A complete description of the timber sale contract and timber cutting permit process is provided in the Forestry Permits and Timber Sale Contracts Handbook (Appendix 9).

  - **1.21.1 Program Organization**

    The Lummi Forestry Division is a component of the Lummi Natural Resources Department and consists of one full-time Forest Manager and one full-time Forest Technician (Figure 13). The divisions within the Lummi Natural Resources Department cooperate by reviewing projects, providing comments, participating in on-site inter-disciplinary (ID) teams, and by providing professional and technical advice in their respective fields of authority.

  - **1.21.2 Program Funding**

    The Forestry Division receives annual funding for program administration from the Lummi Indian Business Council (LIBC). The Bureau of Indian Affairs (BIA) provides these funds to LIBC through the Tribe's annual funding agreement. The Forestry Division also receives ten percent of the revenues derived from timber harvests on trust lands of the Reservation when such products exceed a market value of $5,000. These funds are termed forest management deductions and can only be used to perform forest management activities as required by the Code of Federal Regulations and LIBC Resolution #2001-124. In addition to these two funding sources, the Forestry Division also receives funding for fire preparedness. These funds can only be used to purchase firefighting supplies and to assist in fire suppression activities. Historically, the Forestry Division has also applied for and received add-on funding from the BIA for special projects such as the 2007 Reservation-wide forest inventory and analysis.

    A historical record of annual funding provided to the Forestry Division by the LIBC between the years of 1990 and 2009 is provided in Appendix 1. Funding steadily diminished between 1990 and 2002. After 2003, funding increased significantly and peaked in 2006.

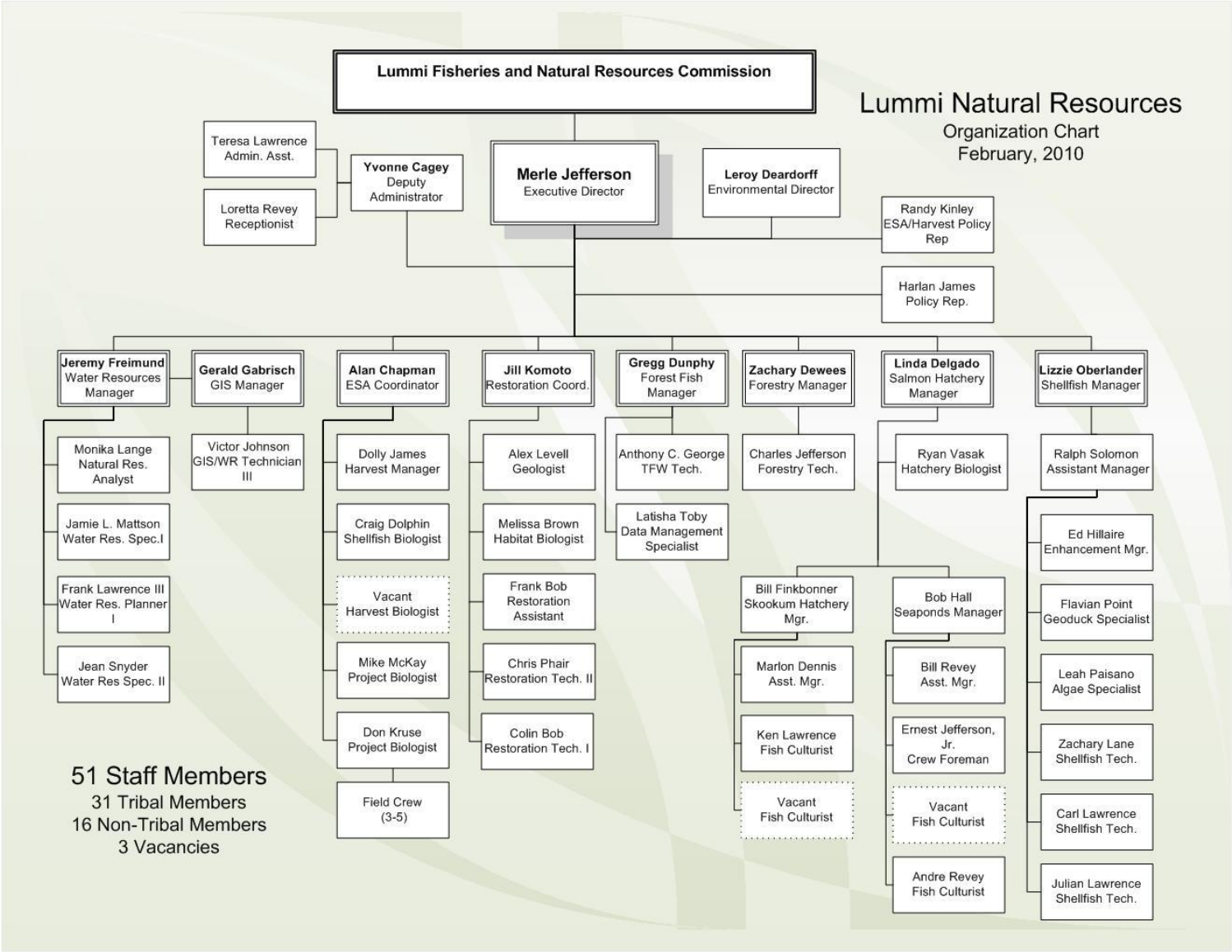


Figure 13. Organizational Chart for the Lummi Natural Resources Department

1.21.3 Federal Program Regulations

Although the Lummi Nation is a self-governing tribe, the Tribe is still subject to the federal laws and regulations that govern forest management on Indian trust lands. These laws and regulations are outlined in the National Indian Forest Resources Management Act of 1990 (NIFRMA) and the Code of Federal Regulations (CFR) respectively.

The NIFRMA was enacted to protect Indian forestlands from trespass, unauthorized harvests, and poor management. The NIFRMA requires the federal government to undertake management activities on Indian forestlands, which must incorporate the principles of sustained yield and include tribal participation. The NIFRMA also provides the federal government with final approval authority on all harvests of Indian forest products from trust lands. CFR Part 163, General Forestry Regulations outlines the administrative requirements for the sale and use of Indian forest products in order to meet the NIFRMA requirements.

In addition to NIFRMA and CFR Part 163, forest management and permitting activities on the Lummi Reservation are also subject to the National Environmental Policy Act (NEPA), the Clean Water Act (CWA), the Clean Air Act (CAA), the Endangered Species Act (ESA), the Bald and Golden Eagle Protection Act (BGEPA), the Migratory Bird Treaty Act (MBTA), the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), the National Historic Preservation Act (NHPA), and the Archaeological Resources Protection Act (ARPA).

1.21.4 Tribal Program Regulations

Title 10.18 – Forestry in the Lummi Code of Laws establishes the Tribe's management authority over forest resources within the Reservation and clearly defines the permitting requirements for the harvest and use of forest resources. Permits specifically addressed in Title 10.18 include firewood permits, beachwood permits, timber cutting permits, and burn permits. In addition to Title 10.18, forest management and permitting activities on the Lummi Reservation are also subject to Title 13 Tidelands Code, Title 15 Land Use, Zoning, and Development Code; Title 17 Water Resources Protection Code; Title 18 Solid Waste Control and Disposal Code; Title 40 Cultural Resources Preservation Code, and the Lummi Nation Coastal Zone Management Plan.

1.21.5 General Goals of the Lummi Forestry Division

General goals of the Forestry Division were developed from responses obtained from a survey of 25 tribal members conducted in 1994. The survey was conducted to provide tribal members with direct input into the policies and management practices contained within the Forest Management Plan. The survey was distributed to nearly 2,500 tribal members and tribal staff through the Squol Quol (Lummi newspaper) and at staff meetings. The goals were ranked in order of importance. The objectives and methods that will be employed by the Forestry Division to achieve each of these general goals are provided in Table 5.

Table 5. General Goals of the Lummi Forestry Division

Goals	Methods
1. Water Quality	Ensure adequate protection of water quality by: implementing best management practices for timber harvesting, forest road construction, and reforestation; adhering to land use permit conditions and buffer requirements provided by the Lummi Water Resources Division; and suspending operations when water resource issues are identified until they are corrected.
2. Wildlife	Avoid or minimize negative impacts to wildlife by: adhering to buffer requirements and protection measures, retaining wildlife reserve trees and downed woody debris where possible during timber harvest, clumping leave trees around sensitive areas to maximize habitat value, and practicing commercial thinning operations to increase structural diversity within plantations.
3. Cultural	Eliminate disturbance of cultural resources by: consulting with the Lummi

Values	Tribal Historic Preservation Office (THPO) and adhering to THPO land use permit conditions and buffer requirements
4. Recreation	Provide/retain recreational opportunities where possible.
5. Employment Opportunities	Create natural resource employment opportunities for tribal members where possible from reforestation, stand maintenance, thinning, and firewood cutting projects.
6. Logging Practices	Minimize negative impacts associated with timber harvest by: implementing best management practices for timber harvesting and forest road construction, employing responsible harvest unit and road design, conducting harvest operations during the dry season to protect soil and water resources, selecting appropriate harvest systems and equipment, observing resource protection requirements, employing road and skid trail maintenance practices, suspending operations when resource issues are identified until they are corrected, and using aesthetic buffers where appropriate.
7. Reforestation	Ensure successful reforestation after timber harvest by: implementing adequate site preparation; selecting appropriate reforestation species; purchasing vigorous stock types from acceptable seed zones; ensuring proper seedling handling, transport, and storage; planting during the planting season (Jan. 1 – March 31) and at densities conducive to timber production; ensuring proper planting techniques; employing wildlife damage protective measures; employing timely release treatments; and scheduling inter-planting where necessary.
8. Timber Sale Revenue	Manage stands to provide a sustainable income source for tribal members by: maximizing timber sale revenues through proper sale and marketing, harvesting stands before natural mortality occurs, and ensuring adequate reforestation and stand density management.
9. Herbicide Use	Ensure responsible and judicious use by: employing integrated pest management principles, using manual control methods where appropriate, only permitting the use of general-use herbicides, implementing best management practices, ensuring application efficacy, adhering to land use permit conditions provided by the Lummi Water Resources Division, and posting public notices when necessary.
10. Wetland Preservation	Ensure adequate protection of wetlands by: consulting with the Lummi Water Resources Division and adhering to land use permit conditions and buffer requirements; preparing wetland mitigation plans where timber harvest occurs in forested wetlands.
11. Firewood	Increase tribal opportunities for firewood cutting by: advertising firewood cutting opportunities in the Squol-Quol; issuing firewood and beachwood cutting permits; and coordinating with state and federal agencies.
12. Thinning[1]	Practice stand density management by: identifying overstocked plantations that need thinning treatments and creating a prioritization list; practicing timely thinning treatments before stand growth, vigor, and health are significantly reduced; managing stand densities according to accepted stand density management guidelines; retaining leave vigorous trees; and increasing structural diversity.
[1]This was not included in the original survey but was added to this section since thinning is an important forest management activity.	

- **1.21.6 Economic Benefits**

  The methods described in Table 5 will allow the Forestry Division to manage stands in a manner that produces economic value to the landowners while providing continued ecological services, cultural and aesthetic value, and employment opportunities.

  Since the sustainable annual allowable cut permits harvest on approximately 80 acres per year, direct economic benefits from timber harvesting will be limited to individuals who choose to log their property. Most decisions of when to harvest are based on the landowner's current management objective and timeframe rather than a specific economic rotation age where net present value is maximized. Depending on the quantity and quality of harvest volumes, current market prices, and assuming a timber harvest rate of 80 acres per year, timber harvests on the Lummi Reservation have the potential to produce revenues for landowners in excess of $500,000 each year.

  In addition to the 2 full time employees (1 non-native, 1 native), forest management activities provide business and employment opportunities for interested tribal members within the community. Slash burning, tree planting, vegetation management, pre-commercial thinning and reforestation surveys are typically contracted out and preference is given to tribal members in the bidding process. Most forest consulting and logging activities are awarded to non-natives due to a lack of qualified and/or interested native firms.

- **1.21.7 Harvest History**

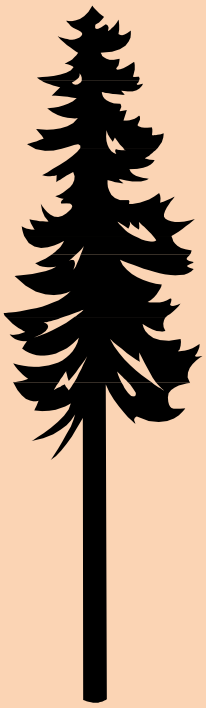
  Timber harvesting has occurred on the Lummi Reservation since the late 1800's but harvest volume records until 1954 are intermittent and incomplete. Since 1954, records on harvest volumes have been kept and are provided in Appendix 1.

- **1.21.8 Plantation Management History**

  Since the beginning of tribal involvement in the Forestry Program in 1979, the Forestry Division has maintained an active reforestation and plantation management program. Over the past 30 years, records indicate that 1,345 acres have been replanted and 1,009 acres have received some type of release treatment. A lack of adequate program funding prevented reforestation projects prior to 1979. As a result, many of the second and third-growth timber stands on the Lummi Reservation were regenerated naturally and are mainly deciduous in content. Fortunately, hardwood values have increased significantly in recent years and constitute a more valuable timber resource than previously realized.

  A summary of plantation management history on the Lummi Reservation is provided in Appendix 1. This table represents the most complete record of plantation management history available for the Lummi Reservation. An "X" was placed in the column if no data was available or if the plantation did not receive the treatment. Unfortunately, the Forestry Division was unable to locate planting or maintenance records between the years of 1993 and 2004. Personal communication with LNR staff indicates that tree planting and plantation maintenance efforts did occur during this time period and the 2008 Forest Inventory Analysis Report indicates 254 acres of forested trust land in the 6 to 15-year age class.

Forest Inventory



- **2.0 Overview**

  A stand-based Reservation-wide forest inventory was conducted on the Lummi Reservation (excluding Portage Island) in 2007 under contract with International Forestry Consultants, Inc. (INFO). Fieldwork took place in late 2006 and into early 2007. The final inventory report was delivered in February 2007.

  The inventory was designed by the Forestry Division and was conducted using Atterbury Consultant's variable log length timber cruising system and the Atterbury SuperAce timber cruising software. The inventory was funded predominantly through add-on funding received from the Forest Management Inventory and Planning Division of the BIA Northwest Regional Office. In total, 901 plots were taken yielding a project sampling error of 3.8%.

- **2.1 Inventory Methodology**

  - **2.1.1 Stand Typing**

    Stand types were refined and updated from existing stand types using high-resolution aerial photographs. Stand types were first separated into four categories based on the predominant land use. Forested stand types were further delineated by species composition, size class, and stocking. The minimum timber type size was set at 5 acres. All timber types less than five acres were included with an adjacent stand that most closely reflected that stand's composition. Preliminary timber type calls and type lines were adjusted by INFO where necessary as the inventory progressed.

    Stand Type Example: RCgfMt57. In this stand, western red cedar (RC) is the dominant species by volume followed by grand fir (gf). This stand contains medium sized saw timber (Mt) and has 51 to 70% crown cover (57).

  - **2.1.2 Cruise Intensity**

    Cruise intensity was based on stand acreage to achieve a target sampling error of 7% or less at one standard deviation (68.1% confidence limit) on a Reservation-wide level. In total, 712 plots were installed in merchantable timber types and 189 plots were installed in pre-merchantable timber types.

  - **2.1.3 Plot Distribution**

    Plots were distributed throughout timber types on a square or rectangular grid using ARCinfo GIS. Plots that were added or dropped during the timber cruise were noted on field maps and/or recorded with a GPS unit and updated in GIS.

  - **2.1.4 Plot Design**

    At each sample location within merchantable timber types, a point sample was taken to determine stand volume and other relevant stand metrics, a nested 1/50th-acre fixed-area plot was taken to determine understory regeneration, and another nested 1/100th-acre fixed-area plot was taken to determine species composition of lesser vegetation.

    At each sample location within pre-merchantable timber types, a 1/50th-acre fixed-area plot was taken to determine seedling or sapling count and a 1/100th-acre fixed-area plot was taken to determine species composition of competing vegetation.

  - **2.1.5 Site Trees**

    Site trees of the predominant species that were in the dominant crown class, healthy, and visibly free of defect were selected and measured to determine site index and total age of the stand. Five site trees were measured in stands greater than 10 acres. Three site trees were measured in stands less than 10 acres. Red alder was the most common site tree species used.

- **2.1.6 Check Cruising Requirements**

  Five percent of each cruiser's work in merchantable stands was inspected to ensure compliance with the tolerance limits provided in the contract. No non-compliance trends were identified.

- **2.2 Inventory Reports**

  A summary of each inventory report generated from the forest inventory is provided below. Full reports can be referenced for further detail.

  - **2.2.1 Tract Summary**

    The tract summary report lists the total timbered acres, non-stocked acres, and non-timbered acres and the volume total for the entire Reservation in net MBF. There are approximately 11,653 acres within the boundaries of the reservation (excluding Portage Island). Approximately 5,360 acres are considered timbered (46% of the land base), which contain approximately 52,193 MBF. Approximately 328 acres of timberland (2.8% of the land base) are considered non-stocked.

  - **2.2.2 Non-Stocked and Non-Timbered Acres**

    The non-stocked and non-timbered acres report is a more detailed version of the tract summary. It reports the acreage total for the Reservation based on land use cover. In addition to listing timbered acreage and non-stocked timbered acreage, it also lists non-timbered acreage such as open space/brush, forested wetlands and developed lands. A summary of this report is provided in Appendix 2.

  - **2.2.3 Catalog - Species Volumes**

    The catalog – species volumes report contains relevant stand metrics by individual species and for all species combined for each timber type. Metrics contained in this report include age, site index, average DBH, average form factor, average total height, stocking normality, basal area per acre, trees per acre, logs per acre, average log volume in cubic and board feet, total net cubic and board feet per acre, total cubic units, and total MBF. For multi-aged stands, the report lists each age class and its associated metrics separately. It includes both merchantable and pre-merchantable timber. Timber types are listed by township, range, and section.

  - **2.2.4 Project Statistics**

    The project statistics report provides a statistical analysis for the entire inventory project. It reports the total number of sample plots taken, trees cruised, the average number of trees per plot, and the percent of the trees sampled. This table also provides a stand summary by species and reports the coefficient of variation and standard error (both in percent) for board feet, cubic feet, trees per acre, basal area per acre, net board feet per acre, and net cubic feet per acre. A statistics report was also produced for each timber type. A summary of the project statistics report is provided in Appendix 2.

  - **2.2.5 Reservation-wide Stand Type Summary Table**

    The Reservation-wide stand type summary table provides a summary of relevant stand metrics for each timber type including total acres, board feet per acre, basal area per acre, trees per acre, stand type call, and total MBF. In its entirety, this table includes forested types and non-forested types. The stand type summary table for forested types is provided in Appendix 2.

  - **2.2.6 Understory Vegetation**

    The understory vegetation table lists the predominant understory vegetation cover for each timber type.

  - **2.2.7 Species, Sort, and Grade (Board Foot Volumes)**

    The species, sort, and grade report lists the total volumes for individual species by sort and grade for all timber types combined on the Lummi Reservation. It reports the following for each

species, sort, and grade combination: percent of the total net board foot volume, percent defect, gross and net board foot volume per acre, total net MBF, the percent of the total net board foot volume that falls within a pre-defined scaling diameter and log length range, the average log length, the average number of board feet in the average log, and the average number of logs per acre.

A pie chart displaying total net volumes (MBF) of conifer vs. hardwood is provided in Figure 14 and a bar graph displaying volumes (MBF) by individual species is provided in Figure 15.

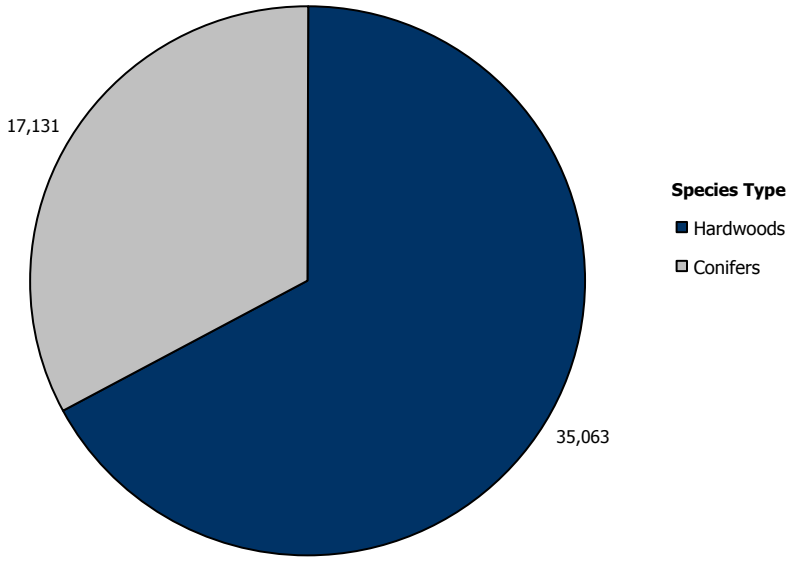


Figure 14. Total Net Volume (MBF) of Conifer vs. Hardwood on the Lummi Reservation

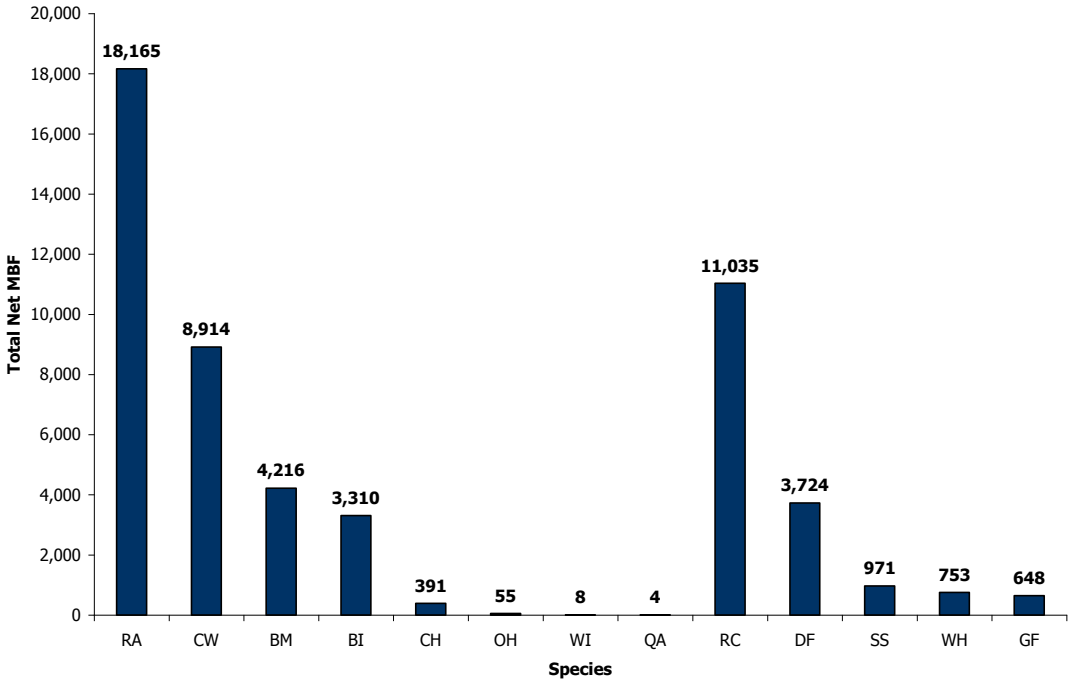


Figure 15. Total Net Volume (MBF) by Species on the Lummi Reservation

Red alder is the predominant species by volume on the Lummi Reservation followed by western red cedar and black cottonwood. A species, sort, and grade (board foot volumes) report was also produced for each merchantable timber type. The species, sort, and grade report and the statistics report are used when planning timber cruises for harvest operations. The species, sort, and grade report is also used to establish a preliminary timber valuation, which assists in the planning phase of the timber harvest process.

- **2.2.8 Stand Table Summary**

  The stand table summary lists cruise trees by species and DBH class. For each DBH class, it reports the number of trees cruised, average form factor, average total height, trees per acre, basal area per acre, logs per acre, net cubic and board foot volume of the average log, tons per acre, net cubic and board feet per acre, total tons, total cunits, and total MBF. A stand table summary report was also produced for each timber type.

- **2.3 Inventory Maps**

Inventory maps produced from the forest inventory include the final stand type map of the entire Reservation (Figure 16) and a stand type map depicting plot locations. These maps were provided as hard copies and as shapefiles to be used in GIS. Metrics listed in the reservation-wide stand type summary table were entered into the attribute table for each stand type in the shapefile to make the stand type layer more useful.

0 1 2
Miles

Cartography: Victor "Turtle" Johnson victorj@lummi-nsn.gov
Datum, Projection, Coordinate System: NAD83 UTM 10 N

Lummi Nation GIS Department makes no claim as to the accuracy, completeness, or content of any data contained herein.
This map is not intended to reflect the extent of land boundaries of the Lummi Reservation.
All warranties of fitness for a particular purpose and of merchantability are hereby disclaimed.
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Figure 16. Stand Type Map of the Inventoried Area of the Lummi Reservation

- **2.4 Forest Inventory Analysis**

A forest inventory analysis was conducted for trust lands only (excluding Portage Island) under contract with International Forestry Consultants, Inc. (INFO). The inventory analysis was started in late 2008 and delivered to the Forestry Division in February of 2009. It was funded predominantly through add-on funding received from the Forest Management Inventory and Planning Division of the BIA Northwest Regional Office.

The purpose of the FIA was to determine future forest growth and to estimate the maximum allowable harvest in both volume and acreage that is sustainable on trust lands of the Lummi Reservation. A summary of the FIA results is provided in Table 6. Fee land is included in this table for comparative purposes but was not included in determining the growth/year, indicated allowable cut, regulated allowable cut, or sustainable allowable cut.

Table 6. Forest Inventory Analysis Summary for the Lummi Reservation

Factor	Trust	Fee
Acreage	7,863	3,264
Forested Acreage (stocked)	3,903	1,347
Forested Acreage (non-stocked)	237	72
Non-Forested Acreage	3,723	1,846
Total Volume MBF	39,806	12,387
Volume (MBF)/Acre	10.2	9.2
Site Index (DF)	94	91
Growth/Year	4.4%	*
Indicated Allowable Cut (MBF)	1,767	*
Regulated Allowable Cut (Acres)	83	*
Sustainable Allowable Cut (MBF)	1,459	*

- **2.4.1 Forest Condition**

The condition within each stand is comparatively described by the type call and the volumes/acre in the inventory reports (INFO, 2009). In general, forested stands on the Lummi Reservation are moderately to poorly stocked and many stands contain areas of open brush as a result of historic cutting practices and a lack of an active reforestation program. Many of the mature stands present throughout the Reservation were naturally regenerated after the logger and/or landowner selectively harvested the largest and most valuable trees leaving the smaller, low-value species with defective growth habits to re-seed the area. Large areas of the reservation also contain a high water table that prevents the growth of species other than cottonwood. Although stocking is considered to be poor to moderate, growth rates are good.

Because of the poor stocking, there is significant growth of vine maple, willow, and other undesirable woody brush species. This heavy brush component prevents the natural regeneration of desirable tree species (INFO, 2009). Establishing forestry plantations at densities conducive to timber production and implementing brush control measures can greatly improve future stocking. No insect, disease, or significant animal damage problems were detected during the inventory.

- **2.4.2 Age Class Distribution**

A significant portion of forested trust land on the Lummi Reservation is mature to over-mature. 35% of the forested land base is under the age of 25 years, 10% is between the ages of 25 to 50 years, and 55% is 55 years and older. A bar graph displaying the age class distribution (in 5 year intervals) by acreage is provided in Figure 17. A pie chart displaying the percent contribution of each age class for all forested trust land is provided in Figure 18.

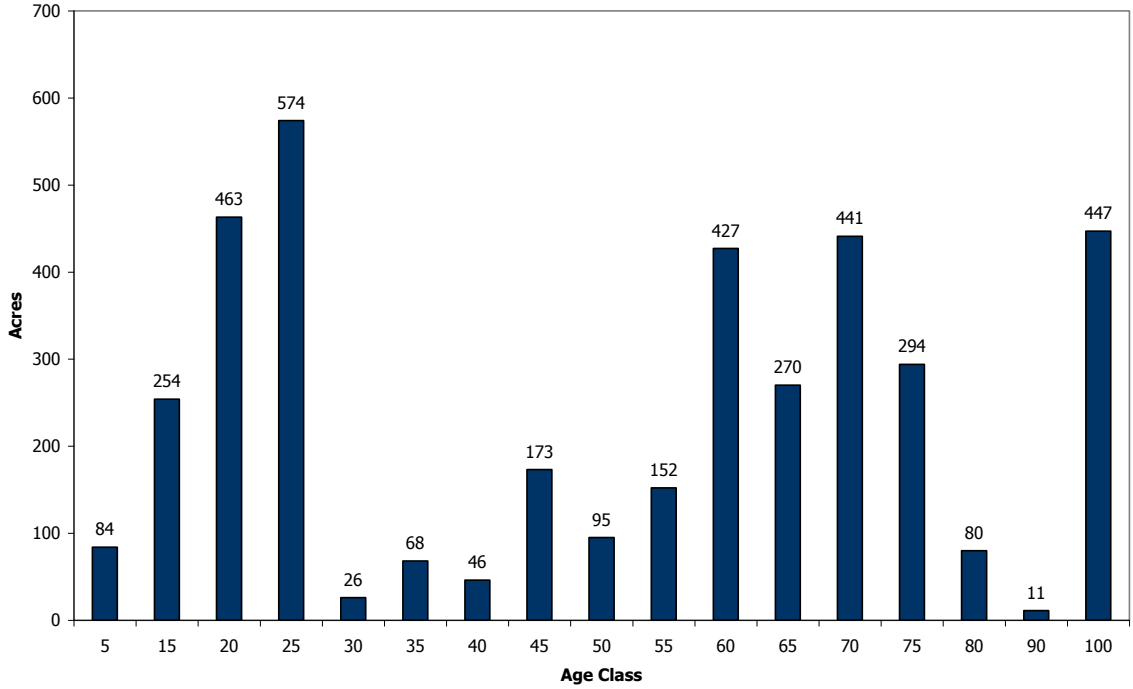


Figure 17. Age Class Distribution by Acreage of Trust Lands on the Lummi Reservation

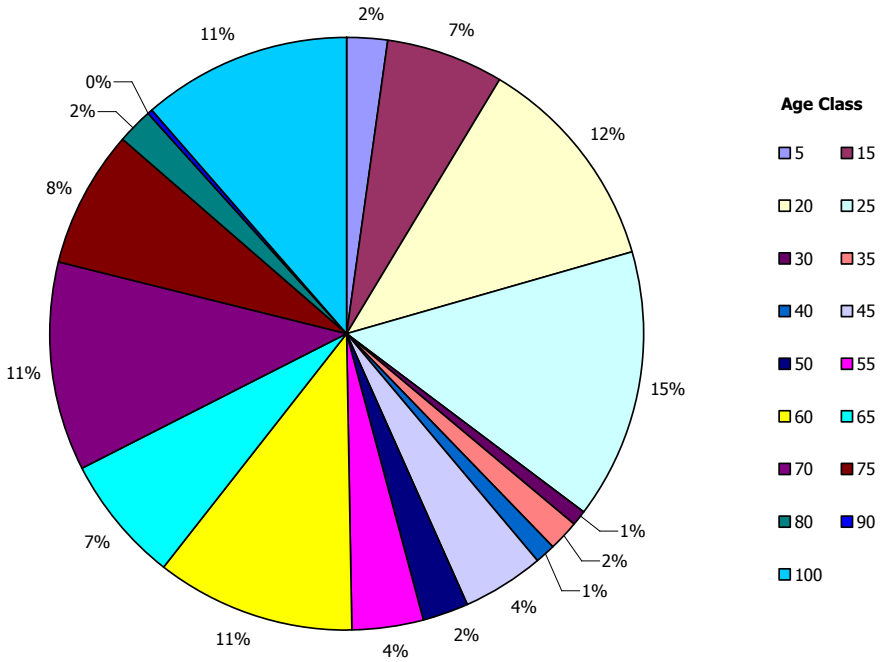


Figure 18. Percent Contribution of Each Age Class for all Forested Trust Land on the Lummi Reservation

2.4.3 Site Index

Site index is a measure of the land's potential productivity for a particular tree species and is based on the relationship between tree height and tree age of dominant and co-dominant trees. The higher the potential productivity of a site, the taller a tree will be at a given base age. The base age most commonly used is 50-years old. Thus site index is expressed as the potential tree height at the age of 50 (age taken at DBH).

Site index provides a measure for standardized comparisons of productivity between sites and across a range of existing stand conditions. It can be used as a silvicultural tool to prescribe treatments and analyze investments and also serves as the main driver for many growth and yield models, which predict future forest growth and timber yields (Nussbaum, 1996).

Based on site index information provided in the Whatcom County Soil Survey for major soil types in forested areas on the Lummi Reservation, the 50-year site index values for red alder range between 85 and 95 with an average of 88 indicating an average site class value of 3. The 50-year Douglas-fir site index values range between 100 and 130 with an average of 116 also indicating an average site class value of 3.

Since most timber stands on the Lummi Reservation do not contain acceptable Douglas-fir site trees or are more suitable for the growth of red alder, most site index measurements were taken on dominant and co-dominant red alder trees. The average 50-year site index value obtained for red alder was 90 indicating a site class value of 3, which is consistent with the values provided in the Whatcom County Soil Survey. Therefore, at age 50, dominant red alder trees could be expected be 90 feet tall. On Douglas-fir sites, the average 50-year site index value obtained from the inventory was 121 indicating a site class value of 2, which is close to the average site index value of 116 and site class value of 3 listed in the Whatcom County Soil Survey. The validity of some of the Douglas-fir site measurements are in question since the volumes/acre listed in yield tables for site class 2 ground are higher than volumes/acre measured or historically harvested on the Lummi Reservation. A site class map of the Lummi Reservation was developed from site index values obtained from the forest inventory (Figure 19). Site class values (base 50) were determined using site index tables published by Norman Worthington and others (red alder), James King (Douglas-fir), and Ken Wiley (western hemlock).

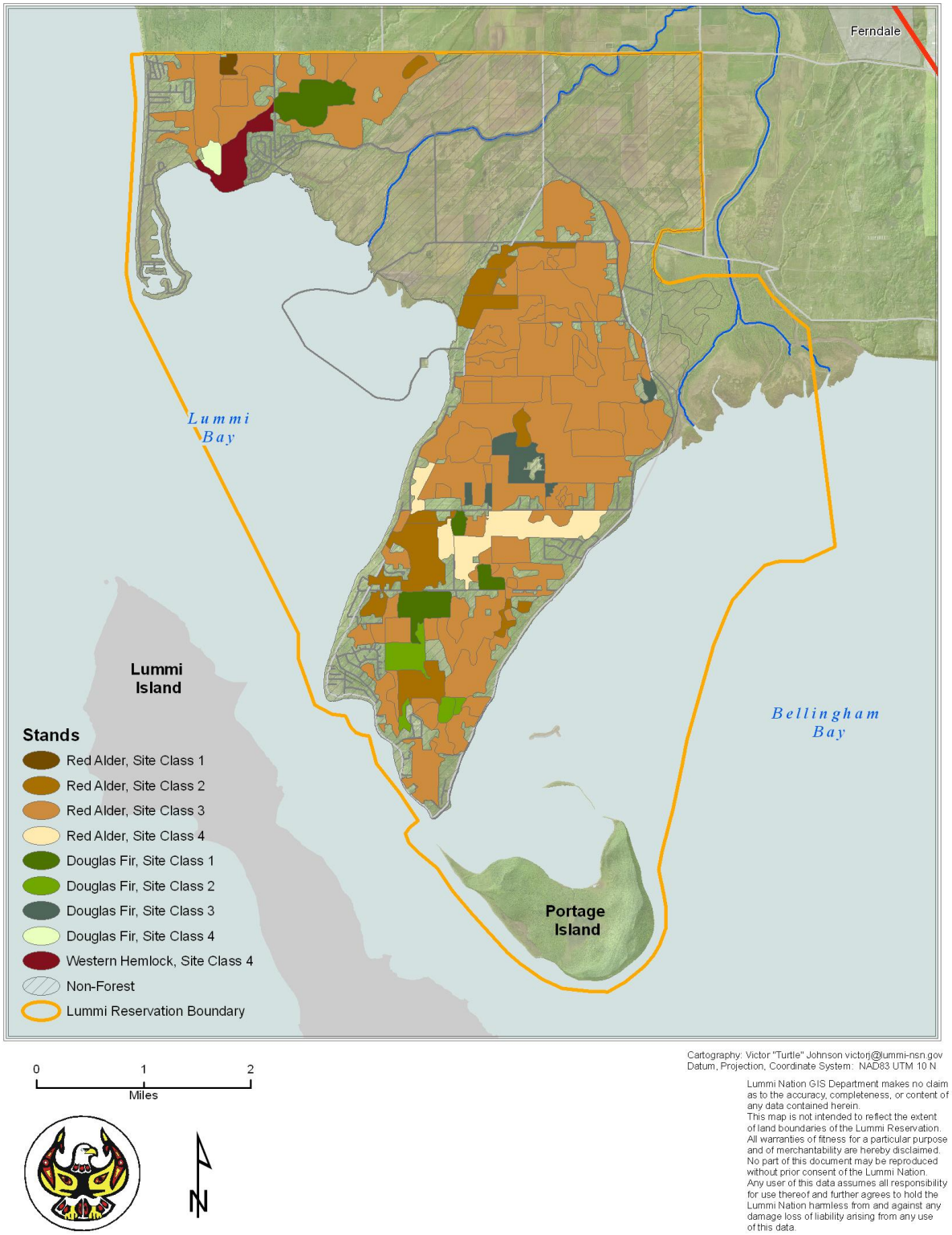


Figure 19. Site Class Map of the Lummi Reservation

2.4.4 Forest Growth Per Year

Forest Projection and Planning System (FPS) software was used by INFO for growth projection analysis on trust lands. In this system, growth/year is calculated from growth equations based on site quality, competition, and measured growth. Growth includes the effects of in-growth (establishment of new trees), accretion (growth of trees from one period to the next), and mortality (death of other trees) (INFO, 2009).

Growth on forested trust lands of the Lummi Reservation was calculated at 4.44% per year. On the Reservation as a whole, growth was calculated at 3.53% per year.

2.4.5 Optimal Rotation Age

The optimal rotation age is the age at which land value is greatest. This was calculated using the Faustmann formula. Based on maximization of land value under typical forest management regimes, the average optimal rotation age was determined to be 47 years. The rotation age calculation and the optimal rotation age for each timber type are provided in the inventory analysis report. Rotation ages on the Lummi Reservation range between 40 and 60 years old.

2.4.6 Sustainable Annual Allowable Cut

The Sustainable Annual Allowable Cut (AAC) was determined using the FPS Harvest Scheduler. The sustainable AAC is calculated from growth equations that are based on site index, species age, crown ratio, tree size, and stocking levels (INFO, 2009). Using FPS, a sustainable AAC over 50 years was calculated at 1,459 MBF per year. Over the first 10-year planning period, approximately 1,457 MBF or 81 acres per year can be harvested.

The FPS variables used in this harvest schedule calculation were:

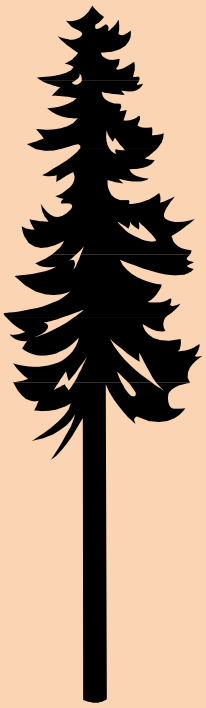
- Minimum stand size = 1 acre
- Maximum clearcut size = 60 acres
- Minimum BF volume/acre = 1,000 BF

All stands were grown through the entire planning horizon and the same merchantability standards set forth in the original inventory were included in the projected yields (INFO, 2009). The allowable harvest number also assumes harvested stands will be re-planted. A copy of the FPS Forest Harvest Report is provided as an appendix to the inventory analysis report.

The Forestry Division will set the target AAC to 700 MBF or 40 acres per year to account for non-participation by landowners since the Forestry Division cannot control when Assignment landowners will want harvest their timber. However, the AAC may exceed 700 MBF or 40 acres per year up to the calculated sustainable AAC of 1,459 MBF or 81 acres per year if demand and staff are adequate.

The AAC figure is a benchmark that will be used in harvest scheduling. Flexibility will be maintained to enable response to market conditions or other unforeseen factors.

Timber Harvesting



- **3.0 Overview**

  Timber harvesting represents the culmination of many years of forest growth. Depending on the forest type(s), timber harvesting may only occur once every 30 to 80 years, possibly longer. The primary goal of timber harvesting on trust lands of the Lummi Reservation will be to meet landowner objectives while ensuring adequate resource protection.

  The complexity of timber harvesting requires substantial amounts of information and planning to develop a systematic harvest strategy. Factors to consider include cutting prescription; harvest unit design; season of operation; logging equipment; soils; terrain; log extraction methods; road, skid trail, and landing location; water, cultural, and wildlife resources; aesthetics; and adjacency constraints. The following section includes pertinent information on each of these topics along with best management practices that will be used by the Forestry Division to develop viable harvest strategies.

- **3.1 Management Systems**

  Management systems are classified as either even-aged or uneven-aged. In even-age management systems, all or most of the trees are harvested at the same time. The next generation of trees will be approximately the same age and will be managed as a single cohort. At most, an even-age stand will have 2 distinct age classes. In contrast, un-even age management systems use selective harvesting techniques resulting in a forest structure with at least 3 different age classes (Hanley and Baumgartner, 2005).

  Even-age management systems are commonly used in Washington since they have proven to be more effective in achieving common management objectives. Accordingly, the Forestry Division will practice even-age management of western red cedar, red alder, and Douglas-fir. In cases where the majority of the trust ownership desires a continuous forest cover on their property, adjustments can be made to the even-age system to meet the landowner's aesthetic requirements such as retaining more leave trees and employing patch cuts or by employing uneven age harvest strategies.

  - **3.1.1 Even-Aged Management Systems**

    There are three main types of even-aged harvesting systems. These include the clearcut, seed tree, and shelterwood systems. The clearcut system is preferred since it is more effective than the seed tree or shelterwood systems at meeting common management objectives for most forest types found in western Washington and offers many economic, silvicultural, and operational advantages (Hanley and Baumgartner, 2005). This is especially true if regenerating shade-intolerant species such as Douglas-fir and red alder. The seed tree and shelterwood systems were excluded from further consideration for the following reasons:

    1. Many of the mature stands present on the Lummi Reservation were regenerated naturally. These stands are typically poorly stocked, contain many low-value species, and have trees with defective growth habits. These stands were likely high-graded wherein the logger and/or landowner selectively harvested the largest and most valuable trees leaving the smaller, defective, and low-value species to re-seed the area. Employing the seed tree or shelterwood systems within these stands would only perpetuate the inferior genotypes and phenotypes currently present.
    2. The seed tree and shelterwood systems depend largely on natural regeneration to fill in the openings created during harvest. Since artificial regeneration is the preferred regeneration method in managed forests in western Washington, these even-age systems are less relevant that the clearcut system where artificial regeneration is typically required.
    3. Experience has shown that natural regeneration from valuable timber species following timber harvest on the Lummi Reservation is spotty and unpredictable. The explosive brush

growth that is commonly observed post harvest on the Lummi Reservation further reduces the potential for acceptable levels of natural regeneration.

4. A high water table exists throughout most of the Lummi Reservation due to the geologic history of the area resulting in shallow rooting depths. Since the Lummi Reservation is a peninsula, it is more exposed to strong winds coming in from the Puget Sound. Shallow rooting depth and high winds can result in significant blowdown especially on more exposed sites. Therefore, it is probable that a high percentage of leave trees within a harvested area will blow down post harvest.
5. The shelterwood system is employed in areas where extreme temperatures can severely impact regeneration. This is not a problem on the Lummi Reservation since it experiences a modified marine climate, where extreme temperatures rarely occur.

Because of these factors, the clearcut harvesting system with reserve trees is the preferred even-age management system for the Lummi Reservation.

- **3.1.2 Clearcut System with Reserve Trees**

In the clearcut system, the stand's overstory is removed in a single harvest and a new even-aged stand is artificially regenerated. All snags and some wildlife trees are retained within the clearcut to provide habitat structures. Additional leave trees are sometimes left to mitigate for the aesthetic impacts. The cutting prescription is incorporated into the BIA Timber Sale Contract or in the Special Provisions of the BIA Paid Timber Cutting Permit. A common cutting prescription used on trust lands is described in the following excerpt from a BIA Timber Sale Contract:

"All merchantable and non-merchantable living trees with a DBH of 6 inches or greater shall be harvested and all live non-merchantable hardwood trees 20 feet in height and taller shall be cut. Healthy, sub-merchantable conifers may be retained as wildlife trees and/or for silvicultural reasons. Snags and standing cull conifer trees with a DBH of 16 inches or larger will be designated as wildlife trees within the upland portion of the harvest unit and will not be cut unless they are determined to be unsafe to forest workers. Within the Special Use Area, all green merchantable trees greater than 8 inches DBH shall be cut. All pre-merchantable timber, standing culls and existing snags shall be retained to provide perch trees, nest sites for cavity nesters, and forage areas for various bird species and shall not be cut unless they are determined to be unsafe to forest workers."

Cutting prescriptions will be adjusted as needed to meet site-specific management objectives or constraints.

- **3.2 Harvest Scheduling**

The goal of the Lummi Nation's timber harvest schedule is to support the management objectives of landowners and to achieve an approximate balance between maximizing net-growth and harvesting at the earliest practical time. The timber harvest schedule is driven predominantly by landowner requests. In order to effectively meet forest management and landowner objectives, harvest units will be prioritized on the harvest schedule based on the following guidelines.

- **3.2.1 Harvest Scheduling Guidelines**

1. Priority will be given to harvest units containing mortality caused by old age, blowdown, fire, insects and disease, overstocking (commercial thinning), or other causes to minimize value loss. When feasible, cutting boundaries and prescriptions will be designed to minimize the potential for future mortality.
2. The harvesting of second-growth stands will be scheduled on a first-come, first-serve basis.
3. Harvest units that are in close proximity to each other and can be combined as one sale will be given priority over harvest units that do not meet this qualification.

4. Timber harvests that are conducive to planned forest development projects will be given priority over timber harvests which do not meet this qualification.

Fluctuations in log markets, staffing, or other conditions may lead to departures from the harvest schedule. When necessary, the harvest schedule will be revised as needed to maintain a realistic harvest date.

- **3.3 Harvest Unit Design Guidelines**

Harvest units will be designed according to the following guidelines to minimize environmental and aesthetic impacts while remaining economically viable:

1. To the extent practical and permitted by the Water Resources Division, harvest within streams and wetlands and their associated buffers will be avoided or minimized.
2. To the extent practical and permitted by the Cultural Department, harvest within cultural resource management areas and their associated buffers will be avoided or minimized.
3. Harvest unit size will not exceed 60 acres unless otherwise approved by the Lummi Natural Resources Commission.
4. In determining maximum harvest unit size, the area will include the acreage of the proposed harvest unit and all contiguous acreage owned by the same landowner(s) that has been harvested in the past 3 years except when the acreage shares a common perimeter of 20% or less.
5. Where practical, an aesthetic buffer of vegetation no less than 25 feet in width will be left on the perimeter of harvest units which lie adjacent to roads or home sites or are otherwise highly visible to the general public to mitigate for aesthetic impacts.

- **3.4 Silvicultural Prescription (Harvest Plan)**

A silvicultural prescription (harvest plan) will be developed when necessary for all trust land timber sales on the Lummi Reservation. Components of the silvicultural prescription are provided in section 9.3.11 - Silvicultural Prescription of the Forestry Permits and Timber Sale Contracts Handbook (Appendix 9).

- **3.5 Logging Season**

Most logging operations will be restricted to periods of dry weather to prevent and minimize the potential for soil erosion, soil compaction, surface runoff, and water resource sedimentation. Logging during periods of wet weather can result in unacceptably high levels of damage to soil and water resources.

  - **3.5.1 Logging Season BMPs**

    1. Logging and road construction activities will be limited to a time period after June 1st but before November 1st unless otherwise approved by the LIBC Forest Manager.
    2. No work in connection with timber harvest operations should be performed when wet weather conditions cause saturated soils creating the potential for soil compaction, displacement, and other natural resource damage.
    3. Logging operations should be temporarily suspended in whole or in part if resource damage appears imminent until such time as weather and soil conditions become favorable to logging and road building operations.
    4. Commercial thinning operations that utilize a tracked feller-buncher or harvester and a forwarder may occur throughout the year when approved by the LIBC Forest Manager.

- **3.6 Harvest Systems**

Timber harvests will be accomplished with either ground-based or cable logging systems. Ground-based systems will be used on gentle to moderate slopes. Cable systems will be used in sensitive

areas where ground-based equipment is not appropriate or where ground-based equipment cannot safely or effectively operate. Ground-based systems are most often used on the Lummi Reservation due to the gentle topography.

- **3.6.1 Ground-Based Systems**

  Ground-based harvest systems are used in areas with slopes less than 30% when soil conditions are suitable. Trees are typically felled with mechanical falling equipment although trees may be felled manually where mechanical falling equipment is restricted. Harvested logs are attached to a wheeled skidder or crawler tractor using a cable or grapple and are skidded from stump to landing. Downhill skidding is preferred since it significantly increases productivity, reduces logging costs, and causes less site disturbance (Garland, 1997 A). For most ground-based skidding machines, downhill skidding is limited to slopes less than 30% while uphill and sidehill skidding is limited to slopes less than 20%.

  Ground-based harvest systems are simpler and cheaper than cable harvesting systems since they do not require the same level of expertise or labor to execute. However, productivity is typically lower and soil disturbance and/or compaction can be more of a concern (Kellogg, 2007). Some machines are better suited for use in clearcuts or selection harvests, while others work well in both. Matching the appropriate equipment to the harvest unit is important to ensure that management goals can be met while protecting forest resources.

- **3.6.2 Cable Systems**

  Cable harvest systems are used in areas with slopes greater than 30% or in areas containing sensitive soils where ground-based harvest equipment cannot be used. Trees are typically felled manually since the terrain restricts ground-based felling equipment. Harvested logs are harnessed to a cable system, which is attached to a yarder that pulls the logs up to the landing. Depending on the equipment and system used, logs may be pulled along the ground surface, partially suspended, or completely suspended off the ground surface. Cable systems typically yard timber uphill but some systems can also yard downhill if necessary. Depending on the type of rigging and yarder capability, cable yarding can be used in selection harvests as well as clearcuts (Greulich et al., 1996).

  Cable harvest systems are limited by the shape/terrain of the ground. The ground profile within a harvest unit can be classified as concave, planar, or convex. A concave ground profile is ideal for cable harvest systems since this shape provides the greatest deflection and therefore, the highest payloads. The most difficult profile is highly convex since this ground shape offers little or no deflection making payloads uneconomical. On planar shaped ground, necessary deflection can be achieved but most often will require rigging a tailhold tree 30 to 50 feet high and/or through the use of intermediate supports (Shiess et al., 1999).

  Poor cable system location can result in extremely expensive logging and cause resource damage. The road system must be planned, located, and constructed with the particular cable yarding system in mind (Greulich et al., 1996). Cable harvest systems require more technical knowledge and skill than ground based logging systems and are much more expensive and labor intensive to execute. Because of these factors, the harvest unit must contain sufficient volume and value for this system to be cost-effective.

- **3.7 Harvest Equipment**

  Cutting prescription, timber size, sale volume, production potential, topographic limitations, harvest costs, access, and environmental concerns should be taken into consideration in determining appropriate harvest equipment. Permitting inappropriate equipment can lead to increased harvest costs, unacceptable levels of site disturbance, surface runoff, erosion, and reduced site productivity (Parker and Bowers, 2006).

- **3.7.1 Tree Falling Equipment**

Most timber harvests on the Lummi Reservation are within the optimal operating range for mechanical falling equipment. Mechanical tree falling equipment offers greater production, volume recovery, and worker safety and less site disturbance than manual falling within the range of its operating environment. However, it also has distinct stem size limitations, is limited to relatively flat ground, and does not provide the same level of productivity in hardwood stands due to tree form (Erwin and Rummer, 2009 C). Mechanical falling machines are available as wheeled or tracked, drive-to-tree or swing-to-tree, and may be equipped with attachments that provide them the ability to top, de-limb, and buck logs (Appendix 3). A tracked, swing-to-tree, feller-buncher with a saw-head attachment is preferred for timber harvests on trust lands of the Lummi Reservation. Tracked swing-to-tree machines cause less soil disturbance since the machine can remain in one position while cutting, swinging, and bunching.

Manual falling is used in areas where mechanical falling equipment is restricted, when a cable harvesting system is used, or where the tree exceeds the size capability of the mechanical falling equipment. Special tools including jacks and falling levers can aid manual fallers in directional falling (Erwin, 2009 B).

- **3.7.1.1 Tree Falling BMPs**

1. Reasonable care should be taken to fell trees in directions that minimize damage to the stems, crowns, and root systems of wildlife reserve trees, leave trees retained for silvicultural purposes, and/or young reproduction.
2. Reasonable care should be taken to avoid felling trees into sensitive sites approved for harvest by the Water Resources Division and/or the Cultural Department. When felling timber in or around sensitive sites, the use of controlled felling methods (mechanical tree felling, line felling, or tree jacking) should be considered to maintain adequate protection.
3. No trees should be felled across property or timber sale boundaries.
4. "In-lead" felling techniques should be considered on gentle slopes to minimize ground disturbance and to facilitate skidding operations. On steep slopes, trees should be felled along the contour of the hill to keep the logs from sliding downhill and to minimize breakage.
5. Stands that contain significant blowdown should have the blowdown removed prior to falling standing timber to reduce breakage.
6. Trees should be cut as low as practical to avoid waste. Trees should be properly bucked to mill standards to maximize volume and value.
7. The logging operator or tree service must provide and maintain a minimum coverage of broad liability insurance prior to and throughout the duration of timber falling activities.

- **3.7.1.2 In-Lead Felling**

In-lead felling is a technique used to reduce soil disturbance and skidding costs and increase volume recovery. When trees are felled in-lead, the top or the butt of the felled tree is oriented towards the skid trail making tree extraction easier, particularly if a cable skidder is used. In-lead felling is very easy to accomplish with mechanical falling equipment.

- **3.7.2 Skidding Equipment**

Ground-based skidding equipment is used for most timber harvest on the Lummi Reservation. Skidders may be wheeled or tracked and configured to transport logs using a cable, grapple, clam-bunk, or forwarder bunk (Appendix 3). Cable and grapple skidders are commonly used in harvest units that are not shovel logged. Forwarders are commonly used in commercial thinning operations. A hydraulic excavator or a tracked skidder equipped with a grapple is preferred for timber harvests on trust lands of the Lummi Reservation since tracked machines cause less soil

disturbance. Grapple skidders also work well with mechanical falling equipment. Maximum economical skidding distances vary by machine and harvest unit, but typically are somewhere between 500 to 2,000 ft. (Greulich et al., 1996).

- **3.7.2.1 Skidding Methods**

  There are three types of skidding methods: whole-tree, tree-length, and cut-to-length. Whole-tree skidding is used on the Lummi Reservation since it substantially reduces the amount of site preparation because the entire tree is transported to the landing. It also reduces the number of skid trail passes required to transport the same volume of wood. Logging slash is concentrated around landing sites because the tree is processed into logs at the landing instead of at the stump. Landing size is usually greater when the whole tree method is used. Tree length skidding will be avoided since it leaves logging slash in the harvest unit significantly increasing the cost of site preparation. The cut-to-length method will only used in commercial thinning operations.

- **3.7.3 Ground-Based Harvest and Skidding BMPs**

  1. Ground-based harvest and skidding equipment will only be used in areas with slopes less than 30%.
  2. Ground-based harvest and skidding equipment will not be used or permitted where it would cause unacceptable damage to a natural resource.
  3. All harvested timber should be whole tree yarded unless otherwise approved by the LIBC Forest Manager except in commercial thinning operations using a harvester and forwarder.
  3. Ground-based skidding equipment should be restricted to designated skid trails.
  4. Wheeled equipment should not be permitted in areas with saturated soils unless otherwise approved by the LIBC Forest Manager.
  5. Where feasible, logs should be skidded with at least one end suspended off the ground to minimize soil disturbance.
  6. Where harvest within a water resource is permitted, ground-based skidding should be done in a manner designed to minimize soil disturbance and sediment delivery. Harvest equipment should be limited to a tracked hydraulic excavator or a low ground pressure skidder unless otherwise approved by the LIBC Forest Manager.
  7. No skidding should be permitted through defined channels with flowing water.
  8. When transporting logs in or through a sensitive site, the number of routes through the zone should be minimized.
  9. Ground-based skidding will be suspended from November 1st to June 1st. These dates may be adjusted at the discretion of the LIBC Forest Manager if soil moisture is low enough to allow for safe operation.

- **3.7.4 Cable Yarding Systems**

  There are four basic cable yarding systems: the jammer, highlead, standing skyline, and live skyline systems (Greulich et al., 1996). The need for cable yarding is unlikely due to the gentle topography of the Lummi Reservation. However, if cable yarding is necessary, it can be accomplished using either the Jammer or Highlead system. A description and illustration of these systems are provided in Appendix 3.

- **3.7.5 Cable Yarding System BMPs**

  1. All harvested timber will be whole tree yarded unless otherwise approved by the LIBC Forest Manager.

2. Uphill yarding should be used whenever possible. Where downhill yarding is used, reasonable care should be taken to lift the leading end of the log to minimize downhill soil displacement and movement of logging slash.
3. Yarding corridors should be located in areas where safe yarding operations can occur.
4. Yarding corridors, tail trees, and intermediate support trees should be marked on the ground prior to cutting.
5. Average yarding distance should not be less than 700 feet when a highlead system is used and not less than 300 feet when a jammer is used.
6. All cables should be pulled out of reserved timber prior to rigging the next yarding corridor.
7. Where cable yarding across a water resource is permitted, logs should be partially or fully suspended above the ground to minimize damage to adjacent trees and vegetation. The number and size of yarding corridors should be minimized. Yarding corridors should be located no closer to each other than 100 feet (measured edge to edge) and should be no wider than 30 feet.
8. Reserve trees should not be used for rub trees, corner blocks or cable ties unless protected from damage by effective protection devices.
9. All logging slash should be placed in a stable location prior to moving to another landing area. Logging slash should not be left lodged against standing trees.

- **3.7.6 Bucking Equipment**

  Bucking and limbing will be done with a chainsaw or with a specialized machine. Machines commonly used for limbing and bucking include a processor or a stroke delimber.

- **3.7.7 Log Loading Equipment**

  Log loading is typically done with a hydraulic excavator equipped with a log grapple. Hydraulic excavators are capable of loading 20 or more truckloads a day and only require small landing space to operate (Greulich et al., 1996). Self-loading log trucks are occasionally used on small jobs or to pick up partial loads. They do not have the same payload capacity as a conventional log truck (15 to 20% less volume) and are more expensive per ton-mile than conventional log hauling trucks (10 to 25% higher cost).

- **3.7.8 Log Trucks**

  The three basic types of log trucks include the conventional, self-loader, and mule train. Each of these truck types varies in size and hauling capacity (Appendix 3). The most common logging truck used in western Washington is the conventional log truck (tandem axle truck with a pole trailer) (Greulich et al., 1996). Trucking is arranged and paid for by the timber sale purchaser. The timber sale purchaser is also responsible for ensuring load accountability, making sure the trucking service carries adequate liability insurance, controlling traffic onto county roads, placing signs on county roads in both directions to provide motorists with notice that logging trucks are turning onto the road, and providing truckers with gate access to the harvest unit.

- **3.8 Skid Trail Design, Construction, Use, and Maintenance**

  Careful skid trail planning and design can reduce the level of soil damage and increase the area suitable for tree growth post harvest. The Forestry Division will design the skid trail system for trust land timber sales. The logging operator will be permitted to propose a different skid trail system than the one designed by the Forestry Division if necessary to avoid wet areas or to facilitate better access. The proposed system will have to meet the standards described in this section and be approved by the LIBC Forest Manager prior to the commencement of logging operations. Skid trails will be designed to minimize skid trail area, new road construction, and to avoid sensitive sites while maintaining economical skidding distances.

- **3.8.1 Skid Trail Design, Construction, Use, and Maintenance BMPs**

  1. The area occupied by skid trails, roads, and landings should not exceed 15% of the total harvest unit area unless otherwise approved by the LIBC Forest Manager. Natural openings within the stand and old skid trails should be used as part the skid trail system wherever practical.
  2. Main skid trails should be designed such that only 10 percent of the trail has an adverse grade and up to 20 percent of the trail has a favorable grade.
  3. The number and location of landings should be identified prior to laying out the selected skid trail pattern.
  4. Skid trail width should not exceed 1.5 times with width of the skidding machine.
  5. Sensitive areas and their associated buffers should be avoided or minimized.
  6. Skid trails should be located on the smoothest and firmest ground available. Hummocks, wildlife reserve trees, saturated soils, and rocks should be avoided.
  7. Skid trails should be made as straight as possible for the longest practicable distance.
  8. Skid trails should intersect at a 45-degree angle or less and be oriented toward the landing wherever possible. Skid trail intersections directly opposite of each other and sharp curves at the bottom of steep downhill segments should be avoided.
  9. Excavation for skid trail construction should only be used to achieve a flat running surface in areas with side slopes greater than 20 percent. Excavated skid trails should be constructed as narrow as possible and adequately treated to minimize erosion.
  10. A mat of logging slash should be placed on top of each skid trail and maintained whenever possible. Low areas within the skid trail should be filed with cull trees and logging slash to minimize the potential for rutting.
  11. On sloped ground, skid trails should be out-sloped where practical, but be in-sloped where necessary to prevent logs from sliding or rolling downhill off the skid trail.
  12. Only one skidding machine should work on a skid trail at a time to prevent trail widening.
  13. Water bars should be constructed on skid trails where flowing water becomes a problem. All skid trails on sloping ground should be water-barred where necessary after harvest.
  14. Avoid creating "rub trees" unless they will be retained as wildlife reserve trees.
  15. Non-permanent skid trails should be mechanically scarified to break up compaction where necessary.
  16. Skid trails with exposed, erodible soils that may reasonably be expected to cause resource damage should be treated with an erosion control measure.

- **3.8.2 Forwarding Corridor Design, Construction, Use, and Maintenance BMPs**

  1. The area occupied by forwarding corridors should not exceed 20% of the harvest unit area for the first commercial thin and 10% of the harvest unit area for the second commercial thin. Natural openings or old skid trails should be used whenever possible.
  2. The distance between forwarding corridors should be maximized to reduce the potential impacts on the root systems of leave trees. The distance between forwarding corridors should be no less than 55 feet for the first commercial thin and no less than 130 feet for the second commercial thin.
  3. Timber within forwarding corridors should be felled and processed prior to felling adjacent timber.

4. Forwarding corridors should be kept as narrow as possible and should be no greater than 15 feet wide including "bumper trees". "Bumper trees" should be designated and used along the corridor to minimize damage to leave trees and should be harvested on the way out after harvest operations are complete.
5. A mat of logging slash should be placed on top of each forwarding corridor and maintained whenever possible. Low areas within the forwarding corridor should be filled with cull trees and logging slash where necessary to minimize rutting.

- **3.9 Landing Design, Construction, and Maintenance**

Landings will be located to sufficiently service the harvest unit while avoiding sensitive resources. For ground-based skidding systems, 1 landing is typically required per 25 acres if the average skidding distance is 600 feet and there are no terrain restrictions. Since most timber harvests on the Lummi Reservation rarely exceed 50 acres in size, 1 to 2 landings are usually sufficient.

- **3.9.1 Landing Design, Construction, and Maintenance BMPs**

1. The number and location of landings must be identified on the ground before road construction begins.
2. Landings should be incorporated with existing roads, natural openings, or old skid trails whenever possible. Existing landings should be used wherever practical.
3. Landings should be located to prevent resource damage. Landings should not be located within natural drainage channels, water resources, or other sensitive sites.
4. The number of landings within the harvest unit should be minimized while not significantly impacting the productivity of the harvest operation. Landings should be placed in strategic locations to maintain an average skidding distance of 600 feet or less.
5. Landing sites should be located on the smoothest and firmest ground available.
6. Landings should be no larger that reasonably necessary to accommodate harvest and loading equipment, log trucks, log decks, and residual logging slash.
7. Landings should not be placed in areas that would create an immediate fire danger to adjacent lands.
8. Landings should be constructed reasonably level but with enough slope (2 to 5%) to minimize the accumulation of water by providing drainage where necessary. The maximum slope of any landing should not exceed 8%.
9. Excessive excavation and filling should be avoided during landing construction.
10. 4 to 8-inch crushed rock or geotextiles should be used on landings where the soil is easily saturated.
11. Water should be drained away from landings by out-sloping or cross-draining roads uphill from landings. Self-maintaining drainage structures should be installed if necessary.
12. Landings requiring sidecast or fill should be no larger than reasonably necessary for safe operation.
13. Consider scarifying landings after harvest operations are complete so that water storage and tree growing capacity are partially restored.
14. All cut slopes from landing construction should be cut back to an angle expected to remain stable.
15. Fill material and woody debris from the landing should be pulled back if there is potential for delivery to a water resource. Debris should be placed in a stable location on the forest floor.
16. Landings with exposed, erodible soils that may reasonably be expected to cause resource damage should be treated with an erosion control measure.

- **3.10 Timber Harvest Within Forested Wetlands**

  Timber harvest within forested wetlands and their associated buffers will be avoided where practical or as required by the LIBC Water Resources Manager. The Lummi Nation Water Resource Protection Code (Title 17) considers timber harvest within forested wetlands a regulated activity. Therefore, a mitigation plan must be prepared if timber harvest is planned within a forested wetland and its buffer. Components of the mitigation plan are provided in section 9.3.9 – Stream or Wetland Mitigation Plan of the Forestry Permits and Timber Sale Contracts Handbook (Appendix 9).

  - **3.10.1 Timber Harvest within Forested Wetlands BMPs**

    1. Harvest within forested wetlands and their associated buffers will only occur upon the approval of a mitigation plan by the LIBC Water Resources Manager.
    2. Ground-based harvest equipment should be low ground pressure (LGP) equipment.
    3. Where feasible, at least one end of the log should be suspended during yarding operations.
    4. All pre-merchantable timber, standing culls and snags should be retained unless they pose a danger to forest workers, adjacent home sites, power lines, roads, or other improvements.

- **3.11 Wildlife Protection**

  Every practical measure will be taken to avoid and/or minimize impacts to Reservation wildlife and wildlife habitat from timber harvest operations. If a wildlife resource issue is identified, the timber cutting permit or timber sale contract will be conditioned as necessary to avoid or minimize impacts. A biological assessment and an environmental assessment are prepared when necessary for major timber harvests on trust lands to address potential impacts and identify conservation measures.

  - **3.11.1 Wildlife Protection BMPs**

    1. Wildlife will be protected according to the requirements of applicable Federal acts and Tribal policies. Harvest restrictions around bald eagle nest sites will be in compliance with the United States Fish and Wildlife Service's National Bald Eagle Management Guidelines.
    2. If an endangered or threatened species is found within the harvest unit, operations will immediately be suspended and all necessary protection actions will be taken.
    3. Wildlife reserve trees should be retained where they do not pose a significant hazard to adjacent home sites, power lines, roads or other improvements, or logging operations.
    4. Wildlife reserve trees should be large with defective growth habits, broken tops, and cavities (Appendix 3). Wildlife reserve trees should be at least 12 inches in diameter and 30 feet tall and may include conifer or hardwood species.
    5. Wildlife reserve trees should be clumped adjacent to sensitive sites (if any) or around very large snags to enlarge undisturbed habitat.
    6. Wildlife reserve trees should be protected during harvest operations.
    7. Landowner(s) should not be allowed to cut down wildlife reserve trees for firewood.
    8. Downed logs should be retained where possible as long as tree seedlings can be planted on an 8 x 8 ft. spacing.

- **3.12 Cultural Resource Protection**

  Every practical measure will be taken to avoid impacts to cultural resources resulting from timber harvest operations. If a cultural resource issue is identified during the Technical Review Committee (TRC) review process, the timber cutting permit or timber sale contract will be conditioned as necessary to avoid or minimize impacts.

- **3.12.1 Cultural Resource Protection BMPs**
  1. Cultural resources will be protected in accordance with the requirements provided by the Tribal Historic Preservation Office (Cultural Department) during the technical review process.
  2. In the event that archaeological materials (e.g. shell midden, faunal remains, stone tools), human remains, or grave markers are observed during project activities, all work in the immediate vicinity will stop, and the area will be secured. The Lummi Nation Tribal Historic Preservation Office (360-384-2298) will be contacted immediately in order to help assess the situation and determine how to preserve the resource(s). All applicable laws pertaining to archaeological resources will be followed.

- **3.13 Environmental Pollution Protection**

  Every practical measure will be taken to avoid and/or minimize impacts to water quality and soil resources on the Reservation resulting from accidental fluid spills from harvesting equipment.

  - **3.13.1 Environmental Pollution Protection BMPs**
    1. The logging operator will regularly monitor for equipment leaks and properly maintain equipment to minimize leaks or spills. Equipment with chronic leakage will not be permitted for use.
    2. The logging operator will provide, maintain, and know how to use spill response materials on site and will take immediate and appropriate action to stop and contain equipment leaks or spills.
    3. Leaks and spills will be contained and handled in an environmentally responsible manner.
    4. The logging operator will immediately report any chemical and/or petroleum product spills to the LIBC Forest Manager.
    5. All cables, machine parts, and other inorganic debris resulting from the harvest operation should be removed after harvest.

- **3.14 Fire Protection**

  Forest fires are rare in western Washington but the risk of forest fire increases during harvest operations in the summer and early fall when fire danger is highest.

  - **3.14.1 Fire Protection BMPs**
    1. Fire fighting tools and equipment will be provided and maintained on site by the logging operator.
    2. The logging operator will be required to take immediate and independent fire suppression action on all fires within the harvest unit. The logging operator will be paid for fighting fires other than those caused by the logging operator's neglect at rates determined by the LIBC Forest Manager.
    3. Logging slash resulting from the harvest operations will be piled compactly and away from reserve trees (wildlife or otherwise) on the whole area.

- **3.15 Site Preparation (Logging Slash Cleanup and Disposal)**

  Harvest units will be mechanically site prepped to ensure that the unit is in a condition suitable for tree planting after timber harvest. Site preparation usually entails some degree of residual slash piling even when whole-tree skidding is used. Residual slash loads can be quite high in harvest units on the Lummi Reservation, particularly in natural stands comprised of western red cedar and hardwoods. Logging slash cleanup also reduces the fire hazard and mitigates for aesthetic impacts. Site preparation BMPs are provided in the Site Preparation section of this document.

- **3.16 Timber Trespass**

  Timber trespass occurring on trust lands on the Lummi Reservation will be handled in accordance with the Code of Federal Regulations, Title 25, Part 163.29 and the Lummi Code of Laws, Title 10. Timber trespass on fee lands on the Lummi Reservation will be handled in accordance with the Lummi Code of Laws, Title 10.

- **3.17 Forestland Conversion**

  The conversion of forestland into non-forest uses such as residential or commercial development can exert negative impacts on adjacent forestlands. The permanent removal of forest cover can alter the local hydrology resulting in additional run-off and water accumulation in adjacent forested areas. This alteration in hydrology can saturate the root zones of adjacent trees resulting in death, particularly if the conversion occurs in an upland area where timber species are less tolerant of wet ground. Forestland conversion also represents a permanent loss of wildlife habitat and has the potential to limit the use of management activities on adjacent forested properties.

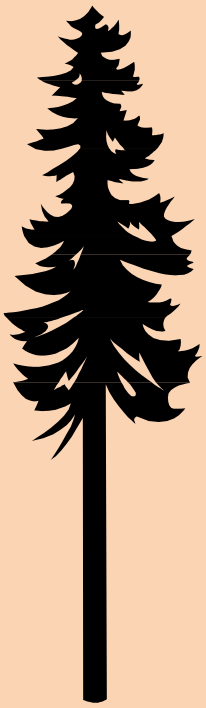
- **3.18 Timber Sale Contracting**

  The Forestry Division is responsible for processing and administering BIA Timber Sale Contracts and BIA Paid Timber Cutting Permits for the sale of forest products from trust lands. A description and sample of each of these contract documents is provided in the Forestry Permits and Timber Sale Contracts Handbook (Appendix 9). Although the Forestry Division is not responsible for or involved in timber sale contracts on fee lands, it is responsible for permitting timber harvest on fee lands consistent with the requirements of the Lummi Code of Laws, Title 10. A Land Use Permit from the Lummi Planning Department is also required for timber harvest operations.

  - **3.18.1 Logging Costs**

    Logging costs vary depending on the characteristics of the harvest unit. Volume/acre, timber size, species composition, terrain, cutting prescription, logging equipment, harvest system, road and landing construction, average skidding and hauling distances, site preparation, resource protection measures, and site constraints all influence on the final logging cost. Depending on the weight of these factors, logging costs typically range between $105 to $145/MBF for larger, higher value timber sales and $180 to $220/MBF for smaller, lower value timber sales. Hauling costs range between $40 to $80/MBF depending on mill location. Actual logging and hauling costs will be calculated using the Forestry Division's Timber Appraisal spreadsheet.

Forest Roads



- **4.0 Overview**

  The goal of forest road construction is to effectively meet timber harvest and management needs while minimizing impacts to soils, water quality, aquatic and terrestrial habitat, and other natural resources. This goal will be achieved by constructing roads according to proper design standards, using best management practices, properly adjusting road design specifications as needed to account for unforeseen conditions that arise during the road construction process, and carrying out necessary maintenance.

  Most forest roads on the Lummi Reservation can be categorized as minor timber haul roads. Typically these roads will be closed to vehicle use after harvest activities are completed, although some may become part of the Reservation road system.

- **4.1 Forest Road Location**

  Forest roads will be located to provide the best combination of meeting management objectives while minimizing environmental impacts and costs. The logging operator will be permitted to propose different road locations than those selected by the Forestry Division if necessary to avoid wet areas or to facilitate better access. The proposed locations will have to meet the standards described in this section and be approved by the LIBC Forest Manager prior to the commencement of logging operations.

  - **4.1.1 Forest Road Location BMPs**

    1. The number of forest roads should be minimized. The area occupied by roads, landings, and skid trails should not exceed 15% of the total harvest unit area.
    2. Forest roads should be strategically located to fit the natural topography of the area; to minimize stream or wetland crossings, the need for new road construction, drainage structures, and site disturbance; to allow for drainage away from the road; and to maximize the area served by each road.
    3. Forest roads should be located on well-drained soils whenever possible.
    4. Where sensitive natural resources cannot be avoided, efforts should be made to minimize road length in these areas and to direct the road away from them as quickly as possible.
    5. Forest roads should be located on flat terrain as much as possible to limit site disturbance.
    6. Existing forest roads should be used whenever practical and should be reconstructed to a level at or exceeding a new forest road. Roads on adjacent ownerships should be considered for use if they adequately serve the planned harvest or management operation.

- **4.2 Forest Road Design**

  Forest roads will be designed to meet management objectives while minimizing slope alteration, the number of stream crossings, and impacts to site productivity. Most new forest road construction on the Lummi Reservation is associated with a specific timber harvest. Haul roads are typically low-use semi-permanent or temporary but may be permanent if they provide access to additional harvest units or are needed for future management activities.

  Road grades will be kept between 2% and 10% as often as possible. Flat grades (less than 2%) will be avoided to ensure that water drains out of the road prism. If a flat grade is unavoidable, a crowned road surface will be installed to provide sufficient drainage away from the road subgrade. When steep grades are unavoidable, appropriate drainage structures will be selected and spaced properly.

  Basic forest road design standards are established in the "Road Design Specifications for Construction and Maintenance" insert to the BIA Timber Sale Contract or the BIA Paid Timber Cutting Permit. These design standards can be modified or expanded upon as needed. A sample insert is provided

as part of a sample BIA timber sale contract in the Forestry Permits and Timber Sale Contracts Handbook (Appendix 9). Additional road design information is provided in Appendix 4.

- **4.2.1 Forest Road Design BMPs**

  1. The services of a professional road engineer should be procured where base level engineering is insufficient.
  2. Roads should be designed to be no wider than necessary to accommodate the anticipated use. Road width should not exceed more than 32 feet for a double lane road or 22 feet for a single lane road exclusive of any width necessary for safe operations on curves and turnouts.
  3. Road grades should not exceed 10%. If grades exceeding 10% are necessary, grade length should be minimized or be broken up by using drainage structures. An average grade of 5% or less is preferred. Grade changes should be gradual to accommodate log trucks.
  4. Roads should include sufficient drainage structures to adequately handle surface runoff.
  5. "Sunken" forest roads that are lower than the surrounding ground level and do not drain properly should be avoided. Sunken roads commonly occur on gentle slopes where cut and fill is unnecessary. The road surface should be crowned so that water drains away from the road surface.
  6. Cut and fill slopes should be designed to ensure that the road will remain stable.

- **4.3 Forest Road Construction**

  Each phase of road construction will be conducted according to the approved road plan. Plans and designs may need to be slightly modified during construction as changing conditions are encountered in the field. If substantial road design changes must be made, these changes must be documented in an amended road plan and approved by the LIBC Forest Manager.

  Since most forest roads on the Lummi Reservation are temporary, low-use roads that will only be used during harvest operations, all road construction activities can take place in the same year. If a road will be permanent and it is consistent with the operation schedule, forest roads should be constructed 1-year in advance to allow the road to settle. After the road has settled, it can be graded, shaped, and surfaced.

  All phases of road construction will take place during dry weather when soil moisture is low. Uncompleted road construction left for an extended period of time will be drained by surface shaping, installing adequate drainage structures, and implementing adequate erosion control measures.

  - **4.3.1 Clearing, Grubbing, and Excavating**

    All timber, vegetation, and snags will be cleared within the road way and all stumps and organic debris will be removed from the road prism or anywhere fill or sidecast material will be deposited. Timber cleared during the construction of a roadway on another person's property will be left on the property from which it was cut or disposed of in a manner suitable to the landowner and consistent with the road use agreement. Clearing and grubbing material will be disposed of by scattering, piling & burning, or chipping. A road bench will be excavated after clearing and grubbing is complete.

    - **4.3.1.1 Clearing and Grubbing BMPs**

      1. Right-of-way timber should be removed or decked where the decks will not be covered by fill material or act as support for the fill or embankment.
      2. Merchantable right-of-way timber should be yarded to neat, workman-like decking areas that will not interfere with the construction of the road or turnouts.
      3. All clearing debris should be placed outside the road prism and should not be buried in the road to ensure road stability. Undisturbed stumps, roots, and other solid objects may

be left if they will be a minimum of three feet below the subgrade or slope surface of embankments.

4. Un-merchantable clearing debris should be placed in natural or cleared openings within the sale unit or on the road right-of-way and should not be left lodged against standing trees.
5. Stumps overhanging the top of cut banks should be removed.
6. Roads constructed on sloped ground near a water resource should have clearing debris placed on the downhill side of the road at the toe of the road fill to assist in trapping sediment.

- **4.3.2 Cut and Fill Slopes**

Cut and fill slopes are necessary when roads are constructed on gentle to moderately sloping ground. The angle of the cut and fill slopes determines the amount of ground occupied by the road and adjacent slope stability. Soil characteristics largely determine the appropriate angle of the cut and fill slope. The steeper the cut slope, the less area occupied by the road prism and the less material that must be excavated (ODF, 2000 B). Cut and fill slopes constructed overly steep may become unstable. Balanced Cut and Fill (BCF) construction is commonly used on gently sloping terrain (Appendix 4).

Cut and fill slope standards are established in the "Road Design Specifications for Construction and Maintenance" insert to the BIA Timber Sale Contract or the BIA Paid Timber Cutting Permit. A sample insert is provided as part of a sample BIA timber sale contract in the Forestry Permits and Timber Sale Contracts Handbook (Appendix 9).

- **4.3.2.1 Cut and Fill Slope BMPs**

1. Cut and fill slopes should be constructed in conformance with established cut and fill standards in the "Road Design Specifications for Construction and Maintenance" contract/permit insert.
2. BCF construction should be used whenever possible. Cut and fills should be balanced so that as much of the excavated material is deposited in the road fill sections as is practical to minimize the need for removing excess material.
3. Fill slopes should be spread and compacted to develop sufficient strength to support traffic. Fill slopes should be built up by layering. Horizontal layers not exceeding 8 inches in depth should be placed separately and thoroughly compacted.
4. Individual rocks or boulders may be placed in the fill slope as long as they are placed at least 6 inches below the subgrade and carefully distributed.
5. Side cast and fill should be removed after harvest operations are complete where necessary. The road surface should be ripped to allow drainage through the surface and promote re-vegetation. All excavated material should be placed against the cut slope or at another stable location. Excavated material should not be placed in areas on the road surface that will allow water to pond.

- **4.3.3 Subgrade Construction**

Subgrades will be constructed to be no wider than necessary to accommodate the anticipated use. Turnouts will be constructed where necessary to accommodate traffic moving in both directions. Where curves are necessary, additional subgrade width may be required on the inside of the curve to accommodate the off tracking of the rear wheels of log trucks. Subgrades will be compacted to ensure stability. Most forest roads can be adequately compacted using a crawler tractor, shovel, or a standard roller. A standard roller can seal the road surface better reducing the potential for pothole formation and washboarding (ODF, 2000 B).

- **4.3.3.1 Subgrade Construction BMPs**

  1. The minimum subgrade width should be 16 feet for single lane forest roads and 26 feet for double lane forest roads measured shoulder to shoulder excluding ditches or any additional width necessary for safe operations on curves and turnouts.
  2. The grade and alignment of the subgrade should have smooth continuity without abrupt changes in direction.
  3. The road subgrade should be composed of firm, well-compacted granular soil free of organic debris.
  4. The subgrade must be compacted before applying surfacing materials. Subgrade compaction should be done in 1 to 2 foot layers running the excavation equipment over the entire width of the lifts. If the soils are too wet, they should be allowed to dry, and if they are too dry, they should be watered to achieve adequate compaction.
  5. The road shape (crowned, outsloped, or insloped) must be built into the subgrade to assist in drainage.
  6. Where turnouts are constructed, the subgrade width should be widened by at least 20 feet for a length of 25 feet.
  7. Geotextiles should be considered to reduce the amount of base rock (ballast) or in soft areas as approved by the LIBC Forest Manager.

- **4.3.4 Road Surface Shapes**

  The road surface shape is important for providing good surface drainage and maintaining firm and stable subgrades to support log loads (ODF, 2000 B). The surface of the haul road can be shaped in three basic ways: crowned, insloped, or outsloped. The selected shape depends on drainage needs, soil characteristics, topography, expected traffic, and whether the road will be permanent or temporary. Since the Lummi Reservation contains gentle topography, a crowned road surface will most often be used to provide surface drainage away from the road subgrade. Outsloped roads are used on moderate slopes while insloped roads are used on steep slopes.

  - **4.3.4.1 Road Surface Shape BMPs**

    1. Road surfaces should be crowned, insloped, or outsloped as necessary to prevent the accumulation of water on the road surface.
    2. Crowned road surfaces should have a minimum of 2% slope; outsloped road surfaces should have a minimum 4% slope; and insloped road surfaces should have a minimum 4% slope.
    3. Outsloped roads should not be used on road grades greater than 8%.
    4. All surface shaping should be completed prior to hauling.

- **4.3.5 Road Surfacing**

  The surface of the road will be designed for the anticipated use. In some cases, total or partial rocking of the road surface may be necessary to protect soil and water resources or to minimize the tracking of sediment onto paved roads. Rocking protects the road subgrade, improves overall road drainage, reduces the amount of sediment runoff, allows road use during wet periods, and reduces road maintenance. However, rocking increases road cost and may increase the cost of abandonment if the road is temporary and the road surface must be scarified.

  Geotextiles may be used when constructing a road over a soft area, to reduce the amount of rock in the base layer, or when resurfacing a reoccurring problem area. Geotextiles spread vehicle loads over the entire subgrade and help prevent the surfacing rock from sinking into the subgrade soil.

- **4.3.5.1 Road Surfacing BMPs**

  1. The road subgrade should be compacted and shaped prior to applying surface material. The condition of the road subgrade is critical to the performance of the surfacing material. Surface rock alone cannot be used to shape the road surface.
  2. A minimum of 6-inches of pit run gravel should be used on temporary roads that will only be used during the dry season. A minimum of 3-inches of pit run gravel should be used on temporary roads that are reconstructed and will only be used during the dry season.
  3. Consider only rocking sensitive portions of temporary roads such as over culverts, across dips or water bars, in soft spots, or where the haul road meets a public road wherever possible.
  4. For permanent roads, rock should be applied in two layers: the base layer and the surface layer. The base layer should be comprised of large rock ranging from 6 to 18 inches in depth. The surface layer should be comprised of smaller rock ranging from 2 to 4 inches in depth (Garland and Jackson, 2002).
  5. End dumping and spreading of material by bulldozer should not be permitted.
  6. Rocking should be done during dry weather and suspended when there is surface runoff.
  7. Ditches should be constructed prior to rocking the road surface (ODF, 2000 B).
  8. Geotextiles should be considered when constructing a road over extremely soft soils or when resurfacing a recurring problem area. Geotextiles must be placed prior to rocking to allow water to pass from the surface rock into the subgrade while keeping subgrade fines from 'pumping' into the road surfacing.

- **4.3.6 Quarry Spalls**

  Quarry spalls are used to stabilize the entrance and exit of hauling roads to reduce the amount of sediment transported onto paved roads. Although the use of quarry spalls is un-common, it should be considered in harvest units with forested wetlands or in units where logging slash will be chipped and trucks will be hauling hog fuel in the winter.

  Quarry spalls are typically constructed with 4 to 8 inch rock, are 1 foot in depth, and are installed for the first 50 to 100 feet of the access road. Hog fuel (wood-based mulch) may be substituted for or combined with quarry spalls on temporary roads. Hog fuel is generally less effective at stabilizing entrances, requires more maintenance, is not recommended for entrance stabilization in urban areas, and should be used only at sites where the amount of traffic is very limited (WADOE, 2005).

- **4.3.7 Turnouts**

  Turnouts will be used where needed and placed where the terrain allows. Turnouts should be at least 8 feet in width and 25 feet long with a 25-foot transition at each end.

- **4.3.8 Erosion Control & Spoil Disposal**

  Erosion control measures will be used when necessary during road construction activities. If a road is experiencing excessive erosion, it may be indicative of poor road location and design. Spoils created during road construction, maintenance, or abandonment will be disposed of in an environmentally responsible manner.

  - **4.3.8.1 Erosion Control & Spoil Disposal BMPs**

    1. Disturbed or exposed soils should be stabilized where there is a risk of unacceptable soil erosion using straw, sod, bio-matting, tree boughs, logging slash, mulching, or some other method until the area can be re-vegetated.

2. Spoils should be located in areas with low timber productivity, on stable slopes with gentle topography, and away from water resources. Spoil disposal areas should be identified and approved prior to road construction.
3. Spoils should only be handled when they are dry. If spoils must be handled when wet, sediment controls should be considered.

- **4.3.9 Wetland Forest Road Design and Construction**

  Where practical, road construction through forested wetlands and their associated buffers will be avoided to protect wetland function and to reduce road construction costs. Some road construction through forested wetlands will be unavoidable since 40% of the Lummi Reservation is considered wetlands.

  The Lummi Nation Water Resource Protection Code (Title 17) considers road construction through wetlands a regulated activity. Therefore, a wetland mitigation plan (WMP) must be prepared prior to road construction. Components of the mitigation plan are provided in section 9.3.9 – Stream and Wetland Mitigation Plan of the Forestry Permits and Timber Sale Contracts Handbook (Appendix 9). Since new forest road construction is typically associated with a specific timber sale, road construction impacts can be addressed in the timber harvest WMP.

  The location, design, construction, and maintenance of roads in forested wetlands must be in compliance with the guidelines provided in the Clean Water Act, Section 323.4 – Discharges Not Requiring Permits: Best Management Practices for Farm Roads, Forest Roads, or Temporary Roads for Moving Mining Equipment (Appendix 4).

- **4.4 Forest Road Drainage Structures**

  Good road drainage is necessary to remove water from the road subgrade. Drainage structures include relief culverts, dips, and water bars. These structures should be installed where necessary to divert and/or disperse surface water away from the road prism onto a stable portion of the forest floor.

  - **4.4.1 Forest Road Drainage Structure BMPs**

    1. All necessary drainage structures and ditches should be installed during road construction.
    2. Drainage structures should discharge into vegetation or onto a non-erodible area or the forest floor. Drainage structures should not discharge into streams or wetlands, on erodible soils, over fill slopes, or onto lower, parallel roads and skid trails.
    3. Drainage structures should be installed at all low points or wet areas in the road gradient. Where natural topographic features do not control drainage structure spacing, drainage structures should be installed at a frequency consistent with the Drainage Structure Spacing Guidelines provided in Appendix 4.
    4. If a drainage structure cannot be installed in a wet or natural drainage area, water should not be diverted and transported in a ditch for more than 100 feet to the next drainage structure. Water from seeps and springs should be returned to the forest floor as close to the point of origin as reasonably practical.
    5. Water should only be diverted from normal channels to the extent necessary to properly install the drainage structure.

  - **4.4.2 Relief Culverts**

    Relief culverts divert ditch water onto the forest floor and are more expensive to install than dips or water bars. They are more commonly used on high-traffic roads, roads with steep grades, or where a dip or water bar would be inappropriate.

- **4.4.2.1 Relief Culvert Location, Design, and Construction BMPs**

  1. Relief culverts should be located to provide cross drainage on road grades at regular intervals just above steep grades, below bank seepages, and where water will run onto landings or forest roads.
  2. Relief culverts should not be located where they would overload a site with drainage water and potentially result in resource damage or discharge onto unstable slopes.
  3. Relief culverts should not be used on roads where adequate maintenance is not possible.
  4. Culvert size should be appropriate for the size of the drainage ditch but no less than 12 inches in diameter. All culverts should be corrugated to slow the speed of discharge.
  5. Culverts should be installed in conformance with the culvert installation specifications in the "Road Design Specifications for Construction and Maintenance" contract/permit insert.
  6. From the road centerline, culverts should be skewed 0 to 3 degrees on road grades of 3% or less; 30 degrees on road grades between 3 to 12%; and 45 degrees on road grades over 12%.
  7. Culverts should be sloped 3 degrees down in the direction of flow. The slope of the culvert should not exceed 7 degrees to minimize out fall velocity.
  8. Culvert outlets should be positioned a minimum of 1 foot beyond the toe of the road fill. Culvert inlets should be positioned a minimum of 1 foot beyond the cut side of the road subgrade so that it does not get buried.
  9. Culvert bedding and backfill should be composed of firm, well-compacted granular soil, free of rocks, logs, stumps, limbs, and other objects that would dent or damage the pipe during installation or use.
  10. Culverts should be covered with at least 12 inches of fill or to a depth of 1/3 the culvert diameter (whichever is greater) to prevent crushing.
  11. Rock armoring should be placed around the inlet and outlet of the culvert where there is potential for erosion around the inlet or outlet.
  12. Rock armored headwalls and rock armored ditch blocks should be installed for relief culverts located on erodible soils or where the road gradient is greater than 6%.
  13. Consider applying surface rock over the tops of relief culverts for natural surface roads that are not rocked.

- **4.4.3 Broad-Based Dips**

  A broad-based dip is a medium cost drainage structures that is essentially a stretched out water bar approximately 65 to 100 feet in length. Dips may be used in place of culverts or to back up culverts. Dips are best used on roads surfaced with native material, low traffic roads, and outsloped roads.

  - **4.4.3.1 Broad-Based Dip Location, Design, and Construction BMPs**

    1. Dips should only be considered on low-use, temporary, or outsloped roads.
    2. Dips should not be used on curves or on grades greater than 10% because the structure can degrade quickly and may create a danger for log trucks (Wiest, 1998).
    3. Dips should be constructed deep enough to provide adequate drainage and wide enough to allow trucks and equipment to pass safely.
    4. Dips should be oriented perpendicular to the road on road grades less than 3% or where short length dips are used. Dips should be skewed at least 30 degrees from the road centerline for road grades greater than 3%.

5. Rock or some other energy dissipater should be placed at the dip outlet.
6. Dips should be surfaced with rock where rutting may occur.
7. If a dip is constructed near a sensitive water resource, the outflow should be re-vegetated as soon as possible.

- **4.4.4 Water Bars**

Water bars are quick and cheap to construct and are usually only used on a partially or fully abandoned road to replace a relief culvert.

- **4.4.4.1 Water Bar Location, Design, and Construction BMPs**

1. Water bars should only be installed on low-use, temporary, or abandoned roads.
2. Water bars should not be placed in swales, gullies, or low areas where water has no escape.
3. Each water bar should be cut into the road surface to a depth of at least 8 inches with a ditch length of at least 4 feet. A continuous, firm berm of soil built at least 12 inches above the normal road grade and at least 4 feet in length should be constructed downhill and parallel to the waterbar ditch. The material excavated for the ditch should be used to create the berm. The depth and length of the water bar should be increased in areas with erodible soils or where necessary.
4. Water bar berms should be constructed into and flush with the cut slope to block and divert water running down the ditch line.
5. Water bars should be constructed perpendicular to the road centerline on road grades less than 3% or at the bottom of a dip. Water bars should be skewed at least 30 degrees from the road centerline on road grades greater than 3%.
6. The cross drainage grade of the water bar should be at least 2%.
7. Waterbars should be sufficiently opened at the lower end so water can easily run off the road. Rock or some other energy dissipater should be placed at the outlet or along the ditch bottom if there is erosion potential.
8. Driving heavy equipment over water bars should be avoided to maintain functionality.

- **4.4.5 Drainage Ditches**

Drainage ditches transport surface runoff and seepage to drainage structures so that water is diverted away from the road prism. Narrow, v-shaped ditches transport runoff very fast whereas wide, flat-bottom ditches slow it down. A minimum grade of 3 percent is usually necessary to keep water from standing in the ditch (Wiest, 2009). If drainage ditches are too long, flowing water can erode the ditch, particularly on steeper road grades.

- **4.4.5.1 Drainage Ditch BMPs**

1. Drainage ditches should be constructed on roads exceeding 10%.
2. Drainage ditches should be 1 foot deeper than the road prism and 2 or 3 feet wide especially through cut sections on either side of the road.
3. Drainage ditches should have the same gradient as the road.
4. Drainage ditches should be rocked where erosion is occurring in the ditch line. Grass seeding or silt fences can also reduce ditch erosion.
5. Where used, ditch outs should be constructed so that they intersect the roadside ditch at the same depth and are outsloped 1 % to 3%.

6. Outflow from ditch outs should discharge into vegetation or onto a non-erodible area or the forest floor. Ditch outs should not discharge into streams or wetlands, on erodible soils, or over fill slopes.

- **4.5 Stream Crossing Structures**

Stream crossing structures include culverts, fords, and bridges. The need for bridge installations is not expected since the Lummi Reservation contains very few fish bearing streams and most streams are very small in size. Stream crossings must be must be in compliance with the guidelines provided in the Clean Water Act, Section 323.4 – Discharges Not Requiring Permits: Best Management Practices for Farm Roads, Forest Roads, or Temporary Roads for Moving Mining Equipment (Appendix 4). Most stream crossings are temporary and will only be used during harvest operations.

- **4.5.1 General Stream Crossing Structure Design and Construction BMPs**

1. To the extent practical, streams should be kept in their natural channel while installing stream-crossing structures. Physical changes to the stream channel from excavation or filling should be minimized.
2. Stream crossings should be installed at as close to a right angle as possible to minimize the road footprint.
3. Construction activity within the stream should only occur during periods of low or normal flow.
4. The approach to the stream crossing should be stabilized with rock or gravel to minimize the potential for sediment entry.
5. Approaches to temporary stream crossings should be water barred and stabilized at the time of the crossing removal.

- **4.5.2 Stream Crossing Culverts**

Stream crossing culverts come in three general shapes: round, pipe arch, and plate arch. Round culverts are the least expensive and easiest to install but are the least desirable for fish passage. In contrast, the structural plate arch is the most expensive and hardest to install but most desirable for fish passage since the natural streambed is retained (Brannon et al., 2001).

The size of stream crossing culverts must be equal to or greater than the bankfull width of the stream to prevent ponding, the potential for fill failure, and stream and bank erosion. Bankfull width is defined as *"the lateral extent of the water surface elevation perpendicular to the channel at bankfull depth."* Bankfull depth is defined as *"the average vertical distance between the channel bed and the estimated water surface elevation required to completely fill the channel to a point above which water would enter the floodplain or intersect a terrace or hillslope."* In cases where multiple channels exist, bankfull width is *"the sum of the individual channel widths along the cross-section" and the bankfull depth is "the average depth of all channels along the cross-section"* (WFPB, 2007 A).

- **4.5.2.1 Stream Crossing Culvert Design and Construction BMPs**

1. Stream crossing culverts should be equal to or greater than bankfull width or at least 24-inches for fish bearing, perennial streams or 18-inches for non-fish bearing seasonal streams, whichever is greater. All culverts should be corrugated to slow the speed of discharge.
2. Larger culverts, temporary bridges, pipe arches, or open bottom culverts should be considered when crossing a flat, broad area with poorly defined channels, for crossings requiring deep fills, and for streams which transport large amounts of debris.
3. Culverts should be installed so that the alignment and slope of the culvert parallels the natural slope and flow of the streambed to reduce potential blockages (WFPB, 2006).

4. The stream channel should not be widened at the culvert inlet to prevent the accumulation of debris and potential blockages.
5. Culvert inlets and outlets should be positioned a minimum of 1 foot beyond the toe of the road fill. The inlet, outlet, and surrounding fill material should be stabilized to ensure that the culvert stays in place.
6. Culverts should be installed in conformance with the culvert installation specifications in the "Road Design Specifications for Construction and Maintenance" contract/permit insert.
7. Rounded culverts should be installed at least 6-inches below the natural streambed.
8. Culverts should be covered with at least 12 inches of fill or to a depth of 1/3 the culvert diameter (whichever is greater) to prevent crushing.
9. Rock armored headwalls large enough to withstand expected flows for the life of the culvert should be installed at the inlet of all stream-crossing culverts to minimize the potential for erosion or fill failure.
10. Surface rock should be applied over the tops of stream crossing culverts for natural surface roads that are not rocked.
11. All slash and debris generated by harvest or road building operations should be removed within 50 feet upstream from a culvert inlet to prevent the potential for plugging.

- **4.5.3 Fords**

  Fords are an inexpensive and safe option for crossing shallow, non-fish bearing streams at a firm rocky location within the streambed on low-use or temporary roads. Fords are only appropriate to use during periods of low or no flow because of the potential to generate and deliver sediment (WFPB, 2006).

  - **4.5.3.1 Ford Design and Construction BMPs**

    1. Fords should only be used in non-fish bearing perennial and seasonal streams during periods of low and no flow.
    2. Fords should be located where stream banks are low.
    3. Fords should be constructed to fit to the conditions of the crossing site considering stream substrate; bank and channel stability; and width, depth, flow volume, flood frequency, and debris loading.
    4. Crushed rock or other acceptable materials should be used if the streambed does not have a firm rock or gravel base.
    5. Ditch-outs should be installed on both sides of the approach to divert water away from the stream.

- **4.5.4 Bridges**

  Permanent bridges are major road structures that require the professional services of a licensed forest engineer. Bridge installations are not expected since most forest roads on the Lummi Reservation are temporary, most streams are small, and very few streams are fish bearing. If a bridge is necessary, temporary portable bridges will be considered as an economical way to cross a stream for a short-duration job.

- **4.6 Forest Road Maintenance**

  Proper road maintenance protects the road investment and minimizes unintended resource impacts. Common maintenance problems are typically caused by wet areas in the road and low spots in ditch lines. The logging operator is responsible for road maintenance throughout the harvest operation.

Road maintenance requirements are incorporated into the "Road Design Specifications for Construction and Maintenance" insert to the BIA Timber Sale Contract or Paid Timber Cutting Permit.

- **4.6.1 Forest Road Maintenance BMPs**

  1. Surface grading should be performed only as needed to maintain the surface drainage and to protect the subgrade before severe pothole formation, wash boarding, or water pooling.
  2. Surface grading should be done when the road surface contains sufficient moisture to facilitate easy cutting, moving and compaction of materials. Surface grading should not be done during periods of heavy rain. Oversized material dislodged during grading should be removed from the road surface.
  3. Drainage structures should be maintained as necessary to maintain functionality. Material removed from drainage structures should be disposed of on a stable portion of the forest floor. Brush accumulations should be removed around inlets and outlets to reduce the risk of blockage.
  4. Shallow failures or small slumps on the cut slope or fill slope should be repaired and stabilized.
  5. Geotextiles should be considered where problem wet areas consistently occur.
  6. Stream crossing structures should be maintained or replaced where a stream regularly flows over the road, is diverted into a ditch, where material accumulates at the culvert inlet, where down cutting in the stream channel occurs, where stream banks are eroded immediately downstream of the culvert (outlet scour/drop), where the fill located above the culvert inlet is eroded, or where the culvert inlet is crushed or dented.
  7. Non-active forest roads should be maintained only as necessary to prevent resource damage.

- **4.7 Forest Road Abandonment**

  Roads may be partially or fully abandoned. Partial abandonment is used for roads that will be needed again after log periods of inactivity. Full abandonment is used for roads that will not be needed again for the foreseeable future.

  Partial abandonment will be done on most temporary roads since the road will be needed again and it can be reconstructed with much less effort and expense. Consistent with the Clean Water Act, full abandonment will be completed on all temporary roads constructed within forested wetlands. A gate will be installed in front of all forest roads on trust lands.

  - **4.7.1 Forest Road Abandonment BMPs**

    1. Abandoned roads should be outsloped, waterbarred, or otherwise left in a condition that provides adequate self-maintaining surface drainage, prevents erosion, maintains natural drainage patterns, maintains hydrologic connectivity within wetlands, and minimizes surface runoff.
    2. All road abandonment work should be completed during dry weather when soil moisture conditions are low.
    3. All stream crossing culverts should be removed where the road will be abandoned or where proper maintenance is not feasible. The natural streambed should be restored to as close to the original location as possible so that it matches the width and gradient of the stream both upstream and downstream. The stream channel and side slopes should be left at a stable angle.
    4. Relief culverts should be removed and replaced with a drivable ditch or waterbar.
    5. All fills and berms should be removed where necessary and consistent with the type of abandonment.

6. Drainage ditches should be left in a suitable condition to reduce erosion. Vegetation growing in ditches that are within 100 feet of a water crossing should be maintained to filter sediment.
7. All material removed during road abandonment should be disposed of in a stable portion of the forest floor and away from water resources.
8. The road entrance should be sufficiently blocked to prohibit access to four-wheel drive highway vehicles.

- **4.8 Forest Road Access**

  Forest road access must be secured through easement agreements if there is a need to use a private road or to construct new road across another landowner's property. The Forestry Division uses two types of easement agreements: a Revocable Road Crossing Permit (New Road Construction) and a Revocable Road Crossing Permit (Existing Road Use). A description of each type of easement agreement and samples are provided in the Forestry Permits and Timber Sale Contract Handbook (Appendix 9).

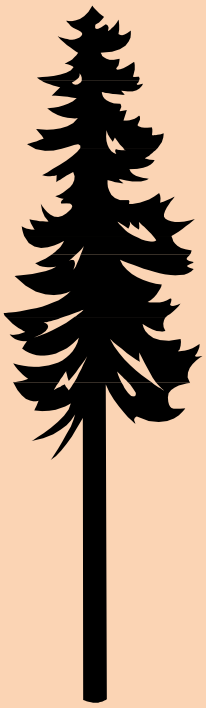
- **4.9 Forest Road Contracting**

  Forest road construction is incorporated into the BIA Timber Sale Contract or the BIA Paid Timber Cutting Permit. Contracting for forest road construction is not typically completed as a separate operation. A Land Use Permit from the Lummi Planning Department is required for timber harvest and associated road construction.

  - **4.9.1 Road Construction Cost**

    Road construction typically costs between $7 to $12/MBF for most harvest units on the Lummi Reservation depending on length of road, number of drainage structures, and surfacing requirements. Actual road construction costs will be calculated using the Forestry Division's Timber Appraisal spreadsheet.

Site Preparation



- 5.0 Overview

  Site preparation is any treatment applied to the soil or vegetation to enhance artificial or natural regeneration. Site preparation usually includes some degree of slash piling and disposal, controlling undesirable vegetation, and sometimes soil scarification. These activities produce microenvironments or "microsites" free of duff and competing vegetation that are favorable to the survival and growth of seedlings. Site preparation also increases site accessibility, which reduces overall planting costs. The objectives of site preparation treatments vary based on site constraints, management objectives, and treatment cost. A listing of site preparation objectives and benefits is provided Appendix 5.

  Selecting and implementing the proper site preparation treatments or combination of treatments will ensure prompt establishment of desired regeneration, increased wood production, shorter harvest rotations, and increased long-term financial gain (Fitzgerald, 1998). The efficacy of the selected treatment or combination of treatments depends on the site's limiting factors for tree growth. These limiting factors may be biotic, climactic, edaphic, or geologic in nature (Port Madison, 1989). When the correct treatment is used, the site's limiting factors for tree growth are minimized.

- 5.1 Site Preparation Treatments

  The four main site preparation treatments include mechanical, chemical, prescribed fire and/or chipping. Treatments are usually combined to meet site preparation objectives and may be extensive or minimal depending on the site. All harvest units will be adequately site prepped as necessary to ensure adequate reforestation.

  - 5.1.1 Mechanical Site Preparation

    Mechanical site preparation is the most frequently used site preparation treatment. The operation entails piling residual logging slash and ripped brush into piles after harvest operations are complete. The piles are then burned, chipped, or left on site depending on management objectives and site constraints. Mechanical site preparation sometimes includes soil scarification to loosen up compacted areas and to expose mineral soil for easier tree planting. Mechanical site preparation is usually necessary after timber harvest on the Lummi Reservation for tree planting. Residual slash loads can be excessive in natural stands comprised of hardwoods and western red cedar.

    - 5.1.1.1 Treatment Method and Equipment

      An excavator equipped with a rake bucket or a crawler tractor equipped with a brush blade is commonly used for piling logging slash. Excavators are preferred over crawler tractors because they cause less soil disturbance and create slash piles free of dirt. Piles to be burned or chipped should be stacked by an excavator to minimize the amount of dirt in the pile.

    - 5.1.1.2 Treatment Season

      Logging contractors will be required to complete mechanical site preparation immediately after harvest or before November 1st to ensure the treatment is completed during periods of dry weather to minimize the potential for soil compaction.

    - 5.1.1.3 Contracting

      Mechanical site preparation is considered part of the harvest operation and is incorporated into the BIA Timber Sale Contract or in the Special Provisions of the BIA Paid Timber-Cutting Permit. The requirements for mechanical site preparation are described in the following excerpt from a BIA Timber Sale Contract:

      "Areas of excessive amounts of logging slash, uprooted vegetation, and woody vegetation shall be pushed into circular piles. Limited amounts of crushed limbs, uprooted vegetation, and non-merchantable pieces can remain on the soil surface as long as seedlings can be

planted efficiently on a 9-foot spacing. The soil shall be scarified mechanically, by uprooting herbaceous and woody vegetation from the soil, without removing the top 6 inches of the soil from the immediate area. All uprooted vegetation shall be shaken free of dirt prior to piling. All slash piles shall be less than 25 feet in diameter, free of dirt, located at least 100 feet away from standing timber, aquatic resources, and any home or improvement, and have a 10-foot fire line constructed around them down to mineral soil. No work shall be performed when, in the opinion of the Forest Manager, weather conditions create saturated soils increasing the potential for soil compaction and displacement."

- 5.1.1.4 Cost

  The cost for mechanical site preparation is included in the minimum bid price for the timber sale and is set at approximately $500/acre. This price does not include the cost of burning, which is typically done by the Forestry Division or a contractor. The cost per acre may be increased or decreased to account for excessive slash loads or undesirable vegetation.

  The Forestry Division requires logging operators to conduct whole-tree yarding to keep the cost of mechanical site preparation low by concentrating slash loads around landing sites. The whole-tree yarding requirement generally reduces the need for site preparation to between 15% and 30% of the harvest unit area.

- 5.1.1.5 Mechanical Treatment of Vine Maple Clumps

  Vine maple will expand its original aerial biomass by five-fold following a timber harvest and can develop into a serious competitor with planted seedlings (WADNR, 1999). Excessive concentrations of vine maple should be ripped out of the ground during mechanical site preparation since this is one of the more effective control methods.

- 5.1.1.6 Mechanical Site Preparation BMPs

  1. Excessive amounts of logging slash and uprooted vegetation should be piled into circular slash piles or windrows or be mechanically scattered.
  2. Slash piles should not exceed 50 feet in diameter. They should be free of dirt and piled in a manner to facilitate efficient burning.
  3. Slash piles should have a 10-foot wide fire line constructed around them down to mineral soil prior to ignition.
  4. Slash piles should be located at least 100 feet away from standing timber, aquatic resources, and any home, road, or other improvement to prevent creating an immediate fire danger.
  5. Excessive accumulations of slash along the harvest unit boundary should be pulled back into the harvest unit at least 100 feet.
  6. Soil scarification should be done in a manner that does not remove the first 6 inches of topsoil from the immediate area since this can reduce site productivity (Port Madison, 1989). Soil scarification should not be considered in sensitive sites unless approved by the LIBC Forest Manager.
  7. Slash removal offsite should be considered if it is evident that leaving the slash onsite creates an extreme fire hazard.

o 5.1.2 Chemical Site Preparation

Chemical site preparation (herbicide application) may be considered prior to tree planting to control competing vegetation. A description of chemical site preparation treatments and BMPs are provided in the Vegetation Management section of this document.

- 5.1.3 Prescribed Fire

Prescribed fire is only used on the Lummi Reservation to dispose of residual slash piles. Slash pile burning creates more planting spots, improves access for planting crews, reduces fire hazards, and releases large quantities of nutrients that stimulate plant growth. However, burning can create excessive smoke, which can become a public nuisance and may increase seed germination of undesirable plant species. It also carries liability for suppression costs if the fire escapes into adjacent timber.

- 5.1.3.1 Treatment Method and Equipment

  Hand-held drip torches filled with a mixture of equal parts kerosene and #1 diesel fuel is used to ignite slash piles. The 50-50 mix may have to be adjusted to get the fuel to carry the flame. Increasing the percentage of kerosene will provide better ignition while increasing the percentage of #1 diesel fuel will provide sustained burning. Gasoline should never be used due to the potential for the formation of explosive vapors (Forestry Suppliers, 2004). Drip torch instructions should always be referenced prior to use to ensure safe operation. An excavator, bulldozer, or a 300-gallon water tank with a functioning pump and adequate hose length must be onsite at all times during burning.

- 5.1.3.2 Treatment Season

  Slash pile burning will be completed in the spring, fall, and winter when fire danger is low and weather conditions are favorable for adequate smoke dispersal. Burning at these times will also ensure that the fire does not burn too hot resulting in soil damage and nutrient loss (Fitzgerald, 1999).

- 5.1.3.3 Contracting

  Slash pile burning will be done in house or contracted out. The contractor will be selected sometime in late summer so that burning can occur in the fall and winter when fire danger is low. A sample Slash Pile Burning Contract Agreement is provided in Appendix 5.

- 5.1.3.4 Cost

  Contract slash pile burning can range from $50 to $200/acre depending on size, number, condition, and distribution of slash piles; weather conditions; terrain; amount of fire break construction (if any); and adjacent land use.

- 5.1.3.5 Permits

  A commercial burning permit from Lummi Natural Resources is required for slash pile burning. Burning will be conducted in compliance with the requirements and conditions specified in the permit. A sample Commercial Burning Permit is provided in the Forestry Permits and Timber Sale Contracts Handbook (Appendix 9).

- 5.1.3.6 Prescribed Fire BMPs

  1. Slash pile burning should be conducted when environmental conditions can be characterized as cool, cloudy, or foggy and when the wind is blowing less than 10 MPH.
  2. If undesirable weather conditions develop during burning, piles must be extinguished to maintain safety. If undesirable weather conditions persist, a portion of the pile should be covered with a piece of tarp at least 10 square feet in size to keep a portion of the pile dry so that it can be burned at a later date.
  3. For optimal efficiency, slash piles should be left to season for one year prior to burning. Seasoned piles burn substantially faster, more complete, and produce less smoke then un-seasoned piles.
  4. Only slash piles located at least 100 feet away from standing timber or other improvements should be burned.

5. Gasoline should never be used in drip torches due to the potential for the formation of explosive vapors.
6. An excavator, bulldozer, or a water tank holding at least 300 gallons of water with a functioning pump and sufficient hose length should be on site while burning.
7. All fires should be totally extinguished at the end of the working day.

- 5.1.4 Chipping

Slash pile chipping is emerging as a viable alternative to burning and will be used where appropriate and economically feasible. Chipping carries no risk of wildfire and does not generate smoke, which can create a public nuisance and contribute to reduced air quality.

Chipping costs are controlled by the hogfuel and pulp markets. The price for hogfuel usually goes up in the winter when log supply is low. Winter has historically been the best time to conduct chipping operations since the price for hogfuel can sufficiently offset the cost of chipping, loading and hauling. Chipping costs may be prohibitive when hogfuel prices are low. The continued and future use of chipping as a viable alternative to burning will depend on the future development of hogfuel markets.

- 5.1.4.1 Treatment Method and Equipment

  An excavator and a tracked tub grinder are commonly used for chipping operations. The tub grinder can drive right up to the pile for processing. If there are many smaller piles, the contractor may load the slash onto a separate, smaller tracked machine and drive the piles over to the tub grinder for processing. The contractor may opt to load and haul the logging slash to another location for chipping.

- 5.1.4.2 Treatment Season

  Fall and winter are the best times to conduct chipping from an economic standpoint but the potential for soil damage is high during this time. The development and use of hogfuel roads can mitigate for potential soil damage by providing a protective layer of organic material over the soil surface. Chipping during winter shouldn't be considered in units with soils that are easily compacted.

- 5.1.4.3 Contracting

  Chipping operations (grinding, loading, and hauling) are typically contracted out to a single contractor since most chipping contractors have trucking integrated into their operation. The contractor retains ownership of the chips in order for the operation to be completed at little or no cost. Knowledge of current hogfuel prices is important when considering bids. A sample Logging Slash Chipping and Removal Contract Agreement is provided in Appendix 5.

  Chipping, loading, and trucking may also be contracted out separately while retaining ownership of the chips. Operation costs are paid up front and hopefully recouped after the chips are marketed and sold. This approach requires more administration since purchase agreements must be obtained and payments must be processed.

- 5.1.4.4 Cost

  Chipping costs approximately $12 to $14/green ton. Trucking costs between $7 to $8/green ton. The total cost of chipping, loading, and hauling is approximately $21/green ton. If hogfuel prices are greater than $21/ton, the operation should be done at little to no cost if the contractor retains ownership of the chips.

- 5.1.4.5 Permits

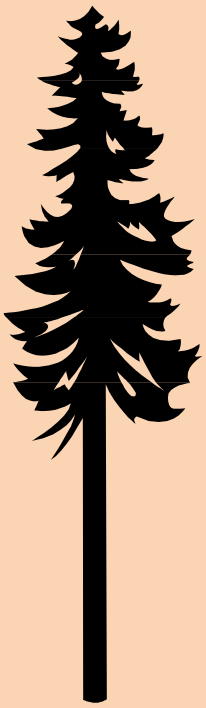
  A Land Use Permit from the Lummi Planning Department will be obtained for chipping operations. If chipping is anticipated on a harvest unit, it should be incorporated into the Land Use Permit for the timber harvest so that two separate permits are not necessary.

Chipping will be conducted in compliance with the requirements and conditions specified in the permit.

- 5.1.4.6 Chipping BMPs

  1. All slash moving, grinding, loading, and hauling activities should be conducted in a manner that will minimize resource damage.
  2. Reasonable and practical measures should be taken to prevent soil disturbance where soil is saturated including the use of straw, sod, bio-matting, tree boughs, logging slash, hog fuel roads or some other method approved by the LIBC Forest Manager.
  3. No stumps should be pulled during the operation.

Reforestation



- **6.0 Overview**

  The goal of reforestation on the Lummi Reservation is to restore the forested condition as soon as possible after harvest to ensure a continued supply of the environmental and economic benefits provided by the Reservation's forestland. Successful regeneration will be achieved by employing artificial regeneration (tree planting) and by taking advantage of natural regeneration where appropriate.

- **6.1 Artificial Regeneration**

  Artificial regeneration is the preferred regeneration method because it provides complete control over stocking, species composition, and seedling quality. Artificial regeneration success depends on obtaining and planting healthy seedlings adapted to local climate and site conditions; handling, storing, and planting seedlings properly; and implementing timely and effective plantation maintenance treatments to minimize competition in early stages of development.

  The primary goal in artificial regeneration is to have rapidly growing, healthy seedlings distributed uniformly throughout the site within 3 to 5 years of planting. At 3 to 5 years, a young tree is usually able to compete with grasses and shrubs on its own if it has received proper maintenance.

  - **6.1.1 Seedling Selection**

    Selecting appropriate seedlings for artificial regeneration is an essential step in producing successful forestry plantations. Seedlings vary by species, seed zone, elevation, and stock type.

    - **6.1.1.1 Species**

      The selected species will be well suited to a site's unique growing conditions. An evaluation will be conducted to identify site constraints including areas of poor drainage, exposed areas, droughty areas, and competing vegetation. The USDA soil survey of Whatcom County will also be referenced for species recommendations.

      As a general rule, the preferred timber species on upland sites will be red alder and Douglas-fir. On wetter sites, the preferred timber species will be western red cedar, red alder, and possibly western hemlock. Western red cedar and red alder will be planted in areas with known pockets of laminated root rot. These species are immune to this disease, which can remain in the soil for 50 or more years (Thies and Sturrock, 1995).

    - **6.1.1.2 Seed Zone and Elevation**

      Seedlings will be purchased from the appropriate geographic seed zone and elevation band for the Lummi Reservation. If seedlings from a different seed zone or elevation band must be used, attempts will be made to stay within one seed zone or elevation band away from the site.

      Moving seedlings from northern to southern seed zones is safer than moving seedlings from western to eastern seed zones. West-to-east seed zone movement is risky because drought adaptation changes along this gradient (Duddles and Landgren, 2006). In terms of elevation, it is safer to move seedlings from higher elevation bands to lower elevation bands due to the differences in the length of growing season (Duddles and Landgren, 2006).

      The preferable elevation band for the Lummi Reservation is 0 – 500 feet. Seedlings from the 0 – 1000 foot elevation band are also acceptable but seedlings from elevation bands above 1000 feet should be avoided. Descriptions and maps of preferred seed zones are provided in Appendix 6.

    - **6.1.1.3 Stock Type**

      Stock type is a two-digit code that refers to the method used to grow the seedlings (i.e. bareroot or plug) and how long it was grown at the nursery (usually between 1 – 3 years).

Stock type is a good indicator of seedling size and the shoot-to-root ratio, which are both important to know when selecting seedlings appropriate for your site (Atkinson and Fitzgerald, 2002). A description of common stock types, the type of conditions they are designed for, and other considerations are provided in Appendix 6.

Preferred conifer stock types on the Lummi Reservation include P+1s, 1+1s and 2+1s due to the heavy brush competition common in forestry plantations. These stock types are larger and are designed to be more competitive in brushy conditions. The preferred stock type for red alder is a 1+0. This is currently considered the best combination of cost and quality. Plug+0.5s are very robust and a good choice but are more expensive than 1+0's.

- **6.1.2 Planting Season**

The best time to plant conifer seedlings in western Washington is from January through March. The best time to plant hardwood seedlings is from mid-March to mid-April. Seedlings are dormant at this time and least sensitive to the stresses of lifting, handling and out-planting (Duddles and Landgren, 2006). Soil moisture levels are also high at this time which benefits the developing root system. Out-planting later than the recommended dates may not allow the seedling enough time to develop an adequate root system prior to the onset of summer drought stress. Dormancy may also be lost which increases the seedling's susceptibility to handling and out-planting stress (Emmingham et al., 2006).

- **6.1.3 Planting Density**

Forestry plantations will be established at the initial planting densities listed in Appendix 6 to ensure adequate stocking. These densities will be adjusted as necessary to account for unique site conditions and varying management objectives.

- **6.1.4 Purchasing Seedlings**

A seedling source will be secured 6 months to 2 years before harvest to ensure that the right high quality seedlings are obtained from commercial nurseries. Contract growing agreements with commercial nurseries will be pursued when possible to produce the required quantities of the preferred timber species and stock types. When contract growing is not possible, seedlings will be ordered as early as practicable (1 year in advance) to ensure the best selection of species and stock types. Purchasing speculative stock or surplus trees will be avoided. These trees may be low quality or have been stored for long periods of time.

- **6.1.5 Seedling Cost**

Seedling cost varies according to the nursery, species, seed source, stock type, quantity ordered, buyer specifications, markets, and availability. Costs range from $150-$450 per 1,000 seedlings (15¢ - 45¢/tree). In general, larger stock types are more expensive. A list of western Washington nurseries that produce commercial forestry seedlings is provided in Appendix 6.

- **6.1.6 Seedling Pick-Up**

The nursery should be contacted at least 4 to 6 weeks before the order is needed so that the nursery has adequate time to process the order. The nursery should be contacted again one week prior to picking up the order to confirm that the seedlings have been lifted and are in cold storage. Bags should be frequently checked at the time of pick up to make sure they are labeled with the species, stock type, seed zone, elevation, seedling count, and lift date. Bags should also be checked for any holes or signs of abuse. Mislabeled or abused bags should not be accepted.

- **6.1.7 Seedling Transport**

Refrigerated trucks or vans will be considered when transporting seedlings long distances from the nursery to cold storage to maintain cool seedling temperatures (35°F) and high humidity (95%). However, seedlings can be safely transported in the back of a pick-up truck during the winter months if proper protective measures are implemented to protect the seedlings from sun exposure, the truck's exhaust system, and internal respiration within the planting bag.

- **6.1.7.1 Seedling Transport BMPs**

  1. The truck bed should be lined with Styrofoam sheets to protect seedlings from the heat generated by the exhaust system.
  2. Spacer boards should be placed between the Styrofoam and the first layer of tree bags to allow ventilation and prevent heat buildup from respiration.
  3. Planting bags should not be stacked more than 3 high unless necessary. If necessary, spacer boards should be placed between additional layers of tree bags.
  4. The truckload should be covered with a solar reflecting tarp that is securely fastened to the truck. The tarp should cover both the top and sides of the load from sun and wind. A standard dark colored tarp should not be used.
  5. Seedlings should be transported on cool cloudy days, early morning, late evening, or at night.
  6. Seedlings should be unloaded into refrigerated storage as quickly as possible.
  7. If the trip will take longer than 4 hours and the outdoor temperature is expected to be above 40 degrees, renting a refrigerated truck or van should be considered.

- **6.1.8 Seedling Storage**

  Proper offsite and onsite seedling storage is very important in maximizing the chances of out planting success. As temperature increases above 34 degrees, seedlings begin to metabolize utilizing food reserves that are needed to support growth and avoid transplanting shock following out-planting (Emmingham et al., 2006). Therefore, it is important to maintain the seedlings at temperatures as close to 34 degrees as possible to reduce the amount of food the seedlings use while they are out of their natural environment. If planting red alder, it is even more important to maintain low temperatures since red alder can de-harden very rapidly when removed from cold storage (Weyerhaeuser, 2005).

  - **6.1.8.1 Offsite Storage BMPs**

    1. Seedlings should be stored in a cold storage facility until the day they are needed for planting. Cold storage temperatures should be maintained between 34 – 36 degrees to prevent respiration and root mold damage.
    2. Seedlings should not be stored in freezing temperatures. If accidentally frozen, thaw slowly before planting.
    3. Planting bags should not be stacked more than 3 high
    4. Torn bags should be repaired immediately with duct tape.
    5. Allow space between stacks for air circulation.
    6. Minimize the amount of time seedlings are in cold storage (it is best to plant within 10 days of receiving them).
    7. Avoid storing seedlings in coolers used for fruit storage. The fruit ripening process produces large amounts of ethylene, a gaseous plant hormone that can jeopardize seedlings' later development (Rose and Haase, 2006).

  - **6.1.8.2 Onsite Storage BMPs**

    1. Seedlings should be stored in the shade of standing timber or under a reflective space blanket (Mylar) to keep them cool. Canvas or dark-colored coverings should not be used and direct exposure to sunlight should be avoided.
    2. Seedlings should be planted on cool, wet days (the best air temperatures for planting are between 34 and 42 degrees).

3. All trees taken out of cold storage should be planted the same day.
4. A thermometer should be kept onsite to periodically check the temperature within seedling bags throughout the day.

- **6.1.9 Seedling Care and Handling During Planting**

Improper care and handling during planting can significantly increase seedling mortality. Tree planters will be instructed to handle seedlings carefully and as little as possible before they are put in the ground.

- **6.1.9.1 Seedling Care and Handling BMPs**

1. Tree bags should not be opened until they are needed. When a tree bag is opened, it should be resealed as soon as possible to maintain the high humidity.
2. Seedling roots should be kept moist at all times. Seedlings should be dipped in water for 1 minute prior to placing them in the planting bag to provide added protection to the root system. Seedlings should be carried in a planting bag or bucket lined with a vapor barrier, wet burlap, peat moss, saw dust, or similar moist material.
3. Tree planters should only carry the number of seedlings that can be planted within two to three hours. Seedlings should not be packed tightly in the planting bags but should be kept loose for easy removal.
4. The planting hole should be prepared before removing the seedling from the planting bag. Only one seedling should be removed at a time.
5. Do not hit or vigorously shake seedlings in an effort to dislodge excess soil. Seedlings can be damaged by excessive vibration.
6. Roots should not be pruned.
7. Seedlings should be planted at the same depth they grew in the nursery (usually 1 inch above the root collar).

Proper care and handling is even more important when planting red alder. Red alder seedlings are brittle and prone to breakage and careless loading into planting bags can cause considerable breakage to roots and stems (Weyerhaeuser, 2005). Additional care must be taken when closing the planting hole so that the stem is not wounded by the planter's boot. Red alder seedlings should also be planted deeper than conifers (approximately 1 – 2 inches above the root collar) to partially offset the effects of heat and drought on the seedling (Weyerhaeuser, 2005).

- **6.1.10 Planting Location**

Selecting good planting locations and creating appropriately sized planting holes are both very important to seedling survival. Although a pre-determined square planting grid is used as a guide, it is more important to select good planting spots than to space trees precisely.

- **6.1.10.1 Planting Location BMPs**

1. Seedlings should be planted in areas with exposed mineral soil that are not surrounded by concentrations of re-sprouting brush, animal holes, or game trails.
2. Favorable microsites next to a log, stump, or mound that protect seedlings from direct sunlight and wind should be used where available.
3. Planting holes should be dug in mineral soil only. Avoid mixing any organic debris such as rotten wood, branches or needles in the planting hole.
4. Planting in wet depressions, duff, or decaying wood should be avoided.
5. Planting holes should be deep enough to accommodate roots to avoid J-rooting or L-rooting. The soil around the roots should be firm to eliminate air pockets in the planting hole.

- **6.1.11 Planting Mistakes**

  Planting mistakes include improper planting depth, crooked roots, loose planting, damaged bark, and poor planting soil. An illustration and description of these mistakes are provided in Appendix 6. These mistakes can cause seedling mortality and retard tree growth and will be monitored when conducting tree planting contract compliance.

- **6.1.12 Contracting**

  Tree planting will be contracted out to a qualified contractor. A sample Tree Planting Contract Agreement is provided in Appendix 6.

  - **6.1.12.1 Cost**

    The cost of tree planting (excluding the cost of seedlings) ranges from 25¢ - 50¢/tree depending upon site conditions, seedling size, and planting density.

    Terrain, access, site prep, and soil type can impact tree planting cost. The more difficult a unit is to plant, the higher the tree planting cost. Larger seedlings are more expensive to plant than smaller seedlings since production is generally lower when planting larger stock types. Higher planting densities also increase the cost per acre but production is usually higher since less time is spent walking to the next planting location.

  - **6.1.12.2 Permits**

    A Land Use Permit from the Lummi Planning Department will be obtained when necessary for tree planting. Tree planting should be incorporated into the Land Use Permit for the timber harvest so that two separate permits are not necessary.

- **6.1.13 Reforestation Surveys**

  An early summer walk-thru survey will be conducted after the seedlings have undergone mild stresses. If early mortality is observed, it is likely that the planting stock was dead or low in vigor at the time of planting (Rose and Haase, 2006). If trees are dying in the absence of environmental extremes and despite good site preparation, then stock quality is a factor and may need to be addressed with the nursery (Rose and Haase, 2006). A second walk-thru will be conducted in late-summer or early fall to evaluate how the seedlings are dealing with heat or moisture stress. If the seedlings are developing short, stubby "stress needles", it suggests that the seedlings experienced root damage at or before planting (Rose and Haase, 2006). Animal damage and competing vegetation will also be observed during this inspection.

  A formal stocking survey will be conducted at the third or fourth year following out-planting to assess survivorship. Surveys will be done in the winter when brush is low and seedlings are easily visible for inspection. If these surveys determine that stocking is below acceptable levels, inter-planting will be conducted. A description of the reforestation survey methodology is provided in Appendix 6.

- **6.2 Natural Regeneration**

  Natural regeneration of desirable timber species will be used opportunistically after the unit has been planted. Occasionally, areas within plantations experience excessive mortality and naturally regenerate with red alder. It these situations, the natural seedlings may be managed instead of the artificial seedlings. Natural regeneration is much more prevalent in hardwoods than conifers and comes from germinated seeds on the forest floor, stump sprouts, root sprouts, or from advance reproduction growing in the understory prior to harvest. Areas of valuable advance reproduction will be protected during timber harvest to assist in meeting regeneration requirements.

- **6.3 General Reforestation BMPs**

  1. Tree planting will be done after clearcutting or partial cutting where 50 percent or more of the timber volume is removed within any 5-year period, unless the LIBC Forest Manager determines that the live trees remaining will reasonably utilize the timber growing capacity of the soils.
  2. The selected reforestation species should be commercially valuable, suitable to the environmental conditions of the site, and be from an acceptable seed zone.
  3. Seedlings should be properly stored, handled, and planted to maximize survivorship.
  4. Satisfactory reforestation should be completed within 2 years of the completion of harvest.
  5. A harvest unit will be considered adequately reforested when the unit contains an average of 222 or more vigorous, undamaged, and commercially valuable seedlings per acre (14 x 14 ft. spacing) that have survived on the site for at least 1 growing season. Up to 20 percent of the harvested area may contain fewer than 222 seedlings per acre, but no portion of the harvested area with timber growing capacity should contain less than 151 seedlings per acre (17 x 17 ft. spacing).
  6. Competing vegetation should be controlled to the extent necessary to allow establishment, survival, and growth of commercial tree species.
  7. Tree planting will not be done where trees are removed under a thinning program reasonably expected to maximize the long-term production of commercial timber or where the land will be developed for a use other than forestry.
  8. Tree planting may not be pursued in harvest units that have an average of 151 vigorous, un-damaged, well-distributed saplings (greater than 4-inches at DBH) or merchantable trees (greater than 8-inches at DBH) per acre of a commercial timber species. Up to 20 percent of the harvested area may contain fewer than 151 saplings per acre, but should not contain less than 109 (20 x 20 ft. spacing) saplings per acre.

- **6.4 Wildlife Damage Protection**

  Wildlife damage to forestry plantations caused by deer and voles has been noted on the Lummi Reservation. Animal damage may cause a reduction or delay in forest growth and increase establishment costs. The three main approaches to controlling animal damage include eliminating and/or reducing access to seedlings, manipulating habitat so that it is less attractive, and reducing the animal population. A combination of control methods usually provides the best results. Poison baiting or trapping will not be used because of the risk to non-target animals. Instead, tubing, bud caps, repellents, and habitat manipulation techniques will be used. A description of these control methods is provided in Appendix 6.

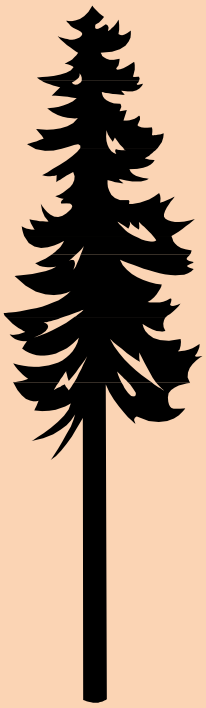
  - **6.4.1 Contracting**

    Wildlife deterrent installations and applications will be contracted out to a qualified contractor. A sample Wildlife Deterrent Application Agreement is provided in Appendix 6.

    - **6.4.1.1 Cost**

      Costs for installing wildlife protection can vary depending on tree planting density, terrain, unit conditions, and the type of protection installed. A summary of costs is provided in Appendix 6.

Vegetation Management



- **7.0 Overview**

  Vegetation management will be implemented within forestry plantations during the first 1 to 4 years following out-planting to ensure seedling survival and desired growth rates. Competition from undesirable vegetation can negatively impact both diameter and height growth resulting in a long-term impact on volume production and an increase in the time required for a stand to reach maturity. Implementing vegetation control measures early in stand development will keep undesirable vegetation from becoming well established and suppressing planted seedlings.

- **7.1 Problem Vegetation in Forestry Plantations**

  The species composition of problem vegetation in forestry plantations is fairly similar due to the geography and relatively small size of the Lummi Reservation. However, the quantity and vigor of certain species can vary significantly. Common problem species include black cottonwood, willow, paper birch, cherry, salmonberry, red elderberry, thimbleberry, and blackberry. A complete listing of common species found in forestry plantations is provided in Appendix 7. Unit surveys will be conducted to identify problem vegetation and to determine appropriate control methods if needed.

- **7.2 Integrated Pest Management Principles**

  Problem vegetation in forestry plantations will be controlled using Integrated Pest Management (IPM) principles. IPM is an effective and environmentally sensitive approach for managing problem vegetation that uses best available science in combination with all available control methods to manage problem vegetation in an economical and environmentally responsible manner. IPM is a four-tiered approach that includes setting action thresholds, identifying and monitoring problem vegetation, preventing problem vegetation, and controlling problem vegetation.

- **7.3 Manual Control Methods**

  Manual control methods will be considered where appropriate. Although manual controls only provide a temporary advantage for seedlings, past experience indicates that this is usually adequate in meeting plantation release objectives. Manual control methods are more labor intensive, time consuming, and expensive when compared to herbicide controls but have the advantage of avoiding herbicide use, which is preferred and desired around sensitive sites or in red alder and western red cedar plantations. Manual control methods also provide for more opportunities for tribal employment.

  - **7.3.1 Timing**

    Correct timing is important in manual treatment success. Cutting at certain times of year and during a specific stage of development can provide better and longer lasting control. This is important since cutting some undesirable hardwoods and shrubs can result in vigorous sprouting and re-growth, which allows undesirable species to quickly regain their competitive advantage over planted seedlings (Fitzgerald, 1998). Manual control guidelines to maximize treatment success are provided in Appendix 7.

  - **7.3.2 Treatment Method and Equipment**

    Manual control treatments will be done using machetes, gas-powered brushers, chainsaws, or other appropriate equipment.

  - **7.3.3 Seedling Damage**

    Seedling damage from manual plantation release treatments should not exceed 5%. Seedling damage may be caused by cutting tools and from falling slash. Seedling damage is more prevalent when gas-powered equipment is used, particularly if seedlings are hidden by vegetation. Experience has shown that machetes provide the highest degree of control and the least amount of seedling damage.

- **7.3.4 Manual Control BMPs**

  1. Manual control methods should be scheduled at the proper time for the target species.
  2. Target vegetation should always be cut as close to the ground as possible and below the lowest live branch.
  3. Undesirable vegetation exceeding 5 inches at DBH should be girdled.
  4. Extra care should be taken when using gas powered equipment for brushing.

- **7.4 Herbicide Control Methods**

  Herbicide control methods will be considered where appropriate and where manual control methods are insufficient to meet vegetation control objectives. Safe and dependable herbicides have been developed for most forestry needs (Newton, 2009). The selected herbicide and application method depends on species composition, degree of control required, weather, site constraints, herbicide activity, and season of application.

  Only general-use herbicides will be considered for use in forestry plantations. The Environmental Protection Agency (EPA) has determined that general-use herbicides do not cause unreasonable adverse effects on the environment when used in accordance with widespread and commonly recognized practices (EPA, 2010). Common general-use forestry herbicides include glyphosate, imazapyr, triclopyr, sulfometuron, and metsulfuron.

  - **7.4.1 Treatment Method and Equipment**

    Only ground-based application methods will be considered for herbicide applications. Backpack applications are effective in controlling brush less than 5 to 6 feet tall in areas where the applicators can move freely through the unit. Once undesirable vegetation exceeds 6 feet in height, it is difficult to get good coverage and effective control over the target vegetation (Fitzgerald, 1998).

    Backpack applications also provide applicators with high degree of control over where herbicide is sprayed reducing potential seedling damage or non-target exposure. Backpack sprayers typically hold 3-5 gallons of spray mix. Production per individual usually ranges between 1 to 5 acres per day depending upon terrain, vegetation density, and spray method (Newton, 2009).

  - **7.4.2 Foliar and Soil Applications**

    Foliar applications entail spaying herbicide on plant foliage and can provide a high degree of vegetation control. Foliar applications can be used in both site preparation and plantation release treatments. Soil applications are mainly used in site preparation treatments. Plantation release treatments generally use lower rates/acre than site preparation treatments because of the potential for seedling damage.

    Soil active herbicides are commonly combined in foliar applications to provide pre-emergent control. These herbicides target the root systems of undesirable vegetation, prevent seed germination, and also provide some minor foliage activity as well. Grasses and forbs are more susceptible to these herbicides than are deep-rooted, well-established woody plants. A certain amount of moisture is required to activate soil active herbicides and carry them into the rooting zone of the target vegetation. Because of this, soil active herbicides can be applied during periods of rainy weather (Belz, 2002). However, they are usually applied in the mid-summer as part of a foliar application.

    - **7.4.2.1 Surfactants**

      A surfactant is a wetting or penetrating agent that is added to a herbicide mixture to improve herbicide performance. Surfactants must be matched appropriately to the herbicide, the type of application (site preparation vs. plantation release), and be approved for safe use around planted species. Most surfactants increase the potential for seedling injury and must be used carefully in release treatments.

- **7.4.2.2 Dyes**

  Dyes are used in herbicide mixtures to easily identify treated areas. Dyes help to achieve a uniform application and reduce the risk of over-application. The selected dye must be compatible with the herbicide used. If a water-soluble herbicide is used, then a water-soluble dye must be used. If an oil-soluble herbicide is used, then an oil-soluble dye must be used.

- **7.4.3 Site Preparation Applications**

  Site preparation applications are done prior to tree planting and can be done as a broadcast application (foliar and soil) or as a spray-to-wet application (foliar) depending on the density of undesirable vegetation and management objectives. An effective site preparation application can be very beneficial before planting red alder since release sprays may not be feasible due to red alder's sensitivity to forestry herbicides.

  - **7.4.3.1 Timing**

    Site preparation applications may occur in the summer, early fall, or spring depending on the planting schedule for the site. Site preparation sprays right after timber harvest occur in late summer/early fall. If the unit is left to green up for one growing season, application should occur in mid-summer since a mid-summer application usually provides the most control over undesirable species (Newton, 2009).

  - **7.4.3.2 Preferred Weather Conditions**

    Foliar applications should be conducted during sunny, dry weather with temperatures less than 75 degrees and winds less than 7 MPH. If rain or high wind is in the forecast, operations should be suspended until periods of dry, calm weather. High winds or heavy rains during or immediately after spraying can cause the herbicide to drift away or wash off target vegetation reducing its effectiveness (Fitzgerald, 1998). Soil applications with Oust may occur when raining.

  - **7.4.3.3 Application Options**

    Site preparation herbicide prescriptions are based on management objectives; the type, quantity, and vigor of competing vegetation; the level of control desired; environmental constraints specific to the site; and the selected reforestation species. A list of general use herbicides labeled for site preparation by reforestation species is provided in Appendix 7. A description of application options including herbicide formulations, guidelines for application by reforestation species, and application method are also provided in Appendix 7. These options are templates that have been developed from herbicide labels and other sources and may be considered for use. These templates are guides that are not intended to replace the directions on herbicide labels or the recommendations of professional applicators and should be adjusted as necessary.

- **7.4.4 Plantation Release Applications**

  Plantation release applications are used to control competing vegetation to allow seedlings to reach the "free-to-grow" stage. The "free-to-grow" stage is reached when the top growth whorl of the seedling is above competing vegetation and the seedling is expected to maintain its dominant position with no additional control treatments (Belz, 2002).

  Plantation release applications are most effective when conducted early in seedling development. Early release is more critical for shade-intolerant species such as Douglas-fir and red alder. Shade-tolerant species such as western red cedar and western hemlock are better able to compete when partially overtopped by vegetation (Duddles and Cloughesy, 2002).

  Plantation release applications can be done as a broadcast application (foliar and soil) or as a spray-to-wet application (foliar) depending on the reforestation species, density of undesirable

vegetation, and management objective. Broadcast applications in western red cedar, red alder, and western hemlock plantations may not be desirable due to herbicide sensitivity.

- **7.4.4.1 Timing**

  Plantation release applications are usually done as late foliar sprays (early September to early October). At this time, target vegetation has had an entire season to grow and develop a significant amount of leaf surface area and is still susceptible to herbicides while conifer seedlings are slightly immune because they are hardening off for winter and preparing for dormancy. Late foliar release applications will not be considered in red alder plantations due to the potential for seedling damage. An early spring release treatment may be considered if red alder seedlings have not experienced bud burst.

- **7.4.4.2 Preferred Weather Conditions**

  The preferred weather conditions are the same as those described for site preparation applications.

  7.4.4.3 Application Options

  Plantation release herbicide prescriptions are based on the sensitivity of the reforestation species; the type, quantity, and vigor of competing vegetation; the level of control desired; application method; and environmental constraints specific to the site. A list of general use herbicides labeled for plantation release by reforestation species is provided in Appendix 7. A description of application options including herbicide formulations, guidelines for application by reforestation species, and application method are also provided in Appendix 7. These options are templates that have been developed from herbicide labels and other sources and may be considered for use. These templates are guides that are not intended to replace the directions on herbicide labels or the recommendations of professional applicators and should be adjusted as necessary.

- **7.4.4.4 Seedling Damage**

  Seedling damage from plantation release treatments should not exceed 5%. The level of damage is determined by seedling visibility during treatment, application rates, application timing, and whether or not a surfactant is used. The use of a surfactant can increase damage to 15% or greater if the applicators do not exercise necessary caution while spraying (Belz, 2002).

More information on herbicide treatments and alternative control methods can be found in the Pacific Northwest Weed Control Handbook, which is available online at http://weeds.ippc.orst.edu/pnw/weeds.

7.4.5 Application in Forested Wetlands

Certain formulations of glyphosate are permitted for use in and around forested wetlands if standing water is present. These formulations of glyphosate may be considered for site preparation and plantation release applications in moderate and low value forested wetlands if permitted by the LIBC Water Resources Manager.

7.4.6 Cut-Surface Applications

Cut-surface applications are individual plant treatments that may be used to control problem hardwood species. These applications entail spraying or painting herbicide onto the cut surface of a stump or into a series of deep wounds made by the applicator that penetrate into the bark and sapwood along the trunk of a standing tree.

The cut-stump application is used to treat individual hardwood stumps after cutting. The main goal is to reduce stump sprouting of undesirable hardwoods. This treatment is particularly beneficial when reforestation units have 4 or more stumps of bigleaf maple or black cottonwood

per acre (WADNR, 1999). Treatment is possible any time of year but the effectiveness of the treatment can vary significantly (Newton, 2009).

The frill treatment is used to control individual hardwood or brush species. This treatment is generally applied to individual stems greater than 4-inches at DBH (Belz, 2002). Herbicide is applied to incisions that penetrate the bark and cambium layer of the target tree. Treatment is possible any time of year but the effectiveness of the treatment can vary significantly (Newton, 2009).

A description of each application technique including target species, mixing rates, treatment techniques, and application timing are provided in Appendix 7.

- **7.4.7 Herbicide Application BMPs**

  1. All herbicide applications should be done by a licensed herbicide applicator.
  2. Herbicides must be handled, mixed, and applied according to label directions.
  3. Extreme care should be taken during the measuring and mixing process. No mixing should be done in areas where an accidental spill could enter an aquatic resource or surface water.
  4. Unless otherwise specified on the label(s), the W.A.L.E.S herbicide mixing methodology should be used to avoid chemical incompatibility problems and maximize treatment efficacy.
  5. Mixed herbicide batches should be sprayed the same day to maximize treatment efficacy.
  6. Herbicide containers should be sealed and tightly secured to the vehicle when being transported to the application site. No leakage or spilling should occur during transport. Herbicide containers should be periodically monitored to ensure no leakage or spilling.
  7. Backpack sprayers should be properly calibrated to ensure appropriate application rates. Spray pressures and techniques that minimize spray drift should be used.
  8. A public notice should be posted 24 hours in advance of spraying for a period of at least 24 hours where application occurs near or adjacent to residential areas and/or public roadways.
  9. Herbicide labels and material safety data sheets should be onsite at all times during application.
  10. Herbicide application should be done during favorable weather conditions that are expected to last a minimum of 24 hours.
  11. No herbicides may be applied within 50 feet of a domestic water supply well or within 100 feet of a public water supply unless otherwise approved by the LIBC Water Resources Manager.
  12. Excess herbicide mix and empty herbicide containers must be disposed of according to label directions. Larger volumes should be taken to designated dumps or disposal plants.
  13. Herbicide spills must be handled according to the herbicide label(s) and material safety data sheet(s) and must be the first and highest priority. Immediate action should be taken to contain spilled material by trenching or diking and by using absorbent pillows, sand, sawdust, vermiculite, or kitty litter to absorb the chemical.

- **7.5 Post-Treatment Survey**

  Plantations will be inspected after vegetation control treatments to assess treatment effectiveness and identify any future problems. The unit will be visited once in the summer to assess competition and once in the winter to assess seedling condition.

- **7.6 Vegetation Management Contracting**

  Most vegetation management treatments will be contracted out. A sample Hand Slashing Contract Agreement and a Ground Herbicide Application Contract Agreement are provided in Appendix 7.

  - **7.6.1 Cost**

    Manual control treatments generally cost between $200 to $350/acre. Foliar and basal bark applications generally cost between $90 to $150/acre depending upon the amount and type of herbicide used, size of treatment area, and the density and type of target vegetation. Cut stump and frill treatments usually cost around $4 to $5/stump or stem.

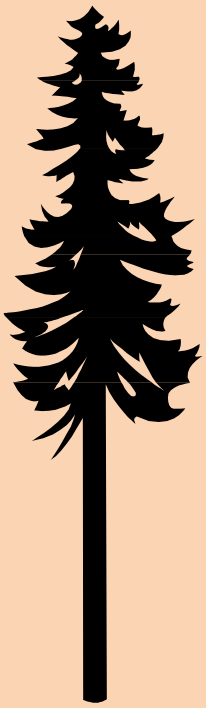
  - **7.6.2 Permits**

    A Land Use Permit from the Lummi Planning Department will be obtained when necessary for vegetation control treatments and will be conducted in compliance with the requirements and conditions specified in the permit.

  - **7.6.3 Public Notification**

    A public notification will be posted for vegetation control treatment where herbicides are used in harvest units near or adjacent to residential areas and/or roadways. A sample public notification is provided in Appendix 7.

Thinning



THINNING

- **8.0 Overview**

  Thinning is a valuable management tool that will be used to accelerate stand development and to maintain tree vigor and stand health. As seedlings grow, their growing space increasingly overlaps and they begin to compete for resources. The stand will eventually reach a point where top growth is maximized in relation to the stand's average diameter and stocking. When this point is reached, a reduction in the number of trees per acre is necessary to free up additional growing space so that crop trees can grow faster and increase in volume.

  The increased volume growth associated with a thinning normally occurs as diameter growth rather than height growth (Emmingham and Elwood, 2002). Stands left to thin naturally must wait until less competitive trees die from insufficient resources resulting in an overall reduction in stand growth and health. Even when dominant trees are released, they are less able to respond to the increase in growing space and exhibit slower growth rates (Holmberg et al., 2006).

- **8.1 Thinning Objectives**

  1. Redistribute the total volume of a stand to fewer, large, high quality trees to maximize value.
  2. Provide more frequent periodic incomes for landowners.
  3. Utilize and profit from trees that would otherwise be lost to mortality.
  4. Increase profitability of growing stock by reducing investment in standing volume.
  5. Enhance non-timber values such as wildlife habitat and aesthetics.

- **8.2 Thinning Types**

  There are two main types of thinning: pre-commercial and commercial. Pre-commercial thinning is an investment that removes a large amount of trees in immature stands to accelerate the growth of remaining trees to the point where they have commercial value. Commercial thinning is an intermediate harvest that is profitable or revenue-neutral that removes less competitive trees to provide crop trees with more growing space so that they produce large, high quality logs.

- **8.3 Thinning Risks**

  There are inherent risks associated with thinning, particularly in stands where thinning has been delayed. The major risk factors associated with thinning include thinning shock, sunscald, blowdown and breakage, and manager or operator error. A description of these risks is provided in Appendix 8. Understanding these risks and how a stand will respond to a given thinning prescription can help minimize potential negative impacts.

- **8.4 Thinning Intensity & Frequency**

  Thinning intensity refers to the number of trees removed in a thinning operation relative to current stocking. It can be light or heavy depending on thinning type, management objectives, and site characteristics. Thinning intensity determines the amount of growing space made available to leave trees and, along with site productivity, the length of time competition will be reduced. If the thinning is too light, the site's growth potential is spread over too many trees to achieve maximum benefits. If thinning is too heavy, considerable amounts of site resources are outside the reach of leave trees and the growth potential of a site is under utilized (Emmingham and Elwood, 2002). Heavy thinnings also have a higher risk of blowdown.

  Thinning frequency refers to how often a stand is thinned. It can be high (5 to 10 year intervals) as is the case for red alder or low (15 to 20 year intervals) as is the case for conifers. Commercial thinning frequency will be determined by the time it takes a stand to reach the Management Zone Upper Limit for the predominant species. This strategy will provide an optimal balance between stand growth, tree form, natural pruning, and forest health. It is also the best way to imitate nature without the delay caused by natural mortality to occur (Holmberg et al., 2006).

- **8.5 Topography**

  Topography can play an important role in developing thinning prescriptions since it influences site conditions, determines risk factors, and impacts operation costs. The flat, gentle topography of the Lummi Reservation allows flexibility in developing and conducting thinning operations. However, the Reservation experiences high winds and stand exposure will be considered when developing thinning prescriptions.

- **8.6 Thinning Season**

  Thinning operations in conifers stands will take place in late summer, fall, or winter when trees are dormant or are beginning to go into dormancy. Thinning operations in hardwood stands will take place in the winter because the bark is toughest during this season (Hibbs, 1996). Thinning operations in the spring and early summer will be avoided since trees are actively growing and are very susceptible to bark damage (Emmingham and Elwood, 2002).

- **8.7 Measuring Stand Competition**

  Stand density measures are used to quantify and express stand competition. These measures can be used to determine if a stand is growing well in relation to its management objectives, if a thinning is needed, and for comparing and prioritizing stands for thinning treatments. They can also be used to develop stocking guides for individual species. Most stand density measures are applicable to single-species, even-aged stands and are based on empirical observation (Arney and Milner, 2006).

  - **8.7.1 Curtis' Relative Density (RD)**

    Curtis' Relative Density (RD) is widely used in western Washington and will be the stand density measure used for planning thinning operations. Curtis' RD is independent of site quality and is only meaningful in commercial stands.

    Curtis's RD was originally developed for use in Douglas-fir stands. The measure is used for other species but the RD values that correspond to the management and mortality zones are species specific. The higher a species' shade tolerance, the higher the RD values associated with each zone (Holmberg, et al., 2006). Shade-tolerant species can efficiently use lower light intensities and therefore, closer spacing results in greater wood production per acre. Although the concept of RD only applies to single species, even-aged stands, it can be used in mixed-species and uneven-aged stands if stands are judiciously stratified (Holmberg et al., 2006). RD can then be calculated for each stand component and used to calculate a weighted stand average. Instructions for computing Curtis' RD are provided in Appendix 8. Four stocking standards are used in relation to RD values for stocking assessment. These standards include: Understocked, Management Zone Lower Limit, Management Zone Upper Limit, and the Mortality Zone.

    - **8.7.1.1 Relative Density Stocking Guides**

      Tabular stocking guides were developed for Douglas-fir, red alder, and western red cedar/western hemlock using published RD values that correspond to each species' management and mortality zones. These RD stocking guides are provided in Appendix 8. The RD values used for western red cedar are those recommended for western hemlock since literature on western red cedar density management is fairly limited. The RD values used for Douglas-fir and western hemlock are consistent with values used by the Washington State Department of Natural Resources. The RD values used for red alder were converted from the "Density Management Guide for Red Alder" (Puettmann et al., 1993).

      The RD stocking guides will be used to develop thinning prescriptions. Once the residual relative density is identified, the number of leave trees per acre can be determined from the species' stocking guide with an estimate of the stand's average DBH after thinning. Examples using RD to develop commercial thinning prescriptions are provided in Appendix 8.

- **8.7.2 Height/Diameter (H/D) Ratio**

  Height/Diameter ratio is another stand density measure that can be used with Curtis' RD to assist in prioritizing stands for commercial thinning. The H/D ratio is a measure of tree stability, which is important to know prior to developing and implementing a thinning prescription (SAF, NPSC, 1995). The H/D ratio is calculated by dividing the stand's average total height by the stand's average diameter. Both measures must be in the same units (usually feet) in order to calculate the ratio. An H/D ratio less than or equal to 85 indicates good tree stability for shade-intolerant species and an H/D ratio less than or equal to 90 indicates good tree stability for shade-tolerant species.

  Stands with a high H/D ratio have lower tree stability and an increased risk of blowdown and breakage (Hanley and Baumgartner, 2005). Stands with higher H/D ratios should be prioritized over the stands with lower H/D ratios to reduce further increases in risk unless the H/D ratio is so high that blowdown risk cannot be mitigated (Holmberg et al., 2006).

- **8.8 Thinning Unit Planning**

  Eligible thinning units will be identified based on forest inventory data, surveys, planting records, and aerial photos. Reconnaissance will be conducted to determine stand acreage, species composition, trees per acre, quadratic mean diameter, stand density, average total height, crown ratios, 10-year growth, stand health, stand boundaries, access, risk, and site limitations.

- **8.9 Pre-Commercial Thinning (PCT)**

  Pre-commercial thinning will be considered in immature stands where necessary to accelerate stand growth and to remove less competitive trees and undesirable species. If biologically feasible, it is preferable from an economic standpoint to forgo a pre-commercial thinning and wait until the stand grows to commercial size and then conduct a commercial thinning (Holmberg et al., 2006).

  - **8.9.1 PCT Density Guidelines**

    Pre-commercial thinning will be conducted in accordance with the PCT density guidelines provided in Appendix 8 unless management objectives, site constraints, or current economic factors dictate a different strategy. If these guidelines are inconsistent with the stand's management objective, the species' relative density stocking guide will be referenced to determine the appropriate trees per acre figure for the desired target diameter. Consideration will be given to the span of time until the next stand entry and the anticipated growth rate in determining residual stocking after a PCT. The larger the trees must be to support a commercial thinning, the wider the spacing after pre-commercial thinning (Reukema, 1975). However, residual spacing shouldn't be so wide as to create poor log quality, extended rotation lengths, or higher thinning risks.

    - **8.9.1.1 PCT Density Guidelines for Natural Red Alder Regeneration**

      Natural red alder regeneration is very common on the Lummi Reservation. Due to red alder's high economic value, natural red alder regeneration will be encouraged where silviculturally appropriate. Natural red alder regeneration is typically very dense and pre-commercial thinning early in stand development is necessary to achieve the desired spacing for timber production. Natural red alder stands will be thinned to 600 trees per acre between the ages of 2 to 4 to achieve the desired stocking for an artificially regenerated red alder stand.

  - **8.9.2 PCT Surveys**

    Candidate PCT units will be surveyed for need and prioritization. If the unit is within the age range and appears to be ready for a PCT after an initial walk-thru, plots will be installed to determine species composition, trees per acre, average crown ratio, average diameter, stand density, and average total height. PCT survey methodology is provided in Appendix 8.

- **8.9.3 Guidelines for Prioritizing PCT Units**

  1. Priority should be given to stands with crown ratios that are at 50% or less and are at the optimal height, DBH, and age for the species to conduct a PCT to maximize growth response and to reduce project costs.
  2. Species with weak small log markets should be prioritized over species with strong small log markets. A PCT may not be advisable if the species has a strong market for small wood products such as chip & saw and pulp logs, which would support a commercial thinning.
  3. Stands planted with shade-intolerant species should be given priority over stands planted with shade-tolerant species. Shade-tolerant species hold their crown longer under competition, which offers more flexibility in scheduling thinning operations (BCMOF, 1999).
  4. Stands impacted or at high risk of being impacted by a forest health issue should be prioritized over low risk stands. Thinning can be used to sanitize infected stands lowering future losses and can increase leave tree vigor, which increases tree resistance to insects and disease.
  5. Stands with good access should be prioritized over stands will poor access due to the lower management and harvest costs.

  In addition to the guidelines above, consideration will be given to PCT unit size and site quality. Conducting a PCT in larger units will make more of an impact on a forest level, produce more revenues in the future, and will reduce thinning risks associated with commercial thinning. Conducting a PCT in smaller units may be necessary to ensure that these units contain logs large enough to support a commercial thinning and are attractive to purchasers. Stands growing on higher sites will produce greater volume gains from a PCT and therefore provide a better return on the investment. However, low sites generally benefit more from a PCT since the time required for trees to reach commercial size without a PCT is much greater than on high sites and may make the difference in whether or not merchantable trees are produced within an economic timeframe (Reukema, 1975). On higher sites, a satisfactory crop may be produced without a PCT.

- **8.9.4 PCT Method and Equipment**

  PCT projects will be done mechanically. A mechanical PCT is generally done with a crew of 4 - 8 men equipped with chainsaws. Machetes or hatchets may also be used if the trees are small enough. Non-desirable trees are cut and laid on the ground to decompose. Mechanical PCTs temporarily result in heavy slash loads, decreased access, and increased fire danger. Cut trees should be placed as close to the ground as possible to increase decomposition rates and reduce fire danger.

- **8.9.5 PCT Slash Disposal**

  PCT slash will be left untreated to decompose naturally since there is little need or incentive to treat the slash. Decomposition is generally fast in western Washington due to the mild, wet climate (Oester and Emmingham, 1997). Lopping can accelerate slash decomposition but is more expensive and will only be considered where there are legitimate forest protection or public safety concerns.

- **8.9.6 PCT Contracting**

  Pre-commercial thinning will be contracted out. A sample Pre-Commercial Thinning Contract Agreement is provided in Appendix 8.

  - **8.9.6.1 Cost**

    Based on local cost data, pre-commercial thinning operations generally range between $125 - $200/acre.

- **8.9.6.2 Permits**

  A Land Use Permit from the Lummi Planning Department will be obtained when necessary for pre-commercial thinnings and will be conducted in compliance with the requirements and conditions specified in the permit.

- **8.10 Commercial Thinning (CT)**

  Commercial thinning will be considered where necessary to maintain good growth rates and increases in log values by removing less competitive trees and undesirable species. For most stands, only one commercial thinning will be conducted prior to final harvest. Because commercial thinning is using some of tomorrow's wood today, the remaining forest must be left in a healthy and productive condition to preserve future options.

  - **8.10.1 Low Thinning (thin-from-below)**

    A low thinning will be used for most commercial thinning operations. A low thinning removes small, less-competitive trees from the lower crown classes to free up additional growing space for larger, competitive trees in the dominant crown class. All suppressed, most intermediate, and many co-dominant trees are removed in a low thinning. A low thinning generally elicits a strong growth response in leave trees allowing the stand to continue growing at a rapid rate so that trees grow larger and produce greater income in later logging entries. It also reduces the risk of blowdown, thinning shock, and sunscald (Emmingham and Green, 2003).

  - **8.10.2 High Thinning (thin-from-above)**

    A high thinning will only be considered in special circumstances. A high thinning removes fewer, larger trees in the dominant and co-dominant crown class to release a larger number of smaller leave trees in the lower crown classes but not to the point where the stand's growing capacity is reduced. This practice can produce greater income in early logging entries, allow early logging of marginally commercial stands, and promote development of slower growing shade-tolerant species such as western red cedar and western hemlock (Emmingham and Green, 2003). However, a high thinning reduces the stand's average diameter, height, and crown ratio and is not likely to produce the same growth response that is observed in a low thinning, particularly for shade-intolerant species such as Douglas-fir or red alder (Emmingham and Elwood, 2002). There is also the potential for high-grading, which can produce a stand comprised of low value species with poor form that are subject to thinning shock (Emmingham and Green, 2009).

  - **8.10.3 CT Density Guidelines**

    Commercial thinning will be conducted in accordance with the CT density guidelines provided in Appendix 8 unless management objectives, site constraints, or current economic factors dictate a different strategy. When stand structure reaches the pre-thinning RD values or live crown ratios listed in these guidelines, the stand is ready for commercial thinning or final harvest. These thinning guidelines will be used to maintain full stocking of quality trees, optimize thinning response and financial return, and minimize the risk of blowdown and breakage.

  - **8.10.4 Guidelines for Prioritizing CT Units**

    1. Priority should be given to stands with characteristics that indicate commercial thinning is economically feasible and silviculturally appropriate. Candidate stands for commercial thinning have the following characteristics:

       - *A relative density value between the upper limit of the management zone and the lower limit of the mortality zone.* This is the best time to thin from both a biological and financial standpoint. Stands grossly exceeding the mortality zone lower limit should not be prioritized over stands slightly exceeding the limit.

       - *Crown ratios of leave trees must be ≥ 30% for shade-intolerant conifers, ≥ 35% for shade tolerant conifers and ≥ 40% for hardwoods.* Crown ratios are indicative of tree

vigor and release potential. If leave trees do not meet the crown ratios above, commercial thinning should be avoided or done as a light application.

- *Conifer stand is within the 30-year (25 to 34) or 40-year (35 to 44) age class. Red alder stand is within the 20-year (15 to 24) age class.* Commercial thinning in conifer stands usually occurs when the stand reaches the 30-year age class (25 – 34 yrs. old) or the 40-year age class (35 – 44 yrs. old) if the stand received a PCT. Red alder stands should be commercially thinned when the stand reaches the 20-year (15 – 24 yrs. old) age class. Red alder only responds to thinning with increased diameter growth until approximately 20-years old (Deal and Harrington, 2006).
- *No severe reduction in growth rings for the past 10 years.* Stands that have experienced several years of severe reductions in ring growth and have crown ratios < 30% often have poor release potential (BCMOF, 1999).
- *Height/Diameter ratios of leave trees will be around 85 for shade-intolerant species and around 90 for shade-tolerant species.* These values indicate good tree stability and reduced risk of stem bending and blowdown. Stands with low crown ratios and high height/diameter ratios are not good candidates for commercial thinning.
- *Stand contains enough harvestable volume to be economically viable while still meeting residual stocking objectives.* For conifer stands, economic harvest volume is usually 25 – 30 tons/acre.

2. Species with strong small log markets should be prioritized over species with weak small log markets to ensure that the operation generates acceptable revenues.
3. Stands impacted or at high risk of being impacted by a forest health issue should be prioritized over low risk stands. Thinning can be used to sanitize infected stands lowering future losses and can increase leave tree vigor, which increases tree resistance to insects and disease.
4. Stands planted with shade-intolerant species should be given priority over stands planted with shade-tolerant species. Shade-tolerant species hold their crown longer under competition, which offers more flexibility in scheduling thinning operations (BCMOF, 1999).
7. Stands that have not received a PCT should be prioritized over stands that have received a PCT unless stand characteristics suggest the un-thinned stand will exhibit a poor thinning response.
8. Stands with lower thinning risk factors should be prioritized over stands with higher risk factors. Thinning shock risk is higher in older stands that have experienced prolonged competition. Risk of sunscald and residual stand damage is higher in stands planted with thin barked species such as western red cedar, red alder, and western hemlock. Blowdown & breakage risk is higher in stands exposed to high winds, in areas with a high water table, and in stands planted with shallow-rooted species (western red cedar and western hemlock) or with red alder.
9. Stands with good access should be prioritized over stands will poor access due to the lower management and harvest costs.
10. Stands that are larger in size should be given priority over smaller stands to maximize sale revenue and the treatment benefits on a forest level. Efforts should be made to include smaller acreage units with larger acreage units to increase their attractiveness to potential bidders.
11. Stands growing on higher sites should be prioritized since this will produce greater volume gains from the treatment and better financial returns. Stands on lower sites should not be routinely commercially thinned unless there is an economic advantage and risk of prescription failure is mitigated (Holmberg et al., 2006). Stands on low sites exhibit an

extended response time, which increases the risk of failure since the stand remains susceptible to blowdown, post-treatment shock, and lower vigor for a longer period of time.

- **8.10.5 CT Timber Cruising**

  Candidate CT units will be surveyed for need and prioritization. If the unit is within the age range and appears to be ready for a CT after an initial walk-thru, plots will be installed to determine species composition, volume per acre, trees per acre, basal area per acre, average diameter, stand density, and average total height. CT timber cruising methodology is provided in Appendix 8.

- **8.10.6 CT in Un-Managed Stands**

  A large proportion of the Lummi Reservation's forested land base has been unmanaged and was regenerated naturally. Typically, unmanaged stands lack the stocking, species composition, and structure to support a commercial thinning. Although most commercial thinning efforts will focus on managed stands, some unmanaged stands may be considered for commercial thinning if it can be supported. The decision to commercially thin in unmanaged stands will depend on the following factors:

  - The thinning is not too late to expect a growth response from the stand.
  - Current stand structure will allow for the creation of the desired residual stand structure.
  - There is sufficient merchantable volume per acre to support a commercial thinning.
  - Stand has a low blowdown risk.

  Over time, there will be a gradual conversion to managed stands on the Lummi Reservation. Eventually, managed stands will constitute the major source from which stands suitable for commercial thinning will be selected.

- **8.10.7 CT Benefits for Wildlife Habitat**

  Commercial thinning can be used to increase habitat opportunities for wildlife on both a forest and stand level. In areas of extensive second growth, commercial thinning can be used to increase the variety of seral stages available to wildlife. A variety of final rotation ages can create a mosaic of stands with different stand structures and habitat opportunities.

- **8.10.8 Acceptable CT Harvest Equipment**

  Only feller-bunchers, harvesters, and forwarders will be used in commercial thinning operations to limit the potential for residual stand damage. This equipment provides operators with a high degree of control when falling, delimbing, bucking, piling, and transporting wood. This equipment is also very effective with small wood, has high production rates, can work all year round on certain sites, and minimizes soil impacts. Other ground-based, mechanized equipment may be authorized if deemed operationally appropriate.

- **8.10.9 Forwarding Corridors**

  Details on the design, construction, and use of forwarding corridors can be found in the Timber Harvesting section of this document.

- **8.10.10 CT Contracting**

  Commercial thinning operations will be executed under the authority of a paid BIA Paid Timber Cutting Permit or a BIA Timber Sale Contract for Estimated Volumes. Forest products may be sold on a per load or per ton basis. A sample BIA Paid Timber Cutting Permit along with Special and Additional permit provisions for a commercial thinning operation is provided in the Forestry Permits and Timber Sale Contracts Handbook (Appendix 9). A Land Use Permit from the Lummi Planning Department will also be obtained for commercial thinning operations.

- **8.10.10.1 Cost**

  Based on local cost data, commercial thinning operations generally range between $25 to $32/ton. Hauling costs range from $5 to $10/ton.

- **8.10.11 CT Sale Administration BMPs**

  Commercial thinning sales are considered high-risk and effective communication with the operator and close monitoring are necessary throughout the duration of the project.

  1. Frequent inspections should be conducted in the early stages of the operation to ensure compliance with the permit or contract conditions and specifications.
  2. Regular inspections should continue as the sale progresses and compliance plots (1/20th-acre fixed-area plots) should be taken in cut over areas to verify that the contractor is meeting the thinning prescription and resource protection requirements.
  3. Notes should be taken on residual stand damage, soil disturbance, road condition, unauthorized harvesting, and waste. If infractions are observed, a verbal warning should be given. If infractions continue, an administrative remedy should be used to ensure that thinning objectives are met.

- **8.10.12 CT Leave Tree Damage**

  Minimizing damage to leave trees is necessary for a successful commercial thinning since leave trees must be left in a healthy and productive condition. The impact of tree damage after commercial thinning depends in part on the species' susceptibility to decay pathogens. In western Washington, hardwoods are the most susceptible group followed by the true fir, hemlock, Sitka spruce, and western red cedar group. Douglas-fir is the least susceptible (BCMOF, 1999).

  Zero bark damage is the goal since but some residual stand damage is unavoidable. Leave trees along skid trails or roads may have slightly higher surface damage due to their location. Skilled and experienced operators are essential in minimizing damage to leave trees. Frequent commercial thinning typically produces more wounds at the base of leave trees resulting in a higher incidence in decay.

  - **8.10.12.1 Unacceptable Leave Tree Damage Guidelines**
    - Residual tree has one or more wounds on its bole exposing the cambium layer that in total exceeds 20 square inches.
    - Residual treetop is broken or the live crown of a tree is reduced below 30% for conifers or 40% for hardwoods.
    - Residual tree has more than 1/3 of the circumference of its root collar or root system injured such that the cambium layer is exposed or has a major gouge on the stem or a major root.
    - Greater than 10% of the leave trees have wounds of less than 20 square inches.

- **8.11 Leave Tree Selection BMPs**

  1. Leave trees should have the following characteristics to ensure that they are vigorous, healthy, and able to produce large, high-quality logs:
     - Be in the dominant or co-dominant crown class
     - Have crown ratios ≥ 30% for conifers or ≥ 40% for hardwoods
     - Be the preferred timber species
     - Have straight, clear boles with little taper and small branches
     - Have no broken, forked, or damaged top

- Exhibits no disease or stress indicators
- Are uniformly spaced

2. All undesirable timber species and trees that are suppressed, poorly formed, diseased, or "wolf" trees should be removed. Cut trees should be selected in the following order:
   - Undesirable species
   - Diseased trees (if any)
   - Crooked trees
   - Forked trees
   - Damaged trees
   - Small crowned trees
3. When managing mixed-species stands, a mix of leave tree species should be retained to:
   - Have high market value
   - Have good growth potential
   - Be well adapted to the site
   - Be either non-hosts or more resistant to local insect and/or disease problems

- **8.12 In-Growth Management BMPs**

  In-growth occurs when natural regeneration grows between the preferred artificial regeneration. Undesirable in-growth should be removed early in stand development or during pre-commercial thinning.

  1. Vegetation control measures should be conducted early in stand development to minimize in-growth of undesirable hardwoods.
  2. Excessive ground disturbance during logging should be reduced to minimize the potential for natural hardwood regeneration.
  3. Trees removed during pre-commercial thinning should be cut below the lowest live branch to ensure that the tree does not survive to compete with leave trees.
  4. Stand density should be kept within the management zone for the species to limit opportunities for in-growth.
  5. Stands that have been pre-commercially thinned should be monitored to ensure that fast-growing, undesirable hardwoods do not re-establish on site and compete with leave trees.

- **8.13 Clump Management BMPs**

  Clumps occur when trees are not planted at the proper spacing or as a result of in-growth. Excessive tree clumps can make it difficult to achieve uniform spacing during thinning operations.

  1. Avoid creating larger openings than what already exist.
  2. Do not maintain an area of overdense trees to compensate for a large gap in another part of the stand.
  3. Clumps that are over three crown widths should be thinned in the middle.
  4. Leave tree spacing at the edges of openings should be no less than 75% of the desired spacing e.g. if the prescription spacing is 16 feet, the spacing along edges should be no less than 12 feet.

- **8.14 Thinning and Forest Health**

  Thinning can be an effective tool for controlling the level of damage caused by various forest diseases and insects. Root rots are a common forest disease problem for conifers in western Washington. In the Puget Sound region, Laminated root rot and Armillaria root disease are the two

most common. Trees become infected when healthy roots come into contact with infected roots (Goheen and Willhite, 2006). If done properly, thinning can reduce the volume losses caused by root rots. However if a tree is already infected, the infected tree will eventually die regardless of the increase in tree vigor resulting from the thinning (Oester and Emmingham, 1997). Thinning guidelines for areas with root rot are provided in Appendix 8.

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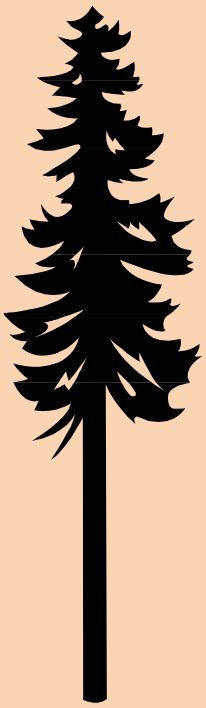

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Appendices

Appendix 1
Reservation Setting

APPENDIX 1

Woodland Management and Productivity Soil Summary for Major Soil Types of the Lummi Reservation								
Soil Name	Management Concerns					Potential Productivity		Trees to Plant
	Erosion Hazard	Equipment Limitation	Seedling Mortality	Blowdown Hazard	Plant Competition	Common Trees	Site Index (50 yr.)	
Bellingham (11)	Slight	Severe	Severe	Severe	Severe	Red alder Bigleaf maple Western red cedar Western hemlock	Red alder: 85 (site class 4)	Red alder Western red cedar
Birchbay (12,13,14)	Slight	Moderate	Slight	Moderate	Severe	Douglas-fir Red alder Western hemlock Western red cedar Grand fir Paper birch	Douglas-fir: 115 (site class 3)	Douglas-fir Red alder
Clipper (31)	Slight	Moderate	Slight	Moderate	Severe	Red alder Western hemlock Western red cedar Douglas-fir	Red alder: 95 (site class 4)	Red alder Western red cedar
Everson (53)	Slight	Severe	Severe	Severe	Severe	Red alder Western red cedar Bigleaf maple Western hemlock Douglas-fir	Red alder: 85 (site class 4)	Red alder Western red cedar
Hale (61,62)	Slight	Severe	Slight	Moderate	Moderate	Red alder Douglas-fir Western hemlock Western red cedar	Red alder: 90 Douglas-fir: 90 (site class 4)	Red alder Douglas-fir Western red cedar
Hovde (73)	Slight	Severe	Severe	Severe	Severe	Red alder Western red cedar Black cottonwood	Red alder: 85 (site class 4)	Red alder Western red cedar
Kickerville (79,80,81)	Slight	Slight	Slight	Slight	Severe	Douglas-fir Western hemlock Western red cedar Red alder	Douglas-fir: 119 ft (site class 2)	Douglas-fir Red alder
Labounty (93)	Slight	Severe	Severe	Severe	Severe	Red alder Western hemlock Western red cedar Douglas-fir	Red alder: 90 ft. (site class 4)	Red alder Western red cedar

Soil Name	Management Concerns					Potential Productivity		Trees to Plant
	Erosion Hazard	Equipment Limitation	Seedling Mortality	Blowdown Hazard	Plant Competition	Common Trees	Site Index (50 yr.)	
Laxton (96,97,98)	Slight	Slight	Slight	Slight	Severe	Douglas-fir Western hemlock Red alder Western red cedar	Douglas-fir 120 ft. (site class 2)	Douglas-fir Red alder
Lynden (99,100)	Slight	Slight	Moderate	Slight	Severe	Douglas-fir Western hemlock Red alder	Douglas-fir 112 ft. (site class 3)	Douglas-fir Red alder
Lynnwood (102,103)	Slight	Slight	Moderate	Slight	Moderate	Douglas-fir Red alder Western hemlock Western red cedar Bigleaf maple	Douglas-fir 115 ft. (site class 3)	Douglas-fir Red alder
Neptune (111)	Slight	Slight	Severe	Slight	Moderate	Douglas-fir Red alder Bigleaf maple	Douglas-fir 100 ft. (site class 3)	Douglas-fir Red alder
Shalcar (144)	Slight	Severe	Severe	Severe	Severe	Red alder Western red cedar Western hemlock Lodgepole pine Sitka spruce	Red alder: 85 ft. (site class 4)	Red alder Western red cedar
Tacoma (163)	Slight	Severe	Severe	Severe	Severe	Red alder Western red cedar Western hemlock Black cottonwood Sitka spruce	Red alder: 90 ft. (site class 4)	Red alder Western red cedar
Whatcom (178,179,180)	Slight	Moderate	Slight	Moderate	Severe	Douglas-fir Western hemlock Red alder Western red cedar Bigleaf maple Paper birch	Douglas-fir: 116 ft. (site class 3)	Douglas-fir Red alder
Whatcom (181)	Moderate	Severe	Slight	Moderate	Severe	Douglas-fir Western hemlock Red alder Western red cedar Bigleaf maple Paper birch	Douglas-fir: 116 ft. (site class 3)	Douglas-fir Red alder

Soil Name	Management Concerns					Potential Productivity		Trees to Plant
	Erosion Hazard	Equipment Limitation	Seedling Mortality	Blowdown Hazard	Plant Competition	Common Trees	Site Index (50 yr.)	
Whatcom (181)	Moderate	Severe	Slight	Moderate	Severe	Douglas-fir Western hemlock Red alder Western red cedar Bigleaf maple Paper birch	Douglas-fir: 116 ft. (site class 3)	Douglas-fir Red alder
Whitehorn (184)	Slight	Severe	Severe	Severe	Severe	Red alder Western red cedar Western hemlock Douglas-fir Black cottonwood	Red alder: 90 ft. (site class 4)	Red alder Western red cedar
Yelm (191)	Slight	Moderate	Moderate	Moderate	Severe	Douglas-fir Red alder Western red cedar Bigleaf maple	Douglas-fir: 130 ft. (site class 2)	Douglas-fir Red alder
Adapted from USDA, 1992.								

Environmental Stress Tolerances of Timber Species of the Lummi Reservation						
Species	**Shade Tolerance**	**Wet Site Tolerance**	**Dry Site Tolerance**	**Cold Tolerance**	**Brush Competition Tolerance**	**Physical Damage Tolerance**
Conifers						
Douglas-fir	Low	Low	Medium	Medium	Low	Low
Western Hemlock	Very High	Medium	Low	Medium	Medium-High	Low
Western Red Cedar	High	High	Low	High	Medium-High	High
Sitka Spruce	Low	High	Low	Medium	Medium	Medium
Grand Fir	High	Medium	Medium	High	Medium	Low
Hardwoods						
Red Alder	Very Low	High	Low	Medium-Low	High	Low
Black Cottonwood	Very Low	High	Medium	Medium	High	High
Paper Birch	Low	Medium	Low	High	High	Medium
Bigleaf Maple	Very High	Medium	Medium	Medium	High	High
Adapted from Hanley and Baumgartner, 2002, USFS, 1987, and other sources.						

Common Forest Diseases in Western Washington		
Disease Type	**Disease Name**	**Host**
Needle Casts	Swiss Needle Cast (*Phaeocryptopus gaeumannii*)	Douglas-fir
	Rhabdocline Needle Cast (*Rhabdocline pseudotsugae*)	Douglas-fir
Root Rots	Laminated Root Rot (*Phellinus weirii*)	All conifers
	Armillaria Rood Disease (*Armillaria ostoyae*)	All conifers
Fungus Rots	Pencil Rot (*Postia sericiomollis*)	Western red cedar
	Brown Crumbly Rot (*Fomitopsis pinicola*)	Most conifers
	Schweinitizii Root and Butt Rot (*Phaeolus schweinitzii*)	Douglas-fir and most other conifers
Stem Cankers	Douglas-fir Stem Canker (*Phomopsis lokoyae*)	Douglas-fir and occasionally grand fir
	Septoria (*Septoria alnifolia*)	Red alder (mainly a nursery problem)
	Nectria (*Nectria cinnabarina*)	Red alder, willow, bigleaf maple, vine maple, Pacific dogwood, hazel, and western hemlock
Note: The effects of these diseases are controlled and kept to a minimum by implementing forest management practices that salvage damaged trees and remove infected trees to prevent the spread and continued presence of the disease.		
Adapted from Goheen and Willhite, 2006.		

Terrestrial Wildlife of the Lummi Reservation		
Category	**Number of Species**	**Species**
Amphibians	13: 2 observed, 9 expected but unconfirmed, 2 undetermined.	Salamanders, newts, frogs, and toads
Reptiles	5: 4 likely but unconfirmed, 1 unlikely.	Snakes and lizards
Birds	219: 216 observed, 3 probably extirpated.	Loons, grebes, cormorants, herons, bitterns geese, teals, wigeons, pintails, shovelers, ducks, cranes, rails, sandpipers, gulls, terns, eagles, hawks, falcons, grouse, pheasant, owls, swifts, woodpeckers, flycatchers, swallows, crows, jays, ravens, chickadees, magpies, wrens, thrushes, starlings, waxwings, vireos, kinglets, nuthatches, warblers, sparrows, blackbirds, cowbirds, and finches
Mammals	37: 11 observed, 21 expected but unconfirmed, 2 unlikely, 3 probably extirpated.	Possums, shrews, moles, bats, myotis', rabbits, chipmunks, squirrels, mice, voles, muskrat, rats, porcupines, coyotes, fox, raccoons, skunks, weasel, otter, black-tailed deer, and beaver.
Adapted from Eissinger and Drummond, 1994		

Resident Salmonids in Streams and Sloughs on the Lummi Reservation[1]	
Nooksack River	Chinook (*Oncorhynchus tshawytscha*), Coho (*Oncorhynchus kisutch*), chum, pink (*Oncorhynchus gorbuscha*), steelhead (*Oncorhynchus mykiss*), cutthroat (*Oncorhynchus clarki*), native char (*Salvelinus alpinus*), and sockeye (*Oncorhynchus nerka*)
Lummi River	Chinook , Coho, and chum
Jordan's Creek	Chinook, Coho, and chum
Schell Creek	Chinook, Coho, and chum
Sea Ponds Creek	Coho and chum
Kwina Slough	Chinook, Coho, chum, pink, steelhead, cutthroat, char, and sockeye
Smuggler's Slough	Coho, other species presumed
Slater Slough	Coho, other species presumed
[1]Table developed from personal communication with Lummi Natural Resource's Fish Biologists.	

Vegetation Resources of the Lummi Reservation		
TREES		
Common Name	**Scientific Name**	**Habitat**
Bigleaf maple	Acer macrophyllum	Forest
Bitter cherry	Prunus emarginata	Forest
Black cottonwood	Populus trichocarpa	Forest, wet
Cascara	Rhamnus purshiana	Forest
Crab apple	Malus fusca	Forest, wet
Douglas-fir	Psuedotsuga menziesii	Forest
Grand fir	Abies grandis	Forest, wet
Hooker's willow	Salix hookeriana	Forest, wet
Pacific willow	Salix lucida	Forest, wet
Paper birch	Betula papyrifera	Forest
Red alder	Alnus rubra	Forest, wet
Sitka spruce	Picea sitchensis	Forest, wet
Western hemlock	Tsuga heterophylla	Forest
Western red cedar	Thuja plicata	Forest, wet
SHRUBS		
Common Name	**Scientific Name**	**Habitat**
Black gooseberry (swamp currant)	Ribes lacustre	Forest, wet
Black raspberry (blackcap)	Rubus leucodermis	Forest
Cattail	Typha latifolia	Wet
Douglas hawthorn	Crataegus douglasii	Forest, wet
Evergreen blackberry	Rubus laciniatus	Forest, open, wet
Hardhack (spirea)	Spiraea douglasii	Forest, wet
Himalayan blackberry	Rubus discolor	Forest, open, wet
Indian plum	Oemleria cerasiformis	Forest
Japanese knotweed	Polygonum cuspidatum	Open
Labrador tea	Ledum groenlandicum	Wet
Nootka rose	Rosa nutkana	Open, forest
Oceanspray	Holodiscus discolor	Forest, open
Oregon grape	Berberis nervosa	Forest
Red elderberry	Sambucus racemosa	Forest
Red-flowering currant	Ribes sanguineum	Forest
Red huckleberry	Vaccinium parviflorum	Forest
Red-osier dogwood	Cornus stolonifera	Forest, wet
Rusty menziesia	Menziesia ferruginea	Forest
Salal	Gaultheria shallon	Forest
Salmonberry	Rubus spectabilis	Forest, wet
Sitka willow	Salix sitchensis	Forest, wet
Snowberry	Symphoricarpos albus	Forest
Sweet gale	Myrica gale	Wet
Thimbleberry	Rubus parviflorus	Forest
Trailing blackberry (dewberry)	Rubus ursinus	Forest
Twinberry honeysuckle	Lonicera involucrata	Forest, wet
Twinflower	Linnaea borealis	Forest

Vine maple	Acer circinatum	Forest
Western hazel	Corylus cornuta	Forest
FORBS		
Common Name	**Scientific Name**	**Habitat**
Bedstraw	Galium spp.	Forest
Blue violet	Viola adunca	Forest
Bracken fern	Pteridium aquilinum	Forest, open, wet
Bull thistle	Cirsium vulgare	Open
Canadian thistle	Cirsium arvense	Open
Common mullein	Verbascum thapsus	Open
Cow parsnip	Heracleum lanatum	Open
Creeping buttercup	Ranunculus repens	Forest, wet
Dandelion	Taraxacum officinale	Open
Deer fern	Blechnum spicant	Forest
Dock	Rumex acetosella	Open
English plantain	Plantago lanceolata	Open
False lily-of-the-valley	Maianthemum dilatatum	Forest
Fireweed	Epilobium angustifolium	Open
Goldenrod	Solidago spp.	Open
Great betony	Stachys cooleyae	Wet
Hedge nettle	Stachys cooleyae	Forest, wet
Horsetail	Equisetum spp.	Forest, open, wet
Kneeling angelica	Angelica genuflexa	Forest, wet
Lady fern	Athryium filix-femina	Forest, wet
Large-leaved avens	Geum macrophyllum	Forest
Licorice fern	Polypodium glyceryza	Forest
Marsh cinquefoil	Potentilla palustris	Wet
Miner's lettuce	Montia spp.	Forest, open, wet
Nettle	Urtica dioica	Forest, wet
Nightshade	Solanum dulcamara	Forest, wet
Pacific silverweed	Potentiial pacifica	Saltmarsh
Pearly everlasting	Anaphalis margaritacea	Open
Pickleweed	Salicornia virginica	Saltmarsh
Pineapple weed	Matricaria matricarioides	Open
Puget Sound gumweed	Grindelia integrifolia	Open
Rattlesnake plantain	Goodyera oblongifolia	Forest
Saltbrush	Atriplex patula	Saltmarsh
Sea-watch	Angelica lucida	Forest, wet
Skunk cabbage	Lysichitum americanum	Forest, wet
Spotted knapweed	Centaurea maculosa	Open
Strawberry	Fragaria spp.	Forest, open, wet
Sword fern	Polystichum munitum	Forest
Tansy	Tanacetum vulgare	Open
Tansy ragwort	Senecio jacobaea	Open
Touch-me-not	Impatiens spp.	Forest, wet
Trail plant	Adenocaulon bicolor	Forest
Trillium	Trillium ovatum	Forest

Wall lettuce	Lactuca muralis	Open
Water parsley	Oenanthe sarmentosa	Wet
Wild carrot	Daucus carota	Open
Wood fern	Dryopteris gymnocarpium	Forest
Yarrow	Achillea millefolium	Open
Yellow pond-lily	Nuphar polysepalum	Wet
Youth-on-age	Tolmiea menziesii	Forest
GRASSES, SEDGES, RUSHES		
Common Name	**Scientific Name**	**Habitat**
American three-square bulrush	Scirpus americanus	Wet
Baltic rush	Juncus balticus	Open, wet
Barley	Hordeum leporinum	Open
Bluegrasses	Poa spp.	Forest, open, wet
Bull rushes	Scirpus spp.	Forest, open, wet
Dewey's sedge	Carex deweyana	Forest
Foxtails	Alopecurus spp.	Open, wet
Hairgrass	Aira praecox	Open
Hardstem bulrush	Scirpus acutus	Wet
Lyngby sedge	Carex lyngbyei	Wet
Meadow barley	Hordeum brachyantherum	Saltmarsh
Orchard grass	Dactylis glomerata	Forest, open, wet
Perennial ryegrass	Lolium perenne	Forest, open, wet
Quackgrass	Elymus repens	Forest, open, wet
Red fescue	Festuca rubra	Forest, open, wet
Redtop	Agrostis alba	Open, wet
Reed-canary grass	Phalaris arundinacea	Open, wet
Seashore saltgrass	Distichlis spicata	Saltmarsh
Sedges	Carex spp.	Forest, wet
Slough sedge	Carex obnupta	Forest, wet
Soft rush	Juncus effusus	Wet
Tall mannagrass	Glyceria elata	Open, wet
Thin bentgrass	Agrostis diegoensis	Open
Tufted hairgrass	Deschampsia cespitosa	Wet
Tule	Scirpus validus	Wet
Velvetgrass	Holcus lanatus	Open

Ownership Status of the Lummi Reservation Uplands[1]		
Ownership Category	**Acres**	**Percent of Total**
Individual Native Trust	6650	52%
Individual Native Fee	180	1%
Tribal Trust	1892	15%
Tribal Fee	295	2%
Non-Tribal Fee	2838	22%
In Process[2]	1015	8%
Total =	**12,870**	**100%**
Adapted from Stark, 2008.		
[1]Does not include tidelands, all of which are Tribal Trust.		
[2]In Process is land that is in the process of becoming trust land.		

Road Classifications on the Lummi Reservation				
County				
Bay Ln.	Bay Pl.	Bay St.	Bayview Dr.	Beach Ln.
Beach Pl.	Beach Way	Boynton Rd.	Cagey Rd.	Chief Martin Rd.
Cobble Way	Cyprus Way	Decatur Dr.	Emma Rd.	Ferndale Rd.
Finkbonner Rd.	Galiano Rd.	Germaine Rd.	Grove Rd.	Guemes Way
Harbor Ln.	Harbor Pl.	Harmony Rose Ln.	Harnden Rd.	Haxton Way
Hillaire Rd.	Kelbay Ave.	Kwina Rd.	Lake Terrell Rd.	Leeward Pl.
Leeward Way	Lena Rd.	Lopez Dr.	Lummi Shore Dr.	Lummi Shore Dr.
Mackenzie Rd.	Maple Ln.	Marine Dr.	Matia Dr.	Moresby Way
Neptune Cir.	North Red River Rd.	Northgate Rd.	Olympic Dr.	Orcas Way
Patos Rd.	Pender Dr.	Postal Ave.	Prevost Way	Puffin Rd.
Robertson Rd.	Ruth Rd.	Saanich Ave.	Salt Spring Dr.	Scott Rd.
Shaw Ct.	Shorewood Ln.	Sinclair Dr.	Slater Rd.	Smokehouse Rd.
Southgate Rd.	Stuart Circle Dr.	Sucia Dr.	Sunset Way	Thetis Rd.
South Red River Rd.	Velma Rd.	Waldron Ct.	Waldron Dr.	
BIA/Lummi				
Bay Shore Dr.	Cleo Rose Dr.	Dike Rd.	Dorothy Way	Eagle Ave.
Gumel Pl.	Lummi Rd.	Morning Star Dr.	Stommish Ln.	Warchief Cir.
Adams Rd.	Balch Rd.	Blackhawk Way	Eagle Ave.	Jefferson Ln.
Kinley Way	Lady Rose Ct.	Lightning Bird Ln.	Little Beaver Rd.	Lone Eagle Cir.
Lone Wolf Ln.	Morning Star Ln.	Redwing Ct.	Salmon Rd.	Seting Sun Cir.
Shum Cir.	Tiopi Loop	Wekes Ln.	Whatasen Ln.	Zeta Ave.

Zoning District Descriptions of the Lummi Reservation[1]			
Zoning District	**Description**	**Acres**	**Percent of Total**
Residential	The residential zone provides land for tracts of detached single-family homes with a density range comparable to both suburban and rural residential zones, depending on the type and level of services available and neighboring development. Rural Residential: 1 to 3 dwellings per acre Suburban Residential: 5 to 7 dwellings per acre	4,583	19.2%
Commercial	The commercial zone comprises land suitable for commercial and business uses to meet objectives in economic development and provide employment opportunities to improve the economic conditions of Tribal members.	85	0.4%
Light Industrial	The light industrial zone provides land suitable for low impact industrial uses to meet objectives in economic development and provide employment opportunities to improve the economic conditions of the Tribe and its members.	0	0.0%
Forestry	The forestry zone allocates land suitable for the sustained cultivation and production of forest products and provides land for low-density rural residential development, where such mixed uses are consistent with the Comprehensive Plan and the Forest Management Plan.	2,420	10.1%
Agriculture	The agriculture zone recognizes the importance of agriculture and allows the continuation of farming activities by allocating land for them. It also allocates land for accessory and supporting uses to farming, including residential and resource conservation. Uses like restoration and protection of natural resources and residential development are allowed in addition to farming.	3,564	14.9%
Open Space	The open space zone provides land for preservation, conservation, and restoration of environmentally and culturally sensitive areas for low-impact, outdoor recreational uses.	1,944	8.1%
Mixed-Use	The mixed-use zone is intended for important community centers where planned multiple uses are allowed and desirable. Any proposed use allowed in the immediately adjacent zone is allowed in the Mixed-Use zone with a conditional use permit.	740	3.1%
Marine	The marine zone comprises an area for treaty-reserved and tribally controlled fishing activities, seafood production, and harvest.	10,560	44.2%
Total		**23,896**	**100%**

[1]Includes acreage of roads, rivers, etc. on the Reservation which are not included in the Ownership Status table.

Past Timber Harvest Volumes by Year on the Lummi Reservation							
Year	**MBF**	**Year**	**MBF**	**Year**	**MBF**	**Year**	**MBF**
1954	303	1968	430	1982	775	1996	216
1955	3,962	1969	175	1983	1,775	1997	165
1956	365	1970	0	1984	1,467	1998	33
1957	143	1971	0	1985	1,105	1999	0
1958	77	1972	0	1986	783	2000	41
1959	20	1973	0	1987	1,191	2001	376
1960	25	1974	338	1988	1,489	2002	0
1961	268	1975	414	1989	735	2003	993
1962	550	1976	10	1990	194	2004	802
1963	990	1977	0	1991	388	2005	49
1964	518	1978	0	1992	123	2006	30
1965	0	1979	484	1993	5	2007	333
1966	857	1980	730	1994	17	2008	433
1967	550	1981	667	1995	0	2009	134

Annual Program Funding for the Lummi Forestry Division							
Year	**Amount**	**Year**	**Amount**	**Year**	**Amount**	**Year**	**Amount**
1990	$82,921	1995	$71,239	2000	$55,117	2005	$265,367
1991	$72,777	1996	$62,690	2001	$41,838	2006	$267,925
1992	$75,221	1997	$62,690	2002	$41,838	2007	$253,987
1993	$71,239	1998	$64,090	2003	$67,038	2008	$234,216
1994	$71,239	1999	$55,118	2004	$189,047	2009	$204,468

Plantation Management History Summary on the Lummi Reservation										
Assignment No.	**Acres**	**Planting Year**	**Inter Planting Year**	**Species**	**Spray Year**	**Manual Release Year**	**PCT Year**	**PCT Acres**	**CT Year**	**CT Acres**
42-D	26	1980	X	X	X	X	1988	26	X	X
1008	58	1981	X	DF	1986	X	X	X	2007	31
51-G	9	1981	X	DF	X	X	X	X	2007	9
51-H	7	1981	X	DF	X	X	X	X	2007	7
48-B	32	1982	1983	DF	1982	X	X	X	X	X
6-B 6-A	35	1982	1983	15,150 DF 1,000 RC 1,000 WH	1986	X	X	X	X	X
39	66	1982	X	3,800 DF 17,200 RC 6,500 WH	1984	X	1992-1994	66	X	X
8AI 8A11 8A14	15	1982	X	8,980 DF	1985 1986	X	1990	19	2007	15
39	50	1983	X		1986	X	X	X	X	X
45-D	13	1983	X	5,850 DF	X	X	X	X	X	X
45-C 45-E	40	1983	X	17,700 DF	1985	X	X	X	X	X
45-G	16	1983	X	10,240 DF		X	X	X	X	X
40-C	13	1983	X	6,630 DF	X	X	X	X	X	X
8	8	1983	X	X	X	X	X	X	X	X
65-C	20	1983	X	X	1984	X	X	X	X	X

Assignment No.	Acres	Planting Year	Inter Planting Year	Species	Spray Year	Manual Release Year	PCT Year	PCT Acres	CT Year	CT Acres
55-C	11	1983	1983	6,930 DF & RC	1986	X	1992	5	X	X
56-4	8	1983	X	4,000 DF	1986	X	1992	8	X	X
39	35	1983	X	11,220 RC	X	X	X	X	X	X
6-C	18	1984	X	X	X	X	X	X	X	X
45-M	24	1984	X	DF	1985	X	X	X	X	X
45-N										
45-O										
63-L	18	1984	X	X	1985	X	1990	18	X	X
63-N										
65-B	110	1984 & 1985	X	44,541 DF 11,000 RC	1985	X	1995	58	X	X
65-C							1994			
51-K	52	1984 & 1985	X	23,440 DF	1986	X	X	X	2007	6
51-L							2007	2	2007	9
51-M							2007	3	2007	9
51-N							X	X	X	X
69-B	27	1985	X	16,250 DF	1985	X	1995	27	X	X
69-C										
60-AC	30	1985	1986	14,075 DF	1986	X	1992	30	X	X
60-C										
60-S										
8B	40	1986	X	16,720 DF & RC	X	X	1996	40	X	X
42-C	33	1986	X	16,694 DF & RC	1986	X	X	X	X	X
42-D										

Assignment No.	Acres	Planting Year	Inter Planting Year	Species	Spray Year	Manual Release Year	PCT Year	PCT Acres	CT Year	CT Acres
2AQ	8	1986	X	4,000 DF & RC	X	X	X	X	X	X
2AR	8	1986	X	3,776 DF & RC	X	X	X	X	X	X
48-D	30	1987	X	10,890 DF	X	X	X	X	X	X
LANT	25	1987	X	6,700 DF & RC	X	X	1995	25	X	X
8AB	40	1987	X	X	X	X	X	X	X	X
61-B	20	1987	X	8,280 DF & RC	X	X	X	X	X	X
38	35	1988	X	X	X	X	X	X	X	X
SLUDGE	15	1988	X	X	X	X	X	X	X	X
2AE	18	1989	X	X	X	X	X	X	X	X
Kwina	62	1989	1990	X	1990	X	X	X	X	X
3	25	1989	X	X	X	X	X	X	X	X
6D	8	1989	X	X	X	X	X	X	X	X
59-A	29	1989	X	X	X	X	1996	29	X	X
59-C	9	1990	X	X	X	X	1996	9	X	X
59-L 59-N 59-O 59-Y	15	1990	X	X	X	X	1996 (59-L)	5	X	X

Assignment No.	Acres	Planting Year	Inter Planting Year	Species	Spray Year	Manual Release Year	PCT Year	PCT Acres	CT Year	CT Acres
56-AG	9	1990	X	X	X	X	X	X	X	X
56-H										
56-I										
56-J										
56-Y										
6-A	40	1990	X	14,940 DF 2,035 RC	X	X	1995-1996	40	X	X
LANT	12	1991	X	3,000 DF 2,800 RC	X	X	X	X	X	X
66-B	10	1992	X	X	X	X	X	X	X	X
45-H	5	2005	2008	2,100 DF & RC	2006	2008	X	X	X	X
55-B	24	2006	2008	7,800 DF 1,120 RC	2006 2007	2009	X	X	X	X
55-J	10	2006	2008	4,560 DF	2006 2007	2009	X	X	X	X
55-K										
55-L										
55-M										
55-N										
55-O										
55-P										
55-Q										
55-R										
55-S										

Assignment No.	Acres	Planting Year	Inter Planting Year	Species	Spray Year	Manual Release Year	PCT Year	PCT Acres	CT Year	CT Acres
56-C	15	2006	2008	5,070 DF 2,110 RC	2006 2007	2008	X	X	X	X
56-D										
56-U										
59-L	9	2006	2008	2,160 DF 1,440 RC	2006 2007	X	X	X	X	X
59-M										
59-N										
6-A	2	2007	X	1,080 DF	2007 2008	X	X	X	X	X
51-F	4	2007	X	2,152 DF	2007 2008	X	X	X	X	X
51-V	3	2007	X	1,614 DF	2007 2008	X	X	X	X	X
63-Q	4	2007	X	1,937 RC	2007	2008	X	X	X	X
63-D	2	2007	X	1,076 RC	2007	X	X	X	X	X
63-E										
59-F	14	2008	X	7,532 DF 538 RC	2008	X	X	X	X	X
59-G										
59-H										
59-I										
59-J										
59-K										
59-R										
7B	36	2009	X	14,000 RC 8,500 RA 150 DF	2008	X	X	X	X	X

Appendix 2
Forest Inventory

APPENDIX 2

RESERVATION-WIDE STAND BASED FOREST INVENTORY CONTRACT AGREEMENT

Location

The project area for the forest inventory includes all trust lands located within the Lummi Indian Reservation, Whatcom County, Washington.

Payment and Terms

A. The Lummi Indian Business Council (LIBC) shall reimburse the Contractor at the agreed bid price upon satisfactory completion of the inventory project. The work shall be inspected by the LIBC Forest Manager to ensure compliance with specifications and conditions outlined in this contract.

B. The Contractor shall invoice the LIBC Natural Resource Department. Payment for completed work will be made from the LNR Forestry Account.

C. The Contractor shall provide all equipment, tools, supplies, personnel, and transportation to and from the sites.

D. The Contractor shall be required to attend a pre-work conference with the LIBC Forest Manager prior to the execution of this contract.

E. The Contractor shall provide proof of insurance (Certificate of Liability Insurance) in the amount of at least $500,000. The Contractor shall be liable for financial costs for damage to personal and real property.

F. The Lummi Nation reserves the right to waive technical defects and to reject any unsatisfactory work.

G. All inventory work shall be completed on or before XXX XX, 20XX.

Project Conditions and Specifications

General

A. The Contractor shall delineate stand types using the most recent aerial photographs, prepare preliminary stand types, and field-verify these stand type calls using accepted forest sampling methods. The Contractor shall collect, input, summarize, and analyze all of the data as required in this agreement so that a reliable estimate of the Lummi Nation's forest resource is obtained.

B. The Contractor shall collect and input all forest inventory data using Atterbury Consultant's variable log length cruising system and SuperAce timber cruising software.

Stand Typing Requirements

A. Land Use Status

- Prior to stand typing, the Contractor shall classify the Reservation land base by the predominant land use using the following land use status codes:

Code	Land Use Status
A	Agricultural
C	Commercial
F	Forest
M	Mixed-Use
R	Residential
Ob	Open Space - Brush
Og	Open Space - Grass
CC	Clearcut
W	Wetlands
Rf	Forest Road
Rc	County Road

B. Species

- For merchantable stands (all saw-timber and pole-timber), the primary and secondary species shall be identified and listed as the first part of the stand type based on predominance of volume.
- For non-merchantable stands (seedlings and saplings), the primary species shall be identified and listed as the first part of the stand type based on the greatest number of trees per acre.
- The following species codes shall be used:

Species Codes	
Code	**Species**
DF	Douglas-fir
WH	Western Hemlock
RC	Western Red Cedar
GF	Grand Fir
SS	Sitka Spruce
RA	Red Alder
CW	Black Cottonwood
BM	Bigleaf Maple
CH	Cherry
BI	Paper Birch
QA	Quaking Aspen
OH	Other Hardwood

C. Size Class

- The size class for each stand shall be identified and listed as the second part of the stand type using the following size class codes:

Code	Size Class
Ns	Less than 10% stocked
Rp	DBH: 0 - 7 inches (seedlings/saplings)
Pt	DBH: 8 - 11 inches (pole timber)
St	DBH: 12 - 16 inches (small saw timber)
Mt	DBH: 17 - 21 inches (medium saw timber)
Lt	DBH: ≥ 22 inches (large saw timber)

- Saw timber (St) stands are further defined as having a quadratic mean diameter (QMD) ≥ 12 inches and a net volume ≥ 5,000 board feet/acre.
- Pole-timber (Pt) stands are further defined as having a QMD < 12 inches but ≥ 8 inches and are stocked with ≥ 50% pole-timber size trees.
- Seedling and sapling (Rp) stands are further defined as being stocked with ≥ 40% saplings or well-established seedlings.

D. Stocking

- The stocking for each stand shall be identified and listed as the third part of the stand type using the following stocking codes:

Code	Crown Cover %
01	< 10%
13	10 - 30%
35	31 - 50%
57	51 - 70%
71	≥ 71%

- Areas with stocking < 10% shall be classified as non-stocked.

E. Final Stand Type Call

- The final stand type call applied to each stand shall conform to the following example: RCgfMt57. In this example, western red cedar (RC) is the predominant species by volume followed by grand fir (gf). The stand contains medium sized saw timber (Mt) and 51-70% crown cover.

F. Minimum Stand Type Acreage

- The minimum acreage for a stand type shall be 5 acres. All stand types less than five acres shall be included into an adjacent stand that most closely reflects the stand's composition.
- The minimum acreage for non forested types shall be 1 acre.

Timber Cruising Requirements

A. Cruise Intensity (No. of Plots)

- Cruise intensity shall be sufficient to achieve a target sampling error of 7% or less at one standard deviation (68.1% confidence limit) on a reservation-wide level.
- The number of plots installed in each stand type shall be no less than those provided in the table below unless otherwise approved by the LIBC Forest Manager.

Stand Type Acreage	Cruise Intensity
5 - 10	3 plots total
11 - 20	1 plot per 2 acres
21 - 40	1 plot per 4 acres
≥ 41	1 plot per 7.5 acres

B. Plot Distribution

- The Contractor shall distribute the appropriate number of sample points in each stand using either a square or rectangular grid system as dictated by predetermined cruise intensities.

C. Plot Design

- In merchantable stand types, each sample location shall include a point sample (variable-plot) to determine stand volume and other relevant stand metrics, a nested 1/50th-acre fixed-area plot to determine understory regeneration, and a nested 1/100th-acre fixed-area plot to determine species composition of lesser vegetation.

- In pre-merchantable stand types, each sample location shall include a 1/50th-acre fixed area plot to determine seedling and sapling count and a nested 1/100th-acre fixed-area plot to determine species composition of competing vegetation.

D. Cruise Specifications

Point Samples (merchantable stand types only)

- The Contractor shall select a basal area factor (BAF) that will provide an average of 5-7 trees per plot per stand. Only one BAF shall be used in each stand.
- The Contractor may use a sighting point at either DBH or at 16 feet to determine "in/out" status.
- All living "in" trees with a DBH ≥ 8.0 inches shall be recorded at each sample point.
- Species, DBH, form factor, merchantable height, total height, crown ratio, log sort and grade data, and visible defect shall be recorded for every "in" tree on every measure plot. DBH shall be recorded to the nearest inch and tree height shall be recorded to the nearest foot.
- Count plots may be used at the discretion of the Contractor as long as the target sampling error is achieved.
- Estimated species, DBH, total height, and decay class shall be recorded for all "in" dead trees/snags with a DBH ≥ 10 inches and a minimum height of 10 feet.

1/50th-acre Seedling and Sampling Fixed-Area Plot

- All live trees with a DBH < 8 inches or a total height > 1 foot shall be recorded.
- Species and DBH shall be recorded for each tree in the plot. DBH shall be recorded to the nearest inch.
- Total height and crown ratio of at least one tree per species per diameter class shall be recorded at each plot.

1/100th-acre Understory Vegetation Fixed-Area Plot

- The Contractor shall record the three most prevalent species on the plot and provide an accurate estimate of their percent cover. Percent cover shall be recorded as a percent of total ground cover within the plot.

E. Null Plots

- A null plot shall be defined as having no trees (point sample), no regeneration (1/50th-acre fixed-area plot), or no lesser vegetation (1/100th-acre fixed-area plot).
- Where null plots occur, the Contractor shall record XX for the species code and 0 in the tree count or vegetation percent column.

F. Site Trees

- The Contractor shall measure at least five site trees per stand in stands > 10 acres and at least three site trees per stand in stands < 10 acres to determine the site index for each stand.
- Site trees shall be of the predominant species, in the dominant crown class, healthy, visibly free of defect, and exhibit no evidence of ever being suppressed.
- At the discretion of the Contractor, site trees may be selected from sample plots or off sample plots. Species, total height, DBH, and tree age at DBH shall be recorded for each site tree. Total height shall be recorded to the nearest foot and DBH shall be recorded to the nearest inch.

G. Additional Requirements

- The Contractor shall hang three streamers of flagging with each streamer at least 3 feet in length at the edge of each stand to mark the start point for each cruise. The Contractor shall write the stand number, date, and the cruiser's initials on at least one of the streamers.

- The Contractor shall mark each plot center with a stake (branch) tied with flagging and shall hang a 3-foot streamer near plot center close to eye level listing the plot number, BAF used, and the cruiser's initials.
- The Contractor shall be required to hang a 3-foot streamer every two chains to assist in relocating plots. The Contractor shall also hang two 3-foot streamers at each road crossing.
- The Contractor shall attempt to obtain a GPS coordinate for every starting point and plot center within each stand.

Check Cruising Requirements

A. The Contractor shall inspect a minimum of 5% of each cruiser's work in merchantable stands to ensure that the work is compliance with the following tolerance limits:

Category	Tolerance Limit
Tree Count	+/- 2%
Species	None
DBH	+/- 5%
Merchantable Height	+/- 10%
Defect	+/- 10%
Sort & Grade	+/- 1 Grade

B. All check cruise reports shall be provided to the LIBC Forest Manager. If a cruiser's work does not meet the tolerance limits specified above, the Contractor shall be responsible for re-measuring all inaccurate plots within the stand to ensure accurate plot data.

Reporting Requirements

A. The Contractor shall prepare and provide hard copies and electronic copies (on a CD-ROM) of the following inventory reports and maps:

SuperAce Cruise Reports

- Tract Summary (entire inventory project)
- Non-Stocked and Non-Timbered Acres (entire inventory project)
- Catalog – Species Volumes (entire inventory project)
- Project Statistics (entire inventory project and for each individual stand type)
- Species, Sort, and Grade (Board Foot Volumes) (entire inventory project and for each individual stand type)
- Stand Table Summary (entire inventory project and for each individual stand type).

Other Cruise Reports

- Reservation-wide Stand Type Summary Table that lists total stand acreage, BF volume/acre, basal area/acre, trees/acre, stand type call, and total volume for each stand number.
- Understory Vegetation Summary Table that lists predominant understory vegetative cover for each stand type.

Inventory Maps

- The final stand type map for the entire inventory with each stand type labeled by its stand number.
- A stand type map depicting plot locations, plot number, and the starting point of the cruise.
- In addition to an electronic copy of the inventory maps, the Contractor shall also provide a copy of the stand type GIS layer (shape file). Each stand type within the layer shall include all of the stand metrics listed in the Reservation-wide Stand Type Summary Table in the attribute table.

Timbered Acreage vs. Non-Timbered Acreage		
Land Use	**Acres**	**% of Reservation Land Base**
Timberland	5,360	46%
Non-Stocked Timberland	328	3%
Developed & Other Use	5,767	49%
Non-Timber Wetland	198	2%
Total =	**11,653**	**100%**

Statistical Analysis Summary for Reservation-wide Forest Inventory		
Factor	**Value**	**SE%**
No. of Sample Trees	7,476	N/A
Trees/Acre	369	5.4%
Avg. DBH	8.6	N/A
Basal Area/Acre	147	2.4%
Net BF/Acre	9,738	3.8%

Timber Type Summary Table

Lummi Reservation-wide Summary Table

Stand #	Total Acres	Bf / Acre	BA / Acre	Trees/Acre	Type Call	Total MBF
1	90.5	7,626	135	187	BMraMt57	690
2	43.5	5,928	87	165	CWraLt57	258
3	23.1	11,142	144	171	RAcwMt57	258
4	44.3	8,969	116	523	BMcwMt57	398
5	23.7	10,864	123	157	CWraSt57	257
6	11.9	2,993	134	1009	CHrcRp71	36
7	20.3	6,511	159	625	DFchPt71	132
8	20.2	12,726	167	281	CWraLt71	257
9	7.7	1,563	109	1313	DFchPt71	12
10	11.5	5,370	80	93	CWraMt57	62
11	16.4	6,433	116	400	CWraSt57	106
12	85.5	3,040	94	520	RAdfPt71	260
13	99.2	20,164	217	217	RCbmLt57	2,001
14	7.6	20,932	221	69	RCdfLt57	159
15	70.4	6,109	172	825	DFraPt71	430
16	12.5	8,073	118	178	RAcwSt57	101
17	130.5	12,185	155	138	RArcMt57	1,591
18	21.2	35,619	302	89	RCdfLt57	755
19	35.9	20,792	242	250	RArcMt71	746
20	16.0		17	1090	RAcwRp71	
21	29.2	21,942	239	372	RCraLt71	640
22	24.9	13,884	186	128	RCraLt57	346
24	36.5	13,716	165	46	DFraLt35	500
25	5.2	20,294	284	130	RCraLt57	106
26	88.5	7,814	171	789	DFraPt71	692
27	79.8	9,229	127	169	RAbiSt71	736
28	19.5	17,469	220	211	RArcMt71	341
32	27.7	5,480	157	570	DFraPt71	152
35	19.7	18,070	254	102	RCdfLt57	356
36	22.8		42	489	RAchRp71	
38	55.5		30	489	CHraRp71	
39	144.6	12,798	167	126	RAcwLt35	1,851

Lummi Reservation-wide Summary Table

Stand #	Total Acres	Bf / Acre	BA / Acre	Trees/Acre	Type Call	Total MBF
40	11.0	9,894	170	259	RAPt71	109
41	210.1	9,917	132	92	CWraLt57	2,083
42	17.4	5,520	115	481	RAcwPt71	96
43	295.9	16,675	198	130	RCraLt57	4,934
44	16.5	10,490	149	515	CWraPt71	173
45	139.8	3,988	98	404	RAdfRp71	558
46	72.7	13,739	147	86	RAdfMt57	998
47	101.0	9,464	162	116	RArcMt57	955
48	39.0	8,250	124	112	RAbiSt57	322
49	18.5	7,626	105	166	RAbiSt57	141
50	125.8	13,678	160	237	CWraLt71	1,721
51	28.3	2,534	90	487	RAdfRp71	72
52	31.4	11,197	150	230	RAbmPt71	352
53	40.9	787	160	1185	RAbmRp71	32
54	115.7	22,400	273	138	RCbmLt57	2,592
55	45.4	14,091	188	110	CWrcLt57	640
56	11.3	16,433	240	203	RCraMt71	186
58	26.5	13,640	212	96	RArcLt57	361
61	33.6	5,253	136	259	RAcwSt71	177
62	9.7		114	829	RAdfRp71	
63	37.5		163	668	DFraRp71	
66	25.7		4	597	RAchRp71	
68	8.5	12,939	239	400	DFPt71	109
69	8.0	2,073	115	788	RAcwRp71	17
70	5.9		176	630	DFraRp71	
71	196.1	10,166	140	84	RAcwMt57	1,994
72	330.0	10,936	149	264	RAcwMt57	3,609
74	83.7	11,541	217	560	RAdfPt71	966
76	13.8	23,000	185	50	DFrcLt57	316
77	75.2		23	313	CHraRp71	
78	27.1	21,366	229	177	RCcwLt57	578
79	39.9	6,293	133	463	RAchRp71	251

Lummi Reservation-wide Summary Table

Stand #	Total Acres	Bf / Acre	BA / Acre	Trees/Acre	Type Call	Total MBF
80	158.6	12,885	185	176	RAcwSt71	2,043
81	39.8	20,423	230	186	RArcSt71	813
82	200.3		158	551	GFraRp71	
83	13.8	10,174	186	389	RCbiMt71	140
84	73.1		104	2940	BIraRp71	
85	13.6	15,739	175	311	CWraLt71	214
86	41.3		91	315	RAbiRp71	
87	13.7		66	368	BIraRp71	
88	175.8	10,819	138	143	RAcwSt71	1,902
89	114.6		91	487	RArcRp71	
90	9.7		89	232	RAdfPt71	
92	44.2	16,344	192	78	RCraLt57	722
93	13.1		90	389	RAcwRp71	
94	21.8		101	438	DFcwPt71	
97	9.3		27	315	RAbiRp71	
98	15.8		111	572	DFbmRp71	
99	32.6		114	938	RAgfRp71	
100	112.1	7,337	112	202	RAcwMt35	823
101	127.8	15,876	188	67	RCraLt35	2,029
102	27.1		45	2436	BIraRp71	
103	103.4	17,748	171	59	BMraLt57	1,835
104	9.4		121	1110	BMdfRp71	
105	20.0		80	1013	BIraRp71	
106	37.5		85	1162	BIcwRp71	
110	51.5	10,541	175	219	RArcSt71	542
111	136.6	18,413	164	213	CWraSt71	2,515
114	37.2				CC	
116	34.9		4	754	RAcwRp71	
117	18.2		31	5635	RARp71	
118	7.0		5	994	RAdfRp71	
119	7.2				CC	
120	19.2		10	1765	CHraRp71	

Lummi Reservation-wide Summary Table

Stand #	Total Acres	Bf / Acre	BA / Acre	Trees/Acre	Type Call	Total MBF
121	30.0		16	568	DFraRp71	
122	21.5		7	1342	CWrcRp71	
123	25.2	1,840	86	269	CHraRp71	46
124	9.1				CC	
125	26.0				RArcRp71	

Average Form Factor by Timber Species	
Hardwoods	
Species	**Average Form Factor**
Red Alder	81
Black Cottonwood	85
Bigleaf Maple	79
Paper Birch	82
Cherry	81
Other Hardwood	68
Willow	80
Quaking Aspen	80
Conifers	
Western Red Cedar	70
Douglas-fir	80
Sitka Spruce	83
Western Hemlock	84
Grand Fir	80

FOREST INVENTORY ANALYSIS CONTRACT AGREEMENT

Location

The project area included in the forest inventory analysis includes all trust lands located within the Lummi Indian Reservation, Whatcom County, Washington.

Payment and Terms

A. The Lummi Indian Business Council (LIBC) shall reimburse the Contractor at the agreed bid price upon satisfactory completion of the project. The work shall be inspected by the LIBC Forest Manager to ensure compliance with specifications and conditions outlined in this contract agreement.

B. The Contractor shall invoice the LIBC Natural Resource Department. Payment for completed work will be made from the LNR Forestry Account.

C. The Contractor shall be provided with data and reports from previous forest inventories for use in the inventory analysis.

D. The Contractor shall be required to attend a pre-work conference with the LIBC Forest Manager prior to the execution of this contract.

E. The Contractor shall provide all equipment, tools, supplies, and personnel to complete the project.

F. All work performed by the Contractor under this contract shall be the property of the Lummi Nation.

G. The Lummi Nation reserves the right to waive technical defects and to reject any unsatisfactory work.

H. All inventory analysis work shall be completed on or before XXX XX, 20XX.

Project Conditions and Specifications

A. The Contractor shall provide the Lummi Nation with three hardcopies and one electronic copy of the Forest Inventory Analysis report.

B. The Contractor shall use the Forest Projection and Planning System (FPS) developed by the Forest Biometrics Research Institute (FBRI) for all growth modeling and allowable harvest calculations. The Contractor shall also provide the Forestry Division with a copy of the Access database file containing all of the stand data used in FPS for growth and harvest projections.

C. The Inventory Analysis report shall include and adequately address the following components:

D. <u>Preface</u>

- Purpose and description of analysis.

E. <u>Synopsis</u>

- A summary of the results from the forest inventory analysis including forest area, inventory summary statistics (i.e. total MBF, site index, average MBF/acre, growth per year, sample statistics, indicated allowable cut, regulated allowable cut, and sustainable allowable cut), and a description of the area under management.

F. <u>Description of Forest</u>

- A description of the location, topography, climate, major forest types, site index and site class, economic development, and utilization of forest resources on the Lummi Reservation.
- A table summarizing the total acreage for each stand type and the percent of the total forest that the stand type comprises consistent with the format provided in Exhibit A.

G. <u>Summary of Inventory and Analysis Results</u>

- A description of previous forest inventories and results including sample methods, forest area, volume, growth, mortality, indicated allowable cut (IAC), annual allowable cut (AAC) and past harvest history.

- A description of the current forest inventory that includes the following elements:
  1. Sample Methods: A description of sampling intensity, plot distribution, plot design, field procedures, timber type criteria, data collection and processing.
  2. Stand Volumes: A table summarizing net per acre BF volume summaries by species by timber type in a format consistent with Exhibit B and a table summarizing net total BF volume summaries by species by timber type in a format consistent with Exhibit C.
  3. Species and Size Distribution: A table summarizing trees per acre, basal area (square feet) per acre, and quadratic mean diameter by species by timber type in a format consistent with Exhibit C.
  4. Statistical Analysis: A table listing the average, standard error, and coefficient of variation for trees per acre, basal area per acre, and net board foot volume per acre for each timber type in a format consistent with Exhibit D. The number and type of plots (cruise vs. count) used for each timber type shall also be included.
  5. Age Class Distribution: A table listing the acreage and the percent of total acreage comprised of different age classes on the Reservation in a format consistent with Exhibit E.
  6. Forest Condition: A brief description of stocking, age, growth conditions, species composition, mortality, and problems with brush, insects, disease, and damaging wildlife.
  7. Area: A table listing stand type acreage by ownership status in a format consistent with Exhibit F.
  8. Forest Growth: A description of the calculated growth/year on trust lands using FPS software.
  9. Rotation Age Calculation and Summary: A table listing the optimal rotation age calculated for each timber type using the Faustmann Formula.
  10. Harvest Schedule for the Next 10 Years: A description of the indicated allowable cut (MBF) based on calculated growth per year, the regulated allowable cut (acres) based on total forested trust acres and calculated rotation age, and the sustainable annual allowable cut (MBF) based on projections in the FPS Harvest Scheduler. The Contractor shall provide a hardcopy of the FPS Harvest Scheduler printout as part of the inventory analysis report.
  11. Site Index Summary: A table listing the site index for each timber type and the site index reference species.
  12. Inventory Cost Data: A brief description of the cost of the forest inventory and analysis.

Exhibit A

Lummi Reservation Timber Types		
Timber Type	**Acres**	**Percent of Total**
RCraMt57	XXX.X	X%
RAbmLt57	XXX.X	X%
DFraPt71	XXX.X	X%
Total Timber Acres	**XXX.X**	**X%**
Non-Timber Type	**Acres**	**Percent of Total**
Agriculture	XXX.X	X%
Commercial	XXX.X	X%
Residential	XXX.X	X%
Total Non-Timber Acres	**XXX.X**	**X%**
Total Acres	**XXX.X**	**X%**

Exhibit B

Net Volume per Acre by Species by Timber Type (BF Scribner)													
Timber Type	**Hardwoods**					**Conifers**					**Combined**		
	Red alder	Bigleaf maple	Paper birch	Black cotton wood	Misc. Hard wood	Douglas -fir	Western hemlock	Western red cedar	Sitka Spruce	Grand fir	All Hard woods	All Conifers	All Species
RCraMt57													
RAbmLt57													
DFraPt71													
Weighted Average													
% of Total													

Exhibit C

Total Net Volume by Species by Timber Type (BF Scribner)													
Timber Type	**Hardwoods**					**Conifers**					**Combined**		
	Red alder	Bigleaf maple	Paper birch	Black cotton wood	Misc. Hard wood	Douglas -fir	Western hemlock	Western red cedar	Sitka Spruce	Grand fir	All Hard woods	All Conifers	All Species
RCraMt57													
RAbmLt57													
DFraPt71													
Reservation Total													
% of Total													100%

Exhibit D

Statistical Analysis by Timber Type							
Timber Type	**Metric**	**CV (%)**	**SE (%)**	**Low**	**Average**	**High**	**No. of Plots**
RCraLt57	Trees/Acre	87.7	20.7	86	109	131	19 (13 Cruise, 6 Count)
	Basal Area/Acre	43.5	10.2	226	251	277	
	Net BF/Acre	42.4	10.0	19,547	21,714	23,882	

Exhibit E

Age Class Distribution		
Age Class	**Acreage**	**Percent of Total**
5		
10		
15		
20		
25		
30		
40		
50		
60		
70		
80		
90		
100		
120		
140		
160		
180		
200+		
All Age Classes		100%

Exhibit F

Stand Type Acreage by Ownership Status					
Timber Type No.	**Trust**	**Fee**	**In Process**	**Unplatted**	**Total**
1	10	5	2	0	17
2	22	13	7	0	42

Appendix 3
Timber Harvesting

APPENDIX 3

Economic, Silvicultural, and Operational Advantages of the Clearcut System

Economic Advantages

1. Least costly harvesting system to use: lower cost of sale administration, planning, layout, supervision, harvesting, site preparation, plantation establishment and maintenance, and intermediate stand treatments.
2. Maximizes harvest income.

Silvicultural Advantages

1. Simplifies site preparation, plantation establishment and maintenance, and intermediate stand treatments.
2. Rapidly achieves a vigorous, free-growing plantation through artificial regeneration.
3. Provides excellent control over species composition, stocking, and seedling quality through artificial regeneration.
4. No possibility for logging damage to regeneration since tree planting occurs after all logging and site preparation activities are complete.
5. Maximizes growth rates and volume yields.
6. Increases the applicability of accepted density management tools and growth and yield models.
7. Intermediate stand treatments such as thinning, pruning, and fertilization can be easily incorporated into this system.
8. Allows for easier control of insect and disease problems.
9. The most effective harvesting system for growing shade-intolerant species such as Douglas-fir and red alder.
10. Single harvest entry minimizes the potential for soil compaction (other systems require multiple entries increasing the likelihood of machine related soil compaction)
11. No risk of damaging residual crop trees since all merchantable timber is harvested.
12. Benefits many species of wildlife that prefer early successional habitats such as deer and elk.

Operational Advantages

1. Simplifies cutting prescription for logging operators.
2. Requires significantly less contract administration and supervision.
3. More easily accommodates highly specialized equipment.
4. Allows logging operators to optimize workflow and productivity.
5. Enhances worker safety because most or all trees are removed.

Disadvantages of the Clearcut System

1. Usually not considered to be visually pleasing.
2. May exert negative impacts on wildlife species that require more structurally diverse habitats typically found in later successional stages of forest development if adjacent habitats are not available for displaced wildlife.
3. May exert negative impacts on water quality in adjacent water resources by increasing the potential for surface run-off.
4. May exert negative impacts on soil resources.

5. May cause the water table to rise.
6. May reduce biological diversity by promoting monocultures on relatively short rotations if mixed-species plantations are not pursued.
7. No merchantable trees will be available for harvest for an extended period of time (approximately 30-60 years) unless commercial thinning is done.

Skidding Method Descriptions			
Method	**At Stump**	**Transportation**	**Landing Operations**
Whole-Tree Method	Fell	Skid whole tree	Process into logs or chips and load onto log truck
Tree-Length Method	Fell, de-limb, and top	Skid processed tree	Process into logs or chips and load onto log truck
Cut-to-Length Method (commercial thinning)	Fell, de-limb, and process into logs	Forward processed logs to the landing	Load onto log truck
Adapted from Kellogg, 1993.			

Three Basic Types of Mechanical Falling Equipment and Their Functions	
Equipment Type	**Description**
Feller (single-function)	Capabilities: Capable of directional tree falling; usually can handle larger trees than dual-function or multi-function machines; not commonly used in western Washington. Drive-to-tree machines typically cause greater site disturbance and have lower slope limitations than swing-to-tree machines. Tree Size Limit: 24-inches at the stump for most arrangements; 35-inches at the stump with larger head attachments.
Feller-Buncher (dual-function)	Capabilities: Capable of directional tree falling and bunching cut trees for a skidder to pick up; commonly used in western Washington; works best with a grapple skidder because they are capable of building optimum-sized bunches for grapple skidding. Tree Size Limit: 24-inches at the stump for most arrangements; 35-inches at the stump with larger head attachments.
Feller-Processor (multi-function)	Capabilities: Can directionally fell, de-limb, top, buck, and bunch trees at the stump using a specifically designed attachment called a harvester head; creates a mat of limbs in front of the machine from processing trees that it travels on as it progresses through the harvest unit; mat reduces soil disturbance and compaction, assists in slash disposal and decomposition, and reduces fire-related slash problems; typically only used in commercial thinning operations in western Washington; limbing capability of most harvester heads is limited to smaller diameter trees; processed logs are picked up by a forwarder. Tree Size Limit: 20-inches at the stump for single-grip harvesters; 26-inches at the stump for double-grip harvesters.
Adapted from MacDonald, 1999 and Greulich et al., 1996	

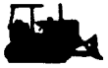
Reasons for Equipment Preferences

A tracked, swing-to-tree, feller-buncher with a saw-head attachment is preferred for timber harvests on trust lands of the Lummi Reservation for the following reasons:

1. Tracked machines exert less ground pressure and cause less soil displacement than wheeled machines. They can also operate on wet ground unsuitable for wheeled equipment.
2. Swing-to-tree machines allow the operator to keep the machine in one position while cutting, swinging, and bunching, which lowers the potential for machine-related soil damage. Swing-to-tree machines can also operate on higher slopes (MacDonald, 1999).
3. Swing-to-tree machines operate well in and around sensitive sites such as wetland buffers or other special use areas where selective harvests can occur. These machines can reach into buffers and cut and extract trees without entering the buffer or doing any damage to leave trees.
4. Feller-bunchers are conducive to whole-tree yarding and can control where trees are placed after cutting.
5. The saw-head attachment causes less damage to the butt log during felling than a shear attachment providing better recovery.

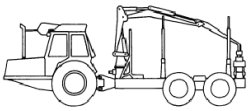
A hydraulic excavator or a tracked skidder equipped with a grapple is preferred for timber harvests on trust lands of the Lummi Reservation for the following reasons:

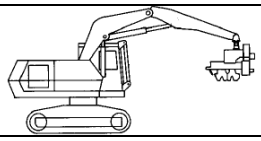
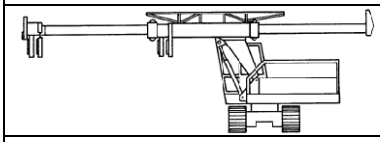
1. Tracked machines exert less ground pressure and cause less soil displacement than wheeled machines. They can also operate on wet ground unsuitable for wheeled equipment.
2. The grapple arrangement works well in units harvested with mechanical falling equipment and is conducive to whole tree yarding.
3. Tracked machines can haul larger payloads making them more suitable for skidding larger timber and potentially reducing the number of skid trail passes.
4. Hydraulic excavators can reach into buffers and/or sensitive sites and extract trees while minimizing site damage.

Skidding Equipment Comparison					
Factor	**Wheeled Skidders**	**Crawler Tractors**	**High Speed Tracked Skidders (LGP)**	**Hydraulic Excavators (Shovel Logging)**	**Forwarder**
					
▪ Timber Size Capability	All sizes within design range of machine	All sizes within design range of machine	All sizes within design range of machine	All sizes within design range of machine	Small to medium timber less than 30 inches at DBH
▪ Slope Limitations	30% when skidding downhill 15% when skidding uphill or sidehill Downhill skidding preferred	30% when skidding downhill 20% when skidding uphill or sidehill Downhill skidding preferred	35% when skidding uphill 25% when skidding uphill or sidehill Downhill skidding preferred	35 to 40% with self-leveling machines when skidding uphill. 20% with non self-leveling machines 20% when skidding uphill or sidehill Downhill skidding is preferred	35% when skidding uphill 25% when skidding uphill or sidehill Downhill skidding preferred
▪ Production Potential	Medium to high	Medium to high Avg. production of 40 MBF/day in clearcut with favorable conditions	Medium to high Avg. production of 40 MBF/day in clearcut with favorable conditions	Medium to very high. Avg. productivity of 80 MBF/day in clearcuts with favorable conditions	Medium to high
▪ Maximum Skidding Distance (feet)	1000 ft downhill 500 ft. uphill Avg. of 700 ft. or less preferred	700 ft. downhill 350 ft. uphill Avg. of 600 ft. or less preferred	2000 ft. downhill 1000 ft. uphill Avg. of 800 ft. or less preferred	400 ft. downhill 200 ft. uphill Avg. of 300 ft. or less preferred	3,000 ft. downhill 1500 ft. uphill Avg. of 1,500 ft. or less preferred
▪ Road Spacing	800 to 1500 ft.	800 ft.	2500 to 3500 ft.	400 ft.	3000 to 5000 ft.
▪ Harvest Applications	Clearcut and partial cuts Potential for damage to residual crop trees in thinnings (higher than a tracked skidder) Machine width may limit tree spacing	Clearcut and partial cuts Potential for damage to residual crop trees in thinnings Machine width may limit tree spacing	Clearcut and partial cuts Sites with sensitive soils where low ground pressure is needed Potential for damage to residual crop trees in thinnings Machine width may limit tree spacing	Clearcuts or very heavy partial cuts Some use in thinnings Can operate well around sensitive sites, reserve trees, and across uneven surfaces	Thinnings and partial cuts Some use in clearcuts
▪ Soil Disturbance	Medium to high disturbance with grapple machines Lower disturbance with wide tire (43" to 50") machines since wide tires provide better "flotation" on low-strength soils reducing rutting potential	Medium to high disturbance (depends on practices)	Medium to high disturbance (depends on practices)	Low Logs are usually lifted off the ground	Low to medium disturbance Causes less soil disturbance than other skidders because logs are not dragged on the ground
▪ Water Resource Protection	Can be excellent	Can be excellent	Can be excellent	Excellent	Can be excellent
▪ Slash Handling Capability	Yes	Yes	Yes	Yes	No
▪ Contractor and Equipment Availability	Common	Common	Occasionally used	Common	Commonly used in thinnings
▪ Other Uses	None	Road and landing construction, installing culverts	None	Road and landing construction, installing culverts, log loading	None
▪ Yarding Cost/Unit of Production	Low	Moderately Low	High	Low	High
▪ Road Construction Cost/Unit of Production	Low	Moderate	Low	Moderate to high	Low
Adapted from Greulich et al., 1996 and Parker and Bowers, 2006.					

Cable and Grapple Skidder Comparison	
Cable Skidder	**Description**
	Very common; can be highly productive when skidding larger timber; works better on adverse slopes or in wet areas; can drop their load and move forward to more firm terrain before winching reducing the risk of soil disturbance; acquiring a load can be time-consuming; often used with manual felling crews because they are more efficient than other skidders in scattered timber.
Grapple Skidder	**Description**
	Can provide higher production than cable skidders when timber has been mechanically felled and bunched for easy pick-up; production between grapple and cable skidders is nearly equal when skidding large timber that has been felled manually; provides a safer work environment for logging operators.

Wheeled and Tracked Skidder Comparison	
Wheeled Skidder	**Description**
	Very common; can yield high production rates; may be equipped with either a cable or grapple attachment; tires can be matched to logging conditions of the harvest unit - wide tires (43 to 50 inches) can be used in harvest units with sensitive soils to provide lower ground pressure and on steeper slopes to provide more stability, narrower tires (32 inches) can be used to operate in selection cuts or on narrow skid trails; tire chains can be used to improve traction in problem areas. Advantages: High production rates; longer skidding distances than traditional tracked machines; can operate profitably in sales with low volumes per acre; highly maneuverable; offers lower logging costs than other skidding machines on favorable terrain; can be used in partial harvests and clearcuts. Disadvantages: Usually causes more soil disturbance than other types of ground-based skidding machines; unsuitable for operations on wet and easily compactable soils; traction problems in wet areas; limited upslope capability (15%); higher potential for damage to residual timber in partial cuts or thinnings; can only push or pull logs at the landing, push logging slash into piles, and do minor skid trail work.
Tracked Skidder	**Description**
	Tracked skidding machines include crawler tractors (dozers), hydraulic excavators (shovels), and high speed tracked skidders. Typically able to perform multiple tasks including road, skid trail, and landing construction, culvert installation, log loading (hydraulic excavator only), site preparation and brush piling; crawler tractors and high-speed tracked skidders may be equipped with either a cable or grapple attachment; cable attachments are also available to convert a hydraulic excavator into a cable skidder but logs are usually transported with the hydraulic boom. Advantages: Multi-task equipment can lower total operation cost; suitable for partial harvests or thinnings (as long as the tractor blade is removed); can operate profitably in sales with low volumes per acre; pulls larger payloads; causes less soil compaction; can operate on wet ground unsuitable for wheeled skidders; can operate on steeper slopes since they are more stable; may be equipped with wide, low ground pressure (LGP) tracks on sensitive sites. Disadvantages: Travels at slower speeds (excluding high-speed tracked skidder), less maneuverable, and more expensive than wheeled skidders; shorter skidding distances (excluding high-speed tracked skidders).
Adapted from Greulich et al. 1996, Kellogg, 2007, Erwin, 2009 A, and Erwin and Rummer, 2009 B.	

Forwarder	
Forwarder	**Description**
	Only used with the cut-to-length harvesting system (commercial thinning operations); loads and transports processed logs to a designated landing site or roadside location; causes minimal soil disturbance since transported logs never touch the ground; can carry 8 to 15 tons (1 to 2 MBF) per load depending on forwarder size; forwarding distance can reach a mile or more if necessary reducing the need for road construction or re-construction. Advantages: Causes less soil damage than a wheeled or tracked skidder; requires smaller landings; well suited for commercial thinning or partial cutting operations; requires fewer roads and skid trails due the machine's ability to transport loads long distances; landings require little to no cleanup since all log processing is done in the woods. Disadvantages: Very expensive to own and operate, which increases logging costs; must be used in coordination with a feller-processor to be cost effective; not applicable for use in clearcut harvests; only capable of transporting processed logs with an average length of 20 feet or less; "cut-to-length" system results in a significant amount of logging slash dispersed throughout the unit.
Adapted from Greulich et al., 1996	

Bucking Equipment	
Processor	**Description**
	Commonly used in western Washington; capable of limbing and bucking trees with a maximum diameter of about 20 inches; some models can process logs up to 35 inches.
Stroke Delimber	**Description**
	Maximum tree size is determined by the diameter of the processing tunnel of the machine; less efficient than processors for small trees because they pass over each log twice to complete the processing cycle; can process several small trees simultaneously.
Adapted from MacDonald, 1999.	

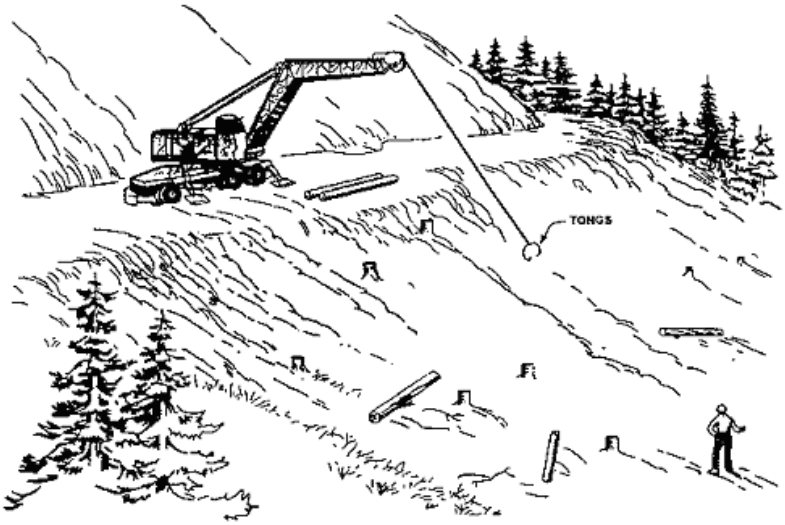
Jammer and Highlead System Comparison		
Factor	**Jammer**	**Highlead**
▪ Timber Size Capability	Small to medium timber	Medium to large timber
▪ Slope Limitations	30 to 55%	30 to 70% Limited by deflection, suited for steep slopes
▪ Production Potential	Medium to high	Medium to high
▪ Maximum Yarding Distance (feet)	450 ft. (uphill only)	1000 ft. uphill 500 ft. downhill 700 ft. uphill when using modified highlead system
▪ Road Spacing	300 to 500 ft.	800 to 1500 ft. 500 to 850 ft. when using modified highlead system
▪ Harvest Applications	Clearcuts Partial cuts along roads	Clearcuts Partial cuts are only possible when using modified highlead system. Damage to residual stand in partial cuts can be severe.
▪ Soil Disturbance	Moderate	Moderate
▪ Water Resource Protection	Depends on practices	Depends on practices
▪ Slash Handling Capability	Yes (expensive)	Yes (expensive)
▪ Contractor and Equipment Availability	Limited availability on Westside	Common
▪ Other Uses	None	None
▪ Yarding Cost/Unit of Production	Moderate	Moderate to high
▪ Road Construction Cost/Unit of Production	Medium	Medium
Adapted from Greulich et al., 1996 and Parker and Bowers, 2006.		

Jammers

Jammers are usually small yarders and are the most basic type of cable yarding system. Jammers may be wheeled or tracked and are equipped with a one or two drum winch. One drum is used to power a skidding line, which is attached to the log and the other drum, if used, is attached to a haulback line (Wenger, 1984). Single-drum jammers use a mechanism to cast the mainline down the hill where it is hooked to a log. Double-drum jammers can be rigged with a haulback line to pull the mainline out into the woods (Erwin and Rummer, 2009 A).

Jammers are only capable of yarding uphill and are limited to maximum yarding distances of 300 to 450 ft (Wenger, 1984). Because of the relatively short yarding distances, jammers are best suited for harvesting smaller areas adjacent to roads. Jammers also have limited applications in selection harvests. Their simplicity and relatively low cost make them competitive with ground-based systems on steeper ground (Erwin and Rummer, 2009 A).

Shovel Loader Jammer



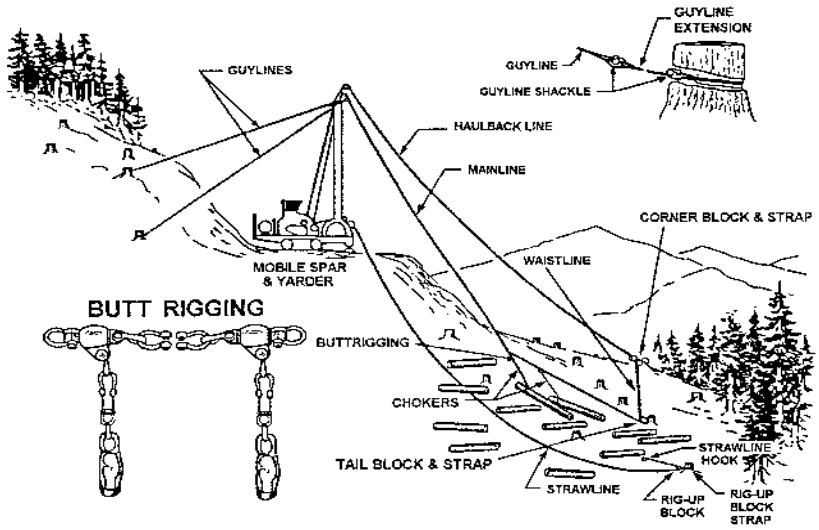
WADLI, 2009.

Highlead System

A standard highlead system is comprised of a mobile spar and yarder and the following operating lines: a mainline (used to pull the logs and rigging to the landing), a haulback line (used to pull the mainline rigging back to where the logs will be hooked to the rigging), and a strawline (used to pull out the heavier lines) (Greulich et al., 1996). The spar and yarder may be separate or combined into one machine. The spar provides lift to the leading end of the log and can be 50 to 120 ft. in height. The spar also allows the operator to overcome obstacles and reduce the amount of soil disturbance (Wenger, 1984). Spar height and harvest unit terrain are the two limiting factors to the amount of lift provided.

Highlead systems are capable of yarding uphill, downhill and sidehill. Downhill and sidehill yarding is discouraged since control of log movement is minimal and severe site damage often results (Wegner, 1984). Highlead systems may also cause unacceptable damage to soil when the logs are yarded up to the landing. Uphill yarding distances are limited to 1,000 feet or less which is about twice as long as that provided by jammers. The highlead system is best used in clearcuts. Harvest costs and residual damage to leave trees can be very high in selection harvests. Highlead systems are very popular in the Pacific Northwest because they are reliable, simple, and can be run with only two drums on the yarder (Greulich, 1996).

Highlead System

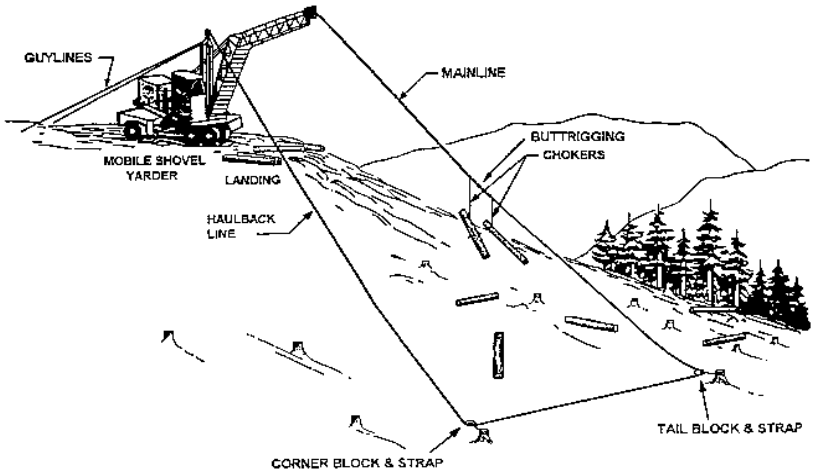


WADLI, 2009.

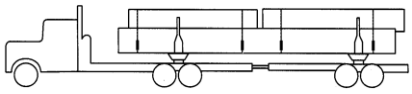
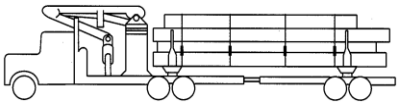
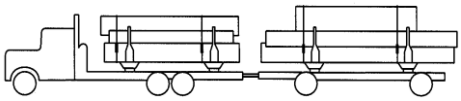
Modified Highlead System

The mobile shovel yarder or mobile logger is a modification of the highlead system. These machines are usually track mounted and their mobility permits yarding selective harvests and clearcuts. Logs can be yarded uphill and decked in rows along the edge of the truck road. Because of this ability, landing size can be reduced with this system. The modified highlead system is limited by uphill yarding distances of 700 feet or less (Wegner, 1984).

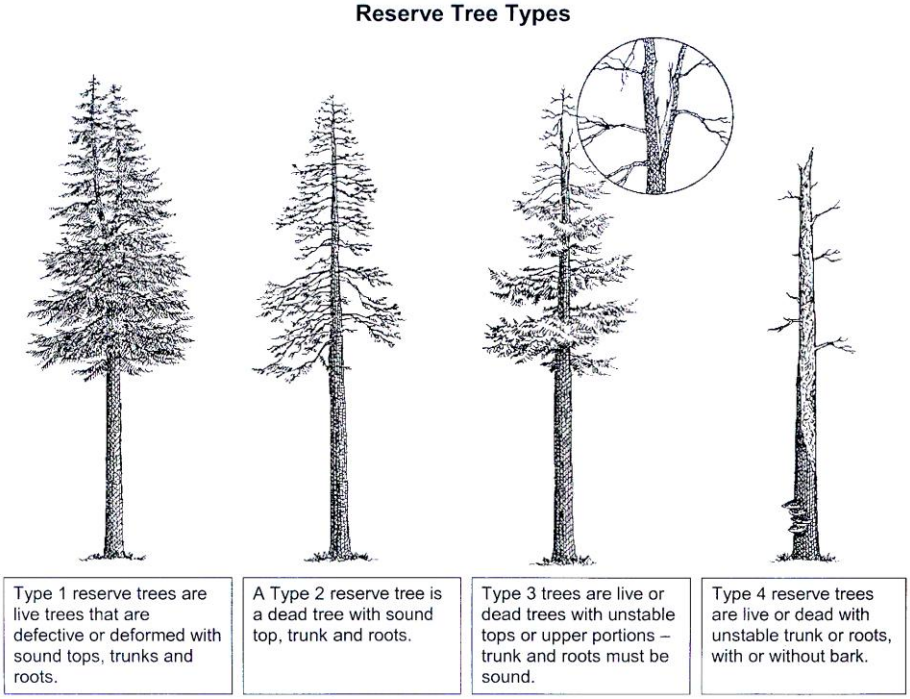
Modified Highlead System



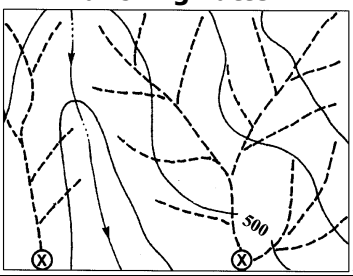
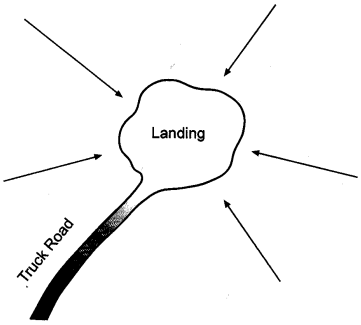
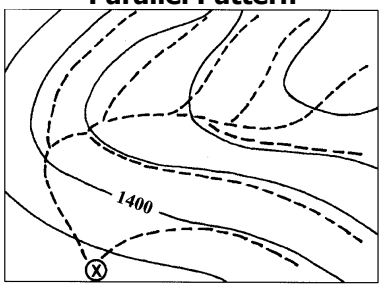
WADLI, 2009.

Three Basic Types of Log Trucks and Carrying Capacities					
Log Truck Type	**MBF Range[1]**	**Net Wt. (lb)**	**Net Wt. (tons)**	**Log Length (ft.)**	**Avg. Bunk Log Length (ft.)**
Conventional Log Truck 	3.5 to 6.0	54,000 to 60,000	27 to 30	28 to 52	36
Self-Loader 	2.0 to 4.5	44,000 to 50,000	22 to 25	17 to 43	32
Mule Train 	4.5 to 6.5	52,000 to 56,000	26 to 28	Truck: 12 to 26 Trailer: 17 to 34	20
[1]The low-range MBF represent small logs or timber with a high degree of taper; the mid-range MBF represents older, second-growth timber; the high-range MBF represents very large or old-growth timber.					
Adapted from Garland, 1997 B and Mason et al., 2008.					

Conifer Wildlife Reserve Tree Types



WADNR, 1992.

Skid Trail Patterns	
Branching Pattern 	The branching pattern is commonly used on gentle slopes. The branching pattern has one or more main trails from which secondary trails branch off.
Radial Pattern 	The radial pattern is useful in logging smaller parcels which have a single landing located in the center of the harvest unit.
Parallel Pattern 	The parallel pattern is typically used on steeper slopes and attempts to locate skid trails parallel to the contours of the slope.
Adapted from Garland, 1997 A and Greulich et al., 1996	

Appendix 4
Forest Roads

APPENDIX 4

Forest Road Design Considerations	
Level of Road Use	Duration (temporary or permanent); amount (light, medium, or heavy); frequency (intermittent or continuous); type of vehicles (commercial or administrative); and season
Physical Factors	Soils, topography, streams or wetlands, cultural sites, bedrock, and weather
Environmental Factors	Streams and wetlands, threatened and endangered species, environmentally sensitive sites, aquatic habitat, scenic values, and recreational use
Benefits, Costs, and Risks	Consider alternative designs and locations; maximize benefits while minimizing cost and risk

Forest Road Design Standards

Low use roads are designed for short-term, intermittent use and low traffic volumes. These types of roads experience heavy use during periods of log hauling but very little after harvest is complete. They are usually temporary, less than 0.5 mile in length, access one or two logging units and may be closed or vacated after use. Low use roads typically have a 12 to 16 foot subgrade width; are crowned, out-sloped, or in-sloped (no ditch); and may or may not be surfaced with pit run gravel (ODF, 2000 A).

Medium use roads are designed to be semi-permanent or permanent and need to be able to accommodate heavy equipment. These types of roads experience heavy use during periods of log hauling and light to moderate use during other times. They usually access more than one harvest unit and provide important access for forest management and protection. Medium use roads typically have a 14 to 16 foot subgrade width; are crowned or in-sloped; and are surfaced with pit run gravel or other rock (ODF, 2000 A).

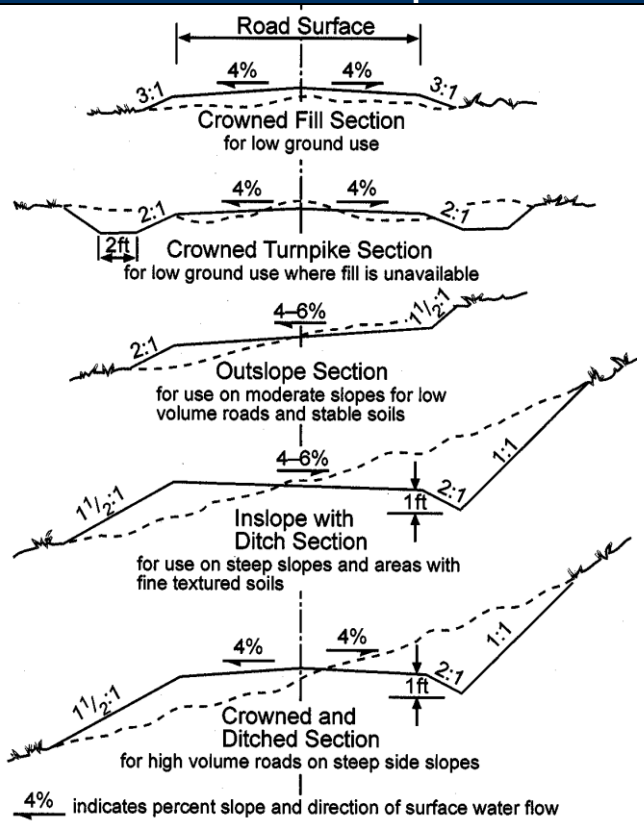
Disposal Methods for Clearing & Grubbing Debris on the Lummi Reservation	
Method	**Description**
Scattering	▪ Debris is pushed or placed outside the roadway where natural openings in the stand exist. ▪ Debris should lie flat on the ground. Do not push debris against standing trees. ▪ Avoid excessive accumulations and ensure that the area can still be planted at the desired spacing. ▪ Scattering will be limited to the following conditions: 1. On slopes less than 55% for safety and economic reasons. 2. In stands open enough to facilitate this technique.
Pile & Burn	▪ Debris is piled in clean, burnable piles within portions of the right-of-way or at other acceptable locations. ▪ Debris burning may take place before, during, or after subgrade construction depending on the situation. ▪ Right-of-way debris is burned so that there is no residual material greater than 3 inches in diameter and 3 feet in length. ▪ Material remaining after burning is buried or scattered. ▪ Burning may be required when the clearing debris must be removed from the right-of-way and there are no suitable disposal areas within a reasonable distance.
Chipping	▪ Right-of-way debris is fed through a chipper and chips are dispersed through openings in the trees in layers less than 36 inches thick.
Adapted from ODF, 2000 B.	

Balanced Cut and Fill (BCF) Construction

BCF construction may be used on gently sloping terrain, which is characteristic of the Lummi Reservation. In BCF construction, the dozer starts at the top of the proposed cut slope, excavating and side-casting material until the desired road grade and width is obtained. Material is pushed or "drifted" in front of the blade to areas where fill is needed (i.e. to cover culverts and build up flat or low areas along the alignment). This common method of BCF road construction does not always lend itself to standard compaction methods where fill is placed and compacted in thin layers (ODF, 2000 B). Therefore, additional compaction is required in areas where fill stability is important.

A more protective method of BCF construction utilizes a hydraulic excavator instead of a dozer to pioneer the road bench. An excavator can cleanly remove slash, stumps, and logs and place them at the base of the fill slope so they are not incorporated into the fill. It can also grub or clean off the organic layer, excavate mineral soil and place it bucket by bucket beginning at the base of the slope. The powerful hydraulic systems of large excavators permit them to partially compact the fill as material is placed. Waste material can be carefully placed and is more stable and less susceptible to failure than material that is pushed or sidecast by a dozer (ODF, 2000 B).

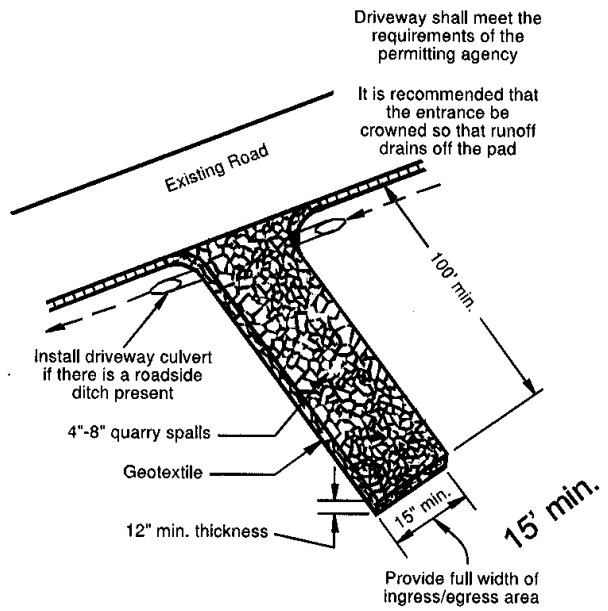
Road Surface Shapes



Brannon et al., 2001.

Factors for Rocking or Not Rocking Forest Roads	
Factors for Rocking	**Factors for Not Rocking**
• Soil type is weak, poorly drained, or erodible. • Road grade is steep. • Road is close to a stream or wetland and could easily deliver sediment. • Road is permanent and access is needed throughout the year. • Closing the road during un-needed periods is not practical or possible. • Road will be heavily used (several MMBF of timber will be hauled over the road). • Rock is readily available and relatively inexpensive.	• Soil type is gravely and well drained. • Road grade is gentle (less than 8%). • Road is not near a stream or wetland or there are filtering opportunities for road runoff prior to entering a stream or wetland. • Road will be used one time or during the dry season • Will be closed after short-term use. • Road will only be used to haul a small amount of timber (one timber sale). • Other access options are available if this road is shut down during wet periods. • Rock is scarce, must be hauled long distances, and is expensive to apply.
Adapted from ODF, 2000 A.	

Quarry Spall Profile View



WADOE, 2005.

Clean Water Act BMPS for Forest Road Construction in Streams and Wetlands

Construction or maintenance of farm roads, forest roads, or temporary roads for moving mining equipment, where such roads are constructed and maintained in accordance with best management practices (BMPs) to assure that flow and circulation patterns and chemical and biological characteristics of waters of the United States are not impaired, that the reach of the waters of the United States is not reduced, and that any adverse effect on the aquatic environment will be otherwise minimized. These BMPs which must be applied to satisfy this provision shall include those detailed BMPs described in the State's approved program description pursuant to the requirements of 40 CFR 233.22(i), and shall also include the following baseline provisions:

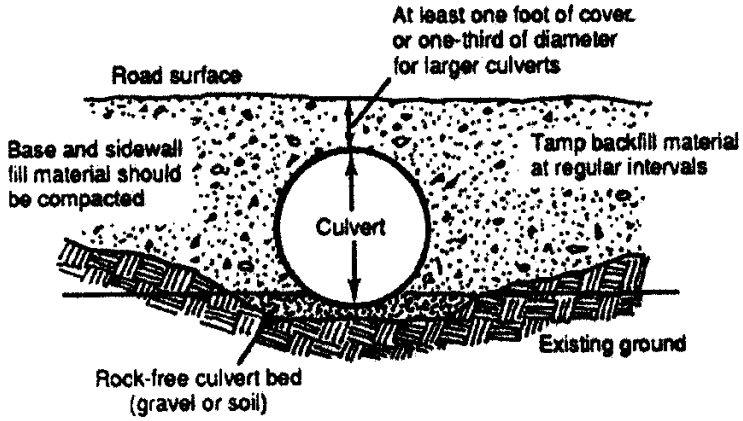
1. Permanent roads (for farming or forestry activities), temporary access roads (for mining, forestry, or farm purposes) and skid trails (for logging) in waters of the U.S. shall be held to the minimum

feasible number, width, and total length consistent with the purpose of specific farming, silvicultural or mining operations, and local topographic and climatic conditions.

2. All roads, temporary or permanent, shall be located sufficiently far from streams or other water bodies (except for portions of such roads which must cross water bodies) to minimize discharges of dredged or fill material into waters of the U.S.
3. The road fill shall be bridged, culverted, or otherwise designed to prevent the restriction of expected flood flows.
4. The fill shall be properly stabilized and maintained during and following construction to prevent erosion.
5. Discharges of dredged or fill material into waters of the United States to construct a road fill shall be made in a manner that minimizes the encroachment of trucks, tractors, bulldozers, or other heavy equipment within waters of the United States (including adjacent wetlands) that lie outside the lateral boundaries of the fill itself.
6. In designing, constructing, and maintaining roads, vegetative disturbance in the waters of the U.S. shall be kept to a minimum.
7. The design, construction and maintenance of the road crossing shall not disrupt the migration or other movement of those species of aquatic life inhabiting the water body.
8. Borrowed material shall be taken from upland sources whenever feasible.
9. The discharge shall not take, or jeopardize the continued existence of, a threatened or endangered species as defined under the Endangered Species Act, or adversely modify or destroy the critical habitat of such species.
10. Discharges into breeding and nesting areas for migratory waterfowl, spawning areas, and wetlands shall be avoided if practical alternatives exist.
11. The discharge shall not be located in the proximity of a public water supply intake.
12. The discharge shall not occur in areas of concentrated shellfish production.
13. The discharge shall not occur in a component of the National Wild and Scenic River System.
14. The discharge of material shall consist of suitable material free from toxic pollutants in toxic amounts.
15. All temporary fills shall be removed in their entirety and the area restored to its original elevation.

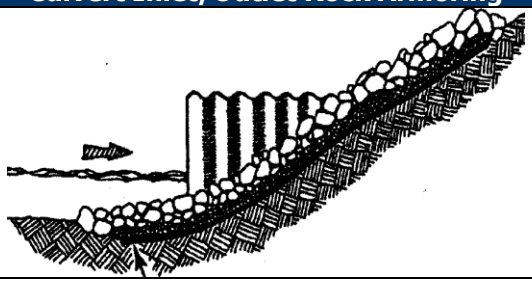
Drainage Structure Spacing Guidelines			
Road Grade (%)	**Soil Erosion Rating**		
	High (Fine-grained soil)	**Normal** (Sandy loam)	**Low** (Rocky/gravelly soil)
0 – 4%	800	1000	1500
5 – 9%	500	800	1000
10 – 14%	300	400	500
15 – 19%	200	300	400
Over 19%	150	200	300
Distances are approximate and should be varied to take advantage of natural features.			
Adapted from ODF, 2000 A.			

Cross Section of a Properly Installed Culvert



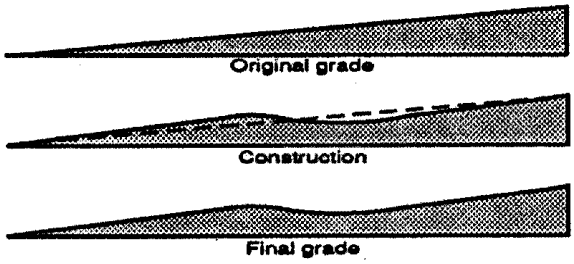
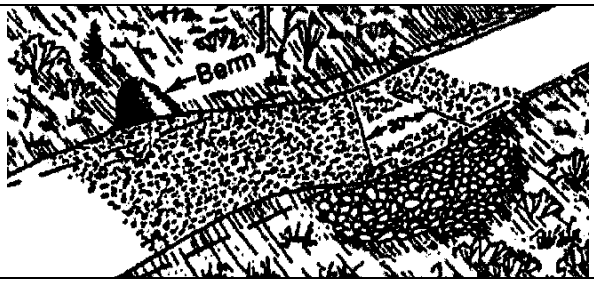
Holaday, 1995.

Culvert Inlet/Outlet Rock Armoring



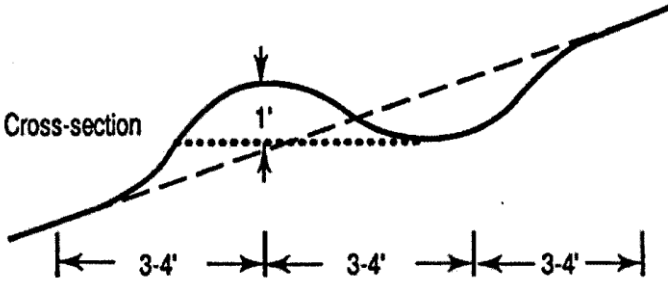
Holaday, 1995.

Broad-Based Dip

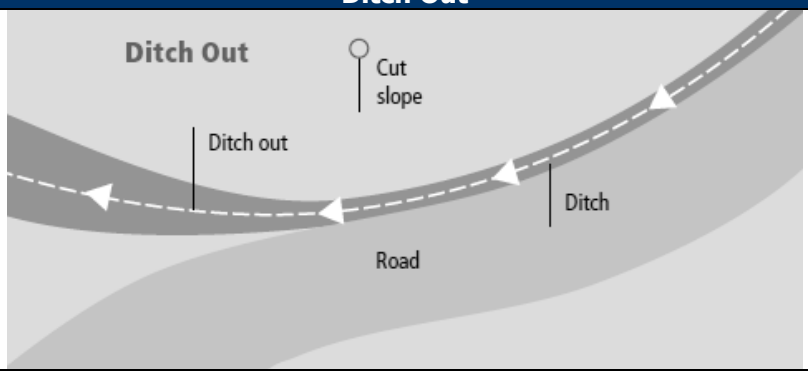
Cross Section	Profile View
	

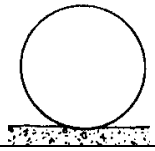
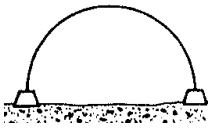
Holaday, 1995.

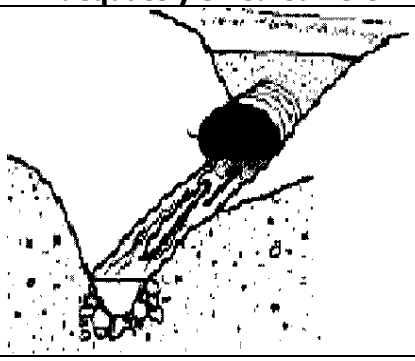
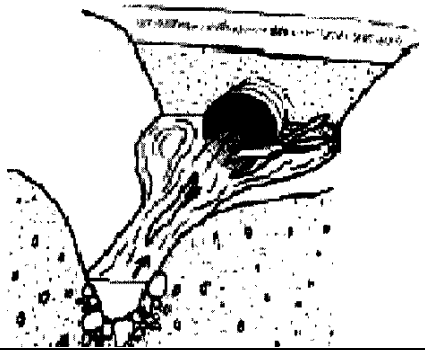
Water Bar Cross Section

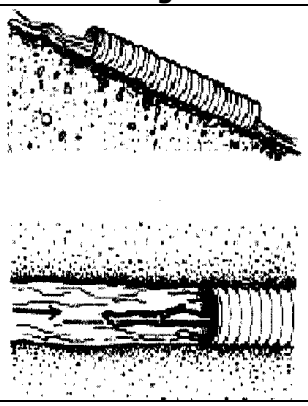
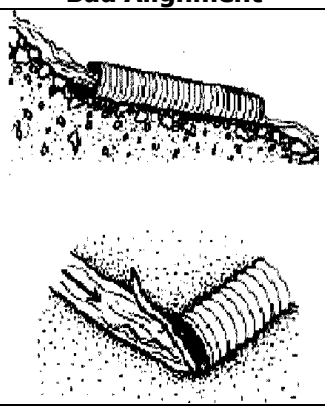


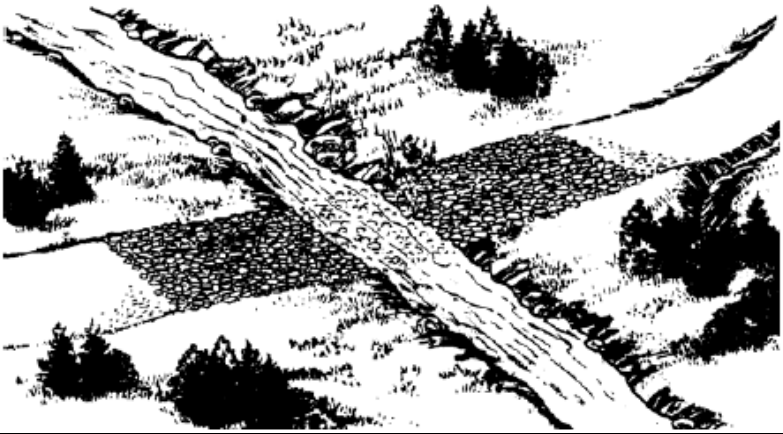
Holaday, 1995.

Ditch Out

WADNR, 2007.

Stream Crossing Culvert Shapes		
Corrugated Round	**Corrugated Pipe Arch**	**Structural Plate Arch**
		
Adapted from Brannon et al., 2001.		

Stream Crossing Culvert Sizing	
Adequately Sized Culvert	**Inadequately Sized Culvert**
	
Adapted from WFPB, 2006.	

Stream Culvert Alignment	
Good Alignment	**Bad Alignment**
	
Adapted from WFPB, 2006.	

Ford Crossing

WFPB, 2006.

Types of Forest Road Abandonment	
Abandonment	**Activities**
Partial	• Public access is blocked with a gate or other barrier. • Relief culverts are removed and replaced with drivable ditches or waterbars. • Stream crossings may or may not be removed. • The road surface and landings may be treated to disperse surface runoff and prevent erosion. May include some re-grading or scarification. • Unstable road and landing fills are removed. • Logging debris is removed from drainage ditches • Exposed soils may or may not be re-vegetated.
Full	• All access is blocked by a non-drivable berm installed at the entrance. • All stream crossing structures are removed. • Relief culverts are removed and replaced with drivable ditches or waterbars. • The road surface and landings are treated to disperse surface runoff and prevent erosion. May include some re-grading or scarification. Road surface should be outsloped if on sloping terrain. • Unstable road and landing fills are removed. • Sidecast material (if any) is pulled back. • Exposed soils are re-vegetated.
Adapted from ODF, 2000 C and WFPB, 2007 B.	

Appendix 5
Site Preparation

Site Preparation Objectives and Benefits	
Objective	Benefit
1. Reduce logging slash	• Improves site access by removing excessive brush and slash obstacles created by logging operation. • Facilitates easier and more uniform tree planting, which reduces planting costs. • Reduces potential for logging slash to obstruct seedling development. • Reduces fire hazard.
2. Control competing vegetation	• Improves seedling survival and growth. • Makes more nutrients, moisture, and sunlight available to seedlings during their establishment so that they can reach the "free-to-grow" stage.
3. Improve soil conditions	• Exposes mineral soil for tree planting. • Improves water-holding capacity of soil. • Reduces soil compaction along skid trails and landings (if soil is left compacted, seedling growth and long-term productivity of the site is reduced).
4. Reduce habitat for damaging wildlife	• Eliminates hiding cover and browse for damaging wildlife.
5. Control insects and disease	• Remove non-merchantable trees that are infected with disease. • Eliminate slash piles that may attract insects.
6. Improve general appearance	• Rid the area of unsightly slash.
Adapted from Fitzgerald, 1998.	

SLASH PILE BURNING CONTRACT AGREEMENT

Location

The XX-acre harvest unit is located on Indian Trust Assignment No. XX in a portion of Section XX, Township XX North, Range XX East, Willamete Meridian, Lummi Indian Reservation, Whatcom County, Washington.

Payment and Terms

A. The Lummi Indian Business Council (LIBC) shall reimburse the Contractor upon the satisfactory completion of all slash burning at the bid price/acre.

B. The treatment shall be inspected by the LIBC Forest Manager to ensure compliance with specifications and conditions of the contract.

C. The Contractor shall invoice the LIBC Natural Resource Department. Payment for completed work will be made from the LNR Forestry Account.

D. Partial payments can be made for work that has been completed and inspected by the LIBC Forest Manager. Payment will be based off of the acreage completed and prorated accordingly.

E. The Contractor shall provide all equipment, tools, supplies, personnel, and transportation to and from the site(s).

F. The Contractor must provide proof of general liability or professional liability insurance naming Lummi Indian Business Council as additional insured in the amount of at least $1,000,000.

G. The Contractor shall be required to obtain a commercial burning permit from Lummi Natural Resources (LNR) prior to execution of this contract. The LNR commercial burning permit shall be made part of this contract.

H. The burning permit will be suspended at the issuance of a county wide burning ban. It may be re-activated by the LIBC Forest Manager after the ban has been lifted. In this case, the Contractor shall be paid for work completed up to this point.

I. The burning permit and the slash burning operation may be suspended or cancelled by the Lummi Natural Resource department if deemed necessary for the protection of life, property or air quality. LIBC cannot make any guarantees that a burning permit will be valid for the extent of the contract dates. In this case, the Contractor shall not be penalized or charged for work not performed.

J. The Contractor is solely responsible for any and all damages resulting from his operation. Any damage to improvements, existing structures, and roads shall be repaired promptly to the satisfaction of the LIBC Forest Manager and at the Contractor's expense.

K. The Contractor shall be liable for all financial costs for fire suppression and damage to personal and real property if the fire escapes for any cause. The Contractor agrees to furnish sufficient men and equipment at his expense to suppress the fire and to pay the Lummi Natural Resource Department or other fire fighting agencies for all reasonable expenses incurred in such suppression; unless such hiring and furnishing of equipment and payment of expenses are otherwise provided for by law.

L. The Contractor shall complete all necessary roadwork required to make the unit accessible to equipment at his expense.

M. The Contractor shall return the road surface, driveways, and drainage structures to the same condition that is equal to or better than it was prior to the start of slash burning operations. All access roads shall be maintained through the life of the contract. All roads and ditches, including the site access road, shall remain clear of debris at all times.

N. The Contractor shall regularly check fuel or hydraulic fluid hoses, oil or fuel drums, oil, fuel, or hydraulic fluid transfer valves, and fittings for leaks and properly maintain equipment used for slash piling and burning to minimize the potential for leaks and/or spills. If there is evidence of hydraulic

fluid or petroleum product leakage, the Contractor shall immediately stop operations, contain and clean up the spill, and properly dispose of contaminated materials. Further use of such equipment shall be suspended until the deficiency has been corrected.

O. The Contractor shall provide and maintain spill response materials on site, ensure that the operators know how to use the material, and take immediate and appropriate action to stop and contain leaks or spills of chemicals and other petroleum products. The Contractor shall immediately report any chemical and/or petroleum product spills resulting from the operation that enter or may enter Lummi Nation Waters to the LIBC Forest Manager.

P. The Contractor shall have a representative readily available on the project site at all times who shall be authorized to receive any notices or instructions from the LIBC Forest Manager in regard to contract performance and to take such action thereon as required by the LIBC Forest Manager on behalf of the Contractor.

Q. The Contractor shall be required to attend a pre-work conference with the LIBC Forest Manager prior to the execution of this contract.

R. All slash pile burning shall be completed on or before February XX, 20XX.

S. If the Contractor has not completed burning XX% of all the slash piles from the site by February 1, 20XX as required by the contract, LIBC shall charge a $XXX penalty for each day past the contract due date for a period of up to XX days. After XX days, the Contractor shall vacate all equipment and personnel from the project area.

T. The Lummi Nation reserves the right to waive technical defects, to reject any unsatisfactory work, and to make changes to the project as needed.

Treatment Conditions and Specifications

A. The Contractor shall notify Whatcom County Fires Dispatch Center at 360-676-6814 and Marietta Fire District at 360-733-6612 one hour prior to ignition of slash.

B. If the fire creates a public nuisance from smoke or ash, it must be extinguished until such time when weather conditions become favorable for adequate smoke dispersal.

C. Prior to burning, the Contractor shall consult with the LIBC Forest Manager to determine the maximum number of piles to be burned safely at one time. Under no circumstances will the number of burning piles exceed this agreed upon amount.

D. The Contractor shall maintain all necessary water tanks, pumps, hoses, and equipment on site consistent with the requirements of the LNR commercial burning permit.

E. In the event of fire escape, the Contractor shall notify the LIBC Forest Manager as soon as possible.

F. No burning shall occur during periods of high fire danger.

G. The Contractor shall totally extinguish the fire at the end of business day unless a night watchman is present to monitor the piles over night.

H. The Contractor shall not burn if wind is blowing more than 5 miles per hour from any direction when conditions are dry. If weather conditions become undesirable during burning, the Contractor may be required to extinguish slash piles to maintain safety. If undesirable weather conditions persist and burning cannot take place at the preferred time, the Contractor shall cover a portion of the pile with a piece of tarp 10 square feet in size to keep a portion of the pile dry so that it can be ignited when burning conditions are safe. Whenever possible, the piles should be burned during the wet season.

I. A slash pile is considered satisfactorily burned if approximately 90 percent of the slash pile has been consumed.

J. If piles require restacking, the Contractor shall use an excavator. No crawler tractors or dozer type machines are permitted for use when restacking. The Contractor shall make every effort to ensure the pile contains a minimum of dirt and other non-organic debris.

LOGGING SLASH CHIPPING AND REMOVAL CONTRACT AGREEMENT

Location

The XX-acre harvest unit is located on Indian Trust Assignment No. XX in a portion of Section XX, Township XX North, Range XX East, Willamete Meridian, Lummi Indian Reservation, Whatcom County, Washington.

Terms and Conditions

A. The Contractor shall remove approximately XX% of all of the slash piles located within the harvest unit, Assignment No. XX. No slash piles shall be present on XX of the XX acres.

B. If the Contractor is unable to reach a slash pile due to saturated soils, the Contractor shall contact the LIBC Forest Manager and obtain approval for leaving the slash pile onsite. Piles that are deemed inaccessible by the LIBC Forest Manager and the Contractor shall be designated with pink and green ribbon.

C. The Contractor shall be required to attend a pre-work conference with the LIBC Forest Manager prior to the execution of this contract.

D. All logging slash removal shall be completed by February 1, 20XX.

E. If the Contractor has not completed removing XX% of all the slash piles from the site by February 1, 20XX as required by the contract, LIBC shall charge a $XXX penalty for each day past the contract due date for a period of up to XX days. After XX days, the Contractor shall vacate all equipment and personnel from the project area.

F. The Contractor shall provide all personnel, equipment, tools, supplies, and transportation to and from the site, in order to perform the work.

G. The Contractor must provide proof of general liability or professional liability insurance naming Lummi Indian Business Council as additional insured in the amount of at least $1,000,000.

H. The Contractor is solely responsible for any and all damages resulting from their operation. Any damage to improvements, existing structures, and roads shall be repaired promptly to the satisfaction of the LIBC Forest Manager and at the Contractor's expense.

I. The Contractor shall complete all necessary roadwork required to make the unit accessible to chip vans at the Contractor's expense.

J. The Contractor shall return the road surface, driveways, and drainage structures to the same condition that is equal to or better than it was prior to the start of slash removal operations. All access roads shall be maintained through the life of the contract. All roads and ditches, including the site access road, shall remain clear of debris at all times.

K. The Contractor shall regularly check fuel or hydraulic fluid hoses, oil or fuel drums, oil, fuel, or hydraulic fluid transfer valves, and fittings for leaks and properly maintain equipment used for grinding, loading, and hauling to minimize the potential for leaks and/or spills. If there is evidence of hydraulic fluid or petroleum product leakage, the Contractor shall immediately stop operations, contain and clean up the spill, and properly dispose of contaminated materials. Further use of such equipment shall be suspended until the deficiency has been corrected.

L. The Contractor shall provide and maintain spill response materials on site, ensure that the operators know how to use the material, and take immediate and appropriate action to stop and contain leaks or spills of chemicals and other petroleum products.

M. The Contractor shall immediately report any chemical and/or petroleum product spills resulting from the operation that enter or may enter Lummi Nation Waters to the LIBC Forest Manager.

N. The Contractor shall have a representative readily available on the project site at all times who shall be authorized to receive any notices or instructions from the LIBC Forest Manager in regard to

contract performance and to take such action thereon as required by the LIBC Forest Manager on behalf of the Contractor.

O. The Lummi Nation reserves the right to waive technical defects, to reject any unsatisfactory work, and to make changes to the project as needed.

Treatment Specifications

A. All slash moving, grinding, loading, and hauling activities shall be conducted in a manner that will minimize soil erosion, soil compaction, and damage to aquatic resources.

B. Where soil is saturated and susceptible to compaction, the Contractor shall take reasonable and practical measures to retain road surfaces and prevent the gullying of roads and skid trails including the use of straw, sod, bio-matting, tree boughs, logging slash, mulching or some other method approved by the LIBC Forest Manager. Hogfuel roads shall be developed as required by the LIBC Forest Manager and at the Contractor's expense.

C. The LIBC Forest Manager may suspend operations in whole or in part for such periods, as he may deem necessary to avoid excessive damage when ground conditions are unfavorable. In this case, the contract end date will be extended for as many days as the LIBC Forest Manager suspended operations.

D. No stumps shall be pulled during the operation.

Appendix 6
Reforestation

APPENDIX 6

Descriptions and Maps of Preferred Seed Zones by Species

Douglas-fir

The Islands seed zone is the preferred seed zone for Douglas-fir planting stock on the Lummi Reservation (consists of old seed zone 211 and portions of 201, 202, 212, and 221). If seedlings from this seed zone cannot be obtained, seedlings from the western portion of the Skagit seed zone (consists of portions of 201, 202 and old seed zone 403) and the northern portion of the Kitsap seed zone (consists of old seed zone 212 and the western portions of 411 and 412) may be used if necessary.

Red Alder

The Nooksack seed zone is the preferred seed zone for red alder planting stock on the Lummi Reservation (consists of old seed zones 201, the northern half of 202, and the western half of 401). If seedlings from this seed zone cannot be obtained, seedlings from the northern portion of the Puget Sound seed zone (consists of the southern portion of old seed zone 202, the northern portion of seed zone 212, the western portion of seed zones 403 and 411) may be used if necessary.

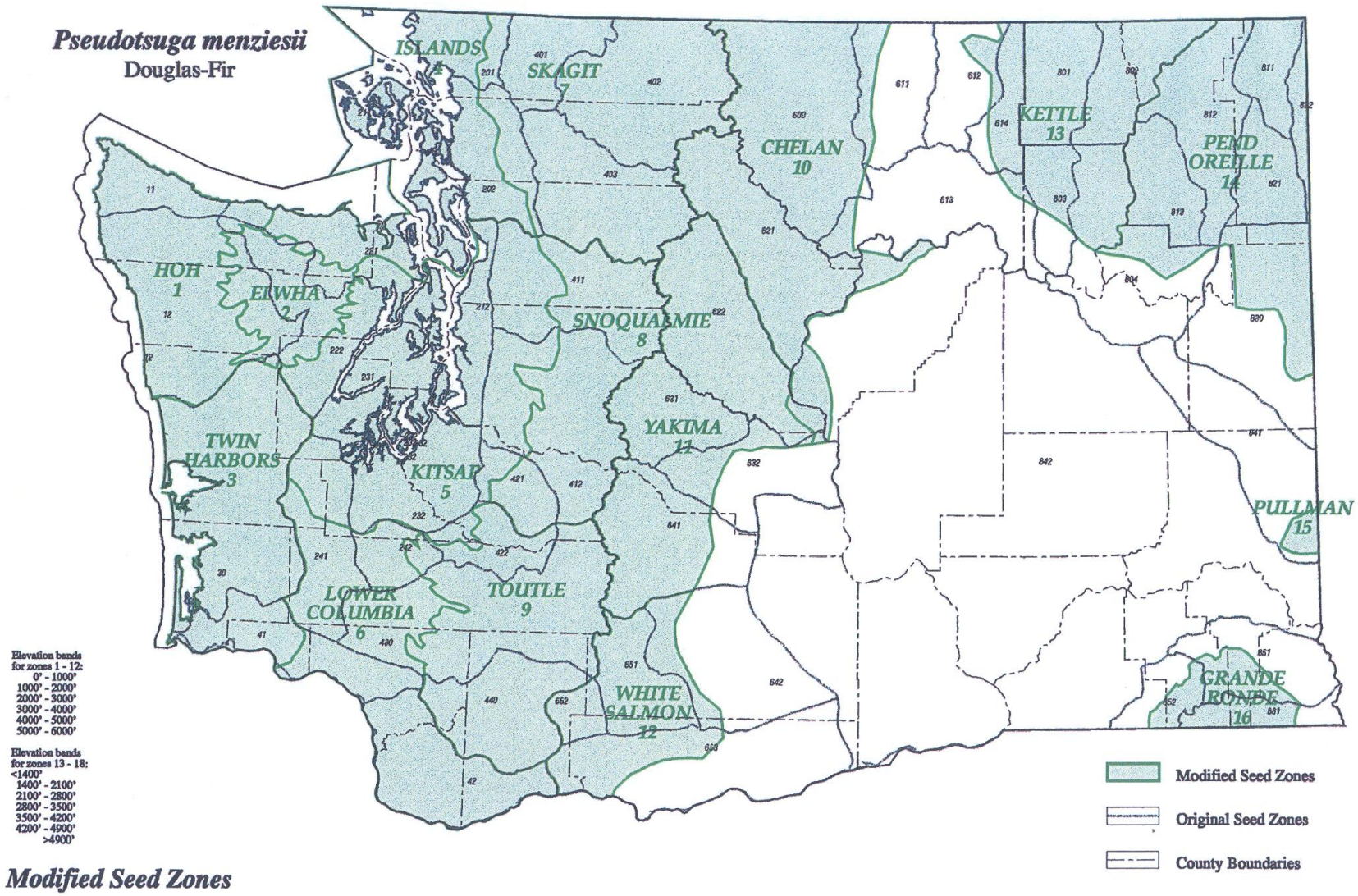
Western Red Cedar

The Puget Sound seed zone is the preferred seed zone for western red cedar planting stock on the Lummi Reservation (consists of old seed zones 201, 202, 211, 212, 221, 222, 231 and the western portions of 411 and 412). Given the large size of this seed zone, it is not expected that there will be a need to obtain seedlings from other seed zones.

Western Hemlock

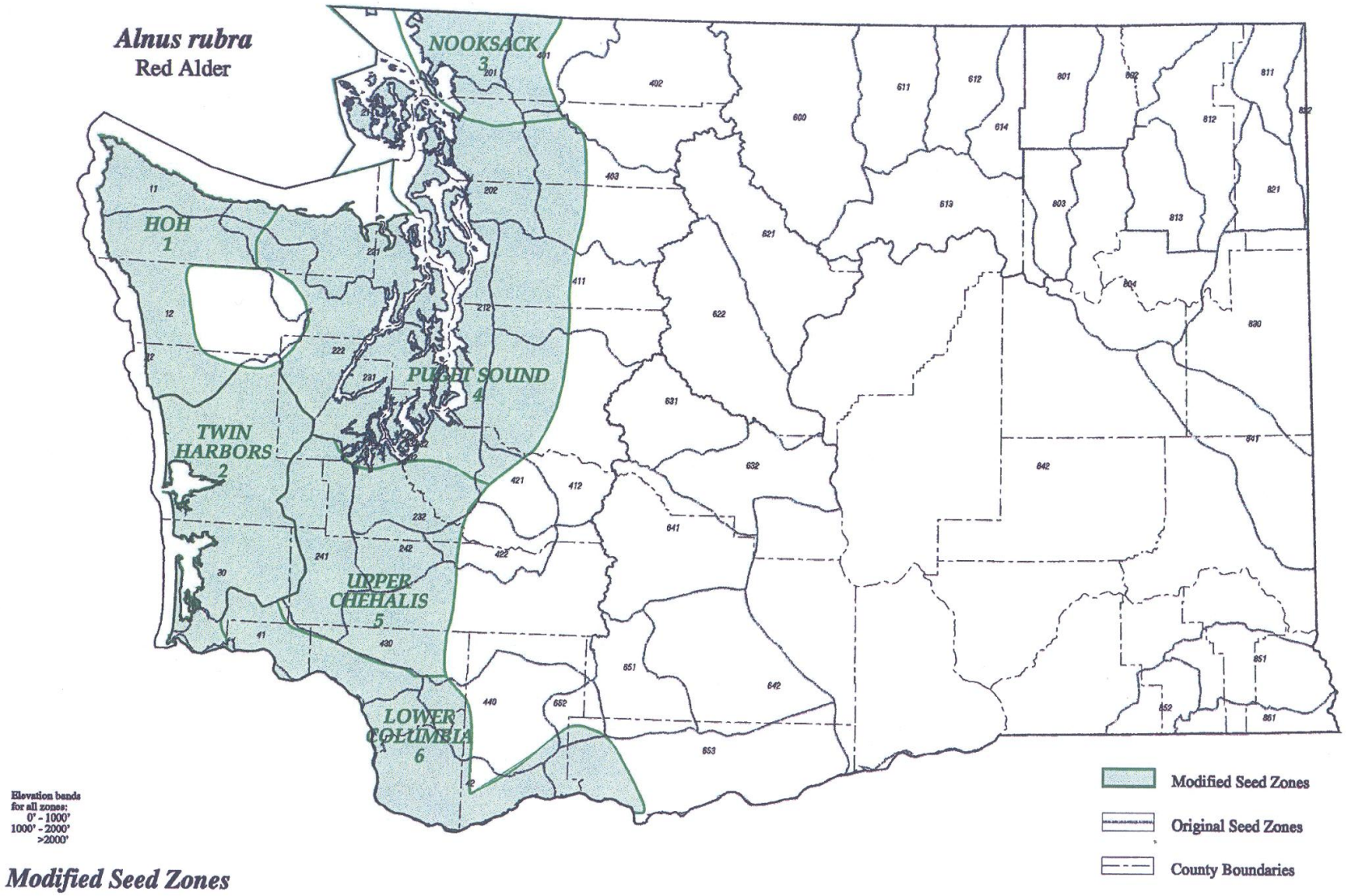
The North Sound seed zone is the preferred seed zone for western hemlock on the Lummi Reservation (consists of old seed zones 201, 202, 211, 212, the northern portions of 222, 231, and 232, and the western portions of 411 and 412). Given the large size of this seed zone, it is not expected that there will be a need to obtain seedlings from other seed zones.

Douglas-fir Seed Zone Map of Washington



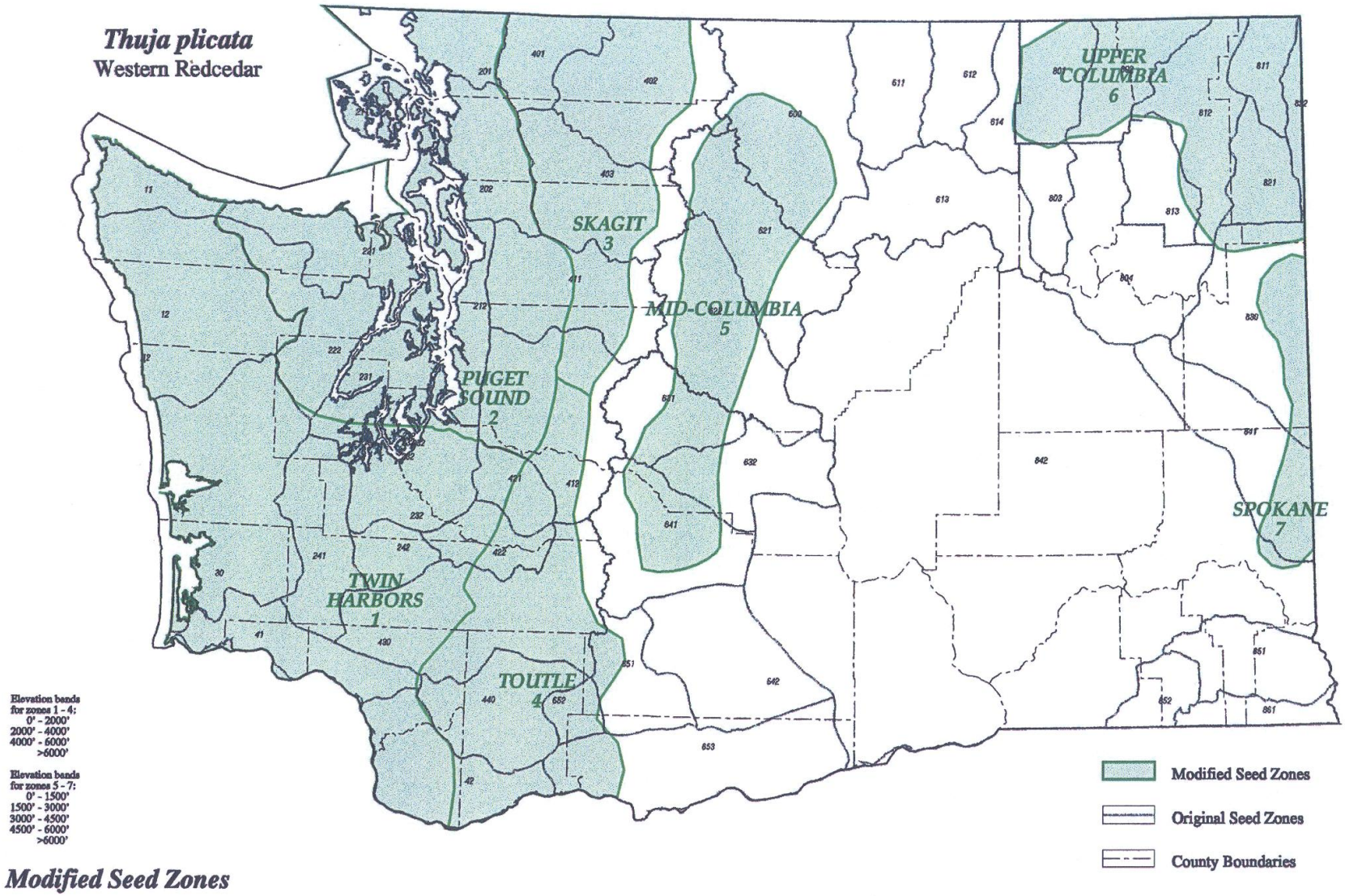
WADNR, 2008.

Red Alder Seed Zone Map of Washington



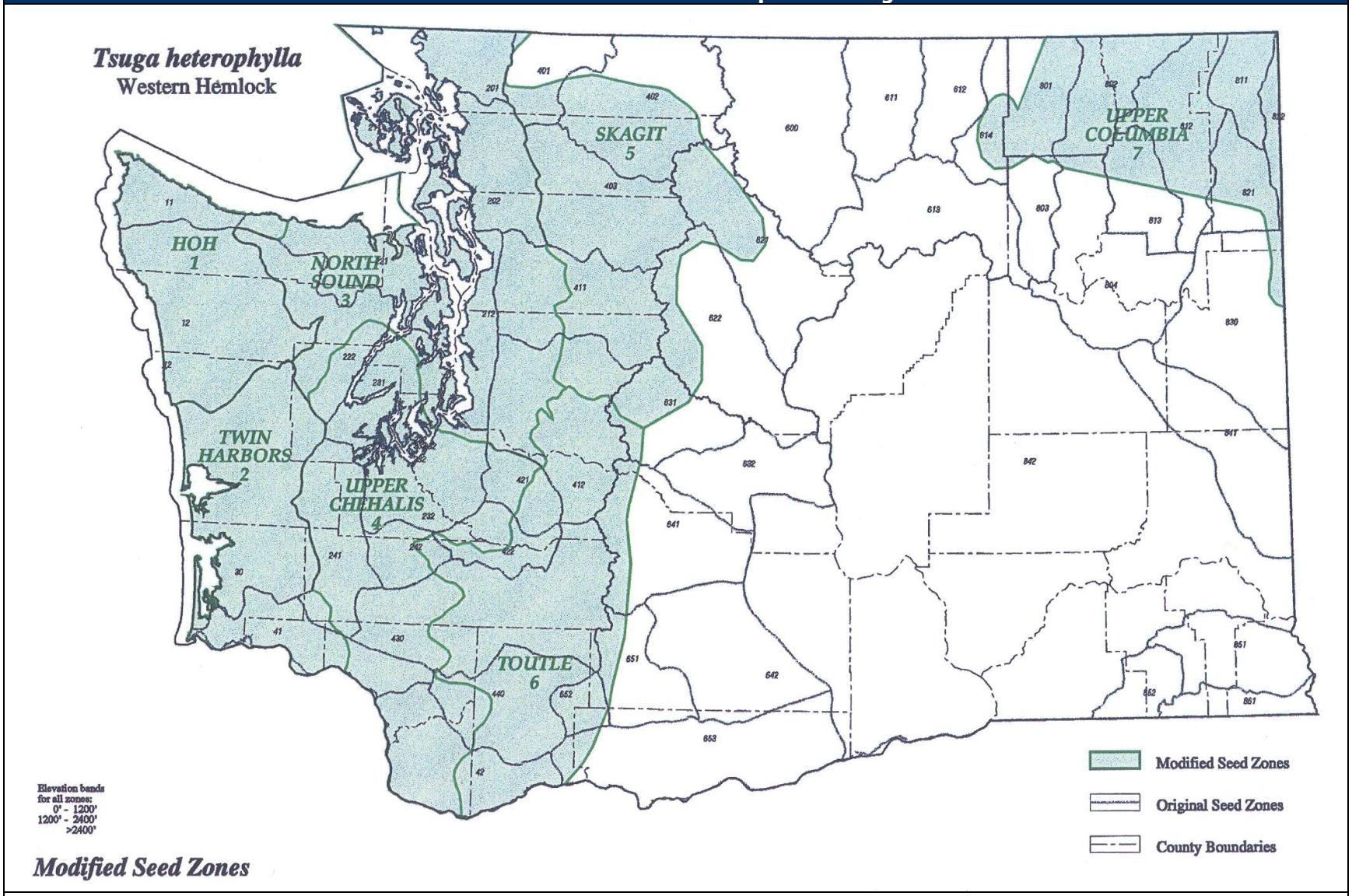
WADNR, 2008.

Western Red Cedar Seed Zone Map of Washington



WADNR, 2008.

Western Hemlock Seed Zone Map of Washington



WADNR, 2008.

Stock Type Descriptions

Planting stock comes in two basic types: bare-root seedlings and plug seedlings. Bare-root seedlings (as the name implies) are grown in an outdoor nursery field. Plug seedlings are grown in Styrofoam containers at close spacing in the greenhouse. Bare-root seedlings generally take one to two years to grow while plug seedlings generally take one year or less to grow depending on species (ODF, 2008). A common nursery practice is to grow seedlings as a plug for their first year and then transplant them into an outdoor bare-root field for a year.

Larger seedlings have many advantages. They resist being bent by soil movement, falling debris and wind, are more resistant to animal damage, have better lateral branch and bud development, are more resistant to heat, and generally have more roots. A seedling's stem caliper (or diameter) is the single best indicator of seedling quality for all stock types and is usually measured in millimeters at the soil line (Duddles and Landgren, 2006). A minimum stem caliper should be specified when communicating grading standards with the nursery.

A seedling's shoot-to-root ratio refers to the volume of the stem and foliage compared to the volume of the root wad. It is an indicator of a seedling's ability to support itself once it is planted. A good shoot-to-root ratio for conifers ranges between 1.5:1 - 2:1 (Duddles and Landgren, 2006).

Red Alder

The preferred attributes for red alder planting stock include a height range of 18 - 36 inches (average 28-30 inches), a minimum basal caliper of 0.20 inches (5 mm) measured 1 inch above the root collar, healthy buds along the entire length of the stem, a full and fibrous root system, and free of disease and damage (Weyerhaeuser, 2005).

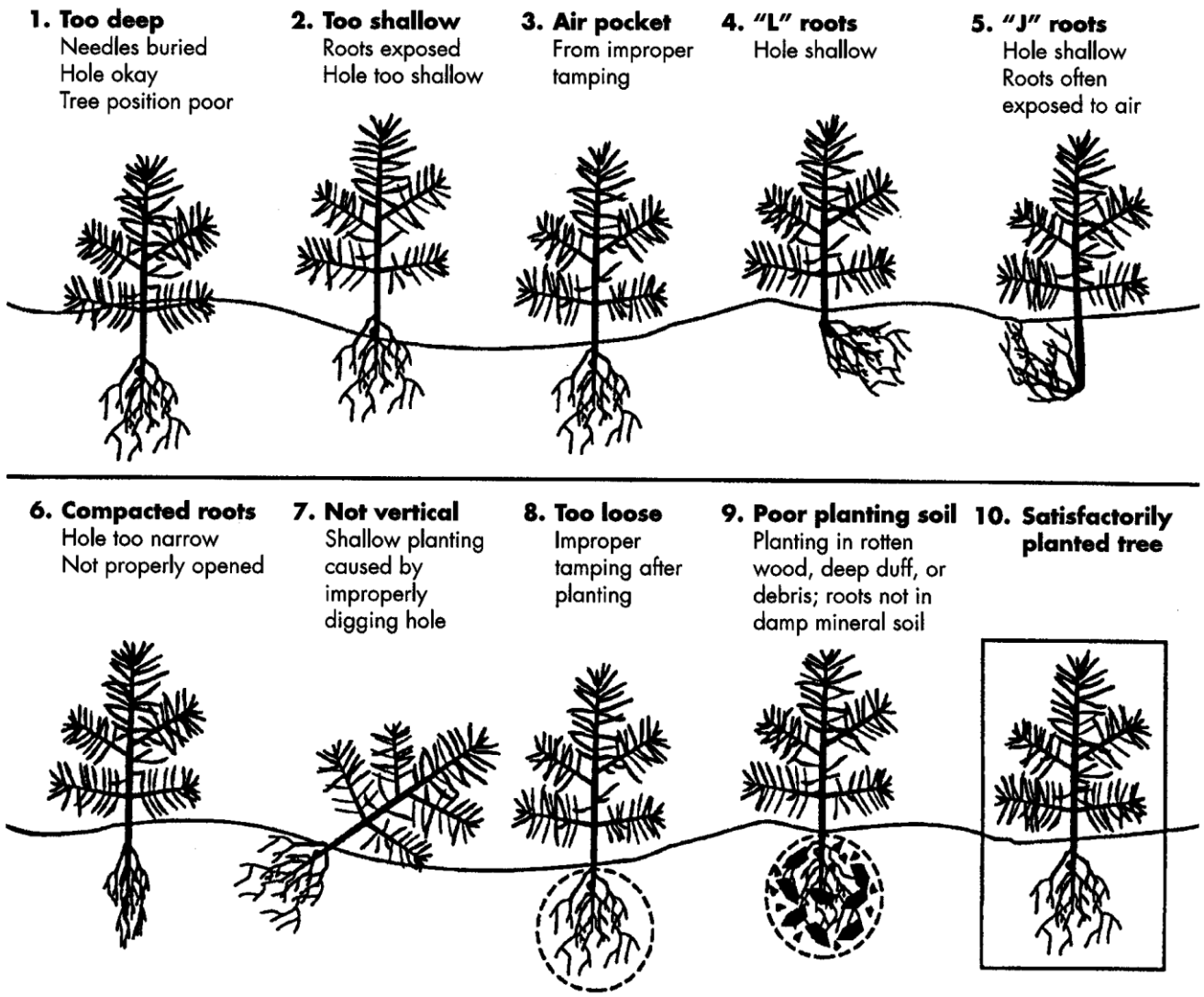
Seedling Stock Types				
Stock Type	**Greenhouse Years**	**Bare-root Field Years**	**Description**	**Designed For:**
P+0	2	0	Grown 2 years in the greenhouse.	Harsher sites: rocky slopes and nutrient poor sites.
P+1/2	1	0.5	Grown 1 year in greenhouse, lifted & transplanted at wider spacing, grown for ½ year in the bareroot field.	Red alder is propagated as a Plug+0.5.
P+1	1	1	Grown 1 year in greenhouse, lifted & transplanted at wider spacing, grown for 1 year in bareroot field. Difficult to obtain without a contract.	Douglas-fir, red cedar, red alder, hemlock, larch, some true firs and some pines are propagated as Plug + 1's.
P+2	1	2	Grown 1 year in greenhouse, lifted & transplanted at wider spacing, grown for 2 years in bareroot field.	
1+0	0	1	Grown for 1 year in bareroot field.	Red alder is propagated as a 1+0.
1+1	0	2	Grown for 1 year in a bareroot field, lifted & transplanted at wider spacing, grown for another 1 year in bareroot field.	Best for quick growth where brush and animal damage is an issue. Also designed to survive on infertile sites. Has a larger diameter, is taller, and has a larger root mass. Usually exhibits better survival and more growth. More expensive than a 2+0.
2+0	0	2	Grown for 2 years in a bareroot field.	Best for sites with low amounts of competing vegetation and minimal levels of animal damage.
2+1	0	3	Grown for 2 years in a bareroot field, lifted and transplanted at wider spacing, grown for another 1 year in a bareroot field.	Good for areas requiring quick green-up or areas with very high levels of animal browse. P+1 or 1+1 may be just as good at a lower price. Not commonly grown.
Note: Not all species and stock types are grown for all seed zones each year.				
Adapted from Hanley and Baumgartner, 2005 and Rose and Haase, 2006.				

Initial Planting Density by Species for Lummi Forestry Plantations		
Species	**Initial Planting Density (TPA)**	**Spacing (ft. x ft.)**
Douglas-fir	435 or 538	10 x 10 or 9 x 9
Red alder	603	8.5 x 8.5
Western red cedar	603	8.5 x 8.5

Western Washington Forest Seedling Nurseries					
Name	**Phone**	**Address**	**Commercial Conifers**	**Commercial Hardwoods**	**Large Caliper Stock**
▪ Aldrich Berry Farm & Nursery Inc.	360-983-3138	190 Aldrich Rd., Mossyrock, WA 98564	Yes	No	Yes
▪ Cascade Conifers	360-754-6827	1137 SE 85th, Olympia, WA 98501	Yes	No	Yes
▪ Fir Run Nursery	253-848-4731	15102 91st Ave. Ct. E, Puyallup, WA 98373	Yes	No	Yes
▪ Hood Canal Nurseries	360-638-2091	4110 Carver Dr. Port Gamble, WA 98364	Yes	Yes	No
▪ IFA Nurseries (Nisqually)	360-456-5669	135 Nisqually Cut-Off Rd. SE, Olympia, WA 98503	Yes	Yes	No
▪ Lawyer Nursery	360-456-1839	7515 SE Meridian Rd., Olympia, WA 98513	Yes	Yes	Yes
▪ Lewis River Reforestation	360-225-6357	1203 NW Hayes Road, Woodland, WA 98674	Yes	No	Yes
▪ Makah Tribal Nursery	360-645-2753	P.O. Box 116, Neah Bay, WA 98537	Yes	No	Yes
▪ Microseed Nursery	360-887-4477	18516 NW 41st Ave., Ridgefield, WA 98642	Yes	Yes	Yes
▪ Silvaseed Company	253-843-2246	317 James St. N, Roy, WA 98580	Yes	Yes	No
▪ WACD (Skagit)	360-757-1094	16564 Bradley Rd., Bow, WA 98232	Yes	No	No
▪ WADNR (Webster)	360-753-5305	9805 Blomberg Rd. SW, Olympia, WA 98504	Yes	No	No
▪ Weyerhaeuser Co. (Mima)	360-273-5578	8844 Gate Rd. SW, Olympia, WA 98512	Yes	No	Yes
Adapted from WSU, 1997 and other sources.					

Temperature Guidelines for Storage of Dormant Bare-root Seedlings	
Short-term Storage: 1 – 5 hours	**Temperature Range**
Ideal	34 – 36° F
Tolerable (no damage likely)	36 – 40° F
Risk zone	40 – 68° F
Damage probable	68 – 86° F
Respiration damage occurring	86° F +
Long-term Storage: 5+ hours	**Temperature Range**
Subfreezing	26 – 28° F
Ideal	34 – 36° F
Tolerable	36 – 42° F
Risk zone (damage proportional to time in storage)	42 – 50° F
Respiration damage occurring; greater risk from desiccation	50° F +
Emmingham et al., 2006.	

Common Planting Mistakes



Elefritz et al., 2006.

Description of Tree Planting Mistakes

Improper Planting Depth

Seedling survival is low when trees are planted too shallow or too deep. Planting seedlings too shallow results in loose trees that fall over. Planting seedlings too deep exposes the bark to soil disease (Elefritz et al., 2006). Trees should be planted so that the soil surface is midway between the top of the roots and the first limbs. Hardwood trees should be planted 1-inch deeper than the nursery soil line.

Crooked Roots (L-roots, J-roots, tangled roots, compacted roots)

Crooked roots occur when the planting hole isn't deep enough. As a result, the roots don't hang down naturally and are curled up in the bottom of the planting hole. Trees planted like this do not grow naturally and are described as being "J-rooted" or "L-rooted" (Elefritz et al., 2006).

Loose Planting

Seedlings that are planted loosely have a higher probability of developing air pockets within the planting hole, which can dry out the roots and cause poor performance or even death (Elefritz et al., 2006). Loosely planted seedlings are also more susceptible to being blown over by high winds. The soils in the planting hole should be firm but not compacted and able to withstand a light tug and the base of the seedling.

Damaged Bark

Damaged bark is usually caused by a planting tool or boot when firming up the soil within the planting hole. Tree planters must exercise appropriate caution when tamping down the soil around the tree.

Poor Planting Soil

All seedlings should be planted in bare mineral soil. Seedlings that have organic matter, rotten wood, rock, or ash in the planting hole have less direct root-to-soil contact and a higher probability of developing air pockets, which reduces their chances of survival. Undesirable material should be removed from the planting hole prior to planting the tree.

TREE PLANTING CONTRACT AGREEMENT

Location

The planting unit is located in a portion of Section XX, Township X North, Range X East, on the Lummi Indian Reservation, Whatcom County, Washington. There are approximately XX-acres to be planted on the following trust assignment: XX-X. Please see the attached map.

Payment and Terms

A. The Lummi Indian Business Council (LIBC) shall provide approximately X,XXX Douglas-fir P+1 seedlings, X,XXX western red cedar Plug+1 seedlings, and X,XXX red alder 1+0 seedlings. Trees will be available for planting on approximately January XX, 20XX.

B. The Lummi Indian Business Council shall reimburse the Contractor upon the satisfactory completion of all tree planting at the bid price per tree. The tree planting will be inspected by the LIBC Forest Manager to ensure compliance with the tree planting and handling specifications. The full rate per tree shall be paid if 90 percent or greater of the inspected trees are properly planted. The rate shall be reduced by 5 cents per tree for every 10 percent drop in planting quality. **If the planting quality falls below 75 percent, the area shall be replanted at the Contractor's own expense.**

C. The Contractor shall invoice the LIBC Natural Resource Department for satisfactory work completed on each of the Assignments. Payment for work done will be from the LNR Forestry Account.

D. The Contractor shall be required to attend a pre-work conference with the LIBC Forest Manager prior to the execution of this contract.

E. The Contractor shall provide all equipment, planting tools, supplies, personnel, and transportation to and from the site.

F. All tree planting shall be satisfactorily completed on or before March 31, 20XX.

G. The Contractor shall provide proof of Insurance (Certificate of Liability Insurance) in the amount of at least $500,000 in broad liability insurance. The Contractor shall be liable for financial costs for damage to personal and real property.

H. The Lummi Nation reserves the right to waive technical defects and to reject any unsatisfactory work.

Onsite Seedling Storage

A. All trees taken out of cold storage shall be planted the same day. No exceptions.

B. Nursery bags shall be kept in a cool, moist, shady place not exposed to sun or wind under a reflective space blanket (mylar). Do not use canvas or dark-colored coverings.

C. Avoid nursery bag exposure to direct sunlight at all times.

Care and Handling During Planting

A. Do not open nursery bags until they are needed. The seedlings must remain in the nursery bags until time of transfer to planting bags. When a nursery bag is opened, make sure it is resealed as soon as possible to maintain the high humidity.

B. Dip seedlings in water prior to placing them in the planting bag to provide added protection to the root system.

C. Carry seedlings in a planting bag or bucket lined with a vapor barrier, wet burlap, peat moss, saw dust, or similar moist material. Adding moist peat moss to the bag will provide a water supply and reduce seedling temperatures.

D. Temperatures in the planting bag or bucket shall not exceed 50° F at any time during the planting operation. Keep a thermometer onsite and check temperature periodically throughout the day.

E. Do not pack seedlings tightly in the planting bags. Seedlings shall be arranged in the planting bags so that one can be easily removed without dislodging or damaging the other seedlings.

F. Carry only the number of seedlings that can be planted within two to three hours.

G. Only hand tools capable of opening a hole perpendicular to the ground surface broken out on 3 sides and at least 12 inches deep or deep enough to accommodate the root system whichever is greater, will be used. The tools selected must also be capable of cutting and removing matter from the soil surface, which should be removed before the hole is made.

H. Prepare the planting hole before removing the seedling from the planting bag. Only the seedling to be planted shall be removed from the planting bag.

I. No root pruning or top pruning shall be performed to the planting stock.

J. Do not hit or vigorously shake seedlings in an effort to dislodge excess soil. Seedlings can be damaged by excessive vibration.

K. Planting holes shall be dug in mineral soil only. No organic debris such as rotten wood, branches, or needles or rocks shall be in the planting hole.

L. After the hole is prepared, the seedling shall be suspended near the center of the hole with the roots in a natural arrangement. The depth of the seedling after filling, packing, and leveling, shall come to a point midway between the top lateral roots and the lower branches, i.e. the same depth the seedling grew in the nursery (usually 1 inch above the root collar).

M. Seedlings shall be placed in the soil erect, perpendicular to a horizontal plane and not perpendicular to the slope of the land.

N. No portion of the roots shall be exposed to air and no branches shall be covered by soil. Seedling roots shall not be doubled up, twisted, tangled, or bunched. Moist mineral soil shall be filled in and compacted around the roots. No air pockets or organic material should be left in the hole.

O. Soil compaction shall be such that the seedlings shall not pull loose by a tug strong enough to detach a group of needles. After compaction, the soil must be smoothed out to the level of the surrounding surface.

Planting Density and Location

A. The preferred planting density is XXX trees per acre. Where possible, seedlings should be planted on an X x X-foot spacing. This distance may vary by 25 percent to take advantage of good microsites provided that the specified planting density is still achieved. The Contractor will not be penalized for not following an X x X-foot spacing where it is physically impossible to plant trees.

B. Seedlings shall be planted in the best spots possible within the spacing limits. Where possible, seedlings shall be planted behind stumps, logs, dead brush, or other dead shade to provide protection from sun and wind exposure and from animal damage.

C. Avoid planting in areas surrounded by concentrations o re-sprouting brush and/or animal holes and game trails.

D. Mounds of loose soil, standing water, solid rock, or spots of decaying wood over 6 inches deep are not considered suitable planting spots.

Operation Suspension

No tree planting shall be performed when one of the following conditions exists:

A. When the ground is frozen or when frost is more than 0.25-inches deep in the soil or when frost heaving is occurring.

B. When there is more than 1-inch of snow on the soil surface.

C. When the soil moisture is so high that the soil cannot be effectively firmed around the trees.

D. When soil moisture is not sufficient to sustain the planted trees.

E. When outdoor air temperature reaches 60° F.

LUMMI NATION - NATURAL RESOURCE DEPARTMENT - FORESTRY DIVISION **TREE PLANTING CONTRACT COMPLIANCE SHEET**		
Unit:		
Contractor:		
Inspector:		
Date:		
Tree Planting Characteristic	**Satisfactory**	**Unsatisfactory**
▪ Proper Seedling Storage & Handling		
▪ Appropriate Spacing		
▪ Good Use of Microsites		
▪ Seedlings Vertically Erect		
▪ Seedling Planting Depth		
▪ Exposed Roots, J-rooted, etc.		
▪ Soil Compacted Properly		
▪ Planting Site Selection		
TOTAL		
Narrative Report and Recommendations:		

Reforestation Survey Methodology

Appropriately sized fixed-area plots at a density of 1-2 plots per acre will be installed on a uniform grid for stocking surveys. The plot radius used must be long enough so that if the plot lands directly in the middle of a row of trees, it will pick these trees up in the sample (ACI, 2006). The minimum acceptable plot radius can be calculated using the formula below:

- Minimum acceptable plot radius (ft.) = SQRT.[((Tree spacing/2)^2)+((Tree spacing/2)^2)]

The table below provides the minimum acceptable fixed-area plot radius for tree spacings commonly used in forestry plantations.

Minimum Acceptable Fixed-Area Plot Radius for Tree Spacings Commonly Used in Forestry Plantations					
Initial Planting Spacing (ft. x ft.)	**Trees per Acre (TPA)**	**Minimum Acceptable Circular Plot Radius**		**Plot Size (Acres)**	**Plot Size (Fraction Acres)**
		Feet	**Inches**		
7	889	4	11	0.00177	1/565
8	681	5	8	0.00231	1/433
9	538	6	4	0.00292	1/342
10	436	7	1	0.00361	1/277
11	360	7	9	0.00436	1/229
12	303	8	6	0.00519	1/193
13	258	9	2	0.00609	1/164
14	222	9	11	0.00707	1/141

At each plot, a tree count by species will be taken of planted species only. A height estimate, vigor rating, damage type, damage rating, and competition rating will then assigned for each seedling in the plot using the scales provided in the table below. This additional qualitative information will facilitate the assessment of the overall health of the forestry plantation.

Tree Characteristics Noted in Reforestation Surveys	
Height Estimate (ft)	▪ Estimate seedling height to nearest foot
Vigor Rating	▪ Good Vigor = 1 ▪ Moderate Vigor = 2 ▪ Poor Vigor = 3
Damage Type	▪ None = 1 ▪ Spray Burn = 2 ▪ Browse = 3 ▪ Human = 4 ▪ Weather = 5
Damage Rating	▪ None = 1 ▪ Minor Damage = 2 ▪ Major Damage = 3
Competition Rating	▪ Low = 1 ▪ Moderate = 2 ▪ High = 3

Wildlife Damage Descriptions and Protection Methods

Deer Damage

Deer damage in forestry plantations is common due to deer abundance and mobility. Damage typically occurs in spring during budburst but also occurs in the fall and winter when preferred forage is limited. The order of preference for conifer browsing in plantations on the Lummi Reservation appears to be Douglas-fir followed by western red cedar. In mixed-species plantations, Douglas-fir is browsed heavily while western red cedar is left largely untouched. Deer browse has also been noted on red alder seedlings in the spring.

- Preferred Habitat

  Deer typically feed in forest openings that have been created by timber harvesting activities since these areas produce high quality forage (grass, forbs, and young shoots of woody shrubs) and provide cover in adjacent timber (Duddles and Edge, 1999).

- Identification

  Deer browse usually leaves a clean break that becomes blunt after the broken face of the shoot forms a callus. If browsing occurs on older shoots in early spring, the bark may slip off leaving a stripped stem some distance below the break. Special attention should be paid to areas prone to high deer use such as areas near the timberline, along skid roads, on benches, and in the flat areas (Duddles and Edge, 1999).

- Impacts

  Deer browse generally doesn't kill seedlings. Most damage occurs to the terminal and primary leaders causing a reduction in seasonal height growth and tree vigor. Seedlings already under stress or in competition with grass or brush are more likely to be impacted by severe browsing due to a loss of needle tissue. Deer may also occasionally pull newly planted seedlings out of the ground (Duddles and Edge, 1999).

- Protection Methods

  Implementing protection methods early on will minimize establishment costs and maximize the seedling's chances for survival and rapid growth. Re-entry to implement protection methods or to re-plant will cost more than early preventative treatment. Failure to use adequate protection methods can lead to partial or full plantation failure (Duddles and Edge, 1999).

  - Tubing

    Plastic and/or rigid polypropylene mesh tubes are commonly installed around seedlings at the time of planting to prevent browse by deer, voles, and other wildlife. The tubes are available in a variety of height and diameter combinations and have no adverse effect on seedling survival. The polypropylene material that Vexar tubes are made of is photodegradable and will break down in 2 to 5 years. Most tubes are designed to expand with stem growth (Duddles and Edge, 1999).

    Tubing is expensive and labor intensive to install. The tube should be installed 6 to 8 inches into the ground during tree planting and must be planted straight with the seedling. If mesh tubes are used, the seedling's terminal leaders should not be entangled in the tube's mesh. Bamboo stakes can be installed with mesh tubes when planting small seedlings to provide additional support. Installing tubing on seedlings that are already planted and established is more costly, difficult and time consuming.

    Tubing should be checked annually to make sure that the terminal bud is still protected and that the tube is not retarding tree growth (Duddles and Edge, 1999). Deer may still nip branch tips but the severity of the damage won't be as significant. Damage can be further reduced if the seedling and the tubing are treated with a repellent.

- Leader Tubes

  Leader tubes are used exclusively to protect the seedling's terminal leader. This protection method is effective in preventing browse damage to the terminals on older seedlings. The tubes must be secured to a stake or stapled to a small lateral branch to prevent loss during high winds (Duddles and Edge, 1999).

- Paper Bud Caps

  Paper bud caps are rectangular pieces of waterproof paper that are folded lengthwise and stapled around the terminal leader forming a protective cylinder. Bud caps normally require annual adjustment or replacement since they can be lost during high winds. The bud cap can be stapled to a smaller lower branch for added security. Bent terminals can result if bud caps are used on smaller seedlings in areas exposed to high winds. Paper bud caps have no adverse effect on seedling height growth (Duddles and Edge, 1999).

- Repellents

  Repellents are applied directly to the foliage of seedlings to deter browsing by emitting an offensive odor and/or taste. Most repellents include ingredients such as bone meal, blood meal, putrefied egg solids or putrefied seafood. Repellents can last 2 to 4 months during the spring and summer before reapplication is necessary. Any new growth that occurs after the application will be unprotected and will have to be treated during the next application.

  - Deer-Away Big Game Repellent (BGR)

    BGR contains putrefied egg solids and repels by odor and taste. It has been used extensively to deter deer and elk browse on Douglas-fir and western hemlock seedlings. Field studies have shown it to be 85% to 100% effective in keeping deer and elk away (Extension.org, 2009). A comparison of deer repellents conducted by the USDA Forest Service found BGR to be the most effective repellent tested (Trent et al., 2001). One application lasts for 2 to 3 months.

    BGR should be applied on dry seedlings during sunny weather to ensure prompt drying. Approximately 400 to 600 conifer seedlings can be treated with 1 pound of BGR powder or 1 gallon of liquid BGR (Extension.org, 2009). If purchased in liquid form, it must be mixed with water for spraying. The powder form is used when using the "dusting" technique. BGR should be applied to all susceptible new growth and leaders.

  - Plantskydd

    Plantskydd contains dried pig or cow's blood. It repels deer by odor, which the deer associate with predator activity thereby stimulating a fear-based flight response (Clarke, 2009). An application of Plantskydd will last about 3 months if applied during the spring or summer.

    Plantskydd should only be applied to dry seedlings during sunny weather to ensure prompt drying. It is available in either a soluble powder, pre-mix, or granular formation and is not offensive to applicators or tree planters (Clarke, 2009). Approximately 400 to 600 seedlings can be treated with 2.2 pounds of soluble powder. Plantskydd should be applied to seedlings using a backpack sprayer with a diaphragm type pump. Diaphragm type pumps are designed to allow small abrasive particles to pass through the pump without causing damage to the pump assembly.

  - Seadust Wildlife Controllant

    Seadust contains ground up oysters, shrimp, and other shellfish by-products. It repels deer by odor, taste, and texture. Seadust may be applied at any time during the year but is especially effective when applied during the growing season.

Seadust must be applied when the seedling's foliage is wet to activate the cellulose-based adhesive that is included in the granular dust mixture. A light coating on the surface of the outer foliage is adequate for protection. To protect plants for 2 months or more (including periods of rain), the seedling's foliage must be sprayed with a mixture of the Seadust Bond Spreader Sticker at 3 to 5 percent in water when the seedling is dry prior to applying Seadust. Approximately 200 seedlings can be treated with 1 pound of Seadust and approximately 500 seedlings can be treated with 1 gallon of the Bond Spreader Sticker (Campbell, 2008).

- Habitat Manipulation

  Habitat manipulation through cultural treatments may deter deer browse, particularly when combined with other protection methods. Planting a mixture of tree species, leaving more browse options on site, and leaving more residual slash onsite to create a physical barrier to deer movement may assist in reducing browse damage (Duddles and Edge, 1999).

  Larger planting stock 24 to 30 inches in height and 1/8-inch in diameter are better able to withstand moderate levels of browsing and brush competition (Duddles and Edge, 1999). Promoting vigorous growth of seedlings by vegetation management will allow the tree to reach a height that eliminates animal access to the terminal shoot.

Vole Damage

Voles are commonly found on sites where there is an abundant cover of grass and forbs. Generally, voles girdle small seedlings that are less than 2-inches in diameter at ground level. The potential for vole damage is higher on sites with a heavy grass layer or on afforestation projects (reforestation of old agricultural fields and pastures).

- Preferred Habitat

  Voles are found in grassy areas, meadows, marshy areas, pastures, and riparian areas where there is dense cover and security from predators. Voles must always have dense, overhead grassy cover (Duddles and DeCalesta, 1992).

- Identification

  Voles girdle seedlings from the ground level to about 5-inches up the stem. The remaining bark on the damaged stem has a fuzzy appearance because voles can only remove small portions of bark with each bite due to their small teeth (vole tooth marks are about 1/32-inch wide). Feeding begins on one side of the seedling and progresses upward. As the girdling continues, all of the bark may be removed up to the lower lateral branches. Also look for well-used runways through and under vegetation, and small burrow openings that lack soil mounds (Duddles and DeCalesta, 1992).

- Impacts

  Voles don't cause as much damage to forestry plantations as deer but they can still cause notable damage and mortality, particularly on sites with a heavy grass layer.

- Protection Methods

  - Tubing

    Tubes provide good protection since they eliminate the vole's access to the base of the seedling. If using mesh tubing, the mesh should be 1/4 inch (0.6 cm) or less in size. Bury the tube 6 to 8 inches under ground during tree planting.

  - Tin Foil

    Wrapping the base of seedlings in tin foil can provide an effective barrier to voles and can achieve a nearly 100 percent reduction in vole damage at a low cost for nearly two years (Duddles and DeCalesta, 1992). Cut a 12-inch roll of tin foil into two 6-inch roles. Using one 6-inch role, wrap the base of the seedling twice. Foil should not be used on seedlings less than 10 inches tall since it can rub all the bark off if the seedlings are exposed to high winds.

- Habitat Manipulation

  Implementing proper site preparation in combination with a vegetation management program is one of the most effective means of reducing or eliminating vole damage because it eliminates the vegetative cover they depend on.

Costs for Various Wildlife Deterrent Methods		
Deterrent Method	**Supply Cost/Seeding**	**Labor Cost/Seedling**
Tubing	$0.14 to $0.45	$0.40*
Leader tubes	$0.09	$0.20
Paper bud caps	$0.06	$0.13
Big Game repellent	$0.05	$0.23 to $0.30
Plantskydd	$0.07	$0.23 to $0.25
Seadust	$0.08	$0.30
*Includes installing with a bamboo stake		

WILDLIFE DETERRENT APPLICATION CONTRACT AGREEMENT

Location

The treatment unit is located in a portion of Section XX, Township X North, Range X East, on the Lummi Indian Reservation, Whatcom County, Washington. There are approximately XX seedlings to be treated on the following trust assignment: XX-X. Please see the attached map.

Payment and Terms

A. The Lummi Indian Business Council (LIBC) shall reimburse the Contractor upon the satisfactory completion of all wildlife deterrent application per unit at the bid price/seedling.

B. The treatment shall be inspected by the LIBC Forest Manager to ensure compliance with specifications and conditions of the contract.

C. The Contractor shall invoice the LIBC Natural Resource Department. Payment for completed work will be made from the LNR Forestry Account.

D. The Contractor shall provide all equipment, tools, supplies, personnel, and transportation to and from the site(s).

E. The Contractor shall be required to attend a pre-work conference with the LIBC Forest Manager prior to the execution of this contract.

F. The Contractor shall have available proof of Insurance (Certificate of Liability Insurance) in the amount of at least $500,000. The Contractor shall be liable for financial costs for damage to personal and real property.

G. The Lummi Nation reserves the right to waive technical defects and to reject any unsatisfactory work.

H. All wildlife deterrent application work shall commence upon approval of the contract and shall be completed on or before June XX, 20XX.

Treatment Conditions

A. All work shall be performed in compliance with Tribal regulations.

B. Any changes, additions or subtractions to treated areas shall be approved by the LIBC Forest Manager prior to application.

C. All wildlife deterrent application shall be done during dry weather conditions that are expected to last a minimum of 24 hours. No treatment work shall be performed when, in the opinion of the LIBC Forest Manager, weather conditions are unfavorable for the treatment operation. Unfavorable weather conditions include, but are not limited to rain, air temperatures below freezing, extreme temperatures over 75 degrees, and winds greater than 7 MPH.

D. All adhesive shall be applied the day it is mixed. No adhesive that has been mixed and stored overnight shall be used.

E. The applicator shall provide adequate agitation while spraying to maintain adhesive suspension.

F. If a spill occurs, the Contractor shall take immediate measures to stop the container leak and contain the spilled material by trenching and diking with dirt. Containment and clean-up will be the first and highest priority. Upon containment, the spill shall be reported to the Forest Manager.

G. The Contractor shall be responsible for proper mixing, handling, storage, and disposal of all deterrent and adhesive. There shall be no leakage of any deterrent or adhesive into any water source located on the Reservation.

Treatment Specifications – Foliar Application

A. The adhesive mixture shall contain 5% Bond Spreader Sticker and 95% water. It shall be mixed in accordance with the label directions.

B. Using a backpack sprayer filled with the Bond Spreader Sticker and water, the Contractor shall uniformly apply the mixture to the new spring growth and outer foliage of the seedling.

C. Do not spray the target seedling to wet. Thorough coverage of the growing tips, terminal leader, and outer foliage is needed, while maximizing the use of the mixture.

D. After the seedling has been sprayed with the Bond Spreader Sticker and water mixture, the Contractor shall uniformly sprinkle a light coating of the Seadust Wildlife Deterrent onto the new spring growth and outer foliage.

Appendix 7
Vegetation Management

APPENDIX 7

Problem Vegetation in Forestry Plantations on the Lummi Reservation		
Type of Vegetation	**Problem Species**	**Reason for Concern**
Hardwoods	▪ Black cottonwood ▪ Paper birch ▪ Bigleaf maple ▪ Red alder ▪ Willow	▪ Most native hardwood species in western Washington grow much faster than conifer species when young and easily out-compete conifer seedlings for site resources. ▪ Native hardwoods are also prolific seeders and have the ability to re-sprout quickly from stumps. Some species have extensive root systems (bigleaf maple).
Shrubs	▪ Salmonberry ▪ Red elderberry ▪ Thimbleberry ▪ Vine maple ▪ Blackberry ▪ Currant (gooseberry) ▪ Rose ▪ Snowberry ▪ Ocean spray	▪ Shrub species often produce abundant seed and are aggressive sprouters (particularly salmonberry and thimbleberry). ▪ The increase in site resources following timber harvest can promote rapid brush development. Shrub species that were minor components in the stand pre-harvest can completely occupy a site in 1 to 2 years if no vegetation control measures are implemented. ▪ Most shrub species can grow 10 to 15 feet tall and can easily out-compete planted seedlings that are nearby.
Forbs & Grasses	▪ Nettles ▪ Mullein ▪ Thistle ▪ Fireweed ▪ Various annuals and perennials	▪ Moisture competition from grasses and forbs can negatively affect growth. ▪ During the summer, competition for nutrients and moisture can become critical for newly planted seedlings. ▪ 85% of grass biomass is below ground, which allows it to use up available moisture and nutrients early in the growing season before the more slowly responding conifer trees can establish adequate root systems.
Adapted from Duddles and Cloughesy, 2002.		

Manual Control Guidelines for Problem Vegetation in Forestry Plantations	
HARDWOODS	
Species	**Manual Control Guidelines**
Bigleaf maple	▪ Re-sprouts rapidly after cutting and can grow 6-13 feet in height in the first year. ▪ Cutting in late summer should produce the least amount of sprouts. ▪ Girdling is not effective without the use of chemical.
Black cottonwood	▪ Re-sprouts rapidly regardless of the season in which it was cut. Will continue to re-sprout vigorously even after repeated cuttings. ▪ Sprouting can be reduced if cut during the growing season immediately after full leaf development. Maximum re-sprouting will occur if cut during the dormant season. ▪ Girdling is not effective without the use of chemical.
Paper birch & Cherry	▪ Re-sprouts rapidly after cutting. Plants cut during the dormant season sprout the most vigorously. ▪ Can be effectively girdled in every season but sprouting is a problem. Double-frilled girdles or notched girdles are needed to ensure a high rate of top mortality.
Red alder	▪ Cutting when seedling is taller than 6 feet results in a higher degree of control than if seedling is cut when shorter than 6 feet. ▪ Trees cut during the growing season have a significantly higher morality rate than those cut in the dormant season (trees cut in January have the lowest mortality) ▪ The lower the stem is cut, the higher the mortality rate. Cut below all live limbs. ▪ Alder more than 2 inches in diameter can be killed fairly well by cutting at the ground line from mid-June to mid-August. Smaller stems are more likely to sprout at any time. ▪ Sprouting vigor is greatest on 1 to 4 year old seedlings. ▪ Repeated cuttings will significantly reduce sprouting vigor. ▪ Not considered a strong sprouter when compared to other species. ▪ Girdling results in satisfactory top-kill and minimizes sprouting. ▪ Can be effectively girdled in every season. Double-frill girdles are more effective than single girdles. ▪ Trees less than 15 yrs. old or smaller than 6-inches at DBH may re-sprout after girdling. ▪ Girdled trees may take over 1 year to die.
Willow	▪ Re-sprouts rapidly regardless of the season in which it was cut. Plants cut during the dormant season sprout the most vigorously. ▪ Willow sprouts can grow 6-10 feet in the first growing season. The rapid growth of willow allows it to overtop other species after manual cutting. ▪ Girdling can result in prolific basal sprouting and is not effective without the use of chemical.
Aspen	▪ Re-sprouts rapidly from root suckers regardless of the season in which it was cut. ▪ Girdling of mature aspen can be successful but suckers will still be produced. ▪ Most girdled trees die within 1 to 3 years.
SHRUBS	
Species	**Manual Control Guidelines**
Salmonberry	▪ Stem density and leaf area actually increase after cutting. ▪ Rapid sprouting and suckering occur after cutting regardless of the season in which it was cut. ▪ Can grow up to 3 feet in height by the end of the following growing season after cutting. ▪ Can be cut 2 to 3 times in one growing season and will still come back the following year. Repeated cuttings may help reduce vigor.

Thimbleberry	▪ Stem density and leaf area actually increase after cutting. ▪ Rapid sprouting and suckering occur after cutting regardless of the season in which it was cut. ▪ Can grow 2-3 feet in height by the end of the following growing season after cutting. ▪ Height and cover often equals or exceeds pre-treatment levels 1 to 2 years after cutting. ▪ Can be cut 2 to 3 times in one growing season and will still come back the following year. Repeated cuttings may help reduce vigor.
Red elderberry	▪ Elderberry is considered to be one of the fastest sprouting species in the PNW. ▪ Cutting is not considered to be an effective control method due to the rapid sprouting after cutting. Some plants also produce rhizome suckers after cutting. ▪ A sprout can grow up to 75% of its full height in the first growing season after cutting. ▪ Cutting during dormancy or early summer will produce fewer sprouts than late summer cutting. Repeated cuttings may help reduce vigor.
Vine Maple	▪ Prolific basal sprouting occurs after cutting and sprouts can grow 3 feet in the first year. ▪ Crown volume and height can recover to pre-cut levels after 2 to 3 years.
Black Gooseberry	▪ Gooseberry will re-sprout from root collars after cutting.
Rose	▪ Sprouting can occur in the same growing season as cutting but recovery from cutting occurs at a moderate rate in comparison to other shrub species.
Snowberry	▪ Species will sucker and sprout from roots and rhizomes in response to cutting.
Hazel	▪ Sprouts prolifically after cutting and generally produces 2 to 4 sprouts per cut stem. Sprouts can grow 3 to 5 feet in the first year. ▪ Ability to sprout is not significantly affected by repeated cuttings. ▪ Sprouting may be reduced if cut late in the growing season.
Salal	▪ Usually one cutting is sufficient. ▪ Re-growth after cutting is slow. Normally takes 1 to 4 years to return to pretreatment levels after cutting. ▪ Cutting causes an increase in stem density.
FORBS	
Species	**Manual Control Guidelines**
Fireweed	▪ Cutting is only effective in reducing competition for the current year. It will grow back in full force the following growing season.
Bracken fern	▪ Sends up new fronds right after cutting. ▪ May be cut many times in one growing season but will still produce new fronds the next year. ▪ Repeated cuttings over several years may reduce vigor.
Adapted from Coates et al., 1990 and other sources.	

HAND SLASHING CONTRACT AGREEMENT

Location

The units are located in a portion of Section XX and XX, Township XX North, Range XX East, on the Lummi Indian Reservation, Whatcom County, Washington. There are approximately XX-acres to be treated on the following trust Assignments: X-X and XX-X. Please see attached map.

Problem vegetation includes XX, XX, XX, and XX.

Payment and Terms

A. The Lummi Indian Business Council (LIBC) shall reimburse the Contractor upon the satisfactory completion of all hand slashing per unit at the bid price/acre.

B. The treatment shall be inspected by the LIBC Forest Manager to ensure compliance with specifications and conditions of the contract.

C. The Contractor shall invoice the LIBC Natural Resource Department. Payment for completed work will be made from the LNR Forestry Account.

D. The Contractor shall provide all equipment, tools, supplies, personnel, and transportation to and from the site(s).

E. The Contractor shall be required to attend a pre-work conference with the LIBC Forest Manager prior to the execution of this contract.

F. The Contractor shall provide proof of Insurance (Certificate of Liability Insurance) in the amount of at least $1,000,000. The Contractor shall be liable for financial costs for damage to personal and real property.

G. The Lummi Nation reserves the right to waive technical defects and to reject any unsatisfactory work.

H. All work shall commence upon approval of the contract and shall be completed on or before September XX, 20XX.

Treatment Conditions

A. All woody shrubs and hardwood trees greater than two feet tall shall be severed and felled, except for hardwoods over 5 inches in diameter, which shall be girdled.

B. All woody shrubs and hardwood trees should be cut as close to their point of origin as possible and below the lowest live branch.

C. The severing and felling of all woody shrubs and hardwood trees shall be accomplished while avoiding physical damage to planted conifers. Damage to planted conifers shall not exceed 5% as determined by the LIBC Forest Manager.

D. Any hardwood tree with a DBH greater than five inches shall be girdled by removing the bark from the main stem in a two inch wide band completely around the stem below the lowest live branch.

E. Planted conifers shall be protected at all times while cutting woody shrubs and hardwoods and shall be left undamaged.

F. No woody shrubs or hardwoods shall be in contact with the top half of any planted conifer after cutting.

G. When a patch of hardwoods 1/20 acre in size (26 foot radius) or larger exists with no conifers, the hardwoods shall be thinned to a 12 x 12 foot spacing. Red alder is the preferred hardwood crop tree.

H. All access roads shall be maintained throughout the life of the permit. All roads, ditches, and culverts including the site access road, shall remain clear of debris. Activities that will result in excessive deterioration of ditches, culverts, or roadways shall be avoided.

I. No woody shrubs or hardwoods shall be felled across property lines.

J. Any changes, additions or subtractions to treated areas shall be approved by the LIBC Forest Manager prior to application.

GROUND HERBICIDE APPLICATION CONTRACT AGREEMENT

Location

The spray units are located in a portion of Section XX and XX, Township XX North, Range XX East, on the Lummi Indian Reservation, Whatcom County, Washington. There are approximately XX-acres to be treated on the following trust Assignments: X-X and XX-X. Please see attached map.

Problem vegetation includes XX, XX, XX, and XX.

Payment and Terms

I. The Lummi Indian Business Council (LIBC) shall reimburse the Contractor upon the satisfactory completion of all herbicide application per unit at the bid price/acre.

J. The treatment shall be inspected by the LIBC Forest Manager to ensure compliance with specifications and conditions of the contract.

K. The Contractor shall invoice the LIBC Natural Resource Department. Payment for completed work will be made from the LNR Forestry Account.

L. The Contractor shall provide all equipment, tools, supplies, personnel, and transportation to and from the site(s).

M. The Contractor shall be required to attend a pre-work conference with the LIBC Forest Manager prior to the execution of this contract.

N. The Contractor shall provide proof of Insurance (Certificate of Liability Insurance) in the amount of at least $1,000,000. The Contractor shall be liable for financial costs for damage to personal and real property.

O. The Contractor shall have a valid Washington State Department of Agriculture Pesticide Applicator License.

P. The Lummi Nation reserves the right to waive technical defects and to reject any unsatisfactory work.

Q. All herbicide application work shall commence upon approval of the contract and shall be completed on or before September XX, 20XX.

Treatment Conditions

A. All work shall be performed in compliance with Tribal and Federal Pesticide Rules and Regulations.

B. All herbicides shall be mixed and applied in accordance with the herbicide label directions. Only EPA approved herbicides shall be applied to Indian trust lands.

C. The Contractor shall keep adequate application records for each site in compliance will all federal rules and regulations. A copy of each record shall be provided to the LIBC Forest Manager upon completion of the contract.

D. Any changes, additions or subtractions to treated areas shall be approved by the LIBC Forest Manager prior to application.

E. All herbicide application shall be done during dry weather conditions that are expected to last a minimum of 24 hours. No treatment work shall be performed when, in the opinion of the LIBC Forest Manager, weather conditions are unfavorable for the treatment operation. Unfavorable weather conditions include, but are not limited to rain, air temperatures below freezing, extreme temperatures over 75 degrees, and winds greater than 7 MPH.

F. Application shall be within the property lines of the Indian-owned trust property, to insure NO off target application to adjacent properties.

G. The applicator shall use spray pressures and techniques that minimize spray drift.

H. The applicator shall provide adequate agitation while spraying to maintain herbicide suspension.

I. The Contractor shall maintain a minimum buffer distance of 50 feet around all flowing or open water to insure that no application is applied to or reaches water resources.

J. Herbicide solution may not be batched or mixed within 300 feet of any open water.

K. The Contractor shall be responsible for proper mixing, handling, storage, and disposal of all chemicals. There shall be no leakage of any chemicals into any water source located on trust property.

L. If a spill occurs, the Contractor shall take immediate measures to stop the container leak and contain the spilled material by trenching, diking with dirt, and using absorbent chemical pillows, sand, sawdust, vermiculite, or kitty litter to absorb the chemical. Containment and clean-up will be the first and highest priority. Each spill must be handled according to the product label and material safety data sheet. Upon containment, the spill shall be reported to the LIBC Forest Manager and the Water Resources Manager.

M. All herbicides shall be applied the day they are mixed. No herbicide that has been mixed and stored overnight shall be used.

Treatment Specifications – Foliar and Soil Application

A. Do not spray the target vegetation to wet. Thorough coverage of the top leaf surface (growing tips & terminal leader) and at least two sides is needed, while maximizing the use of the herbicide mixture.

B. Backpack spray equipment with flat or adjustable spray tips that deliver less than 1 gallon of spray per minute shall be used.

C. Backpack pressure will be set so that small droplets between 0.7 to 2.2 mm are produced at a density of 70 or more droplets per square inch instead of a vaporized mist.

D. Site Preparation Herbicide Prescription
   - The Contractor shall apply a total herbicide solution of 10 gallons/acre.
   - The Contractor shall mix and apply the chemicals listed below at the following rates:
     - Oust Extra (sulfometuron + metsulfuron): 4 ounces/acre
     - Hi-Light (dye): 16 to 32 ounces/100 gallons of spray mixture.

E. Plantation Release Herbicide Prescription
   - The Contractor shall apply a total herbicide solution of 10 gallons/acre.
   - The Contractor shall mix and apply the chemicals listed below at the following rates:
     - Accord Concentrate (glyphosate): 36 ounces/acre
     - Arsenal AC (imazapyr): 2 ounces/acre
     - SylGard 309 (surfactant): 0.5 ounces/acre
     - Hi-Light (dye): 16 to 32 ounces/100 gallons of spray mixture.

F. The Contractor shall mix the herbicide solution in the following order: water, Oust Extra or Oust XP, Accord Concentrate, Arsenal AC, Garlon 4 (if used), SylTac or SylGard, and then Hi-Light. If a batch is mixed that does not follow this mixing order, it cannot be used unless a different mixing order is specified on the herbicide labels.

G. The Contractor shall completely dissolve the Oust Extra or Oust XP in a separate 1-gallon bucket of water prior to dumping into the batching drum.

Treatment Specifications – Conventional Cut Stump Application

A. The applicator shall spray or paint all of the exposed cambium area next to the bark, the entire circumference of the stump, and the root collar down to the soil line of the target stump until thoroughly wet but not to the point of runoff. Thorough coverage of the target stump is required.

B. The applicator shall clear away any moss and/or debris on or around the target stump before treating.

C. If treating a larger stump, the applicator shall also treat any exposed roots that may surround the stump to ensure effective control.

D. Do not spray stumps that are visibly wet. If the herbicide mixture turns white when applied to the stump, the stump is too wet for application. In this situation, the applicator shall cease spraying activities until environmental conditions become favorable for application.

E. Backpack spray equipment with flat or adjustable spray tips, a squirt bottle, or a paint brush shall be used to apply the herbicide solution. If a backpack sprayer with an adjustable spray tip is used, the nozzle of the wand shall be set to produce a spray pattern with larger droplets to reduce the potential for herbicide drift onto seedlings.

F. Cut Stump Herbicide Prescription
   - The Contractor shall mix and apply the chemicals listed below at the following rates:
     - Garlon 4 (triclopyr): 25% of total volume
     - W.E.B oil: 75% of total volume
     - An oil soluble dye compatible with Garlon 4

G. The Contractor shall mix the herbicide solution in the following order: W.E.B. oil, Garlon 4, and then the oil-soluble dye.

Treatment Specifications – Frill Application

A. The applicator shall make one cut into the target stem for every 3 inches of diameter using a hatchet, machete, chainsaw, or axe at an oblique angle. The cut shall be made deep enough to significantly penetrate the cambium and sapwood of the target tree. Please see Exhibit 1.

B. All cuts shall be made at a height no more that 3 feet above the ground line or below the lowest living branch whichever is closest to the ground line.

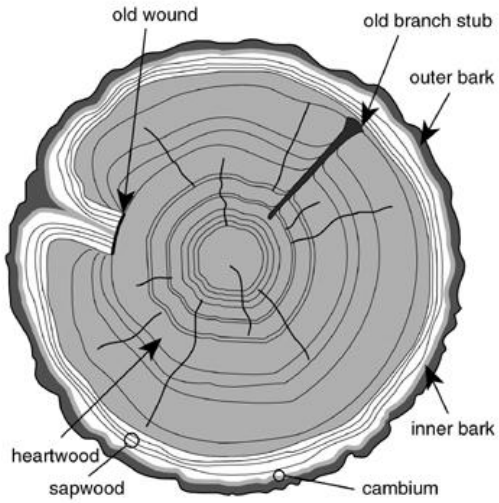
C. The applicator shall apply 0.25 teaspoons of herbicide solution into each cut. The herbicide should be sprayed directly onto the cambium and no liquid should ooze out of the notch.

D. As an alternative to spaced cuts, the applicator may also make a continuous frill or girdle around each target stem. As with spaced cuts, the herbicide should be sprayed directly onto the cambium and no liquid should ooze out of the notches.

E. Frill Herbicide Prescription
   - The Contractor shall mix and apply the chemicals listed below at the following rates for treating black cottonwood, paper birch, red alder, cherry, and willow:
     - Arsenal AC (imazapyr): 25% of total volume
     - Water: 75% of total volume
     - Hi-Light (dye): 16 to 32 ounces/100 gallons of spray mixture.
   - For treating bigleaf maple, the Contractor shall mix and apply at the following rates:
     - Arsenal AC (imazapyr): 50% of total volume
     - Water: 50% of total volume
     - Hi-Light (dye): 16 to 32 ounces/100 gallons of spray mixture.

F. The Contractor shall mix the herbicide solution in the following order: water, Arsenal AC and then Hi-light.

Exhibit 1:



LUMMI NATURAL RESOURCES
FORESTRY DIVISION

PUBLIC NOTICE OF HERBICIDE APPLICATION FOR BRUSH CONTROL

The Lummi Forestry Division will be conducting a herbicide ground application with backpack sprayers to control brush in recently established forestry plantations.

The following herbicides will be used in the application: Accord Concentrate (glyphosate).

Application will be made within the cleared area between September XX, 20XX and September XX, 20XX.

For further information contact:
Forest Manager
Lummi Natural Resources
2616 Kwina Road
Bellingham, WA 98226
360-384-2228

W.A.L.E.S Herbicide Mixing Methodology

The mixing order of herbicides is important to ensure the best application results and to avoid chemical incompatibility problems. The W.A.L.E.S acronym is a tool that was developed to assist applicators in avoiding incompatibility problems when mixing herbicides.

1. **W** = Wettable Powders (Oust XP, Oust Extra, Escort XP)
2. **A** = Amine Salts (Accord XRT, Accord Concentrate, Arsenal AC, Garlon 3A)
3. **L** = Liquids
4. **E** = Emulsifiable Concentrates (Garlon 4)
5. **S** = Surfactants and Adjuvants (Sylgard 309, SylTac, Hasten, Activator 90)

Problems can develop when the W.A.L.E.S mixing methodology is not used. If an emulsifiable concentrate is added first, then a surfactant, and finally a wettable powder, the powder may stick onto the oily products and adhere to the sides of the spray tank never fully dissolving into the mixture. This will reduce application efficacy and may also cause sprayers to clog.

Site Preparation General Use Herbicide Options by Reforestation Species			
Douglas-fir	**Western Red Cedar**	**Western Hemlock**	**Red Alder**
Accord Concentrate	Accord Concentrate	Accord Concentrate	Accord Concentrate
Arsenal Applicator's Concentrate	*	Arsenal Applicator's Concentrate	*
Oust Extra	Oust Extra	Oust Extra	*
Oust XP	Oust XP	Oust XP	*
Escort XP	Escort XP	Escort XP	Escort XP
Garlon 4	Garlon 4	Garlon 4	*
Garlon 3A	Garlon 3A	Garlon 3A	*

Plantation Release General Use Herbicide Options by Reforestation Species			
Douglas-fir	**Western Red Cedar**	**Western Hemlock**	**Red Alder**
Accord Concentrate	Accord Concentrate	Accord Concentrate	Accord Concentrate
Arsenal Applicator's Concentrate	*	*	*
Oust XP	Oust XP	Oust XP	*
Escort XP	Escort XP	Escort XP	*
Garlon 4	Garlon 4	Garlon 4	*
Garlon 3A	Garlon 3A	Garlon 3A	*

Site Preparation Ground-Based Broadcast Application Options on Douglas-fir and Western Hemlock Sites							
Unit Condition	Problem Vegetation	Unit Description	Herbicide Formulation[1] Water is used as the carrier			Special Notes	Timing
			Chemical	Label	Rate/Acre		
Post Harvest ▪ Option 1	Will control or partially control the following species: ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Elderberry ▪ Cherry ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	▪ Vegetation mechanically reduced by harvest operation. ▪ Mostly bare ground.	Sulfometuron (56.25%) Metsulfuron (15.00%)	Oust Extra[2]	2.5 to 5 ounces	▪ Oust Extra may be applied when raining if used by itself. ▪ For safety, wait 3 months after application before planting.	Early September to Late October
			N/A	Hi-Light (dye)	-	▪ 16 to 32 ounces/100 gallons of spray mixture.	
Post Harvest ▪ Option 2	Will control or partially control the following species: ▪ Black cottonwood ▪ Cherry ▪ Willow ▪ Red alder ▪ Bigleaf maple ▪ Paper birch ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Elderberry ▪ Vine maple ▪ Hazel ▪ Snowberry ▪ Oceanspray ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	▪ Vegetation mechanically reduced by harvest operation. ▪ Target vegetation still has viable foliage.	Glyphosate (53.8%)	Accord Concentrate	48 to 64 ounces	▪ Broad spectrum control	Early September to Early October (Late Foliar) It is preferable to conduct the spray earlier if harvest operations permit to increase control.
			Sulfometuron (56.25%) Metsulfuron (15.00%)	Oust Extra[2]	2.5 to 4 ounces	▪ For safety, wait 3 months after application before planting.	
			N/A	SylTac (surfactant)	4 ounces	▪ Increases herbicide activity.	
			N/A	Hi-Light (dye)	-	▪ 16 to 32 ounces/100 gallons of spray mixture.	
1-Year Post Harvest ▪ Option 3		▪ Heavy vegetation. ▪ Unit left to "brush up" for one growing season to increase leaf surface area.	Glyphosate (53.8%)	Accord Concentrate	48 ounces	▪ Broad spectrum control	Early July to Late August (Mid-Summer Foliar)
			Sulfometuron (56.25%) Metsulfuron (15.00%)	Oust Extra[2]	2.5 to 4 ounces	▪ For safety, wait 3 months after application before planting.	
			Imazapyr (53.1%)	Arsenal Applicators Concentrate	4 to 6 ounces	▪ Provides added control over problem hardwoods and shrubs.	
			N/A	SylTac (surfactant)	4 ounces	▪ Increases herbicide activity.	
			N/A	Hi-Light (dye)	-	▪ 16 to 32 ounces/100 gallons of spray mixture.	

[1]Formulations listed above are based on a total solution application rate of 10 gallons/acre.

[2]Use the lower rate of Oust Extra on coarse-textured soils (loamy sands, sandy loams) and the higher rate on fine textured soils (sandy clay loams and silty clay loams) (Dupont, 2008 B and C). Oust XP may be substituted for Oust Extra but may only be applied at a rate of 2 to 4 ounces/acre. Oust XP is designed to control grasses and forbs and will not control certain shrub species as well as Oust Extra.

Adapted from Dupont, 2008 B, Dow Agrosciences, 2007, and Wilbur-Ellis, 2008 A.

Site Preparation Ground-Based Spray-to-Wet Application Options on Douglas-fir and Western Hemlock Sites							
Unit Condition	Problem Vegetation	Unit Description	Herbicide Formulation Water is used as the carrier			Special Notes	Timing
			Chemical	Label	Rate		
Post Harvest ▪ Option 1	Will control or partially control the following species: ▪ Black cottonwood ▪ Cherry ▪ Willow ▪ Red alder ▪ Bigleaf maple ▪ Paper birch ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Elderberry ▪ Vine maple ▪ Hazel ▪ Snowberry ▪ Oceanspray ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	▪ Vegetation mechanically reduced by harvest operation. ▪ Target vegetation still has viable foliage.	Glyphosate (53.8%)	Accord Concentrate	2% by volume	▪ Broad spectrum control	Early September to Early October (Late Foliar) It is preferable to conduct the spray earlier if harvest operations permit to increase control.
			N/A	SylTac (surfactant)	0.13% to 0.4% by volume	▪ Increases herbicide activity. ▪ 1 to 3 teaspoons per gallon of spray mixture.	
			N/A	Hi-Light (dye)	0.125% to 0.25% by volume	▪ 16 to 32 ounces/100 gallons of spray mixture.	
1-Year Post Harvest ▪ Option 2		▪ Heavy vegetation. ▪ Unit left to "brush up" for one growing season to increase leaf surface area.	Glyphosate (53.8%)	Accord Concentrate	2% by volume	▪ Broad spectrum control	Early July to Late August (Mid-Summer Foliar)
			Imazapyr (53.1%)	Arsenal Applicators Concentrate	0.035% to 0.5% by volume	▪ Provides added control over problem hardwoods and shrubs.	
			N/A	SylTac (surfactant)	0.13% to 0.4% by volume	▪ Increases herbicide activity. ▪ 1 to 3 teaspoons per gallon of spray mixture.	
			N/A	Hi-Light (dye)	0.125% to 0.25% by volume	▪ 16 to 32 ounces/100 gallons of spray mixture.	
Adapted from Dow Agrosciences, 2007, BASF, 2008, and Wilbur-Ellis, 2008 A.							

Site Preparation Ground-Based Broadcast Application Options on Western Red Cedar Sites							
Unit Condition	Problem Vegetation	Unit Description	Herbicide Formulation[1] Water must be used as the carrier			Special Notes	Timing
			Chemical	Label	Rate/Acre		
Post Harvest ▪ Option 1	Will control or partially control the following species: ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Elderberry ▪ Cherry ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	▪ Vegetation mechanically reduced by harvest operation. ▪ Mostly bare ground.	Sulfometuron (56.25%) Metsulfuron (15.00%)	Oust Extra[2]	2 to 3 ounces	▪ Oust Extra may be applied when raining if used by itself. ▪ For safety, wait 3 months after application before planting.	Early September to Late October
			N/A	Hi-Light (dye)	-	▪ 16 to 32 ounces/100 gallons of spray mixture.	
Post Harvest ▪ Option 2	Will control or partially control the following species: ▪ Black cottonwood ▪ Cherry ▪ Willow ▪ Red alder ▪ Bigleaf maple ▪ Paper birch ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Elderberry ▪ Vine maple ▪ Hazel ▪ Snowberry ▪ Oceanspray ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	▪ Vegetation mechanically reduced by harvest operation. ▪ Target vegetation still has viable foliage.	Glyphosate (53.8%)	Accord Concentrate	48 to 64 ounces	▪ Broad spectrum control	Early September to Early October (Late Foliar) It is preferable to conduct the spray earlier if harvest operations permit to increase control.
			Sulfometuron (56.25%) Metsulfuron (15.00%)	Oust Extra[2]	2 to 3 ounces	▪ For safety, wait 3 months after application before planting.	
			N/A	SylTac (surfactant)	4 ounces	▪ Increases herbicide activity.	
			N/A	Hi-Light (dye)	-	▪ 16 to 32 ounces/100 gallons of spray mixture.	
1-Year Post Harvest ▪ Option 3		▪ Heavy vegetation. ▪ Unit left to "brush up" for one growing season to increase leaf surface area.	▪ Refer to herbicide prescription and rates listed for Option 2.				Early July to Late August (Mid-Summer Foliar)

[1]Formulations listed above are based on a total solution application rate of 10 gallons/acre.

[2]Use the lower rate of Oust Extra on coarse-textured soils (loamy sands, sandy loams) and the higher rate on fine textured soils (sandy clay loams and silty clay loams) (Dupont, 2008 B and C). Oust XP may be substituted for Oust Extra but may only be applied at a rate of 2 to 3 ounces/acre. Oust XP is designed to control grasses and forbs and will not control certain shrub species as well as Oust Extra.

Adapted from Dupont, 2008 B, Dow Agrosciences, 2007, and Wilbur-Ellis, 2008 A.

Site Preparation Ground-Based Spray-to-Wet Application Options on Western Red Cedar Sites							
Unit Condition	Problem Vegetation	Unit Description	Herbicide Formulation Water must be used as the carrier			Special Notes	Timing
			Chemical	Label	Rate		
Post Harvest ▪ Option 1	Will control or partially control the following species: ▪ Black cottonwood ▪ Cherry ▪ Willow ▪ Red alder ▪ Bigleaf maple ▪ Paper birch ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Elderberry ▪ Vine maple ▪ Hazel ▪ Snowberry ▪ Oceanspray ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	▪ Vegetation mechanically reduced by harvest operation. ▪ Target vegetation still has viable foliage.	Glyphosate (53.8%)	Accord Concentrate	2% by volume	▪ Broad spectrum control	Early September to Early October (Late Foliar) It is preferable to conduct the spray earlier if harvest operations permit to increase control.
			N/A	SylTac (surfactant)	0.13% to 0.4% by volume	▪ Increases herbicide activity. ▪ 1 to 3 teaspoons per gallon of spray mixture.	
			N/A	Hi-Light (dye)	0.125% to 0.25% by volume	▪ 16 to 32 ounces/100 gallons of spray mixture.	
1-Year Post Harvest ▪ Option 2		▪ Heavy vegetation. ▪ Unit left to "brush up" for one growing season to increase leaf surface area.	▪ Refer to herbicide prescription and rates listed for Option 2.				Early July to Late August (Mid-Summer Foliar)
Adapted from Dow Agrosciences, 2007 and Wilbur-Ellis, 2008 A.							

Site Preparation Ground-Based Broadcast and Spray-to-Wet Application Options on Red Alder Sites

Broadcast Application

Unit Condition	Problem Vegetation	Unit Description	Herbicide Formulation[1] Water must be used as the carrier			Special Notes	Timing
			Chemical	Label	Rate/Acre		
Post Harvest ▪ Option 1	Will control or partially control the following species: ▪ Black cottonwood ▪ Cherry ▪ Willow ▪ Red alder ▪ Bigleaf maple ▪ Paper birch ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Elderberry ▪ Vine maple ▪ Hazel ▪ Snowberry ▪ Oceanspray ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	▪ Vegetation mechanically reduced by harvest operation. ▪ Target vegetation still has viable foliage.	Glyphosate (53.8%)	Accord Concentrate	48 to 64 ounces	▪ Broad spectrum control	Early September to Early October (Late Foliar) OR Late March to Mid April (Early Foliar) before seedling bud burst.
			N/A	SylTac (surfactant)	4 ounces	▪ Increases herbicide activity.	
			N/A	Hi-Light (dye)	-	▪ 16 to 32 ounces/100 gallons of spray mixture.	
1-Year Post Harvest ▪ Option 2		▪ Heavy vegetation. ▪ Unit left to "brush up" for one growing season to increase leaf surface area.	▪ Refer to herbicide prescription and rates listed for Option 1.				Early July to Late August (Mid-Summer Foliar)

[1] Formulations listed above are based on a total solution application rate of 10 gallons/acre.

Note: Escort XP is also labeled for use in red alder site preparation. It does not provide the same broad-spectrum control as Accord Concentrate but it does provide some pre-emergent activity. If used, it must be applied at 2 ounces per acre. It should be mixed with a surfactant at a minimum rate of 0.25% by volume (32 ounces per 100 gallons of spray solution). Escort XP cannot be used with surfactants that are seed oil based, are seed oil/silicone blends (SylTac) or contain acetic acid (LI 700) (Dupont, 2008 A).

Spray-to-Wet Application

Unit Condition	Problem Vegetation	Unit Description	Herbicide Formulation Water must be used as the carrier			Special Notes	Timing
			Chemical	Label	Rate		
Post Harvest ▪ Option 1	Same as above	Same as above	Glyphosate (53.8%)	Accord Concentrate	2% by volume	▪ Broad spectrum control	Same as above
			N/A	SylTac (surfactant)	0.13% to 0.4% by volume	▪ Increases herbicide activity. ▪ 1 to 3 teaspoons per gallon of spray mixture.	
			N/A	Hi-Light (dye)	0.125% to 0.25% by volume	▪ 16 to 32 ounces/100 gallons of spray mixture.	
1-Year Post Harvest ▪ Option 2		Same as above	▪ Refer to herbicide prescription and rates listed for Option 1.				Same as above

Adapted from Dow Agrosciences, 2007 and Wilbur-Ellis, 2008 A.

Site Preparation Ground-Based Broadcast and Spray-to-Wet Application Options in Forested Wetlands on Douglas-fir, Western Red Cedar, Western Hemlock, and Red Alder Sites

Broadcast Application

Unit Condition	Problem Vegetation	Unit Description	Herbicide Formulation[1] Water must be used as the carrier			Special Notes	Timing
			Chemical	Label	Rate/Acre		
Post Harvest ▪ Option 1	Will control or partially control the following species: ▪ Black cottonwood ▪ Cherry ▪ Willow ▪ Red alder ▪ Bigleaf maple ▪ Paper birch ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Elderberry ▪ Vine maple ▪ Hazel ▪ Snowberry ▪ Oceanspray ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	▪ Vegetation mechanically reduced by harvest operation. ▪ Target vegetation still has viable foliage.	Glyphosate (53.8%)	Accord Concentrate	48 to 64 ounces	▪ Broad spectrum control	Early September to Early October (Late Foliar) It is preferable to conduct the spray earlier if harvest operations permit to increase control. OR Red Alder Only: Late March to Mid April (Early Foliar) before seedling bud burst
			N/A	LI 700 (surfactant)	7 to 14 ounces	▪ Increases herbicide activity.	
			N/A	Hi-Light (dye)	-	▪ 16 to 32 ounces/100 gallons of spray mixture.	
1-Year Post Harvest ▪ Option 2		▪ Heavy vegetation. ▪ Unit left to "brush up" for one growing season to increase leaf surface area.	▪ Refer to herbicide prescription and rates listed for Option 1.				Early July to Late August (Mid-Summer Foliar)

[1]Formulations listed above are based on a total solution application rate of 10 gallons/acre.

Spray-to-Wet Application

Unit Condition	Problem Vegetation	Unit Description	Herbicide Formulation Water must be used as the carrier			Special Notes	Timing
			Chemical	Label	Rate		
Post Harvest ▪ Option 1	Same as above	Same as above	Glyphosate (53.8%)	Accord Concentrate	2% by volume	▪ Broad spectrum control	Same as above
			N/A	LI 700 (surfactant)	0.25% to 0.5% by volume	▪ Increases herbicide activity.	
			N/A	Hi-Light (dye)	0.125% to 0.25% by volume	▪ 16 to 32 ounces/100 gallons of spray mixture.	
1-Year Post Harvest ▪ Option 2		Same as above	▪ Refer to herbicide prescription and rates listed for Option 1.				Same as above

Adapted from Dow Agrosciences, 2007 and Loveland Products, Inc., 2008 B.

Plantation Release Ground-Based Directed Broadcast Application Options on Douglas-fir Sites						
Unit Condition	Problem Vegetation	Herbicide Formulation[1] Water must be used as the carrier			Special Notes	Timing
		Chemical	Label	Rate/Acre		
First or Second Release Spray ▪ Option 1	Will control or partially control the following species: ▪ Black cottonwood ▪ Cherry ▪ Willow ▪ Red alder ▪ Bigleaf maple ▪ Paper birch ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Elderberry ▪ Vine maple ▪ Hazel ▪ Snowberry ▪ Oceanspray ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	Glyphosate (53.8%)	Accord Concentrate[2]	32 to 36 ounces	▪ Broad-spectrum control. ▪ Avoid spray contact with seedlings! ▪ Injury will occur to seedlings if the buds are not sufficiently hardened off for the season.	Early September to Early October (Late Foliar)
		Imazapyr (53.1%)	Arsenal Applicators Concentrate[3]	2 to 4 ounces	▪ Provides added control over problem hardwoods and shrubs. ▪ Avoid spray contact with seedlings, particularly if higher rate is used. ▪ Injury may occur to seedlings if the buds are not sufficiently hardened off for the season.	
		N/A	SylGard 309 (surfactant)	0.5 ounces	▪ Increases herbicide activity. ▪ Exceeding 1 ounce/acre of surfactant will cause unacceptable injury to seedlings on lowland sites (below 1,500 ft. elevation).	
		N/A	Hi-Light (dye)	-	▪ 16 to 32 ounces/100 gallons of spray mixture.	
First or Second Release Spray ▪ Option 2	Will control or partially control the following species: ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	Sulfometuron (75.0%)	Oust XP[4]	2 to 4 ounces	▪ Only use if site did not receive a site preparation spray with Oust Extra or Oust XP and competition from shrubs and hardwoods is not as significant. ▪ Most conifers are generally resistant when applied after buds are sufficiently hardened off for the season. Otherwise, injury may occur. ▪ Avoid spray contact with seedlings.	Early September to Early October (Late Foliar)
		N/A	Hi-Light (dye)	-	▪ 16 to 32 ounces/100 gallons of spray mixture.	

[1] Formulations listed above are based on a total solution application rate of 10 gallons/acre.

[2] Only use where seedlings have been established for more than one year (Dow AgroSciences, 2007).

[3] Arsenal AC may or may not be included. However it greatly increases control over problem hardwoods and shrubs.

[4] If Oust XP is used, using a surfactant may injure or kill seedlings if spray contacts the foliage. If a surfactant is used, use SylGard 309 at a rate of 0.5 ounces/acre. Use the lower rate of Oust XP on coarse-textured soils (loamy sands, sandy loams) and the higher rate on fine textured soils (sandy clay loams and silty clay loams) (Dupont, 2008 C).

Adapted from Dow Agrosciences, 2007, BASF 2008, Wilbur-Ellis, 2008 B, and Dupont, 2008 C.

Plantation Release Ground-Based Directed Broadcast Application Options on Western Red Cedar and Western Hemlock Sites						
Unit Condition	Problem Vegetation	Herbicide Formulation[1] Water must be used as the carrier			Special Notes	Timing
		Chemical	Label	Rate/Acre		
First or Second Release Spray ▪ Option 1	Will control or partially control the following species: ▪ Black cottonwood ▪ Cherry ▪ Willow ▪ Red alder ▪ Bigleaf maple ▪ Paper birch ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Elderberry ▪ Vine maple ▪ Hazel ▪ Snowberry ▪ Oceanspray ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	Glyphosate (53.8%)	Accord Concentrate[2]	48 to 64 ounces	▪ Broad-spectrum control. ▪ Western red cedar and western hemlock are very sensitive to glyphosate when used with a surfactant. To reduce the degree of injury, no surfactant is used but the herbicide rate is increased. ▪ Avoid spray contact with seedlings! ▪ Injury may occur to seedlings if the buds are not sufficiently hardened off for the season.	Early September to Early October (Late Foliar)
		N/A	Hi-Light (dye)	-	▪ 16 to 32 ounces/100 gallons of spray mixture.	
First or Second Release Spray ▪ Option 2	Will control or partially control the following species: ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	Sulfometuron (75.0%)	Oust XP[3]	2 to 4 ounces (Western Hemlock) 2 to 3 ounces (Western Red Cedar)	▪ Only use if site did not receive a site preparation spray with Oust Extra or Oust XP and competition from shrubs and hardwoods is not as significant. ▪ Most conifers are generally resistant when applied after buds are sufficiently hardened off for the season. Otherwise, injury may occur. ▪ Avoid spray contact with seedlings.	Early September to Early October (Late Foliar)
		N/A	Hi-Light (dye)	-	▪ 16 to 32 ounces/100 gallons of spray mixture.	

[1]Formulations listed above are based on a total solution application rate of 10 gallons/acre.

[2]Only use where seedlings have been established for more than one year (Dow AgroSciences, 2007).

[3]Use the lower rate of Oust XP on coarse-textured soils (loamy sands, sandy loams) and the higher rate on fine textured soils (sandy clay loams and silty clay loams) (Dupont, 2008 C).

Adapted from Dow Agrosciences, 2007 and Dupont, 2008 C.

Plantation Release Ground-Based Spray-to-Wet Application Options on Douglas-fir, Western Red Cedar, Western Hemlock, and Red Alder Sites						
Unit Condition	Problem Vegetation	Herbicide Formulation Water must be used as the carrier			Special Notes	Timing
		Chemical	Label	Rate		
First or Second Release Spray ▪ Option 1	Will control or partially control the following species: ▪ Black cottonwood ▪ Cherry ▪ Willow ▪ Red alder ▪ Bigleaf maple ▪ Paper birch ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Elderberry ▪ Vine maple ▪ Hazel ▪ Snowberry ▪ Oceanspray ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	Glyphosate (53.8%)	Accord Concentrate	2% by volume	▪ Broad-spectrum control. ▪ Western red cedar, western hemlock, and red alder are very sensitive to glyphosate when used with a surfactant. ▪ Avoid spray contact with seedlings! ▪ Injury will occur to seedlings if the buds are not sufficiently hardened off for the season (conifers only).	Early September to Early October (Late Foliar)
		N/A	Activator 90	0.25% to 0.5% by volume	▪ Increases herbicide activity.	
		N/A	Hi-Light (dye)	0.125% to 0.25% by volume	▪ 16 to 32 ounces/100 gallons of spray mixture.	
Option 2 is NOT Approved for Use in Red Alder Plantations						
First or Second Release Spray ▪ Option 2	Will control or partially control the following species: ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Snowberry ▪ Rose ▪ Elderberry ▪ Cherry ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	Metsulfuron (60.0%)	Escort XP[1]	0.016% to 0.031% by volume	▪ 2 to 4 ounces/100 gallons of spray mixture. ▪ Western red cedar is much less sensitive to metsulfuron than glyphosate. However, metsulfuron controls fewer species but it does provide some pre-emergent control. ▪ Avoid spray contact with seedlings!	Early September to Early October (Late Foliar)
		N/A	Activator 90	0.25% to 0.5% by volume	▪ Increases herbicide activity. ▪ 32 to 64 ounces/100 gallons of spray mixture.	
		N/A	Hi-Light (dye)	0.125% to 0.25% by volume	▪ 16 to 32 ounces/100 gallons of spray mixture.	
[1]Escort XP is not labeled for release treatments in red alder plantations (Dupont, 2008 A).						
Adapted from Dow Agrosciences, 2007, Loveland Products, Inc., 2008 A, and Dupont, 2008 A.						

Plantation Release Ground-Based Directed Broadcast Application and Spray-to-Wet Application Options in Forested Wetlands on Douglas-fir, Western Red Cedar, Western Hemlock, and Red Alder[1] Sites

Directed Broadcast Application (Cannot Be Used in Red Alder Plantations)

Unit Condition	Problem Vegetation	Herbicide Formulation[2] Water must be used as the carrier			Special Notes	Timing
		Chemical	Label	Rate/Acre		
First or Second Release Spray ▪ Option 1	Will control or partially control the following species: ▪ Black cottonwood ▪ Cherry ▪ Willow ▪ Red alder ▪ Bigleaf maple ▪ Paper birch ▪ Salmonberry ▪ Blackberry ▪ Thimbleberry ▪ Elderberry ▪ Vine maple ▪ Hazel ▪ Snowberry ▪ Oceanspray ▪ Broadleaf weeds and forbs ▪ Various annual and perennial grasses	Glyphosate (53.8%)	Accord Concentrate	32 to 36 ounces	▪ Broad-spectrum control. ▪ Western red cedar, western hemlock, and red alder are very sensitive to glyphosate when used with a surfactant. ▪ Avoid spray contact with seedlings! ▪ Injury will occur to seedlings if the buds are not sufficiently hardened off for the season (conifers only).	Early September to Early October (Late Foliar)
		N/A	LI 700 (surfactant)	3 to 4 ounces	▪ Increases herbicide activity.	
		N/A	Hi-Light (dye)	-	▪ 16 to 32 ounces/100 gallons of spray mixture.	

Spray-to-Wet Application

Unit Condition	Problem Vegetation	Herbicide Formulation Water must be used as the carrier			Special Notes	Timing
		Chemical	Label	Rate		
First or Second Release Spray ▪ Option 1	Same as above	Glyphosate (53.8%)	Accord Concentrate	2% by volume	▪ Broad-spectrum control. ▪ Western red cedar, western hemlock, and red alder are very sensitive to glyphosate when used with a surfactant. ▪ Avoid spray contact with seedlings!	Early September to Early October (Late Foliar) OR Red Alder Only: Late March to Mid April (Early Foliar) before seedling bud burst
		N/A	LI 700 (surfactant)	0.25% to 0.5% by volume	▪ Increases herbicide activity.	
		N/A	Hi-Light (dye)	0.125% to 0.25% by volume	▪ 16 to 32 ounces/100 gallons of spray mixture.	

[1]Directed broadcast applications cannot be used in red alder plantations.

[2]Formulations listed above are based on a total solution application rate of 10 gallons/acre.

Adapted from Dow Agrosciences, 2007 and Loveland Products, Inc., 2008 B.

Cut-Stump Application: Herbicide Formulations and Guidelines				
Application Technique	**Target Species**	**Chemicals and Mix Rates[1]**	**Treatment Technique[2]**	**Application Timing**
Conventional Oil-based herbicides	Will control or partially control sprouting stumps of the following species: ▪ Bigleaf maple ▪ Black cottonwood ▪ Paper birch ▪ Cherry ▪ Willow	Triclopyr ester (Garlon 4) ▪ Dilute into a mixture containing 20 - 30% chemical and 70 - 80% W.E.B oil or some other oil carrier.	▪ Spray or paint all of the exposed cambium area next to the bark, the entire circumference of the stump, and the root collar down to the soil line of the target stump. ▪ Spray target areas of the stump until thoroughly wet but not to the point of run off. ▪ If treating a larger tree, it is important to also treat any exposed roots that may surround the stump to ensure effective control. ▪ Treatment can be made any time after cutting but preferably after at least 1 to 30 days has passed since cutting and/or before the stump re-sprouts. ▪ Use the higher rate for larger trees and on hard to control species. Special attention should be paid to bigleaf maple and black cottonwood since these species are vigorous sprouters.	▪ Application may take place any time of year after cutting except when it is raining or snowing or if snow or water prevents spraying to the ground line. ▪ Treatment in the spring should be avoided since sap is moving upward and chemical loss is likely. ▪ Application during the winter months is easier since the tree is not leafed out and is easier to access.
Thinline Water-soluble herbicides	Will control or partially control sprouting stumps of the following species: ▪ Black cottonwood ▪ Red alder ▪ Willow	Glyphosate (Accord Concentrate) ▪ May be applied undiluted at 100% or as a dilute mixture containing 50% chemical, 50% water.	▪ A highly concentrated mixture or undiluted herbicide is applied only to the exposed cambium layer next to the bark around the entire circumference of a freshly cut stump surface. ▪ One tablespoonful or about 0.5 ounces is adequate for most stumps under 12-inches in diameter when uniformly distributed in a thin line around the cambium perimeter. ▪ Two tablespoons or about 1 ounce is required for stumps over 12 inches in diameter. ▪ The stump must be treated immediately after the stump is cut, preferably within 10 minutes of cutting. A delay of 30 minutes or more between cutting and application will greatly reduce the treatment effectiveness. ▪ If more than 30 minutes has passed since the time of cutting, you will need to either re-cut the stump and quickly apply the selected water-soluble herbicide or switch to using the ester form of triclopyr (Garlon 4). ▪ This method is far less costly than the conventional application technique since significantly less herbicide is used and less time is spent at each stump by the applicator. ▪ Special attention should be paid to bigleaf maple and black cottonwood since these species are vigorous sprouters.	▪ Application is most effective during mid-summer to mid-fall.[3]
	Will control or partially control sprouting stumps of the following species: ▪ Bigleaf maple ▪ Black cottonwood ▪ Paper birch ▪ Cherry ▪ Red alder ▪ Willow	Imazapyr (Arsenal AC) ▪ Dilute into a mixture containing 5% chemical, 95% water.		▪ Application is most effective during mid-summer to mid-fall.[3] ▪ Application may take place any time of year except during spring when sap is moving upward (March to May).
		Triclopyr amine (Garlon 3A) ▪ Apply undiluted at 100%.		▪ Application is most effective during the early summer (June to July). ▪ Application may take place any time of year except during spring when sap is moving upward (March to May).

[1]Addition of a dye into the herbicide mixture will aid in visual assessment of treated stumps.

[2]Herbicide mixtures may be applied with a backpack or hand-held sprayer, a squirt bottle, or a paint brush.

[3]Stumps receiving this treatment during mid-summer to mid-fall may sprout weakly the second year but should eventually die.

Adapted from Dow Agrosciences, 2008, Dow Agrosciences, 2007, BASF, 2008, Belz, 2002, and Newton, 2009.

Frill Application: Herbicide Formulations and Guidelines			
Target Species	**Chemicals and Mix Rates**	**Treatment Technique[1]**	**Application Timing**
Used to kill individual stems greater than 4-inches of the following species: ▪ Bigleaf maple ▪ Black cottonwood ▪ Paper birch ▪ Red alder ▪ Cherry ▪ Willow	Imazapyr (Arsenal AC) ▪ If treating black cottonwood, paper birch, red alder, cherry, and willow, apply as a dilute mixture containing 25% chemical and 75% water. ▪ If treating bigleaf maple, apply as a dilute mixture containing 50% chemical and 50% water. ▪ Heavy dosages of imazapyr can result in flashback damage to untreated trees.	▪ Make one cut for every 3 inches of diameter and apply 1 milliliter (0.25 teaspoons) of the herbicide mixture into each cut. ▪ If a continuous frill is made around the target stem instead of spaced cuts, spray the exposed cambium layer in the frill with the herbicide mixture.	▪ Application is most effective from late summer to early fall. ▪ Application may take place any time of year but treatment effectiveness will be impacted. ▪ If application takes place in the winter and spring, higher concentrations of chemical should be used.
	Triclopyr amine (Garlon 3A) ▪ If treating black cottonwood, paper birch, red alder, cherry, and willow, apply as a dilute mixture containing 50% chemical, 50% water. ▪ If treating bigleaf maple, apply undiluted at 100%.	▪ Make one cut for every 3 to 4 inches of diameter and apply 1 milliliter (0.25 teaspoons) of the herbicide mixture into each cut if using the diluted solution or 0.5 milliliters (0.125 teaspoons) if using the undiluted solution. ▪ If a continuous frill is made around the target stem instead of spaced cuts, spray the exposed cambium layer in the frill with the herbicide mixture.	▪ Application is most effective from late summer to early fall but application may take place any time of year with good success. ▪ Application is effective in the spring, fall, and winter if trees are completely frilled.
[1]Oblique angled cuts should be made through the bark and into the cambium and sapwood of the target tree using a hatchet, machete, chainsaw or axe. Cuts should be made at a convenient height less than 3 feet above the ground line and below all live branches. Once the cut has been made, the herbicide solution should be applied immediately to the cut with a backpack sprayer, squirt bottle, or other instrument. The herbicide should be sprayed directly onto the cambium and no liquid should ooze out of the notch. As an alternative to spaced cuts, a continuous frill may also be made around the target tree using a chainsaw. The bark layer can then be pealed off using a hatchet exposing the cambium layer for treatment.			
Adapted from BASF, 2008, Dow Agrosciences, 2008, Belz, 2002, and Newton, 2009.			

Appendix 8
Thinning

Thinning Risks

Thinning Shock

Thinning shock occurs in stands that experience prolonged competition making tree crowns temporarily incapable of using the additional growing space. Thinning shock generally occurs in stands where crown ratios are less than 30% (Emmingham and Green, 2003). Stand growth may be significantly slowed or may stop for a few years after thinning until the trees develop the additional foliage necessary to support tree growth.

Sunscald

Sunscald results from the sudden exposure of tree trunks to sun after a thinning. Dense stands tend to have thinner bark and excessive sun exposure (generally on the south and southwest side) can kill phloem and xylem cells under the bark. This can result in defective logs, reduced growth, and reduced log value (Emmingham and Green, 2003). Sunscald potential is higher for thinned barked species such as western red cedar, western hemlock, and red alder, particularly if they have been growing in dense stands.

Blowdown & Breakage

Blowdown risk always increases temporarily after a thinning but the risk is much higher if the stand is considered grossly overstocked (this is particularly true in commercial thinning operations). Trees growing in very dense stands for extended periods of time lack the adequate stem and root systems required to survive in a more open and exposed growing condition. The potential for blowdown and breakage is very high for red alder stands.

Manager or Operator Error

This type of error may occur if an incorrect or poor thinning prescription is selected, if thinning is implemented too early or too late, or as a result of operator carelessness. If an operator is careless or inexperienced, the operator may cause excessive damage to leave trees or remove trees that should be retained.

Computing Curtis' Relative Density

In Curtis' Relative Density, the stand's basal area per acre and quadratic mean diameter function as a proxy for leaf area (site occupancy) and indicate the level of competition within a stand.

The equation for computing Curtis' Relative Density is:

- Curtis' Relative Density = Basal Area per Acre/SQRT. (QMD)

Basal area/acre and QMD can be extracted from the statistical cruise report provided by Atterbury's SuperAce software. If only a few reconnaissance plots are taken, basal area/acre and QMD can be computed using the Relative Density Calculator spreadsheet. This spreadsheet can be used to determine RD values for each reconnaissance plot, which can then averaged to obtain an overall stand value.

Steps for Computing Curtis' Relative Density From Plot Data

1. Calculate Basal Area per Acre (BA/Acre): BA/Acre = Basal Area Factor x Tree Count
2. Calculate Trees per Acre for each DBH Class (TPA/DBH Class): TPA/DBH Class = Basal Area Factor/(0.005454 x DBH^2)
3. Calculate Total Trees per Acre (TPA): Total TPA = Sum (Trees per Acre per DBH Class)
4. Calculate the Average Basal Area/Tree (BAPT): BAPT = Basal Area per Acre/Trees per Acre
5. Calculate Quadratic Mean Diameter (QMD): QMD = SQRT. (BAPT/0.005454)
6. Calculate Relative Density (RD): RD = Basal Area per Acre/SQRT. (QMD)

Plot Data Example

Plot Data: BAF = 40			
DBH Class	**Tree Count**	**Basal Area/Acre**	**Trees per Acre**
24	1	40	13
18	2	80	45
21	1	40	17
16	2	80	57
12	1	40	51
TOTALS	**7**	**280**	**183**
BAPT =			**1.53**
QMD =			**16.7**
RD =			**68**

Relative Density Stocking Standards	
Stocking Standard	**Description**
▪ Understocked	Commercial timber stands with RD values below the Management Zone Lower Limit for the species are considered understocked for timber production.
▪ Management Zone Lower Limit	Commercial timber stands with RD values at or above the Management Zone Lower Limit are considered adequately stocked for timber production.
▪ Management Zone Upper Limit	Commercial timber stands with RD values at or approaching the Management Zone Upper Limit are considered fully stocked for timber production and may be considered for thinning or final harvest.
▪ Mortality Zone	Commercial timber stands with RD values at or exceeding the Mortality Zone are considered overstocked for timber production. Stands within the mortality zone experience reduced growth rates, have crown ratios of 30% or less, are susceptible to biotic and/or abiotic mortality agents because of a reduction in stand vigor, and are beginning to "self-thin".

Douglas-fir Stocking Guide Using Curtis' Relative Density (RD)									
Quadratic Mean Diameter (QMD)	Management Zone Lower Limit RD = 35			Management Zone Upper Limit RD = 60			Mortality Zone Lower Limit RD = 65		
	Trees per Acre (TPA)	Spacing (ft. x ft.)	Basal Area per Acre	Trees per Acre (TPA)	Spacing (ft. x ft.)	Basal Area per Acre	Trees per Acre (TPA)	Spacing (ft. x ft.)	Basal Area per Acre
6	437	10	86	749	8	147	811	7	159
7	347	11	93	594	9	159	644	8	172
8	284	12	99	486	9	170	527	9	184
9	238	14	105	407	10	180	441	10	195
10	203	15	111	348	11	190	377	11	206
11	176	16	116	302	12	199	327	12	216
12	154	17	121	265	13	208	287	12	225
13	137	18	126	235	14	216	254	13	234
14	123	19	131	210	14	224	228	14	243
15	110	20	136	189	15	232	205	15	252
16	100	21	140	172	16	240	186	15	260
17	92	22	144	157	17	247	170	16	268
18	84	23	148	144	17	255	156	17	276
19	77	24	153	133	18	262	144	17	283
20	72	25	157	123	19	268	133	18	291
21	67	26	160	114	20	275	124	19	298
22	62	26	164	107	20	281	115	19	305
23	58	27	168	100	21	288	108	20	312
24	55	28	171	94	22	294	101	21	318

Red Alder Stocking Guide Using Curtis' Relative Density (RD)									
Quadratic Mean Diameter (QMD)	Management Zone Lower Limit RD = 20			Management Zone Upper Limit RD = 35			Mortality Zone Lower Limit RD = 40		
	Trees per Acre (TPA)	Spacing (ft. x ft.)	Basal Area per Acre	Trees per Acre (TPA)	Spacing (ft. x ft.)	Basal Area per Acre	Trees per Acre (TPA)	Spacing (ft. x ft.)	Basal Area per Acre
6	250	13	49	437	10	86	499	9	98
7	198	15	53	347	11	93	396	10	106
8	162	16	57	284	12	99	324	12	113
9	136	18	60	238	14	105	272	13	120
10	116	19	63	203	15	111	232	14	126
11	101	21	66	176	16	116	201	15	133
12	88	22	69	154	17	121	176	16	139
13	78	24	72	137	18	126	156	17	144
14	70	25	75	123	19	131	140	18	150
15	63	26	77	110	20	136	126	19	155
16	57	28	80	100	21	140	115	19	160
17	52	29	82	92	22	144	105	20	165
18	48	30	85	84	23	148	96	21	170
19	44	31	87	77	24	153	89	22	174
20	41	33	89	72	25	157	82	23	179
21	38	34	92	67	26	160	76	24	183
22	36	35	94	62	26	164	71	25	188
23	33	36	96	58	27	168	66	26	192
24	31	37	98	55	28	171	62	26	196

Western Red Cedar/Western Hemlock Stocking Guide Using Curtis' Relative Density (RD)									
Quadratic Mean Diameter (QMD)	Management Zone Lower Limit RD = 40			Management Zone Upper Limit RD = 65			Mortality Zone Lower Limit RD = 70		
	Trees per Acre (TPA)	Spacing (ft. x ft.)	Basal Area per Acre	Trees per Acre (TPA)	Spacing (ft. x ft.)	Basal Area per Acre	Trees per Acre (TPA)	Spacing (ft. x ft.)	Basal Area per Acre
6	499	9	98	811	7	159	873	7	171
7	396	10	106	644	8	172	693	8	185
8	324	12	113	527	9	184	567	9	198
9	272	13	120	441	10	195	475	10	210
10	232	14	126	377	11	206	406	10	221
11	201	15	133	327	12	216	352	11	232
12	176	16	139	287	12	225	309	12	242
13	156	17	144	254	13	234	274	13	252
14	140	18	150	228	14	243	245	13	262
15	126	19	155	205	15	252	221	14	271
16	115	19	160	186	15	260	201	15	280
17	105	20	165	170	16	268	183	15	289
18	96	21	170	156	17	276	168	16	297
19	89	22	174	144	17	283	155	17	305
20	82	23	179	133	18	291	143	17	313
21	76	24	183	124	19	298	133	18	321
22	71	25	188	115	19	305	124	19	328
23	66	26	192	108	20	312	116	19	336
24	62	26	196	101	21	318	109	20	343

Using Relative Density to Develop CT Prescriptions

If a Douglas-fir stand with a QMD of 8-inches and 400 trees per acre will be thinned from below and the operation is estimated to increase the stand's QMD to 11-inches, at least 175 trees per acre should be left according to the stocking guide to ensure that the stand is not understocked (RD < 35). At 175 trees per acre, the stand should be able to attain a QMD of 16 inches before the stand reaches the management zone upper limit or mortality zone.

If the thin-from-above approach is used, results from the tabular stocking guides must be adjusted since removing larger trees reduces the stand's QMD after thinning. If a red alder stand with a QMD of 10-inches and 230 trees per acre is thinned from above and the operation is estimated to reduce the stand's QMD to 8-inches, at least 160 trees per acre should be left according to the stocking guide to ensure that the stand is not understocked (RD < 20).

Acceptable H/D Ratios					
Shade-Intolerant Species			**Shade-Tolerant Species**		
An H/D ratio ≤ 85 indicates good tree stability			An H/D ratio ≤ 90 indicates good tree stability An H/D ratio ≤ 95 may also be acceptable depending on the site		
Acceptable Total Heights by DBH with a Height/DBH Ratio = 85			Acceptable Total Heights by DBH with a Height/DBH Ratio = 90		
DBH (in.)	DBH (ft.)	Total Ht. (ft.)	DBH (in.)	DBH (ft.)	Total Ht. (ft.)
6	0.50	43	6	0.50	45
7	0.58	50	7	0.58	53
8	0.67	57	8	0.67	60
9	0.75	64	9	0.75	68
10	0.83	71	10	0.83	75
11	0.92	78	11	0.92	83
12	1.00	85	12	1.00	90
13	1.08	92	13	1.08	98
14	1.17	99	14	1.17	105
15	1.25	106	15	1.25	113
16	1.33	113	16	1.33	120
17	1.42	120	17	1.42	128
18	1.50	128	18	1.50	135
19	1.58	135	19	1.58	143
20	1.67	142	20	1.67	150
Note: An H/D ratio ≥ 100 is considered extreme for both shade-intolerant and shade-tolerant species. A stand with this H/D ratio should be thinned very lightly, stage thinned, or not thinned at all.					

Pre-Commercial Thinning Density Guidelines for Westside Species							
Species	**Optimum Conditions for PCT**			**Tree Spacing for Optimum Wood Production[1]**		**Potential Problems**	
	Age (yrs)	**Height (ft)**	**DBH (in)**	**TPA**	**Spacing (ft x ft)**	**In-growth Potential**	**Sunscald Potential**
Douglas-fir[2]	10 – 15	10 – 15	2 – 4	345	11	Low	Moderate
Western Hemlock	10 – 15	15 – 25	2 – 4	375	11	High	High
Red Alder	4 – 6	26 – 33	3 - 4	285	12	High	High
[1]Recommended spacing assumes first commercial thinning when average DBH = 10" for Douglas-fir and western hemlock and 8" for red alder. [2]On higher sites planted with Douglas-fir, PCT at 10 – 12 yrs. old; on lower sites, PCT at 13-15 yrs. old (Reukema, 1975). Western red cedar is not listed because pre-commercial thinning in western red cedar stands is not generally practiced unless heavy in-growth has occurred (Stennick, 2009).							
Adapted from Oester and Emmingham, 1997.							

PCT Survey Methodology

Appropriately sized fixed-area plots at a density of 1-2 plots per acre will be installed on a uniform grid. The plot radius used must be long enough so that if the plot lands directly in the middle of a row of trees, it will pick these trees up in the sample (ACI, 2006). The minimum acceptable plot radius can be calculated using the formula below:

- Minimum acceptable plot radius (ft.) = SQRT.[((Tree spacing/2)^2)+((Tree spacing/2)^2)]

The table below provides the minimum acceptable fixed-area plot radius for tree spacings commonly used in forestry plantations.

Minimum Acceptable Fixed-Area Plot Radius for Tree Spacings Commonly Used in Forestry Plantations					
Initial Planting Spacing (ft. x ft.)	**Trees per Acre (TPA)**	**Minimum Acceptable Circular Plot Radius**		**Plot Size (Acres)**	**Plot Size (Fraction Acres)**
		Feet	**Inches**		
7	889	4	11	0.00177	1/565
8	681	5	8	0.00231	1/433
9	538	6	4	0.00292	1/342
10	436	7	1	0.00361	1/277
11	360	7	9	0.00436	1/229
12	303	8	6	0.00519	1/193
13	258	9	2	0.00609	1/164
14	222	9	11	0.00707	1/141

At each plot, species, DBH, total height, and crown ratio will be recorded for each "in" tree. If data for the management unit is available in the most recent Reservation-wide forest inventory, it will be used in place of conducting an actual survey.

PRE-COMMERCIAL THINNING CONTRACT AGREEMENT

Location

The pre-commercial thinning units are located in a portion of Section XX, Township X North, Range X East on the Lummi Indian Reservation, Whatcom County, Washington. There are approximately XX-acres to be pre-commercially thinned on the following trust allotments: XX-X & XX-X. Please see attached map. The Contractor shall confine the operation to the designated project area, which has been flagged out with XX ribbon.

Payment and Terms

A. The Lummi Indian Business Council (LIBC) shall reimburse the Contractor upon the satisfactory completion of all pre-commercial thinning per unit at the bid price/acre.

B. The treatment shall be inspected by the LIBC Forest Manager to ensure compliance with specifications and conditions of the contract. Circular 1/20th acre plots (26.3 ft. radius, horizontal distance) will be installed by the LIBC Forest Manager to check contract compliance and as a basis for determining satisfactory quality.

C. The Contractor shall invoice the LIBC Natural Resource Department. Payment for completed work will be made from the LNR Forestry Account.

D. The Contractor shall provide all equipment, supplies, personnel, and transportation to and from the site(s).

E. The Contractor shall be required to attend a pre-work conference with the LIBC Forest Manager prior to the execution of this contract.

F. The Contractor shall provide proof of Insurance (Certificate of Liability Insurance) in the amount of at least $1,000,000 in broad liability insurance. The Contractor shall be liable for financial costs for damage to personal and real property.

G. The Lummi Nation reserves the right to waive technical defects and to reject any unsatisfactory work. The required number of leave trees per acre must fall between the maximum and minimum listed in the Leave Tree Distribution portion of the thinning prescription. Areas not meeting these specifications will be considered unsatisfactory work.

H. The operation is subject to fire precaution shutdown periods and the Contractor shall comply with the current precaution levels and operation restrictions for the area.

I. All pre-commercial thinning work shall commence upon approval of the contract and shall be completed on or before XXX, X, XXXX.

Treatment Conditions and Specifications

Stand Description: Allotment No. X-X, Stand 1	
Species Composition:	XX% XX and XX% XX
Age:	XX years old
Trees per Acre:	XXX
Avg. DBH:	XX-inches
Avg. Total Height:	XX-feet
Slope:	XX%
Aspect:	X
Forest Health Issues:	XX
Thinning Prescription	
Thinning Type:	Thin-from-Below: All suppressed and intermediate trees shall be cut.
Target Leave Trees/Acre:	XXX
Target Species Composition:	• The target SPECIES composition of the residual stands shall be: XX XX and XX XX. • XX is the preferred timber species. • All XX shall be cut. • Species composition may vary by up to 15%.
Leave Tree Definition:	• Leave trees shall be the BEST XXX trees per acre of the preferred SPECIES distributed UNIFORMLY over the area. • The BEST trees are defined as having the following characteristics in descending order of importance: 1. Fullest and most vigorous crown. 2. Free of disease, major defect, and damage. 3. Largest diameter. 4. Best form, which includes tallest tree, straightest bole, least taper, or smallest limb diameter. • Leave trees will be selected by comparing their characteristics with other trees in the stand.
Leave Tree Distribution:	• Leave trees must be UNIFORMLY distributed throughout the unit. • UNIFORMLY distributed means that openings created by felling shall not exceed XX feet. • The maximum number of leave trees on any one-acre is XXX and the minimum number of leave trees on any one acre is XXX provided that the average in the unit is approximately XXX trees per acre. • Selection of superior leave trees shall supersede strict adherence to the specified spacing. • Avoid creating larger openings than what already exists. • Don't maintain an area of overdense trees to compensate for a large gap in another part of the stand.
Unacceptable Leave Tree Damage:	• The Contractor shall take the utmost care in minimizing damage to leave trees by utilizing skilled, directional felling techniques and shall strive for zero damage at all times. • Unacceptable leave tree damage shall be defined as follows: o Leave tree has one or more wounds on its bole exposing the cambium layer, which in total exceeds 1 square inch. A wound is defined as the removal of outer bark and cambium from the stem

	with no penetration into the sapwood. ○ Leave tree top is broken or the live crown is reduced below 50%. ○ Leave tree has a major gouge on the stem caused by a power saw. A gouge involves penetration into the sapwood or deeper. ○ Greater than 10% of the leave trees have wounds of less than 1 square inch.
Cut Tree Definition:	• All XX and XX exceeding XX feet in total height or XX in diameter shall be cut. • All trees exhibiting symptoms of XX (disease or infection) shall be cut. • Single trees within openings shall be retained even if they are designated as cut trees. • Forked or double-topped trees shall be cut. However, if selected to leave, they shall be left wholly uncut.
Cut Tree Stump Height:	• All cut trees shall be cut as close to the ground as practical below the lowest living branch. • Under no circumstance shall stump height exceed 1 foot. • Cut stump angle shall not be greater than 30 degrees from horizontal. • All cut trees shall be cut from the stump completely. No cut tree shall be left "hinged" to the stump.
Slash Disposal:	• No cut trees shall be left hanging up in the overstory or leaning against leave trees. • ALL cut trees shall be dropped and laid flat on the ground for worker safety and to expedite decomposition.

Commercial Thinning Density Guidelines for Westside Species[1] (Single Density Thinning - Smallwood)					
Factor	**Douglas-fir**	**Red Alder**	**Western Red Cedar**	**Western Hemlock**	**Mixed Species Stands**
Pre-thinning RD	≥ 55	≥ 35	≥ 60	≥ 60	≥ 65
Live Crown Ratio	≥ 30%	≥ 40%	≥ 35%	≥ 35%	≥ 35%
Residual H/D Ratio	< 85	< 85[2]	< 90	< 90	< 85 (shade intolerant) < 90 (shade tolerant)
d/D Ratio[3]	0.8 – 1				
Residual Stand RD[4]	35 – 40	20 – 25	40 – 45	40 – 45	45

[1]Applicable for stands less than 45 years old. Commercial thinning in stands over the age of 45 is not typically done to increase wood production.
[2]This is not a published value but is an estimate based on shade tolerance.
[3]The d/D ratio is the most common quantitative expression of thinning type (BCMOF, 1999). It is the ratio of the average DBH of trees removed in a thinning to the average DBH of the stand before thinning. A d/D ratio of 1 implies thinning evenly throughout the diameter classes, a d/D ratio < 1 implies a low thinning, and a d/D ratio > 1 implies a high thinning.
[4]For conifers, RD should not be reduced by more than 20 RD points OR 40% of pre-thinning RD except when management objectives necessitate otherwise. For red alder, RD should not be reduced by more than 15 RD points. Maintaining the minimum RD values after thinning will ensure that future stand stocking is not sacrificed for current income. RD may vary by 5 to 7 RD points on either side of the average after thinning is complete.

Adapted from WADNR, 1999.

CT Timber Cruising Methdology

Cruise Method

Volume and grade estimates for commercial thinning will be determined using fixed-area or variable plots. 1/20th-acre fixed-area plots have historically provided good results. The thinning prescription must be specified prior to beginning the cruise so that cut tree designations can be made while cruising. Only designated cut trees should be cruised for volume. Although not necessary, species and DBH should be taken on leave trees to determine an accurate figure for trees per acre for the entire stand. Leave tree data cannot be included in the plot data entered into Atterbury's SuperAce software since the objective of the cruise is to determine cut tree volume. When variable plots are used, cut and leave tree designations are made from all 'in" trees at the sample point.

Cruise Intensity

Since commercial thinnings are typically sold on a scale basis, it is not as imperative to meet the sampling error required for a lump sum sale (≤10% at one standard deviation). However, this is a reasonable standard that will be the cruising objective on commercial thinning scale sales. Installing at least one plot per acre will generally achieve this sampling error. A more detailed description on timber cruising methodology is provided in the Forestry Permits and Timber Sale Contracts Handbook (Appendix 9). A cruise may not be necessary if acceptable cruise data is available for the management unit in the most recent forest inventory.

Cruise Design

Plots will be established on a uniform grid with cruise lines oriented perpendicular to topography lines to achieve a representative sample. If necessary, adjustments will be made for non-stocked acreage.

Tree Measurements

All conifer and hardwood trees with a DBH ≥ 4" that are designated as cut trees will be cruised for volume at each plot. Species, DBH, form factor, bole height, sort, grade, and defect will be recorded.

Cruise Reports

Cruise data will be compiled and analyzed using Atterbury's SuperAce cruising program. Relevant reports for commercial thinnings include Log Stock Table Tons, Statistics, Species, Sort & Grade, Stand Table Summary, and Tree Segment Volumes.

Root Rot Thinning Guidelines in Single-Species Stands

- No thinning should occur within 50 feet of the infection center.
- 10 - 15 year old sapling stands infected with Laminated root rot: cut all trees displaying symptoms and all those adjacent to them (within 15 to 25 feet) to eliminate the disease pathway. Cut all the susceptible adjacent trees even if they do not show symptoms.
- 10 - 20 year old sapling stands severely infected with Armillaria root rot (> 4 infection centers per acre): no pre-commercial thinning should be done.
- 10 - 20 year old sapling stands moderately infected with Armillaria root rot (< 4 infection centers per acre): pre-commercial thinning should be done with the focus on cutting infected trees and susceptible adjacent trees within 60 feet.
- 25 - 35 year old pole stands infected with high levels of root rot (> 20% of area is visibly affected): no commercial thinning should be done.
- 25 - 35 year old pole stands infected with moderate levels of Laminated root rot: cut all trees in infection center and re-stock with fast growing, resistant hardwood species or less susceptible conifer species or isolate the infection center by harvesting adjacent "bridge trees".

Root Rot Thinning Guidelines in Mixed-Species Stands

- Leave non-host species (hardwoods) or conifers with low susceptibility to disease (western red cedar) around the disease center.

Appendix 9
Forestry Permits and Timber Sale Contracts Handbook

LUMMI FORESTRY DIVISION

Forestry Permits and Timber Sale Contracts Handbook

Prepared by: Zach Dewees, Forest Manager
Lummi Natural Resource Department
Forestry Division

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FORESTRY PERMITS AND TIMBER SALE CONTRACTS HANDBOOK

- **1.0 Overview**

  The Forestry Division is responsible for processing, issuing, and administering LNR Beachwood Permits, LNR Firewood Permits, LNR Commercial and Residential Burning Permits, LNR Residential Tree Removal Permits, LNR Fee Land Timber Cutting Permits, BIA Free Use Timber Cutting Permits, BIA Paid Timber Cutting Permits, and BIA Timber Sale Contracts.

  The following section provides pertinent details for each of type of permit and contract including information on permit processing and administration, the federal and tribal regulatory structure, and samples of each type of permit and contract. A comprehensive step by step section on processing and administering BIA paid timber cutting permits and BIA timber sale contracts is provided later in this section since these instruments are used for major timber harvesting activities that require extensive planning, environmental and technical reporting, fieldwork, timber marketing, and contract administration.

- **1.1 Permit Regulations**

  - **1.1.1 Federal Regulations**

    All timber harvesting activities on trust lands of the Lummi Reservation are subject to the Code of Federal Regulations, Part 163 – General Forestry Regulations. These regulations were developed as a result of the National Indian Forest Resources Management Act of 1990 and outline the administrative requirements for the sale and use of Indian forest products. A copy of the Code of Federal Regulations, Part 163, General Forestry Regulations is provided in Appendix A. In addition to NIFRMA and CFR Part 163, timber harvest and permitting activities on the Lummi Reservation are also subject to the National Environmental Policy Act (NEPA), the Clean Water Act (CWA), the Clean Air Act (CAA): Federal Air Rules for Reservations (Code of Federal Regulations - Part 49), the Endangered Species Act (ESA), the Bald and Golden Eagle Protection Act (BGEPA), the Migratory Bird Treaty Act (MBTA), the National Historic Preservation Act (NHPA), and the Archaeological Resources Protection Act (ARPA). A copy of relevant portions of the Code of Federal Regulations, Part 49, Tribal Clean Air Act Authority is provided in Appendix B.

  - **1.1.2 Tribal Regulations**

    Title 10.18 – Forestry in the Lummi Code of Laws establishes the Tribe's management authority over forest resources within the Reservation and clearly defines the permitting requirements for the harvest and use of forest resources. Permits specifically addressed in Title 10.18 include firewood permits, beachwood permits, timber cutting permits, and burn permits. A copy of Title 10.18 – Forestry is provided in Appendix C. In addition to Title 10.18, timber harvest and permitting activities on the Lummi Reservation are also subject to Title 13 Tidelands Code, Title 15 Land Use, Zoning, and Development Code; Title 17 Water Resources Protection Code; Title 18 Solid Waste Control and Disposal Code; Title 40 Cultural Resources Preservation Code, and the Lummi Nation Coastal Zone Management Plan.

- **1.2 Forestry Permits**

  - **1.2.1 LNR Beachwood Cutting Permit**

    An LNR beachwood cutting permit is required to harvest beachwood on tribal tidelands of the Lummi Reservation. Beachwood cutting permits are available upon request but can only be issued to enrolled Lummi tribal members. The Permittee is limited to 3 cords per permit and the wood is restricted to personal use only. No beachwood cutting is permitted on Portage Island or along any islands or shoreline of the Nooksack River. Specific regulations for beachwood cutting permits can be found in the Lummi Code of Laws, Title 10.18.050. A sample LNR Beachwood Cutting Permit is provided in Appendix D.

- **1.2.2 LNR Firewood Cutting Permit**

  An LNR firewood cutting permit is required for cutting blowdown on trust land zoned for residential, agriculture, commercial, or mixed-use. No trees may be felled under the authority of an LNR firewood cutting permit. Firewood cutting permits are available upon request but can only be issued to enrolled tribal members who hold an interest in the trust parcel they wish to cut on or to enrolled tribal members who wish to cut blowdown on land owned by the Tribe. It may be necessary to obtain an informational title status report from Lummi Realty or from the BIA to verify ownership prior to issuing a firewood cutting permit on individual native trust land. If the trust parcel has undivided interests, the permit applicant must obtain consent from 51% of the ownership in writing. The Permittee is limited to 3 cords per permit and the wood is restricted to personal use only.

  If a landowner wishes to cut firewood from a deck of timber remaining after the completion of a BIA paid timber cutting permit or BIA timber sale contract, an LNR firewood cutting permit cannot be used. Instead, a BIA free use timber cutting permit must be issued and approved by the BIA Superintendent.

  Specific regulations for firewood cutting permits can be found in the Lummi Code of Laws, Title 10.18.040. A sample LNR Firewood Cutting Permit is provided in Appendix E.

- **1.2.3 LNR Burning Permit**

  - **1.2.3.1 Residential Burning Permit**

    A residential burning permit is required for all outdoor burning of yard waste or small land clearing debris. Residential burning permits are available upon request and may be issued to both enrolled tribal members and non-tribal members. The burning permit provides the Permittee with instructions on what can and cannot be burned, safe burning techniques, liability, and contact information for the Whatcom County Fire Dispatch Center and the Marietta Fire District. The permit requires the Permittee to contact these two fire agencies prior to ignition so they are aware of burning in the area. No burning is permitted when a burn ban is in effect except for cultural fires, recreational fires limited to 3 feet in diameter in an enclosure, and burning in burn barrels with a wire mesh cover. Residential burning permits may be temporarily suspended or permanently revoked if burning presents a public nuisance or health hazard.

  - **1.2.3.2 Commercial Burning Permit**

    A commercial burning permit is required for all outdoor burning of logging slash or land clearing debris resulting from commercial timber harvest or land clearing operations. Commercial burning permits usually take 1 to 5 days to obtain and may be issued to both enrolled tribal members and non-tribal members. Like the residential burning permit, the commercial burning permit provides the Permittee with instructions on what can and cannot be burned, safe burning techniques, liability, and contact information for the Whatcom County Fire Dispatch Center and the Marietta Fire District. The permit requires the Permittee to contact these two fire agencies prior to ignition so they are aware of burning in the area. This is particularly important for commercial burning operations since the smoke generated can appear as a large forest fire to the general public. The Permittee is also required to notify all adjacent landowners within a 0.25-mile radius of the burning activities prior to receiving the permit. The Permittee must provide proof of insurance that covers fire damage if the fire escapes. No commercial burning is permitted when a burn ban is in effect. Commercial burning permits may be temporarily suspended or permanently revoked if burning presents a public nuisance or health hazard. Commercial burning near residential areas may not be possible where there is heavy landowner opposition.

    Federal regulations for open burning on Indian Reservations can be found in the Code of Federal Regulations, Part 49.131. Tribal regulations for burning permits can be found in the

Lummi Code of Laws, Title 10.18.100. A sample LNR Residential Burning Permit is provided in **Appendix 9F** and a sample LNR Commercial Burning Permit is provided in Appendix G.

- **1.2.4 LNR Residential Tree Removal Permit**

An LNR Residential Tree Removal Permit (RTRP) is required for all small-scale timber cutting activities on trust and fee parcels zoned for residential, agriculture, commercial, or mixed-use where forest products are valued at less than $5001 stumpage price, and land clearing is less than 1-acre in size. On trust land, there is the added condition that the parcel must have a single landowner in order to qualify or in the case of undivided interest, must have a homestead lease that is recorded on a certified title status report and all landowners involved have signed the homestead lease. If either of these two conditions does not exist, a residential tree removal permit cannot be used on trust land and a BIA free-use timber cutting permit is required.

In 2007, the Lummi Forestry Division mailed a memorandum of understanding to the BIA proposing the use and justification for the Residential Tree Removal Permit for trust lands. The BIA concurred with the MOU and a copy of their response letter along with the MOU is provided in Appendix H.

Residential tree removal permits usually take 1 to 3 weeks to obtain. They typically are issued for hazard tree removal, small homesite clearings, and firewood harvest. The main purpose of the permit is to outline the Permittee's liability in proceeding with the harvest, to protect Reservation resources, and to protect the Tribe from legal action. If the harvest area is adjacent to homes, powerlines, roads, or other improvements, the Permittee may be required to hire a contractor with sufficient liability insurance to cover any accidental damages. In this case, the Permittee or contractor must provide a copy of the contractor's current certificate of liability insurance to the LIBC Forest Manager to ensure that the contractor holds adequate coverage prior to permit issuance. Specific regulations for timber cutting permits can be found in the Lummi Code of Laws, Title 10.18.080.

A step-by-step flowchart for processing LNR Residential Tree Removal Permits is provided in Appendix I. A sample LNR Residential Tree Removal Permit is provided in Appendix J.

- **1.2.5 LNR Fee Land Timber Cutting Permit**

An LNR Fee Land Timber Cutting Permit is required for all timber harvest activities on fee lands, which do not qualify for a residential tree removal permit. Fee land timber cutting permits usually take 2 weeks to 3 months to obtain. These are typically issued for moderate to large-scale timber harvest activities on fee lands. Prior to issuing a fee land timber cutting permit, the permit applicant must prepare and submit a silvicultural prescription (harvest plan), which must be approved by the LIBC Forest Manager. Components of the silvicultural prescription are listed in 9.3.11 of this section. The Permittee is required to hire a contractor with sufficient liability insurance to cover any accidental damages that may occur during the operation. The Permittee or contractor must provide a copy of the contractor's current certificate of liability insurance to the LIBC Forest Manager to ensure that the contractor holds adequate coverage prior to permit issuance. Harvests on fee lands are not counted towards the Tribe's annual allowable cut figure since this figure is based on trust lands only. Specific regulations for timber cutting permits can be found in the Lummi Code of Laws, Title 10.18.080.

A step-by-step flowchart for processing LNR Fee Land Timber Cutting Permits is provided in Appendix K. A sample LNR Fee Land Timber Cutting Permit is provided in Appendix L.

- **1.2.6 BIA Free-Use Timber Cutting Permit (Form 5-5331)**

A BIA Free-Use Timber Cutting Permit is required for all timber cutting activities on trust land zoned for forest use where forest products are valued at less than $5,001 stumpage price and on trust land with any other zoning classification that has more than one landowner where forest products are valued at less than $5,001 stumpage price.

BIA free use timber cutting permits usually take 2 weeks to 3 months to obtain. If the trust parcel has undivided interests, the individual applying for the permit must obtain consent from at least 51% of the landowners. BIA free use permits are typically issued for small homesite clearings, firewood harvest, and for hazard tree removal. The estimated value that may be harvested in a fiscal year by any individual under the authority of this permit cannot not exceed $5,001 stumpage price. It may also be stipulated that the forest products removed under a free-use permit cannot be sold or exchanged for other goods or services (CFR 163.26(b)).

A "Request for Approval" permit package must be sent to the BIA for review and approval prior to permit issuance and must contain the following items:

1. Request for Approval cover sheet
2. Three original copies of the Free Use Timber Cutting Permit
3. Landowner consent form (if multiple landowners)
4. Forest Manager's narrative
5. Timber cruise reports and valuation.
6. TRC comments
7. Categorical Exclusion Checklist (If any questions on the checklist are answered "yes", an Environmental Assessment is required).
8. Informational Title Status Report
9. Relevant maps and aerial photos
10. Copy of the Lummi Land Use Application

Copies of previous free use timber cutting permits and permit packets are on file at the Forestry Division office. These can be used for preparing future Request for Approval packets. A step-by-step flowchart for processing BIA Free Use Timber Cutting Permits is provided in Appendix M. A sample BIA Free Use Timber Cutting Permit is provided in Appendix N.

If the harvest area is adjacent to homes, powerlines, roads, or other improvements, the Permittee may be required to hire a contractor with sufficient liability insurance to cover any accidental damages that may occur during the operation. The Permittee or contractor must provide a copy of the contractor's current certificate of liability insurance to the LIBC Forest Manager to ensure that the contractor holds adequate coverage prior to permit issuance.

Federal regulations for BIA free use timber cutting permits can be found in The Code of Federal Regulations, Part 163. Tribal regulations for timber cutting permits can be found in the Lummi Code of Laws, Title 10.18.080.

- **1.2.7 BIA Paid Timber Cutting Permit (Form 5-5531)**

A BIA Paid Timber Cutting Permit is required for all timber harvests on trust lands, regardless of zoning classification, where forest products are valued at more than $5,001 but less than $25,000 stumpage price (CFR 163.26(c)). This permit is typically used for small to moderate-scale timber harvests and commercial thinning operations. In addition to the timber cutting permit, Special and Additional Timber Cutting Permit Provisions, Road Use Permits (if any), and a harvest unit map are made part of the permit. The Special and Additional Timber Cutting Permit Provisions detail the requirements and conditions of the timber sale that are not included in the permit. A BIA paid timber cutting permit is issued to the timber sale purchaser and not the landowner(s). The Permittee (purchaser) must provide a copy of his current certificate of liability insurance to the Officer-in-Charge to ensure that the Purchaser holds adequate coverage prior to permit approval and issuance. All BIA paid timber cutting permits are subject to the 10% forest management deduction fee since all timber sales executed under the authority of this permit are valued at over $5,001 stumpage price (CFR 163.25(c)). Deductions are taken out by the BIA and deposited into the Tribe's Forest Management Deduction account.

A BIA paid timber cutting permit usually takes 3 months to 2 years to obtain depending on scheduled harvests, the size of the harvest unit, resource issues, and the number of landowners. If the harvest quota for the current year or the next year has been met, the sale will have to be scheduled 1 or 2 years later. There are also seasonal restrictions placed on harvest operations, which may impact when a paid timber cutting permit may be executed. If the trust parcel has undivided interests, signed Power-of-Attorney forms must be obtained from at least 51% of the ownership, which may also take some time. The estimated value that may be harvested in a fiscal year by any individual under the authority of this permit cannot not exceed $25,000 stumpage price (CFR 163.25(c)). A step-by-step flowchart for processing BIA Paid Timber Cutting Permits is provided in Appendix O.

A "Request for Approval" permit package must be sent to the BIA for review and approval prior to permit issuance and must contain the following items:

1. Request for Approval cover sheet
2. Three original copies of the Paid Timber Cutting Permit, Special an Additional Permit Provisions, and Road Use Permits (if any).
3. Forest Manager's narrative
4. Timber cruise reports and valuation
5. TRC comments
6. Signed Power of Attorney forms
7. Categorical Exclusion Checklist (If any questions on the checklist are answered "yes", an Environmental Assessment is required).
8. Informational Title Status Report
9. Relevant maps and aerial photos
10. Copy of the Lummi Land Use Application

Copies of previous paid timber cutting permits and permit packets are on file at the Forestry Division office. These can be used for preparing future Request for Approval packets. Permit language is critical to the success of the operation and should be closely scrutinized. Essential departures from the approved permit language should be made only after talking with the BIA Agency or Regional Office. A sample BIA Paid Timber Cutting Permit along with Special and Additional Provisions is provided in Appendix P.

Federal regulations for BIA paid timber cutting permits can be found in The Code of Federal Regulations, Part 163. Tribal regulations for timber cutting permits including fines for cutting without a permit can be found in the Lummi Code of Laws, Title 10.18.080.

- **1.2.8 Special Allotment Timber Cutting Permit (Form 5328)**

Although rarely used due to past performance problems, a Special Allotment Timber Cutting Permit (SATCP) may be issued to the sole owner of an Assignment if the owner has logging contracting experience and provides adequate proof of this experience to the Approving Officer. With this permit, the sole owner is responsible for administering the permit and selling the timber to another party under a separate contract from his or her Assignment. The SATCP is a two-page form that includes logging unit location, cutting designations, permit dates, administrative fees, special deposit and standard provisions. Special provisions and a logging unit map are attached. The permit must include provisions for payment of Forest Management Deductions by the Assignment owner to the Tribe's Forest Management Deduction account (CFR 163.26(d)). The permit may also require the Assignment owner to make a bond deposit with the Secretary as required for other types of timber cutting permits or timber sale contracts. The Assignment owner must provide evidence acceptable to the Secretary that he or she has arranged a bona fide sale of the forest products on terms that will protect the Assignment owner's interests.

- **1.2.9 BIA Timber Sale Contracts (Form 5-5327 OR Form 5-5324 and Form 5-5323)**

BIA timber sale contracts are required for all timber harvests on trust lands, regardless of zoning classification, where forest products are valued at more than $15,000 stumpage price unless a special form for a particular sale is approved by the BIA Superintendent (CFR 163.19(a)). As previously mentioned, a BIA Paid Timber Cutting Permit may be used for sales up to $25,000. BIA Timber Sale Contracts are used for medium to large-scale timber harvests. The timber sale purchaser and the BIA Superintendent (who is the designated representative for the heirs of the Assignment) enter into the contract. Like paid timber cutting permits, all BIA timber sale contracts are subject to the 10% forest management deduction fee, which is taken out by the BIA and deposited into the Tribe's Forest Management Deduction account.

There are two timber sale contract forms available for use:

- **Form 5-5327 – Timber Contract for the Sale of Predetermined Volumes**

  Form 5-5327 is used for timber sales where payment is based on volumes that have been determined prior to sale (lump sum sales).

- **Form 5-5324 – Timber Contract for the Sale of Estimated Volumes**

  Form 5-5324 is used for timber sales where payment is based on actual scaled timber volumes (scale sales). If the timber sale contains multiple assignments, **Form 5-5326 - Subsidiary Allotment Timber Contract Sale of Estimated Volumes** must be used and attached to form 5-5324. This document is a subsidiary contract that is required for each assignment in the logging unit and lists the estimated volumes for each assignment. These volumes are used to distribute the advance payment.

A combination of Form 5327 and Form 5324 can be used in special situations where some volume will be sold on a scale basis and some volume will be sold on a lump sum basis.

The majority of timber sales on the Lummi Reservation are done on a lump sum basis so Form 5327 is the contract form most often used. The trend for the timber industry (including state and federal agencies) is to sell timber using Predetermined Volume or Lump Sum timber sale contracts because they are more cost effective, require much less administrative work, foster a competitive bidding environment, and shift log price market risk from the Seller to the Purchaser. Form 5324 is a useful contract instrument for commercial thinning operations. Form 5327 and 5324 are considered Part A of the timber sale contract, which detail the requirements and conditions of the timber sale. A logging unit map; specifications for road design, construction, and maintenance; the road use agreement or permit (if any); and occasionally a skid trail map are attached to Part A as exhibits.

- **Form 5-5323 – Timber Sale Contract Standard Provisions**

  Form 5-5323 is Part B of the timber sale contract and is attached to Part A whether form 5327 or 5324 is used. Part B contains standard provisions that apply to all contract sales of forest products, unless superseded by special provisions in Part A. It is important to be familiar with the Standard Provisions. Duplication or diminishment of the general powers contained in Part B should be avoided.

A BIA timber sale contract usually takes 1 to 2 years to complete depending on scheduled harvests, the size of the harvest unit, resource issues, and the number of landowners. If the harvest quota for the current year or the next year has been met, the sale will have to be scheduled 1 or 2 years later. There are also seasonal restrictions placed on harvest operations, which may impact when a timber sale contract may be executed. If the trust parcel has undivided interests, signed Power-of-Attorney forms must be obtained from at least 51% of the ownership, which may take some time. If the sale is valued at over $25,000, a draft Environmental Assessment (EA) must be prepared which must go out for a 1-month public comment. If no public comments are received, the final EA and a Finding of No Significant Impact (FONSI) are prepared which must also go out for another 1-month comment period.

Finally, depending on the timber sale value, the sale must be advertised for a period of 15 to 60 days (CFR 163.15(a)).

The environmental reporting requirements and administrative paperwork for timber sale contracts vary depending on value. Timber sales valued between $15,000 and $25,000 do not require an EA or a FONSI. A step-by-step flowchart for processing BIA Timber Sale Contracts is provided in Appendix Q.

A "Request for Approval" contract package must be sent to the BIA for review and approval prior to contract issuance and must contain the following items:

1. Request for Approval cover sheet
2. Forest Officer's Report (includes silvicultural prescription, environmental reporting, sample contract, advertisement, and prospectus)
3. Timber cruise reports and valuation
4. TRC comments
5. Signed Power of Attorney forms
6. Categorical Exclusion Checklist (if applicable)
7. Informational Title Status Report
8. Relevant maps and aerial photos
9. Copy of the Lummi Land Use Application

Copies of previous timber sale contracts and contract packets are on file at the Forestry Division office. These can be used for preparing future Request for Approval packets. Contract language is critical to the success of the operation and should be closely scrutinized. Essential departures from the approved contract language should be made only after talking with the BIA Agency or Area Office. A sample BIA Timber Sale Contract, Form 5327 – Timber Contract for the Sale of Predetermined Volumes, Part A along with exhibits and Form 5-5323 – Timber Sale Contract Standard Provisions, Part B is provided in Appendix R.

Federal regulations for BIA timber sale contracts can be found in The Code of Federal Regulations, Part 163. Tribal regulations for timber cutting permits including fines for cutting without a permit (which also apply to contracts) can be found in the Lummi Code of Laws, Title 10.18.080.

- **1.3 Processing BIA Paid Timber Cutting Permits and Timber Sale Contracts**

The following section provides a detailed step-by-step procedure for processing and administering BIA paid timber cutting permits and BIA timber sale contracts. This section expands upon the BIA Puget Sound Agency Timber Sale Handbook and is uniquely tailored to conditions present on the Lummi Reservation. The steps provided in this section correspond with the steps listed in the flowcharts for BIA paid timber cutting permits and timber sale contracts. The steps for the timber cutting permit and timber sale contract are basically the same but the time involved with each step may vary considerably. Generally, preparing a paid timber cutting permit requires less time than preparing a timber sale contract.

- **1.3.1 Lummi Land Use Application**

Most land use activities on the Lummi Reservation must have a Lummi Land Use Permit prior to conducting operations. This includes all timber harvest and tree removal projects, forest road construction, and other management actions. The Lummi Land Use Permit application process allows pertinent Natural Resource, Cultural, and Planning Department staff to review proposed projects for potential effects on sensitive environmental and cultural resources. If a wetland, stream, endangered species, bald eagle's nest, or culturally sensitive site is identified within or adjacent to the proposed project area during this inter-disciplinary review process, the land use

permit will be conditioned by the Technical Review Committee to ensure adequate protections are maintained. Typically, the land use application is filled out and submitted to Lummi Planning by the landowner(s). However, the Forestry Division may also fill out and submit land use applications on behalf of the landowner(s).

- **1.3.2 Technical Review Committee (TRC) Comments**

  Comments received from the Technical Review Committee during the land use application process must be adhered to and incorporated into the final harvest design. Conditions commonly placed on land use permits include observing cultural, water resource, and bald eagle nest buffers, avoiding surface runoff and soil erosion, and monitoring operating equipment for leaks. Conditions may also call for additional environmental reporting and permits and recommend mitigation measures.

- **1.3.3 Ownership Records (Informational Title Status Report)**

  Once the project has been reviewed and conditioned by the Lummi Technical Review Committee, an informational title status report (TSR) must be obtained from the BIA to identify the ownership. The TSR lists all landowners on the property, including non-tribal members. A written or verbal request is made to the Puget Sound Agency or the Portland Area Office. Typically, an informational TSR is received via fax or mail within 1 to 3 days of the request. Once the TSR is received, it should be submitted to Lummi Realty for review. Lummi Realty is actively involved in all land transactions taking place on the Lummi Reservation. As such, they are able to identify deceased landowners whose Assignment interests are in probate or other recording errors that may be on the TSR. After Lummi Realty has reviewed the TSR, a spreadsheet should be made listing each landowner and their percent interest in the Assignment to identify the majority landowners. Instructions for reading a TSR are on file at the Forestry Division office.

- **1.3.4 Preliminary Reconnaissance**

  - **1.3.4.1 Office Reconnaissance**

    Harvest Unit Review and Planning

    After receiving the harvest restrictions provided by the Lummi Technical Review Committee and identifying the landowners, office reconnaissance of the proposed harvest unit can begin to determine harvest feasibility before conducting onsite inspections. Maps and aerial photos necessary for this preliminary analysis can be developed in GIS. Relevant harvest unit maps to create at this time include a timber type map, a resource protection map (depicting wetlands, streams, cultural sites, and bald eagle nest sites), a topographic and soils map, an ownership map, and a zoning map. These maps will assist in the preliminary identification of property boundaries, potential harvest unit boundaries, and road and landing locations. If sensitive resources are present within the harvest unit, they can be used as control points in selecting the best road and landing locations. These locations can then be reviewed on the ground to determine their suitability for use.

    Using GIS, determine the approximate net stand acreage (excluding sensitive areas where harvest is not permitted) for each timber type present within the harvest unit. Reference the most recent forest inventory to determine which timber type numbers are present within the harvest unit and extract relevant inventory data for each timber type including stand age, species composition, volume/acre (board foot or tons), basal area/acre, trees/acre, and average DBH. The most recent forest inventory data for the Lummi Reservation also includes sort and grade volume information for each merchantable stand. This information can be used to obtain an estimate of timber quality and value.

    Preliminary Valuation

    Once the inventory data for each timber type within the harvest unit has been obtained, enter the species, sort, and grade volume data for each timber type into a spreadsheet. Since most harvest units only contain a percentage of an entire timber type, the sort and

grade volume data must be prorated to accurately reflect the timber type acreage within the harvest unit.

After the volume estimate has been obtained, prices can be assigned to each species, sort, and grade combination available in the harvest unit. Prices may be obtained using updated price sheets from local mills or from Log Lines. The Forestry Division maintains an active subscription to Log Lines, which can be accessed online at any time. A logging cost of $105 to $145/MBF (depending on harvest unit size) and a hauling cost of $55 to $80/MBF are appropriate for the preliminary valuation. Enter these numbers into the spreadsheet and establish an estimate of the total volume and value available within the harvest unit.

Although a formal timber cruise and appraisal will be conducted later on to establish a more accurate estimate of volume and value, a preliminary valuation can provide insight into the level of permitting and administration required for the timber sale. It also provides a rough estimate to include in correspondence with landowners describing the proposed sale.

During this time, it may also be valuable to determine the financial maturity of the stand. The approximate age of financial maturity is 45 to 55 years old for Douglas-fir stands; 35 to 40 years old for red alder stands; and 55 to 60 years old for western red cedar stands (Mason, 2003). Generally, stands are financially mature if they contain a high percentage of mature, large logs and the growth rate is not adequate to justify delaying harvest. Occasionally a dense stand of small, merchantable trees may be considered financially mature if it exhibits stagnated growth rates and poor crown ratios. Market conditions can also have a strong effect on financial maturity. A depressed export market and/or vigorous domestic or pulp market could slightly lower the age of financial maturity since log size and quality are less of a factor.

- **1.3.4.2 Field Reconnaissance**

  Once the site constraints, harvestable acreage, stand composition, and approximate stand value have been identified, field reconnaissance can begin. Visit each stand type (if more than one is present) and cross reference the data extracted from the most recent forest inventory with what is observed out in the field. Take additional notes on the timber quality, stocking, growth rates, defect, damage, rot indicators, and areas of blowdown.

  Evaluate logging feasibility and make a preliminary determination of the type of logging equipment that would be suitable for the site. If sensitive environmental or cultural resources are located within or adjacent to the unit, ensure that they are typed correctly and that the responsible Department has flagged the buffers on the ground so there is no confusion about their location. Inspect potential road and landing locations identified in the office reconnaissance to assess their suitability for use. If road and landing locations appear suitable and no resource issues are identified, flag and GPS the road and landing locations on the ground. Likewise, if adjustments to the road or landing locations must be made, flag and GPS the adjusted route. A thorough reconnaissance at this time will pay off later with efficient environmental assessment preparation and harvest design.

  If results from the preliminary reconnaissance and environmental review indicate that harvest is not feasible, a letter should be written to the landowner(s) describing the reasons for not proceeding with the harvest. It is important that the data and analysis leading to the "No" decision are well documented and filed for future reference.

- **1.3.5 Landowner Consent**

  If results from the preliminary reconnaissance and environmental review are favorable, submit the ownership list to the Lummi Enrollment Department to obtain landowner addresses and other contact information. If landowners are from other tribes, the Lummi Enrollment Department will be able to provide the contact information for that tribe's Enrollment office. Usually a written request stating the need for the individual's contact information is sufficient. Addresses can also

be obtained by request from the BIA's TAAMS program and from published directories, OST records, and from other Assignment landowners. If there are fee interests on the property, the Whatcom County Assessor's office may be able to provide fee landowner contact information. The phone book may also be a viable option.

After contact information has been obtained, the next step is to obtain signed Power-of-Attorney forms from at least 51% of the ownership. The Power-of-Attorney form is a standard BIA form (5-5315) that authorizes the BIA to advertise the timber sale and to enter into a contract to sell the timber on behalf of the landowner(s). If tribal interests are involved, the Tribe must adopt a tribal resolution authorizing the execution of the Power-of-Attorney for the Tribe. The Power-of-Attorney form is required for BIA approval of paid timber cutting permits and timber sale contracts. A sample POA form is provided in Appendix S.

An informative letter must be developed to accompany the Power-of-Attorney form. The letter should explain details of the property, the proposed harvest action, the sale process, and directions on how to fill out the enclosed Power-of-Attorney form. Including a self-addressed, stamped envelope in the letter will assist in landowner response. A diligent attempt must be made to contact all landowners (trust and fee). Previous POA request letters are on file at the Forestry Division office, which can be used for preparing future letters.

The BIA Superintendent may sign Power-of-Attorney forms on behalf of trust interests belonging to minors or those declared incompetent in the absence of a legal guardian and for deceased owners whose probates have not been finalized. If a probate is later finalized (prior to sale advertisement), the heirs should be contacted for consent. The BIA Superintendent may also sign POA forms to prevent loss of value from catastrophic situations.

If there are fee interests on a trust parcel, Power-of-Attorney forms must be obtained from all fee landowners prior to proceeding with the timber sale. If complete consent from fee interest cannot be obtained and the sale appears to be in the best interest of trust landowners, the BIA Superintendent must be contacted for a decision. A memorandum to the BIA Superintendent must be prepared requesting authority to advertise the sale without complete fee owner consent. The memorandum should include a summary of efforts to contact landowners, the amount of fee and trust consent obtained, and a discussion of the need for the sale. Based on this memorandum, the BIA Superintendent will make a decision on whether or not to proceed with the timber sale.

Landowner consent should be resolved during the planning phase of the project. If there are many landowners, it may take more time to obtain the required 51% consent. Minor fieldwork can be done on the timber sale while awaiting consent if there is some certainty that consent will be obtained. If not, no further work should be done on the sale until consent has been obtained or assured.

In addition to written correspondence, it is also good practice to contact major landowners by telephone to discuss the proposal. For sales on Assignments with a large numbers of landowners, meetings may be held to discuss details of the sale proposal.

- **1.3.6 Timber Sale Access**

Once landowner consent has been obtained, all necessary easement agreements should be secured. An easement agreement is required when there is a need to use a private road or to construct new road across another landowner's property to access the harvest unit. Do not proceed with a biological and environmental assessment and harvest design if access to the harvest unit has not been secured.

- **1.3.6.1 Easement Agreements**

  Easement agreements provide a mechanism for securing clear and enforceable user rights. An easement is a non-possessory interest in the land of another party that entitles the owner of the easement to limited use of the other party's land without interference. Easements are

generally temporary but are irrevocable within the term of their existence unless the user fails to meet the conditions of the agreement (Curtiss and Maag, 2008).

- **1.3.6.2 Revocable Road Crossing Permit**

  If new road must be constructed across another landowner's property or if access to an existing road is needed to access a harvest unit, a Revocable Road Crossing Permit is required. A Revocable Road Crossing Permit may be used for new road construction or for existing road use but the permit language for each situation varies.

  Revocable road crossing permits identify the conditions and timeframe for constructing or using the road, landowner payments, and environmental protection and maintenance requirements. The revocable road crossing permit must be signed by at least 51% of the ownership and approved by the BIA prior to construction or use. As with the Power-of-Attorney form, the BIA Superintendent may also sign the Revocable Road Crossing Permit on behalf of trust interests belonging to minors or those declared incompetent in the absence of a legal guardian and for deceased owners whose probates have not been finalized.

  A sample BIA Revocable Road Crossing Permit (New Road Construction) is provided in Appendix T and a sample BIA Revocable Road Crossing Permit (Existing Road Use) provided in Appendix U. These forms can be used for both trust and fee land.

  Because of the additional field and administrative work, every effort should be made to avoid new road construction across another landowner's property. Existing roads should be used whenever possible. For BIA timber sale contracts and most paid timber cutting permits, the Forestry Division secures road crossing permits or agreements for the duration of the timber sale. For all other types of timber cutting permits, the Permittee is responsible for securing temporary access to the permit area.

- **1.3.6.3 Road Use Fee Rate**

  Road use fees may or may not be necessary depending on what is acceptable to the landowners granting the easement. If the landowners request a user fee, compensation for road use can be calculated using the Road Use Fee Rate worksheet in the Timber Appraisal spreadsheet. This worksheet is based off of the Washington State DNR road user schedule. The road use fee rate is calculated based on the amount of volume that will be hauled from the road, the number of road stations used, and the estimated value of the road. Road use fees will be collected from the users and distributed to the landowners of each road segment.

  User fees do not apply to Assignments included in the harvest unit. However, compensation may be required if substantial amounts of sand and gravel are obtained from Assignments in the harvest unit.

- **1.3.6.4 Inherent Access**

  In 1983, the BIA issued a memo titled "Bureau Access to Forested Trust Property for Forest Management Purposes" which states that the BIA, its agents, representatives, or licensees are granted inherent access to Indian trust forest property to fulfill it's obligation under 25 CFR, Part 163 to carry out all types of forest management activities including: sales and utilization of forest products, forest protection, forest development, and forest inventory and management planning. "Agents, representatives, or licensees" include tribal governments acting under a PL 93-638 contract/grant or other instrument, a person employed by the BIA via a contract, or a BIA timber sale/permit contractor or subcontractor. The memo also outlines landowner consultation and compensation requirements. A copy of this memo is provided in Appendix V. Invoking inherent access should be avoided and is usually not necessary. However, it may be required if all other practical options have been unsuccessful.

- **1.3.7 Categorical Exclusion (CE)**

  Categorical exclusions are established by the National Environmental Policy Act and are defined as "a category of actions that do not individually or cumulatively have a significant effect on the human environment and therefore normally do not require further analysis in either an environmental assessment or an environmental impact statement."

  Categorical exclusions may be used for specific types of timber harvesting and management activities but only if an approved Forest Management Plan is in place and the specific types of timber harvesting and management activities for which a categorical exclusion is used are consistent with the policies and guidelines established in the Management Plan which has been addressed in an earlier NEPA analysis. The proposed timber harvesting or management activity must pass the Exception Checklist for BIA Categorical Exclusions by answering "no" to all of the checklist questions. A sample Exception Checklist for BIA Categorical Exclusions is provided in Appendix W.

  Timber harvesting and management activities for which a categorical exclusion may be used include the following:

  1. Approval and issuance of free-use timber cutting permits for the harvest of forest products not to exceed $5,000 in value per fiscal year per individual.
  2. Approval and issuance of paid timber cutting permits or timber sale contracts for products valued at less than $25,000.
  3. Approval of annual logging plans.
  4. Approval of forest stand improvement projects on less than 2,000 acres.
  5. Approval of forest road construction and skid trails.
  6. Approval of reforestation projects with native species including associated site preparation and maintenance activities on less than 2,000 acres.

- **1.3.8 Biological Assessment (BA)**

  A biological assessment must be prepared where the proposed harvest action may impact ESA listed species to evaluate the potential effects within the action area. The action area is typically defined as everything within a 1-mile radius from the harvest or management unit. The biological assessment must determine if these species and their habitats are likely to be adversely affected by the action and if formal consultation with the United States Fish and Wildlife Service (USFWS) (for fresh water fish species and terrestrial wildlife) or the National Marine Fisheries Service (NMFS) (for marine and anadromous species) is necessary prior to proceeding with harvest. Section 7 of the Endangered Species Act requires all federal agencies to consult with the USFWS and NMFS if they are proposing an "action" that may affect listed species or their designated habitat. "Action" is defined broadly to include funding, permitting and other regulatory actions.

  Locations of listed species on the Lummi Reservation can be referenced in the Lummi Nation's GIS program. A current list of ESA animal species can be obtained from the USFWS and NMFS websites and a current list of ESA plant species can be obtained from the Washington state Natural Heritage Information System website. If listed species are found within or near the project area, coordination with the U.S. Fish and Wildlife Service and National Marine Fisheries Service is necessary to develop adequate protection measures which must be documented in the biological assessment.

  The biological assessment should include a description of the project, the action area, species and habitat information, an analysis of the effects, conservation measures taken, and a determination of effect for each listed species present within the action area. One of three determinations of effect can be made.

1. **"No effect"**. This finding means there will be no impacts, positive or negative, to listed species. Generally, this means that no listed species will be exposed to the proposed action and its environmental consequences (USFWS, 2009). Concurrence from the USFWS or NMFS is not required to proceed with harvest planning. However, concurrence from the BIA on the "no effect" finding is required.
2. **"May effect, but not likely to adversely effect"**. This finding means that all effects are beneficial, insignificant, or discountable. Beneficial effects mean that the action has a positive impact on the species without any concurrent adverse effect. Insignificant effects relate to the size of the impact and include those effects that are undetectable, not measurable, or cannot be evaluated. Discountable effects are those that are extremely unlikely to occur (USFWS, 2009). This finding requires written concurrence from either the USFWS or NMFS depending on the species impacted. Concurrence is required before a FONSI can be issued.
3. "**May effect, and is likely to adversely effect**". This finding means that listed species are likely to be exposed to the action and/or its environmental consequences and be negatively impacted by the exposure (USFWS, 2009). Formal consultation with either the USFWS or NMFS (depending on species impacted) is required if an action is likely to "adversely affect" listed species and designated critical habitat.

Most biological assessments prepared for timber harvests on the Lummi Reservation result in a "no effect" finding since most of the current endangered and threatened species present within and around the Reservation are aquatic species present within Puget Sound.

Previous biological assessments are on file at the Forestry Division office, which can be used for preparing future biological assessments. A sample table of contents for a biological assessment is provided in Appendix X. If an environmental assessment is prepared for the timber harvest, the biological assessment must be included as an appendix to the environmental assessment.

- **1.3.9 Stream or Wetland Mitigation Plan**

The Lummi Nation Water Resource Protection Code, Title 17 considers timber harvest and road construction activities within streams and wetlands a regulated activity (17.06.030). As a result, a mitigation plan must be prepared and approved by the LIBC Water Resources Manager if timber harvest or road construction is planned within a stream or wetland and their associated buffers. The mitigation plan must provide a description of the project; an assessment of cultural resources, vegetation, wildlife, water resources, and soil resources; an ecological assessment of impacts to the site; a mitigation approach; and a monitoring, site protection, and a maintenance plan. If a forest road will be constructed within a forested wetland, it must be located, designed, and constructed in compliance with the requirements of Section 323.4 of the Clean Water Act. A copy these requirements are provided as an appendix to the Forest Roads section of the Forest Management Plan. Previous mitigation plans are on file at the Forestry Division office, which can be used for preparing future mitigation plans. A sample table of contents for a wetland mitigation plan is provided in Appendix Y. As with a biological assessment, the mitigation plan is included as an appendix to the environmental assessment.

- **1.3.10 Environmental Assessment (EA)**

An environmental assessment is required for timber harvesting and management activities that do not qualify for a categorical exclusion. After the biological assessment and stream or wetland mitigation plan (if applicable) have been completed, work on the environmental assessment (EA) can begin. An EA is usually written for contract timber sales over $25,000. The EA involves reviewing the proposed timber harvest or management action along with other alternatives for resource impacts in accordance with the National Environmental Policy Act (NEPA) of 1969 and applicable Council on Environmental Quality (CEQ) regulations. If the environmental impacts of the proposed action will be significant, a decision must be made to either continue with preparing an environmental impact statement (EIS) or abandoning the project due to excessive resource

concerns. The primary requirement of NEPA is that an Environmental Impact Statement be prepared for every MAJOR action significantly affecting the quality of the human environment.

The EA should include all comments and harvest restrictions received from the Technical Review Committee (inter-disciplinary analysis), the results of the biological assessment (BA), and relevant sections of the stream or wetland mitigation plan. Much of the content in the BA and mitigation plan can also be used in the EA, which should assist in expediting document preparation. For efficiency, a combined environmental assessment may be prepared for a group of proposed timber sales if they are in the same vicinity. The EA should included a description of considered alternatives, details on the purpose and need for action, the existing environment, anticipated environmental consequences of each alternative considered and mitigation measures, and a listing of agencies and/or persons consulted for the proposed project. Previous environmental assessments are on file at the Forestry Division office, which can be used for preparing future environmental assessments. A sample table of contents for an environmental assessment is provided in Appendix Z. The 30 BIAM Supplement 1, NEPA Handbook is another resource that can be referenced for guidance in preparing environmental assessments.

- **1.3.10.1 Notice of Availability (NOA)**

  A notice of availability (NOA) must be prepared for each draft environmental assessment and signed by the BIA Superintendent. The NOA describes the project proposal, project need, considered alternatives, and identifies the comment period and the responsible official. The NOA advises interested parties that the EA for the proposed action is available for public review and comment. The public review and comment period is 30-days long. The NOA and the draft EA are mailed to the BIA and the NOA is placed on the Washington State Environmental Protection Act (SEPA) register for the 30-day public comment period. The SEPA register can be accessed online on the Washington Department of Ecology website. If comments on the proposed timber harvest or management action are received, these comments must be reviewed for potential incorporation into the final EA document. It may be necessary to consult with the individual providing comments to resolve potential conflicts prior to preparing the final EA document. Comments and written correspondence should be included as an appendix to the EA. Previous Notice of Availability documents are on file at the Forestry Division office, which can be used for preparing future Notice of Availability documents.

- **1.3.10.2 Finding of No Significant Impact (FONSI)**

  After the 30-day public comment period has ended and all comments received (if any) have been addressed, the final EA document can be prepared. As part of the final EA, a Finding of No Significant Impact (FONSI) must be prepared and presented with the final EA to the BIA Superintendent. The FONSI includes a brief description of the proposed action, alternatives considered, a statement of the finding, and reasons supporting the finding. The Superintendent reviews the EA and makes a decision on whether or not the proposed action will have a significant impact on the quality of the human or natural environment. After reviewing the EA, the Superintendent may decide to take one of the following actions:

  1. Sign the FONSI
  2. Direct further analysis
  3. Initiate an Environmental Impact Study
  4. Discontinue or defer the project

  If the BIA Superintendent agrees with the finding (selected alternative), he/she will sign the FONSI and the NOA and an Environmental Impact Statement (EIS) will not be prepared. Copies of the FONSI and NOA along with the final EA will be distributed to the appropriate government agencies. A copy of the FONSI and final EA are also submitted for posting on

the Washington State SEPA Register for another 30-day public comment period. After this additional 30-day comment period, project implementation may take place.

If the BIA Superintendent does not agree with the finding and requires further analysis or decides to discontinue or defer the project, the project scheduling should be adjusted as necessary. Landowners should also be informed of the environmental analysis and of any reasons for project delays. Previous Finding of No Significant Impact documents are on file at the Forestry Division office, which can be used for preparing future Finding of No Significant Impact documents.

- **1.3.11 Silvicultural Prescription**

Once all of the environmental analysis and reporting is complete, the silvicultural prescription can be developed. Most of the silvicultural prescription is completed during the environmental assessment. However, it is important to refine the details prior to beginning fieldwork and layout. The silvicultural prescription includes specific operation plans for timber harvest, road construction/re-construction, site preparation, and reforestation. The silvicultural prescription is included in the Forest Officer's Report (FOR) or the Forest Manager's Narrative (FMN). Components of the silvicultural prescription will also be used in the BIA Timber Sale Contract or in the Special Provisions of the BIA Paid Timber Cutting Permit.

The Timber Harvesting and Forest Roads sections of the Forest Management Plan provide reference material that can be used for evaluating different harvest equipment, logging systems, road construction strategies, and resource protection measures. The Site Preparation, Reforestation, and Vegetation Management sections provide reference material that can be used for developing the proper site preparation and reforestation strategy.

The silvicultural prescription must include the following elements.

1. Harvest Scenario

   Identify the type of harvest, harvest unit acreage, Assignment numbers, and provide a brief description of the stand.

2. Stand Description

   Identify the different timber types. Provide information on species composition, stand age, and stocking for each timber type and identify predominant understory vegetation.

3. Terrain

   Describe slopes, aspects, elevation changes, and any other relevant topographic features within the harvest unit.

4. Cutting Prescription

   Identify which trees will be cut and which trees will be left for each distinct cutting area in the harvest unit. Identify the minimum DBH to be cut, snag and standing cull tree retention (wildlife reserve trees), pre-merchantable timber retention, and species preference of retention trees (if any). Also describe felling precautions to minimize damage to leave trees and young reproduction.

5. Proposed Harvest Equipment

   Identify acceptable ground-based or cable harvest equipment that will be used for felling; skidding; road, skid trail and landing construction; and site preparation.

6. Road, Landing, and Skid Trail Design and Construction

   Identify how many stations of road will be constructed or reconstructed. Identify if the road will be permanent or temporary; maximum road width; the surface shape of the road; type and depth of surfacing materials; location, type, and size of drainage structures; use of geotextiles (if applicable); stream crossings (if any); drainage ditches (if any); quarry spalls

(if any); spoil disposal areas (if any); any measures necessary for abandonment; and the estimated dates of road construction and abandonment (if necessary). Identify landing locations, skid trail layout, and maximum skid trail width.

7. Resource Protection Plan

   Identify conservation measures that will be taken to minimize or mitigate for any damage to site resources and wildlife habitat. Identify sensitive areas that will be excluded from the harvest area. A distinction should be made between those areas that are excluded because of potential resource impacts rather than economics. Identify operational restrictions that may be implemented due to saturated soils or rutting of roads and skid trails.

8. Site Preparation Plan

   Identify mechanical and chemical site preparation measures that will be taken to make the site ready for tree planting post harvest. Describe requirements for logging slash clean up; landings, skid trail, and road scarification (if any); slash disposal method; and site preparation treatments.

9. Reforestation Plan

   Identify species, planting density, seed zone, stock types, planting season and planned maintenance efforts.

- **1.3.12 Property Lines and/or Harvest Unit Boundaries**
  - **1.3.12.1 Property Lines**

    Prior to delineating the harvest unit boundaries, the property lines of the Assignment(s) that contain the harvest unit should be clearly established on the ground to avoid any potential trespass issues. The Lummi Reservation is heavily monumented, which makes locating property lines much easier. A map depicting the entire section that the harvest unit is located in is very useful in determining where relevant corners are located prior to conducting the field search.

    If monuments were located in the past, they may have a significant amount of flagging or paint blazes around them. If they do not, hang flagging or paint blazes to assist in future location. Trees surrounding known corners will typically be marked with a yellow or silver bearing tree and/or location tag. The information engraved on these tags will provide directions to the nearby monument. The condition of corner evidence and monuments should be documented in the sale/permit file. In some cases, reference point tags have been defaced or otherwise damaged making them unreadable. Corner monuments may also be buried making them impossible to locate without a metal detector. If a corner monument cannot be found, known corners must be located and used as a control point to ensure accuracy.

    Assignment property lines on the Lummi Reservation typically run in the cardinal directions (north, south, east, west) making property line location much easier. In most cases, the Forestry Division is capable of conducting the property line survey without the assistance of a licensed surveyor. Assignment property lines are run from known corners using a hand compass that has been adjusted for the current declination. Property lines are brushed and heavily flagged with ribbon (usually orange and blue) to ensure prolonged visibility. Yellow BIA timber sale boundary tags may also be used to designate the property line if it is the same as the timber sale boundary line. Clearly marking the property lines is required prior to sale advertisement and contract/permit issuance.

    Establishing straight and accurate property lines is critical. Property lines may have to be rerun in order to achieve this. The frequent use of back-sighting is a good technique to ensure that the line is straight. It is also important to be aware of any local attraction that may be occurring which may skew your compass readings. Common items worn or used

that may influence the compass reading include a belt buckle, wrist watch, knife, car keys, machete, pen, or data recorder. While establishing property lines, take notes of relevant information such as trespass, fallen logs across the property line, and other potential problem areas.

In addition to the standard method of locating and establishing property lines, the Lummi Forestry Division has a resource grade GPS unit that can be used to assist in this process. The GIS layer of the Lummi Reservation Assignments (among others) can be loaded onto the unit and used to locate monuments in the field. Resource grade GPS units have an accuracy range of + or – 20 centimeters to less than 3 meters. If the data is post processed, the accuracy of the lines will typically be sub-meter. Post processing GPS data removes 99% of the GPS error (Lahm, 2006).

To ensure accurate and effective GPS data collection, "mission planning" should be used. Mission planning provides information on satellite coverage for a 12 hour planning period, which allows the user to schedule GPS data collection times when satellite coverage is good. Four satellites are required to get a three-dimensional position with the GPS unit. The Position Dilution of Precision (PDOP) should be maintained below 6 to ensure measurement accuracy. Higher PDOP values are associated with diminished satellite geometry and measurement reliability (Lahm, 2006).

Resource grade GPS units also have critical settings that can be used to determine the quality of the spatial data being collected. If the GPS unit is having difficulty obtaining position information from the satellites, position the antennae so that it faces south and wait. If this does not work, rotate the antennae in place 45 degrees and wait. Continue this routine until position information is received (Lahm, 2006). If this technique fails, it may be necessary to temporarily adjust the critical settings to a less accurate level.

In cases where there is no survey corner nearby or in the vicinity, it may be necessary to hire a licensed surveyor to locate and mark the Assignment property lines prior to harvest.

- **1.3.12.2 Harvest Unit Boundaries**

  The harvest unit boundary identifies the designated area for timber harvest under the authority of the timber sale contract or timber cutting permit. In most cases, large portions of the harvest unit boundary will be the same as the Assignment property lines. However, this will not be the case if the Assignment also contains a non-merchantable timber type, a large brush field, a road through the unit, a high value wetland, a stream, a bald eagle's nest, or a culturally sensitive site. These areas and any associated buffers must be excluded from the harvest area and incorporated into the final harvest boundary design.

- **1.3.12.3 Timber Types**

  If more than one timber type is present within the harvest unit, it is important to distinguish between the harvest unit boundary and the boundary of the timber types present within the harvest unit. When conducting the timber cruise, each timber type must be delineated, and cruised as a separate unit. Therefore, it may be necessary to flag and map the boundaries of each timber type separately from the harvest unit boundary.

  Timber types should be delineated based on species composition, size class, volume/acre, age, stocking, and stand history. The minimum size limit for a timber type is 2 acres. If a road runs through the harvest unit, it must be excluded from the timber type and harvest unit acreage.

- **1.3.12.4 Exclusion Zones**

  Timber harvest is permitted within certain wetlands and their buffers if approved by the LIBC Water Resources Manager. Selective harvest within the secondary buffer of bald eagle's nests may be permitted if it is in compliance with the USFWS National Bald Eagle Management Guidelines.

Selective harvest areas are considered "Special Use Areas" and should be clearly marked on the ground. If harvest is not permitted within a wetland but selective harvest is permitted within the wetland buffer, then the wetland boundary and buffer should be clearly marked with different colors of flagging or paint blazes. Likewise, if a bald eagle's nest is located within the harvest unit, the boundary of both the 330 foot "no-cut" buffer and the 660 foot "selective-cut" buffer should be clearly marked with different color flagging and paint blazes so there is no confusion. Cutting instructions and details on the flagging and/or painting for these Special Use Areas must be documented in the timber sale contract or in the special provisions of the timber cutting permit and discussed with the logging crew prior to harvest.

If there are many sensitive management zone areas within a harvest boundary, it may be helpful to purchase specialty flagging. "Timber Sale Boundary", "Wetland Boundary", "Riparian Management Zone", "No Cut Zone", and "Property Boundary" are options available for purchase. The colors of the property line, harvest boundary, and any other special use areas must be different to avoid confusion. Once the harvest boundary has been determined and flagged on the ground, yellow BIA timber sale boundary tags should be put up along the harvest boundary at a frequency and height that makes them easily noticeable to an equipment operator or hand faller. Boundary lines may also be painted if necessary. If a portion of the harvest unit boundary runs adjacent to a recent clearcut, flagging and boundary tagging is typically not necessary since there is a clear, distinct edge. Clearly marking the harvest unit boundary and special use areas is required prior to sale advertisement and contract/permit issuance.

Once the harvest unit boundary, Special Use Areas (if any), and timber types (if more than one) are flagged, they must be mapped using the Forestry Division's resource grade GPS unit and uploaded into the GIS database.

- **1.3.13 Timber Cruise**

After the silvicultural prescription has been developed and all necessary boundaries have been established on the ground and mapped with the GPS unit, the timber cruise can be completed to estimate the quantity and quality of merchantable timber.

- **1.3.13.1 Timber Cruising System and Software**

The Forestry Division uses Atterbury Consultant's variable log length timber cruising system and SuperAce timber cruising software. This system allows the user to cruise trees as they will be cut into logs using the preferred log lengths and grades of local mills and scaling bureaus. Table 1 lists the cruising factors in order of importance when using the Atterbury SuperAce system. The attention given to each of these factors should be consistent with weighting provided in this list.

Table 1. Cruising Factors in Order of Importance Using Atterbury's SuperAce Cruising System and Software	
1. Net Acreage	• Accurate maps supply 50% of the answer. Accurate net acreage of the timber type is just as important as the timber cruise since acreage is used to expand most timber cruises to a total stand basis. Acreage should be within 0.1 to 0.2 acres.
2. Sampling System	• The sampling system, design, and intensity are critical decisions to be made for each stand. The "Key to Timber Cruise Sampling Systems" should be used as a guide to determine which system to use in addition to considering the advantages and disadvantages of each system.
3. Tree Count	• An accurate tree count is essential on every type of plot.
4. Bole Height	• Bole height is the MOST IMPORTANT tree measurement for volume estimates. It must be measured on every sample tree to the nearest foot.
5. Species	• Species must be correctly identified since the value paid for different timber species varies significantly.
6. Lengths and Scaling Rules	• "Pencil buck" trees as they would be cut for local log markets. Follow standard bucking practices for mills in the area.
7. Sort & Grade	• A sort & grade classification must be assigned to each log according to local rules and mill preferences.
8. DBH (D4'H) & Form Factor	• Although low on the list, DBH and Form Factor should be measured or estimated with reasonable accuracy.
9. Defect Deductions	• Defect deductions are classified in feet for length deductions and in inches for diameter deductions. Defect deductions can also be classified as a percent of the total log.
10. Bark Thickness	• Average default bark thickness values by species are provided in SuperAce. This can be measured on a few sample trees for increased volume accuracy.
11. A_o Factor	• A constant supplied by SuperAce depending on species and age that is used in equations for calculating tree bole diameters.
ACI, 2006.	

The user's manual for Atterbury's SuperAce software is on file at the Forestry Division office. This manual should be referenced when planning a cruise and when managing cruise data.

- **1.3.13.2 Timber Cruise Objective**

The objective of the timber cruise is to obtain a reliable estimate of net timber volumes by species, sort, and grade. To meet this objective, the sampling error for the timber cruise must be 10% or less at one standard deviation (68.1% confidence limit). Estimating timber volumes within the minimum sampling error is a very important step in the timber sale process, particularly when the sale will be sold as a lump sum. For lump sum sales (Form 5-5327 – Timber Contract for the Sale of Predetermined Volumes), the volume estimate is used to determine the minimum acceptable bid price. For scale sales (Form 5-5324 – Timber Contract for the Sale of Estimated Volumes) the cruise is also important but not as important since payment is based on actual scaled timber. Obtaining accurate volume estimates depends on proper cruise design, execution, and data processing.

- **1.3.13.3 Timber Cruise Design**

Timber cruise design involves selecting the most appropriate sampling system and number of plots, determining plot or strip dimensions and plot or strip layout within the harvest unit, and preparing an accurate cruise map.

- **Selecting a Sampling System**

Selecting the appropriate sampling system is necessary to obtain reliable cruise data in an efficient manner. There are five types of sampling systems that can be used: 100%, strip, fixed-area plot, prism plot (point sample), and combinations thereof. A key to selecting the most appropriate sampling system is provided in Table 2. A description of each type of sampling system along with advantages and disadvantages are provided in Table 3 - 6 to further assist in the selection process.

Table 2. Key to Timber Cruise Sampling Systems	
INSTRUCTIONS: To use this key, identify or estimate stand acreage, size class, and stocking based on observation, aerial photographs, comparable data, and personal knowledge of the timber stand. Start at the top of the key and find the most suitable stand description.	
For Small Areas ≤ 10 acres	
Stand Description	**Recommended Plot Type**
Small Trees Up To 8-inch DBH	Fixed-Area Plots
Few Large Trees, ROW cruises	100% Cruise or "1 in X" Cruise
Many Large Trees	Strip Cruise or Fixed-Area Plots
For Large Areas > 10 acres	
Stand Description	**Recommended Plot Type**
Small Trees Up To 8-inch DBH	Fixed-Area Plots
Trees Over 8-inch DBH	Prism Plots
Even-aged Stand w/ Large Overstory Trees	Prism Plots plus 100% Cruise of Overstory Trees
Variable Stocking	Prism Plots plus Count Plots
Homogenous, Even Age Stand (Species & DBH)	Prism Plots plus Count Plots
Adapted from ACI, 2006.	

Table 3. 100% Cruise	
Description	• A 100% cruise is not a sampling system. It is a cruise of the total population since every tree is measured. This type of cruise is rarely feasible and should not be attempted unless every tree can be identified and measured.
Situations for Use	• A cruise of one tree. • Marked trees along a right-of-way. • A few (less than 100) large scattered overstory trees in a reproduction type which can be easily identified. • A few scattered, large trees in a stand (usually high value trees of a different species, size, or age). • Stands less than 5 acres in size.
Advantages	• No sampling • Provides a record of every tree
Disadvantages	• 100% cruises are time consuming and therefore expensive. The higher costs must be justified by specific requirements, which cannot be obtained otherwise. • Possibility of missing trees or cruising trees twice.
Adapted from ACI, 2006.	

Table 4. Strip Cruise	
Description	• A cruise of a percentage of the total stand acreage or total number of trees using fixed width strips that are run through the stand at regular intervals along a baseline. • The probability that a tree will be sampled is proportional to its frequency within the stand.
Situations for Use	• In small stands less than 10 acres in size • Areas of unknown size • Irregular shaped areas • Right-of-way timber or where a right-of-way is widened. • Brushy areas or areas with broken topography where prism cruising would not work
Advantages	• Stand acreage does not have to be accurate. Can be used when stand acreage is not known but stand boundaries are established. Blow-up factors can be independent of acreage. • Can avoid critical acreage errors in small units. • Simple and efficient for small areas. • Brushy areas with scattered trees can be cruised accurately. • Strips have fewer borderline trees in comparison to a plot cruise of the same intensity since the total perimeter of the sample unit is usually smaller.
Disadvantages	• The entire tree distribution will be sampled, which may mean that many small trees will have to be recorded. Sampling small trees adds greatly to the cost of cruising but typically adds little to the volume and value, which increases cruising cost per volume. • Time consuming on large areas. • An accurate baseline has to run completely through or adjacent to the unit. Accurate strip widths placed at right angles to the baseline have to be constantly maintained with frequent checking of borderline trees. The strip center must be accurately marked in order to do this. Errors are easily incurred through inaccurate estimation of strip widths. • There is no balancing of diameter and trees per acre as in a prism cruise. If the diameters are estimated too small in a strip cruise, the volume will be low. • More efficient and reliable with a two-person crew. • Difficult to conduct check cruising on strip cruises if the strip center is not marked on the ground. • Strip cruises do not lend themselves well to calculating statistics. For better statistics, strips can be divided into equal sized rectangular plots by changing plot numbers at a consistent distance.
Adapted from ACI, 2006 and Avery and Burkhart, 1994.	

Table 5. Fixed-Area Plot Cruise	
Description	• A cruise of a percentage of the total stand acreage using fixed-area plots that are placed throughout the stand at regular or random intervals. Circular plots are most often used because they are easy to construct in the field. • The probability that a tree will be sampled is proportional to its frequency within the stand.
Situations for Use	• Small acreage situations. • Small, strangely shaped acreages where prism plots or strips would not work. • Stands with an average DBH less than 8 inches that are hard to cruise with a prism (e.g. stands ready for first commercial thinning). • Areas that are too brushy to prism cruise.
Advantages	• Simple and efficient for small areas. • Fixed area plots are an easy way to get volume per acre estimates on very small trees. • Can be used for pre-sampling to estimate stand metrics. • Suitable for one-person cruising.
Disadvantages	• The entire tree distribution will be sampled, which may mean that many small trees will have to be recorded. Sampling small trees adds greatly to the cost of cruising but typically adds little to the volume and value, which increases cruising cost per volume. • Difficult to determine if borderline trees are "in" or "out" especially on steep terrain. Extra care must be taken while measuring borderline trees. The distance from plot center to the geometric center of the tree must be horizontal distance not sloping distance. On sloping ground, it is difficult to get the correct horizontal distance. • Time consuming on large areas. • Acreage must be accurate.
Adapted from ACI, 2006 and Avery and Burkhart, 1994.	

Table 6. Prism Plot Cruise (Point Sampling)	
Description	• The most popular sampling system for cruising merchantable timber and the most widely used system in the PNW. • A cruise of a sample of the population based on sample points. • The probability that a tree will be sampled is proportional to its size (larger trees will be sampled more).
Situations for Use	• All merchantable stands greater than 10 acres in size with trees over 8 inches at DBH. • Stands with variable stocking.
Advantages	• Fast and efficient for cruising large areas with merchantable timber. • Trees are selected for sampling based on their size. Large, high-value trees are sampled in greater proportions than smaller trees. This reduces the sampling of smaller trees that do not contribute much to stand volume and value. • Provides a more balanced sample of the diameter classes within the stand. • Usually faster and simpler to apply than other sampling systems, which reduces human error. • Fewer trees have to be measured to get an accurate answer. • Plot boundaries do not have to be measured and established. • System only requires approximate diameters. • Count plots can be used with this system, which can add to the accuracy of a cruise by reducing the standard error.
Disadvantages	• Does not work well in small trees (trees ≤ 8") or in stands with very low stocking. • Difficult to see trees with a Relaskop or a prism in heavy brush or on dark, rainy days. • Acreage must be accurate (preferably within 0.1 to 0.2 acres) since point sampling only measures volume per acre.
Adapted from ACI, 2006, Avery and Burkhart, 1994, and Bell, 1997.	

- **<u>Combination Sampling Systems</u>**

  In some cases, a combination of sampling systems may be necessary to obtain a reliable volume estimate. Stands that contain two distinct populations need to be sampled separately e.g. stands that contain a few species of high value or distinctly different age classes. If a younger, merchantable stand contains a few large, scattered trees left over from the previous harvest, the stand can be prism cruised and the larger, older trees can be 100% cruised or strip cruised.

- **<u>Cruise Intensity</u>**

  Once the sampling system has been selected, cruise intensity can be determined. Cruise intensity is the number of sample points/plots or percent of area cruised (strip cruise) necessary to obtain a volume estimate for a specified sampling error. It is dependent on the level of variation within the stand.

  If sample points or fixed-area plots are used, the number of plots necessary to obtain the desired sampling error can be calculated using the t-score that corresponds with the selected probability level, the stand's coefficient of variation for volume/acre, and the desired sampling error. If the strip cruise system is used, cruise intensity is based on the percentage of the area cruised.

- **Sample Points or Fixed-Area Plots**

  The number of sample points or plots required to obtain a desired sampling error can be calculated using the following formula:

  - $(\text{t-score}^2 \times CV\%^2) / SE\%^2$ = number of plots

  The t-score value is taken from a t-table based on the standard deviation used, the CV% is the coefficient of variation for net BF volume/acre since this is the stand metric of interest, and SE% is the desired sampling error. This method of calculating plots is applicable for both systematic and simple random sampling.

  An estimate of the stand's CV% for net BF volume/acre can be obtained from the most recent forest inventory for the timber type(s) present within the harvest unit. It can also be estimated by installing about 10 to 15 test sample points or plots or by past experience. Average timber types have a CV% for BF volume/acre of around 40 to 50% and can be sampled to about +/-10% at 1 standard deviation with 30 to 40 plots (ACI, 2007 A). CV% values for timber types on the Lummi Reservation range between 40 to 80% since there are many naturally regenerated stands with higher variability.

  Example: At 1 standard deviation (probability level = 68.1%) the t-score = 0.999, CV = 70%, and SE =10%. Therefore, $(0.999^2 \times 0.70^2)/0.10^2$ = (0.998 x 0.49)/0.01 = 49 plots. To obtain the desired sampling error of 10% at one standard deviation, 49 plots would be necessary in this stand. The Forestry Division has developed a Plot Number Calculator spreadsheet to quickly determine the number of plots necessary for a range of CV% values and desired SE% values at different probability levels.

- **Strip Cruise**

  The number of sample strips depends on the percent of stand acreage cruised and the dimensions of the sample strips. Sampling 20 to 25% of the stand acreage usually provides a statistically sound sample. If the harvest unit is 20 acres in size and the selected sampling percent is 20% then the number of acres that must be cruised = 20 acres x 0.2 = 4 acres. Strip number, interval, and width should be designed so that they collectively comprise 4 acres.

  A strip width of 32 feet works well since it is easy to see and project 16 feet from the strip centerline, which reduces the need to check borderline trees. At a minimum, at least 6 strips should be installed, particularly in irregularly shaped harvest units. Larger harvest units may have 12 to 18 strips installed (ACI, 2006).

  Example: 20 acre square unit (933 ft. x 933 ft.), 20% cruise (4 cruise acres), strip width = 32 ft. To determine the area contained in one strip, multiply strip width by strip length (32 ft. x 933 ft. = 29,856 $ft.^2$). Next, determine the number of square feet in 4 acres (4 x 43,560 $ft.^2$ =174,240). Now determine the number of 32 ft. x 933 ft. strips needed to comprise 4 acres (174,240/29,856 = 5.8) or 6 sample strips. Using this method ensures that the cruise percent is actual (based on cruised acreage) and not nominal ((strip width/strip interval) x 100).

- **Plot Layout**

  Unbiased plot or strip placement is very important in timber cruising. Plot lines or sample strips should be placed so that they run across the entire range of variation (topography and timber) within the stand. They should not be placed parallel to ridges or streams (ACI, 2006). If little to no variation exists, it is easiest to run the strips north-south or east-west.

- **Systematic Plot Layout**

  Systematic plot layout entails laying out plots along a systematic grid at uniform spacings. Systematic plot layout is preferred over random plot layout because sample units are easy to locate on the ground and they appear to provide a more representative sample since they are uniformly distributed over the entire stand (Avery and Burkhart, 1994)

  Plots may be laid out along a square or rectangular grid. A square grid is most commonly used since this system works best on tracts ranging between 15 to 80 acres and most harvest units on the Lummi Reservation fall within this size range. A rectangular grid works best when cruising stands greater than 80 acres in size (ACI, 2006).

- **Square Grid Plot Spacing**

  When a square grid is used, plot line and plot center spacing can be calculated using the following formula:

  - SQRT. (43,560 x (stand acres/number of plots)

  Example: 50-acre stand, 49 plots to be installed. SQRT. (43,560 x (50/49) = 211 ft. spacing. Therefore, spacing between plot lines and plot centers should be 211 ft.

  Acres represented per plot can be calculated by using the following formula:

  - Plot spacing^2/43,560

  Example: 211 ft. square grid plot spacing. (211^2)/43,560 = 1.022 acres/plot

- **Rectangular Grid Plot Spacing**

  When a rectangular grid is used, the distance between plot lines can be calculated using the following formula once stand acreage and the number of plots are known and the distance between plots is selected:

  - (Acres/plot x 43,560)/distance between plots

  Example: 1.5 acres/plot, 200 ft. plot spacing. (1.5 x 43,560)/200 = 327 feet

  Plot or strip locations can be hand drawn to scale on the map. If point sampling or fixed-area plots are used, plot layout can be done automatically in GIS using the "Forestry Tools" toolbar utility. The first plot or sample point should be located half the distance between plot lines from one stand boundary and half the distance between plots from the adjacent stand boundary i.e. if a 211 ft. square grid is used for plot spacing, the first plot should be located 105 feet from the stand boundary in both directions. If strips are used, the first strip centerline should be located half the distance of the strip interval from the stand boundary.

- **Selecting a Basal Area Factor (Point Sampling) or Plot Size (Fixed-Area)**

  Selecting the appropriate basal area factor or plot size is necessary to ensure that enough trees will be measured to meet the specified sampling error. This decision is just as important as determining the number of plots. In the Atterbury system, it is usually necessary to have 120 to 240 measure trees to meet the sampling error of 10% or less at one standard deviation depending on stand variation.

  - **Basal Area Factor (BAF) Selection**

    A BAF should be selected to provide 2 to 9 trees per plot with an average of 4 to 6 trees per plot for the stand (ACI, 2006). The density and size of the timber must be considered when selecting an appropriate BAF. If the stocking is scattered or the timber is smaller, a smaller BAF should be used to reach out further to obtain the

desired tree count. If the stocking is dense and uniform or the timber is larger, a larger BAF should be used to avoid an unnecessarily high tree count.

A simple way to determine a suitable BAF is to divide the estimated basal area per acre of the stand by the desired tree count (Bell, 1997). Estimating the stand's basal area per acre can be done by installing a few sample points or by extracting it from the most recent forest inventory for the timber type(s) present within the harvest unit.

Example: Basal area/acre = 198, desired tree count = 5 (198/5 = 39.6). Therefore, a 40 BAF should be used in this stand to average 5 trees per plot.

Once the BAF is selected, the same BAF must be used for the entire timber type. More than one BAF can be used in a type to sample different populations within the type (such as a two-tiered stand) but the data from each BAF must be treated as a separate cruise (Bell, 1997).

- **Plot Size (Fixed-Area)**

  Fixed-area plots should be large enough to yield an average of 5 to 10 trees per plot for each timber type (ACI, 2007 A).

  An estimate of the number of trees per acre in the stand is necessary to determine the appropriate plot size. This can be obtained by taking tree counts on a few 1/100-acre circular plots. If the timber is larger, a larger plot size should be used. Yield tables can also be helpful in estimating trees per acre although most stands usually have fewer trees than the "normal" stands represented in yield tables (ACI, 2006)

  Example: Estimated tree spacing = 12 ft. or 303 tree per acre, desired tree count = 10. 303 trees per acre/10 trees per plot = 30. Therefore, using a 1/30-acre plot (21.5 ft. radius) should yield 10 trees per plot.

- **Count Plots (Point Sampling)**

  Count plots are commonly used in point sampling to increase the accuracy of a cruise by reducing the standard error. Count plots should be used when the basal area per acre varies more than the volume per acre to tighten up volume estimates i.e. when tree size is rather consistent but stocking is variable. Count plots should not be used when cruising a small type, which physically limits the number of plots required for an accurate sample. Count plots should also not be used when tree size is highly variable unless there are at least 30 cruise plots with a minimum of 150 cruise trees in your sample (ACI, 2006).

  Count plots only measure the number of trees by species (and therefore basal area). They do not record volume, sort, or grade information. Count plots are used to adjust the basal area for each species, which also adjusts the trees per acre and volume figures from measure plots. Therefore, they must be treated as equally important as cruise plots and accurately measured (ACI, 2006).

- **Cruise Map**

  After the sampling system, cruise intensity, and layout has been determined, a cruise map can be prepared. The cruise map can be easily developed in GIS and should include the harvest unit boundary, timber type boundaries, property lines, known monuments, the township, range, and section, roads, water resources, exclusion zones, any other relevant stand features, the sample grid, plot and plot line spacing or strip line spacing, plot or strip numbers, BAF, plot size, or strip dimensions, cruise line orientation, a compass rose, scale text, and a scale bar. If the map is photocopied, the scale text becomes useless but the scale bar will remain valid (Bloch, 2006).

- **1.3.13.4 Cruise Equipment Calibration**

  Cruise instruments should be calibrated and checked for accuracy before beginning any cruise. The Forestry Division uses a Spiegel Relaskop, a TruPulse 200 laser rangefinder, a Silva Ranger hand compass, and a Spencer's logger's tape. The Relaskop is the preferred instrument when point sampling since the BAF automatically corrects for slope. The laser rangefinder significantly increases cruising efficiency by reducing the time necessary for measuring distances.

  - **Speigel Relaskop**

    The Relaskop can become out of adjustment both in terms of focus and calibration. If the Relaskop is out of focus, the scales are difficult to read. If the Relaskop is out of calibration, tree diameters and trees counts may be wrong. Since these two factors are very important to cruise accuracy, it is important to check the Relaskop for level, BAF calibration, and focus before going into the field or at least once a month (ACI, 2001). Instructions for adjusting the Relaskop's level, BAF calibration, and focus are provided in Appendix AA.

  - **TruPulse 200 Laser Rangefinder**

    If the tilt sensor for the laser rangefinder is out of calibration, it will give incorrect distance and tree height readings. Instructions for calibrating the TruPulse 200 Laser Rangefinder are provided in the user's manual, which is on file at the Forestry Division office.

  - **Silva Ranger Hand Compass**

    The declination of the compass should be checked regularly to ensure accurate compass readings. The National Oceanic & Atmospheric Administration (NOAA) offers a declination calculator online at http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp.

- **1.3.13.5 Field Procedures**

  - **Plot or Strip Establishment**

    Once a sample point or fixed-area plot is located on the ground, it should be clearly marked with flagging indicating the harvest unit, plot number, BAF or plot size, and cruiser initials. When a fixed-area plot is used, the plot radius should also be measured out in the cardinal directions and flagged to establish the plot perimeter and minimize the potential for an inaccurate estimate of the plot radius.

    If strips are used, the baseline must be established and flagged before the first strip can be located. The baseline must run completely through or adjacent to the unit for cruise percent control (ACI, 2006). It can be established using a laser rangefinder, a string box, or a logger's tape. Once the baseline has been established, the first strip centerline can be located. The centerline should be flagged throughout the strip length when running the compass line and frequent checks should be made of the strip edge to ensure accurate strip width. Prior to establishing the next sample strip, record the length of the strip to the nearest foot using a string box or other device and square off the end if it has an irregular end shape. The next sample strip must be offset perpendicular from the first sample strip, and the distance must be carefully measured.

  - **Determining Sample Trees**

    - **Point Sampling**

      The Relaskop must be held directly over plot center and a 360-degree sweep must be made with the selected BAF observing if trees are "in" or "out" at the sighting point. The sighting point may be at D4H (4 ft. above the stump) or form point (16

ft. above the stump) but once the sighting point is selected, the same sighting point must be used for the entire cruise. For smaller timber, it is usually easier to site trees at D4H since these stands typically have higher stocking and less brush to obstruct views. For larger timber, it is usually easier and more accurate to sight trees at form point for the following reasons:

1. Allows the cruiser to observe the tree above the brush reducing the need for brushing and the risk of tree count error (Bell, 1997). The tree bole also has a clearer and lighter background at 16 feet since you are looking up towards the sky instead of into the woods.
2. Sighting at 16 feet puts the point of observation above the portion of the stem that has the greatest amount of taper. Tree boles become more round higher up on the bole and lose the elliptical bole shape that may be present at D4H. If observation is made a little high or low on the stem, the risk of tree count error is less than if the observation is made at D4H where taper is high (Bell, 1997).

If trees are sighted at D4H, form point within the SuperAce software must be changed from 16 to 4 to ensure that the cruise is processed and expanded appropriately.

If the tree is larger than the projected angle of the BAF at the sighting point then the tree is "in" and is sampled. If the tree is smaller than the projected angle of the BAF at the sighting point then the tree is "out" and is not sampled. If the tree appears borderline, make sure you are sighting at the right spot. If it still appears borderline, sight the tree above and below the sighting point. If it appears borderline above your sighting point, it is "in". If it appears borderline below your sighting point, it is "out" (ACI, 2006). If it is still vague, the limiting distance for the tree must be calculated and compared with the distance between the geometric center of the tree and plot center. If the limiting distance is greater than the distance from plot center to the geometric center of the tree, the tree is "in". If the limiting distance is less than the distance from plot center to the geometric center of the tree, the tree is "out". The limiting distance for a tree of a given diameter is calculated using the following formula:

- Limiting Distance = SQRT. [13,865/(BAF/(0.005454 x Diameter^2))]

<u>Example</u>: BAF = 20, DBH = 18.7, sighting point at D4H. SQRT. [13,865/(20/(0.005454 x 18.7^2))] = SQRT. (13,865/10.5) = 36.36. Therefore if the distance from the geometric center of the tree to plot center is closer than 36.36 feet, then the tree is "in".

It is important to never offset from the plot center to determine whether a borderline tree is in or out. Fortunately, experience shows that only about 5 to 10% of trees are borderline (Bell, 1997). In some cases, trees may appear optically "in" but are actually "out" and are not checked for limiting distance. This can be a problem on borderline trees that have an elliptical bole shape rather than a circular bole shape, which may be common in western red cedar trees.

An accurate tree count is critical on every plot in a prism cruise so it is good practice to always do your tree count at least three times before measuring trees (ACI, 2006).

- **<u>Leaning Trees</u>**

  Leaning trees should be evaluated as "in" or "out" as they are seen from plot center. No attempt should be made to visually straighten them up. This approach is based on the assumption that just as many trees will be leaning toward plot center as are leaning away from plot center in the course of a timber

cruise and therefore, should average out (ACI, 2006). Measuring half-plots on the downhill side of a slope could be a problem if a lot of trees are leaning down the hill (ACI, 2006).

- **Blowdown Trees**

  Blowdown trees should be cruised as they lay, regardless of their location prior to blowing down. If trees are being sighted as "in" or "out" at 16 feet above the stump (form point), site at this point on the tree as it lays on the ground and make a determination on whether it is "in" or "out" (ACI, 2006).

- **Fixed-Area Plots and Strip Cruising**

  A tree is considered "in" if the geometric center of the tree lies within the plot or strip boundary. Work with the philosophy that there are no borderline trees - they are either "in" or "out" (ACI, 2006). Borderline trees must be checked with a tape or rangefinder positioned at a right angle to the plot center or stripe centerline. This distance must be horizontal distance not slope distance (Avery and Burkhart, 1994).

- **Sample Tree Measurements**

  - **Tree Measurements**

    Tree measurements required in Atterbury's SuperAce software include species, DBH, form factor, top diameter fraction, bole height, sort, grade, log length(s), and defect. These parameters must be recorded for each "in" tree. In most timber sales, all trees with a DBH ≥ 8 inches are cruised. In commercial thinnings, minimum DBH may be set to ≥ 6 inches.

    Accurate bole height is the most critical measurement in obtaining accurate tree volume estimates in the Atterbury system (ACI, 2006). If bole heights are measured or estimated to be too high or low, the volume estimate will be impacted accordingly. When measuring bole height, height readings should be taken at an angle less than 100% or 45-degrees whenever possible (RS, 2008). Height readings over 100% or 45-degrees are not as reliable because the scale in the Relaskop becomes narrower above this threshold making clear readings more difficult.

    DBH, form factor, and top diameter fraction are also important measurements since they are used in determining tree size i.e. log volume and log grade. When measuring form factor and top diameter fraction with the Relaskop, try to be within ¼ of a bar. There is a little more room for error when measuring or estimating DBH. Small errors in DBH result in little to no volume per acre errors because the changes in trees per acre compensates for the errors (ACI, 2006).

  - **Sort & Grade**

    The majority of logs on the Lummi Reservation are domestic sorts since most timber volume is comprised of hardwoods and western red cedar, which do not have an export market like Douglas-fir or western hemlock. Trees are graded according to the grading rules in the Official Rules for Log Scaling and Grading Bureaus (January 1, 1982, Reprinted June 1, 1996). The Forestry Division has developed a sort & grade table for the Lummi Reservation based on the Official Rules that includes log grades unique to local mills, which has been entered into the SuperAce program.

  - **Defect**

    Log volume must be deducted where visible defect indicators are present. Length deductions should be made to the log when there is visible sweep, crook, crotch rot, catface, a spike, a fire scar, a bark seam, a knot cluster, or a large burl. Length deductions should also be made when there visible evidence of stump rot or conk rot (ACI, 2006). Butt rot in western red cedar and heart rot in red alder is common on

the Lummi Reservation. Diameter deductions should be made when the log contains oversized knots, small burls, weather checks, sap rot, rotten knots, a frost seam that extends the length of the log, and lightning scars. Cull segments are used when the log segment is non-merchantable and will be bucked out. Cull segments should be used when the tree contains non-merchantable tops, crotch, or will be cut as a long butt (ACI, 2006).

- **1.3.13.6 Unique Cruising Situations**
  - **Half Plots**

    Half plots may be used when a sample point or fixed-area plot falls on or very near to the stand boundary where trees from another timber type are either picked up in the sweep or are part of the fixed area plot.

    If timber along the stand boundary is similar to timber within the stand interior, it is usually acceptable to simply move the plot center back along the plot line until all of the "in" trees are within the stand or the entire plot lies within the stand boundary (Avery and Burkhart, 1994). If timber along the stand boundary appears different than the stand interior, the "Walkthrough Method" should be used. For every "in" tree within the stand boundary, measure the distance from the plot center to the geometric center of the tree. This distance is then doubled and projected on the other side of the tree. If the end of this distance falls outside the stand boundary, the tree is counted twice. If not, the tree is only counted once (Iles, 2005). A detailed description of the Walkthrough Method is on file at the Forestry Division office.

  - **Re-Occurring Sample Tree in Point Sampling**

    Although rare, if a sample tree occurs on two sample points, the tree should be considered as a valid "in" tree for each sample point. Each sample point is considered independently of the other. The fact that a tree is counted again will not alter the average basal area per acre. As long as each sample point is put on a per acre basis and the average of all sample points is used in determining the basal area per acre of the stand, there is no error (Bell, 1997). The same procedure can be used if two fixed-area plots overlap each other.

- **1.3.13.7 Timber Cruise Reporting**

  Once the cruise is completed, the cruise data must be entered into the SuperAce software. The SuperAce User's Manual should always be referenced before entering and processing cruise data to ensure that the correct expansion factor, cruise codes, and reference tables are being used. The Forestry Division uses a Nomad TDS handheld data recorder, which syncs with SuperAce using SuperEasy software. Once entered into the SuperAce system, cruise data must carefully reviewed for thoroughness and accuracy. Incorrect grade calls made in the field must be corrected before processing cruise reports. After the data has been correctly entered, relevant cruise reports can be generated.

  - **Relevant Cruise Reports**

    The following reports should be generated for each timber cruise:

    1. Species, Sort, & Grade Report

       This report lists stand volumes for each species, sort, and grade combination available within the harvest unit and is necessary for conducting the timber appraisal.

    2. Tree Segment Report

       This report displays the tree measurements for each sample tree, how the log was pencil bucked, and computed log volumes.

3. Statistics Report

   This report provides a statistical analysis of the timber cruise for all relevant stand metrics.

4. Stand Table Summary Report

   This report is useful for commercial thinnings.

Timber cruise reports should be checked against cut-out volumes to assess the quality of the timber cruise. If there are notable discrepancies between the cruise data and the cut-out volume, analysis should be done to determine sources of error.

- **1.3.14 Timber Appraisal**

After the timber cruise has been completed and volume estimates by species, sort, and grade have been obtained, a timber valuation is completed. There are currently two methods used for timber valuation: the analytical appraisal (or income on conversion return approach) and comparable sales analysis. When possible, both of these methods should be used to complete the valuation of each sale or permit. Unfortunately, a comparable sales analysis is difficult to do for timber sales on the Lummi Reservation due to the following factors:

- The Forestry Division only harvests 30 to 80 acres per year, which limits the availability of relevant comparable sales data (the BIA, PSA may be able to provide relevant comparable sales data from their timber sales).
- Bid results from comparable sales should have been obtained within 6 months of the analysis with no substantial change in market conditions.
- The timber sale and the comparable sales should have a similar species composition, volume per acre, and grade mix.
- **1.3.14.1 Timber Appraisal System**

  The Forestry Division has developed a comprehensive Timber Appraisal spreadsheet based on the different BIA templates using the valuation methodologies described in the "Timber Appraisal Handbook" published by the Forest Service, Region 6, which is on file at the Forestry Division office. This spreadsheet calculates the net value of the timber sale or minimum bid price using the analytical appraisal approach (or income on conversion return approach). Inputs are in blue font and outputs are in black font.

  - **Analytical Appraisal (Income on Conversion Return Approach)**

    In the analytical appraisal method, stumpage prices are determined by the following formula:

    - **Stumpage Value = Log Value - Profit & Risk - Logging Costs**
    - **Log Value**

      Log value must be obtained for each species, sort, and grade combination available in the timber sale based on current price sheets obtained from local mills. Price sheets should be evaluated to see which mills are offering the best prices. These prices should be then be weighed against the cost of hauling to that mill. In some cases, the mill offering the best price will not yield the highest revenue due to the higher hauling cost. Additionally, some mills are more forthcoming with price sheets than others. A listing of local mills and paved hauling distance in miles is provided in the Timber Appraisal spreadsheet.

      Log Lines is another source of log price information if prices cannot be obtained from local mills. However, this data is regional (Puget Sound) and will not provide as accurate log pricing information than the price sheets from local mills.

It is important to identify the average log length for each species, sort, and grade combination when determining which mills are offering the best price. Mills typically offer lower prices for short logs and higher prices for long logs. If the sale contains a higher percentage of short logs, than the species' weighted log price should reflect this. The percentage of net volume by log length for each species, sort, and grade combination is provided in the Species, Sort, and Grade report.

After a price is assigned to each species, sort, and grade combination, a weighted average log price is calculated for each species. This weighted average price is based on the percentage of volume in each sort and grade combination for that particular species. If the species has a significant pulp component, it should be excluded from the weighted average and treated separately because the price paid for pulp logs is typically much lower than that paid for sawlogs.

- **Logging Cost**

  The Timber Appraisal spreadsheet calculates a total logging cost ($)/MBF for falling & bucking, tractor, shovel, and highlead yarding, loading, overhead, site preparation, road construction, re-construction, maintenance, and user fees, log hauling, and other miscellaneous costs. Base costs are determined from regional averages and from direct quotes from equipment rental businesses, sand and gravel companies, and culvert and geotextile providers. A description of these logging costs is included in the Timber Appraisal spreadsheet.

  The silvicultural prescription, which describes harvest unit terrain and identifies the proposed logging system, harvest equipment, the length and scope of road construction or reconstruction, landing construction, culvert installations, exclusion zones, and site preparation requirements is used as the basis for developing the logging cost estimate. Additional contract requirements that are expected to impact logging costs must also be considered.

- **Profit & Risk**

  Profit & Risk 'mimics' the reality that a timber purchaser will bid low enough to recoup all of his costs, plus a reasonable profit. Profit & risk generally ranges between 10 to 15%. Most timber sales on the Lummi Reservation are relatively small, single-season and fairly simple to log. Therefore, the profit and risk margin is generally set at 10%. For smaller timber sales or timber sales with variable volumes, it may be appropriate to use a profit & risk margin of 15%. A purchaser's Profit and Risk (P&R) is calculated using the following formula (assuming a 10% P&R):

  - P&R = Log Value - (Log Value / 1.10)

- **Forest Products Yielding Negative Stumpage Values**

  For some low value forest products, the appraised stumpage price may be a negative value or close to a negative value. In these cases, the price must be set at a 'cull rate' so that forest products yielding negative values do not impact the minimum bid price for the timber sale. The cull rate of $25/MBF will be applied to any species or products appraising less than $25/MBF unless a lower rate is determined to be more appropriate.

- **1.3.15 Forest Manager's Narrative OR Forest Officer's Report**

The Forest Manager's Narrative (FMN) and the Forest Officer's Report (FOR) are both technical documents describing the details of the timber sale. The FMN or the FOR is the last report that must be prepared as part of the timber sale process and ties together all of the pertinent information of the timber sale. The silvicultural prescription prepared earlier must be included in the FMN or FOR. Once the FMN or FOR has been completed and approved by the BIA Superintendent, the timber sale can then be marketed and sold. Since the FMN is used for BIA

Paid Timber Cutting Permits, they are usually much shorter than an FOR which is used for BIA Timber Sale Contracts.

- **1.3.15.1 Forest Manager's Narrative (FMN)**

  The Forest Manager's Narrative describes the need for the timber sale, a description of the timber sale area, the silvicultural prescription, the environmental and technical review process, timber sale access, a description of the timber cruise method and results, a description of the timber appraisal method, and relevant map exhibits and attachments. Previous Forest Manager's Narratives are on file at the Forestry Division office, which can be used for preparing future Forest Manager Narratives. A sample table of contents for a Forest Manager's Narrative is provided in Appendix BB.

- **1.3.15.2 Forest Officer's Report (FOR)**

  The Forest Officer's Report contains two sections. The first section is titled Part A - Narrative and Factual Information and describes current market conditions, a description of the timber sale area, the silvicultural prescription (harvest plan), the sale's compliance with the current forest management plan and the principles of sustained yield, a description of other land use values, the environmental and technical review process, timber sale access, a description of the timber cruise method and results, consent of landowners, a description of the contract form, and proposed marketing procedures. Part A also includes relevant map exhibits and attachments including a sample timber sale contract, advertisement and prospectus and road use agreements. The second section is titled Part B – Theory of Appraisal, which describes the appraisal methodology and includes relevant appraisal worksheets as attachments. Timber appraisal information (Part B) must be kept confidential whereas Part A may be shared with prospective sale purchasers.

  Previous Forest Officer's Reports are on file at the Forestry Division office, which can be used for preparing future Forest Officer's Reports. A sample table of contents for a Forest Officer's Report is provided in Appendix CC.

  - **Sample Timber Cutting Permit or Timber Sale Contract**

    A sample of the paid timber cutting permit or timber sale contract that will be used for the timber sale is required as part of the FMN or FOR and should include the details and requirements generated during environmental analysis and harvest design (see Appendix 9P and 9R). Previous paid timber cutting permits and timber sale contracts are on file at the Forestry Division office, which can be used for preparing future permits or contracts.

  - **Sample Advertisement**

    The advertisement is the marketing instrument for the timber sale and provides basic information about the timber sale and instructions for submitting bids. A sample advertisement is required as part of the FOR. It is also required as part of the FMN if the sale will be advertised. Previous timber sale advertisements are on file at the Forestry Division office, which can be used for preparing future timber sale advertisements.

  - **Sample Prospectus**

    The timber sale prospectus provides more detail than the timber sale advertisement. It outlines contractual requirements specific to the timber sale, describes the requirements and procedures for the bid deposit (CFR 163.17), performance bond (CFR 163.21), and advance payment (CFR 163.23), and also provides instructions for submitting bids. A sample prospectus is required as part of the FOR. It is also required as part of the FMN if the sale will be advertised. Previous timber sale prospectuses are on file at the Forestry Division office, which can be used for preparing future prospectuses.

- **Sample Bid Proposal Form (Form 5-5318)**

  The bid proposal form includes a listing of the species and products available for sale, the bid price, and a description of the bid deposit requirement. This form is used by potential purchasers when submitting bids at a public bid opening. Like the sale advertisement and prospectus, a sample bid proposal form is required as part of the FOR. It is also required as part of the FMN if the sale will be advertised.

  A complete sample advertisement packet that includes the prospectus and bid proposal form is provided in Appendix DD.

- **1.3.16 Submit Permit/Contract Package to BIA for Review and Approval**

After the Forest Manager's Narrative or Forest Officer's Report is complete and the permit or contract package has been prepared, the package must be submitted to the BIA Superintendent for review and approval. After internal review, the Superintendent will either approve or disapprove the timber sale and will notify the Forestry Division by letter of the decision. If the timber sale is approved, then the sale can be marketed. If the timber sale is disapproved, then the reason for disapproval must be addressed.

- **1.3.17 Advertise Timber Sale**

Once the permit or contract packet is approved and if current market conditions are favorable, the timber sale is advertised to the public for bids. Nearly all timber harvests on the Lummi Reservation are marketed through a sale advertisement. In some instances, a sale may be sold by negotiation rather than advertisement. Such unadvertised sales usually involve tribal timber, a right-of-way clearing, harvest of a small tract, or existing or impending mortality. If market conditions are not favorable, advertisement of the timber sale should be delayed until market conditions improve and the landowners should be advised of the decision to delay advertisement.

If the estimated stumpage value of the timber sale does not exceed $15,000, the sale may be advertised by mailing the advertisement and prospectus to potential timber purchasers. If the estimated stumpage value of the timber sale exceeds $15,000, the advertisement must also be published in at least one edition of a regional newspaper i.e. the Bellingham Herald in addition to mailing the advertisement and prospectus to potential purchasers (CFR 163.15). Publishing the sale advertisement in the regional newspaper at least 2 times is preferred. If the timber sale is very high value, it may be beneficial to also publish the advertisement in local newspapers in Mt. Vernon and Everett. The Forestry Division uses the BIA Puget Sound Agency's list of timber purchasers when mailing out the advertisement and prospectus. This list contains approximately 200 potential purchasers from the Puget Sound area.

The length of the advertisement period depends on the value of the timber sale. If the estimated stumpage value is less than $50,000, the advertisement period must be no less than 15 days; if the estimated stumpage value is greater than $50,000 but less than $250,000, the advertisement period must be no less than 30 days; if the estimated stumpage value is greater than $250,000, the advertisement period must be no less than 60 days. Generally, there is no significant advantage to extending the advertisement period beyond 45 days for large sales. If a shorter advertisement period is used, the rationale must be noted in the Forest Officer's Report.

If the sale is not advertised and the permit price is negotiated, price quotes should be obtained from at least three potential purchasers (when possible). To facilitate this negotiation, the appraised price should be left blank on the sample permit or contract. The actual selling price can be filled in later at the time of permit issuance.

- **1.3.18 Public Bid Opening**

Pursuant to the timber sale advertisement, all potential purchasers must deposit their sealed bid for the timber sale by the date and time and at the address listed on the bid proposal form. Bid openings are held at 1:00 PM at the Puget Sound Agency in Everett. Bids are displayed so that all bidders can see how their bid placed and the apparent high bidder is identified. Bid deposits

are required for all advertised contract timber sales (CFR 163.17). If the potential purchaser fails to provide the required bid deposit, the bid will not be considered, even if it is the highest bid.

After bids have been received and the apparent high bidder identified, **Form XBIA – 4321, Abstract of Bids** must be filled out. This form lists the forest products available for sale, each bid received, and the contact information for each bidder. A sample Abstract of Bids form is provided in Appendix EE. A memorandum describing the bid opening results is then prepared and a recommendation on which bid to accept is made by the Forestry Division. The Abstract of Bids form and the individual bid proposals are provided as an attachment to the memorandum. The memorandum is then sent to the BIA Superintendent for review and approval.

If the apparent high bid is accepted, the permit or contract may be executed. If the apparent high bid is not accepted due to the purchaser's poor reputation, the next highest bid will be accepted if agreeable to the bidder. If no bid is received or accepted, the Superintendent may keep the sale open for up to one year. During this period, the sale will be available for the advertised value or the current appraised value, whichever is greater. The sample permit or contract may be updated to reflect changes in language or standards occurring since advertisement.

- **1.3.19 Process Timber Sale Payments**

After the highest bid is accepted, the Purchaser must pay for the timber and the required performance bond in advance of all cutting (CFR 163.21, 163.22, & 163.23). The payment method varies depending on whether the sale is a predetermined or estimated volume sale.

- **1.3.19.1 Predetermined Volume Sales**

  Predetermined volume sales are paid for in a lump sum by a single payment or installment payments. Almost all trust land timber sales on the Lummi Reservation are predetermined volume sales. For paid timber cutting permits, single payments involve payment of the full purchase price prior to approval of the permit. For timber sale contracts, single payments are due within 30 to 90 days of contract approval and must be made prior to any cutting.

  Installment payments may be used for relatively high value sales. When this method is used, timber is released for cutting in blocks of predetermined volume and value. Cutting is not permitted on a block until payment for that block has been received. It is important that the specified payment blocks be identifiable on the ground. Roads and distinct stand types make good payment block boundaries. The contract or permit must specify installment payment amounts and due dates.

- **1.3.19.2 Estimated Volume Sales**

  Estimated volume sales generally require an advance payment of 25% of the estimated stumpage value, which must be paid within 30 days of permit or contract approval and prior to any cutting (CFR 163.23). The remainder of the sale value is paid for at the permit or contract bid rates after the logs have been scaled and a scaling certificate is issued. The Permittee/Purchaser is invoiced for additional Advance Deposits as needed based upon scaling certifications and volume on the ground. The mills or the Permittee/Purchaser mail payment to the BIA lockbox for processing.

- **1.3.19.3 Performance Bonds**

  Performance bonds are required for all timber sale contracts and most paid timber cutting permits and must be collected prior to contract or permit approval. The performance bond amount is determined by the value of the timber sale. Regulations for determining the appropriate performance bond amount and acceptable bond forms are provided in CFR 163.21.

Whether a permit or contract is used, the Purchaser must make all payments to the BIA lockbox. The BIA processes the check on behalf of the landowners and deposits the appropriate amount

into each landowner's Individual Indian Monies (IIM) account based on the TAAMS property title report. An invoice is generated in TAAMS for each payment made by the BIA. The Forestry Division does not have access to TAAMS and must coordinate with the BIA to prepare TAAMS invoices for an Advance Payment, Advance Deposit, Bid Deposit, etc. The amount paid to each landowner is based on their percent interest in the property. The BIA also deducts the 10% forest management deduction fee and deposits this amount into the Tribe's Forest Management Deduction account prior to distributing payment to landowners.

Payments and deposits greater than or equal to $10,000.00 may be made by electronic funds transfer (EFT) unless otherwise specified by the Approving Officer. Payment for amounts less than $10,000.00 may be made by electronic funds transfer, certified check, cashier's check, or postal money order.

- **1.3.20 Execute Paid Timber Cutting Permit or Timber Sale Contract**

After all of the necessary payments have been received, the permit or contract can be executed.

- **1.3.20.1 Pre-harvest Meeting**

Prior to the start of logging, a pre-harvest meeting must be scheduled with the Purchaser to accomplish the following:

- Reiterate contract requirements and answer any questions the Purchaser or logging operator may have regarding the cutting prescription, buffers, or other pertinent sale questions.
- Have the Purchaser fill out the PSA Timber Sale Logging and Road Plan Advice of Operations form. This form provides information on the Purchaser's operating schedule and planned mill deliveries. A sample Timber Sale Logging and Road Plan Advice of Operations form is provided in Appendix FF.
- Check out the BIA log branding hammer and BIA log truck tickets and provide instructions for use. The log branding hammer and truck tickets are provided by the BIA, Puget Sound Agency and are available upon request. Instructions for using log truck tickets are on file at the Forestry Division office.

- **1.3.20.2 Permit or Contract Administration**

Once harvest operations have begun, regular compliance checks must be conducted to ensure that the logging operator is following all of the contract requirements and to trouble-shoot any unforeseen problems that may arise. It is important to visit the site at least twice a week at the beginning of the operation so that any potential problems are resolved early in the operation and their impacts are minimized. Items that should be closely monitored include road construction, the cutting prescription, buffer protections, site disturbance, sediment tracking onto paved roads, and public safety. A timber sale inspection report must be prepared for each site visit documenting the level of compliance, items of concern, and corrective actions (if any). The inspection report must be signed by the Officer-in-Charge and the Purchaser or the Purchaser's representative. The inspection report provides the basis for future corrective actions that may be taken by the Officer-in-Charge if problems are not resolved. A sample PSA Timber Sale Inspection Report is provided in Appendix GG.

If the sale is an estimated volume sale, scaling reports and log truck ticket receipts received from mills must be entered into a spreadsheet to keep track of log loads and payment information.

- **1.3.20.3 Permit or Contract Close Out**

After the harvest is complete and all permit or contract obligations have been met, **Form 5-5319a - Statement of Completion of Timber Contract** and **Form 5-5319b – Summary of Operations** must be completed and submitted to the BIA Puget Sound Agency for processing. A sample of form 5-5319a is provided in Appendix HH and a sample

of form 5-5319b is provided in Appendix II. If the timber sale contains multiple trust parcels, a Statement of Completion must be prepared for each trust parcel in addition to the Statement of Completion and Summary of Operations prepared for the entire timber sale.

After the statement of completion and summary of operations forms have been approved and signed by the BIA Superintendent, the Superintendent will notify the Purchaser in writing that he is relieved of any further liability under the permit or contract and un-obligated advance deposits or performance bonds will be refunded or letters of credit will be returned.

- **1.3.21 Additional Permit and Contract Processing Resources**

Additional permit and contract processing resources can be found the BIA Indian Forest Management Handbook, Contract Sales of Forest Products and Permit Sales of Forest Products.

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Appendix A - CFR Part 163, General Forestry Regulations

sustained yield management of ANCSA forest resources, local processing and other value-added activities.

Subpart F—Program Assessment

163.82 Annual Status Report

142. *Comment:* In § 163.82 of the rule delete the requirement to report the value of timber available for sale and the condition to report required information only for lands managed under an approved forest management plan.

Response: The reporting requirements in § 163.82 of the rule have been changed to conform with reporting requirements stipulated in 25 U.S.C. 3111(c) so the change requested by the comment has been made.

III. Findings and Certifications

The major purpose of the revision has been to provide uniform Indian forestry program operating policy that complies with the National Indian Forest Resources Management Act.

The Department has certified to the Office of Management and Budget (OMB) that these final regulations meet the applicable standards provided in sections 2(a) and 2(b)(2) of Executive Order 12778. These regulations have no preemptive or retroactive effect.

The Department of the Interior has determined that this rule is not a significant regulatory action under Executive Order 12866, and therefore will not be reviewed by the Office of Management and Budget.

In accordance with E.O. 12630, the Department has determined that this rule does not have significant takings implications.

This rule will not have a significant economic impact on a substantial number of small entities under the Regulatory Flexibility Act (5 U.S.C. 601 et seq.). The proposed 25 CFR part 163, General Forest Regulations, will have a positive impact on small business entities. Section 163.13, Indian tribal forest enterprise operations, § 163.14, Sale of forest products, and § 163.22, Payment for forest products provide streamlined rules for the sale and collection of proceeds from the sale of Indian forest products. The rule should benefit both Indian and non-Indian forest product businesses on and adjacent to Indian lands by simplifying sale procedures and improving cash flow to Tribes engaged in forest product industry. Further, the rule will provide a means to deliver technical assistance to Alaska Native Regional and Village Corporations to promote and develop value-added forest product industry. Such assistance will create a positive impact by facilitating initiation of new, small forest product businesses and enhancing existing enterprises. Other than these positive effects, the rule will not cause significant impacts to small business entities because other sections of the rule serve to affirm uniform Indian forest resource management standards, policy and procedures which have been in effect for many years.

The Department has determined that this rule does not have significant federalism effects.

The Department has determined that this rulemaking does not constitute a major Federal action significantly affecting the quality of the human environment and that no detailed statement is required pursuant to the National Environmental Policy Act of 1969.

The information collection requirements contained in this part do not require approval by the Office of Management and Budget under 44 U.S.C. 3501 *et seq.*

The primary author of this document is Mr. Jim Stires, Forester, in the Billings Area Office, Bureau of Indian Affairs, Branch of Forestry, Billings, Montana.

List of Subjects in 25 CFR Part 163

Forests and forest products; Indian lands; education.

For the reasons set forth in the preamble, part 163 of Title 25 of the Code of Federal Regulations is revised as set forth below.

PART 163—GENERAL FORESTRY REGULATIONS

Subpart A—General Provisions

Sec.
163.1 Definitions.
163.2 Information collection.
163.3 Scope and objectives.
163.4 Secretarial recognition of tribal laws.

Subpart B—Forest Management and Operations

163.10 Management of Indian forest land.
163.11 Forest management planning and sustained yield management.
163.12 Harvesting restrictions.
163.13 Indian tribal forest enterprise operations.
163.14 Sale of forest products.
163.15 Advertisement of sales.
163.16 Forest product sales without advertisement.
163.17 Deposit with bid.
163.18 Acceptance and rejection of bids.
163.19 Contracts for the sale of forest products.
163.20 Execution and approval of contracts.
163.21 Bonds required.
163.22 Payment for forest products.
163.23 Advance payment for timber products.
163.24 Duration of timber contracts.
163.25 Forest management deductions.
163.26 Forest product harvesting permits.
163.27 Free-use harvesting without permits.
163.28 Fire management measures.
163.29 Trespass.
163.30 Revocable road use and construction permits for removal of commercial forest products.
163.31 Insect and disease control.
163.32 Forest development.
163.33 Administrative appeals.
163.34 Environmental compliance.
163.35 Indian forest land assistance account.
163.36 Tribal forestry program financial support.
163.37 Forest management research.

Subpart C—Forestry Education, Education Assistance, Recruitment and Training

163.40 Indian and Alaska Native forestry education assistance.
163.41 Postgraduation recruitment, continuing education and training programs.
163.42 Obligated service and breach of contract.

Subpart D—Alaska Native Technical Assistance Program

163.60 Purpose and scope.
163.61 Evaluation committee.
163.62 Annual funding needs assessment and rating.
163.63 Contract, grant, or agreement application and award process.

Subpart E—Cooperative Agreements

163.70 Purpose of agreements.
163.71 Agreement funding.
163.72 Supervisory relationship.

Subpart F—Program Assessment

163.80 Periodic assessment report.
163.81 Assessment guidelines.
163.82 Annual status report.
163.83 Assistance from the Secretary of Agriculture.

Authority: 25 U.S.C. 2, 5, 9, 13, 406, 407, 413, 415, 466; and 3101–3120.

Subpart A—General Provisions

§ 163.1 Definitions.

Advance deposits means, in Timber Contract for the Sale of Estimated Volumes, contract-required deposits in advance of cutting which the purchaser furnishes to maintain an operating balance against which the value of timber to be cut will be charged.

Advance payments means, in Timber Contract for the Sale of Estimated Volumes, non-refundable partial payments of the estimated value of the timber to be cut. Payments are furnished within 30 days of contract approval and prior to cutting. Advance payments are normally 25 percent of the estimated value of the forest products on each allotment. Advance payments may be required for tribal land.

Alaska Native means native as defined in section 3(b) of the Alaska

Native Claims Settlement Act of December 18, 1971 (43 U.S.C. 1604).

ANCSA corporation means both profit and non-profit corporations established pursuant to the Alaska Native Claims Settlement Act (43 U.S.C. 1604).

Approval means authorization by the Secretary, Area Director, Superintendent, tribe or individual Indian in accordance with appropriate delegations of authority.

Approving officer means the officer approving instruments of sale for forest products or his/her authorized representative.

Authorized representative means an individual or entity duly empowered to make decisions under a direct, clear, and specific delegation of authority.

Authorized tribal representative means an individual or entity duly empowered to make decisions under a direct, clear, and specific delegation of authority from an Indian tribe.

Beneficial owner means an individual or entity who holds an ownership interest in Indian land.

Bid deposit means, in Timber Contract for the Sale of Estimated Volumes or in Timber Contract for the Sale of Predetermined Volumes, a deposit with bid furnished by prospective purchasers. At contract execution, the bid deposit of the successful bidder becomes a portion of the contract required advance deposit in estimated volume contracts or an installment payment in predetermined volume contracts.

Commercial forest land means forest land that is producing or capable of producing crops of marketable forest products and is administratively available for intensive management and sustained production.

Expenditure plan means a written agreement between an Indian tribe and the Secretary documenting tribal commitment to undertake specified forest land management activities within general time frames.

Forest or forest land means an ecosystem at least one acre in size, including timberland and woodland, which: Is characterized by a more or less dense and extensive tree cover; contains, or once contained, at least ten percent tree crown cover, and is not developed or planned for exclusive non-forest resource use.

Forest land management activities means all activities performed in the management of Indian forest land including:

(a) All aspects of program administration and executive direction such as:

(1) Development and maintenance of policy and operational procedures, program oversight, and evaluation;

(2) Securing of legal assistance and handling of legal matters;

(3) Budget, finance, and personnel management; and

(4) Development and maintenance of necessary data bases and program reports.

(b) All aspects of the development, preparation and revision of forest inventory and management plans, including aerial photography, mapping, field management inventories and re-inventories, inventory analysis, growth studies, allowable annual cut calculations, environmental assessment, and forest history, consistent with and reflective of tribal integrated resource management plans where such plans exist.

(c) Forest land development, including forestation, thinning, tree improvement activities, and the use of silvicultural treatments to restore or increase growth and yield to the full productive capacity of the forest environment.

(d) Protection against losses from wildfire, including acquisition and maintenance of fire fighting equipment and fire detection systems, construction of fire breaks, hazard reduction, prescribed burning, and the development of cooperative wildfire management agreements.

(e) Protection against insects and disease, including:

(1) All aspects of detection and evaluation;

(2) Preparation of project proposals containing project descriptions, environmental assessments and statements, and cost- benefit analyses necessary to secure funding;

(3) Field suppression operations and reporting.

(f) Assessment of damage caused by forest trespass, infestation or fire, including field examination and survey, damage appraisal, investigation assistance and report, demand letter, and testimony preparation.

(g) All aspects of the preparation, administration, and supervision of timber sale contracts, paid and free use permits, and other Indian forest product harvest sale documents, including;

(1) Cruising, product marketing, silvicultural prescription, appraisal and harvest supervision;

(2) Forest product marketing assistance, including evaluation of marketing and development opportunities related to Indian forest products and consultation and advice to tribes, tribal and Indian enterprises on maximization of return on forest products;

(3) Archeological, historical, environmental and other land management reviews, clearances, and analyses;

(4) Advertising, executing, and supervising contracts;

(5) Marking and scaling of timber; and

(6) Collecting, recording and distributing receipts from sales.

(h) Provision of financial assistance for the education of Indians and Alaska Natives enrolled in accredited programs of postsecondary and postgraduate forestry and forestry-related fields of study, including the provision of scholarships, internships, relocation assistance, and other forms of assistance to cover educational expenses.

(i) Participation in the development and implementation of tribal integrated resource management plans, including activities to coordinate current and future multiple uses of Indian forest lands.

(j) Improvement and maintenance of extended season primary and secondary Indian forest land road systems.

(k) Research activities to improve the basis for determining appropriate management measures to apply to Indian forest land.

Forest management deduction means a percentage of the gross proceeds from the sales of forest products harvested from Indian land which is collected by the Secretary pursuant to 25 U.S.C. 413 to cover in whole or in part the cost of managing and protecting such Indian forest lands.

Forest management plan means the principal document, approved by the Secretary, reflecting and consistent with an integrated resource management plan, which provides for the regulation of the detailed, multiple-use operation of Indian forest land by methods ensuring that such lands remain in a continuously productive state while meeting the objectives of the tribe and which shall include: Standards setting forth the funding and staffing requirements necessary to carry out each management plan, with a report of current forestry funding and staffing levels; and standards providing quantitative criteria to evaluate performance against the objectives set forth in the plan.

Forest products means marketable products extracted from Indian forests, such as: Timber; timber products, including lumber, lath, crating, ties, bolts, logs, pulpwood, fuelwood, posts, poles, and split products; bark; Christmas trees, stays, branches, firewood, berries, mosses, pinyon nuts, roots, acorns, syrups, wild rice,

mushrooms, and herbs; other marketable material; and gravel which is extracted from, and utilized on, Indian forest land.

Forestry-related field or *forestry-related curriculum* means a renewable natural resource management field necessary to manage Indian forest land and other professionally recognized fields as approved by the education committee established pursuant to § 163.40(a)(1).

Forest resources means all the benefits derived from Indian forest land, including forest products, soil productivity, water, fisheries, wildlife, recreation, and aesthetic or other traditional values of Indian forest land.

Forester intern means an Indian or Alaska Native who: Is employed as a forestry or forestry-related technician with the Bureau of Indian Affairs, an Indian tribe, or tribal forest-related enterprise; is acquiring necessary academic qualifications to become a forester or a professional trained in forestry-related fields; and is appointed to one of the Forester Intern positions established pursuant to § 163.40(b).

Indian means a member of an Indian tribe.

Indian enterprise means an enterprise which is designated as such by the Secretary or tribe.

Indian forest land means Indian land, including commercial, non-commercial, productive and non-productive timberland and woodland, that are considered chiefly valuable for the production of forest products or to maintain watershed or other land values enhanced by a forest cover, regardless of whether a formal inspection and land classification action has been taken.

Indian land means land title which is held by: The United States in trust for an Indian, an individual of Indian or Alaska Native ancestry who is not a member of a federally-recognized Indian tribe, or an Indian tribe; or by an Indian, an individual of Indian or Alaska Native ancestry who is not a member of a federally recognized tribe, or an Indian tribe subject to a restriction by the United States against alienation.

Indian tribe or *tribe* means any Indian tribe, band, nation, rancheria, Pueblo or other organized group or community which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians and shall mean, where appropriate, the recognized tribal government of such tribe's reservation.

Installment payments means, in Timber Contract for the Sale of Predetermined Volumes, scheduled partial payments of the total contract value based on purchaser bid. Payments made are normally not refundable.

Integrated resource management plan means a document, approved by an Indian tribe and the Secretary, which provides coordination for the comprehensive management of the natural resources of such tribe's reservation.

Noncommercial forest land means forest land that is available for extensive management, but is incapable of producing sustainable forest products within the general rotation period. Such land may be economically harvested, but the site quality does not warrant significant investment to enhance future crops.

Productive forest land means forest land producing or capable of producing marketable forest products that is unavailable for harvest because of administrative restrictions or because access is not practical.

Reservation means an Indian reservation established pursuant to treaties, Acts of Congress, or Executive Orders and public domain Indian allotments, Alaska Native allotments, rancherias, and former Indian reservations in Oklahoma.

Secretary means the Secretary of the Interior or his or her authorized representative.

Stumpage rate means the stumpage value per unit of measure for a forest product.

Stumpage value means the value of a forest product prior to extraction from Indian forest land.

Sustained yield means the yield of forest products that a forest can produce continuously at a given intensity of management.

Timberland means forest land stocked, or capable of being stocked, with tree species that are regionally utilized for lumber, pulpwood, poles or veneer products.

Trespass means the removal of forest products from, or damaging forest products on, Indian forest land, except when authorized by law and applicable federal or tribal regulations. Trespass can include any damage to forest resources on Indian forest land resulting from activities under contracts or permits or from fire.

Tribal forest enterprise means an Indian enterprise that is initiated and organized by a reservation's recognized tribal government.

Unproductive forest land means forest land that is not producing or capable of producing marketable forest products and is also unavailable for harvest because of administrative restrictions or because access is not practical.

Woodland means forest land not included within the timberland classification, stocked, or capable of being stocked, with tree species of such form and size to produce forest products that are generally marketable within the region for products other than lumber, pulpwood, or veneer.

§ 163.2 Information collection.

The information collection requirements contained in 25 CFR part 163 do not require the approval of the Office of Management and Budget under 44 U.S.C. 3504(h) et seq.

§ 163.3 Scope and objectives.

(a) The regulations in this part are applicable to all Indian forest land except as this part may be superseded by legislation.

(b) Indian forest land management activities undertaken by the Secretary shall be designed to achieve the following objectives:

(1) The development, maintenance and enhancement of Indian forest land in a perpetually productive state in accordance with the principles of sustained yield and with the standards and objectives set forth in forest management plans by providing effective management and protection through the application of sound silvicultural and economic principles to the harvesting of forest products, forestation, timber stand improvement and other forestry practices;

(2) The regulation of Indian forest land through the development and implementation, with the full and active consultation and participation of the appropriate Indian tribe, of forest management plans which are supported by written tribal objectives;

(3) The regulation of Indian forest land in a manner that will ensure the use of good method and order in harvesting so as to make possible, on a sustained yield basis, continuous productivity and a perpetual forest business;

(4) The development of Indian forest land and associated value-added industries by Indians and Indian tribes to promote self-sustaining communities, so that Indians may receive from their Indian forest land not only stumpage value, but also the benefit of all the labor and profit that such Indian forest land is capable of yielding;

(5) The retention of Indian forest land in its natural state when an Indian tribe determines that the recreational, cultural, aesthetic, or traditional values of the Indian forest land represents the highest and best use of the land;

(6) The management and protection of forest resources to retain the beneficial

effects to Indian forest land of regulating water run-off and minimizing soil erosion; and

(7) The maintenance and improvement of timber productivity, grazing, wildlife, fisheries, recreation, aesthetic, cultural and other traditional values.

§ 163.4 Secretarial recognition of tribal laws.

Subject to the Secretary's trust responsibilities, and unless otherwise prohibited by Federal statutory law, the Secretary shall comply with tribal laws pertaining to Indian forest land, including laws regulating the environment or historic or cultural preservation, and shall cooperate with the enforcement of such laws on Indian forest land. Such cooperation does not constitute a waiver of United States sovereign immunity and shall include:

(a) Assistance in the enforcement of such laws;

(b) Provision of notice of such laws to persons or entities undertaking activities on Indian forest land; and

(c) Upon the request of an Indian tribe, the appearance in tribal forums.

Subpart B—Forest Management and Operations

§ 163.10 Management of Indian forest land.

(a) The Secretary shall undertake forest land management activities on Indian forest land, either directly or through contracts, cooperative agreements, or grants under the Indian Self-Determination and Education Assistance Act (Pub. L. 93–638, as amended).

(b) Indian forest land management activities undertaken by the Secretary shall be designed to achieve objectives enumerated in § 163.3 of this part.

§ 163.11 Forest management planning and sustained yield management.

(a) To further the objectives identified in § 163.3 of this part, an appropriate forest management plan shall be prepared and revised as needed for all Indian forest lands. Such documents shall contain a statement describing the manner in which the policies of the tribe and the Secretary will be applied, with a definite plan of silvicultural management, analysis of the short term and long term effects of the plan, and a program of action, including a harvest schedule, for a specified period in the future. Forest management plans shall be based on the principle of sustained yield management and objectives established by the tribe and will require approval of the Secretary.

(b) Forest management planning for Indian forest land shall be carried out through participation in the development and implementation of integrated resource management plans which provide coordination for the comprehensive management of all natural resources on Indian land. If the integrated resource management planning process has not been initiated, or is not ongoing or completed, a stand-alone forest management plan will be prepared.

(c) The harvest of forest products from Indian forest land will be accomplished under the principles of sustained yield management and will not be authorized until practical methods of harvest based on sound economic and silvicultural and other forest management principles have been prescribed. Harvest schedules will be prepared for a specified period of time and updated annually. Such schedules shall support the objectives of the beneficial land owners and the Secretary and shall be directed toward achieving an approximate balance between net growth and harvest at the earliest practical time.

§ 163.12 Harvesting restrictions.

(a) Harvesting timber on commercial forest land will not be permitted unless provisions for natural and/or artificial reforestation of acceptable tree species is included in harvest plans.

(b) Clearing of large contiguous areas will be permitted only on land that, when cleared, will be devoted to a more beneficial use than growing timber crops. This restriction shall not prohibit clearcutting when it is silviculturally appropriate, based on ecological principles, to harvest a particular stand of timber by such method and it otherwise conforms with objectives in § 163.3 of this part.

§ 163.13 Indian tribal forest enterprise operations.

Indian tribal forest enterprises may be initiated and organized with consent of the authorized tribal representatives. Such enterprises may contract for the purchase of non-Indian owned forest products. Subject to approval by the Secretary the following actions may be taken:

(a) Authorized tribal enterprises may enter into formal agreements with tribal representatives for the use of tribal forest products, and with individual beneficial Indian owners for their forest products;

(b) Authorized officials of tribal enterprises, operating under approved agreements for the use of Indian-owned forest products pursuant to this section, may sell the forest products produced according to generally accepted trade practices;

(c) With the consent of the beneficial Indian owners, such enterprises may, without advertisement, contract for the purchase of forest products on Indian land at stumpage rates authorized by the Secretary;

(d) Determination of and payment for stumpage and/or products utilized by such enterprises will be authorized in accordance with § 163.22. However, the Secretary may issue special instructions for payment by methods other than those in § 163.22 of this part; and

(e) Performance bonds may or may not be required in connection with operations on Indian land by such enterprises as determined by the Secretary.

§ 163.14 Sale of forest products.

(a) Consistent with the economic objectives of the tribe and with the consent of the Secretary and authorized by tribal resolution or resolution of recognized tribal government, open market sales of Indian forest products may be authorized. Such sales require consent of the authorized representatives of the tribe for the sale of tribal forest products, and the owners of a majority Indian interest on individually owned lands. Open market sales of forest products from Indian land located off reservations will be permitted with the consent of the Secretary and majority Indian interest of the beneficial Indian owner(s).

(b) On individually owned Indian forest land not formally designated for retention in its natural state, the Secretary may, after consultation, sell the forest products without the consent of the owner(s) when in his or her judgment such action is necessary to prevent loss of value resulting from fire, insects, diseases, windthrow or other catastrophes.

(c) Unless otherwise authorized by the Secretary, each sale of forest products having an estimated stumpage value exceeding $15,000 will not be approved until:

(1) An examination of the forest products to be sold has been made by a forest officer; and

(2) A report setting forth all pertinent information has been submitted to the approving officer as provided in § 163.20 of this part.

(d) With the approval of the Secretary, authorized beneficial Indian owners who have been duly apprised as to the value of the forest products to be sold, may sell or transfer forest products for less than the appraised value.

(e) Except as provided in § 163.14(d) of this part, in all such sales, the forest products shall be appraised and sold at

stumpage rates not less than those established by the Secretary.

§ 163.15 Advertisement of sales.

Except as provided in §§ 163.13, 163.14, 163.16, and 163.26 of this part, sales of forest products shall be made only after advertising.

(a) The advertisement shall be approved by the officer who will approve the instrument of sale. Advertised sales shall be made under sealed bids, or at public auction, or under a combination thereof. The advertisement may limit sales of Indian forest products to Indian forest enterprises, members of the tribe, or may grant to Indian forest enterprises and/or members of the tribe who submitted bids the right to meet the higher bid of a non-member. If the estimated stumpage value of the forest products offered does not exceed $15,000, the advertisement may be made by posters and circular letters. If the estimated stumpage value exceeds $15,000, the advertisement shall also be made in at least one edition of a newspaper of general circulation in the locality where the forest products are situated. If the estimated stumpage value does not exceed $50,000, the advertisement shall be made for not less than 15 days; if the estimated stumpage value exceeds $50,000 but not $250,000, for not less than 30 days; and if the estimated stumpage value exceeds $250,000, for not less than 60 days.

(b) The approving officer may reduce the advertising period because of emergencies such as fire, insect attack, blowdown, limitation of time, or when there would be no practical advantage in advertising for the prescribed period.

(c) If no instrument of sale is executed after such advertisement, the approving officer may, within one year from the last day on which bids were to be received as defined in the advertisement, permit the sale of such forest products. The sale will be made upon the terms and conditions in the advertisement and at not less than the advertised value or the appraised value at the time of sale, whichever is greater.

§ 163.16 Forest product sales without advertisement.

(a) Sales of forest products may be made without advertisement to Indians or non-Indians with the consent of the authorized tribal representatives for tribal forest products or with the consent of the beneficial owners of a majority Indian interest of individually owned Indian land, and the approval of the Secretary when:

(1) Forest products are to be cut in conjunction with the granting of a right-of-way;

(2) Granting an authorized occupancy;

(3) Tribal forest products are to be purchased by an Indian tribal forest enterprise;

(4) It is impractical to secure competition by formal advertising procedures;

(5) It must be cut to protect the forest from injury; or

(6) Otherwise specifically authorized by law.

(b) The approving officer shall establish a documented record of each negotiated transaction. This will include:

(1) A written determination and finding that the transaction is a type allowing use of negotiation procedures;

(2) The extent of solicitation and competition, or a statement of the facts upon which a finding of impracticability of securing competition is based; and

(3) A statement of the factors on which the award is based, including a determination as to the reasonability of the price accepted.

§ 163.17 Deposit with bid.

(a) A deposit shall be made with each proposal for the purchase of Indian forest products. Such deposits shall be at least:

(1) Ten (10) percent if the appraised stumpage value is less than $100,000 and in any event not less than $1,000 or full value whichever is less;

(2) Five (5) percent if the appraised stumpage value is $100,000 to $250,000 but in any event not less than $10,000; and

(3) Three (3) percent if the appraised stumpage value exceeds $250,000 but in any event not less than $12,500.

(b) Deposits shall be in the form of either a certified check, cashier's check, bank draft, postal money order, or irrevocable letter-of-credit, drawn payable as specified in the advertisement, or in cash.

(c) The deposit of the apparent high bidder, and of others who submit a written request to have their bids considered for acceptance will be retained pending acceptance or rejection of the bids. All other deposits will be returned following the opening and posting of bids.

(d) The deposit of the successful bidder will be forfeited and distributed as damages to the beneficial owners if the bidder does not:

(1) Furnish the performance bond required by § 163.21 of this part within the time stipulated in the advertisement for sale of forest products;

(2) Execute the contract; or

(3) Perform the contract.

(e) Forfeiture of a deposit does not limit or waive any further claims for damages available under applicable law or terms of the contract.

(f) In the event of an administrative appeal under 25 CFR part 2, the Secretary may hold such bid deposits in an escrow account pending resolution of the appeal.

§ 163.18 Acceptance and rejection of bids.

(a) The high bid received in accordance with any advertisement issued under authority of this part shall be accepted, except that the approving officer, having set forth the reason(s) in writing, shall have the right to reject the high bid if:

(1) The high bidder is considered unqualified to fulfill the contractual requirement of the advertisement; or

(2) There are reasonable grounds to consider it in the interest of the Indians to reject the high bid.

(b) If the high bid is rejected, the approving officer may authorize:

(1) Rejection of all bids; or

(2) Acceptance of the offer of another bidder who, at bid opening, makes written request that their bid and bid deposit be held pending a bid acceptance.

(c) The officer authorized to accept the bid shall have the discretion to waive minor technical defects in advertisements and proposals, such as typographical errors and misplaced entries.

§ 163.19 Contracts for the sale of forest products.

(a) In sales of forest products with an appraised stumpage value exceeding $15,000, the contract forms approved by the Secretary must be used unless a special form for a particular sale or class of sales is approved by the Secretary.

(b) Unless otherwise directed, the contracts for forest products from individually-owned Indian land will be paid by remittance drawn to the Bureau of Indian Affairs and transmitted to the Superintendent. Upon the request of the tribe, the contracts for tribal forest products may require that the proceeds be paid promptly and directly into a bank depository account designated by such tribe, or by remittance drawn to the Bureau of Indian Affairs and transmitted to the Superintendent.

(c) By mutual agreement of the parties to a contract, contracts may be extended, modified, or assigned subject to approval by the approving officer, and may be terminated by the approving officer upon completion or by mutual agreement.

§ 163.20 Execution and approval of contracts.

(a) All contracts for the sale of tribal forest products shall be executed by the authorized tribal representative(s). There shall be included with the contract an affidavit executed by the authorized tribal representative(s) setting forth the resolution or other authority of the governing body of the tribe. Contracts must be approved by the Secretary to be valid.

(b) Contracts for the sale of individually owned forest products shall be executed by the beneficial Indian owner(s) or the Secretary acting pursuant to a power of attorney from the beneficial Indian owner(s). Contracts must be approved by the Secretary to be valid.

(1) The Secretary may, after consultation with any legally appointed guardian, execute contracts on behalf of minors and beneficial Indian owners who are non compos mentis.

(2) The Secretary may execute contracts for a decedent's estate where ownership has not been determined or for those persons who cannot be located after a reasonable and diligent search and the giving of notice by publication.

(3) Upon the request of the owner of an undivided but unrestricted interest in land in which there are trust or restricted Indian interests, the Secretary may include such unrestricted interest in a sale of the trust or restricted interests in the timber, pursuant to this part, and perform any functions required of him/her by the contract of sale for both the restricted and the unrestricted interests, including the collection and disbursement of payments for timber and the forest management deductions from such payments.

(4) When consent of only a majority interest has been obtained, the Secretary may execute the sale on behalf of all owners to fulfill responsibilities to the beneficiaries of the trust. In such event, the contract file must contain evidence of the effort to obtain consent of all owners. When an individual cannot be located, the Secretary, after a reasonable and diligent search and the giving of notice by publication, may sign a power of attorney consenting to the sale for particular interests. For Indian forest land containing undivided restricted and unrestricted interests, only the restricted interests are considered in determining if a majority interest has been obtained.

§ 163.21 Bonds required.

(a) Performance bonds will be required in connection with all sales of forest products, except they may or may not be required, as determined by the approving officer, in connection with the use of forest products by Indian tribal forest enterprises pursuant to this part in § 163.13 or in timber cutting permits issued pursuant to § 163.26 of this part.

(1) In sales in which the estimated stumpage value, calculated at the appraised stumpage rates, does not exceed $15,000, the bond shall be at least 20 percent of the estimated stumpage value.

(2) In sales in which the estimated stumpage value exceeds $15,000 but is not over $150,000, the bond shall be at least 15 percent of the estimated stumpage value but not less than $3,000.

(3) In sales in which the estimated stumpage value exceeds $150,000, but is not over $350,000, the bond shall be at least 10 percent of the estimated stumpage value but not less than $22,500.

(4) In sales in which the estimated stumpage value exceeds $350,000, the bond shall be at least 5 percent of the estimated stumpage value but not less than $35,000.

(b) Bonds shall be in a form acceptable to the approving officer and may include:

(1) A corporate surety bond by an acceptable surety company;

(2) A cash bond designating the approving officer to act as trustee under terms of an appropriate trust;

(3) Negotiable U.S. Government securities supported by an appropriate trust instrument; or

(4) An irrevocable letter of credit.

§ 163.22 Payment for forest products.

(a) The basis of volume determination for forest products sold shall be the Scribner Decimal C log rules, cubic volume, lineal measurement, piece count, weight, or such other form of measurement as the Secretary may authorize for use. With the exception of Indian tribal forest enterprises pursuant to § 163.13 of this part, payment for forest products will be required in advance of cutting for timber, or removal for other forest products.

(b) Upon the request of an Indian tribe, the Secretary may provide that the purchaser of the forest products of such tribe, which are harvested under a timber sale contract, permit, or other harvest sale document to make advanced deposits, or direct payments of the gross proceeds of such forest products, less any amounts segregated as forest management deductions pursuant to § 163.25 of this part, into accounts designated by such Indian tribe. Such accounts may be in one or more of the following formats:

(1) Escrow accounts at a tribally designated financial institution for receiving deposits with bids and advance deposits from which direct disbursements for timber harvested shall be made to tribes and forest management deductions accounts; or

(2) Tribal depository accounts for receiving advance payments, installment payments, payments from Indian tribal forest enterprises, and/or disbursements from advance deposit accounts or escrow accounts.

(c) The format must allow the Secretary to maintain trust responsibility through written verification that all required deposits, payments, and disbursements have been made.

(d) Terms and conditions for payment of forest products under lump sum (predetermined volume) sales shall be specified in forest product contract documents.

§ 163.23 Advance payment for timber products.

(a) Unless otherwise authorized by the Secretary, and except in the case of lump sum (predetermined volume) sales, contracts for the sale of timber from allotted, trust or restricted Indian forest land shall provide for an advance payment of up to 25 percent of the stumpage value, calculated at the bid price, within 30 days from the date of approval and before cutting begins. Additional advance payments may be specified in contracts. However, no advance payment will be required that would make the sum of such payment and of advance deposits and advance payments previously applied against timber cut from each ownership in a sale exceed 50 percent of the bid stumpage value. Advance payments shall be credited against the timber of each ownership in the sale as the timber is cut and scaled at stumpage rates governing at the time of scaling. Advance payments are not refundable.

(b) Advance payments may be required on tribal land. When required, advance payments will operate the same as provided for in § 163.23(a) of this part.

§ 163.24 Duration of timber contracts.

After the effective date of a forest product contract, unless otherwise authorized by the Secretary, the maximum period which shall be allowed for harvesting the estimated volume of timber purchased, shall be five years.

§ 163.25 Forest management deductions.

(a) Pursuant to the provisions of 25 U.S.C. 413 and 25 U.S.C. 3105, a forest

management deduction shall be withheld from the gross proceeds of sales of forest products harvested from Indian forest land as described in this section.

(b) Gross proceeds shall mean the value in money or money's worth of consideration furnished by the purchaser of forest products purchased under a contract, permit, or other document for the sale of forest products.

(c) Forest management deductions shall not be withheld where the total consideration furnished under a contract, permit or other document for the sale of forest products is less than $5,001.

(d) Except as provided in § 163.25(e) of this part, the amount of the forest management deduction shall not exceed the lesser amount of ten percent (10%) of the gross proceeds or, the actual percentage in effect on November 28, 1990.

(e) The Secretary may increase the forest management deduction percentage for Indian forest land upon receipt of a written request from a tribe supported by a resolution executed by the authorized tribal representatives. At the request of the authorized tribal representatives and at the discretion of the Secretary the forest management deduction percentage may be decreased to not less than one percent (1%) or the requirement for collection may be waived.

(f) Forest management deductions are to be utilized to perform forest land management activities in accordance with an approved expenditure plan. Expenditure plans shall describe the forest land management activities anticipated to be undertaken, establish a time period for their completion, summarize anticipated obligations and expenditures, and specify the method through which funds are to be transferred or credited to tribal accounts from special deposit accounts established to hold amounts withheld as forest management deductions. Any forest management deductions that have not been incorporated into an approved expenditure plan by the end of the fiscal year following the fiscal year in which the deductions are withheld, shall be collected into the general funds of the United States Treasury pursuant to 25 U.S.C. 413.

(1) For Indian forest lands located on an Indian reservation, a written expenditure plan for the use of forest management deductions shall be prepared annually and approved by the authorized tribal representative(s) and the Secretary. The approval of the expenditure plan by the authorized tribal representatives constitutes allocation of tribal funds for Indian forest land management activities. Approval of the expenditure plan by the Secretary shall constitute authority for crediting of forest management deductions to tribal account(s). The full amount of any deduction collected by the Secretary plus any income or interest earned thereon shall be available for expenditure according to the approved expenditure plan for the performance of forest land management activities on the reservation from which the forest management deduction is collected.

(2) Forest management deductions shall be handled in the same manner as described under § 163.25(f)(1) of this part if the expenditure plan approved by an Indian tribe and the Secretary provides for the conduct of forest land management activities on Indian forest lands located outside the boundaries of an Indian reservation.

(3) For public domain and Alaska Native allotments held in trust for Indians by the United States, forest management deductions may be utilized to perform forest land management activities on such lands in accordance with an expenditure plan approved by the Secretary.

(g) Forest management deductions withheld pursuant to this section shall not be available to cover the costs that are paid from funds appropriated for fire suppression or pest control or otherwise offset federal appropriations for meeting the Federal trust responsibility for management of Indian forest land.

(h) Within 120 days after the close of the tribal fiscal year, tribes shall submit to the Secretary a written report detailing the actual expenditure of forest management deductions during the past fiscal year. The Secretary shall have the right to inspect accounts, books, or other tribal records supporting the report.

(i) Forest management deductions incorporated into an expenditure plan approved by the Secretary shall remain available until expended.

(j) As provided in § 163.25(f) of this part, only forest management deductions that have not been incorporated into an approved expenditure plan may be deposited to a U.S. Treasury miscellaneous receipt account. No amount collected as forest management deductions shall be credited to any Federal appropriation. No other forest management deductions or fees derived from Indian forest land shall be collected to be covered into the general funds of the United States Treasury.

§ 163.26 Forest product harvesting permits.

(a) Except as provided in §§ 163.13 and 163.27 of this part, removal of forest products that are not under formal contract, pursuant to § 163.19, shall be under forest product harvesting permit forms approved by the Secretary. Permits will be issued only with the written consent of the beneficial Indian owner(s) or the Secretary, for harvest of forest products from Indian forest land, as authorized in § 163.20 of this part. To be valid, permits must be approved by the Secretary. Minimum stumpage rates at which forest products may be sold will be set at the time consent to issue the permit is obtained. Payment and bonding requirements will be stipulated in the permit document as appropriate.

(b) Free use harvesting permits issued shall specify species and types of forest products to be removed. It may be stipulated that forest products removed under this authority cannot be sold or exchanged for other goods or services. The estimated value which may be harvested in a fiscal year by any individual under this authority shall not exceed $5,000. For the purpose of issuance of free use permits, individual shall mean an individual Indian or any organized group of Indians.

(c) Paid permits subject to forest management deductions, as provided in § 163.25 of this part, may be issued. Unless otherwise authorized by the Secretary, the stumpage value which may be harvested under paid permits in a fiscal year by any individual under this authority shall not exceed $25,000. For the purpose of issuance of paid permits, individual shall mean an individual or any operating entity comprised of more than one individual.

(d) A Special Allotment Timber Harvest Permit may be issued to an Indian having sole beneficial interest in an allotment to harvest and sell designated forest products from his or her allotment. The special permit shall include provision for payment by the Indian of forest management deductions pursuant to § 163.25 of this part. Unless waived by the Secretary, the permit shall also require the Indian to make a bond deposit with the Secretary as required by § 163.21. Such bonds will be returned to the Indian upon satisfactory completion of the permit or will be used by the Secretary in his or her discretion for planting or other work to offset damage to the land or the timber caused by failure to comply with the provisions of the permit. As a condition to granting a special permit under authority of this paragraph, the Indian shall be required to provide evidence acceptable to the Secretary

that he or she has arranged a bona fide sale of the forest products, on terms that will protect the Indian's interests.

§ 163.27 Free-use harvesting without permits.

With the consent of the beneficial Indian owners and the Secretary, Indians may harvest designated types of forest products from Indian forest land without a permit or contract, and without charge. Forest products harvested under this authority shall be for the Indian's personal use, and shall not be sold or exchanged for other goods or services.

§ 163.28 Fire management measures.

(a) The Secretary is authorized to maintain facilities and staff, hire temporary labor, rent fire fighting equipment, purchase tools and supplies, and pay for their transportation as needed, to maintain an adequate level of readiness to meet normal wildfire protection needs and extinguish forest or range fires on Indian land. No expenses for fighting a fire outside Indian lands may be incurred unless the fire threatens Indian land or unless the expenses are incurred pursuant to an approved cooperative agreement with another protection agency. The rates of pay for fire fighters and for equipment rental shall be the rates for fire fighting services that are currently in use by public and private wildfire protection agencies adjacent to Indian reservations on which a fire occurs, unless there are in effect at the time different rates that have been approved by the Secretary. The Secretary may also enter into reciprocal agreements with any fire organization maintaining protection facilities in the vicinity of Indian reservations or other Indian land for mutual aid in wildfire protection. This section does not apply to the rendering of emergency aid, or agreements for mutual aid in fire protection pursuant to the Act of May 27, 1955 (69 Stat. 66).

(b) The Secretary is authorized to conduct a wildfire prevention program to reduce the number of person-caused fires and prevent damage to natural resources on Indian land.

(c) The Secretary is authorized to expend funds for emergency rehabilitation measures needed to stabilize soil and watershed on Indian land damaged by wildfire.

(d) Upon consultation with the beneficial Indian owners, the Secretary may use fire as a management tool on Indian land to achieve land and/or resource management objectives.

§ 163.29 Trespass.

(a) Trespassers will be liable for civil penalties and damages to the enforcement agency and the beneficial Indian owners, and will be subject to prosecution for acts of trespass.

(1) *Cases in Tribal Court.* For trespass actions brought in tribal court pursuant to these regulations, the measure of damages, civil penalties, remedies and procedures will be as set forth in this § 163.29 of this part. All other aspects of a tribal trespass prosecution brought under these regulations will be that prescribed by the law of the tribe in whose reservation or within whose jurisdiction the trespass was committed, unless otherwise prescribed under federal law. Absent applicable tribal or federal law, the measure of damages shall be that prescribed by the law of the state in which the trespass was committed.

(2) *Cases in Federal Court.* For trespass actions brought in Federal court pursuant to these regulations, the measure of damages, civil penalties, remedies and procedures will be as set forth in this § 163.29. In the absence of applicable federal law, the measure shall be that prescribed by the law of the tribe in whose reservation or within whose jurisdiction the trespass was committed, or in the absence of tribal law, the law of the state in which it was committed.

(3) Civil penalties for trespass include, but are not limited to:

(i) Treble damages, whenever any person, without lawful authority injures, severs, or carries off from a reservation any forest product as defined in § 163.1 of this part. Proof of Indian ownership of the premises and commission of the acts by the trespasser are prima facie evidence sufficient to support liability for treble damages, with no requirement to show willfulness or intent. Treble damages shall be based upon the highest stumpage value obtainable from the raw materials involved in the trespass.

(ii) Payment of costs associated with damage to Indian forest land includes, but is not limited to, rehabilitation, reforestation, lost future revenue and lost profits, loss of productivity, and damage to other forest resources.

(iii) Payment of all reasonable costs associated with the enforcement of these trespass regulations beginning with detection and including all processes through the prosecution and collection of damages, including but not limited to field examination and survey, damage appraisal, investigation assistance and reports, witness expenses, demand letters, court costs, and attorney fees.

(iv) Interest calculated at the statutory rate prescribed by the law of the tribe in whose reservation or within whose jurisdiction the trespass was committed, or in the absence of tribal law in the amount prescribed by federal law. Where tribal law or federal law does not supply a statutory interest rate, the rate of interest shall be statutory rate upon judgments as prescribed by the law of the state in which the trespass was committed. Interest shall be based on treble the highest stumpage value obtainable from the raw materials involved in the trespass, and calculated from the date of the trespass until payment is rendered.

(b) Any cash or other proceeds realized from forfeiture of equipment or other goods or from forest products damaged or taken in the trespass shall be applied to satisfy civil penalties and other damages identified under § 163.29(a) of this part. After disposition of real and personal property to pay civil penalties and damages resulting from trespass, any residual funds shall be returned to the trespasser. In the event that collection and forfeiture actions taken against the trespasser result in less than full recovery, civil penalties shall be distributed as follows:

(1) Collection of damages up to the highest stumpage value of the trespass products shall be distributed pro rata between the Indian beneficial owners and any costs and expenses needed to restore the trespass land; or

(2) Collections exceeding the highest stumpage value of the trespass product, but less than full recovery, shall be proportionally distributed pro rata between the Indian beneficial owners, the law enforcement agency, and the cost to restore the trespass land. Forest management deductions shall not be withheld where less than the highest stumpage value of the unprocessed forest products taken in trespass has been recovered.

(c) Indian beneficial owners who trespass, or who are involved in trespass upon their own land, or undivided land in which such owners have a partial interest, shall not receive their beneficial share of any civil penalties and damages collected in consequence of the trespass. Any civil penalties and damages defaulted in consequence of this provision instead shall be distributed first toward restoration of the land subject of the trespass and second toward costs of the enforcement agency in consequence of the trespass, with any remainder to the forest management deduction account of the reservation in which the trespass took place.

(d) Civil penalties and other damages collected under these regulations, except for penalties and damages provided for in §§ 163.29(a)(3) (ii) and (iii) of this part, shall be treated as

proceeds from the sale of forest products from the Indian forest land upon which the trespass occurred.

(e) When a federal official or authorized tribal representative pursuant to § 163.29(j) of this part has reason to believe that Indian forest products are involved in trespass, such individual may seize and take possession of the forest products involved in the trespass if the products are located on reservation. When forest products are seized, the person seizing the products must at the time of the seizure issue a Notice of Seizure to the possessor or claimant of the forest products. The Notice of Seizure shall indicate the date of the seizure, a description of the forest products seized, the estimated value of forest products seized, an indication of whether the forest products are perishable, and the name and authority of the person seizing the forest products. Where the official initiates seizure under these regulations only, the Notice of Seizure shall further include the statement that any challenge or objection to the seizure shall be exclusively through administrative appeal pursuant to part 2 of Title 25, and shall provide the name and the address of the official with whom the appeal may be filed. Alternately, an official may exercise concurrent tribal seizure authority under these regulations using applicable tribal law. In such case, the Notice of Seizure shall identify the tribal law under which the seizure may be challenged, if any. A copy of a Notice of Seizure shall be given to the possessor or claimant at the time of the seizure. If the claimant or possessor is unknown or unavailable, Notice of Seizure shall be posted on the trespass property, and a copy of the Notice shall be kept with any incident report generated by the official seizing the forest products. If the property seized is perishable and will lose substantial value if not sold or otherwise disposed of, the representative of the Secretary, or authorized tribal representative where deferral has been requested, may cause the forest products to be sold. Such sale action shall not be stayed by the filing of an administrative appeal nor by a challenge of the seizure action through a tribal forum. All proceeds from the sale of the forest products shall be placed into an escrow account and held until adjudication or other resolution of the underlying trespass. If it is found that the forest products seized were involved in a trespass, the proceeds shall be applied to the amount of civil penalties and damages awarded. If it is found that a trespass has not occurred or the proceeds are in excess of the amount of the judgment awarded, the proceeds or excess proceeds shall be returned to the possessor or claimant.

(f) When there is reason to believe that Indian forest products are involved in trespass and that such products have been removed to land not under federal or tribal government supervision, the federal official or authorized tribal representative pursuant to § 163.29(k) of this part responsible for the trespass shall immediately provide the following notice to the owner of the land or the party in possession of the trespass products:

(1) That such products could be Indian trust property involved in a trespass; and

(2) That removal or disposition of the forest products may result in criminal and/or civil action by the United States or tribe.

(g) A representative of the Secretary or authorized tribal representative pursuant to § 163.29(j) of this part will promptly determine if a trespass has occurred. The appropriate representative will issue an official Notice of Trespass to the alleged trespasser and, if necessary, the possessor or potential buyer of any trespass products. The Notice is intended to inform the trespasser, buyer, or the processor:

(1) That a determination has been made that a trespass has occurred;

(2) The basis for the determination;

(3) An assessment of the damages, penalties and costs;

(4) Of the seizure of forest products, if applicable; and

(5) That disposition or removal of Indian forest products taken in the trespass may result in civil and/or criminal action by the United States or the tribe.

(h) The Secretary may accept payment of damages in the settlement of civil trespass cases. In the absence of a court order, the Secretary will determine the procedure and approve acceptance of any settlements negotiated by a tribe exercising its concurrent jurisdiction pursuant to § 163.29(j) of this part.

(i) The Secretary may delegate by written agreement or contract, responsibility for detection and investigation of forest trespass.

(j) Indian tribes that adopt the regulations set forth in this section, conformed as necessary to tribal law, shall have concurrent civil jurisdiction to enforce 25 U.S.C. 3106 and this section against any person.

(1) The Secretary shall acknowledge said concurrent civil jurisdiction over trespass, upon:

(i) Receipt of a formal tribal resolution documenting the tribe's adoption of this section; and

(ii) Notification of the ability of the tribal court system to properly adjudicate forest trespass cases, including a statement that the tribal court will enforce the Indian Civil Rights Act or a tribal civil rights law that contains provisions for due process and equal protection that are similar to or stronger than those contained in the Indian Civil Rights Act.

(2) Where an Indian tribe has acquired concurrent civil jurisdiction over trespass cases as set forth in § 163.29(j)(1) of this part, the Secretary and tribe's authorized representatives will be jointly responsible to coordinate prosecution of trespass actions. The Secretary shall, upon timely request of the tribe, defer prosecution of forest trespasses to the tribe. Where said deferral is not requested, the designated Bureau of Indian Affairs forestry trespass official shall coordinate with the authorized forest trespass official of each tribe the exercise of concurrent tribal and Federal trespass jurisdiction as to each trespass. Such officials shall review each case, determine in which forums to recommend bringing an action, and promptly provide their recommendation to the Federal officials responsible for initiating and prosecuting forest trespass cases. Where an Indian tribe has acquired concurrent civil jurisdiction, but does not request deferral of prosecution, the federal officials responsible for initiating and prosecuting such cases may file and prosecute the action in the tribal court or forum.

(3) The Secretary may rescind an Indian tribe's concurrent civil jurisdiction over trespass cases under this regulation if the Secretary or a court of competent jurisdiction determines that the tribal court has not adhered to the due process or equal protection requirements of the Indian Civil Rights Act. If it is determined that said rescission is justified, the Secretary shall provide written Notice of the rescission, including the findings justifying the rescission and the steps needed to remedy the violations causing the rescission, to the chief judge of the tribal judiciary or other authorized tribal official should there be no chief judge. If said steps are not taken within 60 days, the Secretary's rescission of concurrent civil jurisdiction shall become final. The affected tribe(s) may appeal a Notice of Rescission under part 2 of Title 25.

(4) Nothing shall be construed to prohibit or in any way diminish the authority of a tribe to prosecute

individuals under its criminal or civil trespass laws where it has jurisdiction over those individuals.

§ 163.30 Revocable road use and construction permits for removal of commercial forest products.

(a) In accordance with 25 U.S.C. 415 as amended, the Secretary may request tribes and/or other beneficial owners to sign revocable permits designating the Secretary as agent for the landowner and empowering him or her to issue revocable road use and construction permits to users for the purpose of removing forest products.

(b) When a majority of trust interest in a tract has consented, the Secretary may issue revocable road use and construction permits for removal of forest products over and across such land. In addition, the Secretary may act for individual owners when:

(1) One or more of the individual owner(s) of the land or of an interest therein is a minor or a person non compos mentis, and the Secretary finds that such grant, in total or for an interest therein, will cause no substantial injury to the land or the owner, which cannot be adequately compensated for by monetary damages;

(2) The whereabouts of the owner(s) of the land or those with an interest therein are unknown so long as the majority of owner(s) of interests whose whereabouts are known, consent to the grant;

(3) The heirs or devisees of a deceased owner of the land or interest have not been determined, and the Secretary finds the grant will cause no substantial injury to the land or any land owner; or

(4) The owners of interests in the land are so numerous that the Secretary finds it would be impractical to obtain the consent of the majority and finds that such grant in total or an interest therein will cause no substantial injury to the land or the owner(s), that cannot be adequately compensated for by monetary damages.

(c) Nothing in this section shall preclude acquisition of rights-of-way over Indian lands, under 25 CFR part 169, or conflict with provisions of that part.

§ 163.31 Insect and disease control.

(a) The Secretary is authorized to protect and preserve Indian forest land from disease or insects (Sept. 20, 1922, Ch. 349, 42 Stat. 857). The Secretary shall consult with the authorized tribal representatives and beneficial owners of Indian forest land concerning control actions.

(b) The Secretary is responsible for controlling and mitigating harmful effects of insects and diseases on Indian forest land and will coordinate control actions with the Secretary of Agriculture in accordance with 92 Stat. 365, 16 U.S.C. 2101.

§ 163.32 Forest development.

Forest development pertains to forest land management activities undertaken to improve the sustainable productivity of commercial Indian forest land. The program shall consist of reforestation, timber stand improvement projects, and related investments to enhance productivity of commercial forest land with emphasis on accomplishing on-the-ground projects. Forest development funds will be used to re-establish, maintain, and/or improve growth of commercial timber species and control stocking levels on commercial forest land. Forest development activities will be planned and executed using benefit-cost analyses as one of the determinants in establishing priorities for project funding.

§ 163.33 Administrative appeals.

Any challenge to action under 25 CFR part 163 taken by an approving officer or subordinate official exercising delegated authority from the Secretary shall be exclusively through administrative appeal or as provided in the Indian Self-Determination and Education Assistance Act (Pub. L. 93–638, as amended). Such appeal(s) shall be filed in accordance with the provisions of 25 CFR part 2, Appeals from administrative actions, except that an appeal of any action under part 163 of this title shall:

(a) Not stay any action unless otherwise directed by the Secretary; and

(b) Define ''interested party'' for purposes of bringing such an appeal or participating in such an appeal as any person whose own direct economic interest is adversely affected by an action or decision.

§ 163.34 Environmental compliance.

Actions taken by the Secretary under the regulations in this part must comply with the National Environmental Policy Act of 1969, applicable Council on Environmental Quality Regulations, and tribal laws and regulations.

§ 163.35 Indian forest land assistance account.

(a) At the request of a tribe's authorized representatives, the Secretary may establish tribal-specific forest land assistance accounts within the trust fund system.

(b) Deposits shall be credited either to forest transportation or to general forest land management accounts.

(c) Deposits into the accounts may include:

(1) Funds from non-federal sources related to activities on or for the Indian forest land of such tribe's reservation;

(2) Donations or contributions;

(3) Unobligated forestry appropriations for the tribe;

(4) User fees; and

(5) Funds transferred under Federal interagency agreements if otherwise authorized by law.

(d) For purposes of § 163.35(c)(3) of this part; unobligated forestry appropriations shall consist of balances that remain unobligated at the end of the fiscal year(s) for which funds are appropriated for the benefit of an Indian tribe.

(e) Funds in the Indian forest land assistance account plus any interest or other income earned shall remain available until expended and shall not be available to otherwise offset Federal appropriations for the management of Indian forest land.

(f) Funds in the forest land assistance account shall be used only for forest land management activities on the reservation for which the account is established.

(g) Funds in a tribe's forest land assistance account shall be expended in accordance with a plan approved by the tribe and the Secretary.

(h) The Secretary may, where circumstances warrant, at the request of the tribe, or upon the Secretary's own volition, conduct audits of the forest land assistance accounts and shall provide the audit results of to the tribe(s).

§ 163.36 Tribal forestry program financial support.

(a) The Secretary shall maintain a program to provide financial support to qualifying tribal forestry programs. A qualifying tribal forestry program is an organization or entity established by a tribe for purposes of carrying out forest land management activities. Such financial support shall be made available through the Indian Self-Determination and Education Assistance Act (Pub. L. 93–638, as amended).

(b) The authorized tribal representatives of any category 1, 2, or 3 reservation (as defined under § 163.36(b)(1)–(3)) with an established tribal forestry program or with an intent to establish such a program for the purpose of carrying out forest land management activities may apply and qualify for tribal forestry program financial support. Reservation categories, as determined by the Secretary, are defined as:

(1) Category 1 includes major forested reservations comprised of more than 10,000 acres of trust or restricted commercial timberland or having more than a one million board foot harvest of forest products annually.

(2) Category 2 includes minor forested reservations comprised of less than 10,000 acres of trust or restricted commercial timberland and having less than a one million board foot harvest of forest products annually, or whose forest resource is determined by the Secretary to be of significant commercial timber value.

(3) Category 3 includes significant woodland reservations comprised of an identifiable trust or restricted forest area of any size which is lacking a timberland component, and whose forest resource is determined by the Secretary to be of significant commercial woodland value.

(c) A group of tribes that has either established or intends to establish a cooperative tribal forestry program to provide forest land management services to their reservations may apply and qualify for tribal forestry program financial support. For purposes of financial support under this provision, the cooperative tribal forestry program and the commercial forest acreage and annual allowable cut which it represents may be considered as a single reservation.

(d) Before the beginning of each Federal fiscal year, tribes applying to qualify for forestry program financial support shall submit application packages to the Secretary which:

(1) Document that a tribal forestry program exists or that there is an intent to establish such a program;

(2) Describe forest land management activities and the time line for implementing such activities which would result from receiving tribal forestry program financial support; and

(3) Document commitment to sustained yield management.

(e) Tribal forestry program financial support shall provide professional and technical services to carry out forest land management activities and shall be based on levels of funding assistance as follows:

(1) Level one funding assistance shall be equivalent to a Federal Employee General Pay Schedule GS 9 step 5 position salary plus an additional 40 percent of the annual salary for such a position to pay for fringe benefits and support costs;

(2) Level two funding assistance shall be equivalent to an additional Federal Employee General Pay Schedule GS 9 step 5 position salary plus an additional 40 percent of the annual salary for such a position to pay for fringe benefits and support costs; and

(3) Level three funding assistance shall be based on equal distribution of remaining funds among qualifying applicants.

(f) Determination of qualification for level of funding assistance shall be as follows:

(1) A funding level qualification value shall be determined for each eligible applicant using the formula below. Such formula shall only be used to determine which applicants qualify for level one funding assistance. Acreage and allowable cut data used in the formula shall be as maintained by the Secretary. Eligible applicants with a funding level qualification value of one (1) or greater shall qualify for level one assistance.

Funding Level Qualification Formula

$$\left[\frac{.5\times CA}{Tot.\ CA}+\frac{.5\times AAC}{Tot.\ AAC}\right]\times 1000$$

where:

CA=applicant's total commercial Indian forest land acres;

Tot. CA=national total commercial Indian forest land acres;

AAC=applicant's total allowable annual cut from commercial Indian forest land acres; and

Tot. AAC=national total allowable annual cut from commercial Indian forest land acres.

(2) All category 1 or 2 reservations that are eligible applicants under § 163.36(d) of this part are qualified and eligible for level two assistance.

(3) All category 1, 2 or 3 reservations that are eligible applicants under § 163.36(d) of this part are qualified and eligible for level three assistance.

(g) Tribal forestry program financial support funds shall be distributed based on the following:

(1) All requests from reservations qualifying for level one funding assistance must be satisfied before funds are made available for level two funding assistance;

(2) All requests from reservations qualifying for level two funding assistance must be satisfied before funds are made available for level three funding assistance; and

(3) If available funding is not adequate to satisfy all requests at a particular level of funding, funds will be evenly divided among tribes qualifying at that level.

§ 163.37 Forest management research.

The Secretary, with the consent of the authorized Indian representatives' is authorized to perform forestry research activities to improve the basis for determining appropriate land management activities to apply to Indian forest land.

Subpart C—Forestry Education, Education Assistance, Recruitment and Training

§ 163.40 Indian and Alaska Native forestry education assistance.

(a) *Establishment and evaluation of the forestry education assistance programs.* (1) The Secretary shall establish within the Bureau of Indian Affairs Division of Forestry an education committee to coordinate and implement the forestry education assistance programs and to select participants for all the forestry education assistance programs with the exception of the cooperative education program. This committee will be, at a minimum, comprised of a professional educator, a personnel specialist, an Indian or Alaska Native who is not employed by the Bureau of Indian Affairs, and a professional forester from the Bureau of Indian Affairs.

(2) The Secretary, through the Bureau of Indian Affairs Division of Forestry, shall monitor and evaluate the forestry education assistance programs to ensure that there are adequate Indian and Alaska Native foresters and forestry-related professionals to manage the Bureau of Indian Affairs forestry programs and forestry programs maintained by or for tribes and ANCSA Corporations. Such monitoring and evaluating shall identify the number of participants in the intern, cooperative education, scholarship, and outreach programs; the number of participants who completed the requirements to become a professional forester or forestry-related professional; and the number of participants completing advanced degree requirements.

(b) *Forester intern program.* (1) The purpose of the forester intern program is to ensure the future participation of trained, professional Indians and Alaska Natives in the management of Indian and Alaska Native forest land. In keeping with this purpose, the Bureau of Indian Affairs in concert with tribes and Alaska Natives will work:

(i) To obtain the maximum degree of participation from Indians and Alaska Natives in the forester intern program;

(ii) To encourage forester interns to complete an undergraduate degree program in a forestry or forestry-related field which could include courses on indigenous culture; and

(iii) To create an opportunity for the advancement of forestry and forestry-related technicians to professional resource management positions with the

Bureau of Indian Affairs, a tribe, tribal forest enterprise or ANCSA Corporation.

(2) The Secretary, through the Bureau of Indian Affairs Division of Forestry, subject to the availability of personnel resource levels established in agency budgets, shall establish and maintain in the Bureau of Indian Affairs at least 20 positions for the forester intern program. All Indians and Alaska Natives who satisfy the qualification criteria in § 163.40(b)(3) of this part may compete for such positions.

(3) To be considered for selection, applicants for forester intern positions must meet the following criteria:

(i) Be eligible for Indian preference as defined in 25 CFR, part 5 subchapter A;

(ii) Possess a high school diploma or its recognized equivalent;

(iii) Be able to successfully complete the intern program within a three year maximum time period; and

(iv) Possess a letter of acceptance to an accredited post-secondary school or demonstrate that such a letter of acceptance will be acquired within 90 days.

(4) The Bureau of Indian Affairs shall advertise vacancies for forester intern positions semiannually, no later than the first day of April and October, to accommodate entry into school.

(5) Selection of forester interns will be based on the following guidelines:

(i) Selection will be on a competitive basis selecting applicants who have the greatest potential for success in the program;

(ii) Selection will take into consideration the amount of time which will be required for individual applicants to complete the intern program;

(iii) Priority in selection will be given to candidates currently employed with and recommended for participation by the Bureau of Indian Affairs, a tribe, a tribal forest enterprise or ANCSA Corporation; and

(iv) Selection of individuals to the program awaiting the letter of acceptance required by § 163.40(b)(3)(iv) of this part may be canceled if such letter of acceptance is not secured and provided to the education committee in a timely manner.

(6) Forester interns shall comply with each of the following program requirements:

(i) Maintain full-time status in a forestry related curriculum at an accredited post-secondary school having an agreement which assures the transferability of a minimum of 55 semester hours from the post-secondary institution which meet the program requirements for a forestry related program at a bachelor degree granting institution accredited by the American Association of Universities;

(ii) Maintain good academic standing;

(iii) Enter into an obligated service agreement to serve as a professional forester or forestry-related professional with the Bureau of Indian Affairs, the recommending tribe, tribal forest enterprise or ANCSA Corporation for two years for each year in the program; and

(iv) Report for service with the Bureau of Indian Affairs, a tribe, tribal forest enterprise or ANCSA Corporation during any break in attendance at school of more than three weeks duration. Time spent in such service shall be counted toward satisfaction of the intern's obligated service.

(7) The education committee established pursuant to § 163.40(a)(1) of this part will evaluate annually the performance of forester intern program participants against requirements enumerated in § 163.40(b)(6) of this part to ensure that they are satisfactorily progressing toward completing program requirements.

(8) The Secretary shall pay all costs for tuition, books, fees and living expenses incurred by a forester intern while attending an accredited post-secondary school.

(c) *Cooperative education program.* (1) The purpose of the cooperative education program is to recruit and develop promising Indian and Alaska Native students who are enrolled in secondary schools, tribal or Alaska Native community colleges, and other post-secondary schools for employment as professional foresters and other forestry-related professionals by the Bureau of Indian Affairs, a tribe, tribal forest enterprise or ANCSA Corporation.

(2) The program shall be operated by the Bureau of Indian Affairs Division of Forestry in accordance with the provisions of 5 CFR 213.3202(a) and 213.3202(b).

(3) To be considered for selection, applicants for the cooperative education program must meet the following criteria:

(i) Meet eligibility requirements stipulated in 5 CFR 213.3202;

(ii) Be accepted into or enrolled in a course of study at a high school offering college preparatory course work, an accredited institution which grants bachelor degrees in forestry or forestry-related curriculums or a post-secondary education institution which has an agreement with a college or university which grants bachelor degrees in forestry or forestry-related curriculums. The agreement must assure the transferability of a minimum of 55 semester hours from the post-secondary institution which meet the program requirements for a forestry related program at the bachelor degree-granting institution.

(4) Cooperative education steering committees established at the field level shall select program participants based on eligibility requirements stipulated in § 163.40(c)(3) of this part without regard to applicants' financial needs.

(5) A recipient of assistance under the cooperative education program shall be required to enter into an obligated service agreement to serve as a professional forester or forestry- related professional with the Bureau of Indian Affairs, a recommending tribe, tribal forest enterprise or ANCSA Corporation for one year in return for each year in the program.

(6) The Secretary shall pay all costs of tuition, books, fees, and transportation to and from the job site to school, for an Indian or Alaska Native student who is selected for participation in the cooperative education program.

(d) *Scholarship program.* (1) The Secretary is authorized, within the Bureau of Indian Affairs Division of Forestry, to establish and grant forestry scholarships to Indians and Alaska Natives enrolled in accredited programs for post-secondary and graduate forestry and forestry-related programs of study as full-time students.

(2) The education committee established pursuant to this part in § 163.40(a)(1) shall select program participants based on eligibility requirements stipulated in §§ 163.40(d)(5), 163.40(d)(6) and 163.40(d)(7) without regard to applicants' financial needs or past scholastic achievements.

(3) Recipients of scholarships must reapply annually to continue funding beyond the initial award period. Students who have been recipients of scholarships in past years, who are in good academic standing and have been recommended for continuation by their academic institution will be given priority over new applicants for selection for scholarship assistance.

(4) The amount of scholarship funds an individual is awarded each year will be contingent upon the availability of funds appropriated each fiscal year and, therefore, may be subject to yearly changes.

(5) Preparatory scholarships are available for a maximum of two and one half academic years of general, undergraduate course work leading to a degree in forestry or forestry-related curriculums and may be awarded to individuals who meet the following criteria:

(i) Must possess a high school diploma or its recognized equivalent; and

(ii) Be enrolled and in good academic standing or accepted for enrollment at an accredited post-secondary school which grants degrees in forestry or forestry-related curriculums or be in a post-secondary institution which has an agreement with a college or university which grants bachelor degrees in forestry or forestry-related curriculums. The agreement must assure the transferability of a minimum of 55 semester hours from the post-secondary institution which meet the program requirements for a forestry-related curriculum at the bachelor degree granting institution.

(6) Pregraduate scholarships are available for a maximum of three academic years and may be awarded to individuals who meet the following criteria:

(i) Have completed a minimum of 55 semester hours towards a bachelor degree in a forestry or forestry-related curriculum; and

(ii) Be accepted into a forestry or forestry-related bachelor degree-granting program at an accredited college or university.

(7) Graduate scholarships are available for a maximum of three academic years for individuals selected into the graduate program of an accredited college or university that grants advanced degrees in forestry or forestry-related fields.

(8) A recipient of assistance under the scholarship program shall be required to enter into an obligated service agreement to serve as a professional forester or forestry-related professional with the Bureau of Indian Affairs, a tribe, tribal forest enterprise or ANCSA Corporation for one year for each year in the program.

(9) The Secretary shall pay all scholarships approved by the education committee established pursuant to this part in § 163.40(a)(1), for which funding is available.

(e) *Forestry education outreach.* (1) The Secretary shall establish and maintain a forestry education outreach program within the Bureau of Indian Affairs Division of Forestry for Indian and Alaska Native youth which will:

(i) Encourage students to acquire academic skills needed to succeed in post-secondary mathematics and science courses;

(ii) Promote forestry career awareness that could include modern technologies as well as native indigenous forestry technologies;

(iii) Involve students in projects and activities oriented to forestry related professions early so students realize the need to complete required precollege courses; and

(iv) Integrate Indian and Alaska Native forestry program activities into the education of Indian and Alaska Native students.

(2) The program shall be developed and carried out in consultation with appropriate community education organizations, tribes, ANCSA Corporations, and Alaska Native organizations.

(3) The program shall be coordinated and implemented nationally by the education committee established pursuant to § 163.40(a)(1) of this part.

(f) *Postgraduate studies.* (1) The purpose of the postgraduate studies program is to enhance the professional and technical knowledge of Indian and Alaska Native foresters and forestry-related professionals working for the Bureau of Indian Affairs, a tribe, tribal forest enterprise or ANCSA Corporations so that the best possible service is provided to Indian and Alaska Native publics.

(2) The Secretary is authorized to pay the cost of tuition, fees, books and salary of Alaska Natives and Indians who are employed by the Bureau of Indian Affairs, a tribe, tribal forest enterprise or ANCSA Corporation who have previously received diplomas or degrees in forestry or forestry-related curriculums and who wish to pursue advanced levels of education in forestry or forestry-related fields.

(3) Requirements of the postgraduate study program are:

(i) The goal of the advanced study program is to encourage participants to obtain additional academic credentials such as a degree or diploma in a forestry or forestry-related field;

(ii) The duration of course work cannot be less than one semester or more than three years; and

(iii) Students in the postgraduate studies program must meet performance standards as required by the graduate school offering the study program during their course of study.

(4) Program applicants will submit application packages to the education committee established by § 163.40(a)(1). At a minimum, such packages shall contain a complete SF 171 and an endorsement, signed by the applicant's supervisor clearly stating the needs and benefits of the desired training.

(5) The education committee established pursuant to § 163.40(a)(1) shall select program participants based on the following criteria:

(i) Need for the expertise sought at both the local and national levels;

(ii) Expected benefits, both to the location and nationally; and

(iii) Years of experience and the service record of the employee.

(6) Program participants will enter into an obligated service agreement in accordance with § 163.42(a), to serve as a professional forester or forestry-related professional with the Bureau of Indian Affairs, a tribe, tribal forest enterprise or ANCSA Corporation for two years for each year in the program. However, the obligated service requirement may be reduced by the Secretary if the employee receives supplemental funding such as research grants, scholarships or graduate stipends and, as a result, reduces the need for financial assistance. If the obligated service agreement is breached, the Secretary is authorized to pursue collection in accordance with § 163.42(b) of this part.

§ 163.41 Postgraduation recruitment, continuing education and training programs.

(a) *Postgraduation recruitment program.* (1) The purpose of the postgraduation recruitment program is to recruit Indian and Alaska Native graduate foresters and trained forestry technicians into the Bureau of Indian Affairs forestry program or forestry programs conducted by a tribe, tribal forest enterprise or ANCSA Corporation.

(2) The Secretary is authorized to assume outstanding student loans from established lending institutions of Indian and Alaska Native foresters and forestry technicians who have successfully completed a post-secondary forestry or forestry- related curriculum at an accredited institution.

(3) Indian and Alaska Natives receiving benefits under this program shall enter into an obligated service agreement in accordance with § 163.42(a) of this part. Obligated service required under this program will be one year for every $5,000 of student loan debt repaid.

(4) If the obligated service agreement is breached, the Secretary is authorized to pursue collection of the student loan(s) in accordance with § 163.42(b) of this part.

(b) *Postgraduate intergovernmental internships.* (1) Forestry personnel working for the Bureau of Indian Affairs, a tribe, tribal forest enterprise or ANCSA Corporation may apply to the Secretary and be granted an internship within forestry-related programs of agencies of the Department of the Interior.

(2) Foresters or forestry-related personnel from other Department of the Interior agencies may apply through

proper channels for internships within Bureau of Indian Affairs forestry programs and, with the consent of a tribe or Alaska Native organization, within tribal or Alaska Native forestry programs.

(3) Forestry personnel from agencies not within the Department of the Interior may apply, through proper agency channels and pursuant to an interagency agreement, for an internship within the Bureau of Indian Affairs and, with the consent of a tribe or Alaska Native organization, within a tribe, tribal forest enterprise or ANCSA Corporation.

(4) Forestry personnel from a tribe, tribal forest enterprise or ANCSA Corporation may apply, through proper channels and pursuant to a cooperative agreement, for an internship within another tribe, tribal forest enterprise or ANCSA Corporation forestry program.

(5) The employing agency of participating Federal employees will provide for the continuation of salary and benefits.

(6) The host agency for participating tribal, tribal forest enterprise or ANCSA Corporation forestry employees will provide for salaries and benefits.

(7) A bonus pay incentive, up to 25 percent of the intern's base salary, may be provided to intergovernmental interns at the conclusion of the internship period. Bonus pay incentives will be at the discretion of and funded by the host organization and will be conditioned upon the host agency's documentation of the intern's superior performance, in accordance with the agency's performance standards, during the internship period.

(c) *Continuing education and training.* (1) The purpose of continuing education and training is to establish a program to provide for the ongoing education and training of forestry personnel employed by the Bureau of Indian Affairs, a tribe, tribal forest enterprise or ANCSA Corporation. This program will emphasize continuing education and training in three areas:

(i) Orientation training, including tribal-Federal relations and responsibilities;

(ii) Technical forestry education; and

(iii) Developmental training in forest land-based enterprises and marketing.

(2) The Secretary shall implement within the Bureau of Indian Affairs Division of Forestry, an orientation program designed to increase awareness and understanding of Indian culture and its effect on forest management practices and on Federal laws that affect forest management operations and administration in the Indian forestry program.

(3) The Secretary shall implement within the Bureau of Indian Affairs Division of Forestry, a continuing technical forestry education program to assist foresters and forestry-related professionals to perform forest management on Indian forest land.

(4) The Secretary shall implement, within the Bureau of Indian Affairs Division of Forestry, a forest land-based forest enterprise and marketing training program to assist with the development and use of Indian and Alaska Native forest resources.

§ 163.42 Obligated service and breach of contract.

(a) *Obligated service.* (1) Individuals completing forestry education programs with an obligated service requirement may be offered full time permanent employment with the Bureau of Indian Affairs, a tribe, tribal forest enterprise or ANCSA Corporation to fulfill their obligated service within 90 days of the date all program education requirements have been completed. If such employment is not offered within the 90-day period, the student shall be relieved of obligated service requirements. Not less than 30 days prior to the commencement of employment, the employer shall notify the participant of the work assignment, its location and the date work must begin. If the employer is other than the Bureau of Indian Affairs, the employer shall notify the Secretary of the offer for employment.

(2) Qualifying employment time eligible to be credited to fulfilling the obligated service requirement will begin the day after all program education requirements have been completed, with the exception of the forester intern program, which includes the special provisions outlined in § 163.40(b)(6)(iv). The minimum service obligation period shall be one year of full-time employment.

(3) The Secretary or other qualifying employer reserves the right to designate the location of employment for fulfilling the service obligation.

(4) A participant in any of the forestry education programs with an obligated service requirement who receives a degree may, within 30 days of the degree completion date, request a deferment of obligated service to pursue postgraduate or postdoctoral studies. In such cases, the Secretary shall issue a decision within 30 days of receipt of the request for deferral. The Secretary may grant such a request, however, deferments granted in no way waive or otherwise affect obligated service requirements.

(5) A participant in any of the forestry education programs with an obligated service requirement may, within 30 days of the date all program education requirements have been completed, request a waiver of obligated service based on personal or family hardship. The Secretary may grant a full or partial waiver or deny the request for waiver. In such cases, the Secretary shall issue a decision within 30 days of receipt of the request for waiver.

(b) *Breach of contract.* Any individual who has participated in and accepted financial support under forestry education programs with an obligated service requirement and who does not accept employment or unreasonably terminates such employment by their own volition will be required to repay financial assistance as follows:

(1) *Forester intern program*—Amount plus interest equal to the sum of all salary, tuition, books, and fees that the forester intern received while occupying the intern position. The amount of salary paid to the individual during breaks in attendance from school, when the individual was employed by the Bureau of Indian Affairs, a tribe, tribal forest enterprise, or ANCSA Corporation, shall not be included in this total.

(2) *Cooperative education program*—Amount plus interest equal to the sum of all tuition, books, and fees that the individual received under the cooperative education program.

(3) *Scholarship program*—Amount plus interest equal to scholarship(s) provided to the individual under the scholarship program.

(4) *Postgraduation recruitment program*—Amount plus interest equal to the sum of all the individual's student loans assumed by the Secretary under the postgraduation recruitment program.

(5) *Postgraduate studies program*—Amount plus interest equal to the sum of all salary, tuition, books, and fees that the individual received while in the postgraduate studies program. The amount of salary paid to that individual during breaks in attendance from school, when the individual was employed by the Bureau of Indian Affairs, a tribe, a tribal enterprise, or ANCSA Corporation, shall not be included in this total.

(c) *Adjustment of repayment for obligated service performed.* Under forestry education programs with an obligated service requirement, the amount required for repayment will be adjusted by crediting time of obligated service performed prior to breach of contract toward the final amount of debt.

Subpart D—Alaska Native Technical Assistance Program

§ 163.60 Purpose and scope.

(a) The Secretary shall provide a technical assistance program to ANCSA corporations to promote sustained yield management of their forest resources and, where practical and consistent with the economic objectives of the ANCSA Corporations, promote local processing and other value-added activities. For the purpose of this subpart, technical assistance means specialized professional and technical help, advice or assistance in planning, and providing guidance, training and review for programs and projects associated with the management of, or impact upon, Indian forest land, ANCSA corporation forest land, and their related resources. Such technical assistance shall be made available through contracts, grants or agreements entered into in accordance with the Indian Self-Determination and Education Assistance Act (Pub. L. 93–638, as amended).

(b) Nothing in this part shall be construed as: Affecting, modifying or increasing the responsibility of the United States toward ANCSA corporation forest land, or affecting or otherwise modifying the Federal trust responsibility towards Indian forest land; or requiring or otherwise mandating an ANCSA corporation to apply for a contract, grant, or agreement for technical assistance with the Secretary. Such applications are strictly voluntary.

§ 163.61 Evaluation committee.

(a) The Secretary shall establish an evaluation committee to assess and rate technical assistance project proposals. This committee will include, at a minimum, local Bureau of Indian Affairs and Alaska Native representatives with expertise in contracting and forestry.

§ 163.62 Annual funding needs assessment and rating.

(a) Each year, the Secretary will request a technical assistance project needs assessment from ANCSA corporations. The needs assessments will provide information on proposed project goals and estimated costs and benefits and will be rated by the evaluation committee established pursuant to § 163.61 for the purpose of making funding recommendations to the Secretary. To the extent practicable, such recommendations shall achieve an equitable funding distribution between large and small ANCSA corporations and shall give priority for continuation of previously approved multi-year projects.

(b) Based on the recommendations of the evaluation committee, the Secretary shall fund such projects, to the extent available appropriations permit.

§ 163.63 Contract, grant, or agreement application and award process.

(a) At such time that the budget for ANCSA corporation technical assistance projects is known, the Secretary shall advise the ANCSA corporations on which projects were selected for funding and on the deadline for submission of complete and detailed contract, grant or agreement packages.

(b) Upon the request of an ANCSA corporation and to the extent that funds and personnel are available, the Bureau of Indian Affairs shall provide technical assistance to ANCSA corporations to assist them with:

(1) Preparing the technical parts of the contract, grant, or agreement application; and

(2) Obtaining technical assistance from other Federal agencies.

Subpart E—Cooperative Agreements

§ 163.70 Purpose of agreements.

(a) To facilitate administration of the programs and activities of the Department of the Interior, the Secretary is authorized to negotiate and enter into cooperative agreements between Indian tribes and any agency or entity within the Department. Such cooperative agreements include engaging tribes to undertake services and activities on all lands managed by Department of the Interior agencies or entities or to provide services and activities performed by these agencies or entities on Indian forest land to:

(1) Engage in cooperative manpower and job training and development programs;

(2) Develop and publish cooperative environmental education and natural resource planning materials; and

(3) Perform land and facility improvements, including forestry and other natural resources protection, fire protection, reforestation, timber stand improvement, debris removal, and other activities related to land and natural resource management.

(b) The Secretary may enter into such agreements when he or she determines the public interest will be benefited. Nothing in § 163.70(a) shall be construed to limit the authority of the Secretary to enter into cooperative agreements otherwise authorized by law.

§ 163.71 Agreement funding.

In cooperative agreements, the Secretary is authorized to advance or reimburse funds to contractors from any appropriated funds available for similar kinds of work or by furnishing or sharing materials, supplies, facilities, or equipment without regard to the provisions of 31 U.S.C. 3324, relating to the advance of public moneys.

§ 163.72 Supervisory relationship.

In any agreement authorized by the Secretary, Indian tribes and their employees may perform cooperative work under the supervision of the Department of the Interior in emergencies or otherwise, as mutually agreed to, but shall not be deemed to be Federal employees other than for purposes of 28 U.S.C. 2671 through 2680, and 5 U.S.C. 8101 through 8193.

Subpart F—Program Assessment

§ 163.80 Periodic assessment report.

The Secretary shall commission every ten years an independent assessment of Indian forest land and Indian forest land management practices under the guidelines established in § 163.81 of this part.

(a) Assessments shall be conducted in the first year of each decade (e.g., 2000, 2010, etc.) and shall be completed within 24 months of their initiation date. Each assessment shall be initiated no later than November 28 of the designated year.

(b) Except as provided in § 163.83 of this part, each assessment shall be conducted by a non-Federal entity knowledgeable of forest management practices on Federal and private land. Assessments will evaluate and compare investment in and management of Indian forest land with similar Federal and private land.

(c) Completed assessment reports shall be submitted to the Committee on Interior and Insular Affairs of the United States House of Representatives and the Select Committee on Indian Affairs of the United States Senate and shall be made available to Indian tribes.

§ 163.81 Assessment guidelines.

Assessments shall be national in scope and shall include:

(a) An in-depth analysis of management practices on, and the level of funding by management activity for, specific Indian forest land compared with similar Federal and private forest land;

(b) A survey of the condition of Indian forest land, including health and productivity levels;

(c) An evaluation of the staffing patterns, by management activity, of

forestry organizations of the Bureau of Indian Affairs and of Indian tribes;

(d) An evaluation of procedures employed in forest product sales administration, including preparation, field supervision, and accountability for proceeds;

(e) An analysis of the potential for streamlining administrative procedures, rules and policies of the Bureau of Indian Affairs without diminishing the Federal trust responsibility;

(f) A comprehensive review of the intensity and utility of forest inventories and the adequacy of Indian forest land management plans, including their compatibility with other resource inventories and applicable integrated resource management plans and their ability to meet tribal needs and priorities;

(g) An evaluation of the feasibility and desirability of establishing or revising minimum standards against which the adequacy of the forestry program of the Bureau of Indian Affairs in fulfilling its trust responsibility to Indian forest land can be measured;

(h) An evaluation of the effectiveness of implementing the Indian Self-Determination and Education Assistance Act (Pub. L. 93–638, as amended) in regard to the Bureau of Indian Affairs forestry program;

(i) A recommendation of any reforms and increased funding and other resources necessary to bring Indian forest land management programs to a state-of-the-art condition; and

(j) Specific examples and comparisons from across the United States where Indian forest land is located.

§ 163.82 Annual status report.

The Secretary shall, within 6 months of the end of each fiscal year, submit to the Committee on Interior and Insular Affairs of the United States House of Representatives, the Select Committee on Indian Affairs of the United States Senate, and to the affected Indian tribes, a report on the status of Indian forest land with respect to attaining the standards, goals and objectives set forth in approved forest management plans. The report shall identify the amount of Indian forest land in need of forestation or other silvicultural treatment, and the quantity of timber available for sale, offered for sale, and sold, for each Indian tribe.

§ 163.83 Assistance from the Secretary of Agriculture.

The Secretary of the Interior may ask the Secretary of Agriculture, through the Forest Service, on a nonreimbursable basis, for technical assistance in the conduct of such research and evaluation activities as may be necessary for the completion of any reports or assessments required by § 163.80 of this part.

Dated: July 14, 1995.

Ada E. Deer,

Assistant Secretary—Indian Affairs.

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Appendix B - CFR Part 49, Tribal Clean Air Act Authority

§49.131 General rule for open burning.

(a) *What is the purpose of this section?* This section limits the types of materials that can be openly burned within the Indian reservation to control emissions of particulate matter and other noxious fumes to the atmosphere and ground-level concentrations of particulate matter. It is EPA's goal to eliminate open burning disposal practices where alternative methods are feasible and practicable, to encourage the development of alternative disposal methods, to emphasize resource recovery, and to encourage utilization of the highest and best practicable burning methods to minimize emissions where other disposal practices are not feasible.

(b) *Who is affected by this section?* This section applies to any person who conducts open burning and to the owner of the property upon which open burning is conducted.

(c) *What is exempted from this section?* The following open fires are exempted from this section:

(1) Outdoor fires set for cultural or traditional purposes;

(2) Fires set for cultural or traditional purposes within structures such as sweat houses or lodges;

(3) Except during a burn ban under paragraphs (d)(2) and (d)(3) of this section, fires set for recreational purposes provided that no prohibited materials are burned;

(4) Except during a burn ban under paragraphs (d)(2) and (d)(3) of this section and with prior permission from the Regional Administrator, open outdoor fires used by qualified personnel to train firefighters in the methods of fire suppression and fire fighting techniques, provided that training fires are not allowed to smolder after the training session has terminated. Prior to igniting any structure, the fire protection service must ensure that the structure does not contain any asbestos or asbestos-containing materials; batteries; stored chemicals such as pesticides, herbicides, fertilizers, paints, glues, sealers, tars, solvents, household cleaners, or photographic reagents; stored linoleum, plastics, rubber, tires, or insulated wire; or hazardous wastes. Before requesting permission from the Regional Administrator, the fire protection service must notify any appropriate Tribal air pollution authority and obtain any permissions or approvals required by the Tribe, and by any other governments with applicable laws and ordinances;

(5) Except during a burn ban under paragraphs (d)(2) and (d)(3) of this section and with prior permission from the Regional Administrator, one open outdoor fire each year to dispose of fireworks and associated packaging materials. Before requesting permission from the Regional Administrator, the owner or operator must notify any appropriate Tribal air pollution authority and obtain any permissions or approvals required by the Tribe, and by any other governments with applicable laws and ordinances;

(6) Except during a burn ban under paragraphs (d)(2) and (d)(3) of this section, open burning for the disposal of diseased animals or other material by order of a public health official.

(d) *What are the requirements for open burning?*

(1) A person must not openly burn, or allow the open burning of, the following materials:

(i) Garbage;

(ii) Dead animals or parts of dead animals;

(iii) Junked motor vehicles or any materials resulting from a salvage operation;

(iv) Tires or rubber materials or products;

(v) Plastics, plastic products, or styrofoam;

(vi) Asphalt or composition roofing, or any other asphaltic material or product;

(vii) Tar, tarpaper, petroleum products, or paints;

(viii) Paper, paper products, or cardboard other than what is necessary to start a fire or that is generated at single-family residences or residential buildings with four or fewer dwelling units and is burned at the residential site;

(ix) Lumber or timbers treated with preservatives;

(x) Construction debris or demolition waste;

(xi) Pesticides, herbicides, fertilizers, or other chemicals;

(xii) Insulated wire;

(xiii) Batteries;

(xiv) Light bulbs;

(xv) Materials containing mercury (e.g., thermometers);

(xvi) Asbestos or asbestos-containing materials;

(xvii) Pathogenic wastes;

(xviii) Hazardous wastes; or

(xix) Any material other than natural vegetation that normally emits dense smoke or noxious fumes when burned.

(2) Except for exempted fires set for cultural or traditional purposes, all open burning is prohibited whenever the Regional Administrator declares a burn ban due to deteriorating air quality. A burn ban may be declared whenever the Regional Administrator determines that air quality levels have exceeded, or are expected to exceed, 75% of any national ambient air quality standard for particulate matter, and these levels are projected to continue or reoccur over at least the next 24 hours.

(3) Except for exempted fires set for cultural or traditional purposes, all open burning is prohibited whenever the Regional Administrator issues an air stagnation advisory or declares an air pollution alert, air pollution warning, or air pollution emergency pursuant to § 49.137 Rule for air pollution episodes.

(4) Nothing in this section exempts or excuses any person from complying with applicable laws and ordinances of local fire departments and other governmental jurisdictions.

(e) *Are there additional requirements that must be met?*

(1) A person subject to this section must conduct open burning as follows:

(i) All materials to be openly burned must be kept as dry as possible through the use of a cover or dry storage;

(ii) Before igniting a burn, noncombustibles must be separated from the materials to be openly burned to the greatest extent practicable;

(iii) Natural or artificially induced draft must be present, including the use of blowers or air curtain incinerators where practicable;

(iv) To the greatest extent practicable, materials to be openly burned must be separated from the grass or peat layer; and

(v) A fire must not be allowed to smolder.

(2) Except for exempted fires set for cultural or traditional purposes, a person must not initiate any open burning when:

(i) The Regional Administrator has declared a burn ban;

(ii) An air stagnation advisory has been issued or an air pollution alert, warning, or emergency has been declared by the Regional Administrator.

(3) Except for exempted fires set for cultural or traditional purposes, any person conducting open burning when such an advisory is issued or declaration is made must either immediately extinguish the fire, or immediately withhold additional material such that the fire burns down.

(f) *Definitions of terms used in this section.* The following terms that are used in this section are defined in § 49.123 General provisions: Air pollutant, ambient air, emission, open burning, particulate matter, PM10, PM2.5, Regional Administrator, stack, and uncombined water.

§ 49.132 Rule for general open burning permits.

(a) *What is the purpose of this section?* This section establishes a permitting program for open burning within the Indian reservation to control emissions of particulate matter and other noxious fumes to the atmosphere and ground-level concentrations of particulate matter.

(b) *Who is affected by this section?* This section applies to any person who conducts open burning.

(c) *What is exempted from this section?* The following open fires are exempted from this section:

(1) Outdoor fires set for cultural or traditional purposes;

(2) Fires set for cultural or traditional purposes within structures such as sweat houses or lodges;

(3) Fires set for recreational purposes, provided that no prohibited materials are burned;

(4) Forestry and silvicultural burning; and

(5) Agricultural burning.

(xiii) Batteries;

(xiv) Light bulbs;

(xv) Materials containing mercury (e.g., thermometers);

(xvi) Asbestos or asbestos-containing materials;

(xvii) Pathogenic wastes;

(xviii) Hazardous wastes; or

(xix) Any material other than natural vegetation that normally emits dense smoke or noxious fumes when burned.

(2) Except for exempted fires set for cultural or traditional purposes, all open burning is prohibited whenever the Regional Administrator declares a burn ban due to deteriorating air quality. A burn ban may be declared whenever the Regional Administrator determines that air quality levels have exceeded, or are expected to exceed, 75% of any national ambient air quality standard for particulate matter, and these levels are projected to continue or reoccur over at least the next 24 hours.

(3) Except for exempted fires set for cultural or traditional purposes, all open burning is prohibited whenever the Regional Administrator issues an air stagnation advisory or declares an air pollution alert, air pollution warning, or air pollution emergency pursuant to § 49.137 Rule for air pollution episodes.

(4) Nothing in this section exempts or excuses any person from complying with applicable laws and ordinances of local fire departments and other governmental jurisdictions.

(e) *Are there additional requirements that must be met?*

(1) A person subject to this section must conduct open burning as follows:

(i) All materials to be openly burned must be kept as dry as possible through the use of a cover or dry storage;

(ii) Before igniting a burn, noncombustibles must be separated from the materials to be openly burned to the greatest extent practicable;

(iii) Natural or artificially induced draft must be present, including the use of blowers or air curtain incinerators where practicable;

(iv) To the greatest extent practicable, materials to be openly burned must be separated from the grass or peat layer; and

(v) A fire must not be allowed to smolder.

(2) Except for exempted fires set for cultural or traditional purposes, a person must not initiate any open burning when:

(i) The Regional Administrator has declared a burn ban;

(ii) An air stagnation advisory has been issued or an air pollution alert, warning, or emergency has been declared by the Regional Administrator.

(3) Except for exempted fires set for cultural or traditional purposes, any person conducting open burning when such an advisory is issued or declaration is made must either immediately extinguish the fire, or immediately withhold additional material such that the fire burns down.

(f) *Definitions of terms used in this section.* The following terms that are used in this section are defined in § 49.123 General provisions: Air pollutant, ambient air, emission, open burning, particulate matter, PM10, PM2.5, Regional Administrator, stack, and uncombined water.

§ 49.132 Rule for general open burning permits.

(a) *What is the purpose of this section?* This section establishes a permitting program for open burning within the Indian reservation to control emissions of particulate matter and other noxious fumes to the atmosphere and ground-level concentrations of particulate matter.

(b) *Who is affected by this section?* This section applies to any person who conducts open burning.

(c) *What is exempted from this section?* The following open fires are exempted from this section:

(1) Outdoor fires set for cultural or traditional purposes;

(2) Fires set for cultural or traditional purposes within structures such as sweat houses or lodges;

(3) Fires set for recreational purposes, provided that no prohibited materials are burned;

(4) Forestry and silvicultural burning; and

(5) Agricultural burning.

(d) *What are the requirements for open burning?*

(1) A person must apply for and obtain a permit for the open burn, have the permit available on-site during the open burn, and conduct the open burning in accordance with the terms and conditions of the permit.

(2) The date after which a person must apply for and obtain a permit under this section is identified in the implementation plan in subpart M of this part for the specific reservation where this section applies.

(3) A person must comply with the §49.131 General rule for open burning or the EPA-approved Tribal open burning rule, as applicable.

(4) Nothing in this section exempts or excuses any person from complying with any applicable laws and ordinances of local fire departments or other governmental jurisdictions.

(e) *Are there additional requirements that must be met?*

(1) A person subject to this section must submit an application to the Regional Administrator for each proposed open burn. An application must be submitted in writing at least one working day, and no earlier than five working days, prior to the requested date that the burn would be conducted, and must contain, at a minimum, the following information:

(i) Street address of the property upon that the proposed open burning will occur, or if there is no street address of the property, the legal description of the property.

(ii) Name, mailing address, and telephone number of the person who will be responsible for conducting the proposed open burning.

(iii) A plot plan showing the location of the proposed open burning in relation to the property lines and indicating the distances and directions of the nearest residential and commercial properties.

(iv) The type and quantity of materials proposed to be burned, including the estimated volume of material to be burned and the area over which burning will be conducted.

(v) A description of the measures that will be taken to prevent escaped burns, including but not limited to the availability of water.

(vi) The requested date when the proposed open burning would be conducted and the duration of the burn if it is more than one day.

(vii) Any other information specifically requested by the Regional Administrator.

(2) If the proposed open burning is consistent with this section and §49.131 General rule for open burning, or the EPA-approved Tribal open burning rule, the Regional Administrator may issue a burn permit. The permit will authorize burning only for the requested date(s) and will include any conditions that the Regional Administrator determines are necessary to ensure compliance with this section, §49.131 General rule for open burning or the EPA-approved Tribal open burning rule, and to protect the public health and welfare.

(3) When reviewing an application, the Regional Administrator will take into consideration relevant factors including, but not limited to, the size, duration, and location of the proposed open burn, the current and projected air quality conditions, the forecasted meteorological conditions, and other scheduled burning activities in the surrounding area. Where the Regional Administrator determines that the proposed open burning can be conducted without causing an adverse impact on air quality, a permit may be issued.

(4) The Regional Administrator, to the extent practical, will coordinate the issuance of open burning permits with the open burning permit programs of surrounding jurisdictions.

(f) *Definitions of terms used in this section.* The following terms that are used in this section are defined in §49.123 General provisions: Agricultural burning, air pollutant, ambient air, emission, forestry or silvicultural burning, open burning, particulate matter, PM10, PM2.5, Regional Administrator, stack, and uncombined water.

§49.133 Rule for agricultural burning permits.

(a) *What is the purpose of this section?* This section establishes a permitting program for agricultural burning within the Indian reservation to control emissions of particulate matter and other noxious fumes to the atmosphere

and ground-level concentrations of particulate matter.

(b) *Who is affected by this section?* This section applies to any person who conducts agricultural burning.

(c) *What are the requirements for agricultural burning?*

(1) A person must apply for a permit to conduct an agricultural burn, obtain approval of the permit on the day of the burn, have the permit available onsite during the burn, and conduct the burn in accordance with the terms and conditions of the permit.

(2) The date after which a person must apply for and obtain approval of a permit under this section is identified in the implementation plan in subpart M of this part for the specific reservation where this section applies.

(3) A person must comply with §49.131 General rule for open burning or the EPA-approved Tribal open burning rule, as applicable.

(4) Nothing in this section exempts or excuses any person from complying with any applicable laws and ordinances of local fire departments or other governmental jurisdictions.

(d) *Are there additional requirements that must be met?*

(1) A person subject to this section must submit an application to the Regional Administrator for each proposed agricultural burn. An application must contain, at a minimum, the following information:

(i) Street address of the property upon which the proposed agricultural burning will occur or, if there is no street address of the property, the legal description of the property.

(ii) Name, mailing address, and telephone number of the applicant and the person who will be responsible for conducting the proposed agricultural burning.

(iii) A plot plan showing the location of each proposed agricultural burning area in relation to the property lines and indicating the distances and directions of the nearest residential, public, and commercial properties, roads, and other areas that could be impacted by the burning.

(iv) The type and quantity of agricultural wastes proposed to be burned, including the estimated weight of material to be burned and the area over which burning will be conducted.

(v) A description of the burning method(s) to be used (pile or stack burn, open field or broadcast burn, windrow burn, mobile field sanitizer, etc.) and the amount of material to be burned with each method.

(vi) A description of the measures that will be taken to prevent escaped burns, including but not limited to the availability of water and plowed firebreaks.

(vii) The requested date(s) when the proposed agricultural burning would be conducted.

(viii) Any other information specifically requested by the Regional Administrator.

(2) If the proposed agricultural burning is consistent with this section and §49.131 General rule for open burning, or the EPA-approved Tribal open burning rule, the Regional Administrator may approve the agricultural burning permit and authorize burning on the day burning is to be conducted after taking into consideration relevant factors including, but not limited to:

(i) The size, duration, and location of the proposed burn, the current and projected air quality conditions, the forecasted meteorological conditions, and other scheduled burning activities in the surrounding area; and

(ii) Other factors indicating whether or not the proposed agricultural burning can be conducted without causing an adverse impact on air quality.

(3) The Regional Administrator, to the extent practical, will consult with and coordinate approvals to burn with the open burning programs of surrounding jurisdictions.

(e) *Definitions of terms used in this section.* The following terms that are used in this section are defined in §49.123 General provisions: Agricultural burning or agricultural burn, air pollutant, ambient air, emission, open burning, particulate matter, PM10, PM2.5, Regional Administrator, stack, and uncombined water.

§ 49.134 Rule for forestry and silvicultural burning permits.

(a) *What is the purpose of this section?* This section establishes a permitting program for forestry and silvicultural

burning within the Indian reservation to control emissions of particulate matter and other noxious fumes to the atmosphere and ground-level concentrations of particulate matter.

(b) *Who is affected by this section?* This section applies to any person who conducts forestry or silvicultural burning.

(c) *What are the requirements for forestry and silvicultural burning?*

(1) A person must apply for a permit to conduct a forestry or silvicultural burn, obtain approval of the permit on the day of the burn, have the permit available on-site during the burn, and conduct the burn in accordance with the terms and conditions of the permit.

(2) The date after which a person must apply for and obtain approval of a permit under this section is identified in the implementation plan in subpart M of this part for the specific reservation where this section applies.

(3) A person must comply with §49.131 General rule for open burning or the EPA-approved Tribal open burning rule, as applicable.

(4) Nothing in this section exempts or excuses any person from complying with any applicable laws and ordinances of local fire departments or other governmental jurisdictions.

(d) *Are there additional requirements that must be met?*

(1) A person subject to this section must submit an application to the Regional Administrator for each proposed forestry or silvicultural burn. An application must contain, at a minimum, the following information:

(i) Street address of the property upon which the proposed forestry or silvicultural burning will occur or, if there is no street address of the property, the legal description of the property.

(ii) Name, mailing address, and telephone number of the person who will be responsible for conducting the proposed forestry or silvicultural burning.

(iii) A plot plan showing the location of the proposed forestry or silvicultural burning in relation to the property lines and indicating the distances and directions of the nearest residential, public, and commercial properties, roads, and other areas that could be affected by the burning.

(iv) The type and quantity of forestry or silvicultural residues proposed to be burned, including the estimated weight of material to be burned and the area over which burning will be conducted.

(v) A description of the burning method(s) to be used (pile burn, broadcast burn, windrow burn, understory burn, etc.) and the amount of material to be burned with each method.

(vi) A description of the measures that will be taken to prevent escaped burns, including but not limited to the availability of water and firebreaks.

(vii) The requested date(s) that the proposed forestry or silvicultural burning would be conducted.

(viii) Any other information specifically requested by the Regional Administrator.

(2) If the proposed forestry or silvicultural burning is consistent with this section and §49.131 General rule for open burning, or the EPA-approved Tribal open burning rule, the Regional Administrator may approve the forestry or silvicultural burning permit and authorize burning on the day burning is to be conducted after taking into consideration relevant factors including, but not limited to:

(i) The size, duration, and location of the proposed burn, the current and projected air quality conditions, the forecasted meteorological conditions, and other scheduled burning activities in the surrounding area; and

(ii) Other factors indicating whether or not the proposed forestry or silvicultural burning can be conducted without causing an adverse impact on air quality.

(3) The Regional Administrator, to the extent practical, will consult with and coordinate approvals to burn with the open burning programs of surrounding jurisdictions.

(e) *Definitions of terms used in this section.* The following terms that are used in this section are defined in §49.123 General provisions: Air pollutant, ambient air, emission, forestry or silvicultural burning, open burning, particulate matter, PM10, PM2.5, Regional Administrator, stack, and uncombined water.

Appendix C - Lummi Code of Laws, Title 10.18 Forestry

Chapter 10.18 Forestry

10.18.010 Management Authority

The Lummi Natural Resources Department shall be responsible for the management and preservation of the forestry resources within the exterior boundaries of the Lummi Reservation through this Chapter and regulations promulgated under Section 10.06.090.

10.18.020 Removal of Forestry Resources

It shall be unlawful for any person to harvest or assist in the harvest of any standing green timber, including Christmas trees, or any downed firewood or other forestry product on any lands or beaches within the exterior boundaries of the Lummi Reservation without a permit from the Lummi Natural Resources Department. When a permittee violates terms and conditions of a permit relating to area and time of harvest, he/she shall be considered to be acting in the absence of a permit and dealt with under the appropriate section of this Chapter

10.18.030 Permit for Non-Commercial Firewood from Tribal (LIBC) Land

The Lummi Natural Resources Department may issue permit to citizens of the Lummi Nation for the non-commercial cutting of firewood on tribal land, except that no permits will be issued for cutting firewood on Portage Island, except under special permit by the Director in consultation with the Commission, under the following terms and conditions:

(a) A fee of $10.00 is paid.

(b) Permits are limited to three (3) cords per family per year for personal use not for sale.

(c) The applicant is an enrolled member of the Lummi Nation.

(d) No persons other than enrolled members of the Lummi Nation shall assist in the cutting of firewood.

(e) Cutting is restricted to the area and the property described on the permit.

(f) The permit is available at the work site with the identification card issued pursuant to Section 10.04.010 for each person working under the permit.

(g) Cutting is restricted to Red Alder, Maple, Birch, and other hardwoods.

(h) All firewood in the work area must be cut and removed before moving to a new area, and all roads and ditches are to be kept free of tops and other slash at all times.

(i) Trees must be utilized to a 4-inch top, and stumps must be cut shorter than the tree's diameter.

(j) Permits will be valid only during specific time periods identified on the permit.

(k) The permittee assumes all risk of injury or loss arising out of the use of the permit or the entry onto tribal land, and all roads, rights of way, easements, or similar access roads owned, constructed or maintained by the Lummi Nation.

(l) Any other conditions established by the Lummi Natural Resources Department and approved by the Commission and the Council.

Failure to observe any condition of this section or permit issued pursuant to this section shall be a violation punishable by civil penalties as follows:

First violation
$ 50.00 to $500.00

Second violation
$100.00 to $2,000.00 and loss of all firewood permit privileges until the violator, after a period of one year, meets with the Council and the Commission and receives permission to receive woodcutting permits again.

10.18.040 Permit for Non-Commercial Firewood from Assignment Land

The Lummi Natural Resources Department may issue permits to citizens of the Lummi Nation for the non-commercial cutting of firewood on assignment land under the following terms and conditions:

(a) The applicant is an enrolled member of the Lummi Nation who owns the assignment land where the wood is to be cut or has approval in writing from 51% of the registered owners of the land.

(b) No persons other than enrolled members of the Lummi Nation shall assist in the cutting of firewood.

(c) Cutting is restricted to the area and times specified on the permit.

(d) The permit is available at the work site with the Lummi Nation Treaty of Point Elliott identification card issued pursuant to Section 10.04.010 for each person working under the permit.

(f) Cutting is restricted to Red Alder, Maple, Birch, and other hardwoods.

(g) All firewood in the work area must be cut and removed before moving to a new area, and all roads and ditches are to be kept free of tops and other slash at all times.

(h) Trees must be utilized to a 4-inch top, and stumps must be cut shorter than the tree's diameter.

(i) The permittee assumes all risk of injury or loss arising out of the use of the permit or the entry onto the assignment land, and all roads, rights of way, easements, or similar access roads owned, constructed or maintained by the Lummi Nation.

(i) Any other conditions established by the Lummi Natural Resources Department and approved by the Commission and the Council.

(j) The harvest is restricted to less than 10 cords in any one season. Harvest of more than 10 cords will require a timber-cutting permit.

Failure to observe any condition of this section or permit issued pursuant to this section shall be a violation punishable by civil penalties as follows:

First violation
$ 50.00 to $500.00

Second violation
$100.00 to $2,000.00 and loss of permit privileges for six months to one (1) year and forfeiture of wood.

Subsequent violations
$200.00 to $5,000.00 and loss of all fire wood permit privileges until the violator, after a period of one year, meets with the Council and the Commission and receives permission to receive woodcutting permits again, and forfeiture of wood, saws, and equipment.

10.18.050 Permit for Driftwood use from Lummi Tidelands

The Lummi Natural Resources Department may issue a permit allowing the cutting of driftwood and logs found on the tidelands within the exterior boundaries of the Lummi Reservation, that area seaward of the natural vegetation or the meander, whichever be more, under the following terms and conditions:

(a) Fees are paid as follows:
Personal use, no charge
Firewood to be sold, $7.50 per cord
Cedar shakes to be sold, $15.00 per cord.

(b) Permits are limited to fifteen (15) cords.

(c) The applicant is an enrolled member of the Lummi Nation.

(d) No persons other than enrolled members of the Lummi Nation shall assist in the cutting or handling of the wood.

(e) Cutting and removal of wood is restricted to reservation tidelands except around Portage Island, and islands within the Nooksack River (i.e. McNeil Island).

(f) Every effort is to be made to avoid conflicts with the upland owners.

(g) Cutting is restricted to all driftwood and logs not clearly identifiable as being owned by another party.

(h) The permittee will hold harmless the LIBC for any actions of the permittee or his

employees or damages occurring while on tribal lands.

(i) The permittee assumes all risk of injury or loss arising out of the use of the permit or the entry onto tribal land.

(j) The permit and the Lummi Nation Treaty of Point Elliott identification card issued pursuant to Section 10.04.010 for every person working under the permit shall be available at the work site.

(k) Permits will be valid only during specific time periods identified on the permit.

(l) Any other conditions established by the Lummi Natural Resources Department and approved by the Commission and the Council.

Failure to observe any condition of this section or permit issued pursuant to this section shall be a violation punishable by civil penalties as follows:

First violation
$ 50.00 to $500.00

Second violation
$100.00 to $2,000.00 and loss of all fire wood permit privileges until the violator, after a period of one year, meets with the Council and the Commission and receives permission to receive woodcutting permits again.

10.18.060 Permits for Harvest of Miscellaneous Forestry Products on Tribal (LIBC) Lands

The Lummi Natural Resources Department may issue permits for the harvest of forestry products, including but not restricted to cedar boughs and cedar bark, from tribal lands, and open and unclaimed off reservation lands, to enrolled members of the Lummi Nation with terms and conditions as may be approved by the Commission.

Failure to observe any condition of this section or permit issued pursuant to this section shall be a violation punishable by civil penalties as follows:

First violation
$ 50.00 to $500.00

Second violation
$100.00 to $2,000.00 and loss of all permit privileges until the violator, after a period of one year, meets with the Council and the Commission and receives permission to receive permits again and loss of permit .

10.18.070 Forest Practices Review Process

Applications for the harvest or clearing of forest lands shall be submitted to the Planning Department for review under the land use process which will involve review by agencies other than the Lummi Natural Resources Department. Before the Lummi Natural Resources Department may issue a permit for the harvest or clearing of forest lands under the jurisdiction of this Chapter, it shall review the impact of the permitted activity on water quality, wildlife and fish habitat values using standards developed by the Director of Natural Resources in consultation with the Commission.

Permits shall be conditioned to mitigate where impacts would reduce these values below acceptable levels. The party requesting a permit shall be responsible for submitting an initial statement of the potential impacts of the proposed actions and specific measures to minimize or mitigate for potential adverse impacts. The Lummi Natural Resources Department shall review the proposal and after consulting with the other parties involved in the Planning Department Land Use review process approve it, as submitted. Or, after discussions with the party requesting a permit, and a site visit recommend other conditions prior to the issuance of a permit.

The Lummi Natural Resources Department shall develop a permit application form for each permitted activity to ensure that the necessary information is provided to ensure a reasonable decision concerning the impacts of the proposed activity on resources of concern.

10.18.080 Timber Cutting Permit

The Lummi Natural Resources Department may issue permits for the harvest of commercial timber on all tribal and

assignment lands with the following terms and conditions:

(a) Only timber designated by the Lummi Natural Resources Department may be cut.

(b) Every effort shall be made to reduce waste by leaving small stumps and cutting carefully. Any waste may be scaled and charged to the permittee.

(c) Young growth shall be protected.

(d) Slash from the cutting operations, including limbs, tops, damaged young growth and other material, must be piled neatly away from reserve trees.

(e) Slash burning may be done at times and in a manner as required by the Lummi Natural Resources Department.

(f) Fire suppression and prevention equipment may be required, and shall be placed at the disposal of the Lummi Natural Resources Department at cost if required.

(g) Permittee will be liable for any and all damages and costs caused by his neglect or operations to timber and any other property.

(h) The permittee is subject to the jurisdiction of the Lummi Tribal Court and shall be responsible for any and all legal fees imposed or incurred.

(i) A bond may be required, and not released until the area has been inspected for compliance with requirements by the Lummi Natural Resources Department.

(j) The permittee must have a Lummi Natural Resources Department truck ticket filled out at the permits site and attached to each load of logs leaving the exterior bounds of the Reservation.

(k) The truck ticket and associated records must be made available for inspection by the Natural Resources Enforcement Patrol and Lummi Natural Resources Department staff as required.

(l) Truck Tickets and the Mills report on scaled timber received by truck load, must be sent to the Lummi Natural Resources Department as required.

(m) Any timber which has not been identified by the Lummi Natural Resources Department for harvest or is taken from sites not authorized by the Lummi Natural Resources Department shall be charged at triple stumpage rates.

(n) In the case of assignment land, the applicant must an enrolled member of the Lummi Nation who owns the assignment land where the wood is to be cut or has approval in writing from 51% of the registered owners of the land.

Failure to observe any condition of this section or permit issued pursuant to this section shall result in forfeiture of all or part of any bond posted and shall be a violation punishable by civil penalties as follows:

First violation
$ 500.00 to $2,000.00

Second violation
$2,000.00 to $10,000.00,forfeiture of wood and loss of permit privileges until the violator, after a period of one year, meets with the Council and the Commission and receives permission to receive permits again.

10.18.090 Permits for Harvest on Non-tribal Lands

The Lummi Natural Resources Department may issue permits without fee for the harvest or removal of any forestry resources on non-tribal lands within the exterior boundaries of the Lummi Reservation to people other than Lummi Citizens who meet the following terms and conditions:

(a) Produces signed permission for the proposed activity from all of the owners of record of the land where it is to be conducted.

(b) Produces a plan for the activity which details, among other things, the use of the products harvested, the period in which the harvest is to occur, site clean up activities, and plans for reforestation, and any other condition

deemed appropriate by the Lummi Natural Resources Department in consultation with the Commission.

(c) Any other terms and conditions for the conservation and enhancement of the reservation forestry resources deemed necessary by the Lummi Natural Resources Department in consultation with the Commission.

Failure to observe any condition of this section or permit issued pursuant to this section shall be a violation punishable by civil penalties as follows:

First violation
$ 50.00 to $500.00

Second violation
$100.00 to $2,000.00 and loss of permit forfeiture of wood and loss of permit privileges until the violator, after a period of one year, meets with the Council and the Commission and receives permission to receive permits again.

10.18.100 Fire Suppression Authority

The Lummi Natural Resources Department on approval of the Commission in the interest of protection of the forest resources on the reservation may issue regulations governing burning within the exterior boundaries of the Lummi Reservation during periods of extreme danger due to dry weather and/or scarce water reserves. These regulations may include but shall not be limited to:

(a) An open burning ban.

(b) The requirement for a permit for open burning with terms and conditions required for fire protection.

(c) Provide requirements for safe burning.

Notice of the implementation of regulations under this section shall be posted conspicuously at the Natural Resources Office and around the Reservation.

Failure to observe any regulation or term or condition of a permit issued pursuant to this section shall be a violation punishable by civil penalties as follows:

First violation
$ 50.00 to $500.00

Second violation
$100.00 to $2,000.00, forfeiture of wood and loss of permit privileges until the violator, after a period of one year, meets with the Council and the Commission and receives permission to receive permits again.

Chapter 10.19 Enforcement

10.19.010 Enforcement

This title and all regulations issued pursuant to it shall be enforced by the Lummi Natural Resources Enforcement Patrol, Lummi Tribal Law Enforcement personnel, and by any other person authorized by the LIBC.

[Editor's Note: Chief of Police authorized to supervise Natural Resources Enforcement Officers. Resolution 96-60 (3/26/95)]

10.19.020 Lummi Natural Resources Enforcement Patrol

The Lummi Natural Resources Enforcement Patrol shall consist of an administrator, a sergeant, and several enforcement officers with the general duties and responsibilities as set forth in the following sections. These positions are subject to the Personnel Policies of the LIBC, including, but not limited to, hiring, supervision, pay, discipline and grievances. The Chief of Lummi Law and Order shall be responsible to the Council and the Commission for the effective execution of the objectives of the Natural Resources Enforcement Patrol.

10.19.030 Natural Resources Enforcement Patrol Administrator

The Chief of Lummi Law and Order shall serve as the Natural Resources Enforcement Administrator (Administrator). The Administrator shall be responsible, to:

(a) Coordinate the hiring and Commissioning of Patrol Officers,

(b) Supervise, provide oversight, evaluate and

Appendix D - LNR Beachwood Cutting Permit

LUMMI INDIAN BUSINESS COUNCIL
2616 KWINA ROAD • BELLINGHAM, WASHINGTON 98226 • (360) 384-1489

BEACHWOOD CUTTING PERMIT

PERMIT NO: 0X-_____
LUMMI ID NO: _____
DATE:_____ 20XX

Permission is hereby granted to _____, whose address is _____ to cut and remove timber or other wood products in accordance with the provisions of this permit on or before _____ 20XX from the following lands on which authority to grant permits has been obtained:

Legal Description: All tidelands of the Lummi Indian Reservation between the extreme low tide and mean high tide marks.

Allowable Species: All driftwood and logs not clearly identifiable as being owned by another party (escaped logs).

Allowable Volume: Three (3) cords.

Allowable Products: Firewood for home use.

Stumpage Rates: No charge for home use.

Permit Provisions and Restrictions:

NO CUTTING IS ALLOWED ON PORTAGE ISLAND

1) The Permittee assumes all risk of injury or loss arising out of the use of this permit or the entry onto tribal land and all roads, rights of way, easements, or similar access roads owned, constructed, or maintained by the Lummi Nation. The Permittee shall hold the LIBC harmless from all suits, claims, or liabilities of any nature including costs and expenses for or on account of injuries or damages sustained by any persons or property resulting in whole or in part from beachwood cutting activities.
2) The Permittee shall obey all Tribal, Federal, and State laws and ordinances while working under this permit.
3) This permit must accompany the Permittee while cutting beachwood at all times.
4) Cutting shall be confined to Reservation beaches and every effort shall be made by the Permittee to avoid conflicts with upland owners.
5) This permit may be revoked or modified at any time at the discretion of the LIBC Forest Manager.

_____
Permittee Date

_____
Zach Dewees, Forest Manager Date

_____
Leroy Deardorff, Environmental Director Date

Appendix E - LNR Firewood Cutting Permit

LUMMI INDIAN BUSINESS COUNCIL
2616 KWINA ROAD • BELLINGHAM, WASHINGTON 98226 • (360) 384-1489

FIREWOOD CUTTING PERMIT

PERMIT NO: 0X-_____
LUMMI ID NO: _____
DATE:_____ 20XX

Permission is hereby granted to _____, whose address is _____ to cut and remove timber or other wood products in accordance with the provisions of this permit on or before _____ 20XX from the following lands on which authority to grant permits has been obtained:

Allotment Number: _____

Allowable Species: Only downed trees/logs on the ground. **NO TREES ARE TO BE FELLED/CUT DOWN!**

Allowable Volume: Three (3) cords.

Allowable Products: Firewood for home use.

Stumpage Rates: No charge for home use.

Permit Provisions and Restrictions:

NO CUTTING IS ALLOWED OF STANDING TIMBER!

1) The Permittee assumes all risk of injury or loss arising out of the use of this permit or the entry onto tribal land and all roads, rights of way, easements, or similar access roads owned, constructed, or maintained by the Lummi Nation. The Permittee shall hold the LIBC harmless from all suits, claims, or liabilities of any nature including costs and expenses for or on account of injuries or damages sustained by any persons or property resulting in whole or in part from firewood cutting activities.
2) The Permittee shall obey all Tribal and Federal laws and ordinances while working under this permit.
3) This permit must accompany the Permittee while cutting firewood at all times.
4) Cutting shall be confined to the Allotment number designated on the permit.
5) This permit may be revoked or modified at any time at the discretion of the LIBC Forest Manager.

_____ _____
Permittee Date Zach Dewees, Forest Manager Date

_____
Leroy Deardorff, Environmental Director Date

Appendix F - LNR Residential Burning Permit

LUMMI INDIAN BUSINESS COUNCIL
2616 KWINA ROAD • BELLINGHAM, WASHINGTON 98226 • (360) 384-1489

RESIDENTIAL BURNING PERMIT

PERMIT NO: 0X-_____
EXPIRATION DATE:_____ 20XX

In accordance with the Lummi Indian Business Council Burning Regulations, the undersigned is granted permission to burn in compliance with the conditions on this permit.

Permittee Name: _____

Site Address: _____

Mailing Address (if different):_____

Parcel #: _____

Home #: _____

Work #: _____

Reason for Burning	
Forest Fire Hazard Abatement	
Prevention of Fire Hazard	
Home Premises	
Other	
Explain:	

Desired Burn Date (Permit valid for 2 weeks)
• Start Date: _____ • End Date: _____
Type of Material to be Burned:
Water Source:

See Reverse Side for Authorized Conditions

BURNING IS AUTHORIZED SUBJECT TO THE FOLLOWING CONDITIONS

1. **Burn permit MUST be on site at all times during burning**.
2. Permittee may be required to provide proof of insurance that covers fire damage.
3. **Permittee shall notify Whatcom County Fires Dispatch Center at 360-676-6814 and Marietta Fire District at 360-733-6612 one hour prior to ignition of slash**.
4. **The Permittee shall notify all adjacent landowners of the burning activities prior to ignition. If the fire creates a public nuisance from smoke or ash, it must be extinguished until such time when weather conditions become favorable for adequate smoke dispersal.**
5. A site inspection by the Forest Manager may be required prior to ignition.
6. A firebreak 5-feet wide to mineral earth is required around all slash material to be burned.
7. Pile size is not to exceed 10-feet in diameter under any circumstances.
8. Fire must be 50-feet from any structure, standing timber or powerlines.
9. Fire must be 50 feet away from any aquatic resources such as wetlands and streams.
10. Maximum number of piles to be burned at one time: 2 piles.
11. The Permittee shall have a minimum of 1 person age 18 or older in attendance at the fire while burning.
12. The Permittee shall provide the following water requirements (Must be on site):
    - Adequate 1 ½ inch fire-hose to reach around perimeter of fire.
    - Four 5-gallon plastic containers filled with water.
13. The Permittee shall have the following tools on site while burning: a shovel and rake or hoe.
14. **Fire must be totally extinguished upon completion of work.**
15. Do not burn if wind is blowing more than 10 miles per hour from any direction when conditions are dry.
16. **Burning hours are from sunrise to one hour prior to sunset**.
17. **The fire may contain only vegetation and non-treated wood products.** Burning of the following materials is prohibited by federal law (CFR 40 § 49.131): dead animals or parts of dead animals, junked motor vehicles or any materials resulting from a salvage operation, tires or rubber materials or products, plastics, plastic products or styrofoam, asphalt or composition roofing or any other asphaltic material or product, tar, tarpaper, petroleum products, or paints, paper, paper products or cardboard other than what is necessary to start a fire or that is generated at single-family residences or residential buildings with four or fewer dwelling units and is burned at the residential site, lumber or timbers treated with preservatives, construction debris or demolition waste, pesticides, herbicides fertilizers or other chemicals, insulated wire, batteries, light bulbs, materials containing mercury (thermometers), Asbestos or asbestos-containing materials, pathogenic wastes, hazardous wastes, or any material other than natural vegetation that normally emits dense smoke or noxious fumes when burned.
18. This permit is suspended at the issuance of a county wide burning ban. It may be activated again following the lifting of the ban.
19. This permit may be suspended or cancelled by this Department if deemed necessary for the protection of life, property or air quality.
20. **The Permittee agrees to furnish sufficient men and equipment at his expense to suppress the fire if it escapes from any cause, and to pay the Department or other fire fighting agency for all reasonable expenses incurred in such suppression; unless such hiring and furnishing equipment and payment of expenses are otherwise provided for by law**.
21. Other conditions:

Permittee Signature:	Date:
Forest Manager:	Date:
Natural Resources Officer:	Date:

Access to Burn Location (Describe or Draw Map with Major Roads)

Appendix G - LNR Commercial Burning Permit

LUMMI INDIAN BUSINESS COUNCIL
2616 KWINA ROAD • BELLINGHAM, WASHINGTON 98226 • (360) 384-1489

COMMERCIAL BURNING PERMIT

PERMIT NO: 0X-_____
EXPIRATION DATE:_____ 20XX

In accordance with the Lummi Indian Business Council Burning Regulations, the undersigned is granted permission to burn in compliance with the conditions on this permit.

Permittee Name: _____

Site Address: _____

Mailing Address (if different):_____

Parcel #: _____

Home #: _____

Work #: _____

Reason for Burning	
Forest Fire Hazard Abatement	
Prevention of Fire Hazard	
Silvicultural Operation	
Home Premises	
Agriculture	
Other	
Explain:	

Desired Burn Date (Permit valid for 2 weeks)
• Start Date: _____ • End Date: _____
Type of Material to be Burned:
Water Source:

See Reverse Side for Authorized Conditions

BURNING IS AUTHORIZED SUBJECT TO THE FOLLOWING CONDITIONS

1. **Burn permit MUST be on site at all times during burning**.
2. Permittee must provide proof of insurance that covers logging and fire damage.
3. **Permittee shall notify Whatcom County Fires Dispatch Center at 360-676-6814 and Marietta Fire District at 360-733-6612 one hour prior to ignition of slash**.
4. **The Permittee shall notify all adjacent landowners verbally and in writing within a 0.25-mile radius of the burning activities prior to ignition. If the fire creates a public nuisance from smoke or ash, it must be extinguished until such time when weather conditions become favorable for adequate smoke dispersal.**
5. A site inspection by the Forest Manager may be required prior to ignition.
6. A firebreak 10 feet wide to mineral earth is required around all slash material to be burned.
7. Pile size is not to exceed 50-feet in diameter under any circumstances.
8. Fire must be 100-feet from any structure, standing timber, powerlines, or improvement.
9. Fire must be 50 feet away from any aquatic resources such as wetlands and streams.
10. Maximum number of piles to be burned at one time will be determined by LIBC Forest Manager prior to ignition.
11. A backhoe, bulldozer or excavator with an operator must be on site at all times during burning.
12. The Permittee shall have a minimum of 1 person age 18 or older in attendance at the fire while burning.
13. The Permittee shall provide the following water requirements (Must be on site):
    - Adequate 1 ½ inch fire-hose to reach around perimeter of fire.
    - 300-gallon water source with functioning pump.
14. Water requirement may be waived if excavator is onsite during pile burning.
15. **Fire must be totally extinguished upon completion of work.**
16. Do not burn if wind is blowing more than 10 miles per hour from any direction when conditions are dry.
17. **The fire may contain only vegetation and logging slash.** Burning of the following materials is prohibited by federal law (CFR 40 § 49.131): dead animals or parts of dead animals, junked motor vehicles or any materials resulting from a salvage operation, tires or rubber materials or products, plastics, plastic products or styrofoam, asphalt or composition roofing or any other asphaltic material or product, tar, tarpaper, petroleum products, or paints, paper, paper products or cardboard other than what is necessary to start a fire or that is generated at single-family residences or residential buildings with four or fewer dwelling units and is burned at the residential site, lumber or timbers treated with preservatives, construction debris or demolition waste, pesticides, herbicides fertilizers or other chemicals, insulated wire, batteries, light bulbs, materials containing mercury (thermometers), Asbestos or asbestos-containing materials, pathogenic wastes, hazardous wastes, or any material other than natural vegetation that normally emits dense smoke or noxious fumes when burned.
18. This permit is suspended at the issuance of a county wide burning ban. It may be activated again following the lifting of the ban.
19. This permit may be suspended or cancelled by this Department if deemed necessary for the protection of life, property or air quality.
20. **The Permittee agrees to furnish sufficient men and equipment at his expense to suppress the fire if it escapes from any cause, and to pay the Department or other fire fighting agency for all reasonable expenses incurred in such suppression; unless such hiring and furnishing equipment and payment of expenses are otherwise provided for by law**.
21. Other conditions:

_____

I, the Permittee hereby declare that I have notified all adjacent homeowners verbally and/or in writing within a 0.25-mile radius of the burning activities and understand that the fire may have to be extinguished if it creates a public nuisance from smoke or ash. I accept and agree to comply with all of the conditions outlined in this permit.

Permittee	Date:
Forest Manager	Date:
Environmental Director	Date:

Access to Burn Location (Describe or Draw Map with Major Roads)

Appendix H - LNR and BIA MOU for Residential Tree Removal Permits

United States Department of the Interior

Bureau of Indian Affairs
Puget Sound Agency
2707 Colby Ave. - Suite 1101
Everett, Washington 98201-3665
(425) 258-2651

April 13, 2007

Honorable Evelyn Jefferson, Chairwoman
Lummi Business Council
Attn: Zack Dewees
2616 Kwina Road
Bellingham, WA 98226

Dear Chairwoman Jefferson:

We have received the revised Lummi Nation Memorandum regarding the issuance of Timber cutting permits on Trust lands zoned as agricultural, commerical, and mixed-use zone. The Northwest Regional and Agency offices have reviewed the submitted Memorandum of Understanding. We have concurred with the conditions regarding issuances of no permits, as stated in the Lummi Memorandum for these non-forested areas which are not a part of the Reservation forest land base. We continue to support the concept of creating a file to support why a tree cutting permit was not issued, if the question arises.

If you have any further questions, you can contact Stanley Surridge here at the Agency at 425-258-2651 or Joe LaVerdure at the Regional Office at 503-231-6801.

Sincerely,

Judith R. Joseph

Judith R. Joseph
Superintendent

MEMORANDUM OF UNDERSTANDING

TO: BUREAU OF INDIAN AFFAIRS, PUGET SOUND AGENCY

FROM: LUMMI NATION: NATURAL RESOURCES DEPARTMENT; FORESTRY DIVISION

SUBJECT: AMMENDMENT TO THE DECEMBER 7, 2005 MOU: BIA FREE USE TIMBER CUTTING PERMIT EXEMPTION.

DATE: 4/6/2007

CC:

The purpose of this amendment is to propose the inclusion of lands zoned for agriculture, commercial, and mixed-use into the December 7, 2005 MOU between the Bureau of Indian Affairs and the Lummi Nation. This MOU established that a BIA Free Use Timber Cutting Permit is not required when a land use project meets the following criteria:

- *Land clearing is less than 1-acre in size, parcel is zoned for residential development, and contains timber valued at less than $5,001 stumpage price.*

The Lummi Nation proposes to expand this exemption to read as follows:

- *Land clearing is less than 1-acre in size, parcel is zoned for residential, agriculture, commercial, or mixed-use and contains timber valued at less than $5,001 stumpage price.*

As mentioned in the previous MOU, section 163.1 in the Code of Federal Regulations, defines Forest or forestland as "*an ecosystem at least one acre in size, including timberland and woodland, which: Is characterized by a more or less dense and extensive tree cover; contains or once contained, at least ten percent tree crown cover, and is not developed or planned for exclusive non-forest resource use.*" The lands proposed for inclusion into this MOU are, by definition, planned for exclusive non-forest use and therefore do not meet the definition of forest or forestland according to the Code of Federal Regulations.

The Forestry Division believes that the inclusion of lands zoned for agriculture, commercial, and mixed-use into the December 7, 2005 MOU will further enhance the Forestry Division's ability to serve the Lummi Community by allowing the Tribe to:

1. Expedite land use applications to remove hazard trees from trust lands that present a threat to public safety and infrastructure.
2. Expedite land use applications to develop homesites on trust lands where timber is of low quality and value.
3. Focus more of the Forest Manager's time and effort working on commercial forestry projects.

As stated in the previous MOU, the Lummi Nation Forestry Division understands that the following two ownership conditions must exist and be documented in order for a project to qualify for this exemption:

1) Individual requesting a Lummi Nation Land Use Permit is the **sole owner of the trust parcel.**

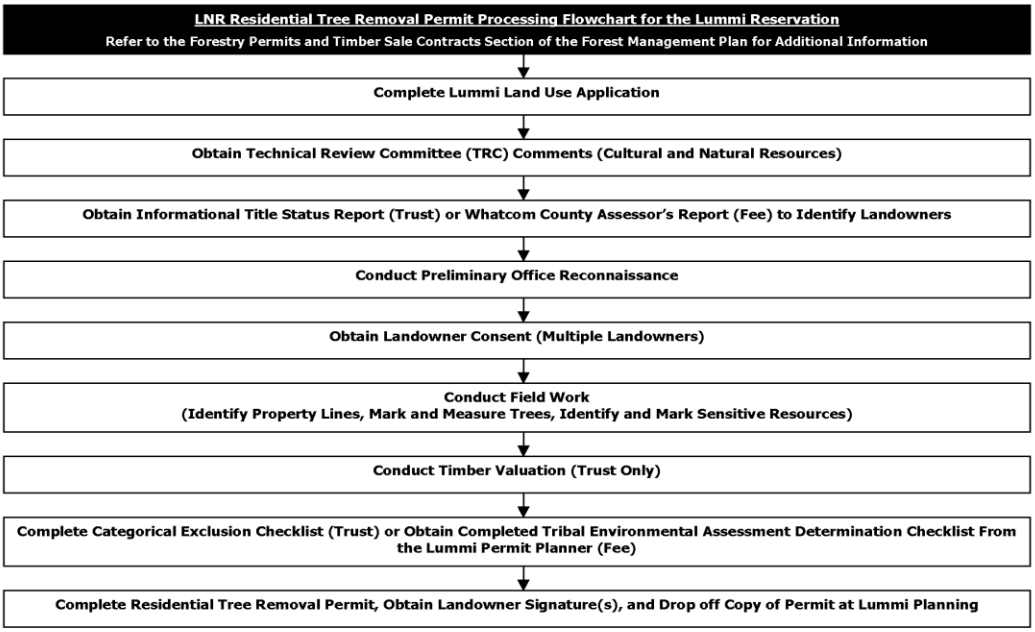
OR

2) **In the case of multiple ownership,** the individual requesting a Lummi Nation Land Use Permit to cut & remove trees must have a homestead lease that is recorded on a certified TSR and all landowners involved must have signed the homestead lease. Trees removed within the legal area defined in the homestead lease are the property of the homestead lessee and **NOT** the landowners.

The Lummi Nation Forestry Division will handle these permit requests as it has for previous projects which met the criteria to qualify for the exemption. Instead of issuing a BIA Free Use Timber Cutting Permit, the Forest Manager will instead create a file for each project to document clearing size, zoning conditions, ownership status, and estimated timber value. The Forest Manager will also issue a Residential Tree Removal Permit that will be made part of the landowner's Land Use Permit. If the Forest Manager's estimate of the timber value is within $250 of the $5,001 threshold, the Forest Manager will re-cruise the trees as sawlogs instead of firewood to ensure compliance with the policies outlined in this MOU.

In the interest of improving services to the Lummi Community, the Lummi Nation Forestry Division hereby requests a letter of concurrence with the amendment presented here at the Puget Sound Agency's earliest possible convenience.

Appendix I - Flowchart for Processing LNR Residential Tree Removal Permits



Appendix J - LNR Residential Tree Removal Permit

LUMMI INDIAN BUSINESS COUNCIL
2616 KWINA ROAD • BELLINGHAM, WASHINGTON 98226 • (360) 384-1489

RESIDENTIAL TREE REMOVAL PERMIT

(TRUST)

There is a single owner, land clearing is less than one acre in size, parcel is zoned for residential, agriculture, commercial, or mixed-use, and timber is appraised at less than $5,001 stumpage price.

Indian **X**
Non-Indian ____
Tribal ____
Lummi Indian Reservation, Date: **XXX XX, 20XX**
Permit No. **XX-XXX**

Permission is hereby granted to **XXXX** whose address is **XXXX, Bellingham, WA 98226** to cut and remove in accordance with the provisions of this permit, on or before **XXX XX, 20XX** from the following lands on which authority to grant timber permits has been obtained:

X.X acres located in the north half of the southeast quarter of the southwest quarter of the northeast quarter of Section 34, Township 38 North, Range 1 East, Willamette Meridian, Whatcom County, Washington.

tribal land or allotment of **XXX**
allotment number **XX-XX** timber of kind, quantity, and price as follows:

- **Approximately XX cords of western red cedar and Douglas-fir.**
- **The Permittee is authorized to remove the XX trees marked with orange paint. No unpainted trees shall be fallen without prior consent from the LIBC Forest Manager.**
- **The Permittee shall confine the operation to the designated project area. No trees shall be fallen outside the site project boundaries.**
- **The Permittee shall assume full liability for any injuries or damages sustained by any persons, existing structures, other improvements, timber and timber trespass that may occur during timber cutting activities. If a tree is fallen outside the project boundaries, the Permittee is responsible for all damages and tree removal costs.**
- **The Permittee shall hold the LIBC and its officers, agents, and employees, harmless from all suits, claims, or liabilities of any nature including costs and expenses for or on account of injuries or damages sustained by any persons or property resulting in whole or in part from timber cutting activities.**
- **The Permittee shall be responsible for temporary access to the permit/project area. The Permittee shall pay for any road use, maintenance, and other fees/charges associated with the use of those roads or easements.**
- **All access roads shall be maintained throughout the life of the permit. All roads and ditches, including the site access road, shall remain clear of debris.**
- **The Permittee pays all tree removal costs including falling, bucking, yarding, road maintenance and construction, labor, insurance and land survey.**
- **The Permittee's contractor shall provide and maintain a minimum coverage of at least $500,000 of broad liability insurance throughout the life of this permit. A copy of the contractor's current certificate of liability insurance shall be provided to the Lummi Forestry Division.**
- **The Permittee shall obtain any other permits that are required from Lummi Planning & Lummi Natural Resources.**

I accept this permit and agree to comply with the foregoing conditions and with the provisions on the reverse side of this permit.

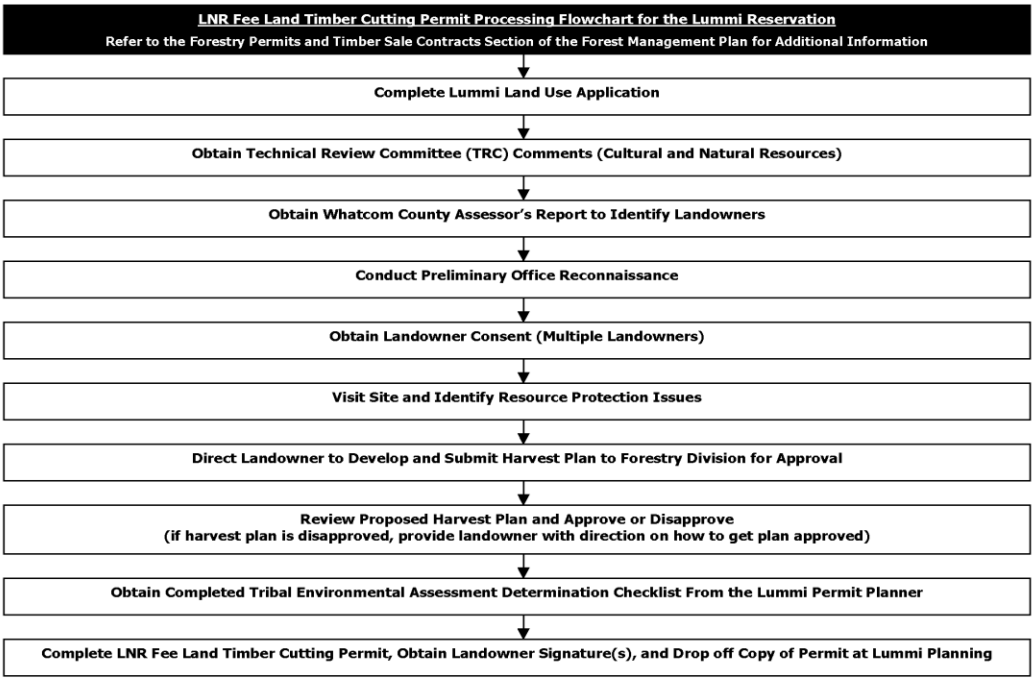
AUTHORIZED: _____ SIGNED: _____
(XXX XXX, Forest Manager) (XXX XXX, Permittee)

APPROVED: _____
(XXX XXX, Environmental Director)

This permit is issued under the following provisions:

1. "LIBC" means the Lummi Indian Business Council, which is the governing body of the Lummi Reservation, having jurisdiction over the permit area.
2. "Forest Manager" means the individual who is assigned to supervise forestry work on the Lummi Reservation and has jurisdiction over the permit area, or his/her authorized representative.
3. "Permittee" means the Permittee, his employees, his contractor or his subcontractors.
4. Only timber as designated by the LIBC Forest Manager may be cut.
5. The slash resulting from the cutting operations, including limbs, tops, damaged young growth and other material will be piled compactly and free of dirt away from reserve trees on the whole area.
6. A Lummi Natural Resources commercial burning permit is required before slash pile burning.
7. No burning is allowed when a burn ban is in effect.
8. If the smoke or ash creates a public nuisance, the Permittee may be required to pursue alternative means of slash disposal such as hauling or chipping.
9. It is understood and agreed upon that the Permittee shall be liable for all suppression costs of fires caused by negligence on the part of the Permittee. It is further understood and agreed that for fires caused by operations or activities of the Permittee, but not through neglect, the Permittee shall pay one-half of the total suppression cost provided that the Permittee's obligation shall be limited to the total value of the permit.
10. The Permittee will comply with all other laws and regulations governing the reservation within which the permit area is located.
11. The Permittee is subject to the jurisdiction of the Lummi Tribal Court and shall be responsible for any legal fees imposed or incurred.

Appendix K - Flowchart for Processing LNR Fee Land Timber Cutting Permits



Appendix L - LNR Fee Land Timber Cutting Permit

LUMMI INDIAN BUSINESS COUNCIL
2616 KWINA ROAD • BELLINGHAM, WASHINGTON 98226 • (360) 384-1489

TIMBER CUTTING PERMIT

(FEE)

Indian ___
Non-Indian __X__
Tribal ____
Lummi Indian Reservation, Date: **XXX XX, 20XX**
Permit No. **XX-XXX**

Permission is hereby granted to **XXXX** whose address is **XXXX, Bellingham, WA 98226** to cut and remove in accordance with the provisions of this permit, on or before **XXX XX, 20XX** from the following lands on which authority to grant timber permits has been obtained:

X.X acres located in the north half of the northeast quarter of the northwest quarter of the southwest quarter of Section 26, Township 38 North, Range 1 East, Willamette Meridian, Whatcom County, Washington.

Fee parcel number XXXXXX XXXXXX

- **The Permittee is authorized to harvest all available timber in a manner consistent with the approved harvest plan, which is made part of this permit.**
- **The Permittee shall confine the operation to the designated project area. No trees shall be fallen outside the site project boundaries.**
- **The Permittee shall assume full liability for any injuries or damages sustained by any persons, existing structures, other improvements, timber and timber trespass that may occur during timber cutting activities. If a tree is fallen outside the project boundaries, the Permittee is responsible for all damages and tree removal costs.**
- **The Permittee shall hold the LIBC and its officers, agents, and employees, harmless from all suits, claims, or liabilities of any nature including costs and expenses for or on account of injuries or damages sustained by any persons or property resulting in whole or in part from timber cutting activities.**
- **The Permittee shall be responsible for temporary access to the permit/project area. The Permittee shall pay for any road use, maintenance, and other fees/charges associated with the use of those roads or easements. All access roads shall be maintained throughout the life of the permit. All roads and ditches, including the site access road, shall remain clear of debris.**
- **The Permittee's contractor shall provide and maintain a minimum coverage of at least $500,000 of broad liability insurance throughout the life of this permit. A copy of the contractor's current certificate of liability insurance shall be provided to the Lummi Forestry Division.**
- **The Permittee shall have all skidding and soil disturbing activities completed by November 1st, 20XX.**
- **The LIBC Forest Manager may temporarily suspend operations in whole or in part if resource damage appears imminent until such time as weather and soil conditions become favorable to logging and road building operations.**
- **The Permittee shall obtain any other permits that are required from Lummi Planning & Lummi Natural Resources.**

I accept this permit and agree to comply with the foregoing conditions and with the provisions on the reverse side of this permit.

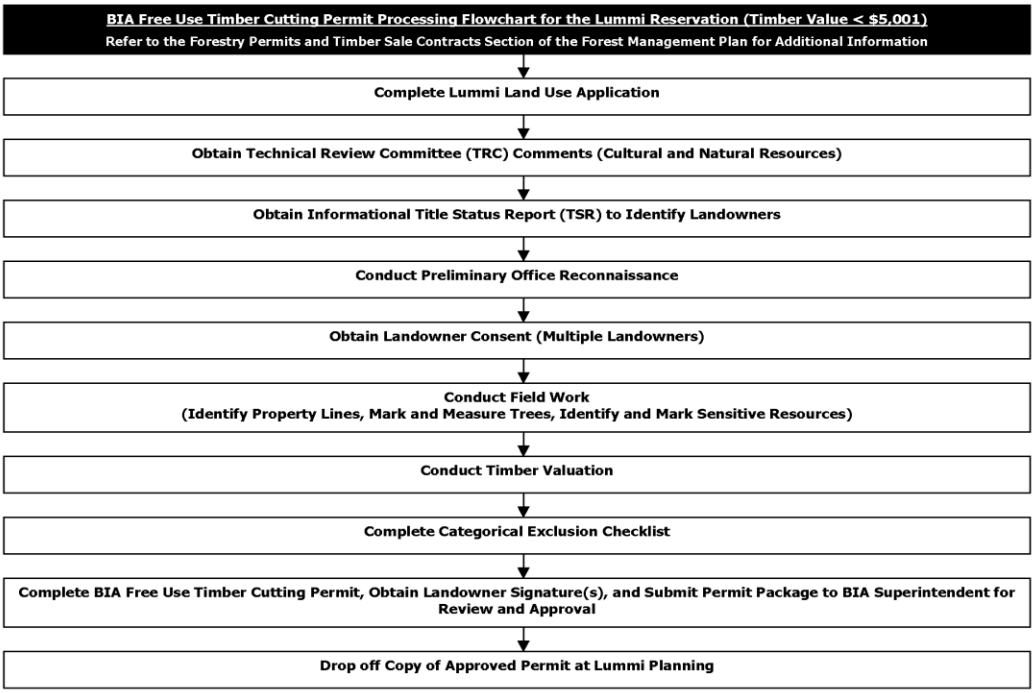
AUTHORIZED: _____ SIGNED: _____
(XXX XXX, Forest Manager) (XXX XXX, Permittee)

APPROVED: _____
(XXX XXX, Environmental Director)

This permit is issued under the following provisions:

1. "LIBC" means the Lummi Indian Business Council, which is the governing body of the Lummi Reservation, having jurisdiction over the permit area.
2. "Forest Manager" means the individual who is assigned to supervise forestry work on the Lummi Reservation and has jurisdiction over the permit area, or his/her authorized representative.
3. "Permittee" means the Permittee, his employees, his contractor or his subcontractors.
4. Only timber as designated by the LIBC Forest Manager may be cut.
5. Prior to the start of work, the Permittee shall be required to inform the LIBC Forest Manager of the logger and/or contractor selected to do the job. Failure to comply with this condition may result in the revocation of this permit.
6. No work in connection with timber harvest operations, including but not limited to, road construction or reconstruction, skid trail and landing construction or reconstruction, timber felling, skidding, yarding, log loading, log hauling, and site preparation shall be performed when in the opinion of the LIBC Forest Manager, wet weather conditions create saturated soils creating the potential for soil compaction, displacement, and other natural resource damage.
7. Spoils generated from road construction activities shall be disposed of in a manner and location suitable to the LIBC Forest Manager.
8. The Permittee shall be responsible for proper maintenance of all roads used throughout the life of the permit. The Permittee's responsibility for normal maintenance commences with the first use of a road for any activity under the contract or permit. Normal maintenance includes but is not limited to grading, blading, shaping rocking, water barring, and installing additional drainage structures; keeping roads, drainage ditches and culverts free of debris; repairing pot holes, damage to ditches, cutbanks, fill slopes and road surfaces; water and/or other dust palliative measures; and any other work needed to protect the road or restore damage caused by road use or natural damage as required by the LIBC Forest Manager.
9. Where feasible, logs shall be skidded with a least one end suspended off the ground to minimize soil disturbance.
10. The slash resulting from the cutting operations, including limbs, tops, damaged young growth and other material will be piled compactly and free of dirt away from reserve trees on the whole area. Trees and tops fallen outside the cutting boundary shall be pulled back inside he cutting unit boundary. Excessive accumulations of slash along the cutting unit boundary shall be pushed back into the cutting unit.
11. Slash piles shall not exceed 50 feet in diameter and shall be located at least 75 feet away from standing timber and at least 100 feet away from any home, road, or other improvement so as not to create an immediate fire danger. Slash piles shall have a 10-foot wide fire line constructed around them down to mineral soil.
12. A Lummi Natural Resources commercial burning permit is required before slash pile burning. No burning is allowed when a burn ban is in effect. If the smoke or ash creates a public nuisance, the Permittee may be required to pursue alternative means of slash disposal such as hauling or chipping.
13. It is understood and agreed upon that the Permittee shall be liable for all suppression costs of fires caused by negligence on the part of the Permittee. It is further understood and agreed that for fires caused by operations or activities of the Permittee, but not through neglect, the Permittee shall pay one-half of the total suppression cost provided that the Permittee's obligation shall be limited to the total value of the permit.
14. The Permittee will comply with all other laws and regulations governing the Lummi reservation.
15. The Permittee is subject to the jurisdiction of the Lummi Tribal Court and shall be responsible for any legal fees imposed or incurred.

Appendix M - Flowchart for Processing BIA Free Use Timber Cutting Permits



Appendix N - BIA Free Use Timber Cutting Permit

FORM 5-5331
Revised
May 1975
(Printing Date Feb. 1981)

UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Indian Affairs

TIMBER CUTTING PERMIT
(FREE USE)

Allotted __**X**___
Tribal _____
Permit No. **XX-XXX**

Indian __**X**__
Non-Indian_____
Lummi Indian Reservation, **XXX XX, 20XX**

Permission is hereby granted to **XXXX** whose address is **XXXX, Bellingham, WA 98226** to cut and remove in accordance with the provisions on the reverse side of this permit, on or before **XXX XX, 20XX** from the following lands on which authority to grant timber permits has been obtained:

Approximately X.X-acres located in the S ½ of the SE ¼ of Section 12, Township 38 North, Range 01 East, Willamette Meridian, Whatcom County, Washington.

tribal land or allotment of **XXXX** allotment number **XX-X** timber of kind, quantity, and price as follows:

- **Approximately XXX cords of western red cedar, Douglas-fir, red alder and bigleaf maple firewood.**
- **The Permittee is authorized to remove the XX trees marked with orange paint. No unpainted trees shall be fallen without prior consent from the LIBC Forest Manager.**
- **The Permittee shall confine the operation to the designated project area. No trees shall be fallen outside the site project boundaries.**
- **The Permittee shall assume full liability for any injuries or damages sustained by any persons, existing structures, other improvements, timber and timber trespass that may occur during timber cutting activities. If a tree is fallen outside the project boundaries, the Permittee is responsible for all damages and tree removal costs.**
- **The Permittee shall hold the LIBC and the BIA, its officers, agents, and employees, harmless from all suits, claims, or liabilities of any nature including costs and expenses for or on account of injuries or damages sustained by any persons or property resulting in whole or in part from timber cutting activities.**
- **The Permittee shall be responsible for temporary access to the permit/project area. The Permittee shall pay for any road use, maintenance, and other fees/charges associated with the use of those roads or easements.**
- **All access roads shall be maintained throughout the life of the permit. All roads and ditches, including the site access road, shall remain clear of debris.**
- **The Permittee pays all tree removal costs including falling, bucking, yarding, road maintenance and construction, labor, insurance and land survey.**
- **The Permittee shall obtain any other permits that are required from Lummi Planning & Lummi Natural Resources.**

Advance stumpage payments to the Superintendent for the timber cut will be made as follows:

Free Use Harvesting Permit {CFR 163.26(b)}. No Charge. No performance bond required. The attached provisions are made part of this permit.

I accept this permit and agree to comply with the foregoing conditions and with the provisions on the reverse side of this permit.

SIGNED: _____
(XXX XXX, Permittee)

WITNESSES:

_____
(XXX XXX, Forest Manager)

AUTHORIZED: _____
(XXX XXX, Allottee)

_____
(XXX XXX, Environmental Director)

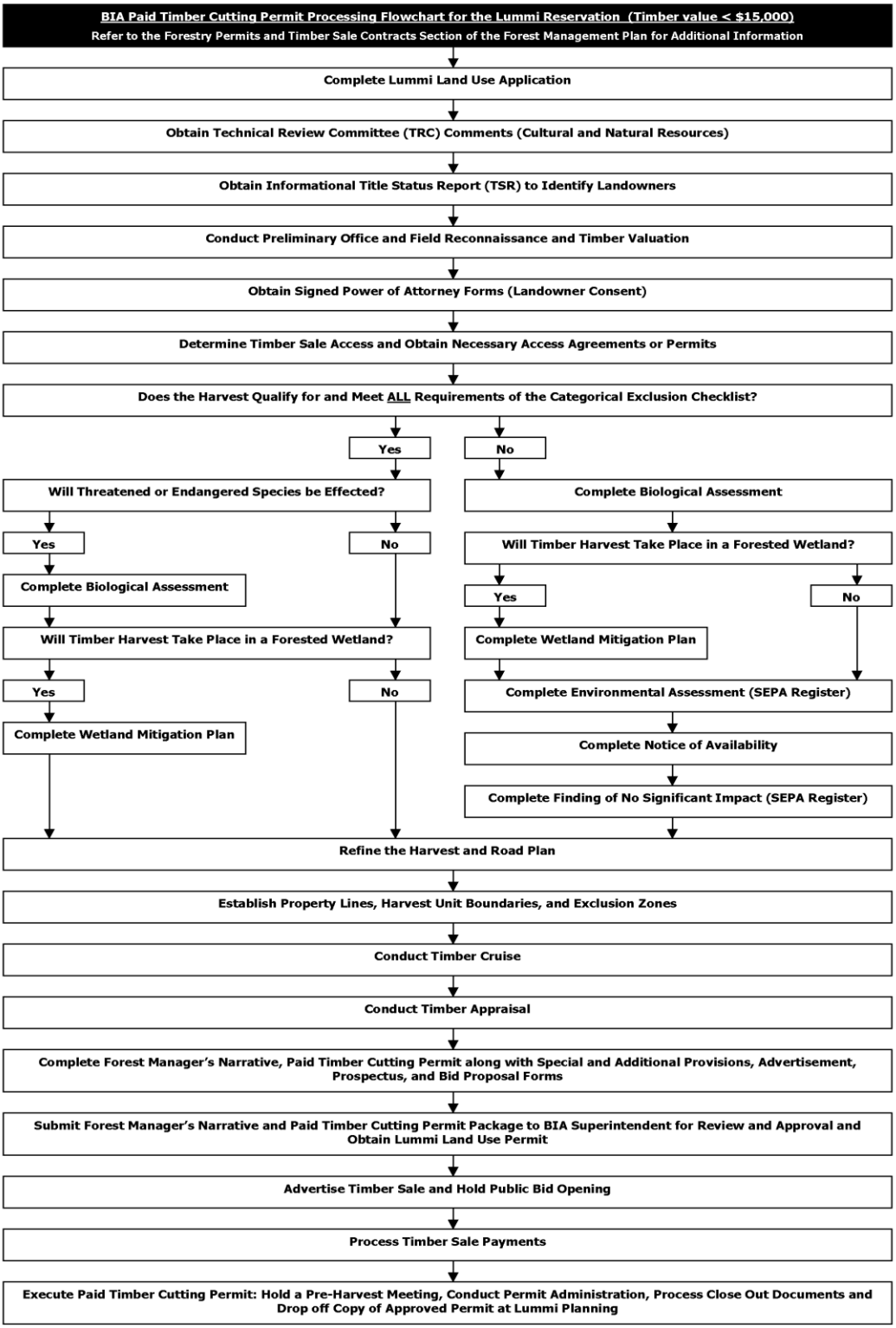
APPROVED: _____
(XXX XXX, Approving Officer)

This permit is issued under the following provisions:

1. "Approving Officer" means the officer approving the permit or his authorized representative.
2. "Superintendent" means the Superintendent or other officer in charge of the Indian Agency having jurisdiction over the permit area, or his authorized representative.
3. "Officer in Charge" means the forest officer of highest rank assigned to the supervision of forestry work at the Indian Agency having jurisdiction over the permit area, or his authorized representative.
4. "Permittee" means the Permittee, his employees, or his subcontractors.
5. Only timber as designated by the Approving Officer or the Officer in Charge may be cut.
6. Young growth will be protected as far as possible.
7. Stumps will be cut as low as practical so as to avoid waste. The mean height of any stump shall not exceed one-half its diameter, except that where this height is considered to be impractical, higher stumps may be authorized by the Officer in Charge.
8. Waste in high stumps, butts, tops, breaks, and partially sound logs, and all trees which are left felled or lodged or badly damaged by the Permittee's operations will be scaled for their merchantable contents and charged against the Permittee.
9. Carelessness on part of fellers or other employees of the Permittee that results in unnecessary breaking of trees will be penalized by scaling such trees full as if they had not been broken.
10. For convenience in scaling, logs or other products shall be decked, stacked, or otherwise held at landing sites designated of by the Officer in Charge and will not be moved therefrom until they have been scaled, stamped, numbered or otherwise released by the Officer in Charge. Products that are moved contrary to the instructions of the Officer in Charge shall be paid by the Permittee at double the permit stumpage rates.
11. If required buy the Officer in Charge, the slash resulting from the cutting operations, including limbs, tops, damaged young growth and other material will be piled compactly and away from reserve trees on the whole area.
12. Burning of the piled slash by the Permittee will be done at such times and in such manner as may be required by the Officer in Charge. Whenever fire runs through slash, except in compliance with instructions of the Officer in Charge, the Permittee may be required to lop and scatter or repile and reburn the slash.
13. During the wildfire season the Permittee shall have a cache of firefighting equipment of the kind and quantity as determined by the Officer in Charge in the area of his operation.
14. It is agreed that during the permit period the Permittee shall take immediate and independent fire suppression action on all fires on or threatening the area covered by this permit. It is further agreed that the Permittee will assist the Bureau of Indian Affairs in suppressing other fires when called upon.
15. It is understood and agreed upon that the Permittee shall be liable for all suppression costs of fires caused by negligence on the part of the Permittee. It is further understood and agreed that for fires caused by operations or activities of the Permittee, but not through neglect, the Permittee shall pay one-half of the total suppression cost provided that the Permittee's obligation shall be limited to the total value of the permit.
16. The Permittee will be paid for fighting fires, other than those caused by the Permittee's neglect or operations, at rates as determined by the Superintendent.
17. The Permittee shall be liable for all damages from fires or otherwise caused by his neglect or operations to timber or any other property of the Indians or the Government in an amount to be determined by the Superintendent.
18. If timber on the permit area is damaged or destroyed by fire, the cause of which was no fault of the Permittee, the Permittee may be authorized by the Approving Officer to utilize products from adjacent areas to fulfill the value terms of this permit.
19. A bond may or may not be required as determined by the Approving Officer.
20. The Permittee will comply with all other laws and regulations governing the reservation within which the permit area is located.

NOTE: This form is to be used for all Indian lands, allotted and tribal and is to be executed in triplicate. In case of allotted lands, the allottee or his heirs shall authorize the permit unless a valid power of attorney has been executed. In case of tribal lands, authorization for cutting may be obtained by Council resolution approving the annual policy statement governing the issuance of permits.

Appendix O - Flowchart for Processing BIA Paid Timber Cutting Permits



Appendix P - BIA Paid Timber Cutting Permit with Special and Additional Provisions

FORM 5-5331
Revised
May 1975
(Printing Date Feb. 1981)

UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Indian Affairs

TIMBER CUTTING PERMIT
(PAID)

Allotted **X**
Tribal _____
Permit No. **XX-XXX**

Indian **X**
Non-Indian_____
Lummi Indian Reservation, **XXX XX, 20XX**

Permission is hereby granted to **XXXX** whose address is **XXXX, Bellingham, WA 98226** to cut and remove in accordance with the provisions on the reverse side of this permit, on or before **XXX XX, 20XX** from the following lands on which authority to grant timber permits has been obtained:

Approximately X.X-acres located in the S ½ of the SE ¼ of Section 12, Township 38 North, Range 01 East, Willamette Meridian, Whatcom County, Washington.

tribal land or allotment of **XXXX** allotment number **XX-X** timber of kind, quantity, and price as follows:

Estimated volume of XXX gross tons of red alder, Douglas-fir, an other species sawlogs, chip & saw, & utility (pulp). Volume estimates and log quality are not guaranteed.

Species/Product	Estimated Volume (Gross Tons)	Payment Rate
Red alder & other hardwood species sawlogs and chip & saw	XXX	$X.XX/ton
Douglas-fir & other conifer species sawlogs and chip & saw	XXX	$X.XX/ton
Douglas-fir & other conifer species utility (pulp)	XXX	$X.XX/ton
Hardwood species utility (pulp) – Removal optional.	XXX	$X.XX/ton
TOTAL	**XXX**	

Advance stumpage payments to the Superintendent for the timber cut will be made as follows:

A performance bond in the amount of $X,XXX.XX shall be posted at the time this permit is approved. All advance deposits shall be made in accordance with the provisions outlined in the attached Special Timber Cutting Permit Provisions. Sufficient funds shall be on deposit with the BIA in advance of all cutting. The attached Special Timber Cutting Permit Provisions and Additional Timber Cutting Provisions are made a part of this Permit.

I accept this permit and agree to comply with the foregoing conditions and with the provisions on the reverse side of this permit.

SIGNED: _____
(XXX XXX, Permittee)

WITNESSES:

_____
(XXX XXX, Forest Manager)

AUTHORIZED: _____
(XXX XXX, Allottee)

_____
(XXX XXX, Environmental Director)

APPROVED: _____
(XXX XXX, Approving Officer)

This permit is issued under the following provisions:

1. "Approving Officer" means the officer approving the permit or his authorized representative.
2. "Superintendent" means the Superintendent or other officer in charge of the Indian Agency having jurisdiction over the permit area, or his authorized representative.
3. "Officer in Charge" means the forest officer of highest rank assigned to the supervision of forestry work at the Indian Agency having jurisdiction over the permit area, or his authorized representative.
4. "Permittee" means the Permittee, his employees, or his subcontractors.
5. Only timber as designated by the Approving Officer or the Officer in Charge may be cut.
6. Young growth will be protected as far as possible.
7. Stumps will be cut as low as practical so as to avoid waste. The mean height of any stump shall not exceed one-half its diameter, except that where this height is considered to be impractical, higher stumps may be authorized by the Officer in Charge.
8. Waste in high stumps, butts, tops, breaks, and partially sound logs, and all trees which are left felled or lodged or badly damaged by the Permittee's operations will be scaled for their merchantable contents and charged against the Permittee.
9. Carelessness on part of fellers or other employees of the Permittee that results in unnecessary breaking of trees will be penalized by scaling such trees full as if they had not been broken.
10. For convenience in scaling, logs or other products shall be decked, stacked, or otherwise held at landing sites designated of by the Officer in Charge and will not be moved therefrom until they have been scaled, stamped, numbered or otherwise released by the Officer in Charge. Products that are moved contrary to the instructions of the Officer in Charge shall be paid by the Permittee at double the permit stumpage rates.
11. If required buy the Officer in Charge, the slash resulting from the cutting operations, including limbs, tops, damaged young growth and other material will be piled compactly and away from reserve trees on the whole area.
12. Burning of the piled slash by the Permittee will be done at such times and in such manner as may be required by the Officer in Charge. Whenever fire runs through slash, except in compliance with instructions of the Officer in Charge, the Permittee may be required to lop and scatter or repile and reburn the slash.
13. During the wildfire season the Permittee shall have a cache of firefighting equipment of the kind and quantity as determined by the Officer in Charge in the area of his operation.
14. It is agreed that during the permit period the Permittee shall take immediate and independent fire suppression action on all fires on or threatening the area covered by this permit. It is further agreed that the Permittee will assist the Bureau of Indian Affairs in suppressing other fires when called upon.
15. It is understood and agreed upon that the Permittee shall be liable for all suppression costs of fires caused by negligence on the part of the Permittee. It is further understood and agreed that for fires caused by operations or activities of the Permittee, but not through neglect, the Permittee shall pay one-half of the total suppression cost provided that the Permittee's obligation shall be limited to the total value of the permit.
16. The Permittee will be paid for fighting fires, other than those caused by the Permittee's neglect or operations, at rates as determined by the Superintendent.
17. The Permittee shall be liable for all damages from fires or otherwise caused by his neglect or operations to timber or any other property of the Indians or the Government in an amount to be determined by the Superintendent.
18. If timber on the permit area is damaged or destroyed by fire, the cause of which was no fault of the Permittee, the Permittee may be authorized by the Approving Officer to utilize products from adjacent areas to fulfill the value terms of this permit.
19. A bond may or may not be required as determined by the Approving Officer.
20. The Permittee will comply with all other laws and regulations governing the reservation within which the permit area is located.

NOTE: This form is to be used for all Indian lands, allotted and tribal and is to be executed in triplicate. In case of allotted lands, the allottee or his heirs shall authorize the permit unless a valid power of attorney has been executed. In case of tribal lands, authorization for cutting may be obtained by Council resolution approving the annual policy statement governing the issuance of permits.

SPECIAL TIMBER CUTTING PERMIT PROVISIONS

XXXX THINNING UNIT
ALLOTMENT No. XXXX
LUMMI INDIAN RESERVATION
TIMBER CUTTING PERMIT No. XX-XXX

ADVANCE DEPOSITS

- The Permittee shall pay for all timber covered under this estimated volume timber cutting permit. All Advance Deposits and Advance Payments shall be deposited with the Bureau of Indian Affairs lockbox and all timber shall be paid for on or before XXX, XX 20XX. Stumpage rates shall be as stated on the timber cutting permit. The first Advance Deposit shall be made prior to the start of logging. The minimum Advance Balance shall be $XXX.XX. The mill or vendor can make advance deposit payments on behalf of the Permittee directly to the BIA. Upon satisfactory completion of the permit, any unused Advance Deposit shall be returned to the Permittee. The stated volumes on this permit are estimates and are not guaranteed. The Permittee is fully responsible for providing all scale/weight tickets and information to the Lummi Tribe within 10 days upon receipt from their forest products vendor.
- As required in 25 CFR 163.25, the 10 percent Forest Management Deduction Fees shall be deducted from the stumpage payment and deposited into the Lummi Forest Management Fee Account if the total value of the permit exceeds $5001.00.

PERFORMANCE BOND

- A performance bond, in the amount of $XXXX.XX shall be posted at the time this permit is approved. It may be in the form of an irrevocable letter of credit, assignment of savings account, cash, or negotiable United States securities.

PROOF OF INSURANCE

- The Permittee shall provide Proof of Insurance at the time of the approval of the permit. The Permittee shall have a minimum coverage of One million dollars ($1,000,000) in broad liability insurance. The Permittee shall assume full liability for any damage to any existing structures and other improvements.
- The Permittee is solely responsible for any and all damages resulting from their operation. Any damage to improvements, including roads, shall be repaired promptly to the satisfaction of the Officer-in-Charge and at the Permittee's expense. The Permittee agrees to hold harmless and indemnify the Lummi Nation and the Bureau of Indian Affairs absolutely and without limit against any and all liabilities, costs, and expenses, including court costs and attorney fees arising from any injury, death, loss or damage, which arise from this operation.

TERMS AND CONDITIONS

- The Permittee shall be required to attend a pre-harvest conference and submit a harvest and road construction plan for approval prior to the commencement of logging operations.
- The Permittee shall advise the Officer-in-Charge of all selling locations prior to hauling.
- The Permittee shall complete all commercial thinning harvest activities by XXXX, XX, 20XX.

1

PROJECT AREA DESCRIPTION

The sale area is approximately XX acres in size and is located in the XX of the XX of Section 35 within TXXN, RXXE, Willamete Meridian, Whatcom County, Washington. A sale area map is attached. The Permittee shall confine the operation to the designated permit area, which has been flagged out with XX ribbon. The total estimated acres are not guaranteed.

STAND DESCRIPTION

Species Composition:	XX% XX and XX% XX
Age:	XX years old
Trees per Acre:	XXX
Quadratic Mean Diameter:	XX-inches
Relative Density:	XX
Average Total Height:	XX-feet
Past Thinning Treatments:	PCT at age 15
Defect:	XX%
Estimated Volume/Acre Available for Harvest:	XX (tons if first commercial thin, MBF is second commercial thin).
Slope:	XX%
Aspect:	X
Forest Health Issues:	XX

THINNING PRESCRIPTION

Thinning Type	• Thin-from-Below: All suppressed and intermediate trees with a DBH greater than or equal to 4-inches shall be cut.
Target Leave Trees/Acre	• XX
Target Species Composition	• The target SPECIES composition of the residual stands shall be: XX XX and XX XX • XX is the preferred timber species. • All XX and XX shall be removed. • Species composition may vary by up to 15%.
Leave Tree Definition	• Leave trees shall be the BEST XXX trees per acre of the preferred SPECIES distributed UNIFORMLY over the area. • The BEST trees are defined as having the following characteristics in descending order of importance: 1. Fullest and most vigorous crown. 2. Free of disease, major defect, and damage. 3. Largest diameter. 4. Best form, which includes tallest tree, straightest bole, least taper, or smallest limb diameter. • Leave trees will be selected by comparing their characteristics with other trees in the stand. • The thinning shall focus on removing the majority of trees with a DBH of less than or equal to 10-inches.

2

Leave Tree Distribution	• Leave trees must be UNIFORMLY distributed throughout the thinning unit. • UNIFORMLY distributed means that openings created by felling shall not exceed XX feet. • Leave tree spacing may vary by up to 12%. • The maximum number of leave trees on any one-acre is XXX and the minimum number of leave trees on any one acre is XXX provided that the average in the thinning unit is approximately XXX trees per acre. • Selection of superior leave trees should supersede strict adherence to the specified spacing. • Avoid creating larger openings than what already exists. • Don't maintain an area of over dense trees to compensate for a large gap in another part of the stand. • At the edges of openings, leave trees no less than half the desired spacing, e.g. if the prescription spacing is 16 feet, the spacing along edges should be no less than 8 feet.
Unacceptable Leave Tree Damage	• The Permittee shall take the utmost care in minimizing damage to leave trees by utilizing skilled, directional felling techniques and shall strive for zero damage at all times. • Unacceptable leave tree damage shall be defined as follows: 1. Leave tree has one or more wounds on its bole exposing the cambium layer, which in total exceeds 20 square inches. A wound is defined as the removal of outer bark and cambium from the stem with no penetration into the sapwood. 2. Top of leave tree is broken or the live crown is reduced below 30% for conifers and 40% for hardwoods. 3. Leave tree has more than 1/3 of the circumference of its root collar or system injured such that the cambium layer is exposed or has a major gouge on the stem or a major root. A gouge involves penetration into the sapwood or deeper. 4. Greater than 10% of the leave trees have wounds of less than 20 square inches.
Cut Tree Definition	• All XX and XX exceeding XX feet in total height or XX in diameter shall be cut. • All trees exhibiting symptoms of XX (disease or infection) shall be cut. • Single trees within openings should be retained even if they are designated as cut trees. • Forked or double-topped trees should be cut. However, if selected to leave, they should be left wholly uncut.
Cut Tree Stump Height	• All cut trees shall be cut as close to the ground as practical. • Stump height shall not exceed 8 inches in height measured on the uphill side.
Slash Disposal	• No cut trees shall be left hanging up in the overstory or leaning against leave trees. • ALL cut trees shall be dropped and laid flat on the ground.

3

REMOVAL OF THINNED MATERIAL

- The Permittee shall be required to remove and pay for all merchantable material deemed available by the thinning prescription from the permit area, unless otherwise approved by the Officer-in-Charge. There is no volume per acre or total unit volume guarantee. There is no guarantee on the marketability, quality, or merchantability of the thinned trees.
- Minimum Merchantability Specifications

  Merchantable material is defined as a tree and products from that tree that equal or exceed the following specifications:

Species and Product	Length (Feet)	Scaling Diameter (Inches)	Net scale in % of gross scale	No. of Minimum Size Products per Tree
All Conifer Sawlogs and Chip & Saw	12	5	33 1/3	1
All Hardwood Sawlogs and Chip & Saw	10	6	33 1/3	1
Conifer Utility (Pulp) Logs	12	2	1/2	1
Hardwood Utility (Pulp) Logs	10	5	1/2	1

- Removal of Non-merchantable Material

  Logs that do not meet the minimum merchantability specifications may be removed at the option of the Permittee. If not removed, non-merchantable logs may be left where they lie after cutting. Merchantable products at landings that make up less than half a log truckload may be removed at the option of the Permittee.
- Log Truck Tickets

  All wood removed from the thinning unit shall have a Bureau of Indian Affairs log truck ticket placed on the back of the log load. These tickets will be provided by the Officer-in-Charge. The Permittee shall return the used log truck ticket book and the completion of sale.

ACCEPTABLE HARVESTING EQUIPMENT

- Only tracked feller-bunchers, tracked harvesters, and forwarders shall be authorized to operate within the thinning unit unless otherwise authorized by the Officer-in-Charge.
- All harvesting practices shall be conducted in a manner that will minimize negative impacts to soils and aquatic resources.

FORWARDING CORRIDOR SPECIFICATIONS

- The acreage of all forwarding corridors shall not exceed XX% of the thinning unit area.
- Natural openings or pre-existing skid trails shall be used whenever possible.
- Timber within forwarding corridors shall be felled and processed prior to felling adjacent timber.
- Forwarding corridors shall be kept as narrow as possible and shall be no greater than 15 feet wide including "bumper trees".
- The distance between forwarding corridors shall be less than or equal to XX feet.
- "Bumper trees" shall be designated and used along the corridor to minimize damage to leave trees and shall be harvested on the way out after harvest operations are complete.
- Logging slash shall be placed on top of the forwarding corridor to function as a protective layer over the exposed soil if determined necessary by the Officer-in-Charge.
- If forwarding corridors become rutted or excavated to a depth of 6 inches or more, forwarding operations shall cease until the corridor is repaired to the satisfaction of the Officer-in-Charge.

LANDING SITE SELECTION

- The best landing sites shall be designated in coordination with the Officer-in-Charge and the Permittee prior to the start of harvesting. Landing sites shall be marked with three XXX ribbons. The Permittee may adjust the landing site location(s) but not without the prior approval of the Officer-in-Charge.

ROAD ACCESS, CONSTRUCTION, AND MAINTENANCE

- The Permittee shall be responsible for temporary access to the permit/project area including obtaining necessary gate keys. The Permittee shall pay for any road use, maintenance, and other fees/charges associated with the use of those roads or easements.
- No new road construction or reconstruction is necessary to access the thinning unit.
- In the event of wet areas in the subgrade, culverts and surfacing material may be needed as directed by the Officer-in-Charge.
- The Permittee shall be responsible for proper maintenance of all roads used throughout the life of the permit. The Permittee's responsibility for normal maintenance commences with the first use of a road for any activity under the contract or permit. Normal maintenance includes but is not limited to grading, blading, shaping rocking, water barring, and installing additional drainage structures; keeping roads, drainage ditches and culverts free of debris; repairing pot holes, damage to ditches, cutbanks, fill slopes and road surfaces; water and/or other dust palliative measures; and any other work needed to protect the road or restore damage caused by road use or natural damage as required by the Officer-in-Charge.
- The Permittee is required to return the road surface to the same condition that is equal to or better, than it was prior to the start of logging.
- All roads and ditches, including the site access road, shall remain clear of debris at all times.
- Existing access shall be utilized whenever possible.

SCALING PROVISIONS

- Forest Products sold under this permit shall be weighed at BIA approved weighing locations. The weighing location for this permit must meet Washington State Department of Agriculture approval. The Permittee shall bear the cost of weighing and scaling. The Permittee shall complete and use BIA log truck tickets, as directed by the Officer-in-Charge to ensure proper accounting of forest products removed from the thinning unit. A log truck ticket must be attached, as designated by the Officer-in-Charge, to each truck and trailer prior to leaving the landing.

PAYMENT FOR LOST LOGS OR OTHER PRODUCTS, DAMAGED TIMBER, AND TIMBER TRESPASS

- Lost Logs

  When scaling or weighing is performed at locations other than the sale area, the Permittee shall be responsible for loss of logs from the time of removal from the sale area until scaled. Lost logs shall be paid for at the contract prices. Determination of volume and piece count for any such log losses shall be made by applying the average net volume per log and percentage species distribution for the entire volume of stumpage previously scaled or weighed to the piece count for logs determined by the Officer-in-Charge to be lost or missing.

- Damaged Timber

  The Permittee shall protect all leave trees inside the permit area and all trees outside the permit area from damage. Damage occurs to trees when, as the result of the Permittee's operation, if one or more of the following has occurred: Tree has one or more wounds on the bole exposing the cambium layer, which in total exceeds 20 square inches; Tree top is broken or the live crown is reduced below 30% for conifers and 40% for hardwoods; or more than 1/3 of the circumference of its root collar or system injured such that the cambium layer is exposed or has a major gouge on the stem or a major root. Payment for damage to leave trees shall be double the stumpage rate, as determined by the Approving Officer.

- Timber Trespass

  The Permittee shall be responsible for any unauthorized cutting beyond such land committed by the permittee or his agents, contractors, subcontractors, employees, and invitees. Permittee agrees to pay triple stumpage for all material removed and/or damaged from the unauthorized cutting. Said stumpage rate shall be the highest market value of the material at the time of the unauthorized cutting

ADDITIONAL PERMIT REQUIREMENTS

- No trees shall be felled outside the designated permit area, unless otherwise approved by the Officer-in-Charge.
- All survey corners, rebars, and stakes shall be protected from damage.
- The Permittee shall provide all personnel, equipment, tools, supplies, and transportation to and from the site, in order to perform the work.
- The cutting areas within the thinning unit may be adjusted by the Officer-in-Charge if the need arises. The total estimated acres are not guaranteed.
- The operation is subject to fire precaution shutdown periods and the operator shall comply with the current precaution levels and operation restrictions for the area.
- The Permittee shall obtain any other necessary licenses and permits as required by the Bureau of Indian Affairs or the Lummi Nation.

ADDITIONAL TIMBER CUTTING PERMIT PROVISIONS

UTILIZATION

SALES OF ESTIMATED VOLUMES. In sales in which the volume of timber is to be determined by measurement of cut products, timber shall be cut to utilize fully the merchantable material and to yield the maximum stumpage value. Timber cut into lengths or products of lesser value shall be scaled as if cut to yield the maximum value of products covered by the permit. Stumps shall be cut as low as practicable to avoid waste. The mean height of any stump shall not exceed one-half of its diameter, except where this height is considered to be impracticable, in which case, the Officer in Charge must authorize the higher stumps. Stumps which exceed the maximum height shall be paid for by the Purchaser at the rate of $10 per stump, which charges, in view of the difficulty of determining the actual damage to the Seller, shall be regarded as fixed, agreed and liquidated damages. In addition, the Officer in Charge may require the Purchaser to re-cut such stumps to the maximum allowable height.

DAMAGE TO TIMBER

The Purchaser may be required to pay at double the contract stumpage rates for merchantable timber not designated for cutting, which is cut or seriously injured through carelessness or negligence. If timber is injured or damaged to the extent that, in the opinion of the Officer in Charge, it will constitute a hazard to residual trees if not removed, the Purchaser may be required to remove such injured or damaged timber. Any waste material or injured or damaged timber which is paid for shall become the property of the Purchaser and may be removed from the sale area at any time prior to the expiration of the permit.

SCALING OF WASTE MATERIAL

Waste in long butts, tops, broken and partially sound logs, in other products, and in all trees designated for cutting which are not cut or which are left felled, lodged or badly damaged by the logging operations shall be paid for by the Purchaser at the permit stumpage rates, except that no additional charge shall be made for such waste material in trees the volume of which was determined prior to the sale.

LOGGING METHODS

The Purchaser's logging methods shall avoid unnecessary damage to reserved trees, young growth, lands, other property and other values of the Indians or Government, and shall employ practices recommended for the protection of water quality. The operation of all logging equipment shall be subject to such restrictions as the Officer in Charge may prescribe.

PROTECTION OF STREAMS

Logging practices and road construction shall be conducted in a manner that will minimize damage to the course and sides of all streams whenever encountered in such activities. Streams as here referred to include both flowing and intermittent watercourses. Written approval of the Officer in Charge is required for the hauling, skidding or yarding through any stream.

SOIL EROSION

Logging practices and road construction shall be conducted in a manner that will minimize soil erosion and damage. Soil and water conditions in naturally moist meadows shall be protected. Where soil is particularly susceptible to erosion, the Purchaser may be required to take reasonable and practicable measures to retain road surfaces and prevent the gullying of roads and skid trails. Barren areas as created by landings and camp and maintenance sites may be required to receive similar care. The Officer in Charge may suspend operations in whole or in part for such periods, as he may deem necessary to avoid excessive damage when ground conditions are unfavorable.

TRANSPORTATION FACILITIES

AUTHORIZATION

The Purchaser is authorized to construct and maintain on the contracted area and on other un-allotted Indian lands such roads, bridges and other transportation facilities as are necessary for logging operations under the contract, subject to applicable regulations and such conditions as the Lummi Indian Business Council (LIBC) may impose. Construction of transportation facilities shall not convey the right of exclusive use to the Purchaser. In these Provisions, "Construction" shall also include reconstruction.

ROAD CONSTRUCTION

The location and design of all roads to be constructed by the Purchaser shall minimize damage to land, improvements, and the environment. The Bureau may, before construction begins, require approval of location and design by inspection.

ROAD MAINTENANCE

All roads which are designated by the Officer in Charge as being necessary for the administration and protection of Indian lands shall at all times be kept free of obstructions resulting from the Purchaser's operations.

IMPROVEMENTS

All bridges, drainage structures, cattle guards or other improvements installed on any road by the Purchaser shall be left intact at the completion of logging operations, unless the removal of such improvements is authorized or required by the Officer-in-Charge.

PURCHASER AND BUREAU REPRESENTATIVES ON SALE AREA

At all times when construction or logging operations are in progress, the Purchaser shall have a representative readily available in the area of such operations who shall be authorized to receive in behalf of the Purchaser any notices or instructions from the Officer-in-Charge in regard to performance under the permit and to take such action thereon as is required by the terms of the permit.

FAILURE TO COMPLETE PERMIT

In the event of failure to complete all obligations assumed under the permit, the Purchaser shall be liable for the depreciation in the value for the remaining timber and for any costs or expenses incurred by or caused to the Seller or the Government as a result of such failure, in an amount to be determined by the Approving Officer.

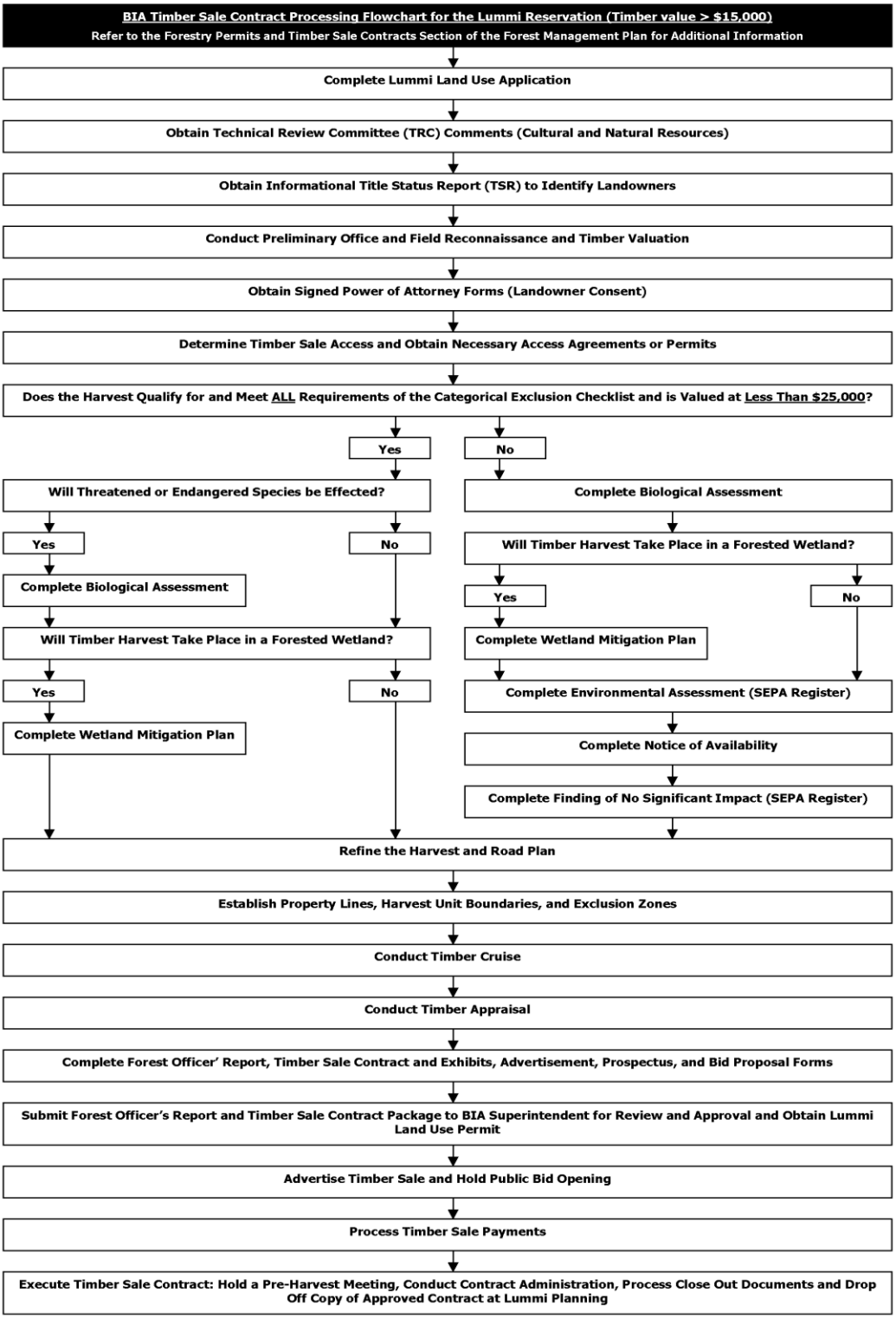
SUSPENSION OF OPERATIONS

The Superintendent may, after written notice to the Permittee, suspend any or all of the Permittee's operations under this permit if the Permittee violates any of the provisions of the permit. The Officer in Charge may stop any portion of the Permittee operations until the Superintendent's written notice is delivered if such suspension is necessary to mitigate damages to the land or other property of the Indians or the Government. Such notice should be delivered within 10 working days. Such suspension of operations may be continued by the Superintendent until there is satisfactory compliance. After written notice from the Superintendent, continued failure to comply with any of the requirements of the Permit shall be grounds for the revocation by the Approving Officer of all rights of the Permittee under the Permit and the Permittee shall be liable for all damages resulting from his breach of Permit.

TIMBER TO BE RESERVED

No timber may be cut except that which is designated by the Officer in Charge. A strip of timber on each side of streams, roads, and trails, along lake shores, in the vicinity of camping places and recreational or ceremonial grounds, and timber in immature stands or other areas which should not be disturbed because of silvicultural, watershed protection or other reason, may be reserved in which little or no cutting shall be allowed.

Appendix Q - Flowchart for Processing BIA Timber Sale Contracts



Appendix R - BIA Timber Sale Contract for the Sale of Predetermined Volumes

FORM 5-5327
(Rev.) May 1976

UNITED STATES
DEPARTMENT OF THE INTERIOR

Bureau of Indian Affairs

PART A

Tribal	
Allotment	
Contract No.	XXX

TIMBER CONTRACT FOR THE SALE OF PREDETERMINED VOLUMES

XXXXX Logging Unit, **Lummi** Indian Reservation

A1. AUTHORITY. This contract is made under the authority of Section(s) 7 and/or 8 of the Act of June 25, 1910 (25 U.S.C. 407 and 406) as amended by the Act of April 30, 1964, and in accordance with the regulations of 25 CFR 163.

A2. PARTIES TO THE CONTRACT. The parties to this contract are the heirs to the XXX XXXX Allotment No. X-X and X-X as represented by the Superintendent, Puget Sound Agency hereinafter called the Seller, and _____ of _____, Washington , hereinafter called the Purchaser.

A3. BUREAU OF INDIAN AFFAIRS REPRESENTATIVES.

(a) **Approving Officer.** The Superintendent, Puget Sound Agency or his authorized representative, is hereinafter called the Approving Officer.

(b) **Superintendent.** The Superintendent, Puget Sound Agency or his authorized representative, is hereinafter called the Superintendent.

A4. TIMBER SOLD. The seller agrees to sell to the Purchaser and the Purchaser agrees to buy, in accordance with the terms and conditions of this contract and the attached Part B, Standard Provisions, which are made a part hereof, the following timber:

(a) **Designated Timber.** All timber, living or dead, standing or down, which has been designated for cutting by the Bureau of Indian Affairs within the boundaries of this unit. The volume of designated timber, which has been determined as stated in A10. (a) herein, the bid stumpage rates and the total purchase price of such designated timber is shown in the following tabulation.

1

Species	Volume	Unit	Bid Rate/Unit	Total Purchase Price
Western red cedar sawlogs	318	Total Volume	Lump Sum	$XXX,XXX.XX
Douglas-fir and other conifer species sawlogs	16			
Red alder sawlogs	135			
Bigleaf maple and other hardwood species sawlogs	40			
Black cottonwood sawlogs	160			
All species hardwood pulp logs.	83			
Cull logs (all species)	Undetermined; Removal optional			
Other wood products (all species)	Undetermined; Removal optional			
TOTAL SAWLOGS	**752**			

The Purchaser agrees to pay the total purchase price shown above regardless of whether the actual volume of timber designated for cutting is more or less than the volumes shown above.

(b) **Additional Timber.** In addition to the timber specified above, this sale also includes any other timber on the contract area which must be cut or removed in clearing for roads, landings, camps and other improvements constructed by the Purchaser and all other timber seriously damaged by logging operations under this contract, if, in the opinion of the Approving Officer, the timber is merchantable for any product in accordance with customary standards and is present in sufficient quantities to permit economic removal to existing markets.

A5. CONTRACT DATES. The contract year is the period of a calendar year. Unless this contract is extended in accordance with Section B2.5 of the Standard Provisions, the Purchaser shall cut and pay for all designated timber on or before October 1, 2009 and shall complete all other obligations on or before the contract expiration date of November 1, 2009.

A6. UNIT DESCRIPTION. This unit is located in a portion of the southeast quarter of Section 3, Township 38 North, Range 1 East, Willamette Meridian, Whatcom County, Washington. (See Timber Sale Map – Contract Exhibit A) and includes the following approximate area:

	Area Within Unit Boundary (Acres)	Area To Be Logged (Acres)
Tribal	0	0
Allotted	49	49
Alienated	0	0
TOTAL	49	49

The unit boundaries are shown approximately on the map attached hereto as Contract Exhibit A and made a part hereof. The Bureau of Indian Affairs has marked the boundaries on the ground unless otherwise specified in Section A13.

A7. PAYMENT OF TIMBER.

(a) The Purchaser shall pay the total purchase price of the timber shown in Section A4. (a) herein by installment per A13. (g) payment(s). Single payment shall be paid on or before the approval of the contract by the Approving Officer and Sections B4.2 and B4.3 of the Standard Provisions shall not apply. Installment payments shall be paid in such amounts and at such times as called for by the Superintendent and Section B4.3 of the Standard Provisions shall not apply.

(b) The Purchaser shall pay for additional timber, which may be cut pursuant to Section A4. (b) herein in such amounts and at such times as called for by the Superintendent. Payment for additional timber shall be computed at the appraised rates shown below:

Species and Product	Unit	Rate per Unit
None		

A8. PERFORMANCE BOND. The Purchaser delivers herewith and agrees to maintain a bond satisfactory to the Approving Officer in the sum of $XX,XXX.XX conditioned upon the faithful performance of all the terms of this contract.

A9. DESIGNATED TIMBER FOR CUTTING.

(a) Designated timber to be cut lies within the logging unit boundaries, which are marked with orange fluorescent and blue ribbon tied together and yellow clearcut tags facing inward toward the unit. Trees with yellow clearcut tags attached to them shall not be cut.

(b) Within the 12-acre upland portion of the harvest unit as shown on the Timber Sale Map – Contract Exhibit A, all merchantable and non-merchantable living trees with a DBH of 6 inches or greater and all live non-merchantable hardwood trees 20 feet in height and taller shall be cut. Healthy, sub-merchantable conifers shall be retained as wildlife trees and/or for silvicultural reasons. Snags and standing cull conifer trees with a DBH of 16 inches or larger shall be retained as wildlife trees unless they are determined to be unsafe to forest workers or as otherwise directed by the Officer-in-Charge. All cut timber meeting the minimum merchantability specifications, as defined in Special Provisions A13. (t), is designated for removal.

(c) Within the 37-acre forested wetland portion of the harvest unit and within the Forest Development Area as shown on the Timber Sale Map – Contract Exhibit A, all merchantable trees with a DBH of 8 inches or greater shall be cut. All standing culls, existing snags, and non-merchantable trees within the forested wetland shall be retained as wildlife reserve trees unless they are determined to be unsafe to forest workers or as otherwise directed by the Officer-in-Charge. All cut timber meeting the minimum merchantability specifications, as defined in Special Provisions A13. (t), is designated for removal.

(d) Stumps shall be cut as low as practical. Reasonable care shall be taken to fell trees in directions that minimize damage to the stems, crowns, and root systems of wildlife reserve trees, leave trees retained for silvicultural purposes, and young reproduction.

A10. SCALING.

(a) **Designated Timber.** This is a sale of predetermined volumes. Scaling is not required but the Bureau of Indian Affairs reserves the right to scale or waste scale at any time during the sale. The Purchaser will be issued a log load receipt book and will be responsible for the attachment of tickets to logs or other products. The receipt shall be attached to a visible portion of the left rear side, or as directed by the Officer-in-Charge, where it shall remain at all times while logs are in transit as evidence of authority to transport logs. Unused and partially used books shall be returned upon completion of hauling.

(b) **Additional Timber.** None

A11. SLASH AND CULL TREE DISPOSAL.

(a) In lieu of B9.3 Cull Tree Felling, the Purchaser shall fell all un-merchantable trees that meet the cutting prescriptions described in A9 (b) and A9 (c), unless otherwise directed by the Officer-in-Charge.

(b) Trees and tops fallen outside the cutting boundary shall be pulled back inside the cutting unit boundary. Excessive accumulations of slash along the cutting unit boundary shall be pushed back into the cutting unit, as directed by the Officer-in-Charge.

(c) All slash created in connection with Class IV forest road construction and reconstruction shall be piled during the construction phase in natural or cleared openings within the cutting unit, or on the road right-of-way. Stumps resulting from the road construction operation shall also be piled along with the right-of-way timber slash.

(d) Herbaceous and woody vegetation shall be uprooted from the soil and piled, without removing the top 6 inches of the soil from the immediate area as directed by the Officer-in-Charge. All logging slash, uprooted herbaceous, and woody vegetation shall be pushed into circular piles. Limited amounts of crushed limbs, uprooted vegetation, and non-merchantable pieces can remain on the soil surface as long as seedlings can be planted efficiently on an 8-foot spacing. Slash piles located throughout the unit shall not exceed 20 feet in diameter, shall be free of dirt, and piled in a manner to facilitate efficient burning. Slash piles shall have a 10-foot wide fire line constructed around them down to mineral soil. Reasonable care shall be taken to minimize excavation during fire trail construction. The Purchaser shall make every reasonable effort to locate slash piles as close to landings or main skid trails as possible while remaining at least 75 feet away from standing timber and at least 100 feet away from any home, road, or other improvement so as not to create an immediate fire danger. The size of slash piles located adjacent to main skid trails may exceed 20-feet in diameter as approved by the Officer-in-Charge. The size of slash piles located adjacent to landings shall not exceed 75 feet unless otherwise approved by the Officer-in-Charge.

A12. ROAD CONSTRUCTION AND MAINTENANCE. See Section B10. of the Timber Sale Contract Part B - Standard Provisions.

(a) All roads within the Logging Unit shall be constructed and/or reconstructed and maintained in conformance with Contract Exhibit B - Road Design Specifications for Construction and Maintenance.

(b) The Purchaser shall be required to construct 8.5 stations of new road, which has been designated with pink and black striped ribbon. The location of this road is shown on the Timber Sale Map – Contract Exhibit A.

(c) The Purchaser shall be required to reconstruct 4.5 stations of old road, which has been designated with pink and black striped ribbon. The location of this road is shown on the Timber Sale Map – Contract Exhibit A.

(d) All newly constructed or reconstructed roads shall have a smooth even grade and a minimum width of 12 feet. A minimum of 6-inches of pit run gravel will be required for newly constructed roads and a minimum of 3-inches of pit run gravel will be required for reconstructed roads unless otherwise directed by the Officer-in-Charge. All roads on slopes greater than 10 percent shall be ditched.

(e) A quarry spall shall be constructed at the entrance of Road 1 and Road 2 as shown on the Timber Sale Map – Contract Exhibit A. Each quarry spall shall be 100 feet long, 12 feet wide, 1 foot in depth, and constructed with 4 to 8 inch rock.

(f) One 18-inch diameter culvert 24 feet in length shall be placed within a pre-existing drainage ditch at the entrance of the Road 1 as shown on the Timber Sale Map – Contract Exhibit A. This culvert location has been marked on the ground with yellow and pink flagging. Additional culverts or acceptable drainage structures shall be installed where necessary to prevent ponding within the wetland or where needed to prevent wet areas in the subgrade as directed by the Officer-in-Charge.

(g) All forest road construction and re-construction shall occur during periods of dry weather. Site disturbance shall be minimized. All road construction and re-construction shall be completed on the designated hauling road prior to hauling.

(h) The Purchaser shall be responsible for normal maintenance of all access and logging roads throughout the life of the contract. The Purchaser's responsibility for normal maintenance commences with the Purchaser's first use of a road for any activity under the contract. Normal maintenance includes but is not limited to grading, blading, shaping, rocking, water barring, and installing additional drainage structures; keeping roads, drainage ditches and culverts free of debris; repairing pot holes, damage to ditches, cutbanks, fill slopes and road surfaces; watering and/or other dust palliative measures.

A13. SPECIAL PROVISIONS.

(a) **Logging and Road Plan.** An approved logging and road construction plan shall be required in accordance with B8.1 of the Standard Provisions before cutting begins. The logging and road plan template provided by the Bureau of Indian Affairs shall be used.

(b) **Road, Landing, and Skid Trail System.** The Purchaser shall be required to use the road, landing, and skid trail system shown in the Road, Landing, and Skid Trail System Map – Contract Exhibit C. Roads shall be kept to a maximum width of 12 feet. The Officer-in-Charge may allow the Purchaser to modify the road, landing, and skid trail design if necessary to avoid wet areas or to facilitate better access. The agreed upon written changes shall be made in an amended Logging and Road Plan prior to the commencement of logging operations.

(c) **Skid Trails.** Skid trail width shall not exceed 15 feet. Stumps within the skid trail shall be cut as low as possible. Only one skidding machine may work on a skid trail at a time.

A mat of logging slash shall be placed on top of each skid trail and maintained whenever possible. Low areas within the skid trail shall be filled with cull trees and logging slash where necessary to minimize rutting. If skid trails become rutted or excavated to a depth of 12 inches or more, skidding operations shall cease until the skid trail is repaired or as directed by the Officer-in-Charge.

All skid trails located on sloping ground shall be water-barred after harvest operations are complete. Water bars shall be placed at a frequency to minimize gullying and soil erosion or as directed by the Officer-in-Charge.

(d) **Landings.** The number of landings within the harvest unit shall not exceed 2 unless otherwise approved by the Officer-in-Charge. Any changes in the proposed landing locations shall be approved by the Officer-in-Charge prior to construction.

Landings shall be constructed reasonably level but with enough slope (2 to 5%) to minimize the accumulation of water. Landings shall be surfaced with a minimum of 6-inches of pit run gravel unless otherwise directed by the Officer-in-Charge. Excessive excavation and filling while constructing landings shall be avoided. Crushed rock up to 6 inches shall be used on landings where the soil is easily saturated.

(e) **Logging Equipment.** If mechanical falling equipment is used, the equipment shall be tracked and equipped with a hydraulic boom. Acceptable skidding equipment includes shovels, crawler tractors, high-speed tracked skidders, or rubber-tired skidders equipped with wide tires at least 43 inches wide.

(f) **Log Extraction Method.** All designated timber to be harvested within the timber sale area as shown on the Timber Sale Map – Contract Exhibit A, shall be whole tree skidded to landings. Where feasible, trees shall be skidded with the butt end suspended off the ground. No skidding is permitted through defined channels with flowing water.

(g) **Equipment Operation Restrictions**. All harvest and road building equipment used in connection with this timber sale shall not be allowed to operate outside the cutting unit boundaries or within the boundaries of designated exclusion zones.

When soil moisture is high and unrestricted operation of harvest equipment would result in unreasonable soil damage, operations shall be restricted to methods that minimize soil damage or postponed until site conditions improve such that skidding may proceed without causing unreasonable soil damage as directed by the Officer-in-Charge.

(h) **Log Branding.** The Purchaser shall brand all logs within the Logging Unit, with a Washington State registered brand at the landing or as directed by the Officer-in-Charge.

(i) **Post Harvest Volume Summary.** The Purchaser shall furnish a volume summary by species, for all designated timber that is cut and removed from the logging unit upon completion of the logging operation.

(j) **Endangered or Threatened Species Protection.** In the event of discovery of any rare or endangered species of bird, plant or animal while the timber sale is active, to include discovery by the Purchaser, his contractors, subcontractors, or their employees, the Purchaser shall immediately suspend all operations in the vicinity of the discovery and notify the Officer-in-Charge. All necessary actions will be taken to protect the threatened or endangered species. The Officer-in-Charge may establish a protective no harvest or selective harvest buffer around the discovery site as deemed necessary and consistent with Federal and Tribal laws.

(k) **Cultural Resource Protection.** In the event that the Purchaser, his contractors, subcontractors, or their employees, discover, encounter, or become aware of any objects or sites of cultural value on the contract area such as historical or pre-historical ruins, graves or grave markers, human remains, fossil or artifacts, shell midden, faunal remains, or stone tools, the Purchaser shall immediately suspend all operations in the vicinity of the cultural value and the area shall be secured. The Purchaser shall notify the Officer-in-Charge immediately in order to help assess the situation and determine how to preserve the resource(s). Compliance with all applicable laws pertaining to archaeological resources is required. Operations may resume at the discovery site upon receipt of written notice from the Superintendent.

(l) **Fire Protection.** Section B11.3 of the Standard Provisions is amended to change the phrase "The Purchaser shall take immediate and independent initial fire suppression action on all fires on the sale area and shall use all necessary manpower and equipment at his disposal, including the employees and equipment of his subcontractors engaged on or near the sale area in construction or in logging, removing, or processing timber." to read, "the Purchaser shall immediately report any and all wildland fires to the contract Officer-in-Charge, or the appropriate authority identified in the Fire or Logging Plan." When called upon by the Superintendent, the Purchaser shall make available any and all of his equipment or qualified manpower, including that of his subcontractors, for hire by the Bureau and to work under the direction of any authorized employee of the Bureau in the suppression of any fire on or threatening Indian lands.

By agreement with the State of Washington, said State may represent the Bureau of Indian Affairs in matters regarding fire protection of Indian lands as stipulated in the Fire Protection Agreement between Washington State Department of Natural Resources and the Bureau of Indian Affairs.

(m) **Environmental Protection.** The Purchaser shall regularly check fuel or hydraulic fluid hoses, oil or fuel drums, oil, fuel, or hydraulic fluid transfer valves, and fittings for leaks and properly maintain equipment used for forest practices to minimize the potential for leaks and/or spills. If there is evidence of hydraulic fluid or petroleum product leakage, the operator shall immediately stop operations, contain and clean up the spill, and properly dispose of contaminated materials. Further use of such equipment shall be suspended until the deficiency has been corrected.

The Purchaser must provide and maintain spill response materials on site, ensure that the operator know how to use the material, and take immediate and appropriate action to stop and contain leaks or spills of chemicals and other petroleum products. The Purchaser shall immediately report any chemical and/or petroleum product spills resulting from the operation to the Officer-in-Charge.

(n) **Insurance Requirements.** The Purchaser shall provide and maintain in force at all times during the performance of the contract, Worker's Compensation Insurance, provided and maintained for all employees of the Purchaser engaged in work under the contract. The Purchaser shall provide and maintain in force at all times during the performance of the contract public liability insurance.

When requested by the Bureau, the Purchaser will provide proof of such coverage during the term of the contract. A Certificate of Insurance shall be furnished to the Bureau within 30 days following contract approval. The Purchaser shall provide 30-day notice to the Bureau in the event of cancellation, non-renewal or a material change in the policies.

(o) **Liability.** The Purchaser assumes all risk of injury and/or death of its employees, subcontractors, and third party persons and all loss of, or damage to property, except as specified otherwise in the Contract, resulting from actions of the Purchaser under this Contract, and agrees to indemnify and

save harmless the Seller and Bureau from any and all liability, loss, cost, and expense including attorney's fees resulting from such injury, death, loss and/or other damage.

(p) **Access Rights and Timber Trespass.** The Purchaser shall have the right to enter upon only the land described herein, for the sole purpose of harvesting and removing designated timber and performing the obligations, authorized under this contract. The Purchaser shall be responsible for any unauthorized cutting beyond such land committed by the Purchaser or his agents, contractors, subcontractors, employees, and invitees. Purchaser agrees to pay triple stumpage for all material removed and/or damaged from the unauthorized cutting. Said stumpage rate shall be the highest market value of the material at the time of the unauthorized cutting. The Purchaser further agrees in the performance of this contract not to employ, or otherwise contract for services of any individual or business entity, which has an outstanding, un-liquidated indebtedness to the United States resulting from trespass against Indian trust timber.

(q) **Method of Payment.** In place of B4.1 Method of Payment of the Standard Provisions, *"The Purchaser shall pay for the timber covered by the contract in advance of cutting, as a single payment or installment payments in sales of predetermined volumes or in the form of advance payments or advance deposits in sales of estimated volumes. Payments and deposits shall be by check, postal money order, cash or electronic funds transfer as designated by the Superintendent via the BIA Lockbox. Checks and postal money orders drawn payable to the Bureau of Indian Affairs and cash shall be transmitted to the Superintendent. Electronic funds transfers shall be made at the Purchaser's bank through the Federal Reserve Bank of New York to the Treasury Department using instructions furnished separately by the Bureau of Indian Affairs. Payments and deposits are due on the date specified in the written request(s) from the Bureau of Indian Affairs."*

(r) **Payment Schedule.** Payment for the Predetermined Volume shall be in the form of two equal installment payments based on the same number of cutting blocks as described in the Purchaser's logging plan and approved by the Superintendent. If installment payments are used, the final payment shall be made no later than 60 days after the contract is approved. However, the Purchaser shall pay for the entire cutting block before any cutting begins in any cutting block. Cutting blocks within the logging unit shall be designated by the Officer-in-charge on the Purchaser's logging plan.

(s) **Bid Deposit.** The Purchaser's bid deposit shall become an Advance Payment, upon approval of the contract.

(t) **Merchantability Specifications.** All timber designated for cutting in Section A9 shall be removed from the Logging Unit unless otherwise approved by the Officer-in-Charge. Trees, when designated for cutting, and products from those trees will equal or exceed the following specifications:

Product Specifications					**Tree Specifications**
Species & Product	Length (feet)	Scaling Diameter (inches)	Net Scale in % of Gross Scale	Net Scale (Bd. Ft.)	No. of Minimum Size Products per Tree
All conifer species sawlogs	8	5	33 1/3	10	2
All hardwood species sawlogs	8	6	33 1/3	10	2

Cull Logs Defined: Cull Logs shall be defined as all logs not meeting the minimum merchantability specifications as to net scale in percent of gross scale that are removed from the Logging Unit by the Purchaser with the intent to manufacture or sell. Removal of these logs is at the Purchaser's option.

Other Wood Products Defined: Other Wood Products shall be defined as all species wood products not meeting Sawlog or Cull Log product specifications as set forth above. Other Wood Products are removed at the Purchaser's option.

(u) **Interest.** The Purchaser will not receive interest on funds paid to, or deposited with, the Bureau of Indian Affairs except on the principal amount of funds returned or refunded to the Purchaser. Interest accrued on the principal amount retained for default will be treated as a penalty and distributed to the beneficial owner(s).

FORM 5-5327
(Rev.) May 1976

A14. EFFECTIVE DATE. This contract shall become effective on the date of approval by the Approving Officer.

WITNESSES:	PURCHASER:
_____ (Name)	_____ Name of Corporation, Partnership, or Individual
_____ (Address)	By: _____
_____ (Name)	By: _____
_____ (Address)	_____ (Date)

Witnesses are required if Purchaser is other than a corporation. If Purchaser is a corporation, the following certificate must be executed:

I, _____, certify that I am the _____ Secretary, of the corporation named as the Purchaser herein; that _____, who signed this contract was then of said corporation: that said contract was duly signed for and in behalf of said corporation by authority of its governing body, and within the scope of its corporate powers.

(Corporate Seal)

_____
Seller

WITNESSES:	
_____ (Name)	
_____ (Address)	_____ Allottee or his legal representative Judith R. Joseph, Superintendent
_____ (Name)	_____ (Date)
_____ (Address)	_____

Signed for the _____ pursuant to Resolution No._____ ___passed by its governing body in a meeting held at _____, on _____ XXX, XX, 20XX.

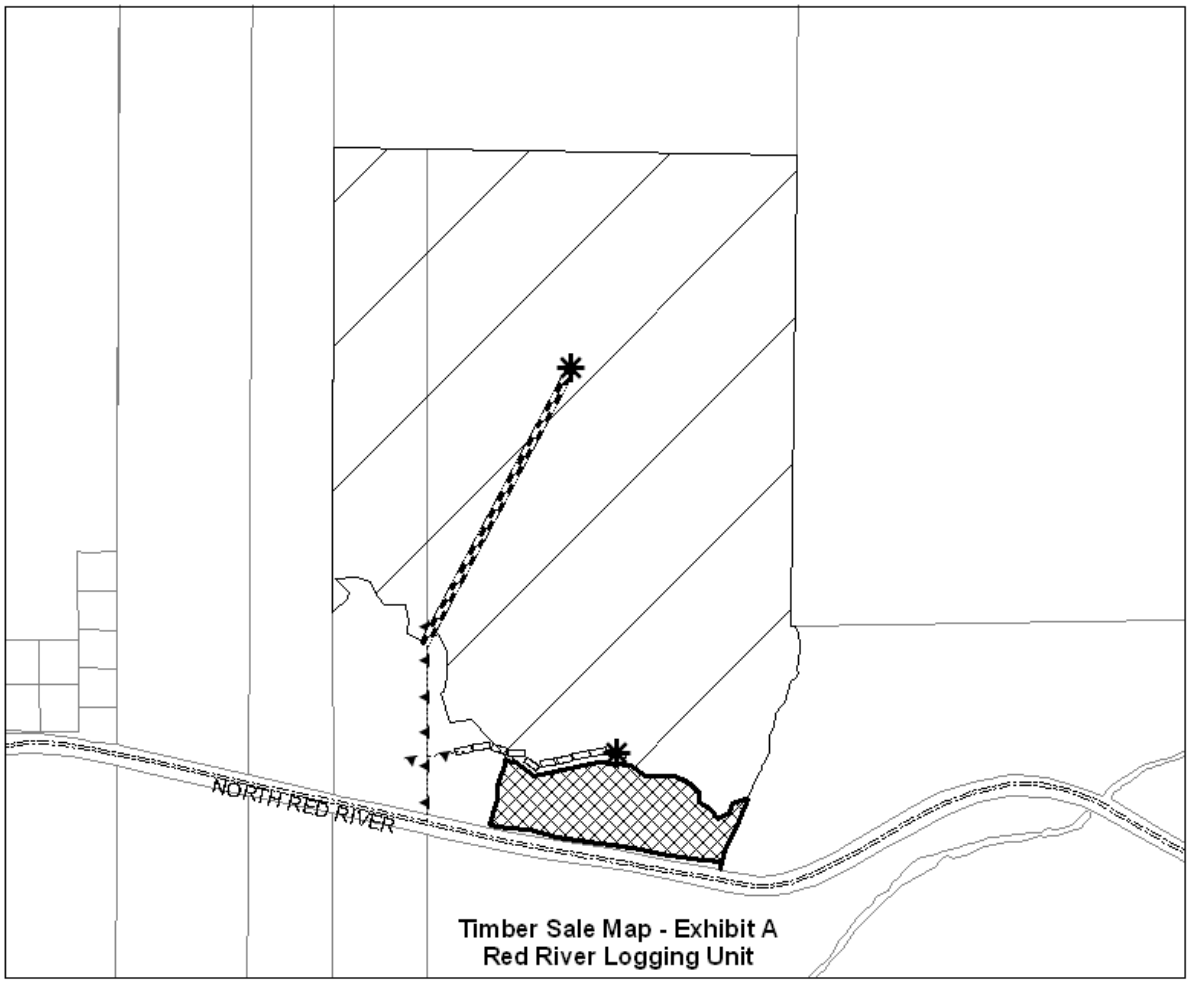
_____ (Name)	_____ (Name)
_____ (Title)	_____ (Title)

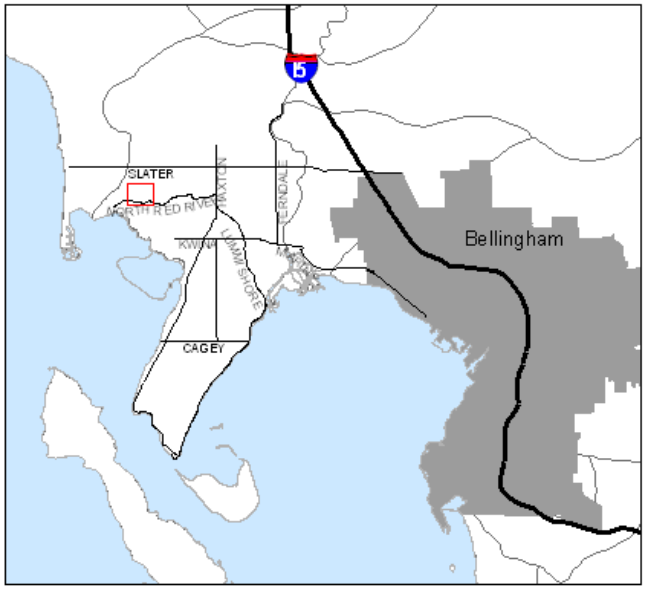
APPROVING OFFICER

Approved: 20XX	_____ Judith R. Joseph, Superintendent

Northwest Region – Puget Sound
Insert to Form 5-5327, Contract No. XXXX
XXXX Logging Unit

6





Legend

- Landings
- Road Re-Construction
- New Road Construction
- Existing Road
- County Road
- Red River Logging Unit (49 Acres)
- Forest Development Area (3 Acres)
- Lummi Reservation Parcels

N

1:4,976

CONTRACT EXHIBIT B – ROAD DESIGN SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE

(a) **General.** All roads within the Logging Unit shall be constructed and/or reconstructed and maintained in conformance with Contract Exhibit B, which is hereby made part of this contract.

The Purchaser shall be required to construct the number of stations of new road, reconstruct the number of stations of old road, and install the minimum number of culverts as specified in A.12. Road Construction and Maintenance.

(b) **Clearing and Grubbing**. All clearing debris created in connection with road construction shall be placed outside the road prism and not buried in the road. All clearing debris and spoils shall not be deposited within standing water present within the forested wetland.

(c) **Subgrade Construction**. Minimum subgrade width is 16 feet shoulder to shoulder. The subgrade shall be shaped with a crowned surface with a 2% slope. The road subgrade shall be composed of firm, well-compacted granular soil free of debris and shall be compacted. Rutting of the subgrade shall not be permitted. Subgrade compaction shall be done in 1 to 2 foot layers running the excavation equipment over the entire width of the lifts. Geotextiles may be used to reduce the amount of base rock or in soft areas as approved by the Officer-in-Charge.

Subgrade width will vary depending on ballast and surfacing depth to provide for a 12-foot roadway with foreslopes of 2:1 on ballast. With 2:1 foreslopes, subgrade width equals surface width plus 4 times the surfacing depth in feet. In addition to the minimum subgrade width of 16 feet, ditches where specified shall be 3 feet wide. The following chart should be used as a guideline.

For 2:1 Ballast (Also see Diagram 1)			
Ballast & Surfacing Depth	**Subgrade Width**	**Subgrade Width Plus 3 Foot Ditch**	**3 Foot Ditch on Both Sides**
12 inches	16 feet	19 feet	22 feet
18 inches	18 feet	21 feet	24 feet
24 inches	20 feet	23 feet	26 feet
30 inches	22 feet	25 feet	28 feet
36 inches	24 feet	27 feet	30 feet
42 inches	26 feet	29 feet	32 feet

Cut slopes shall be constructed to a uniform line and left rough for easier re-vegetation in conformance with the following standards:

Cut Slopes	
Common Earth on side slopes 0% to 55%	1:1
Common Earth on side slopes 55% to 70%	¾:1
Common Earth on side slopes over 70%	½:1
Hardpan or solid rock	¼:1

Fill slopes with a 6-foot height at centerline must have 2 extra feet added to the subgrade width. Fills over 6 feet must have 4 extra feet added to the subgrade.

Fill Slope Ratio	
Common Earth	1.5:1
Rock	1.25:1
Sand Soils	2:1

(d) **Drainage Structures**. All necessary drainage structures and ditches shall be installed during road construction. All drainage structures shall discharge into vegetation, a non-erodible area, or onto the forest floor. Drainage structures shall not discharge into streams, high-value wetlands, on erodible soils, or over fill slopes.

One 18-inch diameter culvert 24 feet in length shall be placed within a pre-existing drainage ditch at the entrance of the Road 1 as shown on the Timber Sale Map – Contract Exhibit A. This culvert location has been marked on the ground with yellow and pink flagging.

Additional culverts or acceptable drainage structures shall be installed where necessary to prevent ponding within the wetland or where needed to prevent wet areas in the subgrade as directed by the Officer-in-Charge. Where used, additional culverts shall not be less than 12 inches in diameter under any circumstance and shall be corrugated to slow the speed of discharge.

From the road centerline, culverts shall be skewed 0 to 3 degrees on road grades of 3% or less and 30 degrees on road grades between 3 to 12%.

Culvert outlets shall be positioned a minimum of 1 foot beyond the toe of the road fill and culvert inlets shall be positioned a minimum of 1 foot beyond the road subgrade. Where a downward slope exists, all culverts shall be sloped 3 degrees down in the direction of flow. Rock armoring or some other energy dissipater shall be placed at the inlet and outlet of the culvert where erosion is taking place.

Culverts shall be installed in conformance with Diagram 2 - Culvert Installation Cross Section. Culvert bedding and backfill shall be composed of firm, well-compacted granular soil, free of rocks, logs, stumps, limbs, and other objects that would dent or damage the pipe during installation or use. Culvert bedding shall be rounded on the culvert radius to a depth of approximately one-sixth the culvert diameter. Culverts should be backfilled in 6-inch layers and tamped up to the top of the culvert. Fill soils should then be placed around the culvert in even layers from both sides. This soil should then be tamped until the desired thickness of coverage is obtained. Where necessary, bedrock shall be excavated as required to provide a uniform foundation for the full length of the culvert. Culverts shall be covered with at least 12 inches of fill or to a depth of 1/3 the culvert diameter (whichever is greater).

(e) **Drainage Ditches.** Roadside drainage ditches shall be 1 foot deeper than the road prism and 3 feet wide unless otherwise approved by the Officer-in-Charge. Drainage ditches shall be constructed at the time of subgrade compaction before applying base rock or surface rock. Drainage ditches shall be constructed so that they have the same gradient as the road and drain away from the road at the outlet end. Drainage ditches shall be rocked where erosion is occurring in the ditch line or as required by the Officer-in-Charge. Ditches shall be kept clear of debris to maintain functionality. Where used, ditchouts shall be constructed so that they intersect the roadside ditch at the same depth and are outsloped 1 to 3%.

(f) **Surfacing.** The road subgrade shall be compacted and shaped prior to applying surface rock. If geotextiles are used, the Purchaser shall place geotextiles prior to applying surface rock. A minimum of 6-inches of pit run gravel will be required for newly constructed roads and a minimum of 3-inches of pit run gravel will be required for reconstructed roads unless otherwise directed by the Officer-in-Charge. The surfacing material must be spread by truck. End dumping and spreading of material by bulldozer shall not be permitted. Rocking shall be done during dry weather and shall be suspended when there is surface runoff.

(g) **Quarry Spalls.** A quarry spall shall be constructed at the entrance of Road 1 and Road 2 as shown on the Timber Sale Map – Contract Exhibit A. Each quarry spall shall be 100 feet long, 12 feet wide, 1 foot in depth, and constructed with 4 to 8 inch rock. The Purchaser shall maintain quarry spalls throughout the life of the contract and shall add additional rock if necessary as required by the Officer-in-Charge. Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.

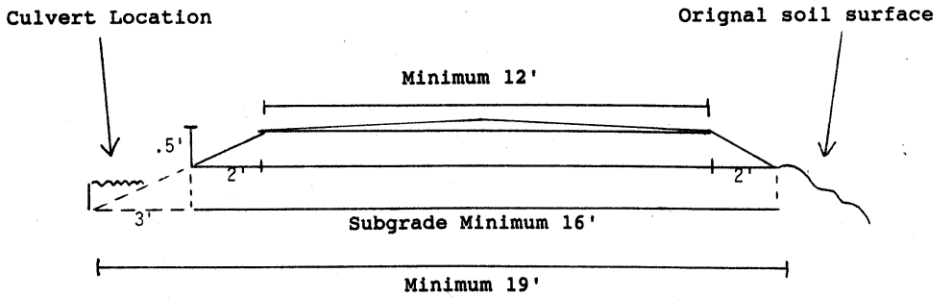
(h) **Spoil Disposal.** Spoils generated from road construction activities shall be disposed of in a manner and location suitable to the Officer-in-Charge.

(i) **Road Maintenance.** The Purchaser shall be responsible for normal maintenance of all access and logging roads throughout the life of the contract. The Purchaser's responsibility for normal maintenance commences with the Purchaser's first use of a road for any activity under the contract. Normal maintenance includes but is not limited to grading, blading, shaping, rocking, water barring, and installing additional drainage structures; keeping roads, drainage ditches and culverts free of debris; repairing pot holes, damage to ditches, cutbanks, fill slopes and road surfaces; watering and/or other dust palliative measures. Debris shall be placed outside the road prism on a stable portion of the forest floor away from water resources.

In the event that harvest operations are suspended due to seasonal constraints, the Purchaser shall not be required to perform normal road maintenance during the inactive period. However, upon resuming any harvest operation activity, the Purchaser shall become responsible for any normal road maintenance that has developed during the inactive period.

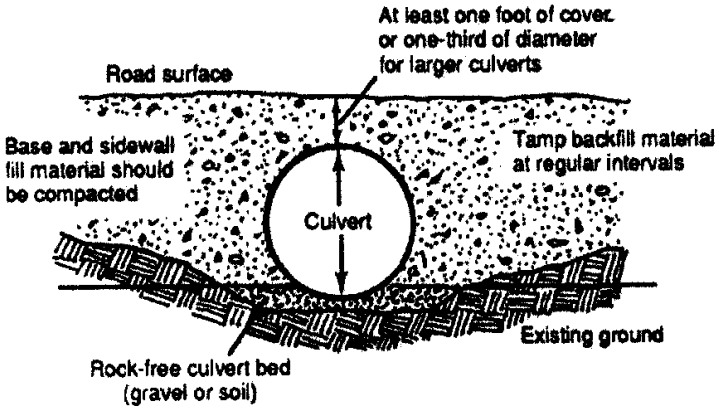
Upon completion of logging, all roads shall be repaired to meet the minimum road specifications and/or closed as designated by the Officer-in-Charge.

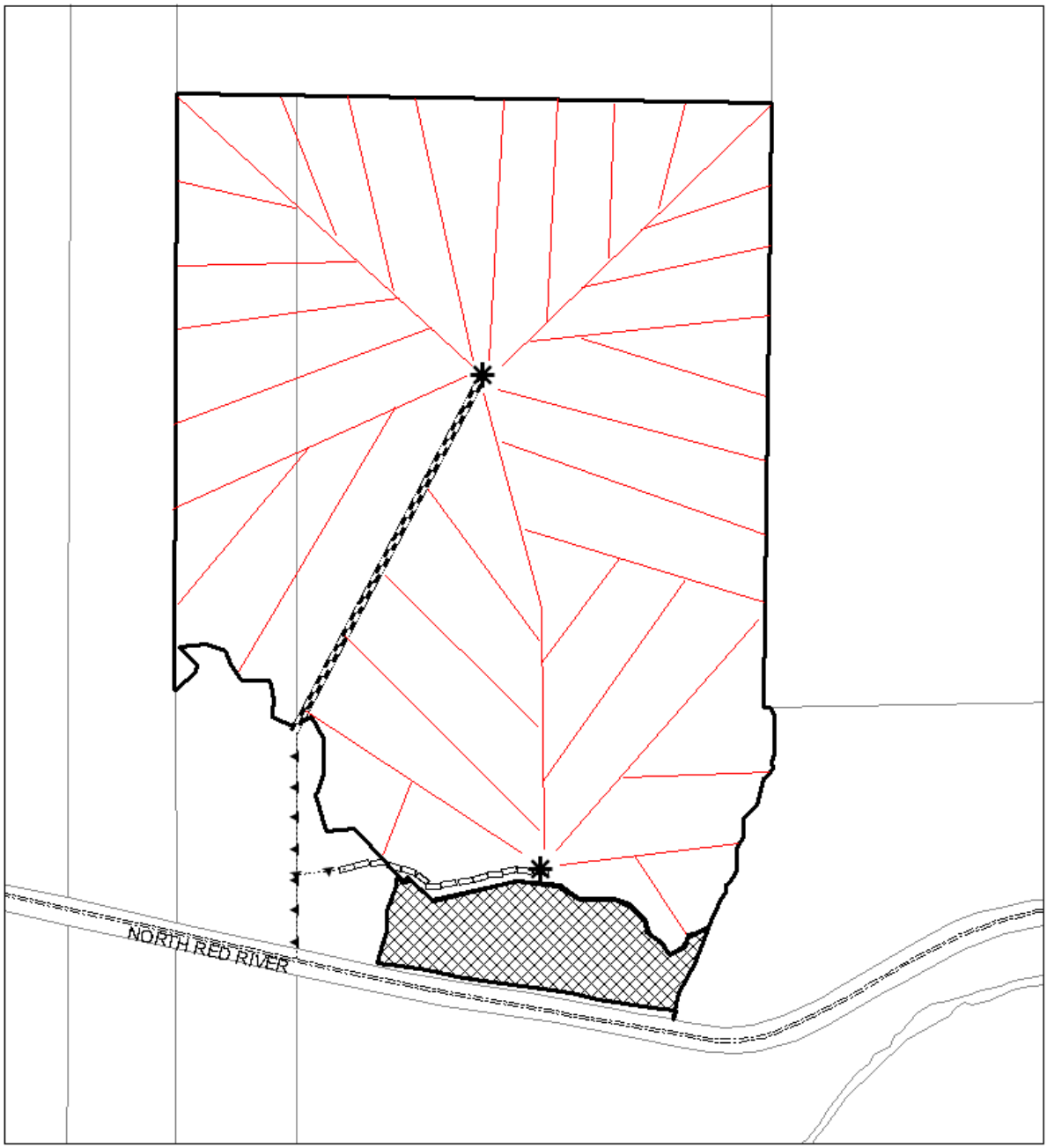
Road Construction Cross Section
XXXXX Logging Unit
Contract Exhibit B
Diagram 1



Road Specification for a 12-foot Road with a Crowned Surface

Culvert Installation Cross Section
XXXXX Logging Unit
Contract Exhibit B
Diagram 2





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Road, Landing, and Skid Trail System Map - Exhibit C
Red River Logging Unit

Legend

- Landings
- Road Re-Construction
- New Road Construction
- Existing Road
- County Road
- Red River Logging Unit (49 Acres)
- Forest Development Area (3 Acres)
- Lummi Reservation Parcels

Form 5-5323
Revised

UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF INDIAN AFFAIRS

TIMBER SALE CONTRACT
PART B
STANDARD PROVISIONS

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The following Standard Provisions are hereby prescribed for use in contracts for the sale of timber from Indian lands except as otherwise provided by the Secretary of the Interior or his authorized representative in particular sales.

B1.0 Definitions. As used in these provisions and in Part A of the contract to which they are attached:

"Approving Officer" means the officer approving the contract or his authorized representative.

"Commissioner" means the Commissioner of Indian Affairs or his authorized representative.

"Area Director" means the Area Director of the Bureau of Indian Affairs Area within which the sale area is located, or his authorized representative.

"Superintendent" means the Superintendent or other officer in charge of the Indian Agency having jurisdiction over the sale area, or his authorized representative.

"Officer in Charge" means the forest officer of highest rank assigned to the supervision of forestry work at the Indian Agency having jurisdiction over the sale area, or his authorized representative.

"Seller" means the Indian tribe or the individual owner or owners of the timber sold under the contract.

"Purchaser" means the purchaser of timber under the contract and his successors in interest.

"Bureau" means the Bureau of Indian Affairs, or the Commissioner, or any person or persons or board duly authorized to act for the Bureau of Indian Affairs or the Commissioner.

"Contract Year" means calendar year or other period of time defined in the contract.

B2.0 General Conditions.

B2.1 Title and Risk of Loss. Title to the timber covered by the contract shall not pass to the Purchaser until it has been scaled, paid for, and removed from the contract area. The risk of loss for all timber which has been cut shall be borne by the Purchaser. The risk of loss as to all standing timber and the fallen timber not a result of the Purchaser's acts or omissions shall remain with the Seller except for those sales based on tree measurement or other determination of total volume obtained prior to sale, in which cases the risk of loss shall pass to the Purchaser upon the approval of the contract by the Approval Officer, and, except as otherwise provided herein with respect to fire damage. Nothing in this paragraph shall be construed to relieve either party of liability for negligence.

B2.2 Interpretation of Contract. The decision of the Approving Officer shall prevail in the interpretation of the contract, subject to the right of appeal prescribed in Section B2.11 herein.

B2.3 Modification. The conditions of sale as set forth in the contract may be modified only through a written agreement between the Seller and the Purchaser prior to the expiration of the contract. No modification shall become effective until approved by the Approving Officer. When a surety bond has been furnished by the Purchaser, he must either obtain a commitment from the surety to continue the bond under the modification or furnish a new bond.

B2.4 Assignment of Interest. The assignment by the Purchaser of any or all of his interest under the contract shall not affect any of the obligations of the parties or the Bureau under the contract until the assignment has been approved by the Approving Officer after consultation with the Seller. The party to whom an interest is assigned must provide a bond as specified in the contract or obtain a commitment from the previous surety to be bound by the assignment when approved. The approval of an assignment by the Approving Officer shall not operate to change the provisions of the contract. Unless otherwise provided for therein, an assignment shall not relieve the assignor of any of the responsibilities and liabilities under the contract.

B2.5 Extension of Time. An extension of time for the performance of the contract is a modification of contract and shall be treated as provided in Section B2.3 herein.

B2.6 Suspension of Operations. The Superintendent may, after written notice to the Purchaser, suspend any or all of the Purchaser's operations under the contract if the Purchaser violates any of the requirements of the contract. The Officer in Charge may stop any portion of the Purchaser's operations until the Superintendent's written notice is delivered if such suspension is necessary to mitigate damages to the land or other property of the Indians or the Government. Such notice should be delivered within 10 working days. Such suspension of operations may be continued by the Superintendent until there is satisfactory compliance. After written notice from the Superintendent, continued failure to comply with any of the requirements of the contract shall be grounds for the revocation by the Approving Officer of all rights of the Purchaser under the contract and the Purchaser shall be liable for all damages resulting from his breach of contract as described in the following section.

B2.7 Failure to Complete Contract. In the event of failure to complete all obligations assumed under the contract, the Purchaser shall be liable for the depreciation in the value for the remaining timber and for any costs or expenses incurred by or caused to the Seller or the Government as a result of such failure, in an amount to be determined by the Approving Officer.

B2.8 Termination of Contract. The contract may be terminated at any time by written agreement between the Seller and the Purchaser. Termination agreements shall not become effective until approved by the Approving Officer.

B2.9 Closure of Contract. Upon completion of all obligations of the timber sale contract the Purchaser shall be given appropriate notice from the Approving Officer.

B2.10 Disputes. Either of the parties to the contract may submit complaints of any action or decision under the contract by the Superintendent or the Officer in Charge in accordance with the following procedure. Complaints shall be made in writing to the Superintendent. If the Superintendent is not the Approving Officer of the contract and the dispute is not resolved to the satisfaction of the parties, a written complaint may then be submitted to the Area Director. If the Area Director is not the Approving Officer and his decision is not satisfactory to the parties, a complaint may be submitted in writing to the Commissioner. Complaints shall be made within 30 days of the action or decision in dispute unless the party making the complaint furnishes reasons satisfactory to the officer receiving the complaint for granting a longer period of time, in which case the officer may extend the period for such length of time as he deems reasonable.

B2.11 Appeals. The parties to this contract may appeal, in accordance with the regulations set forth in 25 CFR Part 2, any action or decision taken by the Approving Officer or his superior officers.

B2.12 Bureau Representative. Notices, requests or other action where formal written notice or report is required herein, or is appropriate, shall be accepted for the Bureau by the Superintendent.

B3.0 Timber To Be Reserved. No timber may be cut except that which is designated by the Officer in Charge. A strip of timber on each side of streams, roads and trails, along lake shores, in the vicinity of camping places and recreational or ceremonial grounds, and timber in immature stands or other areas which should not be disturbed because of silvicultural, watershed protection or other reasons, may be reserved in which little or no cutting shall be allowed.

B4.0 Payments and Deposits.

B4.1 Method of Payments. The Purchaser shall pay for the timber covered by the contract in advance of cutting, as a single payment or installment payments in sales of predetermined volumes or in the form of advance payments or advance deposits in sales of estimated volumes. Payments and deposits shall be by check or postal money order, drawn payable to the Bureau of Indian Affairs, or in cash, and shall be transmitted to the Superintendent.

B4.2 Advance Payments on Allotment Timber. Advance payments are partial payments of the estimated value of timber to be cut on each allotment and are required in all sales of allotment timber in which the cutting period exceeds two years. Advance payments may be paid to the allotment owner as soon as received, and are not refundable. Such payments shall be credited against the allotment timber as it is cut and scaled, at the stumpage rates in effect at the time of scaling. The Purchaser shall pay 25 percent, unless otherwise specified in the Contract, of the estimated value of the timber to be cut, computed at the bid rates, within 30 days from the date of approval of each allotment contract and before cutting begins. The Purchaser may be required to make additional advance payments if specified in the contract. If additional advance payments are specified in the contract, advance deposits previously applied against timber cut on the allotment shall be included in computing the payments. The Approving Officer may, in his discretion, reduce the original estimate of the volume of timber to be cut on any allotment because of error of estimate, losses from fire or other causes, or for similar reasons, but not because of depletion from cutting. If the advance payments on any allotment exceed the total value of timber cut on that allotment by the Purchaser, the amount of the advance payments shall be declared to be the value of the timber so cut. Advance payments on allotment timber shall not operate to reduce the size of the advance deposits that may be required by the Superintendent.

B4.3 Advance Deposits. Advance deposits are used in the sale of estimated volumes to maintain an operating balance against which the value of timber to be cut from tribal or allotted lands will be charged. The Purchaser shall make advance deposits at such times as called for by the Superintendent and in such amounts as required by the contract. The Superintendent may reduce the minimum size of the last advance deposit before completion of the sale or before periods of approximately three months or longer during which no timber cutting is anticipated. In no event shall the advance deposit requested result in a balance of less than the amount designated in the contract.

B4.31 Payment for Timber. Advance deposits shall be applied first to timber cut from tribal lands and shall be applied to allotment timber only after the advance payments on the allotment have been exhausted. All timber shall be paid for at the stumpage rates in effect at the time of scaling except as otherwise provided in the contract.

B4.32 Advance Deposit Balance. To compute the advance deposit balance, the estimated value of timber cut but not yet scaled shall be deducted from the amount of advance deposits currently available.

B4.33 Suspension of Operations. If advance deposits are not received within 15 days of written request therefore, or if at any time the balance in advance deposits is reduced below the required minimum advance deposits balance, the Superintendent may suspend all or any part of the operations until the requested advance deposit is received.

B4.34 Refund of Advance Deposits. At times when cutting operations may be inactive for approximately three months or longer, and if the balance of advance deposits is in excess of the required minimum advance deposit balance specified in the contract, such excess may be refunded at the request of the Purchaser, and at the discretion of the Superintendent. However, no refund shall be made if an unexcused deficiency in minimum cutting requirements exists. Final refund of the total unobligated balance of advance deposits may be authorized by the Approving Officer after all the timber covered by the contract has been paid for.

B5.0 Utilization.

B5.1 Sales of Estimated Volumes. In sales in which the volume of timber is to be determined by measurement of cut products, timber shall be cut to utilize fully the merchantable material and to yield the maximum stumpage value. Timber cut into lengths or products of lesser value shall be scaled as if cut to yield the maximum value of products covered by the contract. Stumps shall be cut as low as practicable to avoid waste. The mean height of any stump shall not exceed one-half of its diameter, except that where this height is considered to be impracticable, higher stumps may be authorized by the Officer in Charge. Stumps which exceed the maximum height shall be paid for by the Purchaser at the rates per stump specified in the contract, which charges, in view of the difficulty of determining the actual damage to the Sheller, shall be regarded as fixed, agreed and liquidated damages. In addition, the Officer in Charge may require the Purchaser to recut such stumps to the maximum allowable height.

B5.2 Sales of Predetermined Volumes. In sales in which the volume of timber sold was determined prior to the sale, the Officer in Charge may require the Purchaser to recut stumps which exceed the maximum height as defined in Section B5.1. In these sales, the Purchaser is expected to practice full utilization but no charge shall be made for poor utilization of timber represented by the predetermined volumes.

B6.0 Cutting Schedule.

B6.1 Minimum Volume. The Bureau will make a reasonable and conscientious effort to keep scaling current, but the volume presented for scaling by the Purchaser within the contract year will not be counted as part of the minimum volume unless actually scaled. During the last year for cutting and paying under the contract, the actual volume of timber designated for cutting shall be controlling if less than or more than the minimum volume required in the contract.

B6.11 Relief from Minimum Requirements. If the Purchaser fails to meet the minimum cutting requirements specified in the contract, the Superintendent at the request of the Purchaser and after consultation with the Seller, may relieve the Purchaser in whole or in part from the minimum annual cutting and paying requirement when, in the opinion of the Superintendent, the Purchaser is prevented by factors beyond his control from meeting the minimum cutting requirements, or when such relief is in the best interest of the Seller.

B6.12 Payment for Deficiencies. If the Purchaser fails to meet the minimum cutting requirements and no relief is granted, the Purchaser shall pay, as liquidated damages, an amount for losses to the Seller arising from deterioration of deficient volume, a delay or loss of growth in the residual stand, delay in establishing a new stand, and from delay in receipt of planned income or other causes, if provided for in the contract. The volume of timber scaled during the following contract year shall not be applied to the minimum requirements for that year until the existing deficiency has been made up. All timber scaled to correct a cutting deficiency shall be paid for at the stumpage rates in effect at the end of the contract year in which the deficiency occurred or at the rates in effect at the time of scaling, whichever are higher, plus the liquidated damage amount, if provided for in the contract. Normal stumpage rate procedures shall be applied at the start of the first monthly period subsequent to the monthly reporting period in which the deficiency is satisfied.

B6.2 Maximum Volume. The volume of timber cut on the sale area during any contract year, not including the cutting deficiencies from any previous year or years or the volume of timber salvaged pursuant to Section B6.3 herein, shall not exceed the maximum volume specified in the contract without the consent of the Superintendent after consultation with the Seller. Logging performance in any contract year beyond the minimum required therefore shall not be applied against the cutting requirements of subsequent contract years unless authorized by the Superintendent after consultation with the Seller.

B6.3 Salvage of Damaged Timber. Any timber within the unit of the species and minimum merchantability specified in the contract which is damaged but not rendered unmerchantable by insects, disease, windthrow, fire or by other forces subsequent to the date the contract is approved, shall be termed merchantable. In contracts for the sale of predetermined volumes in which minimum merchantability standards are not specified, merchantability shall be determined in accordance with customary standards. The Purchaser shall cut and pay for damaged merchantable timber as expeditiously as possible and as the Superintendent may direct. If, in the opinion of the Approving Officer, additional salvage operations are necessary to prevent losses to the Indian owners, he may offer all or part of the damaged timber for sale under one or more separate contracts. When the damage has resulted in an appreciable diminished value of the timber for which the risk of loss remains with the Seller, the Approving Officer shall prescribe the stumpage rates applicable to the damaged timber. In the event any timber covered by the contract is lost, destroyed or damaged by fire, wind, flood, insects, diseases or other causes, to the extent that it is unmerchantable, there shall be no obligation on the part of the Bureau to designate, or on the part of the Purchaser to accept and pay for, other timber in lieu of that destroyed or damaged.

B7.0 Scaling. The term "scaling" as used in these Provision may include various volume determination methods such as log rule, measuring, linear measuring, counting, weighing, sampling, tree measurement before felling or any reasonable method prescribed by the Approving Officer. All scaling shall be conducted by employees of the Bureau unless a written agreement is entered into to accept scaling services of an established scaling organization acceptable to the Approving Officer.

B7.1 Scaling Specifications. Unless otherwise provided for in the contract, the following specifications are prescribed for scaling logs: (a) the Scribner Decimal C log rule shall be used, (b) maximum length of a single log shall be 20 feet, (c) all logs exceeding the maximum scaling length shall be scaled as two or more logs, (d) trim allowance shall be made as follows:

Log Length	*Trim Allowance (Inches)*
8-20 feet	6
21-34 feet	12
35 feet and longer	14

No scaling deduction shall be made if any defect or damage is due to the carelessness of the Purchaser. Products presented for scaling in other than sawlog form shall be scaled as provided in the contract.

B7.2 Convenience in Scaling. The Purchaser shall roll out, deck or otherwise present products in a manner suitable for economical scaling as the Officer in Charge may reasonable direct. The points at which products shall be presented for scaling shall be designated by the Officer in Charge. Products shall not be moved from the designated scaling point until they have been scaled and until they have been stamped, numbered or otherwise released by the Officer in Charge. Products that are moved contrary to the instructions of the Officer in Charge shall be paid for by the Purchaser at double the contract stumpage rates. The Officer in Charge may require that products be decked, stacked or otherwise held for scaling when the average daily volume produced is too small to permit economical scaling.

B7.3 Scaling Unmerchantable Material. Material which is more defective than the minimum merchantable percentage and material smaller than the minimum merchantable size, as specified in the contract, shall be culled if left in the woods, but any material more defective than the minimum merchantable percentages as set forth in the contract, which is removed from the unit at the Purchaser's option, with the intent of manufacture or sale, will be paid for on the basis of net merchantable content or shall be paid for as specified in the contract.

B7.4 Scaling of Waste Material. Waste in long butts, tops, broken and partially sound logs, in other products, and in all trees designated for cutting which are not cut or which are left felled, lodged or badly damaged by the logging operations shall be paid for by the Purchaser at the contract stumpage rates, except that no additional charge shall be made for such waste material in trees the volume of which was determined prior to the sale.

B7.5 Damage to Timber. The Purchaser may be required to pay at double the contract stumpage rates for merchantable timber not designated for cutting which is cut or seriously injured through carelessness or negligence. If timber is injured or damaged to the extent that, in the opinion of the Officer in Charge, it will constitute a hazard to residual trees if not removed, the Purchaser may be required to remove such injured or damaged timber. Any waste material or injured or damaged timber which is paid for shall become the property of the Purchaser and may be removed from the sale area at any time prior to the expiration of the contract.

B7.6 Marking Products. When a separate record of the volume of timber cut from allotments or other areas is required by the Bureau, the Purchaser shall mark all unscaled products with distinctive brands, or perform other procedure as directed by the Officer in Charge to permit positive identification of the products with the land from which they were cut.

B7.7 Reports of Scale. A copy of each scale report or other authorized document showing the volume and value of all products scaled under the contract during the reporting period shall be furnished to the Purchaser by the Superintendent. A copy of each Report of Timber Cut or other appropriate reports, showing the volume and value of timber scaled and the balances in advance payments and advance deposits, shall be furnished to the Purchaser.

B7.8 Check Scales. The Purchaser may arrange with the Bureau, through the Officer in Charge, for a check scaler employed by the Purchaser or representing the Purchaser, to conduct a check scale and compare his scale with that of the Bureau. All data compiled by each party shall be exchanged.

B8.0 Logging Requirements.

B8.1 Logging Plans. The Superintendent may require the Purchaser to present seasonal plans of logging operations for approval before operations begin. When a logging plan has been approved, there shall be no substantial departure from it without the written consent of the officer who approved the plan. The areas to be logged in any season may be designated by the Superintendent when, in his discretion, such action is necessary to prevent deterioration of timber from fire, insects, disease or other cause, or to insure that the sale area is logged in such a manner as to protect fully the interests of the Seller and the Government

B8.2 Logging Methods. The Purchaser's logging methods shall avoid unnecessary damage to reserved trees, young growth, lands, other property and other values of the Indians or

Government, and shall employ practices recommended for the protection of water quality. The operation of all logging equipment shall be subject to such restrictions as the Officer in Charge may prescribe.

B8.3 Protection of Streams. Logging practices and road construction shall be conducted in a manner that will minimize damage to the course and sides of all streams whenever encountered in such activities. Streams as here referred to include both flowing and intermittent water courses. Written approval of the Officer in Charge is required for the hauling, skidding or yarding through any stream.

B8.4 Soil Erosion. Logging practices and road construction shall be conducted in a manner that will minimize soil erosion and damage. Soil and water conditions in naturally moist meadows shall be protected. Where soil is particularly susceptible to erosion, the Purchaser may be required to take reasonable and practicable measures to retain road surfaces and prevent the gullying of roads and skid trails. Barren areas as created by landings and camp and maintenance sites may be required to receive similar care. The Officer in Charge may suspend operations in whole or in part for such periods as he may deem necessary to avoid excessive damage when ground conditions are unfavorable.

B8.5 Safety. The Purchaser shall conduct his operations in compliance with prescribed safety practices and Federal Law. Appropriate warning signs may be required to be posted concerning hazardous conditions arising from his operations.

B9.0 Slash and Cull Trees

B9.1 Treatment of Slash. Treatment of slash as specified in the contract shall be accomplished by the Purchaser concurrently with other phases of logging operations. Slash shall mean limbs, tops, damaged young growth and other material resulting from logging, road construction or other operations of the Purchaser.

B9.2 Burning Slash. The Purchaser shall lop and pile all slash compactly for burning unless otherwise specified in the contract. Slash piles shall be placed a sufficient distance from reserved trees and reproduction to prevent unnecessary damage in burning. The Purchaser shall burn slash in such a manner at such times as the Officer in Charge may direct. Whenever the Purchaser allows fire to run through slash, except in compliance with the instructions of the Officer in Charge, the Purchaser may be required to lop and scatter, or repile and reburn the slash. The Purchaser shall make every reasonable effort to control and suppress all fires which may spread from his slash burning operations. The Purchaser may be relieved in whole or in part of slash disposal requirement on specifically designated areas by the Superintendent.

B9.3 Cull Tree Felling. The Purchaser shall fell all unmerchantable dead trees and designated live cull trees within the area of cutover which are 14 inches or more in diameter at breast height and 16 feet or more in total height. Cull tree felling shall be completed in each part of the sale are as soon as practicable after yarding or skidding and before the slash is burned, if burning is required. The Purchaser may be relieved of cull tree felling requirement on specifically designated areas by the Superintendent.

B10.0 Transportation Facilities.

B10.1 Authorization. The Purchaser is authorized to construct and maintain on the contracted area and on other unallotted Indian lands such roads, bridges and other transportation facilities as are necessary for logging operations under the contract, subject to applicable regulations and such conditions as the Bureau may impose. Construction of transportation facilities shall not convey the right of exclusive use to the Purchaser. In these Provisions, "Construction" shall also include reconstruction.

B10.2 Road Construction. The location and design of all roads to be constructed by the Purchaser shall minimize damage to land, improvements, and the environment. The Bureau may, before construction begins, require approval of location and design by inspection or through the submission of plans and specifications for the location and design of roads and appurtenant structures.

B10.3 Road Maintenance. All roads and trails which are designated by the Officer in Charge as being necessary for the administration and protection of Indian lands shall at all times be kept free of obstructions resulting from the Purchaser's operations.

B10.31 Existing Bureau Roads. Bureau roads are open to public use but may be closed for reasons of public safety, fire prevention or suppression, fish and game protection or to prevent damage to unstable roadbeds. During any period in which the Purchaser uses existing Bureau roads he shall maintain such roads, in proportion to his share of use, as determined by agreement between the Purchaser and the Superintendent. In the event of disagreement, the determination shall be made by the Superintendent.

B10.32 Roads Constructed by Purchaser. Main roads which are designated by the Bureau as roads that will be used as principal access for subsequent administration, management or protection of Indian timber shall be maintained by the Purchaser to prevent deterioration in periods of non-use during the life of the contract and maintenance may be required on such designated roads prior to abandonment.

B10.4 Use by Other Parties. Roads constructed by the Purchaser under authority of the contract, or on rights-of-way held by the Bureau, may be used by other parties as authorized by the Bureau, provided that, in its opinion, the use by other parties will not cause unreasonable interference with the operations of the Purchaser. Such other parties shall provide improvements and maintenance to the roads as may be reasonable and equitable to prevent appreciable increases in the Purchaser's costs of operation as a result of joint use. The extent of such obligations shall be agreed upon by the parties concerned, subject to final determination by the Superintendent if the parties disagree.

B10.5 Improvements. All bridges, drainage structures, cattle guards or other improvements installed on any road by the Purchaser shall be left intact at the completion of logging operations, unless the removal of such improvements is authorized or required by the Superintendent.

B11.0 Fire Prevention and Suppression.

B11.1 Fire Plans. When requested by the Bureau, the Purchaser shall prepare, in cooperation with the Officer in Charge, a plan for the prevention and suppression of fires on the sale area. The plan shall fully reflect the Purchaser's fire protection obligations under the contract. Neither the approval of the plan nor anything contained therein shall relieve the Purchaser from any responsibility under the terms of the contract.

B11.2 Fire precautions. The Purchaser shall furnish and maintain in good and serviceable condition such fire fighting tools and equipment, provide such fire protection personnel and take such fire prevention measures as may be required by the Superintendent to meet the fire protection requirements of the contract and the existing fire danger. The requirements shall not be less than are required under the laws of the State in which the sale area is located.

B11.3 Fire Suppression. The Purchaser shall take immediate and independent initial fire suppression action on all fires on the sale area and shall use all necessary manpower and equipment at his disposal, including the employees and equipment of his subcontractors engaged on or near the sale area in construction or in logging, removing or processing timber. When called upon by the Superintendent, the Purchaser shall

make available any or all of his manpower and equipment, including that of his subcontractors, for hire by the Bureau and to work under the direction of any authorized employee of the Bureau in the suppression of any fire on or threatening Indian lands.

B11.4 Fire Suppression Costs.

B11.41 Purchaser Fires. The origin or spread of all fires on the sale area or operating vicinity for which the Purchaser, including his employees, his subcontractors or their employees, are responsible by act or neglect are hereinafter called Purchaser fires.

B11.411 Purchaser-Neglect Fires. All suppression costs including those incurred by the Bureau of suppressing any such Purchaser fire negligently caused shall be borne by the Purchaser.

B11.412 Purchaser-Operations Fire. The Purchaser shall pay one-half of the total suppression costs for Purchaser fires caused by operations or activities of the Purchaser, but not through neglect, provided that the Purchaser obligation shall be limited in any contract year to a maximum of two percent of the total estimated value of the maximum volume of timber authorized to be cut under the contract during the contract year in which the fire occurred, and provided the Purchaser may be reimbursed for his costs in suppressing Purchaser-operations fires which spread from his slash burning operations. The said total estimated value shall be computed by applying the contract bid rates per unit measure in accordance with the proportionate species composition shown in the contract.

B11.42 Non-Purchaser Fires. Fires on or outside the sale area for which the Purchaser or his employees, his subcontractors or their employees, are in no way responsible by act or neglect are hereinafter called non-Purchaser fires. The Purchaser's cost of suppressing such fires shall be reimbursed at rates authorized by the Bureau. The provision of this section shall not be construed as relieving the Purchaser of fire suppression costs for which he is otherwise liable under State law or Federal law.

B11.5 Fire Damage. The Purchaser's liability for timber damage sustained from Purchaser-operations and non-Purchaser fires shall follow the risk of loss; otherwise the Purchaser shall pay for all damages caused by the Purchaser fire to timber or any other property of the Indians or the Government in an amount to be determined by the Bureau.

B12.0 Improvements.

B12.1 Existing Improvements. The Purchaser may be given permission to use existing improvements which are already on lands covered by the contract and which are necessary for his logging operations under the contract, subject to applicable regulations and such conditions as the Superintendent may impose. All telephone lines, fences, roads, trails and other improvements shall be protected as far as possible in all phases of the Purchaser's operations and, whenever they are damaged, the Purchaser may be required to repair them promptly to as good a condition as before the damage.

B12.2 Damage to Land and Other Property. Damage to land or other property of the Indians or the Government which cannot be repaired shall be paid for by the Purchaser in an amount to be determined by the Bureau. In determining the amount of such damages, the Bureau shall consider the value of any permanent improvements made by the Purchaser. The Purchaser shall protect all survey monuments, witness corners, reference monuments, and bearing trees against destruction, obliteration or damage during its operation. If any monuments, corners or accessories are destroyed, obliterated or damaged by such operations, the Purchaser shall hire a licensed surveyor to reestablish or restore the same, using survey procedures in accordance with the Manual of Instructions for the survey of the public lands of the United States, and shall record such survey in appropriate county records.

B12.3 Construction of Improvements. The Purchaser, with the approval of the Bureau and subject to such conditions as it may impose and to applicable regulations, may construct on lands covered by the contract such improvements as are necessary for the operations under the contract.

B12.4 Use of Timber. Fuelwood and improvements shall be made as far as practicable from unmerchantable timber and such material shall not be charged to the Purchaser. The use of any material not covered by the contract from Indian lands may be restricted by the Bureau.

B12.5 Removal of Property. The Purchaser shall remove all the improvements he may construct in accordance with Section B12.3 herein and other of his property within six months of the contract expiration date unless he is otherwise authorized by the Bureau. After that time, the title of all improvements and to other property shall attach to the land.

B12.6 Refuse Control and Sanitation. Landings and areas where equipment has been operated or repaired shall be cleaned up immediately following use. Improvements constructed or used by the Purchaser on lands belonging to the Indians or the Government and the grounds adjacent thereto shall be maintained in a clean and sanitary condition and thoroughly cleaned upon abandonment or removal of improvements. All equipment, rubbish, garbage, litter, temporary buildings, and other refuse resulting from the Purchaser's operations and occupancy shall be removed and disposed of properly. Purchaser shall not service tractors, trucks or other equipment on Indian lands where pollution to lakes, streams or estuaries is likely to occur.

B13.0 Other Conditions.

B13.1 Other Sales Within Sale Area.

B13.11 Salvage Sales of Minor Volumes. Separate sales of minor volumes of timber covered by the contract may be made to salvage scattered single trees or small groups of trees that cannot be reasonably removed in the Purchaser's operations, provided there is agreement in writing between the Purchaser and the Approving Officer.

B13.12 Other Material. Other sales may be made within the sale area of material not included in the terms of the Purchaser's contract, provided such sales will not, in the judgment of the Superintendent, cause unreasonable interference with operations of the Purchaser. Other Purchasers may be required to provide improvements to Purchaser-constructed roads in accordance with Section B10.4 herein.

B13.2 Rights-of-Way. Rights-of-way may be granted to other parties through any portion of this sale area during the life of the contract provided such rights-of-way will not, in the judgment of the Superintendent, cause unreasonable interference with the operations of the Purchaser.

B13.3 Bureau Services. The Bureau will furnish scaling, marking and other services within a basic workweek of 8 hours per day for 5 days per week, exclusive of Saturdays, Sundays and Government holidays, unless additional services are requested by the Purchaser and approved by the Superintendent. The Purchaser shall pay for such additional services as required by the Act of July 30, 1956 (25 U.S.C. 407d).

B13.4 Purchaser and Bureau Representatives on Sale Area. At all times when construction or logging operations are in progress, the Purchaser shall have a representative readily available in the area of such operations who shall be authorized to receive in behalf of the Purchaser any notices or instructions from the Bureau in regard to performance under the contract and to take such action thereon as is required by the terms of the contract. Written designation of the representative may be required by the Bureau. At the request of the Purchaser the

Bureau shall designate in writing its representative who shall supervise operations under the contract.

B13.5 New Bond. Whenever any bond furnished to guarantee obligations under the contract shall be unsatisfactory to the Approving Officer he may require the Purchaser to furnish a new bond.

B13.6 Indian Labor. When the Purchaser is operating concurrently with a common crew, under a contract with a federal government agency, the non-discrimination clause of the federal government contract shall prevail, except that preferential treatment to Indians may be granted under a publicly announced employment practice within the provisions of Section 703(i) of Public Law 88-352, the Civil Rights Act of 1964 (78 Stat.257). Preferential treatment to Indians shall include employment by the Purchaser and his subcontractors under this contract, of Indians at the same wages as other labor, and in preference to other labor not already in his employment, whenever Indian labor seeking employment is qualified. The Purchaser may be required to make available to the Bureau employment and payroll records as is necessary to enable the Bureau to ascertain compliance with this section, such records shall be considered confidential and shall be available only to Bureau employees whose official duties require access to the information therein.

B13.7 Financial Statements. The requirements of this section shall apply unless otherwise specified in the contract. At the close of each yearly period used by the Purchaser as a basis for his records, and no later than the date specified by the Bureau, the Purchaser shall submit to the Bureau copies of each of a balance sheet, profit and loss statement and detailed statement of operating costs and sales. The statements shall be of a form satisfactory to the Bureau and shall be certified by a certified public accountant and the Purchaser. In addition to or in lieu of the statements by the Purchaser, the Bureau in its discretion may require the Purchaser to submit such certified statements for his divisions and subsidiaries (wholly owned or controlled), or his subcontractors which are engaged in operation under the contract or in the manufacture or sale of products produced thereunder. The statements shall be considered as confidential material and shall be available only to Bureau employees whose official duties require access to the information therein.

B13.8 Purchaser's Records. Records pertaining to the logging, manufacture and sale of material covered by the contract, by the Purchaser, his divisions and subsidiaries (wholly owned or controlled) and his subcontractors, and such other records as it may be necessary to review to confirm the statements submitted by the Purchaser, shall be open to inspection at any reasonable time by authorized Bureau employees for the purpose of obtaining information of the type used by the Bureau in appraisals and redetermination of stumpage rates. The information so obtained shall be regarded as confidential and the right of inspection shall extend for a reasonable time beyond the expiration date of the contract to provide the Bureau an opportunity to obtain relevant information for the full contract period.

B13.9 Maintenance of Law and Order. The Purchaser shall comply with all laws and regulations relating to the maintenance of Law and Order on Indian reservations.

B13.10 Officials Not to Benefit. No Member of, or Delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this contract or to any benefit that may arise therefrom unless it is made with a corporation for its general benefit.

(Page 7 of 7)

Appendix S - Power of Attorney Form

Form 5-5315
May 1970

UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Indian Affairs

POWER OF ATTORNEY FOR SALE OF ALLOTMENT TIMBER

Lummi INDIAN RESERVATION Washington

KNOW ALL MEN BY THESE PRESENTS, that I the undersigned, hereby request, authorize, and empower the Superintendent of the Puget Sound Indian Agency to enter into contract for the sale of the timber upon the following-described lands: Jim Samilatchin Allotment located in the SE ¼ of Section 3, Township 38 North, Range 01 East, Willamete Meridian, Whatcom County, Washington the same being the allotment of Jim Samilatchin Lummi Allottee No. X-X, and authorize him to perform every act necessary and requisite to the consummation of such sale with the same validity as if I were personally present. Provided that no such contract shall be made hereunder at stumpage rates per thousand feet board measure of less than the following: the stumpage rates determined from appraisal in the approved Forest Officer's Report and/or bid as a result of advertisement; as further determined by the terms of the form of contract set forth in the approved Forest Officer's Report and I do also hereby agree to grant any contractor holding any contract hereunder and in conformity herewith, reasonable right-of-way over the above-described lands, provided I shall receive reasonable compensation for any damage done or incurred through such right-of-way. The Comissioner of Indian Affairs or his representative shall definitely determine what shall be considered reasonable damages.

I furthermore agree that the proceeds arising from the sale of this timber may be disposed of in accordance with the regulations of the Department of the Interior, including those providing for the payment of the cost of administration.

Place_____ , _____
(mailing address) (State)

Date_____ , _____

Signature

X_____ _____

Landowner Name, X-X, Int. 0.0166666667

Witnesses:

X_____ _____

_____ _____

GPO 857-656-7

Appendix T - BIA Revocable Road Crossing Permit (New Road Construction)

BUREAU OF INDIAN AFFAIRS
Puget Sound Agency
2707 Colby Avenue - Suite 1101
Everett, Washington 98201

REVOCABLE ROAD CROSSING PERMIT
(New Road Construction)

By authority of the Department of the Interior, the Superintendent of the Puget Sound Agency hereby grants to **XXXX Logging**, hereinafter called the Permittee, a revocable permit for the construction of road across a portion of Lummi Indian Trust **Allotment No. X-X** in order to access the **XXXX Logging Unit** on the Lummi Reservation described as:

Within a portion of the X quarter of Section XX, Township X North, Range X East, Willamette Meridian, Whatcom County, Washington.

In addition to the consideration being paid for this revocable permit, as indicated by the landowner's signatures, the Permittee agrees to pay for the timber within the right-of-way taking at the contract/permit rate.

It is understood and agreed that the Permittee agrees to the following provisions:

1. The Permittee shall construct, operate, and maintain the Right-of-Way in compliance with **A.12 Road Construction and Maintenance** of the Timber Sale Contract.
2. The Permittee shall promptly pay all damages pursuant to 25 CFR 162.14, as determined by the Superintendent to be due to the landowner on account of the operation and maintenance of the Right-of-Way.
3. The Permittee shall indemnify the landowner against any liability for damages to life or property arising from the occupancy or use of the lands by the Permittee.
4. The Permittee shall regularly maintain the right-of-way throughout the duration of the harvest operation and after all harvest operations are completed in compliance with the requirements of **A.12 Road Construction and Maintenance** of the Timber Sale Contract.
5. The Permittee shall not interfere with the use of the lands for or under authority of the landowners for any purpose not inconsistent with the primary purpose for which the temporary right-of-way was granted.
6. The Permittee shall accept the desired easement grant subject to the right of the Secretary of the Interior or his authorized representative to permit roads, canals, ditches, trucks or other project related equipment to cross the right-of-way, upon such terms as may be reasonably determined by the Secretary or his authorized representative to be necessary and equitable to all parties and interest. It is understood and agreed that third parties may use this road or any portion thereof with consent of the Bureau of Indian Affairs and the landowner by agreeing to pay road maintenance cost as set by the Bureau of Indian Affairs.
7. In the event of cancellation prior to its expiration through failure on the part of the Permittee, no part of the payment shall be refunded to the Permittee.
8. While the said premises are in trust or restricted status, all of the Permittee's obligations under this permit, and the obligations of his securities, are the United States' as well as the landowner's.
9. Nothing contained in this permit shall operate to delay or prevent a termination of Federal trust responsibility with respect to the land by the issuance of a fee patent or otherwise during the term of the permit; however, such termination shall not serve to abrogate the permit. The owners of the land and the Permittee and his surety or sureties shall be notified of any such changes in the status of the land.
10. The Permittee agrees that he will not use or cause to be used any part of said premises for any unlawful conduct or purpose.

11. It is further understood and agreed by all parties that this instrument is not a lease and is not to be taken or construed as granting of any leasehold interest or right in or to the land described, but is merely a temporary permit terminable and revocable in the discretion of the Secretary, at any time and in any event not to extend beyond XXX, XX 20XX.
12. The Revocable Road Crossing Permit shall be made part of the Bureau of Indian Affairs Timber Sale Contract.
13. Upon final inspection, the LIBC Forest Manager shall notify the BIA that the timber sale Purchaser/Permittee can be released from any further obligations associated with the use and maintenance of the road at the end of the sale.
14. It is understood and agreed that violations of this permit shall be acted upon in accordance with the regulations in 25 CFR 162.

Dated this XXX day of XXX XX, 20XX

Witnesses:	Permittee:
_____	_____
	Timber Sale Purchaser/Permittee

We, the landowners to the above-described land, hereby consent to this Revocable Road Crossing Permit:

Witnesses:	Landowners	% Interest

APPROVAL

This revocable permit is approved pursuant to authority delegated by the Northwest Region Office delegation, approved pursuant to 209 DM8, 230 DM1, 3 IAM 4, 4a.

Date:	Superintendent, Puget Sound Agency 2707 Colby Avenue – Suite 1101 Everett, WA 98201

Appendix U - BIA Revocable Road Crossing Permit (Existing Road Use)

BUREAU OF INDIAN AFFAIRS
Puget Sound Agency
2707 Colby Avenue - Suite 1101
Everett, Washington 98201

REVOCABLE ROAD CROSSING PERMIT
(Existing Road Use)

By authority of the Department of the Interior, the Superintendent of the Puget Sound Agency hereby grants to **XXXX Logging**, hereinafter called the Permittee, a revocable permit for the temporary access across a portion of Lummi Indian Trust **Allotment No. X-X** using an existing gravel and unimproved dirt road in order to access the **XXXX Logging Unit** on the Lummi Reservation described as:

Within a portion of the X quarter of Section XX, Township X North, Range X East, Willamette Meridian, Whatcom County, Washington.

It is understood and agreed that the Permittee agrees to the following provisions:

1. The Permittee shall regularly maintain the easement throughout the duration of the harvest operation and after all harvest operations are completed in compliance with the requirements of **A.12 Road Construction and Maintenance** of the Timber Sale Contract.
2. The Permittee shall promptly pay all damages pursuant to 25 CFR 162.14, as determined by the Superintendent to be due to the landowner on account of the operation and maintenance of the easement.
3. The Permittee shall indemnify the landowner against any liability for damages to life or property arising from the occupancy or use of the lands by the Permittee.
4. The Permittee shall not interfere with the use of the lands for any purpose not inconsistent with the primary purpose for which the temporary easement was granted.
5. The Permittee shall accept the desired easement grant subject to the right of the Secretary of the Interior or his authorized representative to permit roads, canals, ditches, trucks or other project related equipment to cross the right-of-way, upon such terms as may be reasonably determined by the Secretary or his authorized representative to be necessary and equitable to all parties and interest. It is understood and agreed that third parties may use this road or any portion thereof with consent of the Bureau of Indian Affairs and the landowner by agreeing to pay road maintenance cost as set by the Bureau of Indian Affairs.
6. The Permittee agrees that he will not use or cause to be used any part of said premises for any unlawful conduct or purpose.
7. It is further understood and agreed by all parties that this instrument is not a lease and is not to be taken or construed as granting of any leasehold interest or right in or to the land described, but is merely a temporary road easement terminable and revocable in the discretion of the Secretary, at any time and in any event not to extend beyond XXX, XX 20XX.
8. The Revocable Road Crossing Permit shall be made part of the Bureau of Indian Affairs Timber Sale Contract.
9. Upon final inspection, the LIBC Forest Manager shall notify the BIA that the timber sale Purchaser/Permittee can be released from any further obligations associated with the use and maintenance of the road at the end of the sale.
10. It is understood and agreed that violations of this permit shall be acted upon in accordance with the regulations in 25 CFR 162.

Dated this XXX day of XXX XX, 20XX

Witnesses:	Permittee:
_____	_____
	Timber Sale Purchaser/Permittee

We, the landowners to the above-described land, hereby consent to this Revocable Road Crossing Permit:

Witnesses:	Landowners	% Interest

APPROVAL

This revocable permit is approved pursuant to authority delegated by the Northwest Region Office delegation, approved pursuant to 209 DM8, 230 DM1, 3 IAM 4, 4a.

Date:	Superintendent, Puget Sound Agency 2707 Colby Avenue – Suite 1101 Everett, WA 98201

Appendix V - BIA Inherent Access Memorandum

UNITED STATES GOVERNMENT

memorandum

DATE: 1 26

REPLY TO ATTN OF: Office of the Area Director, Portland Area

SUBJECT: Bureau Access to Forested Trust Property for Forest Management Purposes

TO: All Superintendents, Portland Area

BACKGROUND. On May 13, 1983, Mr. John Fritz, Acting Assistant Secretary - Indian Affairs, issued the following policy statement concerning Bureau access to Indian trust forest property:

> "Congress has funded the Bureau of Indian Affairs to manage and protect the trust forest lands on Indian Reservations. This funding of the forestry program on any Reservation carries with it an inherent access to these lands to carry out all types of forest management activities and to protect the forest from fire, insects and diseases, and trespass, with or without consent of the Indian landowners after appropriate consultation with them, if possible."

The Assistant Secretary's statement confirms that in conducting any forest management activity, the Bureau has a right of access to such lands to fulfill its obligation under 25 C.F.R. Part 163 or other federal law. Such forest management activities include: sales and utilization of forest products, forest protection, forest development, and forest inventory and management planning.

The Bureau may also use agents, representatives, or licensees to conduct or administer all or part of a Bureau program or function involving the management or protection of the trust forest lands on Indian reservations. Such agents, representatives, or licensees may include:

1. Tribal government/department acting under a PL 93-638 contract/grant or other instrument.

2. A person employed by the Bureau of Indian Affairs via a contract or other procurement instrument.

3. Timber sale/permit contractor, or subcontractor, operating as specified in the harvest document and as directed by the Bureau of Indian Affairs.

OPTIONAL FORM NO. 10
(REV. 1-80)
GSA FPMR (41 CFR) 101-11.6
5010-114

IMPLEMENTING INSTRUCTIONS. The Superintendent at all agencies which carry out various forestry activities to manage and protect trust forest lands shall implement the Secretarial policy regarding access to trust forest property as follows:

1. Designation of a Forest Road System (FRS)

a. Designate those existing roads which are determined to be necessary for the carrying out of forest management and protection activities for each reservation. Individually, such road shall be designated as Forest Roads, and collectively all such roads shall be known as the Forest Road System.

b. Indicate any road, or portion thereof, that would require improvement or new construction in order to complete a functional Forest Road System.

c. The Superintendent shall give notice to affected landowners of the initial FRS in such manner deemed appropriate.

2. Landowner Consultation.

a. Use of Designated Forest Roads - Minor or no Monetary Benefit

Consultation with the Indian landowners upon whose land a designated Forest Road is located shall not be required where such road is used to provide Bureau employees, its agents, and representatives access to trust forest lands to perform forestry programs or functions involving the management or protection of the forest which results in no immediate monetary benefit to any Indian landowner or only a minor monetary benefit.

b. Use of Designated Forest Roads - Substantial Monetary Benefit

(1) The Superintendent or his authorized representative shall consult with the Indian landowners upon whose land a designated Forest Road is located when a designated Forest Road is to be used to remove forest products having a substantial monetary value.

(2) The manner and the extent of the consultation with such landowners shall be determined by the Superintendent. However, the minimum consultation required shall be notification to landowners upon whose land the designated Forest Road is located advising them of: such access, its purpose, and the provisions to be implemented for the protection of the landowners' property.

Area Director

Appendix W - Exception Checklist for BIA Categorical Exclusions

EXCEPTION CHECKLIST FOR BIA CATEGORICAL EXCLUSIONS

This checklist may be used in determining whether an individual proposed action which is within a categorical Exclusion (516 DM 2, Appendix 1 and 516 DM 10.5) nevertheless requires the preparation of an Environmental Assessment.

Name of person completing this form: Zack Dewees Lummi Forest Manager
Position

Brief description of the proposed ACTION: Issuance & approval BIA Timber Cutting Permit No.
The Tribe has an approved Forest Management Plan and this Permit activity is covered by
the Plan. 516 DM 10.5H (2) Free (3) Paid Permit (3) Contract less 25K

Answer the following questions "Yes" or "No" --- Is the ACTION one which may:

(Y) (N) Have significant impacts on public health or safety?
(Y) (N) Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation or refuge lands; wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (Executive Order 11990); floodplains (Executive Order 11988); national monuments; migratory birds; and other ecologically significant or critical areas?
(Y) (N) Have highly controversial environmental effects or involve unresolved conflict concerning alternative uses of available resources?
(Y) (N) Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?
(Y) (N) Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?
(Y) (N) Have a direct relationship to other actions with individually insignificant but cumulatively significant environmental effects?
(Y) (N) Have significant impacts on properties listed, or eligible for listing, on the National Register of Historic Places as determined by either the bureau or office?
(Y) (N) Have significant impacts on species listed, or proposed to be listed, on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species?
(Y) (N) Violate a Federal law, or a State, local, or tribal law or requirement imposed for the protection of the environment?
(Y) (N) Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?
(Y) (N) Limit access to and ceremonial use of Indian sacred sites on Federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?
(Y) (N) Contribute to the introduction, continued existence, or spread of noxious weeds or nonnative invasive species known to occur in the area or actions that may promote the introduction, growth, or expansion of the range of such species (Federal Noxious Weed Control Act and Executive Order 13112)?

( ) Questions(s) was (were) answered "Yes". An Environmental Assessment is required.

( ) The examination of the proposed ACTION and the property indicates that no further environmental compliance is required at this time.

Signature, BIA Agency Official Date

Appendix X - Biological Assessment Table of Contents

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LUMMI INDIAN ALLOTMENT NO. X-X
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Appendix AA – Instructions for Adjusting the Relaskop's Level, BAF Calibration, and Focus

Adjusting the Relaskop for Level, BAF Calibration, and Focus (Adapted from "Relaskop Calibration Made Easy" and "Relaskop Focus and Calibration", ACI, 2001)

- **Introduction**

  A Relaskop can periodically become out of adjustment. When a Relaskop is out of focus, it cannot be read properly. Once the focus is adjusted, it may be out of calibration for basal area measurements. However, before testing for calibration, the Relaskop must be adjusted for level.

- **Adjusting for Level**

  The most basic accuracy check of the Relaskop is the wheel balance, which should read zero when held level. The Relaskop level can be checked and adjusted very quickly in the field with no special instruments using the "Two Peg Method".

  - **Two Peg Method**
    - Step 1: Hang two ribbons at eye level between 75 and 100 feet apart (slope is not important).
    - Step 2: Carefully sight from the first ribbon to the second ribbon and record the slope reading from the Relaskop.
    - Step 3: Now sight from the second ribbon back to the first ribbon and record this slope reading from the Relaskop. This slope reading should agree with the first, but be of opposite signs, e.g. -5% and +5%. A difference of more than one percent is significant.

    If the readings do not match, the level must be adjusted using the following steps.

    - Step 1: Remove the front window.
    - Step 2: Rotate the wheel until the one-quarter inch hole opposite the scales appears. This hole accesses the balance adjustment screw.
    - Step 3: By trial and error, rotate the screw to change the balance and match the slope using the two-peg method. If the adjustment screw is a loose fit, (it rotates very easily), the threads need to be set with a thread locking compound or a tiny amount of super glue.

- **Adjusting for BAF Calibration**

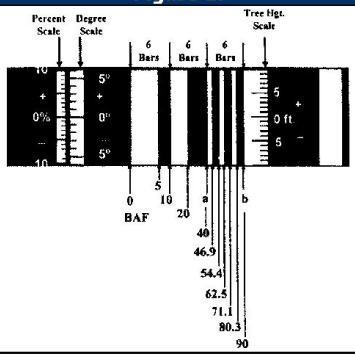
  The Relaskop performs a variety of measurements using projected angles. Therefore, a very careful check to determine if the angles projected by the Relaskop bars are correct will ensure no systematic errors are introduced.

  - **Test for BAF Calibration**

    The test for BAF calibration uses the relationship of limiting distance derived for the American Scale Relaskop: DIAMETER (inches) = DISTANCE (feet) x # BARS x 0.6060606

    - Step 1: Find a table or some other solid surface to hold the Relaskop stable on. Placing the bottom of the instrument on a solid surface will ensure stable, accurate readings.
    - Step 2: Place a 12-inch wide target on a wall exactly 16.5 feet from the wall to the geometric center of the Relaskop. Make sure the 12-inch wide target is placed at the same level as the Relaskop.
    - Step 3: Sight the 12-inch target level with the Relaskop. The 12-inch target should fill the 40 BAF (12 bars) exactly. 16.5 feet x 12 bars x 0.060606 = 12 inches. If the 12-inch target does not read exactly 40 BAF, the Relaskop is out of calibration. Refer to Figure 1. Even if the Relaskop is only off by $1/4^{th}$ of a bar, it needs to be adjusted because it will definitely give you the WRONG answer when cruising.

Figure 1.



- **BAF Calibration**

  The focus ring of the Relaskop needs to be adjusted for BAF calibration. This requires a set of fine screwdrivers. When performing any repair or disassembly of the Relaskop, use a clean area and keep all parts and screws in a container.

  - Step 1: Remove the side cover that is held with the three large screws. Note the threaded aluminum tube containing glass lenses that extends from the eyepiece assembly toward the wheel. Angle calibration is adjusted by screwing this tube (the focus ring) up or down (Figure 2).

Figure 2.

  - Step 2: Loosen the tiny setscrew that is locking the tube. Be especially careful not to remove the setscrew. It is very small and hard to replace. The setscrew is located inside the instrument on newer models and on the outside facing the user's eye on older models.
  - Step 3: Rotate the tube in or out to change the calibration. Moving it down toward the wheel will make the projected angle smaller. By trial and error, adjust and check the instrument against the target. When adjustment is complete, tighten the setscrew and reassemble.

  In most cases, when the Relaskop is properly calibrated, the scales are still in focus. If the scales become out of focus as you are calibrating it, refocus the Relaskop to make sure you can read the scales properly. Repeat the focusing and calibration process until the instrument is in focus and in calibration.

Appendix BB - Forest Manager's Narrative Table of Contents

FOREST MANAGER'S NARRATIVE

"XXXX" LOGGING UNIT
INDIAN TRUST ALLOTMENT NO. X-X
LUMMI INDIAN NATION
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Appendix CC - Forest Officer's Report Table of Contents

FOREST OFFICER'S REPORT

"XXXX" LOGGING UNIT
INDIAN TRUST ALLOTMENT NO. X-X
LUMMI INDIAN NATION
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Appendix DD - Advertisement, Prospectus, and Bid Proposal Packet

SALE OF TIMBER

XXXX LOGGING UNIT

LUMMI INDIAN RESERVATION

SEALED BIDS, in duplicate, on forms provided therefore, marked on the outside "Proposal for Timber, **XXXX LOGGING UNIT**", and addressed to the Superintendent, Puget Sound Agency, 2707 Colby Avenue, Suite 1101, Everett, Washington 98201, will be received until 1:00 P.M., local time, **XXX XX, 20XX**, for the purchase of timber on Lummi Indian Reservation, Washington.

This logging unit contains approximately 26 acres to be clearcut and approximately 4 acres to be selectively harvested with a predetermined net volume of 363,000 board feet of all species merchantable sawlog timber consisting of 154,000 board feet of western red cedar sawlogs; 78,000 board feet of Sitka spruce and other conifer species sawlogs; 103,000 board feet of red alder sawlogs; 15,000 board feet of bigleaf maple and other hardwood species sawlogs; 13,000 board feet of black cottonwood sawlogs; and 70,000 board feet of all species hardwood pulp logs; and an undetermined volume of cull logs and other wood products (all species).

The above stated volumes are estimates and are not guaranteed. Each bidder must state the total purchase price to be paid for all predetermined volume, cull logs, and other wood products on this logging unit. No bid will be accepted for less than $200,535.00 total purchase price. Cull logs and other wood products are removable at the Purchaser's option.

Deposits in the form of a certified check, cashier's check, bank draft, postal money order, or Irrevocable Letter of Credit, drawn payable to the order of the Bureau of Indian Affairs, or cash, in the amount of Fifteen Thousand Dollars and no cents ($15,000.00) must accompany each sealed bid. The deposit of the apparent high bidder and of others who submit written requests to have their bids considered for acceptance will be retained pending acceptance or rejection of the bids. All other deposits will be returned following the completion of the bidding. The deposit of the successful bidder will be applied as part of the purchase price against the timber cut on this unit only, or retained as liquidated damages if the bidder fails to execute the contract and furnish a satisfactory bond in the amount of Twenty-five Thousand Dollars and no cents ($25,000.00) within thirty (30) days of acceptance of the bid. The bond may be in the form of an Irrevocable Letter of Credit, Assignment of Savings Account or cash. The right to waive technical defects and to reject any and all bids is reserved. Before bids are submitted, full information concerning the timber, conditions of the Sale, use of Irrevocable Letters of Credit, and submission of bids should be obtained from the Superintendent, Puget Sound Agency, 2707 Colby Avenue, Suite 1101, Everett, Washington 98201.

Dated this XXX XX, 20XX, at Everett, Washington, Judith R. Joseph, Superintendent, Puget Sound Agency, Bureau of Indian Affairs.

PROSPECTUS

XXXX LOGGING UNIT

LUMMI INDIAN RESERVATION

INTRODUCTION

The Lummi Indian Business Council (LIBC) Forestry Division and the Bureau of Indian Affairs offers for sale by SEALED BID, in accordance with the enclosed ADVERTISEMENT, a PREDETERMINED VOLUME of 363,000 board feet of all species merchantable sawlog timber and 70,000 board feet of all species hardwood pulp logs from the XXXX LOGGING UNIT. Bids will be opened at the Bureau of Indian Affairs, Puget Sound Agency, 2707 Colby Ave. Suite 1101, Everett, Washington 98201-3665 at 1:00 P.M. local time, XXX XX, 20XX.

This Prospectus is intended to furnish you with the principal requirements and features of this logging unit. If the wording or meaning disagrees with the contract, the contract is final and binding. No guarantee is made of predetermined volume or timber quality mentioned herein. Interested bidders are encouraged to obtain a sample contract and to discuss the complete contract obligations with the LIBC Forest Manager, Bellingham, Washington. A bidder must be prepared to assume full responsibility for the success of the operation under the terms of the contract at the bid price. Arrangements may be made at LIBC to examine the logging unit. You are urged to make an examination and to make your own independent estimates to determine your bidding decisions.

THIS TIMBER IS NOT SUBJECT TO EXPORT RESTRICTION OR SUBSTITUTION LAWS. THE STATE TIMBER HARVEST TAX IS NOT IMPOSED ON INDIAN TRUST TIMBER. THIS IS A 10 BOARD FOOT TIMBER SALE.

LOCATION

The "XXXX" Logging Unit is located approximately 7.5 miles due west of Bellingham, Washington across Bellingham Bay on the Lummi Indian Reservation Peninsula. The eastern property line of the logging unit runs adjacent to Chief Martin Road approximately ¼-mile south of Kwina Road. It is located in portions of the NW ¼ of the NE ¼ of Section 13, Township 38 North, Range 01 East, Willamete Meridian, Lummi Indian Reservation, Whatcom County, Washington. **Please see Exhibit A – Timber Sale Map.**

TIMBER QUALITY AND MINIMUM ADVERTISED RATES

The timber within the 26-acre clearcut unit and the 4-acre selective harvest unit (Special Use Area) is a second-growth stand of conifers and hardwoods.

ESTIMATED TIMBER VOLUME AND LOG GRADE PERCENT								
Species	**Volume (Net MBF)**	**Percent By Log Grade**						
		P	**SM**	**1**	**2**	**3**	**4**	**PU**
Western red cedar sawlogs	154			8	31	55	6	
Sitka spruce and other conifer species sawlogs	78			40	49	5	6	
Red alder sawlogs	103			19	31	22	28	
Bigleaf maple and other hardwood species sawlogs	15			27	40		33	
Black cottonwood sawlogs	13	85	15					
All species hardwood pulp logs.	70							100
Cull logs (all species)	Undetermined; Removal optional							
Other wood products (all species)	Undetermined; Removal optional							
TOTAL SALE VOLUME	**433**							

THE MINIMUM ACCEPTABLE BID VALUE IS $XXX,XXX.XX TOTAL PURCHASE PRICE.

MERCHANTABILITY SPECIFICATIONS

All timber designated for cutting shall be removed from the logging unit unless otherwise approved by the Officer-in-Charge. Trees and products from those trees will equal or exceed the following specifications:

Product Specifications					**Tree Specifications**
Species & Product	Length (feet)	Scaling Diameter (inches)	Net Scale in % of Gross Scale	Net Scale (Bd. Ft.)	No. of Minimum Size Products per Tree
All conifer species sawlogs	12	5	33 1/3	10	2
All hardwood species sawlogs	8	6	33 1/3	10	2
All hardwood species pulp logs	10	5	1/2	*	2

LOGGING AND FIRELINE CONSTRUCTION

The Purchaser shall be required to attend a pre-logging conference and to submit a logging and road construction plan for approval before operations commence.

Within the area designated for clearcutting, all merchantable and non-merchantable live and standing timber 20 feet in height and taller shall be cut unless otherwise directed by the Officer-in-Charge. All snags and standing cull conifer trees with a DBH of 16 inches or larger will be designated as wildlife trees within the clearcut portion of the harvest unit and will not be cut unless otherwise directed by the Officer-

in-Charge. Healthy conifer trees too small to meet the merchantability specifications shall also not be cut, unless otherwise directed by the Officer-in-Charge.

Within the area designated for selective harvest - "Special Use Area" – all merchantable live and standing timber 20 feet in height and taller shall be cut unless otherwise directed by the Officer-in-Charge. All non-merchantable timber, standing culls, and snags shall not be cut unless otherwise directed by the Officer-in-Charge.

The boundaries of the clearcut area have been flagged with orange fluorescent and blue ribbon tied together and yellow clearcut tags facing inward toward the unit. Trees containing the yellow clearcut tags shall not be cut. The boundaries of the "Special Use Area" have been flagged with pink wetland delineation ribbon and orange ribbon.

All cut timber shall be whole-tree and shovel yarded to designated landings, or as otherwise approved by the Officer-in-Charge. The entire sale area is flat and is suitable for shovel yarding.

The Purchaser will be required to utilize the road, skid trail, and landing site system designed by the Forest Manager. The Purchaser may propose a different skid trail pattern and/or landing sites but any changes must be approved by the Officer-in-Charge prior to use and/or construction. Maximum use of existing spur roads, skid trails, and landings shall be required.

The Purchaser shall be required to construct a tractor fireline, 10 feet wide down to mineral soil, around all landing piles as directed by the Officer-in-Charge.

ROAD CONSTRUCTION AND RECONSTRUCTION

The Purchaser shall be required to construct approximately 10 stations of new road. The new road construction has been designated with pink ribbon. All newly constructed roads shall have a smooth even grade and a minimum width of 10 feet. A minimum of 6 inches of pit run shall be required for newly constructed roads, or as otherwise directed by the Officer-in-Charge.

The Purchaser shall install culverts at the locations located along Chief Martin Road designated and marked with pink and orange ribbon tied together. A minimum of 2 culverts, no less than 25 feet long and 24 inches in diameter, shall be installed. Upon completion of the logging unit, the north culvert installation shall be removed by the Purchaser and the drainage ditch shall be returned to the same condition as it was prior to the installation.

Upon completion of the logging, all roads shall be repaired to meet the road specifications, or as directed by the Officer-in-Charge.

SLASH DISPOSAL & SITE PREPARATION

The Purchaser shall be required to pile excessive amounts of logging slash and uprooted herbaceous and woody vegetation into circular piles. Due to the whole-tree yarding requirement, it is anticipated that approximately 15 percent of the area may need some brush piling. Limited amounts of crushed limbs, uprooted vegetation, and non-merchantable pieces can remain on the soil surface as long as seedlings can be planted efficiently on an 8-foot spacing. The piles shall be less than 20 feet in diameter and located so as to avoid creating an immediate fire danger to the adjacent property.

SCALING PROVISIONS

This is a predetermined volume sale (lump sum). Scaling is not required but the Bureau of Indian Affairs reserves the right to scale or waste scale at any time during the sale.

CONTRACT PERIOD

The Purchaser shall cut and pay for all designated timber on or before October 15th, 20XX. All other obligations shall be completed on or before November 1st, 20XX.

DEPOSIT WITH BID

A certified check, cashier's check, bank draft, postal money order, or Irrevocable Letter of Credit drawn payable to the order of the Bureau of Indian Affairs in the amount of Fifteen Thousand Dollars and no cents ($15,000.00) MUST ACCOMPANY EACH SEALED BID. Deposits of the unsuccessful bidders will be returned immediately after bids are opened. The Purchaser's bid deposit shall become an Advance Payment, upon approval of the contract.

PERFORMANCE BOND

A Performance bond in the amount of Twenty-Five Thousand dollars and no cents ($25,000.00) may be in the form of a Irrevocable Letter of Credit, cash, or negotiable United States Securities and will be required within thirty (30) days of the acceptance of the bid.

ADVANCE DEPOSIT

None.

PREDETERMINED TOTAL VOLUME PAYMENT

Payment for the Predetermined Volume shall be in the form of two equal installment payments based on the same number of cutting blocks as described in the Purchaser's logging plan and approved by the Superintendent. If installment payments are used, the final payment shall be made no later than 60 days after the contract is approved. However, before any cutting begins in any cutting block, the Purchaser shall pay for the entire cutting block. Cutting blocks within the logging unit shall be designated by the Officer-in-Charge on the Purchaser's logging plan. The Purchaser's bid deposit shall be applied toward this payment.

METHOD OF PAYMENT

Payments and deposits shall be by check, postal money order, cash or electronic funds transfer as designated by the Superintendent and are due on the date specified in the written request from the Bureau of Indian Affairs. Advance Deposits of $10,000.00 and larger may be by electronic funds transfer at the Purchaser's bank through the Federal Reserve Bank of New York to the Treasury Department using instructions furnished separately by the Bureau of Indian Affairs.

CONCLUSION

Additional information concerning the timber, conditions of the sale, site preparation requirements, use of Irrevocable Letters of Credit or Assignment of Savings Account forms, and submissions of bids can be obtained from the Lummi Nation Forest Manager, LIBC Natural Resources Department, 2616 Kwina Road, Bellingham, Washington 98226, phone (360) 384-2228 or from the Superintendent, Bureau of Indian Affairs, Puget Sound Agency, 2707 Colby Avenue, Suite 1101, Everett, Washington 98201, phone (425) 258-2651.

Form 5-5318
Rev. Aug. 1974

U. S. DEPARTMENT OF THE INTERIOR
Bureau of Indian Affairs

Bid Proposal

For the purchase of timber on the _XXXX_ Logging Unit on the _Lummi_ Indian Reservation, the undersigned, hereby bid for the timber advertised as follows:

	SPECIES AND PRODUCT	BID PRICE PER Total Volume
	Western red cedar sawlogs	$ _____
	Sitka spruce and other conifer species sawlogs	
	Red alder sawlogs	
	Bigleaf maple and other hardwood species sawlogs	
	Black cottonwood sawlogs	
	All species hardwood pulp (utility) logs	
	All species – cull logs and other wood products	

The undersigned, remit herewith a certified check, cashier's check, bank draft or postal money order, drawn payable to the Bureau of Indian Affairs, or in cash, in the amount of _Fifteen Thousand_ dollars and _no_ Cents, ($15,000.00) as required by the notice of sale, and agree that if this bid is accepted and the undersigned shall fail to fulfill this agreement in accordance with the regulations governing the sale, then the amount of this deposit shall be retained as liquidated damages for use and benefit of the timber owners. It is understood that if this bid is not the apparent high, bid, the deposit will be returned immediately following the bid opening, unless the undersigned makes a written request to have this bid considered for acceptance.

_____ (Date)

_____ (Signed)

_____ (Title)

_____ (Representing)

INSTRUCTIONS

Enclose this proposal, in duplicate, in a sealed envelope addressed as required by the notice of sale, and plainly mark on the outside of the envelope "Proposal for XXXX Logging Unit, to be opened XXX XX, 20XX."

If the proposal is made by individuals, acting neither as a firm nor as a corporation, each must sign.

If the proposal is made by a co-partnership, the signature must consist of the name of the firm followed by the signature of each of the members of the firm.

If the proposal is made by a corporation, the signature should consist of the name of the corporation followed by the name of the proper officer or officers, as required by the laws of the corporations.

The following receipt form is to be completed when the apparent unsuccessful bidders are present in person and desire the return of their bid deposit immediately.

Receipt is acknowledged of the return of (my) (our) bid deposit of $ _____
(Cash or Amount & Check Number)

_____
(Signature)

_____
(Representing)

_____
(Date)

Appendix EE - Abstract of Bids Form

Form: X BIA-4321

ABSTRACT OF BIDS

ABSTRACT OF SEALED and HIGH ORAL* BIDS RECEIVED at the Lummi Nation at 8:00 a.m., XXX XX, 20XX for the Sale of Timber designated the XXXX Thinning Unit, Lummi Indian Reservation.

Timber Species and Product			Red Alder Sawlogs and Chip & Saw	Douglas-fir Sawlogs, Chip & Saw, and Pulp								Total Advertised Value
Quantity and Units			239 Tons	218 Tons								
Advertised Rate/Unit			$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
Total Value Per Species Product			$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Bid#	Name and Address of Bidder		SEALED and HIGH ORAL* BIDS RECEIVED PER UNIT BY SPECIES									Total Bid Value
1	XXXX Thinning XXX Thin Road XXXX, WA 98284	Bid/Unit	$15.00	$10.00								
		Totals	$3,585.00	$2,180.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,765.00
2		Bid/Unit	$0.00	$0.00								
		Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
3		Bid/Unit										
		Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
4		Bid/Unit										
		Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
5		Bid/Unit										
		Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	*ORAL BIDS**											
1		Bid/Unit										
		Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2		Bid/Unit										
		Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
3		Bid/Unit										
		Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
4		Bid/Unit										
		Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
5		Bid/Unit										
		Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

I hereby certify that the bids herewith abstracted *and the bids listed on the attached record of oral auction** are all that were received and that in addition to the bids attached and abstracted on this form., invitations to bid were sent to a list of prospective bidders.

(*Delete italicized sections if only a Sealed Bid sale.)

DATE **Superintendent**

Appendix FF - Timber Sale Logging and Road Plan Advice of Operations Form

Bureau of Indian Affairs
Puget Sound Agency
Timber Sale Logging and Road Plan
Advice of Operations

Original: _____ Amendment: _____ Date: _____

1. Project Information	
Logging Unit:	Reservation:
Allotment/Tribal:	
Contract No.:	Expiration Date:
Bureau Sale Administrator:	
Purchaser:	Phone:
Address:	
Designated Purchaser Representative:	
Address:	Phone:
Logger and/or Foreman:	Phone:
Subcontractor:	

2. Logging Schedule				
Area or Location:	Falling & Bucking		Yarding & Hauling	
	Start	Finish	Start	Finish

Logging Equipment on Site:	
No. of Sides Operating:	No. of Trucks Hauling:
Estimate of Loads Per Day:	Estimate of Loads per Week:

3. Scaling
Scaling Bureau:
Brand Identification:
Approved Locations:
Log Truck Ticket Books will be issued to:
By: All unused books or portions thereof, will be returned to the Puget Sound Agency within 48 hours of completion of hauling from the Sale area.
Special Provisions:

1 of 2

4. Deposition of Logs				
Species	Log Type	Scaling Method	Delivery Point	Sold To

5. Road Construction and Reconstruction			
Road Location	Stations	Start Date	Completion Date

Additional Road Information:

6. Logging Methods

7. Burning and Site Preparation

Fireline Construction:

Burning Slash and/or Landing Piles:

Site Preparation (including piling & scarification):

8. Additional Items

Sale Administrator - BIA Representative: Date:

Purchaser/Representative: Date:

Approved – Superintendent: Date:

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Appendix GG – PSA Timber Sale Inspection Report

PUGET SOUND AGENCY
TIMBER SALE INSPECTION REPORT

Logging Unit: Date of Inspection:

UTILIZATION

A. Top diameter, sawlogs inches
B. Top diameter, utility/pulp inches
C. Stump height
D. Bucking to defects or breaks
E. Long butts
F. Missed sawlogs
G. Missed utility/pulp
H. Progress of waste pickup

TREE FELLING AND SKIDDING

A. Felling designated timber
B. Felling relative to skid trails
C. Fallen timber within unit boundaries
D. Damaging residual timber
E. Felling non-merch timber greater than feet
F. Location and number of skid trails
G. Condition of skid trails
H. Yarding required timber

SLASH DISPOSAL

A. Tree/log length yarding
B. Location of landing slash piles
C. Location of herbaceous and slash piles
D. Piles of proper size
E. Burning of herbaceous and slash piles
F. Construction of fireline
G. Scarification - accordance with specifications

LANDING

A. Location and size of landings
B. Branding of timber for each allotment

SCALING

A. Loads tagged with Bureau truck tickets
B. All loads properly scaled
C. Scaling certificates received in timely manner
D. Missing loads
E. Advance Deposit balance above $ minimum

1 of 7

ROAD CONSTRUCTION

A. Road location and width
B. Road surfaced including graveling
C. Ditching of roads
D. Proper installation and location of culverts
E. Disposal of road construction debris
F. Road construction completed prior to logging
G. All roads maintained

OTHER CONTRACTUAL REQUIREMENTS

A. Fire equipment and tools
B. Smoke emissions from burning
C. Public and contractor safety

ENVIRONMENTAL PROTECTIVE MEASURES

A. Stream, creek, and other wet areas
B. Soil erosion and compaction
C. Buffer strips observed
D. Damaging physical structures

Loads Not Scaled					**Scaled or To Be Cut**
Tally:	Fallen	Decked	Hauled	Total	
Conifer					< >
Hardwood					< >
Firewood					< >

NARRATIVE REPORT:

Purchaser Representative **Date** **Bureau of Indian Affairs** **Date**

2 of 7

Bureau of Indian Affairs
Puget Sound Agency
Timber Sale Logging and Road Plan
Advice of Operations

Original: _____ Amendment: _____ Date: _____

1. Project Information	
Logging Unit:	Reservation:
Allotment/Tribal:	
Contract No.:	Expiration Date:
Bureau Sale Administrator:	
Purchaser:	Phone:
Address:	
Designated Purchaser Representative:	
Address:	Phone:
Logger and/or Foreman:	Phone:
Subcontractor:	

2. Logging Schedule				
Area or Location:	Falling & Bucking		Yarding & Hauling	
	Start	Finish	Start	Finish

Logging Equipment on Site:	
No. of Sides Operating:	No. of Trucks Hauling:
Estimate of Loads Per Day:	Estimate of Loads per Week:

3. Scaling
Scaling Bureau:
Brand Identification:
Approved Locations:
Log Truck Ticket Books will be issued to:
By: All unused books or portions thereof, will be returned to the Puget Sound Agency within 48 hours of completion of hauling from the Sale area.
Special Provisions:

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4. Deposition of Logs				
Species	Log Type	Scaling Method	Delivery Point	Sold To

5. Road Construction and Reconstruction			
Road Location	Stations	Start Date	Completion Date

Additional Road Information:

6. Logging Methods

7. Burning and Site Preparation

Fireline Construction:

Burning Slash and/or Landing Piles:

Site Preparation (including piling & scarification):

8. Additional Items

Sale Administrator - BIA Representative: Date:

Purchaser/Representative: Date:

Approved – Superintendent: Date:

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Bureau of Indian Affairs
Puget Sound Agency
Load Receipt Summary

Logging Unit: ____________________ Indian Reservation: ____________________

Contract No: ____________________ Purchaser: ____________________

Issued To: ______________ Date: ____________________ By: ______________

BIA Ticket	Scale Ticket	Haul Date	Scale Date	Scale Location	Certificate Scale Number Report	Brand

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Bureau of Indian Affairs
Puget Sound Agency
Unscaled Load Certificate

Logging Unit: ____________________ Contract No: ____________________

BIA Ticket	Brand	No. of Logs	Yard Ticket	No. of Logs	Date Received	Time Received	Date Scaled	No. of Logs

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Bureau of Indian Affairs
Puget Sound Agency
Non-Scaled Receipt

Logging Unit: ______________________ Contract No: ______________________

BIA Ticket	Haul Date	Location	Product Specification	Conversion Factor	Volume/MBF	Scale	Brand Report

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Appendix HH - Statement of Completion of Timber Contract Form

Form 5-5319

UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Indian Affairs
STATEMENT OF COMPLETION OF TIMBER CONTRACT

Agency	Reservation	Date of Final Report
Timber Sale Area	Purchaser	Assignee
Contract No.	Contract Approved	Contract Expiration Date
Land Status: ___ Allotted ___Tribal ___ Other (Specify)_____	Allotment No.	Name of Allottee

Forest Products Scaled			
Species & Products	Volume & Unit Of Measure	Price Per Unit	Value
Total			
Administrative Deductions			
Net Amount Paid to Owners			
Unrestricted (Included in "Total")			
Remarks:			

PURCHASER'S STATEMENT

I hereby surrender all rights under the above contract and request to be released from further obligations thereunder.

_____
_____
_____, ____

OFFICER IN CHARGE'S STATEMENT

I hereby certify that the purchaser has complied with the requirements under the above contract and recommend that he be released from further obligations thereunder.

_____
_____
_____, ____

APPROVING OFFICER'S STATEMENT

I hereby certify that the foregoing is a true account of all timber scaled and funds accrued from the sale of timber on the land under the contract designated above.

_____
_____
_____, ____

Appendix II - Summary of Operations Form

Form 5-5319

SUMMARY OF OPERATIONS REPORT

Scaling Began:	Scaling Completed:	Contract Requirements Completed:
Contract Provides For Stumpage Rate Adjustment: ☐	Contract Does Not Provide For Stumpage Rate Adjustment: ☐	

SUMMARY OF TIMBER CUT BY SPECIES AND BY TYPE OF LAND OWNERSHIP

Species	Unit of Measure	Unit Rate	Volume (MBM)				Value			
			Allotted	Tribal	Other	Total	Allotted	Tribal	Other	Total
Total or Average										
Unrestricted (Included in above total)										

Distribution of Money	
Accounts	Amount
Individual Owner	
Tribal	
Other	
Administrative Deduction	
Total	

Date	Signature
	Title

One Summary will be prepared for each timber sale, except that no Summary is required when there is only one scaling unit in a timber sale area. Indicate on the form the copy on which the Summary appears. When contract provides for adjustment of stumpage rates, the "Unit Rate" will be the Average Rate.