

Akisqnuk Wildlife Habitat Restoration Plan



Prepared for:

Akisqnuk First Nation

and

Fish and Wildlife Compensation Program

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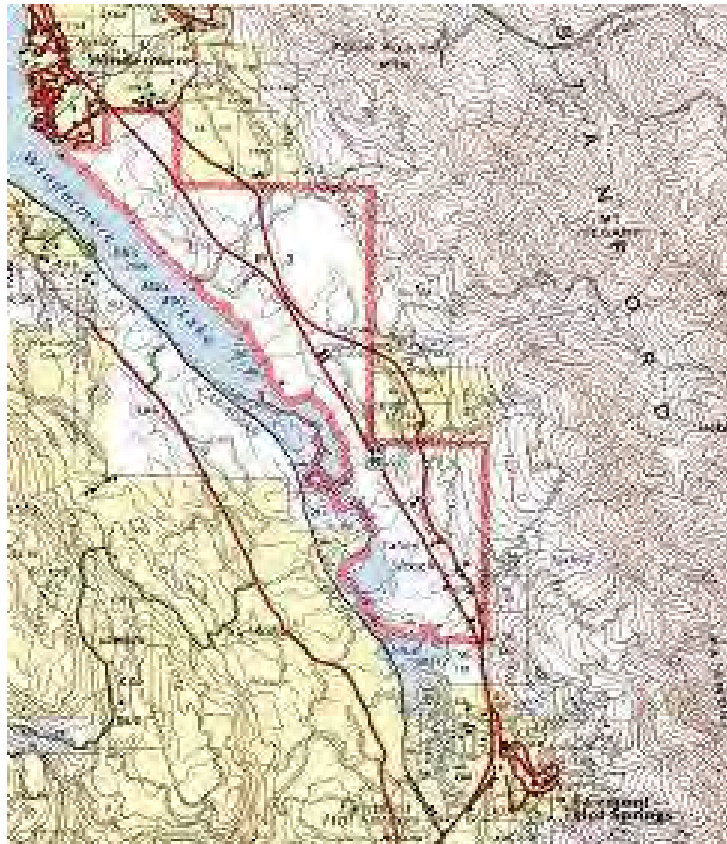
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INTRODUCTION

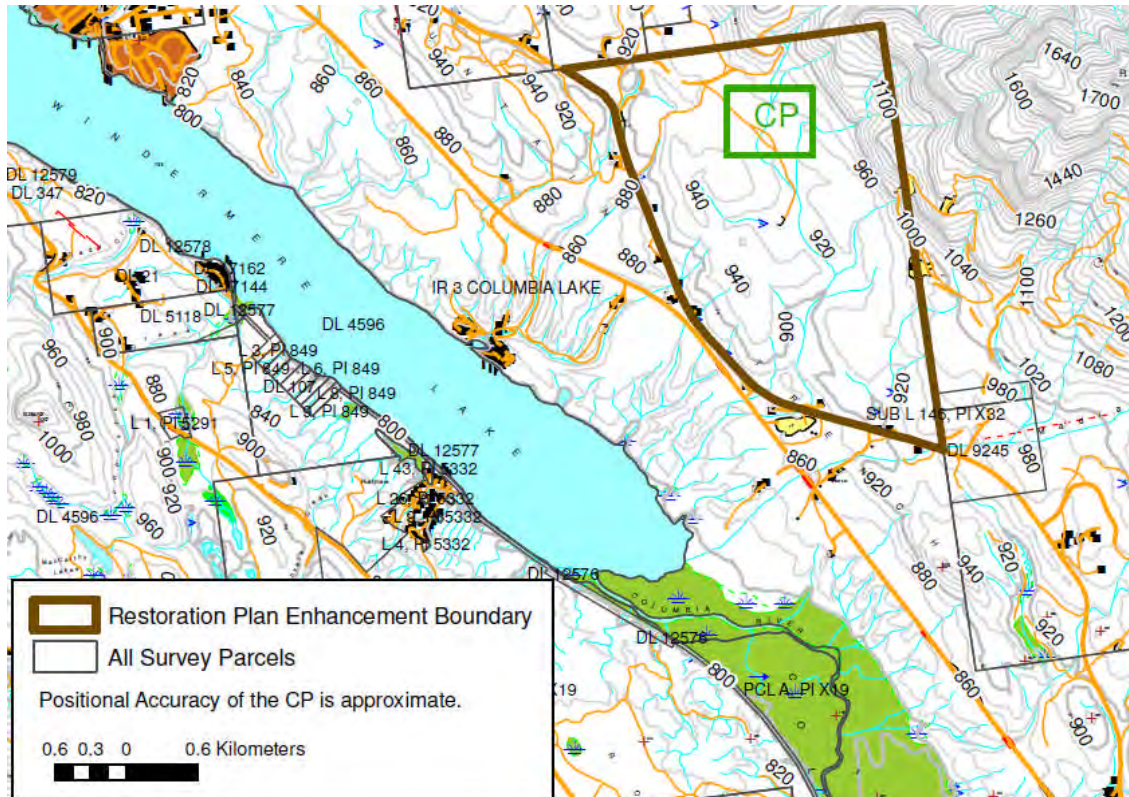
The Akisqnuq First Nation occupies Indian Reserve #3, which lies on the east side of Windermere Lake between Fairmont Hot Springs on the south and Windermere on the north. The reserve is 3,272 ha in size and was allotted to the Akisqnuq First Nation in 1882. The reserve ranges in elevation from 800 m asl along Windermere Lake to more than 1200 m at its highest point on the lower slopes of the Stanford Range of the Rocky Mountains (Figure 1).

Figure 2. Location of the Akisqnuq First Nation Reserve.



The Columbia Basin Fish and Wildlife Compensation Program and the Akisqnuq First Nation have an interest in and have developed a partnership to undertake fire-maintained ecosystem restoration on the Akisqnuq First Nation Reserve. This plan marks the initiation of the process. The project area lies to the east of Kootenay No. 3 road and is approximately 650 ha in size (Figure 2).

Figure 3. Location of restoration site on the Akisqnuq First Nation Reserve.



PHYSICAL, ECOLOGICAL AND CULTURAL CHARACTERISTICS

GEOLOGY/GEOMORPHOLOGY

The following description of the Rocky Mountain Trench is adapted from Ryder (1981).

The Rocky Mountain Trench is a major topographic feature which borders the western front of the Rocky Mountains from 47° N in northwestern Montana, through British Columbia to beyond 59° N, a distance of over 1500 km. It follows a major zone of crustal weakness that is possibly an ancient continental margin.

In the study area, the Trench follows a tectonic depression that was caused by blockfaulting during the Tertiary Period. The steep, western front of the Rockies is a major fault scarp which rises about 1500 m above the Trench floor. Quaternary sediments and weakly consolidated late Tertiary sediments beneath the Trench floor are over 1000 m thick in places. Bedrock that underlies these materials is part of the downfaulted and tilted western fault block. Rock outcrops on the Trench floor are the exposed parts of ridges that separate deep structural basins. In general, the bedrock surface rises gradually westwards into

the hilly terrain of the eastern Purcell Mountains. The marked asymmetry of the Trench thus reflects structural control.

The floor of the Trench is 3 to 16 km wide and varies between 760 and 1060 m in elevation. It consists of undulating morainal terrain with occasional bedrock hills

North of Canal Flats the Trench landscape is dominated by Columbia and Windermere Lakes and low-lying wetlands of the Columbia River floodplain. The lakes are flanked by frayed scarps and gently undulating benches of lacustrine silt, alluvial fans, and areas of undulating till which are traversed by deeply incised meltwater channels.

The sequence of events that occurred during Fraser Glaciation has been reconstructed by Clague (1973, 1975) and much of the following description is condensed from his accounts. At the onset of the glaciation, ice accumulation commenced in cirques at high elevations in the Rocky and Purcell Mountains. These small glaciers gradually expanded and merged into a system of valley glaciers. Eventually, by about 17 000 years B.P. (Clague et al., 1980), large southerly flowing ice streams developed in the Rocky Mountain Trench and the Flathead Valley. The Trench glacier originated in mountains well to the north of the study area, but was augmented by local glaciers. Eventually, all major valleys were occupied by ice that was more than 1000 m thick. Glaciers coalesced across ridged crests so that only high peaks protruded. The trunk glacier reached a thickness of about 1500 m in the Trench at the International Boundary (Daly, 1912). The trunk glacier extended into Montana, and terminal moraines were constructed near Flathead Lake at Polson and Kalispell, 130 km and 60 km respectively south of the Canadian border.

During ice retreat at the end of the early phase of Fraser Glaciation, meltwater streams deposited sands and gravels, while silt and sand accumulated in lakes on the Trench floor. Similar materials were deposited during the interval between the second and third phases, but their characteristics suggest that this was of very short duration and masses of stagnant ice may have persisted in the centre of the Trench.

The final deglaciation commenced about 15 000 years ago. As the glacier snout retreated from terminal moraines in Montana, valley glaciers in British Columbia gradually thinned, and overridden ridges and summits emerged through the lowering ice surface. Glaciers in tributary valleys melted more rapidly than the Trench glacier which was still supplied by ice from mountains further north. Some valleys became open whilst downstream areas were still occupied by ice, so that ice-dammed lakes were formed. At various stages of deglaciation, parts of the valley were temporarily occupied by lakes.

The Rocky Mountain Trench and valleys in the mountains became ice free about 11,000 years ago. During postglacial time, rivers became entrenched into Fraser Glaciation deposits, and in some places bedrock canyons were eroded. Most down cutting occurred within a few thousand years of deglaciation. Former outwash plains and lake floors now constitute terraces in both the Trench and mountain valleys. Floodplains formed along many watercourses, both large and small. Alluvial fans developed where steep mountain creeks emerged onto level ground. A mantle of eolian (windblown) sand and silt has accumulated over large parts of the floor of the Rocky Mountain Trench and other large valleys since deglaciation. Slopes have been modified by weathering, mass movement and accumulation of talus, avalanche debris and other forms of colluvium.

SOILS

Soils of the Rocky Mountain Trench are of two main types typical of grasslands and drier forests: chernozems and brunisols. Dark Brown Chernozems are found in the dry, lower elevation areas of the Trench and occur often on highly calcareous parent materials of coarse textured fluvial and morainal deposits. Soil moisture classes are semiarid and soil temperature regimes are moderately cool boreal. Due to dryness, vegetation cover is usually predominated by grasses and open forest. Base saturation is high.

Eutric Brunisols are found in moister, cooler sites than the Chernozems, and occur on calcareous parent materials of coarse textured fluvial, morainal and colluvial deposits. Soil moisture classes, soil temperature regimes and vegetation cover are all similar to that of Dark Brown Chernozems, Base saturation is high. This soil supports forests of Ponderosa Pine, Douglas-fir and Lodgepole Pine. Dark Gray Chernozems often occur in the grassland forest transition (Valentine et.al. 1978).

CLIMATE

Southeastern British Columbia is an area of great vertical relief with strong climatic gradients. Mountain slopes receive annual precipitation totals of 1500 to 2000 mm, second only to amounts on coastal slopes. About half of this precipitation falls as snow.

In contrast, the narrow valleys of southeastern BC are semiarid, receiving 500 to 750 mm, only slightly more than the valleys of the southern Interior Plateau (Schaefer 1978). Approximately one-half of this precipitation falls as snow, concentrated in the months of December, January and February (Kendrew & Kerr 1955).

Mean annual temperatures in the valleys of southeastern British Columbia are close to 5°C in contrast to values of 10°C for valleys further to the west. This is because the main valley bottoms are at progressively higher elevations as one moves east from the Okanagan Valley to the Rocky Mountain Trench and because Arctic air readily invades valleys close to the Great Plains. Cold winters and cool summers lead to a mean annual range of 25°C, similar to that over the Interior Plateau. With around 1800 hr of bright sunshine per year, southeastern valleys are less sunny than those to the west which receive in excess of 1900 hr. Moisture deficits of 100 to 150 mm are common (Schaefer 1978).

ECOSYSTEMS

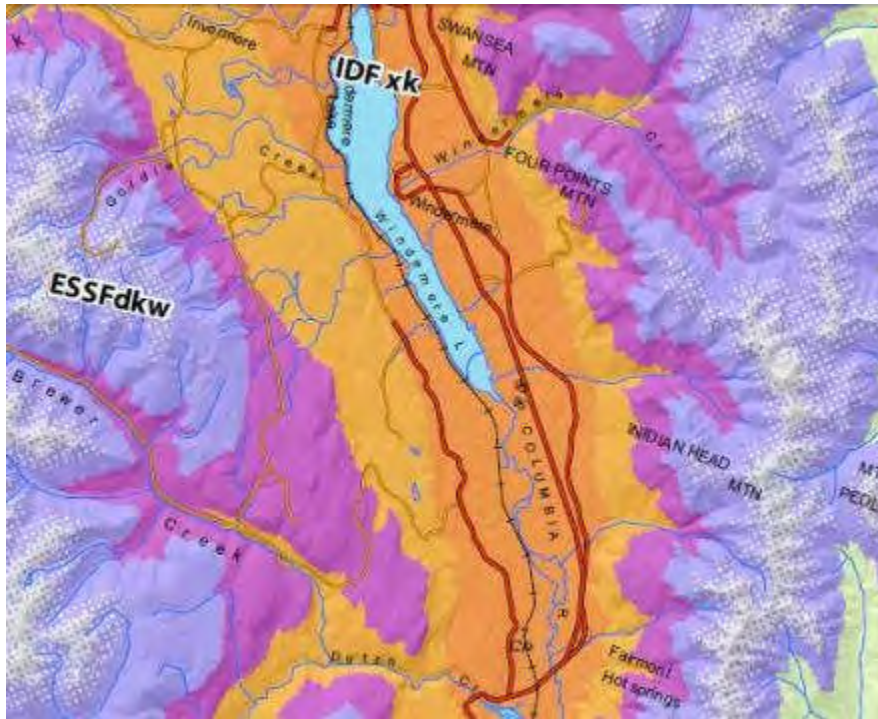
The property is classified as lying primarily within a newly-described Biogeoclimatic Ecosystem Classification, the Interior Douglas fir Biogeoclimatic Zone, Very Dry Cool Variant (IDF_{xk}) (Figure 3). This variant occupies the valley bottom of the Rocky Mountain Trench from Canal Flats to 5-10 km north of Radium at Edgewater. It includes Columbia and Windermere Lakes, and Invermere and Fairmont Hotsprings. This relatively small biogeoclimatic unit follows the Columbia River and is approximately 6-8 km wide and 100 km long. The zonal climate is characterized by a warm, dry climatic regime with relatively long growing seasons [for trees] and soil moisture deficits, particularly on south aspects. The mean annual precipitation ranges from 38-41 cm. Winters are generally mild. Annual snowfall averages 100-125 cm but accumulations are intermittent and rarely exceed 25cm. As a consequence the IDF_{xk}

provides important winter habitat for large ungulates including elk, mule deer and cattle. The intermittent or shallow snow accumulation allows the soil to freeze in cold temperatures. Growing season moisture deficits limit tree and forage productivity, and the short growing season [for agricultural crops] limits agricultural potential. The mean annual temperature, growing season temperature, and winter temperatures are considerably warmer than in the IDF dm2. Most of the IDFxk has been disturbed by fire, grazing and various human disturbances. Consequently, climax zonal plant communities are rare. Zonal stands are dominated by Fd. The poorly developed shrub layer is dominated by Rocky Mountain juniper and a low cover of saskatoon, snowberry and rose. The herb layer contains a diverse mixture of species, but is dominated by bluebunch wheatgrass, rough fescue and a low cover of northern goldenrod, kinnikinnick, and cut-leaved fleabane. The abundance of bluebunch wheatgrass and rough fescue have been significantly reduced by elk, deer and cattle. Many of the herbs are also shade-intolerant, consequently many of these herbs are eliminated as tree canopy closure increases. On disturbed and heavily grazed sites, the presence and cover of Kentucky bluegrass, cheatgrass and needlegrasses tends to increase. Throughout its range the IDFxk occupies the valley bottom and occurs below the IDFdm2 (Lloyd, March, 2006).

A small portion in the northeast of the project area (approximately 50 ha) is classified as Interior Douglas Fir Biogeoclimatic Zone, Dry Mild Variant (IDFdm2). This variant occurs in valley bottoms and on lower slopes of the Rocky Mountain Trench south of the Blaeberry River. The zonal climate is characterized as having hot, very dry summers and cool winters with very light snowfall. Soils generally dry out for long to short time periods during late summer. Zonal sites have climax stands of Interior Douglas-fir (*Pseudotsuga menziesii* var. *glauca*); however mixed seral stands of Douglas-fir, Western Larch (*Larix occidentalis*), and Lodgepole Pine (*Pinus contorta* var. *latifolia*) are more common. The understory is dominated by Pinegrass (*Calamagrostis rubescens*) and a high cover of shrubs, such as Birch-leaved Spirea (*Spiraea betulifolia* ssp. *lucida*), Common Juniper (*Juniperus communis*), Soopolallie (*Shepherdia canadensis*), Saskatoon (*Amelanchier alnifolia*) and Common Snowberry (*Symphoricarpos albus* var. *albus*) (Braumandl 1992).

Both of the Biogeoclimatic Variants lie within Natural Disturbance Type 4 (NDT4) as defined by the Forest Practices Code Biodiversity Guidebook. The NDT4 is characterized by “frequent, stand-maintaining fires”, which historically had fire return intervals ranging from 4 to 50yrs. However, due to fire suppression activities these fires have been all but eliminated from the landscape, resulting in extensive ingress and ingrowth of conifer stands throughout the Rocky Mountain Trench, including the Akisqnuq First Nations Reserve.

Figure 4. Biogeoclimatic zones in the vicinity of the Akisqnuq First Nation Reserve.



BIOTIC FEATURES

In 2004 the Columbia Basin Fish and Wildlife Compensation Program (CBFWCP) commissioned a report entitled: “Habitat Attribute Targets for Red and Blue listed Wildlife Species and Plant Community Conservation”, which identifies red and blue listed wildlife and plant communities for consideration in the management and restoration of the historic fire maintained ecosystems of the East Kootenay component of the Rocky Mountain Trench.

WILDLIFE

Two listed wildlife species, namely badger (Red) and Rocky Mountain bighorn sheep (Blue) occur or historically did occur on the reserve. Another two, Flammulated owl (Blue) and Lewis’ woodpecker (Blue) inhabit the dry forests of the IDF.xk or IDFdm2, and are therefore considered as possible inhabitants of the reserve. According to Antifeau (2011, pers. comm.), flammulated owl have been located both north and south of the reserve and could, in fact, occur on the reserve as well. He also indicated the potential for the presence of rubber boas in appropriate habitat. The BC Conservation Data Base Status of these species are shown in Table 1. The assumed restoration success for these wildlife species can be found in Table 2.

Table 7. Listed wildlife species either found on or potentially found on the Akisqnuq Reserve.

Species	BC Conservation Data Base Status
Badger	Red
Flammulated Owl	Blue
Lewis' Woodpecker	Blue
Rocky Mountain bighorn sheep	Blue
Rubber Boa	

Table 8. Assumed restoration success for listed wildlife species either found on or potentially found on the Akisqnuq Reserve.

Species	Target Ecosystem Component		
	Open Range	Open Forest	Closed Forest
Badger	X	X	x
Flammulated Owl		X	x
Lewis' Woodpecker	X	X	
Rocky Mountain bighorn sheep	X	X	x

X = highly beneficial

x = beneficial

Blank = negligible

In addition to the foregoing, a number of large mammals are known to occur on the Akisqnuq Reserve, namely elk¹, mule deer, whitetailed deer, cougar, black bear and wolf. Numerous elk and a great deal of elk sign was observed during the course of field work, common nighthawks were documented on one occasion and wolf and turkey scat were noted.

PLANTS

The plant species shown in Table 3 are listed by the Conservation Data Centre as occurring in the area of the Akisqnuq Reserve.

Table 9. Listed plant species either found on or potentially found on the Akisqnuq Reserve.

Species	BC Conservation Data Base Status
Hookers townsendia	Red
Nuttalls's sunflower	Red
Plains reedgrass	Blue
Scarlet globe-mallow ²	Red

¹ Elk are a species of particular interest to the Akisqnuq; treatment prescriptions and polygon layout are designed to benefit this species along with the others noted above.

² As related by band members, Scarlet globe-mallow has been located either on or in the vicinity of the subdivision along Kootenay No. 3 Road. Selected plants have been excavated and taken to the Tipi Mountain Native Plant nursery for propagation as mitigation for future development of the subdivision.

PLANT COMMUNITIES

Three of the seven red or blue listed plant communities known to exist within the East Kootenay component of the Rocky Mountain Trench are located within the biogeoclimatic variants found on the Akisqnuq reserve. They are shown in Table 4.

Table 10. Listed plant communities either found on or potentially found on the Akisqnuq Reserve.

Plant Community	Biogeoclimatic Variant and Site Series	BC Conservation Data Base Status
Antelope Brush/Bluebunch Wheatgrass	IDFdm2/02	Red
Bluebunch wheatgrass/Junegrass	IDFvk/83	Red
Douglas-fir/Snowberry/Balsamroot	IDFdm2/03	Red

As is evidenced from this report, restoration of the historic habitats located within the Akisqnuq First Nations Reserve boundaries is both highly desirable and has potential to benefit a number of resident Red and Blue listed species and plant communities. The Red and Blue listed animal species and plant communities, indicated above, with the possible exception of Flammulated owl, would benefit from a restoration program including slashing of ingrowing and ingressing conifer stands and the re-introduction of frequent (5-20 yr return interval) low-intensity, stand maintaining ground fires as an integral component of the management of the reserve.

VEGETATION MANAGEMENT CONCERNS

There are two vegetation management concerns within the reserve.

1. The first is the loss of grasslands and open forest due to ingrowth and ingress of conifer stands caused by the elimination of frequent stand- maintaining fires.
2. Invasive species/noxious weeds are scattered throughout the reserve. Those observed include, but may not be limited to Spotted and Diffuse Knapweed and giant burdock. A large infestation occupies the area at the locked gate in the northwest of the project area and a number of other infestations were noted (see Appendix 2 for locations and density/distribution codes). The risk to the reserve and the values on it is high due to the location of infestations along roadways. These roadways are being driven by band members and will be used to access restoration treatment sites.

GUIDING PRINCIPLES FOR MANAGEMENT

The following principles will guide the restoration plan:

1. managing lands and waters primarily for nature conservation and wildlife habitat
2. enhancing biodiversity targets through restoration and replacement to remediate past disturbances (or the lack thereof).
3. encouraging natural ecological processes to proceed without interference whenever possible.

As well, the Kootenay Boundary Land Use Plan Implementation Strategy (KBLUP-IS; Government of BC, 1997) for NDT4³ ecosystem units will be utilized as desired objectives. These objectives are shown Table 5 below.

Table 11. Tree stocking rate targets and ranges by Ecosystem Component.

Ecosystem Component	Tree Stocking Range/Target (stems/ha)
Shrublands	0
Open Range	0-75 sph TARGET: 20sph
Open Forest	76-400 sph TARGET: 150 sph
Managed Forest	400-5000 sph

Managing the Akisqnuq First Nations Reserve under the NDT4 guidelines is in agreement with the above principles; principles number 2 and 3 particularly are met by the proposed management.

Treatment of stands to create the desired structural state will help to meet principle number 2 by encouraging biodiversity and will benefit a number of Blue and Red listed species.

The elimination of frequent, low intensity surface fires is in conflict with principle number 3. Restoration/maintenance treatments are designed to, as closely as is possible, emulate fire as the primary historic disturbance agent.

Further, the study area is covered by Order-Ungulate Winter Range-U-4-008-Invermere TSA (<http://trench-er.com>); lands within the area are defined primarily as Open Range or Open Forest. Legally the lands within the Akisqnuq Reserve are not contributing to the ecosystem component targets within this Order. However, the plan will adhere to the intent of this Order and manage the ecosystems to reflect the critical contribution of these components to ecosystem health.

TREATMENT OBJECTIVES

- To re-establish historic stand structure and ecological processes to enhance the health and vigour of the ecosystem
- To ensure that wildlife habitat, especially critical ungulate winter range, is maintained in a healthy condition
- To ensure critical habitat for known Red and Blue listed species, which were historically present, is maintained/restored
- To reduce the risk of catastrophic wildfires and associated danger to human values (that is, to ensure any wildfire is within the range of historic variability)
- To promote the production of tall, large diameter conifers for both stand structure and wildlife habitat, current and future. Promotion of large diameter stems will ensure that high quality wildlife trees/snags, which are currently in short supply at the landscape level, are available in perpetuity
- To complement and enhance ongoing NDT4 restoration activities within the Rocky Mountain Forest District
- Minimize/reduce noxious weed infestations and spread.

³ Natural Disturbance Type 4 is influenced by frequent, stand-maintaining fires.

RESTORATION ASSUMPTIONS:

- It is desirable to re-introduce periodic stand-maintaining fires into the reserve ecosystems as both a management tool and as an integral component of the dry ecosystems found there. Re-introduction of fire could occur approximately five years following manual/mechanical treatments to reduce fuel loads. This would allow for a significant vegetation (herbaceous/shrub) response to carry the fire.
- All existing old growth wildlife trees and snags greater than 30cm dbh should be preserved during treatments through:
 - Maintaining no treatment zones and leaving thickets around dangerous snags.
 - Ensuring snags are preserved during prescribed burns by removing accumulations of combustible material from the base of the snag prior to prescribed burning, where inspections indicate this is required.
 - Ensuring that snags are not removed for firewood
- High slash volumes must be abated to reduce the impact of possible wildfires as well as to ensure ease of travel by ungulate species during the critical winter months and to create growing space for understory species. It is preferable to reduce slash loading through removal of volume in the form of merchantable product. However, since there will be limited or no commercial removal, slash loading will be abated through either mastication or by piling and burning, where accumulations are deemed to be excessive.
- Current timber volumes on site have marginal economic viability and should not be counted on to offset the cost of treatment activities. Further, the majority of the large diameter trees on site are ecologically desirable for structure, both current and future, and should not be removed from site.
- It is understood that structural diversity is desirable post-restoration. Through snag retention, patches and strategically placed reserves up to 10-15% of each treatment polygon may be left untreated to maintain thicket habitat dispersed throughout the reserve. Thickets may range from 0.1ha up to 5 ha in size.
- Noxious weed control is to be viewed as an ongoing issue and must be diligently completed on an annual basis. Therefore noxious weed control is not provided for in the annual restoration planning/scheduling and is assumed to be completed outside of this treatment plan.
- The Aksiqnuq community and band members will benefit from the reduced risk of wildfire as the restoration plan is implemented and will also gain valued employment and training opportunities by participating in the plan's implementation.

PLANNING METHODOLOGY

This plan was developed as per the following process:

1. A field reconnaissance of the reserve was initially conducted to determine:
 - a. Existing stand structure/composition as a consequence of historic treatments, including logging in the 1950's, Christmas tree harvesting and historic spacing treatments
 - b. Stump densities from 1950's harvesting, which provides a reflection of the original pre-contact stand structure and composition
 - c. Road/trail locations that may be used for treatment access as well as fireguard locations
 - d. Understory vegetation composition
 - e. Wildlife tree locations and classification
 - f. Noxious/Invasive plant distribution

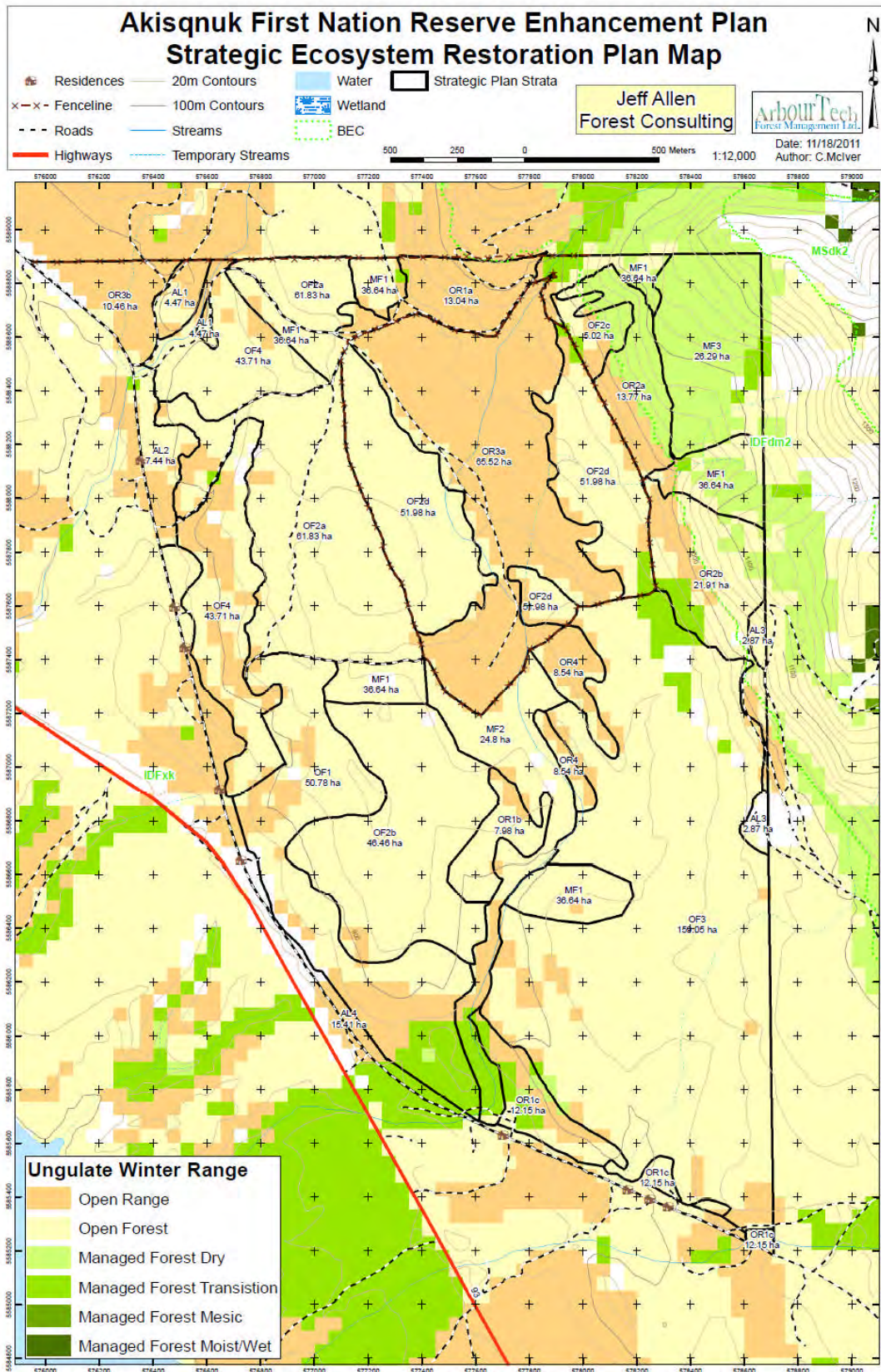
2. Post- reconnaissance, strata were confirmed and detailed information collection was undertaken based on pre-mapped 200 X 200 metre grid of the reserve and selection of 38 plot locations (Sample design was based on the April, 2009 Forest Practices Branch *Silvicultural Survey Procedures Manual*):
 - a. A minimum of three 5.64 m radius sample plots were established to determine tree density data (employing prism sweeps), tree species and diameter per treatment unit stratum. At these sample plots, tree counts and vegetation data were collected. A soil pit was dug at one plot per treatment unit stratum. An additional four tree count plots were established per treatment unit stratum. Additional observational data such as animal tracks and other signs of use were collected.
 - b. Five photos were taken at each sample plot, one in each cardinal direction, unless conditions dictate alternate view(s) and one vertical.
 - c. Additional photos were taken to augment the plot photos and to aid in further describing the project area, as required.
 - d. Plot data was summarized, analyzed and assessed for validity
 - e. Treatment Unit boundaries were confirmed by the Project Team in consultation with the Project Steering Committee
 - f. Treatment Units selected for the first year of treatments were laid out on the ground with pink and blue flagging tape and considered potential fireguard locations
 - g. Leave areas (areas which will not be treated, such as wildlife tree patches, no work zones, riparian areas and currently open areas not requiring enhancement) within the Treatment Units selected for the first year of treatments were clearly marked with yellow flagging tape. Leave areas were not characterized.
 - h. The perimeters of Treatment Units selected for the first year of treatments and leave areas within them (over one hectare in size) were GPS'ed.
 - i. Invasive plants species, density and distribution codes and GPS location were recorded.
 - j. Wildlife trees encountered during the course of the field study were classified on form and degree of decay ((Classes 1-9; Fenger et. al. 2006).
3. Findings were mapped at a scale of approximately 1:12,000
4. Existing stands were assigned a treatment regime that would be required prior to the re-introduction of fire into the ecosystem (where fire is prescribed).
5. Planning was completed on two levels:
 6. The first level of planning involved the creation of larger scale units, up to approximately 100 ha in size, which are, or may easily be, encompassed by fireguards (that is, complete, stand-alone prescribed burn units). As much as possible, existing roads and trails were used as potential fireguards. However, where required, sections of guard requiring construction are identified. This plan assumes that minimal new fireguard construction is desirable both to limit access and noxious weed establishment.
 7. The second level of planning is at the sub-unit level of the larger burn units. These smaller, stand-level units, are stratified primarily on current forest cover and for ease of treatment required prior to the re-introduction of fire, where it will be utilized.
 8. Follow up to this plan is to complete additional prescriptions prior to on-ground treatments in future funding cycles, i.e., years two, three and so on. This will primarily entail setting various post-treatment stocking levels throughout each polygon, based on the priority established for completing each unit.
 9. The time horizon of the plan will allow for all mechanical/manual thinning and harvesting treatments to be completed and to be followed up by one initial post treatment burn and one follow-up burn in approximately 10-12yrs.
 10. The plan attempts to maintain activity based on an annual budget of approximately \$60,000 through its first phase. Mechanical and manual thinning treatments will be completed over the entire project area on the basis of priorities set in the plan. Following that, a budget for maintenance,

comprised of burning or future follow-up hand treatments, will be required. The potential for commercial logging, although limited and less desired by Akisqnuk members, is also considered and is described.

RESULTS

A number of conventions were applied in creating the polygon map (Figure 4 below). The project area was stratified into polygons based on the vegetation characteristics revealed during data collection. There are three basic strata, coincident with those identified in the NDT4 Guidelines, namely Open Range (OR), Open Forest (OF) and Managed Forest (MF). Note: the designations indicate the desired state of the polygon for the life of this plan. A fourth designation shows alienated land (AL) which has been considerably altered from its natural state and which will not be considered for treatment. These sites are occupied by a gravel pit, a rock quarry and a mill site for the rock quarry. A fifth designation, Riparian (R), denotes the small stream adjacent to the gated access road at the north end of the plan area.

Figure 5. Map of vegetation polygons on the Akisqnuq First Nation Reserve.



POLYGON OR 1

Description

Polygons OR 1 consists of current open range areas or areas where treatments will re-create an open range condition. These areas are generally harsh, sparsely-vegetated, steep south-, southwest- or west-facing slopes in the north central and southwest portion of the project area. This type is designated within Ungulate Winter Range Order U-4-008 as Open Range.

Polygon OR1 areas are primarily site series 83 with low existing crown closure of Douglas-fir, estimated at <15%. Ingress in these areas has been slow but steady over the past century resulting in approximately 100 conifers per ha ranging in age from 20 to 100 years and heights of 1 to 15m. Vegetation is dominated by herbaceous species including bluebunch wheatgrass, junegrass and needle-and-thread grass. The primary shrub species, Rocky Mountain Juniper, is dispersed throughout the polygon at variable densities. Townsends hookeri and Scarlet Globe-Mallow, both red listed species, have been identified within this unit. Figure 5 shows photo examples of the OR1 type.

There are dispersed low density wildlife trees on site. These should be maintained during treatments.

Current crown closure is low but, if left unchecked, ingress will accelerate as each existing conifer creates a shaded micro-climate for tree germination. Therefore, though they have low stocking, these areas are considered to be a priority for treatment to halt this ingress. Further, these site series are identified as including Red Listed plant communities and the polygons are therefore considered a high priority for conservation. Treatments will be cheap and easy if done early, as slash loading will not warrant abatement. Slash will be lopped and scattered and allowed to decompose on site.

Treatment objectives are to maintain and/or enhance the structure of the polygons by reducing the presence of conifers to a minimum number, as dictated by practicality. One of the OR1 polygons is laid out and slated for treatment at the present time. A minimum of effort will be required to maintain the desired structural state.

Figure 6. Examples of Polygon OR1.



POLYGON OR 2

Description

Polygons OR2 consist of current open range areas or areas where treatments will re-create an open range condition. These areas are harsh, sparsely-vegetated, steep southwest- or west-facing slopes interspersed with rock bands in the northeast quadrant of the project area. This type is designated within Ungulate Winter Range Order U-4-008 as primarily Open Range.

Polygon OR2 is dominated by site series Ro01. As with OR 1, ingress has been steady over the past century resulting in increasing levels of Douglas-fir variably distributed over the polygon. Stand structure is multi-layered/multi-aged with approximately 455 total conifers per ha, ranging in age from 23-96 years and with heights ranging from 0.5m to 11m. Layer 1 stems have an average diameter of approximately 30cm. Crown closure within this polygon is estimated at 25%, which is well over the maximum of 10% for this ecosystem component under the Kootenay Boundary Land Use Plan-Implementation Strategy (KBLUP-IS).

Herbaceous vegetation is dominated by grass species including bluebunch wheatgrass and junegrass. Shrub species include chokecherry and Rocky Mountain juniper. These site series are identified as including Red Listed plant communities and the polygons are therefore considered a high priority for conservation. Generally, these polygons have experienced relatively little ingrowth/ingress of conifers (only scattered Douglas-fir of various size classes). Figure 6 shows a photo example of the OR 2 type.

Treatment objectives are to maintain and/or enhance the structure of the polygon by reducing the presence of conifers to a minimum number, as dictated by practicality. As well, this polygon will be prescribed for pruning of the layer 1 and 2 stems that are considered, for logistical reasons, too large to fall (terrain makes abatement of large volumes of slash impractical). A further slashing and pruning objective is to increase sight lines within the type to promote Rocky Mountain bighorn sheep habitat. Treatment is considered a high priority; a minimum of effort will be required to maintain the desired structural state. One of the OR2 polygons is laid out and slated for treatment at the present time.

Figure 7. Examples of Polygon OR2.



POLYGON OR 3

Description

Polygons OR3 consists of existing open range areas that are occupied by human activity and are therefore not considered for treatments. The majority of this polygon, located in the north central portion of the project area, is within a Certificate of Possession (CP). Specifically, the CP is under Plan 57895 Lot 34 2000988. The small unit located in the northwest corner of the plan area currently is occupied by a housing unit. Both areas have been heavily impacted by previous anthropogenic activities, including seeding with agronomic species. Further, the ecology of the CP has been highly impacted by topsoil removal. This type is designated within Ungulate Winter Range Order U-4-008 as primarily Open Range. Figure 7 shows a photo example of the OR 3 type.

No survey activities were completed within these areas.

These areas will contribute to the open range budget of the plan area but are not specifically included in treatment scheduling.

Figure 8. Examples of Polygon OR3 (in midground).



POLYGON OR 4

Description

Polygon OR 4 consists of current open range areas or areas where treatments will re-create an open range condition. This area is located immediately to the south of and contiguous to OR 3 but has not been negatively impacted in the same manner as OR 3. This type is designated within Ungulate Winter Range Order U-4-008 as primarily Open Range.

Polygon OR 4 is dominated by site series 84. The terrain, which is a low, neutral slope, distinguishes this polygon from OR 1. There has been relatively light ingress in this unit which requires no treatments in the short term.

Herbaceous vegetation is dominated by grass species, including spreading needlegrass, bluebunch wheatgrass and junegrass. Shrub species include snowberry and Rocky Mountain juniper. These site series are identified as including Red Listed plant communities and the polygons are therefore considered a high priority for conservation.

Treatment objectives are to maintain and/or enhance the structure of the polygon by reducing the presence of conifers to a minimum number, as dictated by practicality. A minimum of effort will be required to maintain the desired structural state.

POLYGON OF 1

Description

Polygon OF 1 consists of current open to closed forest areas interspersed with pockets of open range. These areas are generally well-vegetated, gentle southwest- or west-facing slopes that occupy a horseshoe-shaped area in the southwest of the project area. This type is designated within Ungulate Winter Range Order U-4-008 as dispersed Open Forest/Open Range.

Site series 01/03 dominates the type with an overstory exclusively of Douglas fir. The majority of this polygon has been impacted by historical harvesting and especially Christmas tree management. As a result the majority of the stems in layers 2 and 3 have forks and crooks, which reduces the timber potential throughout the unit. As well, the layer 1 and 2 stems have a high level of stem cankers which again reduces any timber value of the stand. Stocking levels are estimated at 1950 total trees per ha, including 200 layer 1 stems, 450 layer 2, 1100 layer 3, and 200 Layer 4 contributing to an estimated current crown closure of 59%. This exceeds the re-entry target crown closure for the open range (10%) and open forest (40%) component within KBLUP-IS.

Typical understory vegetation composition is a shrub understory of Rocky Mountain juniper, Saskatoon and rose and a herbaceous component dominated by bluebunch wheatgrass, junegrass and needle-and-thread grass (rough fescue does occur). Forbs include wild blue flax, pasture sage, lemonweed and rosy pussytoes. Figure 8 shows a photo example of the OF 1 type.

These site series are identified as including Red Listed plant communities and the polygons are therefore considered a high priority for conservation.

Generally, this polygon has experienced both ingrowth/ingress of conifers. Treatment objectives are to alter the structure of the polygon by reducing the presence of conifers to low end open forest/open range densities, as dictated by practicality.

Figure 9. Example of Polygon OF 1.



POLYGON OF 2

Description

Polygons OF 2 consist of open to closed forest areas interspersed with small areas of open range, similar to Polygon OF 1 but aspects are more variable than in OF 1, which has generally warm aspects. This polygon includes essentially all aspects at a meso-slope level. Two polygons in the west occupy complex topography composed of ridges and draws with a variety of aspects. An additional polygon in the northeast of the project area occupies a relatively steep slope which generally faces west. Two polygons lie within the CP in the centre of the project area. Polygon OF 2 is designated within Ungulate Winter Range Order U-4-008 as Open Forest.

Site series within this polygon ranges from 03 to 01 based primarily on aspect. The overstory is exclusively Douglas-fir with a density of 3643 Douglas-fir per ha, including 571 layer 1, 5141 layer 2, 900 layer 3 and 1657 layer 4 sph, with an additional 329 Rocky Mountain Juniper per ha contributing to an estimated current crown closure of 54%. This exceeds the re-entry target crown closure for the open range (10%) and open forest (40%) component within KBLUP-IS. As with the majority of the project area, this polygon has seen extensive harvesting and Christmas tree activities in the past resulting in the current stand structure, including, as indicated above, extensive crooks, forks and canker disease.

Vegetation includes a shrub component of Rocky Mountain juniper, Saskatoon and rose and a herbaceous component dominated by bluebunch wheatgrass, junegrass and needle-and-thread grass (rough fescue occurs). Forbs include wild blue flax, pasture sage, lemonweed and rosy pussytoes. Figure 9 shows a photo example of the OF 2 type.

These site series are identified as including Red Listed plant communities and the polygons are therefore considered a high priority for conservation.

Generally, these polygons are well-forested with both ingrowth/ingress of conifers. Three of the OF2 polygons are laid out and slated for treatment at the present time. Treatment objectives for the polygons in the west are to alter the structure of the polygons by reducing the presence of conifers to open forest densities. Two polygons were created in this area to provide flexibility for canopy-reduction treatment and also for the potential of prescribed burning. The polygons can be either treated separately or together, as funding and circumstances may dictate. Treatment objectives for the small, westerly facing OF 2 polygon in the northeast is similar, that is, to reduce the presence of conifers to low end open forest densities.

The two polygons which lie in the CP (OF2-D) could be treated in the future, pending an agreement with the CP holder, thereby creating contiguous areas of open habitat across the reserve. The desired condition for the polygon in the northeast is similar to that for the balance of the OF2. However, the size and age class of the trees on it create a situation more conducive to commercial harvest at a point in the future.

Figure 10. Example of Polygon OF 2.



POLYGON OF 3

Description

Polygon OF 3, which occupies the southeasterly one-quarter of the project area, consists primarily of closed forest areas interspersed with areas of open forest and open range. It is similar to OF 2 but has higher crown closure. Polygon OF 3 is designated within Ungulate Winter Range Order U-4-008 as Open Forest.

Site series range from 01-04. The overstory is exclusively Douglas fir, with an estimated density of 2463 sph, including 413 layer 1, 438 layer 2, 863 layer 3 and 725 layer 4 sph and a crown closure of 62%. As can be seen from this layer distribution, the difference between polygon OF 3 and polygon OF 2 is a doubling of the number of layer 4 stems and an increase in crown closure of 7%. The latter indicates larger crowned stems. As with OF 2, this polygon has also seen harvesting and Christmas treeing activity, typical in the Trench.

Commonly-occurring shrubs were snowberry and rose with some Saskatoon. The herbaceous component was highly variable, depending upon the amount of forest canopy. Regardless, pinegrass occurred frequently, as did kinnikinnick, birch-leaved spirea, and spreading needlegrass. Several asters also were frequently found, as was spikelike goldenrod. An understory dominated by moss occupied many of the north- and east-facing slopes. Figure 10 shows a photos example of the OF 3 type.

Generally, this polygon is well-forested with considerable areas of ingrowth/ingress of conifers. Treatment objectives are to alter the structure of the polygon to open forest(medium?)/high end open forest densities. The size and age class of the trees on the site provide the potential for some commercial harvest as well as spacing/slashing treatments.

Figure 11. Example of Polygon OF 3.



POLYGON OF 4 (DEFERRED)

Description

Polygons OF 4 occur in the northwest and west of the project area, separated by a narrow (~100 m wide) band of OF 2. Edaphically and within Ungulate Winter Range Order U-4-008, this polygon would be classified as an Open Forest Polygon. However, these sites are comprised of complex topography, with slopes up to 70% and a variety of aspects. As well, field investigation shows that these two areas support significant numbers of wildlife trees. It is anticipated, based on observed historical activity, that if this area is opened up, the existing wildlife trees would be subject to removal by firewood cutters. Therefore, even though this area is edaphically Open Forest, it will be maintained as a wildlife tree patch at Managed Forest densities, in order to protect the existing wildlife trees.

Vegetation is highly variable with an overstory exclusively of Douglas fir. On shady slopes, pinegrass dominates the understory, although mossy areas frequently occur. On drier, sunny slopes, an understory of shrubs like Rocky Mountain juniper, saskatoon and rose overtop the herbaceous component which is dominated by bluebunch wheatgrass, junegrass and needle-and-thread grass (rough fescue does occur). Forbs include wild blue flax, pasture sage, lemonweed and rosy pussytoes. Site series01-05 dominates these areas. Figure 11 shows photo examples of the OF 4 type.

Generally, these polygons will act as forested refuges/large wildlife tree patches. No treatment for conifer removal is proposed at this time.

The narrow polygon immediately to the east of Kootenay No. 3 Road has not been slated for restoration treatment, given the complex situation of alienated, occupied and potentially occupied land. Values in this area are primarily human-related. Therefore, treatment for fire interface should be considered to provide additional protection to that which will accrue from the nearby restoration treatments.

Figure 11. Example of Polygon OF 4.



POLYGON MF 1

Description

Polygons MF 1 occur at two locations along the northerly project area boundary, two locations in the center (west and south of the CP), and two in the northeast. These sites are northerly aspects or shady swales which are cool, damp and conducive to tree growth. These types have mostly been identified within Ungulate Winter Range Order U-4-008 as managed forest transitional polygons.

The overstory is exclusively Douglas fir with a pinegrass and moss-dominated understory. Site series 05 dominates these areas, with minor 06 types on the flatter receiving areas (mostly in the two polygons along the northwest boundary of the plan area). Stocking is estimated at 2300 total sph, including 1000 layer 1, 700 layer 2, 500 layer 3 and 100 layer 4. Figure 12 shows a photo example of the MF 1 type.

Generally, these polygons act as forested refuges. Ungulate trails and bedding sites throughout the type indicates high use. No treatment for conifer removal is proposed.

Figure 12. Example of Polygon MF 1.



POLYGON MF 2

Description

Polygons MF 2 has two geographic locations. The first is a long, sinuous drainage feature in the south central portion of the project area. This area is a receiving site which is cool and damp. The second area is the riparian/receiving area along the stream transecting the plan area in the extreme northwest corner. Portions of this polygon are identified as managed forest transitional in Ungulate Winter Range Order U-4-008, but primarily the mapping scale of the order did not identify this type.

The overstory supports aspen and spruce, along with Douglas fir. Snowberry was a commonly-occurring shrub; red-osier dogwood and paper birch were found along with rose. A variety of native and non-native grasses occurred, with species reflecting the moisture regime. In the wettest site, grasses included bluejoint and redtop, with asters, wild sarsaparilla, common horsetail appearing as forbs. Site series 06/07 dominates these areas. Figure 13 shows a photo example of the MF 2 type.

Generally, these polygons act as productive forested refuges/biodiversity patches. Ungulate trails and bedding sites throughout the type indicates high use. No treatment for conifer removal is proposed. It is anticipated that succession over time will lead to a greater abundance of spruce and aspen.

Figure 12. Example of Polygon MF 2 (note spruce in background).



POLYGON MF 3

Description

Polygon MF 3, located in the northeast corner of the plan area, lies on a bench immediately above OF 2-C (which is scheduled for treatment to improve sight lines and maintain bluebunch communities). MF 4 is mapped as Managed Forest Dry under Ungulate Winter Range Order U-4-008. The VRI label indicates that the area was harvested in 1950, this was corroborated by personal communication with band members during the site tour. This unit is located in the IDFdm2/IDFxfk transition zone. Figure 14 shows a photo example of the MF 3 type.

Potential may exist to log this polygon at a point in the future, once the tree volume has increased. Access poses a challenge.

Figure 14. Example of Polygon MF 3.



POLYGON RIPARIAN 1

This polygon consists of the riparian area associated with an S6 stream, which transects the plan area in the northwest corner. No treatment is proposed for this area.

POLYGON ALIENATED 1, 2 AND 3

Description

These polygons consist of 3 areas that have been modified beyond any restoration activities anticipated within the plan. They are:

AL1: This area is currently a sawmill site and is dominated by a log yard, sawdust piles and associated structures.

AL2: This area, located along Kootenay Road number 3 in the northwest corner of the plan area, is an existing gravel pit approximately 8m deep.

AL3: This area consists of two separate but associated polygons, one (the northerly) is an existing rock quarry and the area to the south is the mill site for the quarry.

AL4: This area consists of current and future sub-divisions. The area should be treated under the existing Akisqnuq First Nation Community Wildfire Protection Plan, with interface funding as opposed to wildlife habitat funding sources.

Table 12. Planning table sorted by treatment year.

Treatment Unit	Estimated Ha	Primary Site Series Number	BC Conservation Data Base Status	Structural Target	Treatment	Estimated Cost Per Ha (\$)	Estimated Total Cost (\$)	Priority for Treatment	Treatment Year	Annual Budget
OR1-A	13.06	IDFxk 83	Red	OR	Slash (lop & scatter)	\$ 200.00	\$ 2,612.00	Mod	2012	
OR2-A	13.77	IDFxk Ro01/IDFsm2 03	Red	OR	Slash and prune (lop & scatter)	\$ 500.00	\$ 6,885.00	Mod	2012	
OF2-A	61.83	IDFxk03/01	Red	OF	Slash (pile & burn or masticate)	\$ 1,200.00	\$ 74,196.00	High	2012	
OF2-C	5.02	IDFxk03	Red	OF	Slash and prune (pile & burn)	\$ 650.00	\$ 3,263.00	High	2012	\$ 86,956.00
OF2-A	61.83	IDFxk03/01	Red	OF	Burn slash	\$ 350.00	\$ 21,640.50	High	2013	
OF2-C	5.02	IDFxk03	Red	OF	Burn slash	\$ 350.00	\$ 1,757.00	High	2013	\$ 23,397.50
OR1-B	7.98	IDFxk 83	Red	OR	Slash (pile & burn or masticate)	\$ 350.00	\$ 2,793.00	Mod	2014	
OR1-C	12.15	IDFxk 83	Red	OR	Slash (pile & burn or masticate)	\$ 350.00	\$ 4,252.50	Mod	2014	
OR2-B	21.91	IDFxk Ro01/IDFsm2 03	Red	OR	Slash (lop & scatter)	\$ 500.00	\$ 10,955.00	Mod	2014	

Treatment Unit	Estimated Ha	Primary Site Series Number	BC Conservation Data Base Status	Structural Target	Treatment	Estimated Cost Per Ha (\$)	Estimated Total Cost (\$)	Priority for Treatment	Treatment Year	Annual Budget
OR4	8.54	IDFk 83	Red	OR	Slash (lop & scatter)	\$ 200.00	\$ 1,708.00	Low	2014	
OF1	50.78	IDFk 01/03	Red	OR/OF	Slash (pile & burn or masticate)	\$ 1,000.00	\$ 50,780.00	High	2014	
OF2-B	46.46	IDFk03/01	Red	OF	Slash (pile & burn or masticate)	\$ 1,000.00	\$ 46,460.00	High	2014	\$ 116,948.50
OR1-B	7.98	IDFk 83	Red	OR	Burn slash	\$ 350.00	\$ 2,793.00	High	2015	
OR1-C	12.15	IDFk 83	Red	OR	Burn slash	\$ 350.00	\$ 4,252.50	High	2015	
OF1	50.78	IDFk 01/03	Red	OR/OF	Burn slash	\$ 350.00	\$ 17,773.00	High	2015	
OF2-B	46.46	IDFk03/01	Red	OF	Burn slash	\$ 350.00	\$ 16,261.00	High	2015	\$ 41,079.50
OF3-A	39.76	IDFk03/01	Red	OF	Slash (pile & burn or masticate) Potential for Harvest	\$ 1,200.00	\$ 47,712.00	High	2016	\$ 47,712.00
OF3-A	39.79	IDFk03/01	Red	OF	Burn slash	\$ 350.00	\$ 13,926.50	High	2017	\$ 13,926.50
OF3-B	39.76	IDFk03/01	Red	OF	Slash (pile & burn or masticate) Potential for Harvest	\$ 1,200.00	\$ 47,712.00	High	2018	\$ 47,712.00

Treatment Unit	Estimated Ha	Primary Site Series Number	BC Conservation Data Base Status	Structural Target	Treatment	Estimated Cost Per Ha (\$)	Estimated Total Cost (\$)	Priority for Treatment	Treatment Year	Annual Budget
OF3-B	39.76	IDFk03/01	Red	OF	Burn slash	\$ 350.00	\$ 13,916.00	High	2019	\$ 13,916.00
OF3-C	39.76	IDFk03/01	Red	OF	Slash (pile & burn or masticate) Potential for Harvest	\$ 1,200.00	\$ 47,712.00	High	2020	\$ 47,712.00
OF3-C	39.76	IDFk03/01	Red	OF	Burn slash	\$ 350.00	\$ 13,916.00	High	2021	\$ 13,916.00
OF3-D	39.76	IDFk03/01	Red	OF	Slash (pile & burn or masticate) Potential for Harvest	\$ 1,200.00	\$ 47,712.00	High	2022	\$ 47,712.00
OF3-D	39.76	IDFk03/01	Red	OF	Burn slash	\$ 350.00	\$ 13,916.00	High	2023	\$ 13,916.00
OF2-A	61.83	IDFk03/01	Red	OF	Broadcast Burn	\$ 200.00	\$ 12,366.00	High	2024	
OF2-B	46.45	IDFk03/01	Red	OF	Broadcast Burn	\$ 200.00	\$ 9,290.00	High	2024	\$ 21,656.00
OR4	8.54	IDFk 83	Red	OR	Broadcast Burn	\$ 200.00	\$ 1,708.00	High	2028	
OF3-A,B,C,D	159.05	IDFk03/01	Red	OF	Broadcast Burn	\$ 200.00	\$ 31,810.00	High	2028	\$ 33,518.00

Treatment Unit	Estimated Ha	Primary Site Series Number	BC Conservation Data Base Status	Structural Target	Treatment	Estimated Cost Per Ha (\$)	Estimated Total Cost (\$)	Priority for Treatment	Treatment Year	Annual Budget
MF3	26.29	IDFdm2 01/05		MF	Harvest	\$ -	\$ -	Low	2040	
OF2-D	51.99	IDFk03/01	Red	OF	No treatment without agreement of CP holder (alienated)	\$ -	\$ -	N/A	N/A	
OF4	16.38	IDFk03/01	Red	MF Short Term OF Long Term	Defer treatment. Wildlife Tree Patch	\$ -	\$ -	High	N/A	
MF2	24.8	IDFk/IDFdm2 01/05	Blue	MF	Maintain as is	\$ -	\$ -	N/A	N/A	
MF1-A,B,C	35.84	IDFk/IDFdm2 01/05		MF	Maintain as is	\$ -	\$ -	N/A	N/A	
OR3-A	66.3	IDFk 83ms		OR	No treatment (alienated)	\$ -	\$ -	N/A	NA	
OR3-B	10.46	IDFk 83ms		OR	No treatment (alienated)	\$ -	\$ -	N/A	NA	
AL1	3.74	NA	NA	NA	NA	NA		NA	NA	
AL2	1.65	NA	NA	NA	NA	NA		NA	NA	
AL3	2.87	NA	NA	NA	NA	NA		NA	NA	
AL4	20.91	IDFk 04	NA	NA	NA	NA		NA	NA	

Treatment Unit	Estimated Ha	Primary Site Series Number	BC Conservation Data Base Status	Structural Target	Treatment	Estimated Cost Per Ha (\$)	Estimated Total Cost (\$)	Priority for Treatment	Treatment Year	Annual Budget
R1	3.29	IDFxk06/07	N/A	NA	No Treatment			NA	NA	
TOTALS	690.32						\$ 570,078.00			

Table 7. Planning table sorted by Treatment Unit.

Treatment Unit	Estimated Ha	Primary Site Series Number	BC Conservation Data Base Status	Structural Target	Treatment	Estimated Cost Per Ha (\$)	Estimated Total Cost (\$)	Priority for Treatment	Treatment Year
OR1-A	13.06	IDFxk 83	Red	OR	Slash (lop & scatter)	\$ 200.00	\$ 2,612.00	Mod	2012
OR1-B	7.98	IDFxk 83	Red	OR	Slash (pile & burn or masticate)	\$ 350.00	\$ 2,793.00	Mod	2014
OR1-B	7.98	IDFxk 83	Red	OR	Burn slash	\$ 350.00	\$ 2,793.00	High	2015
OR1-C	12.15	IDFxk 83	Red	OR	Slash (pile & burn or masticate)	\$ 350.00	\$ 4,252.50	Mod	2014
OR1-C	12.15	IDFxk 83	Red	OR	Burn slash	\$ 350.00	\$ 4,252.50	High	2015
OR2-A	13.77	IDFxk Ro01/IDFsm2 03	Red	OR	Slash and prune (lop & scatter)	\$ 500.00	\$ 6,885.00	Mod	2012
OR2-B	21.91	IDFxk Ro01/IDFsm2 03	Red	OR	Slash (lop & scatter)	\$ 500.00	\$ 10,955.00	Mod	2014
OR3-A	66.3	IDFxk 83ms		OR	No treatment (alienated)	\$ -	\$ -	N/A	NA
OR3-B	10.46	IDFxk 83ms		OR	No treatment (alienated)	\$ -	\$ -	N/A	NA

Treatment Unit	Estimated Ha	Primary Site Series Number	BC Conservation Data Base Status	Structural Target	Treatment	Estimated Cost Per Ha (\$)	Estimated Total Cost (\$)	Priority for Treatment	Treatment Year
OR4	8.54	IDFk 83	Red	OR	Slash (lop & scatter)	\$ 200.00	\$ 1,708.00	Low	2014
OR4	8.54	IDFk 83	Red	OR	Broadcast Burn	\$ 200.00	\$ 1,708.00	High	2028
OF1	50.78	IDFk 01/03	Red	OR/OF	Slash (pile & burn or masticate)	\$ 1,000.00	\$ 50,780.00	High	2014
OF1	50.78	IDFk 01/03	Red	OR/OF	Burn slash	\$ 350.00	\$ 17,773.00	High	2015
OF2-A	61.83	IDFk03/01	Red	OF	Slash (pile & burn or masticate)	\$ 1,200.00	\$ 74,196.00	High	2012
OF2-A	61.83	IDFk03/01	Red	OF	Burn slash	\$ 350.00	\$ 21,640.50	High	2013
OF2-A	61.83	IDFk03/01	Red	OF	Broadcast Burn	\$ 200.00	\$ 12,366.00	High	2024
OF2-B	46.46	IDFk03/01	Red	OF	Slash (pile & burn or masticate)	\$ 1,000.00	\$ 46,460.00	High	2014
OF2-B	46.46	IDFk03/01	Red	OF	Burn slash	\$ 350.00	\$ 16,261.00	High	2015
OF2-B	46.45	IDFk03/01	Red	OF	Broadcast Burn	\$ 200.00	\$ 9,290.00	High	2024

Treatment Unit	Estimated Ha	Primary Site Series Number	BC Conservation Data Base Status	Structural Target	Treatment	Estimated Cost Per Ha (\$)	Estimated Total Cost (\$)	Priority for Treatment	Treatment Year
OF2-C	5.02	IDFxk03	Red	OF	Slash and prune (pile & burn)	\$ 650.00	\$ 3,263.00	High	2012
OF2-C	5.02	IDFxk03	Red	OF	Burn slash	\$ 350.00	\$ 1,757.00	High	2013
OF2-D	51.99	IDFxk03/01	Red	OF	No treatment without agreement of CP holder (alienated)	\$ -	\$ -	N/A	N/A
OF3-A	39.76	IDFxk03/01	Red	OF	Slash (pile & burn or masticate) Potential for Harvest	\$ 1,200.00	\$ 47,712.00	High	2016
OF3-A	39.79	IDFxk03/01	Red	OF	Burn slash	\$ 350.00	\$ 13,926.50	High	2017
OF3-A, B, C, D	159.05	IDFxk03/01	Red	OF	Broadcast Burn	\$ 200.00	\$ 31,810.00	High	2028
OF3-B	39.76	IDFxk03/01	Red	OF	Slash (pile & burn or masticate) Potential for Harvest	\$ 1,200.00	\$ 47,712.00	High	2018
OF3-B	39.76	IDFxk03/01	Red	OF	Burn slash	\$ 350.00	\$ 13,916.00	High	2019
OF3-C	39.76	IDFxk03/01	Red	OF	Slash (pile & burn or masticate) Potential for Harvest	\$ 1,200.00	\$ 47,712.00	High	2020

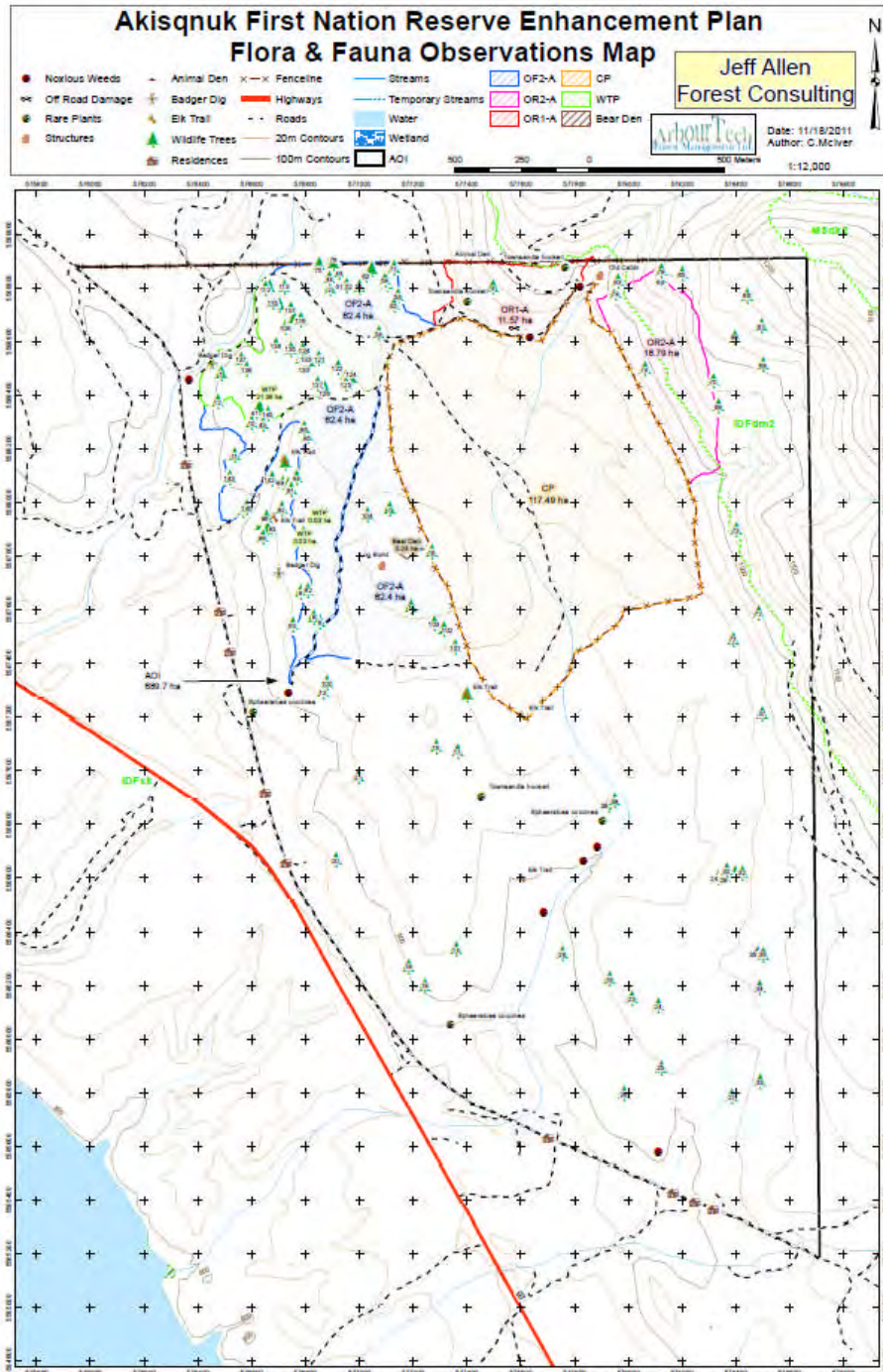
Treatment Unit	Estimated Ha	Primary Site Series Number	BC Conservation Data Base Status	Structural Target	Treatment	Estimated Cost Per Ha (\$)	Estimated Total Cost (\$)	Priority for Treatment	Treatment Year
OF3-C	39.76	IDFk03/01	Red	OF	Burn slash	\$ 350.00	\$ 13,916.00	High	2021
OF3-D	39.76	IDFk03/01	Red	OF	Slash (pile & burn or masticate) Potential for Harvest	\$ 1,200.00	\$ 47,712.00	High	2022
OF3-D	39.76	IDFk03/01	Red	OF	Burn slash	\$ 350.00	\$ 13,916.00	High	2023
OF4	16.38	IDFk03/01	Red	MF Short Term OF Long Term	Defer treatment. Wildlife Tree Patch	\$ -	\$ -	High	N/A
MF2	24.8	IDFk/IDFdm2 01/05	Blue	MF	Maintain as is	\$ -	\$ -	N/A	N/A
MF3	26.29	IDFdm2 01/05		MF	Harvest	\$ -	\$ -	Low	2040
MF1-A,B,C	35.84	IDFk/IDFdm2 01/05		MF	Maintain as is	\$ -	\$ -	N/A	N/A
AL1	3.74	NA	NA	NA	NA	NA		NA	NA
AL2	1.65	NA	NA	NA	NA	NA		NA	NA
AL3	2.87	NA	NA	NA	NA	NA		NA	NA
AL4	20.91	IDFk 04	NA	NA	NA	NA		NA	NA

Treatment Unit	Estimated Ha	Primary Site Series Number	BC Conservation Data Base Status	Structural Target	Treatment	Estimated Cost Per Ha (\$)	Estimated Total Cost (\$)	Priority for Treatment	Treatment Year
R1	3.29	IDFxk06/07	N/A	NA	No Treatment			NA	NA
TOTALS	690.32						\$ 570,078.00		

OBSERVATIONS OF FLORA AND FAUNA

During the course of this project, numerous observations of flora and fauna were made and recorded. Information of note, such as the location of wildlife trees, wildlife sign and rare plants, is provided in Figure 14 (below). The UTM coordinates of wildlife trees, noxious weed infestations and rare plants are provided in Appendices 1, 2 and 4, respectively.

Figure 15. Map of flora and fauna observed on the Akisqnuq Reserve.



RECOMMENDATIONS

1. The Akisqnuk First Nation Reserve currently has infestations of the noxious weeds spotted knapweed, diffuse knapweed, giant burdock and hound's-tongue. The ecosystems on the reserve are at risk from spread of these weeds and it is imperative that noxious weed treatment be undertaken prior to implementing the ecosystem restoration initiative :
 - a. hand and mechanical treatment should be undertaken along roads to be travelled for restoration purposes to reduce the risk of spread by vehicular traffic
 - b. chemical treatment should be undertaken along these roads annually at a time when plants are vulnerable
 - c. a noxious weed inventory for the reserve should be undertaken, a noxious weed management plan should be written and ongoing treatment should be implemented

Teaching band members to identify noxious weeds and increasing their awareness of the impact these plants have upon native ecosystems and wildlife habitat should be considered.

2. Vehicular use of the Akisqnuk First Nation Reserve appears to be uncontrolled, likely leading to the spread of noxious weeds. It is suggested that a vehicular management/control system be considered whereby vehicle use is restricted to existing roads.
3. Wildlife trees are at risk from firewood cutters. This is a primary reason for maintaining the two OF2D polygons as untreated, thereby hiding and protecting the numerous wildlife trees therein. Teaching band members the value of these rare habitat features is suggested.
4. Polygons OR1B, OR1C, OF1 and OF2B should be considered as high priorities for prescription, layout and treatment. Completing the westerly portion of the project area in the early years of the project will serve a significant role in protecting the interface with the dwellings along No. 3 Road and future development of the subdivision area. The polygons
5. Treating polygon OF2D alongside Kootenay No. 3 Road should be considered as a high priority for fireproofing the dwellings along No. 3 Road and future development of the subdivision area. Interface fire funding may be available to pay for this treatment, which will also improve habitat values.

6. The holder of the Certificate of Possession (CP) should be contacted to determine if he is interested in undertaking ecosystem restoration on the CP to improve its habitat values. If consent is acquired, the two OF2 polygons on the CP could be considered a higher priority than polygon OF3 for prescription, layout and treatment.

7. Fences located during surveys for this project, both on the perimeter of the reserve and the CP, were observed to be in poor condition. In numerous situations, these fences pose a hazard to wildlife and consideration should be given to either maintaining or removing them to eliminate the hazard.

8. As per the Rare Plant 2011 Field Report (Appendix 4) “It will be essential to avoid mechanical activity which might result in soil disturbance on fragile south-facing slopes”.

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APPENDICES

APPENDIX I

WILDLIFE TREES LOCATED ON THE AKISQNUK RESERVE

Wildlife Tree Number	Class	UTM Location (all in Zone 11)	Retain	Remove	Comments
1	3	576483 5588482	Y		FDi
2	6	576889 5588795	Y		FDi
3	7	577495 5588800	Y		FDi
4	3	578500 5586317	Y		FDi Dbh=65 cm
5	6	577192 5587609	Y		FDi
6	3	576851 5587554	Y		FDi
7	4	577113 5587977	Y		FDi Dbh=50 cm cavities forming
8	3	576830 5587576	Y		FDi
9	3	576780 5587665	Y		> 4 FDi
10	2	576598 5588300	Y		FDi
11	5	576535 5588177	Y		FDi sloughing bark
12	5	576472 5588375	Y		FDi Dbh=65 cm
13	1/3	576863 5587294	Y		Broken top but living

Wildlife Tree Number	Class	UTM Location (all in Zone 11)	Retain	Remove	Comments
14	3	577358 558633	Y		FDi
15	3	Mapped	Y		FDi cavities
16	4	577284 5587091	Y		FDi Dbh=40 cm
17	4	577363 5587072	Y		FDi
18	4	577243 5586200	Y		FDi
19	5	577181 5586272	Y		FDi Dbh=40 cm sloughing bark
20	5	576911 5586669	Y		FDi 3 trees Dbh=30, 40, 30 cm
21	6	576994 5586980	Y		FDi Dbh=50 cm
22	3	577399 5587285 ⁴	Y		Fdi leaner Dbh=34 cm
23	7	578013 5586154	Y		Stub
24	2	578110 5586125	Y		FDi Dbh=47 cm
25	5	578122 5585897	Y		FDi Dbh=57.5 cm
26	6	576984 5585800	Y		FDi Dbh=66.5 cm
27	7	578385 5585786	Y		FDi Dbh=35.5 cm feeding cavities

⁴ This location is approximate only; the original data is missing.

Wildlife Tree Number	Class	UTM Location (all in Zone 11)	Retain	Remove	Comments
28	4	577753 5586322	Y		FDi Dbh=40 cm
29	3	578356 5586608	Y		FDi Dbh=37 cm
30	5	578364 5586631	Y		FDi
31	5	578397 5586622	Y		FDi Dbh=20.5 cm
32	7	578422 5586622	Y		FDi Dbh=38.5 cm
33	4	578490 5585841	Y		FDi Dbh=35 cm
34	4	578489 5586192	Y		FDi Dbh=30 cm
35	4	578481 5586319	Y		FDi Dbh=30 cm
36	4	578500 5586317	Y		FDi Dbh=40 cm
37	4	578497 5587215	Y		FDi Dbh=35 cm
38	5	577926 5586872	Y		FDi Dbh=30 cm cavities
39	3	577949 5586894	Y		At Dbh=30 cm sloughing bark
40	5	576473 5588378	Y		FDi (Same tree as #12)
41	2-3	576611 5588319	Y		FDi

Wildlife Tree Number	Class	UTM Location (all in Zone 11)	Retain	Remove	Comments
42	5-6	576601 5588288	Y		FDi
43	6	576639 5588295	Y		FDi
44	2	576888 5588883	Y		FDi high value (bottom ½ alive)
45	5	576903 5588888	Y		FDi
46	6	576903 5588888	Y		FDi
47	6	576903 5588888	Y		FDi
48	2	576923 5588860	Y		FDi newly dead (red needles)
49	1	576883 5588844	Y		Small diameter FDi still green; diseased
50	2	576883 5588844	Y		Small diameter FDi; 2-3 more within 40m
51	2	576950 5588810	Y		FDi high value (top ½ dead; 2-3 live whorls)
52	3	576950 5588810	Y		FDi
53	2	576997 5588806	Y		FDi
54	1	577071 5588632	Y		FDi high value (large diameter; ¾ alive)
55	7	577127 5588735	Y		FDi multiple tops; numerous cavities

Wildlife Tree Number	Class	UTM Location (all in Zone 11)	Retain	Remove	Comments
56	3	577142 5588768	Y		FDi 2 broken tops; alive
57	2	577103 5588814	Y		FDi
58	3	577094 5588829	Y		FDi tall; bark sloughing
59	5	577045 5588868	Y		FDi
60	6	577045 5588868	Y		FDi
61	6	577045 5588868	Y		FDi
62	7	577024 5588849	Y		FDi
63	3-6	577960 5588823			Clump of Fdi
64	3	578119 5588836			
65	3	578198 5588851			
66	3-5	578440 5588772			Clump of Fdi
67	3-5	578494 5588661			Clump of Fdi
68	3-5	578500 5588516			Clump of Fdi
69	3-5	578333 55883659			

Wildlife Tree Number	Class	UTM Location (all in Zone 11)	Retain	Remove	Comments
70	6	578315 5588451			
71	7	578388 5587492			
72	4-8	578484 5587588			
73	4	578408 5587900			
74	6	578060 5588496			40 cm X 5m
75	6	576848 5588887			30cm X 10m
76	6	576903 5588891			40cm X 8m
77	6	577127 5588875			
78		577951 5588778			
79		578122 5588862			
80		578395 5588616			
81	6	576750 5587543			40cm X 6m
82	4	576806 5587675			30cm X 12m
83	3	576788 5587885			25cm X 12m

Wildlife Tree Number	Class	UTM Location (all in Zone 11)	Retain	Remove	Comments
84	7	576766 5588092			40cm X 6m
85	7	576804 5588246			40cm X 6m
86	7	576792 5588278			40cm X 6m
87	5	576723 5588149			35cm x 12m
88	3-7	576714 5588074			Group 30-40cm X 5-12m
89	3-7	576721 5588073			Group 30-40cm X 5-12m
90	3-7	576733 5588068			Group 30-40cm X 5-12m
91	3-7	576743 5588050			Group 30-40cm X 5-12m
92	5	576708 5587977			30cm X 12m
93	3	576667 5587901			30cm X 12m
94	3	576657 5587914			35cm X 12m
95	3	576631 5587916			30cm X 12m
96	3	576652 5587941			40cm X 12m
97	3	576655 5587900			30cm X 12m

Wildlife Tree Number	Class	UTM Location (all in Zone 11)	Retain	Remove	Comments
98	3	576639 5587871			30cm X 12m
99	3	576857 5587956			35cm X 11m
100	3	576879 5587328			60cm X 11m
101	2	577256 5587462			45cm X 10m
102	6-7	577312 5587527			Group of 3 30-50cm X 8-16m
103	3	577276 5587548			40 cm X 16m
104	4	577027 5587956			30cm X 8m
105	6	576857 5587956			35cm X 15m
106	6	576722 5588651			40cm X 8m
107	5	576700 5588738			35cm X12m
108	4	576677 5588749			35cm X 12m
109	4	576672 5588796			40cm X 12m
110	4	576670 5588804			40cm X 12m
111	4	576663 5588806			20cm X12m

Wildlife Tree Number	Class	UTM Location (all in Zone 11)	Retain	Remove	Comments
112	3	576649 5588797			40cm X 15m
113	6	576717 5588806			40cm X8m
114	-	576700 5588738			
115		576677 5588749			
116		576781 5588680			
117		576782 5588572			
118		576798 5588553			
119		576811 5588533			
120		576839 5588536			
121		576846 5588538			
122		576920 5588502			
123		576947 5588463			
124		576968 5588466			
125		576949 5588443			

Wildlife Tree Number	Class	UTM Location (all in Zone 11)	Retain	Remove	Comments
126		576869 5588424			
127		576843 5588443			
128		576803 5588489			
129		576801 5588498			
130		576793 5588507			
131		576782 5588535			
132		576811 5588527			
133		576800 5588547			
134		576787 5588571			
135		576743 5588572			
136		576687 5588585			
137		576558 5588531			
138		576579 5588497			
139		576579 5587984			

Wildlife Tree Number	Class	UTM Location (all in Zone 11)	Retain	Remove	Comments
140		576566 5587972			
141		576671 5588082			
142		576673 5588088			
143		576515 5588095			
144		576626 5588353			
145		576657 5588332			

APPENDIX 2

NOXIOUS WEED INFESTATIONS LOCATED ON THE AKISQNUK RESERVE

Infestation Number	Species	Distribution Code	Density Code	Location/Way point	Comments
1	Spotted knapweed	9	4	576344 5588439	Large, dense infestation both on and beside road from highway to northeast for 100m or so
2	Giant burdock	4	1	576344 5588439	Number of burdock plants evident in the vicinity
3	Spotted knapweed	4	2	577633 558861 to 577819 558802 ⁵	Infestation numbers 3 and 4 are coincident.
4	Diffuse knapweed	6	2	577633 558861 to 577819 558802 ⁶	Infestation numbers 3 and 4 are coincident.
5	Spotted knapweed	8	3	576735 5587289	
6	Spotted knapweed	3	2	77833 5586662	
7	Spotted knapweed	1	1	577884 5586717	
8	Spotted knapweed	1	1	577685 5586474	
9	Spotted knapweed	8	-	U 578111 5585581	

⁵ This location is approximate only; the original data is missing.

⁶ This location is approximate only; the original data is missing.

APPENDIX 3

ECOSYSTEM RESTORATION STAND MANAGEMENT PRESCRIPTION

STAND MANAGEMENT PRESCRIPTION: Akisqnuq Reserve

Date: October 10, 2011

A. LOCATION AND GENERAL DESCRIPTION OF AREA			
SU	TREATMENT AREA (TA) IDENTIFIER (OPENING NO.; CUTBLOCK; TIMBER MARK; OTHER)	TREATMENT AREA (Net) (to the nearest 0.1 ha)	
1	OR 1a	11.57	
1	OR 2a	18.79	
2	OF 2a	62.40	
ALL	TOTAL	92.76	

B. MANAGEMENT OBJECTIVES			
B-1. HIGHER LEVEL PLANS			
ARE ANY OF THE TREATMENT AREAS SUBJECT TO A HIGHER LEVEL PLAN? () YES (X) NO			
	PLAN NAME	Y	Date M D
Note	Kootenay Boundary Land Use Plan-Implementation Strategy. (KBLUP-IS) Though legally the Akisqnuq Reserve is not subject to KBLUP-IS this document is the guiding document for treatment of the ecosystem components within Natural Disturbance Type 4 (NDT4).	1997	06
IF NO:	CONSULT WITH OTHER RESOURCE AGENCIES TO ASSIST IN DEVELOPING MANAGEMENT OBJECTIVES FOR THE PRESCRIPTION.		
SUMMARY OF HIGHER-LEVEL OBJECTIVES FOR THESE TREATMENT AREAS (Please rank specific objectives [1 = highest priority, 10 = lowest]): (10) Timber (N/A) Range (N/A) Recreation (N/A) VQO (1) Wildlife habitat (1) Biodiversity (1) Wildlife trees (N/A) Fisheries (N/A) Water quality (N/A) USE SECTION B2. STAND-LEVEL OBJECTIVES TO CLARIFY, CONFIRM AND SPECIFY MANAGEMENT OBJECTIVES FROM HIGHER LEVEL PLANS.			
B-2. STAND-LEVEL OBJECTIVES			
ARE CURRENT STAND-LEVEL OBJECTIVES AVAILABLE FROM SILVICULTURE PRESCRIPTIONS? () Yes (x) No IF 'YES,' SEE ATTACHED FS 711A.			
ARE CURRENT STAND-LEVEL OBJECTIVES STILL APPROPRIATE FOR THESE STANDS? () Yes () No (x) N/A			
USE THIS SECTION TO SUMMARIZE OBJECTIVES FROM HIGHER LEVEL PLANS OR FOR DEVELOPING OR CLARIFYING STAND-LEVEL OBJECTIVES.			
TIMBER MANAGEMENT OBJECTIVES			
THESE OBJECTIVES APPLY TO: SU: 1.2 There are no direct timber management objectives associated with this prescription. Timber harvesting may be carried out in the future to enhance/maintain the wildlife management objectives outlined below.			

**WILDLIFE MANAGEMENT OBJECTIVES –
HABITAT/BIODIVERSITY/WILDLIFE TREES**

THESE OBJECTIVES APPLY TO: SU1,2

The treatment area is located within mapped Ungulate Winter Range as per Ungulate Winter Range Order U-4-008. The treatment area is designated for Open Range and Open Forest management.

Treatment objectives are to create a mosaic of Open Range and Open Forest structures with residual coniferous stocking meeting KBLUP-IS guidelines for these ecosystem components. Specifically post treatment stocking of 0-75 sph for the open range and 76-400 sph for open forest areas, variably dispersed over the landscape. This stand structure will enhance the landscape for red and blue listed species which inhabit open forest/open range stand structures.

Specifically the following species identified in the Conservation Data Centre (CDC) are known to inhabit or may inhabit these habitats:

Species	BC List
American Badger (<i>Taxidea taxus</i>)	Red
Rocky Mountain Bighorn Sheep (<i>Ovis canadensis canadensis</i>)	Blue
Flammulated Owl (<i>Otus flammeolus</i>)	Blue
Lewis' Woodpecker (<i>Melanerpes lewis</i>)	Blue

As well the following species have been indicated as a species of concern by the Ted Antifeau – Rare and Endangered Species Biologist for the Ministry of Forests, Lands and Natural Resource Operations:

Rubber Boa (*Charina bottae*)

The following Plant species are listed in the CDC as occurring in the area of the Akisqnuq Reserve:

Nuttall's Sunflower (<i>Helianthus nuttallii</i> spp. <i>rydbergii</i>)	Red
Hookers townsendia (<i>Townsendia hookeri</i>)	Red
Scarlet globe-mallow (<i>Sphaeralcea coccinea</i>)	Red
Plains Reedgrass (<i>Calamagrostis montanensis</i>)	Blue

All the above species are considered to benefit from lower coniferous crown closure. (ie they prefer grassland or open forest habitats. Coniferous thickets maintained within wildlife tree patches, both within and adjacent to treatment units, will supply thicket habitat for flammulated owls.

Wildlife tree management will promote retention and creation of high quality existing wildlife trees on site.

Due to high levels of fire wood cutting throughout the plan area wildlife tree patches will be left untreated in order to limit access (through opening of stands) to retained wildlife trees/snags. As well creating additional wildlife trees is prescribed.

WATERSHED MANAGEMENT OBJECTIVES		
THESE OBJECTIVES APPLY TO: SU 1,2 There are no domestic or community watersheds within the treatment area.		
FISHERIES/STREAMS–WETLANDS MANAGEMENT OBJECTIVES		
THESE OBJECTIVES APPLY TO: SU 1,2 There are no streams or wetlands within the treatment area. There are 2 S6 streams with associated riparian habitat located within the overall Akisqnuq First Nation Reserve Ecosystem Restoration Plan area. One is located outside the planning sphere of this report in that it runs primarily through the Certificate of Possession area from the northeast. The other, located in the northwest corner of the plan area is outside any treatment areas and will be managed as a reserve area.		
RANGE MANAGEMENT OBJECTIVES	CATTLE USE? () Yes (x) No	IF 'YES' RANGE UNIT PASTURE: This unit is located on the Akisqnuq Reserve and is therefore not a designated range unit.
CATTLE PRIMARY ACCESS TRAILS? () Yes (x) No	IF 'YES' LOCATE ON ATTACHED MAP	SEEDED? () Yes (Year) (x) No Areas adjacent to the treatment area have had historical agronomic seeding, including alfalfa which has dispersed into the surrounding areas and is scattered throughout the reserve area.
THESE OBJECTIVES APPLY TO: SU 1,2		
VISUAL LANDSCAPE MANAGEMENT OBJECTIVES (VQO)	LANDSCAPE SENSITIVITY Low. Unit located on a raised terraced area with no viewscales.	VISUAL QUALITY OBJECTIVE
THESE OBJECTIVES APPLY TO: SU 1,2 To create a landscape with historic stand structures with a parkland appearance.		
RECREATION MANAGEMENT OBJECTIVES	FEATURE SIGNIFICANCE N/A	
KEY FEATURE N/A		MANAGEMENT CLASS N/A
THESE OBJECTIVES APPLY TO: SU 1,2 There are no public recreation objectives as this unit is located on the Akisqnuq Reserve. Band members utilize the area for hunting, wood gathering and other activities.		
OTHER RESOURCE VALUES/INTERESTS MANAGEMENT OBJECTIVES		Noxious Weed Management
THESE OBJECTIVES APPLY TO: SU: 1 and 2 A variety of identified noxious weeds have been identified throughout the planning area of the Akisqnuq Reserve, including but not limited to: Spotted Knapweed (<i>Centaurea maculosa</i>) Diffuse Knapweed (<i>Centaurea diffusa</i>) Giant Burdock (<i>Arctium spp</i>) Hound's-tongue (<i>Cynoglossum officinale</i>) Absinth Woodworm (<i>Artemisia absinthium</i>) These first four species were found throughout the road systems within the plan area, with Artemisia absinthium identified during the botanical recce in the open range habitats (OR1a and OR2a). Prior to use of roads for the purpose of carrying out the treatments prescribed here the road infestations should be treated as follows: A comprehensive treatment program utilizing a combination of hand pulling and bagging, and chemical herbicide treatments should be initiated throughout the plan area. This program should be ongoing annually in order to effectively treat the weed problem. Immediately prior to slashing treatment initiation manually cut and/or hand pull infestations within road prisms and within 2m of road edge. Bag and remove debris. This is to limit the spread along the roadways by vehicular traffic.		

SU: 1 Ecosystem Component: Open Range		TA: OR 1a		Area 11.57 ha													
		TA: OR 2a		Area 18.79 ha													
C-1. AREA DESCRIPTION																	
ZONE, SUBZONE, VARIANT IDF_{xk} (IDF_{dm2} trans.)			SITE SERIES (RANGE) Ro01/83		MOIST/NUTR. GRID 1-3/A-B												
ELEVATION (m) Min: 940 Max: 1080 Avg.: 1010		ASPECT S-W	SLOPE DATA Min. %: 0 Max. %: 45 Avg. %: 45														
			POSITION Low-Mid	SLOPE LENGTH (m) 225	UNIFORMITY Plain												
HUMUS FORM Mor	ROOTING DEPTH (cm) >35	SOIL DEPTH TO RESTRICTING LAYER (cm) >100	SOIL TEXTURE FSL-SL	SOIL COARSE FRAGMENT (%) 64	DRAINAGE Well												
WATER COURSES Water Gullies 1		MECHANIZED STAND TENDING () Yes (x) No															
C-2. CURRENT STAND DESCRIPTION																	
TA or Strata	Layer	Species Composition								Age (bh yrs)	Height (0.1 m)	Ref. year	Site index	Density (stems/ha)	Well-spaced (stems/ha)	Crown Closure (%) All Layers	
		Spp	%	Spp	%	S	%	PP	%								Spp
OR1a and OR2a	1	Fdi	100								96	11	2011	<10	282	N/A	
	2	Fdi	65	JuSc	35						46	5	2011		55	N/A	
	3	Fdi	55	JuSc	45						49	4.6	2011		200	N/A	
	4	Fdi	100								23	0.7	2011		27	N/A	
	All												2011	<10	564		25
C-3. FOREST HEALTH AND PROTECTION																	
FOREST HEALTH			AGENT OCCURRENCE														
SU	AGENT CODE	AGENT NAME	HOST SPECIES	TOTAL TREES AFFECTED (%)	TOTAL CONIFERS AFFECTED (%)	HOST TREES AFFECTED (%)	AREA (ha)										
1		None Noted during survey															
FOREST HEALTH STRATEGIES: There were no forest health agents noted during recce or surveying. This unit is edaphically an open grassland type. Treatment of ingressing coniferous trees will ensure the long term health of this grassland.																	
PROTECTION																	
FIRE HAZARD ASSESSMENT & PROTECTION STRATEGIES: There will be no increased fire hazard following treatment. Treatment will remove current low levels of ingress. Slash loading will be very dispersed with < 1 tonne of slash distributed over the unit. Localized slash loading will be either scattered and left to decompose or be piled and burned.																	

These areas are identified as Open Range areas under Ungulate Winter Range Order U-4-008. With a current crown closure of approximately 25% these areas require a reduction in coniferous stocking in order to meet the desired condition of less than 10% (target crown closure for open range area treatment re-entry). Current crown closure is the result of historic ingress, which due to the edaphic quality of these sites, has been slow but progressive over the past century. This has resulted in an estimated 282 layer 1 Douglas-fir per ha variably distributed over the treatment units. Treatment of the layer 1 stems is problematic due to low commercial value and steep broken slopes (primarily in OR2a). As a result this prescription is to remove all ingressing layers 3 and 4, while pruning the layer 1 and 2 stems to enhance horizontal sight lines.

Overstory Manipulation

- Slash all coniferous stems in layers 3 and 4. Slash all layer 2 stems <15cm dbh. Ensure no live limbs on stumps. Stumps shall not exceed 20cm in height and shall be cut at no greater than a 10 degree angle (ie as flat as possible).
- Remove branches from stems, lop and lay all slash directly on soil surface to promote prompt decomposition.
- Prune all retained coniferous stems in layers 1 and 2 to a height of 2.5m. Pruning will increase sight lines within the unit for enhancement of Rocky Mountain Bighorn Sheep habitat. Scatter pruned branches.
- Slash all Rocky Mountain Juniper < 15cm stump height. Maintain all stems >15cm throughout unit. Though removal of the Rocky Mountain Juniper is not expected to have short or mid-term herbaceous responses the primary objective of removal, as stated, is for horizontal sight lines.
- Do not cut shrubs. Maintain all existing shrubs on site.

Wildlife Trees

- Create approximately 5-10 new wildlife trees per ha through manual girdling, branch removal and future inoculation with heart rot fungus. Due to existing stocking only Douglas-fir is available for wildlife tree creation/recruitment.
- Where slash loading dictates abatement through piling and burning, create approximately 5-10 hard snags through placing slash piles around base of Douglas-fir stems >30cm dbh. Following a minimum 6 months of summer curing burn piles. Preferably create wildlife trees in a clumped distribution.
- Following creation of wildlife trees all trees should be appropriately signed to deter firewood cutters from removing these stems.

SU: 2		Ecosystem Component: Open Forest		TA: OF 2a		Area 62.4 ha										
C-1. AREA DESCRIPTION																
ZONE, SUBZONE, VARIANT IDFxk				SITE SERIES (RANGE) 03/04 (01)			MOIST/NUTR. GRID 2-4/A-B									
ELEVATION (m) Min: 890 Max: 950 Avg.: 940			ASPECT Variable	SLOPE DATA Min. %: 0 Max. %: 45 Avg. %: 15			SLOPE POSITION: Low-Upper LENGTH (m): >200 UNIFORMITY: Undulating									
HUMUS FORM Mor	ROOTING DEPTH (cm) >35		SOIL DEPTH TO RESTRICTING LAYER (cm) >100	SOIL TEXTURE SIL		SOIL COARSE FRAGMENT (%) 35	DRAINAGE Well									
WATER COURSES Water Gullies 1		MECHANIZED STAND TENDING () Yes (x) No		IF YES, SEE OPERATIONAL PLANNING REGULATION FOR FURTHER CONTENT REQUIREMENTS												
C-2. CURRENT STAND DESCRIPTION																
TA or Strata	Layer	Species Composition								Age (bh yrs)	Height (0.1 m)	Ref. year	Site index	Density (stems/ha)	Well-spaced (stems/ha)	Crown Closure (%) All Layers
		Spp	%	Spp	%	Spp	%	Spp	%							
OF2a and OF2c	1	Fdi	98	JuSc	2					89	14	2011	13	473	N/A	
	2	Fdi	95	JuSc	5					41	7.8	2011		491	N/A	
	3	Fdi	88	JuSc	12					24	4.2	2011		891	N/A	
	4	Fdi	97	JuSc	3					8	0.5	2011		1373	N/A	
	All											2011	13	3223		55
C-3. FOREST HEALTH AND PROTECTION																
FOREST HEALTH				AGENT OCCURRENCE												
SU	AGENT CODE	AGENT NAME	HOST SPECIES	TOTAL TREES AFFECTED (%)	TOTAL CONIFERS AFFECTED (%)	HOST TREES AFFECTED (%)	AREA (ha)									
2																
FOREST HEALTH STRATEGIES: Treatment of unit will promote overall health of the stand by reducing inter-stem competition																
PROTECTION																
FIRE HAZARD ASSESSMENT & PROTECTION STRATEGIES: Post treatment slash loading is anticipated to exceed 25 piles per ha. This is anticipated to result in post-treatment slash abatement score of 64.5. Therefore slash abatement is required. Hand pile all slash accumulations at time of treatment. Allow slash to cure for a minimum of 6 months prior to burning of piles.																

D. TARGET STAND CONDITIONS AND OBJECTIVES

STAND TREATMENT REGIME — The stand treatment objectives for all treatment areas in this standards unit must be the same. Clearly describe the average target stand condition for all treatment areas under this standards unit. Clearly identify how you propose to achieve the forest management objectives in Part B of this prescription. Clearly explain how the proposed treatments will achieve the stated objectives and/or mitigate impacts on non-timber forest resources listed in Part B. Where quantification is NOT possible, use qualitative descriptions.

These areas are identified as Open Forest areas under Ungulate Winter Range Order U-4-008. With a current crown closure of approximately 55% these areas require a reduction in coniferous stocking in order to meet the desired condition of less than 40% (target CC for open forest area treatment re-entry). Current crown closure is the result of historic ingress, which due to the edaphic quality of these sites, has been slow but progressive over the past century. This has resulted in an estimated 473 layer 1 Douglas-fir per ha variably distributed over the treatment units. Treatment of the layer 1 stems is problematic due to low commercial value as a consequence of poor form and moderate to high levels of stem cankers. As well, the majority of the stems on site have had some level of Christmas tree manipulation over the past half century or so. This has resulted in extensive forks and crooks throughout the stand.

Target post treatment stand structure is:

- Coniferous stocking 76-400 sph variably distributed.
- Expect numerous small (up to 1 ha) of open range structure distributed over the unit.
- Expect approximately 10-15% of the area to have stocking greater than 400 sph. These areas consist of current high layer 1 stocking types.
- Crown closure between 10-40% variably over the unit

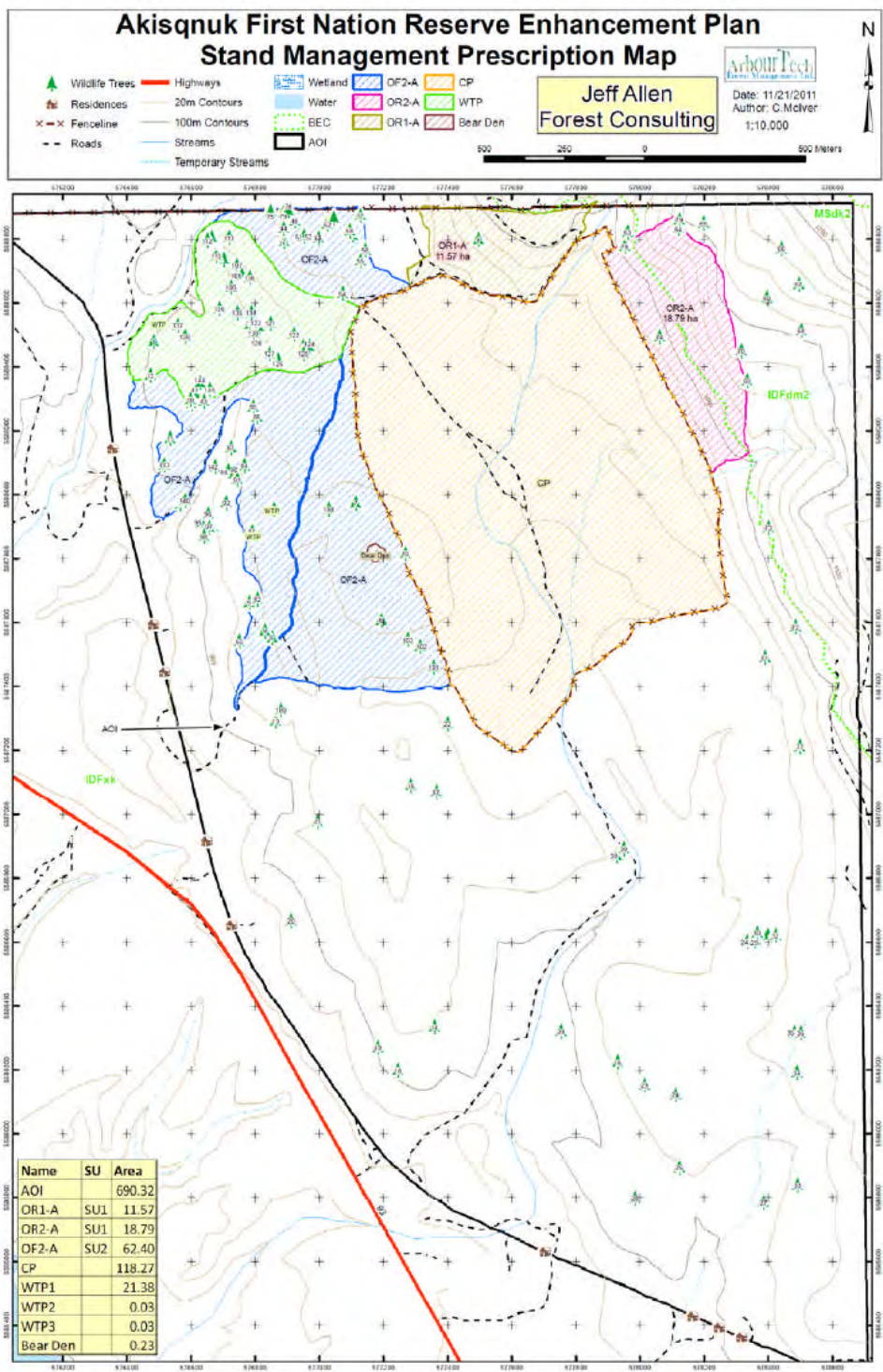
Overstory Manipulation

- Slash all coniferous stems in layers 3 and 4. Slash all layer 2 stems between 12.5 and 15cm dbh. Ensure no live limbs on stumps. Stumps shall not exceed 20cm in height and shall be cut at no greater than a 10 degree angle (ie as flat as possible).
- Within TU OF2c prune layer 1 and 2 stems to a height of 2.5m to improve sightlines. Scatter low accumulations of slash. Where slash levels are moderate to high within this polygon pile and burn slash. Allow all piles to cure for a minimum of 6 months prior to burning. Burn all piles, on frozen soils, within 24 months of creation.
- Slash all Rocky Mountain Juniper < 15cm stump height. Maintain all stems >15cm throughout unit. Though removal of the Rocky Mountain Juniper is not expected to have short or mid-term herbaceous responses the primary objective of removal, as stated, is for horizontal sight lines.
- Hand pile the majority of slash in small hand piles not to exceed 3m diameter by 3m in height. Pile in standard tee-pee fashion to promote good combustion of material.
- Allow all piles to cure for a minimum of 6 months prior to burning. Burn all piles, on frozen soils, within 24 months of creation. Where burning is restricted piles may be masticated if not able to burn in 24 month window. Ensure that a minimum of 85% of pile material is either consumed by burning or masticated to a size less than 30cm X 10cm.
- Rehabilitate burn rings through raking to break up hydrophobic layer, seed with native seed mix in consultation with P. Ag.
- Do not cut shrubs. Maintain all existing shrubs on site.
- Post treatment stocking is anticipated to be an open forest structure with inclusions of small dispersed open range types and small patches where layer 1 stocking exceeds 400 sph.

Wildlife Trees

- Maintain existing wildlife trees within the treatment area through use of No Treatment Zones of approximately 1.5 times the tree height around each tree/patch. The majority of existing snags have been GPS'd. Assess in year of treatment and layout buffer zones as required to ensure safe treatment of area.
- Create approximately 5-10 new wildlife trees per ha through manual girdling, branch removal and inoculation with heart rot fungus. Due to existing stocking, only Douglas-fir is available for wildlife tree creation/recruitment.
- Where slash loading dictates abatement through piling and burning, create approximately 5-10 hard snags through placing slash piles around base of Douglas-fir stems >30cm dbh. Following a minimum 6 months of summer curing burn piles. Preferably ensure that all created wildlife trees are in a clumped distribution.
- Following creation of wildlife trees all trees should be appropriately signed to deter firewood cutters from removing these stems.
- Two major wildlife tree patches have been identified within (see section D-3 Reserve Areas) and adjacent to the treatment area. The adjacent area is located immediately to the north and west of the treatment unit, designated as unit OF 4. This area was omitted due to the high number of existing, high quality wildlife trees and the fact that the area has highly complex, steep slopes, with moderate to high volumes of coniferous stocking which would be problematic to treat. There is little to no commercial value in the standing volumes. Therefore removal would result in extraordinary costs. As well, removal would result in loss of the wildlife trees either during treatment or through firewood cutting.

D-2. SPECIAL AREAS - (TREATMENT PROPOSED)		
TREATMENT AREA # OF2a		TYPE OF SPECIAL AREA (e.g., Riparian Reserve Zone, Riparian Management Zone, Lakeshore Management Zone, FENs)
AREA NO. 1	SIZE N/A ha	Description of special area and significant features (Show approximate location on map)
Small historic log structure.		
DESCRIBE HOW MANAGEMENT ACTIVITIES DIFFER FROM THE REST OF THE STANDARDS UNIT		
Slash up to but do not disturb structure. Ensure slash piles are placed a minimum 10m away from structure.		
D-3. RESERVE AREAS – (NO TREATMENT PROPOSED)		
TREATMENT AREA OF4 - Outside adjacent to treatment area		TYPE OF RESERVE AREA (e.g., Riparian Reserve Zone, Roadside Buffers, others)
AREA NO. 1	SIZE 21.38 ha	Description of reserve area (Show approximate location on map)
Note: this area is located entirely outside treatment unit boundaries and is discussed here to report it on a landscape level basis.		
<p>This area is to be managed as a wildlife tree patch. Wildlife tree inventory at time of assessment indicated that this area contains large numbers of high quality Douglas-fir snags between 20 and 60cm dbh; 4-15m in height, and decay classes 2-8. It was therefore decided to retain this area as a no treatment zone as removal of the snags is considered to be contrary to the objectives of this prescription. Treatment of this area would require the removal of the majority of the identified wildlife trees due to safety concerns if a hand crew was to work in this area.</p> <p>Mechanical mastication was considered but rejected as historically firewood cutters have been very active in the area and have already removed substantial numbers of quality wildlife trees. Therefore it is anticipated that if this area is opened up the existing snags are at high risk of removal. Maintenance of the forest cover masks these stems from view and therefore will hopefully reduce firewood cutting in this area. As well the broken terrain located within this area would limit the mechanically treatable area.</p> <p>As with the treatment areas under this prescription, a signing and public education campaign should be carried out to help retain these high quality stems.</p>		
TREATMENT AREA # OF 2a		TYPE OF RESERVE AREA (e.g., Riparian Reserve Zone, Roadside Buffers, others) Wildlife feature buffer
AREA NO. 2	SIZE 0.23 ha	Description of reserve area (Show approximate location on map)
This area is located to buffer an existing bear den located under a wind thrown root ball. Do not treat within designated area. Ensure no slash piling occurs within 20m of den site.		
-3. ADMINISTRATION		
PRESCRIPTION PREPARED BY (RPF SIGNATURE AND SEAL):		
<p>_____ Jeff Allen RPF NAME (Printed)</p>		<p>_____ RPF SIGNATURE</p>
<p>DATE: _____ RPF NO.: 2551 _____</p>		



FS68 HFP

APPENDIX 4

AKISQNUK RARE PLANT 2011 FIELD REPORT

Akisqnuq Rare Plant

2011 Field Report

Prepared for

Gary Tipper Phase II Ventures

Jeff Allen

Submitted by

Hillary Page

Sage Ecological Research

November 2011

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1. Objectives

Among the goals for the work completed in 2011 was to survey for rare plants in the proposed ecosystem restoration area. Specific goals were to:

- review existing information,
- develop a list of rare plants found at the Kootenae House Historic Site,
- assess rare plant habitat needs and possible mitigation measures.

2. Background

2.1 Rare Species

The British Columbia Conservation Data Centre (CDC) in Victoria is responsible for tracking the status of rare, endangered and vulnerable animal and plant species and communities found in BC. Species are classified as red-listed (endangered or threatened), blue-listed (vulnerable or sensitive) or yellow-listed (not vulnerable, but potentially threatened at some stage of their life history). Red- and blue-listed species are also ranked based on their global (G) status and subnational (S) rarity. The CDC ranks and definitions are as follows:

1. Critically imperiled because of extreme rarity (5 or fewer extant (post-1949) occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extirpation or extinction (S1; G1).
2. Imperiled because of rarity (typically 6-20 extant occurrences or few remaining individuals) or because of some factor(s) making it vulnerable to extirpation or extinction (S2; G2).
3. Rare or uncommon (typically 21-100 occurrences); may be susceptible to large-scale disturbances; e.g., may have lost extensive peripheral populations (S3; G3).
4. Frequent to common (greater than 100 occurrences); apparently secure but may have a restricted distribution; or there may be perceived future threats (S4; G4).
5. Common to very common; demonstrably secure and essentially ineradicable under present conditions (S5; G5).

Using this ranking scheme, a red-listed species with a G5 S1 ranking is very common globally, but is critically imperiled within British Columbia.

2.2 Rare Plants in the Study Area

Based on an assessment of the biogeoclimatic unit and the BC CDC (Conservation Data Centre) species at-risk list for the Rocky Mountain Forest District (BC CDC 2010), there are at least 72

vascular plants that may occur within the project area (Appendix 1). The CDC list includes two COSEWIC (Committee on the Status of Endangered Wildlife in Canada) listed species; *Adiantum capillus-veneris* (southern maiden-hare) and *Pinus albicaulis* (whitebark pine) are both listed as endangered.

A search of the CDC Mapped Occurrences Database shows that there have been three provincially-listed vascular plant species located within 5km of Akisqnuq Reserve: *Plantago eriopoda* (alkali plantain), *Salix boothi* (Booth's willow) and *Helianthus nuttallii* ssp. *Rydbergii* (Nuttall's sunflower) (BC CDC 2011). There were three non-sensitive historical occurrences (pre-1959) that include: *Townsendia hookeri* (Hooker's townsendii), *plains reedgrass* (*Calamagrostis montanensis*) and *Sphaeralcea coccinea* (scarlet globe-mallow) (BC CDC 2011).

3. Methods

The ecosystem restoration site was surveyed on October 16th and October 23rd, 2011. Because the size of the site and limited survey time available it was not possible to survey the entire site. Therefore a targeted survey approach was adopted.

A target list of threatened and endangered vascular plants was used to highlight species that could be found in the study area (Appendix 1). The target plant list developed based on the BC CDC plant lists developed for the Rocky Mountain Forest District (BC CDC 2011). There was an emphasis placed on surveying for species that had been located in the area historically and more recently.

Survey sites were also selected based on consultation with the team leaders and examination of ortho photographs. Due to the project area size, it was not feasible to systematically survey the entire area; therefore, sites were selected that had a higher potential for supporting rare plants. Surveys targeted habitats most likely to contain the target species (e.g. rock outcrops, wetlands and open meadows).

Plants that were not identified in the field were collected and identified using the Illustrated Flora of British Columbia (Douglas et al. 1998a, 1998b, 1999a, 1999b, 2000, 2001a, 2001b, 2002a, 2002b) and other regional plants keys (e.g. the Flora of Alberta, Moss 1983).

When a rare plant was located in the field, UTM coordinates, number of plants, the aerial extent of the population and a detailed habitat description (including a plant association description) were all recorded. This information is necessary to complete the BC Conservation Data Centre field observation form.

It should be noted that this is not the ideal time of year to conduct a plant survey, so the results here should not be considered comprehensive. It is recommended that the site be re-visited to conduct a full survey during the growing season.

4. Results

There were two red-listed species observed in the vicinity of the ecosystem restoration site. Both species were found in open, grassland habitats.

6.1 *Townsendia hookeri* Beaman– *Hooker's townsendii*

There were three populations of *T.hookeri* (Table 1) observed in the study area. One was located near the southern boundary of the study area and the other two populations were observed in the northeast corner.

General Habitat Description:

The sub-populations were generally found in an IDFxk 83ms plant community (needle-and-thread grass). All populations were located on south facing slopes under full light conditions. Common native plant species associated with the occurrences included: *Hesperostipa comata* ssp. *comata* (needle-and-thread grass), *K. macrantha*, *Artemisia frigida* (prairie sagewort), *Antennaria microphylla* (white pussytoes) and *Erigeron pumilis* (shaggy fleabane). The native plant species association represents a plant community that can be expected on dry soils in the study area. Bare soil and cryptogam cover was high at all sites.

Plant Ecology:

T. hookeri is a perennial herb from a taproot. This plant is found on dry, grassy slopes and meadows in the steppe and lower montane zones. It is considered rare in northeastern and southeastern British Columbia (Douglas et al. 1998a).

Table 1. Occurrence descriptions of *Townsendia hookeri* at Kootenae House.

Occurrence ID	Zone	Easting	Northing	# of plants	Area (m ²)	Elev. (m)	Plant Community
1	11U	577454	5586905	2	1	900	South-facing grassland. Full IDFxk 83ms – Dominant species include: <i>K. macrantha</i> , <i>A. frigida</i> , <i>A. microphylla</i> , <i>E. pumilus</i> and <i>H. comata</i>
2	11U	577401	5588748	1-50	42,750	980	South-west facing grassland. Full sun IDFxk 83ms – <i>K. macrantha</i> , <i>A. frigida</i> , <i>A. microphylla</i> and <i>P. spicata</i>
3	11U	577765	5588878	1-50	19,177	980	South facing grassland. IDFxk 83ms Full sun– <i>K. macrantha</i> , <i>A. frigida</i> , <i>A. microphylla</i> and <i>P. spicata</i>

Conservation Status:

T. hookeri has disjunct populations in North America that are considered secure to critically imperiled. It is ranked imperiled/vulnerable in Canada and rare/secure in the United States (Fig. 3; NatureServe 2009). In British Columbia, *T. hookeri* is known only from southeastern and northeastern British Columbia.

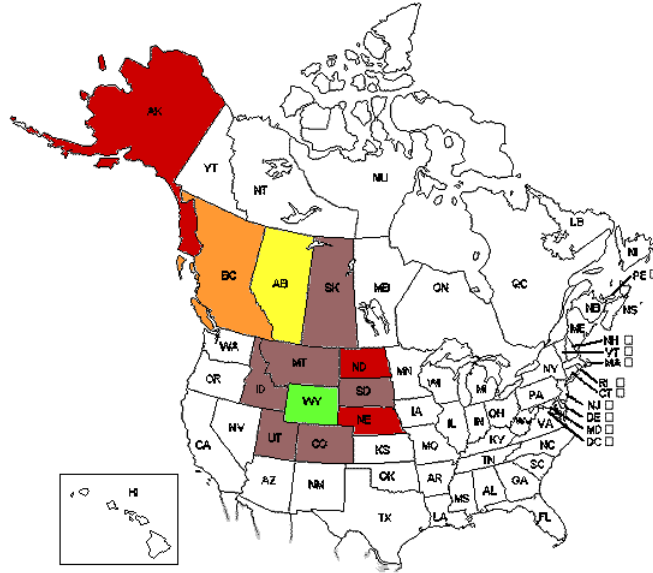


Figure 13.North American distribution of *Townsendia hookeri*. Red indicates the plant is critically imperiled (S1), orange indicates imperiled (S2), yellow indicates vulnerable (S3), light green indicates apparently secure (S4) and purple indicates the plant is not ranked or is under review (NatureServe 2009).

Conservation Strategy:

Population data are lacking for this species therefore at a regional level, it is not possible to determine if populations are increasing or decreasing. Analyses of regional diversity suggest a formerly broad distribution has become subsequently fragmented, possibly due to the last round of glaciations. It is possible that patterns of glaciations has played a causal role in the establishment of the observed geographic pattern in North America (Thompson and Whitton 2006)

In BC, the status of this species is more defined within the context of the Conservation Framework. The Conservation Framework is British Columbia’s new approach for maintaining the biodiversity of the province. The three goals of the Framework are: to contribute to global efforts for species and ecosystem conservation, to prevent species and ecosystems from becoming at risk and to maintain the diversity of native species and ecosystems. Under the framework, *T. hookeri* is rated as priority two under the third goal of maintaining the diversity of native species

and ecosystems. Conservation actions identified by the Ministry of Environment include: inventory, development of a status report and the listing of this species under the wildlife act.

T. hookeri ecology enables this plant to inhabit disturbed or early successional plant communities. The low-growing plant is often found in early-seral plant communities or in areas susceptible to soil disturbance

5. Summary and Recommendations

Two rare species were found in the Akisqnuq ecosystem restoration study area. Both species are grassland dependent species. Successful ecosystem restoration activities should enhance the presence of both species in the area.

Critical habitat for both species is susceptible to soil disturbance. It will be essential to avoid mechanical activity which might result in soil disturbance on fragile south-facing slopes. This will not only maintain rare plant populations but will ensure native grassland plant communities remain intact by preventing habitat destruction and possible spread of invasive species. Mitigation of loss of habitat is not likely, thus it will be important to protect existing habitat.

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Appendix 1. Potential CDC listed vascular terrestrial plant species (red and blue) occurring in the Rocky Mountain Forest District.

Scientific Name	English Name	Global Status	Prov Status	COSEWIC	BC List
<i>Adiantum capillus-veneris</i>	southern maiden-hair	G5	S1	E (May 2000)	Red
<i>Agoseris lackschewitzii</i>	pink agoseris	G4	S2S3		Blue
<i>Anemone canadensis</i>	Canada anemone	G5	S2S3		Blue
<i>Arabidopsis salsuginea</i>	saltwater cress	G4G5	S1		Red
<i>Arnica chamissonis</i> ssp. <i>incana</i>	meadow arnica	G5T3T5	S2S3		Blue
<i>Artemisia ludoviciana</i> ssp. <i>incompta</i>	western mugwort	G5T3T5	S2S3		Blue
<i>Atriplex argentea</i> ssp. <i>argentea</i>	silvery orache	G5T5	S1		Red
<i>Botrychium ascendens</i>	upswept moonwort	G2G3	S2		Red
<i>Botrychium simplex</i>	least moonwort	G5	S2S3		Blue
<i>Bouteloua gracilis</i>	blue grama	G5	S2		Red
<i>Calamagrostis montanensis</i>	plains reedgrass	G5	S3		Blue
<i>Carex crawei</i>	Crawe's sedge	G5	S1		Red
<i>Carex geyeri</i>	elk sedge	G5	S3		Blue
<i>Carex lenticularis</i> var. <i>dolia</i>	Enander's sedge	G5T3	S2S3		Blue
<i>Carex sychnocephala</i>	many-headed sedge	G4	S3		Blue
<i>Castilleja cusickii</i>	Cusick's paintbrush	G4G5	S1		Red
<i>Castilleja gracillima</i>	slender paintbrush	G3G4Q	S2S3		Blue
<i>Castilleja minor</i> ssp. <i>minor</i>	annual paintbrush	G5T5	S1		Red
<i>Cirsium scariosum</i> var. <i>scariosum</i>	elk thistle	G5T5?	S1S3		Red
<i>Cryptantha ambigua</i>	obscure cryptantha	G4	S3		Blue
<i>Delphinium bicolor</i> ssp. <i>bicolor</i>	Montana larkspur	G4G5T4T5	S2S3		Blue
<i>Epilobium glaberrimum</i> ssp. <i>fastigiatum</i>	smooth willowherb	G5T4T5	S2S3		Blue

<i>Gaura coccinea</i>	scarlet gaura	G5	S1	Red
<i>Gayophytum humile</i>	dwarf groundsmoke	G5	S2S3	Blue
<i>Gayophytum racemosum</i>	racemed groundsmoke	G5	S1	Red
<i>Gayophytum ramosissimum</i>	hairstem groundsmoke	G5	S1	Red
<i>Gentiana affinis</i>	prairie gentian	G5	S2S3	Blue
<i>Glycyrrhiza lepidota</i>	wild licorice	G5	S3	Blue
<i>Hedeoma hispida</i>	mock-pennyroyal	G5	S1	Red
<i>Helianthus nuttallii</i> ssp. <i>rydbergii</i>	Nuttall's sunflower	G5T5	S1	Red
<i>Heterocodon rariflorum</i>	heterocodon	G5	S3	Blue
<i>Hypericum scouleri</i> ssp. <i>nortoniae</i>	western St. John's-wort	G5T3T5	S2S3	Blue
<i>Impatiens ecalcarata</i>	spurless touch-me-not	G3G4	S2S3	Blue
<i>Juncus confusus</i>	Colorado rush	G5	S1	Red
<i>Lathyrus bijugatus</i>	pinewood peavine	G4	S1	Red
<i>Lepidium densiflorum</i> var. <i>pubicarpum</i>	prairie pepper-grass	G5T4	S1	Red
<i>Leptosiphon septentrionalis</i>	northern linanthus	G5	S3	Blue
<i>Lewisia triphylla</i>	three-leaved lewisia	G4?	S2S3	Blue
<i>Lomatium sandbergii</i>	Sandberg's desert-parsley	G4	S2S3	Blue
<i>Lomatium triternatum</i> ssp. <i>platycarpum</i>	nine-leaved desert-parsley	G5T3T5	S2	Red
<i>Lupinus arbustus</i> ssp. <i>neolaxiflorus</i>	spurred lupine	G5T1T3	SH	Red
<i>Lupinus arbustus</i> ssp. <i>pseudoparviflorus</i>	Montana lupine	G5T2T3	S1	Red
<i>Lupinus bingenensis</i> var. <i>subsaccatus</i>	Suksdorf's lupine	G4G5TNR	S2	Red
<i>Melica spectabilis</i>	purple oniongrass	G5	S2S3	Blue
<i>Mimulus breviflorus</i>	short-flowered monkey-flower	G4	S1	Red
<i>Muhlenbergia andina</i>	foxtail muhly	G4	S1	Red
<i>Muhlenbergia glomerata</i>	marsh muhly	G5	S3	Blue
<i>Orobanche corymbosa</i> ssp. <i>mutabilis</i>	flat-topped broomrape	G4T3?	S3	Blue

<i>Orobanche ludoviciana</i> ssp. <i>ludoviciana</i>	Suksdorf's broomrape	G5T5	S1		Red
<i>Pellaea gastonyi</i>	Gastony's cliff-brake	G2G3	S2S3		Blue
<i>Physaria didymocarpa</i> var. <i>didymocarpa</i>	common twinpod	G5T4	S2S3		Blue
<i>Pinus albicaulis</i>	whitebark pine	G3G4	S3?	E (Apr 2010)	Blue
<i>Pinus flexilis</i>	limber pine	G4	S3		Blue
<i>Plantago eriopoda</i>	alkali plantain	G5	S3		Blue
<i>Polemonium elegans</i>	elegant Jacob's-ladder	G4	S2S3		Blue
<i>Polygonum engelmannii</i>	Engelmann's knotweed	G3G5	S2S3		Blue
<i>Potentilla diversifolia</i> var. <i>perdissecta</i>	diverse-leaved cinquefoil	G5T4	S2S3		Blue
<i>Potentilla nivea</i> var. <i>pentaphylla</i>	five-leaved cinquefoil	G5T4	S2S3		Blue
<i>Salix boothii</i>	Booth's willow	G5	S2S3		Blue
<i>Schizachyrium scoparium</i>	little bluestem	G5	S1		Red
<i>Scirpus pallidus</i>	pale bulrush	G5	S1		Red
<i>Silene drummondii</i> var. <i>drummondii</i>	Drummond's campion	G5T5	S3		Blue
<i>Sphaeralcea coccinea</i>	scarlet globe-mallow	G5?	S1		Red
<i>Sphenopholis intermedia</i>	slender wedgegrass	G5	S3		Blue
<i>Sphenopholis obtusata</i>	prairie wedgegrass	G5	S1		Red
<i>Sporobolus compositus</i> var. <i>compositus</i>	rough dropseed	G5T5	S3		Blue
<i>Stellaria obtusa</i>	blunt-sepaled starwort	G5	S2S3		Blue
<i>Symphyotrichum ascendens</i>	long-leaved aster	G5	S1S3		Red
<i>Thalictrum dasycarpum</i>	purple meadowrue	G5	S2S3		Blue
<i>Thermopsis rhombifolia</i>	prairie golden bean	G5	S1		Red
<i>Townsendia hookeri</i>	Hooker's townsendia	G5	S2		Red
<i>Trichophorum pumilum</i>	dwarf clubrush	G5	S2S3		Blue