ECOSYSTEM RESTORATION TREATMENT PRESCRIPTION

Society for Ecological Restoration in North Central British Columbia

PROJECT LOCATION AND LEGAL STATUS

GEOGRAPHIC NAME: Euchiniko Lakes Sidehills

LAND STATUS/TENURE: Crown land.

COORDINATES: 53 06 53 N, 124 28 48 W

AREA (ha): 400

MAPSHEET (1:20,000): 93F018 (93F019)

SITE CONDITIONS

GENERAL DESCRIPTION:

The Euchiniko Lakes Sidehills are an area of mixed open forest, shrub and grasslands associated with a southerly aspect escarpment, generally described as a grassland-aspen complex. They are located on the north side of the Euchiniko Lakes section of the Blackwater River.

The area is a linear feature, approximately 14.5 km long, and encompassing about 400 ha. It can be subdivided into two general physical areas, largely defined by slope. Area A is a steep slope, typically 35% to 55%, and as much as 70% in its steepest areas. This slope ranges from 980 to 1040 m elevation in the west, dropping to 960 to 1020 m in the east. The horizontal width of this area varies from 65 m to 270 m, with an average of 165 m. Area B lies above the narrow slope, beginning about 3.3 km from the west end, and extending east for 3.6 km. It is up to 650 m wide, and includes a range of slopes, from broad areas less than 20%, to very steep areas with rock outcrops, and smaller benches or terraces.

Aerial photography from 1961 suggests that the most recent disturbance by fire, *at that time*, had occurred on portions of the area in the decade, or somewhat longer, before 1961. There is no obvious indication in the form of damage to surrounding stands, that fires have been common in this area after 1961.

BEC UNIT AND SITE SERIES:

The area spans three biogeoclimatic subzones. The west half of Area A lies in the SBPSmc BGC subzone, and the east half is SBPSdc. The boundary between these two subzones in this geographic setting is described in the relevant guidebook as a broad transition that is not sharply defined. Area B is within the SBSmc2 BGC subzone. With the exception of areas with coniferous cover, the sites are not described well by the relevant BGC guidebooks. However, there is similarity to the grassland units described by Simonar and Migabo (2004) (hereafter SM04) for the Euchiniko River Sidehills, although these occur in the SBSdk subzone. The following is a description of the main components of the complex. They vary in combinations of geographic attributes (e.g. slope and position, soil moisture), vegetation community structure, disturbance history, and ongoing process (senescence, colonization). Note that they are often very small in area, with numerous transitions occurring over short distances, and may represent different seral stages of plant communities occurring on otherwise similar edatopes. The description includes interpretation of the history and trajectory based on direct observation and comparison of aerial photos taken in 1961, 1974, and 2012.

Crests and Upper Slopes

Apart from rocky outcrops, these are the driest sites in the complex, and typically occur as

a) a narrow strip at the top of the main long linear slope feature where the steep slope rolls over to a flatter area above it,
b) slope >60% immediately below the crest,
c) or tops of small ridges aligned with the general slope.

Ground cover is dominated by kinnikinnick (*Arctostaphylos uva-ursi*), and there may be common juniper (*Juniperus communis*) and various grass species present as well. Short, heavily browsed, low vigour aspen occur singly or in copses. Where aspen have grown above browse height, they nonetheless remain short and of poor form. Lodgepole pine and some spruce regeneration has invaded from the upslope stands since 1961. Stems range in size from small seedlings to trees large enough to have been attacked and killed by mountain pine beetle. Slopes are as steep as 70%, and in these areas ground cover is incomplete with exposed, erodible soils common. The sites may be classed series 02 in each of the BGC subzones. The nearest analogs in SM04 for the conditions include SW (81): Saskatoon – Slender wheatgrass (shrub/steppe), PW : Pasture sage – Slender wheatgrass (grassland) and PK : Pine grass – Kinnikinnick (grassland).

Typical crest position.

Large diameter pine were killed by mountain pine beetle. Smaller, younger stems are scattered below the crest. Ground cover dominated by kinnikinnick.

Typical upper slope position.

Heavily browsed aspen, scattered conifers. Larger aspen stems have poor form.

Aerial photography shows the taller clone at left was present in 1961, but conifers were absent.

Exposed, erodible soils on steep upper slope.

This is a common characteristic where slopes exceed 60%. Pasture sage (*Artemisia frigida*) is also a common species in these locations.

These steep slopes sometimes have trails roughly aligned with the contours running across them.

Contrasting ground cover on upper slope. Images taken at same location illustrate how communities vary over short distances. Note trails following contours.

Browsing pressure on the aspen on these sites is persistent and high, and combined with the dry moisture regime keeps most stems short and available for further browsing. The greatest potential for long term structural change appears to be the growth of conifers. Their demand for water and nutrients is to the detriment of the ground cover species. In the past, periodic wildfires would kill such trees and their slow rate of colonization from neighbouring stands kept the areas open.

Steep Mid-slope Grassland and Brushy Steppe

Sites are common in Area A. Slopes are typically 45-55% and tend to have a greater variety of species present than the crest and upper slope locations. Soils are gravelly and well to rapidly drained, with SL to SiL texture. Ground cover varies from sites with 80% kinnikinnick cover and 5-6 cm of humus to dense grass communities that exclude any kinnikinnick and have 22 cm of humus and much faunal mixing below. Other species include northern bedstraw (*Galium boreale*), yarrow (*Achillea millefolium*), pasture sage, asters (e.g. *Aster conspicuous*), purple peavine (*Lathyrus nevadensis*), American vetch (*Vicia americanum*), wild strawberry (*Fragaria virginiana*), common snowberry (*Symphorycarpos albus*), prickly rose (*Rosa acicularis*), saskatoon (*Amelanchier alnifolia*), bluegrass (*Poa spp*), and common juniper.

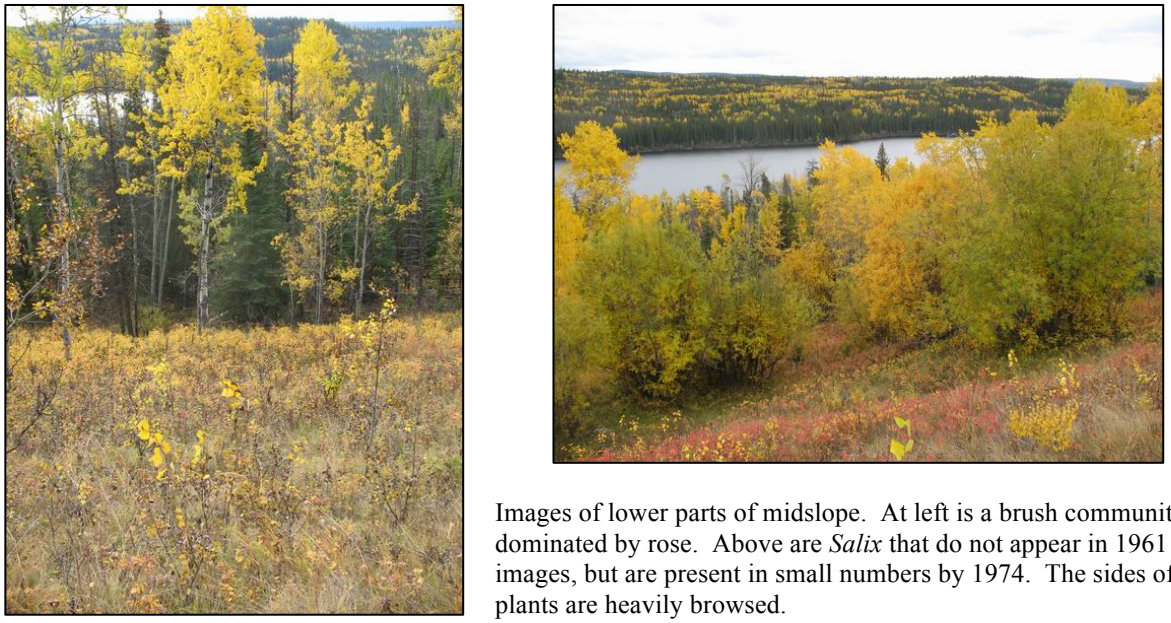
The saskatoon is very heavily browsed, to the point where it exists only as low ground cover. The density and vigour of both prickly rose and common snowberry increases further downslope where soil moisture is greater. Aspen occurs as scattered and heavily browsed stems, or in copses of varying height, with frequent stems that are taller than browse height. Aerial photography suggests some of these sites had burned on the order of a decade

before 1961. Both veteran aspen stems and apparent dense suckering are visible in the 1961 images. By 1974 much of the dense suckering was no longer apparent in images, and by 2012 some of the taller stems were no longer present. Sites in small hollows are more likely to have dense and taller copses of aspen. Scattered stems of both pine and spruce occur on the site. The largest pine were killed by mountain pine beetle, likely between 2000 and 2005.

The 1961 photography also shows darker tones and coarser textures in the lower parts of the slope where prickly rose and other brush species have their greatest cover and height. This suggests the community developed early and has been persistent over more than 50 years.

The nearest analogs in SM04 for the range of conditions include PK : Pine grass – Kinnikinnick (grassland), NW : Needlegrass Slender wheatgrass (grassland) and BW (82): Bluegrass – Slender wheatgrass (grassland), with MA : Aster – Meadowrue – Peavine – Fireweed (mesic herb meadow) on being the lower, brushier areas.

Two midslope locations less than 150 m apart. Kinnikinick with 5-6 cm humus dominates ground cover in open area at left, while dense grasses and 22 cm humus are at right. Large aspen were present in 1961.



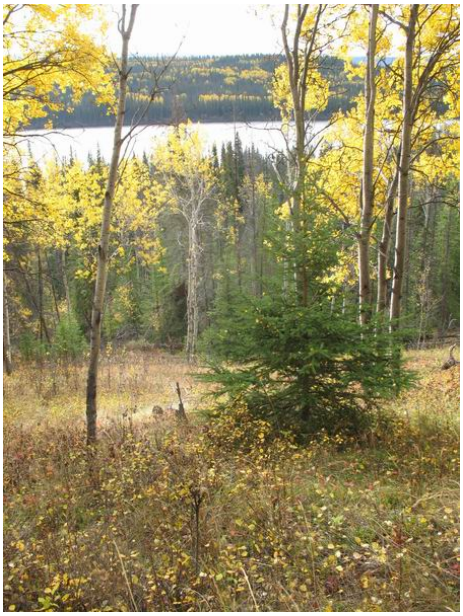
Images of lower parts of midslope. At left is a brush community dominated by rose. Above are *Salix* that do not appear in 1961 images, but are present in small numbers by 1974. The sides of the plants are heavily browsed.

Browsing pressure on the aspen on these sites is persistent and high, but there are also frequent dense copses that have managed to grow above browse height. Aerial photography and field observation suggest this is a development that occurred after 1974. However, is also commonly associated with scattered mature aspen stems that were present in 1961. In the past, periodic wildfire would have killed conifers as well as the stems in aspen copses, and likely affected the proportions of brush and grass species. The intensity of browsing of suckers will have varied across the burned areas. In some cases, groups survived to grow above browse height, while in others the high browse pressure has facilitated grassland development. Copses that exceed browse height are expected, in the absence of fire, to persist until they become senescent.

Senescent Mature Aspen Stands

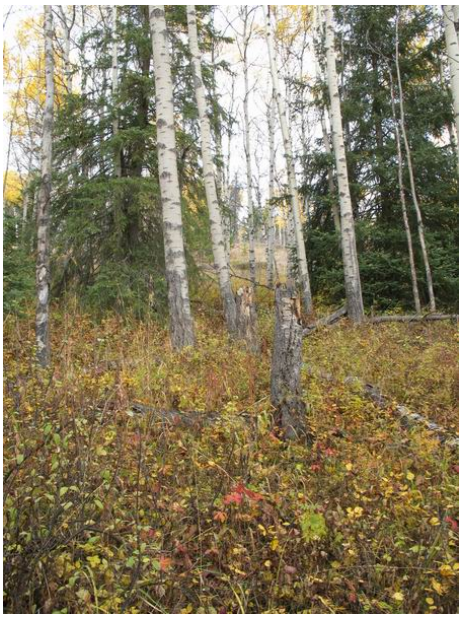
Significant areas of mature aspen appear in Area A in the 1961 aerial photography. These occur on sub-mesic to sub-hygric sites with slopes typically less than 45%. By 2013, many of these sites had a more open canopy and aspen vigour was clearly in decline. Stems are infected by *Phellinus tremulae*, and many have died or broken. Aspen suckers are heavily browsed and do not appear poised to replace the overstorey. Spruce and pine of various ages and sizes have regenerated under this open canopy. On moister sites, cottonwood are replacing the aspen.

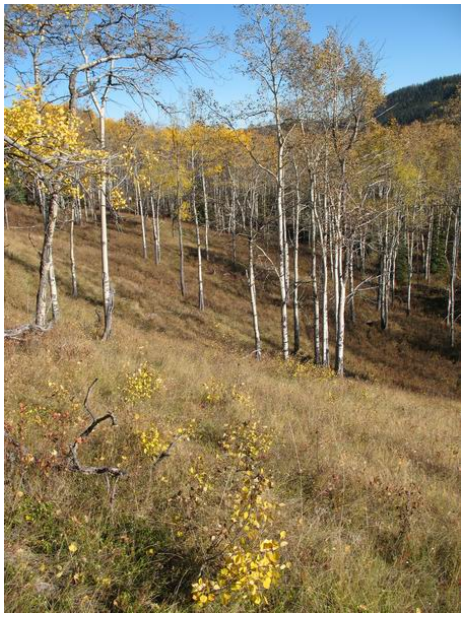
The understorey vegetation covers a broad range due to the range of hygrotopes on which these stands occur, but grasses have a lower presence than in the open areas. These sites can be interpreted in terms of the SBPSdc series descriptions for the understorey vegetation, with submesic sites as series 03, mesic sites as series 01, and subhygric sites as series 05. The height achieved by the dominant aspen also varies by series, from about 15 m on submesic, to 25 m and greater on the mesic and subhygric sites.



Submesic senescent aspen stand. Aspen suckers and brush are heavily browsed. Kinnikinnick cover is high. Both spruce and pine colonizing site and likely to replace aspen in the absence of fire.

Mesic senescent aspen stand. Browse species, including saskatoon, are denser and taller than on submesic site. Conifers will likely replace aspen in the absence of fire.





Views of submesic to mesic, old and open aspen stands in which suckers and other brush species are heavily browsed. These may ultimately revert to open grassland/steppe in the absence of fire if browsing pressure is maintained.

Subhygric senescent aspen stand where aspen are being replaced by cottonwood and spruce. These fresher sites were likely forested, whether in deciduous or coniferous species, for long periods in the past. The moisture regime and flat aspect are also amenable to maintaining forest cover rather than grassland in the future.

Mesic Herb Meadows

Area B has large open areas of gentle slopes (15-25%) and well drained sandy loam gravels with about 13 cm of humus. Dense communities include mixed grasses, prickly rose, fire weed, (*Epilobium angustifolium*), asters, northern bedstraw, peavine, yarrow, western meadowrue (*Thalictrum occidentale*), wild strawberry, common snowberry (*Symphorycarpos albus*), and *Geranium* species. Small drier areas include common juniper and soopolallie (*Sheperdia canadensis*). Wetter areas include common snowberry, black twinberry (*Lonicera involucrata*) and cow parsnip (*Heracleum sphondylium*). Vegetation is greater than 1 m tall in the wet areas. Small aspen copses occur on the edges and within the sites, while strips of juvenile conifers occur along the edges of the site. Numerous game trails and beds were observed in the autumn.

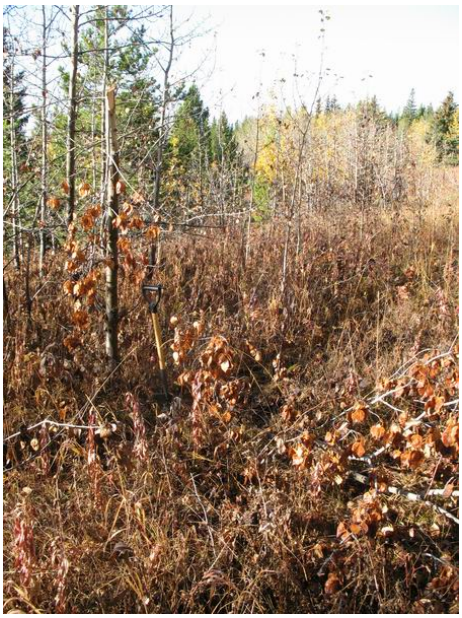
The 1961 aerial photography shows fallen trees within the large open areas, suggesting there had been at least some mature tree cover on the site before a disturbance (fire) killed them. No trees were found in these areas in 2013.

The nearest analogs in SM04 for the range of conditions are MA : Aster – Meadowrue – Peavine – Fireweed (mesic herb meadow) for the majority of the area, and CA : Cow parsnip – Large leaved avens (moist herb meadow) for the small moister areas associated with hollows.

Views of expansive mesic herb meadows. Spruce and pine, and to a lesser extent, aspen, are colonizing area.


Left: Spruce invading from a small pocket of spruce and willow established long ago in a hollow within the larger meadow. Right: Perimeter of large meadow sowing encroachment by spruce and pine. Note pine in left foreground and height gradient.

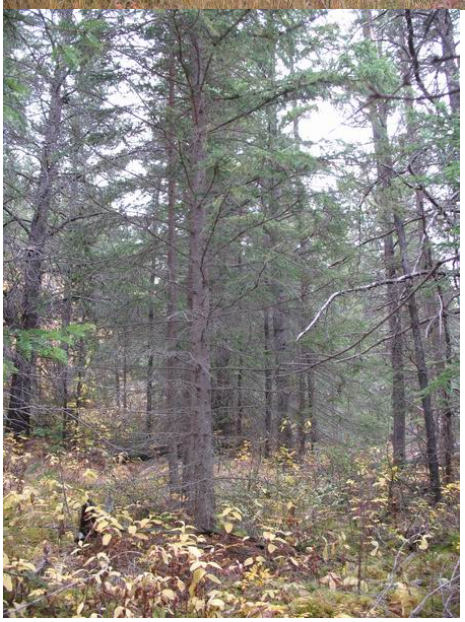
Above: Small mesic herb meadow opening in forested area is being colonized by aspen, spruce and pine. Shorter aspen are browsed, taller stems have *Cytospora* canker. Right: Young cottonwood established in a wetter area. Much bear and moose activity noted.



The mesic herb meadows exist in an area that can also support forest cover typical of circum-mesic sites in the SBSmc2 subzone. Indeed, comparison of current conditions with 1961 aerial photography shows that much of the present forested area closely associated with the meadows occurs on sites that were forested before the last major fire more than 50 years ago. Some of the current meadow area may have arisen as a result of that disturbance (fallen stems visible where there are no trees present in 2013). However, encroachment of trees, clearly younger than those in the forested area, represents a significant decline in meadow area over time due to the length of perimeter involved. Time has also permitted individual conifer stems and aspen or cottonwood copses to become established within the larger areas. Lastly, the colonization of small openings with trees is changing the character of these areas, and likely allowing snow to persist longer in the spring. In the absence of disturbance that would remove or set back these stems (or of climate change that favours grasslands), the process can be expected to accelerate.

Midslope Coniferous Areas

Within both Area A and B are small stands of pine and spruce. They tend to occur on lesser slopes or flat areas that are subjected to lower solar irradiation than the steep open areas, retain moisture longer, and are therefore naturally more conducive to tree growth. They include the spectrum of sites from subxeric through subhygric. Some of the stands appear in the 1961 photography as remnants that survived an earlier fire, others seeded in later. The remnant pine stands were subsequently infested by mountain pine beetle, and there is now ingress of young pine amongst the snags. Both bear and ungulate beds were found within these areas, indicating that they are an important part of the current complex of conditions. The same process of pine colonization of the crests and upper slopes from adjacent stands is also observed in these areas, with these remnants being the source of seed for the encroachment.



Above Left: Encroachment of pine from remnant stand onto grassland slope below. Note oldest stems were killed by mountain pine beetle.

Above Right: Pine regeneration in a beetle killed remnant of previous fire.

Left: Spruce regeneration in a small moist pocket in which bears or ungulates find refuge and bedding areas.

Other Phenomena

Horses range freely at the eastern end of the area. They graze along the access road from the northeast, and follow an old snip-n-skid trail to the upper slopes of the grassland area. Here they graze the upper slopes and seek refuge in the old aspen stands at the top of the slope. Rattlebox (Yellow rattle, *Rhinanthus minor*) was observed growing only in areas where the horses range. It is a hemi-parasite of grasses and its spread appears related to the horses' activity.

VALUES AT RISK:

Plantations of pine and spruce have been established upslope of the Sidehills area. There is photographic and inventory evidence that fires on the Sidehills also burned into the adjacent upslope forested areas.

DEGRADATION INDICATOR:

1. There is an unnatural level of tree presence in open grassland areas due to encroachment by conifers and aspen/cottonwood because of fire exclusion policy.
2. Old aspen stands have increasing levels of conifers which may ultimately replace the current overstorey, whereas in the past regime of frequent fires, these would have been killed, and the aspen would regenerate or the site would cycle to a grassland due to herbivory.

CAUSE OF DEGRADATION:

More than 50 years have passed without significant disturbance by fire. Periodic fires are considered to be the main agent by which grassland reversion to forested conditions is prevented. In the longer term, climate change is likely to facilitate grassland development or maintenance in this area if it warms and dries.

ECOLOGICAL SERVICE OR SOCIO-ECONOMIC VALUE AT RISK BECAUSE OF DEGRADATION:

Early spring forage for ungulates and bears is at risk as trees develop on grasslands.

TREATMENTS

TARGET ECOSYSTEM:

1. Grassland/steppe areas.
2. Open senescent aspen stands with conifer understories.

TREATMENT TYPE AND RATIONALE:

Spring burning of a portion of the area using helicopter drip-torch. The area is long, and it is unlikely that the entire area was burned in any one event in the past. Burning portions over different years allows evaluation and adjustments to be made in subsequent treatments. It also prevents an "instantaneous" large change occurring due to a single event over the entire area. If burned, treatments may need to be performed over a period of days due to differing rates of snowmelt and drying of vegetation on different aspects/exposures.

Alternatively, conifers may be hand felled in selected areas and left to decay, but this is likely to be more expensive.

DESIRED FUTURE CONDITION:

1. Open grassland areas will have less than 20% of presently live conifers remaining after treatment.
2. Areas where encroaching conifers have developed continuous canopy coverage between the grasslands and adjacent old forest will be reduced by more than 80% due to heat girdling or candling.
3. Areas of senescent mature aspen will have at least 50% of understorey conifers killed. (This may be a more difficult area to ignite and achieve continuous ground fire that in turn kills the conifers.

Small areas of surviving conifers on lesser slopes, within the larger grassland area, and where they existed as small stands in the past, will be acceptable.