Report on Sutherland Grassland (Tl'o 'anun) Reconnaissance

Prepared for

Society for Ecosystem Restoration in North Central British Columbia

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March 2015

Contents

1. Introduction

The Sutherland grassland-aspen complex (Tl'o 'anun, or grassy hill) is located within the Sutherland River Protected Area. The area was historically valuable for several First Nations groups, particularly as a spring bear-hunting area. Concern has previously been expressed in a number of reports regarding the potential for aspen encroachment of the grassland areas, and whether interventions in the form of burning or brushing would be desirable.

This report describes work that was done under contract to the Society for Ecosystem Restoration in North Central BC (SERNbc), with funding from the Habitat Conservation Trust Foundation (HCTF). The project sought to investigate and address some of the stated management goals (Vanderhoof Land and Resource Management Plan, Parks Management Direction Statement) related to south aspect grasslands and aspen encroachment. Field visits to record conditions and to help calibrate aerial photo interpretation were completed in the late summer and early autumn of 2014. Older aerial photographs were acquired and examined to provide historical context. Field data, including ground level photographs, as well as limited interpretations were assembled for convenient viewing in KMZ format (viewed using Google Earth), and a summary poster was produced to facilitate discussion by land managers.

1.1 Objectives

The objectives of this project were to collect sufficient field data in the candidate area to either develop treatment prescriptions and maps, or to provide a rationale for not treating the area. This would include preparation of a burn plan if burning were the prescribed treatment.

1.2 Project Area and Context

The area identified for examination is approximately 1050 ha in size, on a large hill with generally south to southwest aspect, within the Sutherland River Protected Area. It is approximately 30 km north of the community of Fraser Lake (54.322 N, 124.760 W, Figure 1).

The area lies within the Babine Upland (BAU) Ecosection within the Sub-boreal Interior Ecoprovince. The lower elevations are within the Sub-Boreal Spruce, dry-cool (SBSdk) biogeoclimatic (BGC) subzone. The middle to upper elevations are within the Sub-Boreal Spruce, Babine moist-cold (SBSmc2) BGC subzone, and a small area at the highest elevation is classed as the Engelmann Spruce Subalpine Fir, Nechako moist-very cold (ESSFmv1) BGC subzone. The elevation range is 815-1275 m.

The Sutherland River Protected Area was established by order in council in July 2000, after the 1997 Vanderhoof Land and Resource Management Plan (LRMP) identified it as a strongly supported candidate for protection. It is contiguous with Sutherland River Park to the northwest, established in April 2001 following recommendation by the Lakes LRMP.

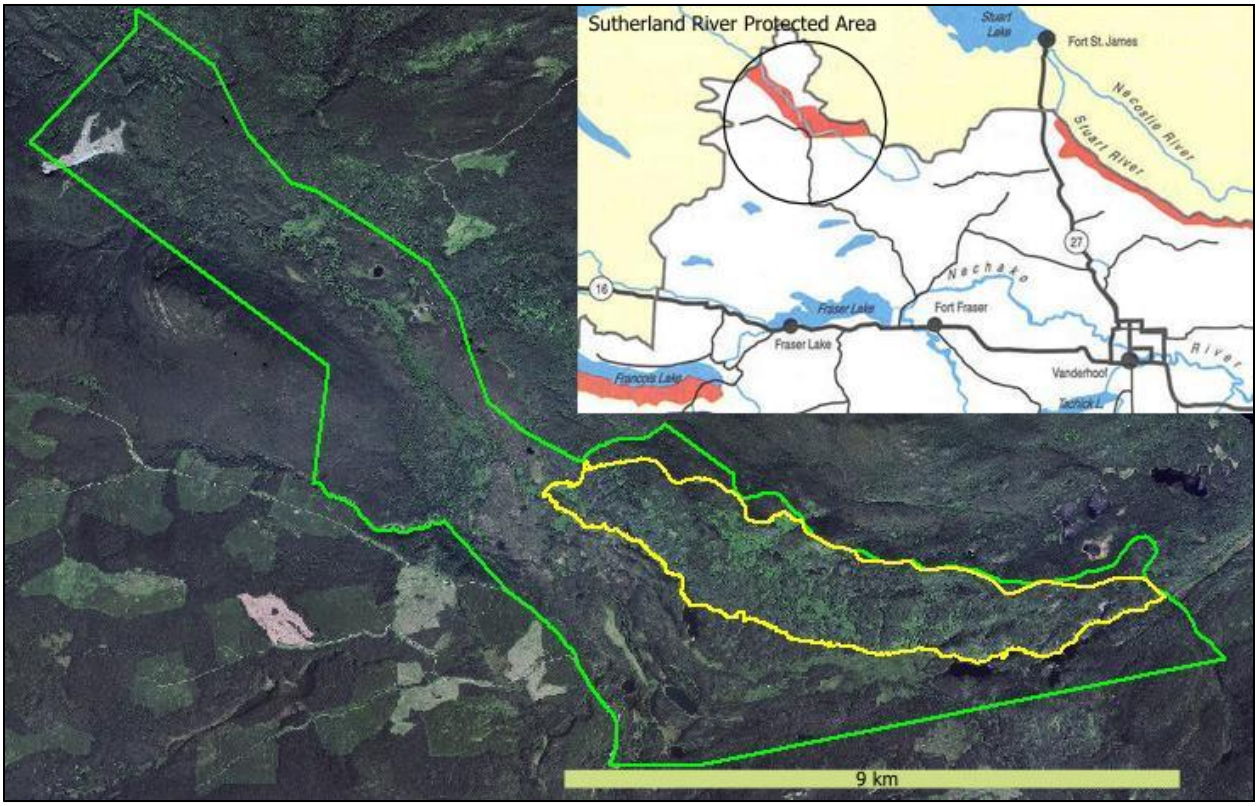

Figure 1. Location of the candidate area (yellow) within the Sutherland River Protected Area.

The Vanderhoof LRMP drew attention to the "park-like grassy sidehills with their groves of aspen and Douglas-fir" that "were a favorite bear-hunting area in the spring". Horse trails, still used today, were developed by the local guiding family (Steiner) before the 1960s. The Steiner family reports that native peoples periodically burned the hillsides as a management technique.

The area is locally well-known for its wildlife, and the LRMP mentioned wolves and grizzly bear, mule deer and moose, and furbearers. The occurrence of cougars was described by guide Ray Steiner. The presence of elk is not noted, but interest in management interventions was expressed by the now defunct Rocky Mountain Elk Foundation Canada in the 1990s.

The LRMP listed two wildlife objectives:

- Maintain the current distribution, abundance and critical elements of wildlife habitats
- Maintain moose and grizzly populations

Strategies for achieving these objectives included:

- Maintain existing distribution of forest vegetation age classes and species in riparian, open grassland and open forest types by proactive management such as burning and manual brushing.
- Maintain forage and decrease encroachment of aspen on south facing slopes with appropriate vegetation management (e.g. burning).

In November 2003, the Management Direction Statement (MDS) for the park and protected area was published. No update has been made since. The document confirms the management direction provided in the Vanderhoof LRMP, and describes a number of conservation attributes of relevance to the project area:

- Contains some of the most extensive and best-developed Douglas-fir ecosystems in the Skeena Region.
- Contains rare plant communities including: saskatoon-slender wheatgrass (SBSdk/81, SBSmc2/81; red-listed) on dry south-facing slopes;… Douglas-fir-feathermoss-stepmoss (SBSdk/04; blue-listed) on south-facing rocky knolls.
- Conserves the following wildlife values: …high value spring grizzly bear habitat in wetlands and lower slopes; habitat for reptiles and insects in dry Douglas-fir and scrub-steppe plant communities...

The role of the protected area as expressed in the MDS includes "to conserve representative ecosystems and provincially significant plant communities, particularly south-aspect grasslands, and important wildlife habitat ranging from wet floodplain to dry upland ecosystems. … The dry upland grasslands, scrub-steppe and open forests provide valuable spring forage, and harbour migrating birds, reptiles, and uncommon insects."

Several management issues of relevance to the project area were described in the MDS under the theme "Protecting Ecological Values":

- The existing distribution of age classes and species in open forest and scrub-steppe ecosystems might change because of forest fire suppression.
- The native vegetation and rare plant communities may be at risk because of colonization by non-native plant species and weeds brought in by horses.
- Aspen encroachment might decrease forage value for moose and grizzly bear and displace grasslands.

Then, for the goal of protecting ecological values relevant to the project area, the following strategies were listed:

- Implement an inventory of the area's fauna and flora with priority given to the following:
    - Rare riparian and upland communities;
    - Critical grizzly bear foraging areas along river valley; and,
    - Critical moose calving areas on south facing slopes.
- Work with (other agencies) to inventory fish, moose, and grizzly bears as necessary.
- Develop a fire management plan; consider using prescribed burning to prevent encroachment of grassland, scrub-steppe and open forest ecosystems; maintain natural fire cycles of fire-dependent ecosystems.
- Consider manual brushing (including hinging) to prevent aspen encroachment of grassland and scrub-steppe ecosystems.
- Establish photo plots to evaluate change in plant community composition and the effect on listed plant communities.
- Allow continued horseback riding (guide-outfitter and recreational use) on trails associated with Shass Mountain Trail; work with guide-outfitter and horseback riding clubs to minimize impacts; provide information on low impact horse riding practices to visitors; monitor horse use and ecological damage.
- Work with Ministry of Forests (Lakes and Vanderhoof Districts) and forest companies to minimize impacts of forest harvesting on ecological values.

- If recreation use increases as access to the park becomes easier, monitor impacts and manage appropriately (e.g. access control); work with Ministry of Forests and forest licensees to restrict motorized access to the park from new roads.
- Monitor introduction of noxious weeds and undertake control measures if necessary.

The MDS makes clear in the very first paragraph of its introduction that while it identifies strategies, the completion of all these strategies is dependent on funding and funding procedures. So, for example, by the end of 2014, no fire management plan had been developed.

2. Methods

Stereoscopic views of the area were set up from the 30 cm 2012 digital aerial photography of the area and a preliminary reconnaissance route was selected to sample a range of ecosystems across a broad range of elevation, slopes, and vegetation cover types. Due to the extreme fire season in 2014, the planned initial field day involving SERNbc and BC Parks representatives was delayed until mid-September (both helicopter and staff availability were affected). However, observations from the initial transect were very useful for deciding how to delineate and interpret vegetation types and selecting the routes for subsequent transects.

Forested areas were delineated and interpreted based on leading and other species, vegetation height and texture, and simple descriptions were applied. The resolution of the photography did not permit definitively distinguishing between brushland and grassland open areas. Three more field transects were designed and field work was completed October 7, on each transect accompanied by a different FLNRO employee. The SERNbc digital field card was used to record observations at preselected and *ad hoc* locations. Numerous photos were taken. Transect lengths were optimistic and needed to be truncated or plots dropped due to time limitations, but the reconnaissance still provided a broad coverage of the area.

The notes were reviewed, resulting in some of the previously typed vegetation labels and boundaries being adjusted.

To help understand the trajectory that led to the current distribution of vegetation, digital versions of 1960 aerial photography of the area were obtained. Stereo models were made and an orthophoto was constructed. A detailed comparison of the type of vegetation present was undertaken. Areas that had changed from open to treed, or from treed to open, were delineated. Areas of “normal” development, i.e., where ingress had occurred in open forested types, or the general enlargement of crowns and accompanying decrease in stand density, were not considered in this exercise.

The recorded fire history of the area was obtained, and guide Ray Steiner was interviewed.

The amount of area in different types and the amount of area that had undergone significant change were determined and summarized. A poster was made to convey the main attributes of the area and facilitate discussion, as well as several KMZ files that contained more detailed information organized as layers for convenient viewing using Google Earth.

A meeting was held with representatives from FLNRO, Parks, WFMB, and SERNbc to discuss the findings decide what course of action should be taken.

3. Results

5.1 Fire History

The only formal record of fire disturbance on the area indicates that 54% of the area burned in a human-caused fire that began on 5 September, 1928 (Figure 2).

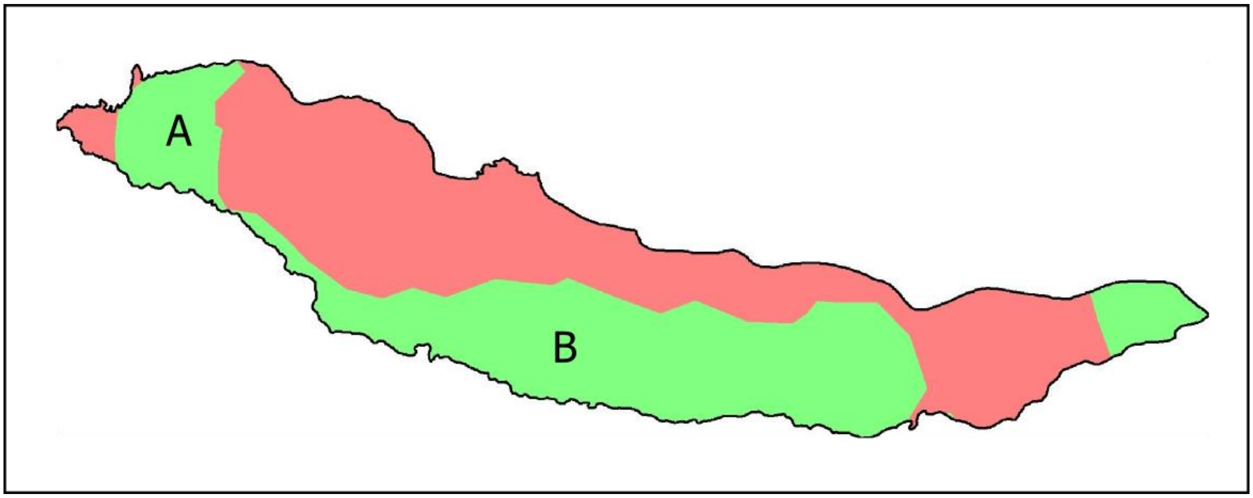

Figure 2. Extent of 1928 fire (red) as derived from linens. Areas around A and B were affected by the same event.

The record obtained from iMapBC had been digitized from original linens. Comparison of the boundary to natural features such as wetlands and lakes indicates an easterly bias of about 180 m. Comparison to 1960 aerial photography indicates that the boundary mapping was at coarse resolution, and did not include significant areas that were clearly part of the event, or included areas that were skipped by the fire. For example, the area around "A" in Figure 2 experienced fire, as evidenced from a tree cohort of the correct age, but it included Douglas-fir and pine veterans (since dead), indicating that it was a patchy burn here, which may have led to a choice to represent it as not burned. The large area around "B" is more difficult to interpret, but tree height variations observed in the 1960 images suggest that portions of it likely burned in 1928 and that the mapped fire boundary is approximate.

5.2 Vegetation by Species or Broad Community Type

The delineation of vegetation identified 22 different species and structural types within the area, plus a rock and a pond type. The vegetated area can be divided into two broad groups – open and forested. In general, the open areas are grassland or brushland types, and a very small amount of pocket wetlands. Alder, willow and/or spruce swales were readily delineated. The photography did not allow distinction between all brushlands and grasslands, but a small number of open areas dominated by *Rubus parviflorus* or *Lonicera involucrata* in specific terrain locations were identified, with the interpretation calibrated by field observations. In most other open areas, whether mesic or drier, there was not sufficient resolution to reliably distinguish between vegetation dominated by grasses, fireweed, or any of the many woody brush species that occur in the area. There were 19 different forested type labels applied, with six leading species and varying combinations of the other five. A simplified summary is provided in Table 1.

Table 1. Proportion of area in different vegetation types.

Type	Area (ha)	Proportion of Area (%)
Aspen	450	42.8
Aspen and Conifer	26	2.5
Grassland/Brushland	161	15.3
Dead Pl and other species	140	13.3
Dead Pl	47	4.4
Fd	61	5.8
Fd Sx Pl	42	4.0
Spruce-leading stands	67	6.4
Rock	20	1.9
Alder Willow Spruce Swale	8	0.7
Black Spruce	7	0.7
Wetland	5	0.5
Brush (*Rubus parviflorus or Lonicera involucrata* dominated)	5	0.5
Aspen, Open, Steep	4	0.4
Fd, Open and steep	4	0.3
Mix of small dead and live pine	2	0.2
Bl Sx	1	0.1
Pond	1	0.1
Total	1051	

When the cover types from Table 1 are further grouped into six broader categories, approximately 73% of the area is occupied by aspen-leading, dead pine-leading, or Douglas-fir-leading stands, and 16% of the area is in grassland or brushland cover. Figure 3 provides a graphic summary of this distribution.

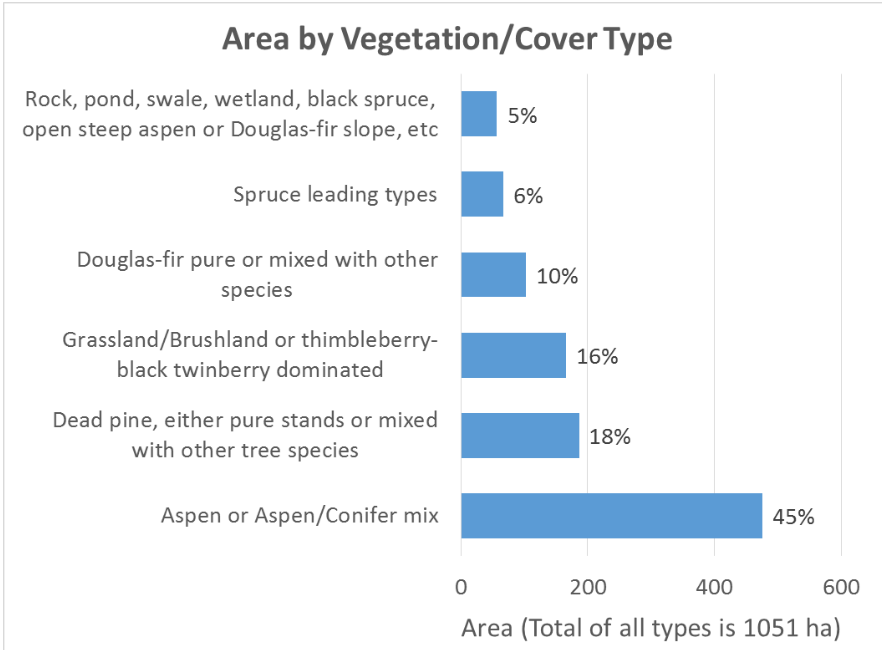

Figure 3. Area and proportion of area in six broad groupings of vegetation/cover types.

The map in Figure 4 shows the distribution of vegetation types over the area. The concentration of Douglas-fir stands in the western portion of the area is readily apparent, as is the large proportion of aspen cover and the high proportion of open grassland-brushland directly bordering the aspen types. Note also that these open area boundaries are complex and have a high edge to area ratio. Better mapping resolution is available in the companion KMZ files.

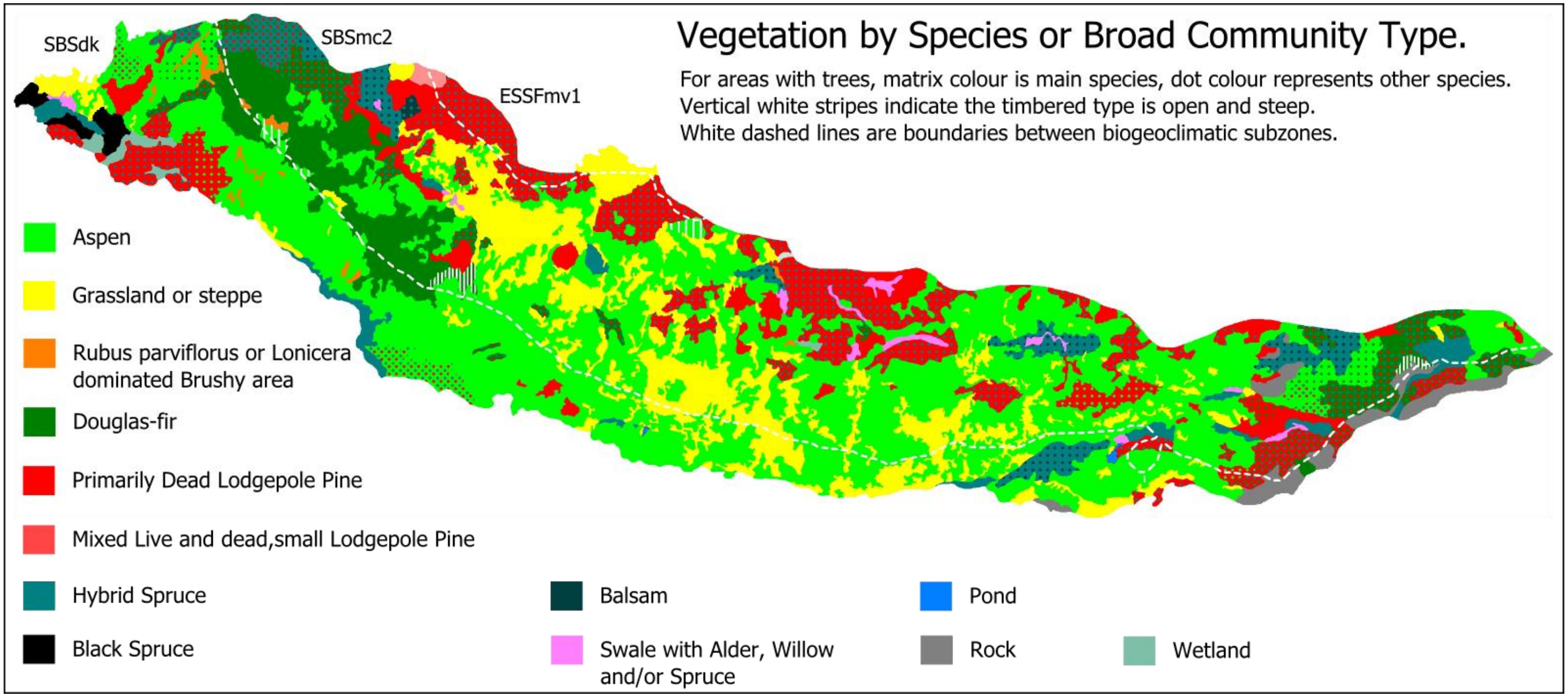

Figure 4. Vegetation by species or broad community type. Includes location of Biogeoclimatic subzone boundaries.

5.3 Biogeoclimatic Classification

The 1051 ha area spans three biogeoclimatic subzones, with boundaries depicted in Figure 4 and area distribution as in Table 2:

Table 2. Area Distribution of BGC Subzones

BGC Subzone	Area (ha)	Proportion of Area (%)
SBSdk	349	33
SBSmc2	681	65
ESSFmv1	21	2

Given the reconnaissance level field coverage, site series were not systematically mapped, but generally, most of the area in the subzones is mesic or drier. The principal exceptions are lower, toe and depressed slope positions, where the receiving position leads to small areas of subhygric or wetter conditions. Soils in most of the lower elevation sites are derived from silts that are free of coarse fragments, with gravelly tills further upslope. Rocky outcrops occur at the highest elevations in the center of the area, and become increasingly common to the east such that they occur over the entire elevation range in the eastern one-fifth of the area.

5.4 Douglas-fir Stands

Stands of Douglas-fir (Fd) are common in the SBSmc2 and upper reaches of the SBSdk portions of the west end of area (Figure 4). Small groves of veterans are common, but there is a considerable area of younger Fd that regenerated after the 1928 fire. These areas vary from dense, 100% Fd to mixes containing spruce and dead pine, to sparsely regenerated areas with brushy understories. The younger stands often have a cohort of shorter, smaller diameter trees that would act as ladder fuels in the event of a fire, but these appear to be dying due to suppression so that the stands could enter a period of relatively lower vulnerability. Due to the range of conditions concentrated in a relatively small area, the entire ensemble is considered to have a high value as future ungulate (mule deer) winter range. Figures 5-10 illustrate a range of stand conditions.

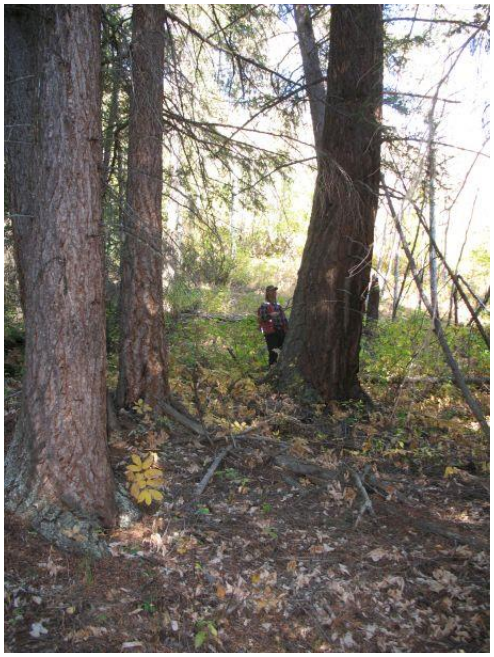

Figure 5. Grove of large Douglas-fir veterans

Figure 6. Dense Douglas-fir 66 years BH age with sparse understory

Figure 7. Douglas-fir with ladder fuels throughout stand. Veterans are falling but the larger of the younger trees are poised to become dominant.

Figure 8. Stand with ~50% Douglas-fir is potential future ungulate winter range.

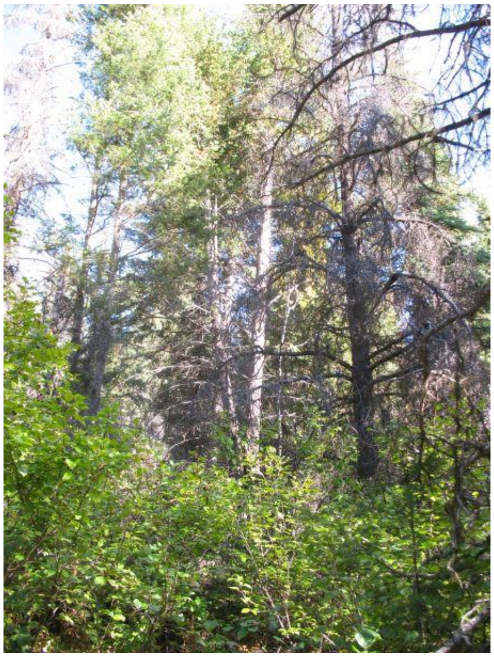

Figure 9. Example of open stocked Fd with a component of Sx and dead Pl, with limby stems and much alder in the understorey.

Figure 10. Steep open slope near repose with regenerating Fd of wide age and size range and numerous browse species.

5.5 Grassland/Brushland

5.5.1 Native Grasses

Native grass species are abundant in most openings, with bluejoint, blue wildrye and Pumpelly brome being the most common. Other unidentified species of wildrye, as well as brome that may be a hybrid of Pumpelly brome, were noted. Slender wheatgrass is common on the drier crests and south aspects classed as SBSdk/81 or SBSdk/82, and their equivalents in the SBSmc2 subzone. Lesser amounts of *Poa* species and Fescues were noted.

Nipping of both the wildrye and slender wheatgrass was observed throughout the area, likely due to deer. Heavily bear-trampled areas were observed in both the openings and the well-lit aspen stands with grass in the understory. The seed had been consumed, and it is likely the bears were doing this by purposely drawing stems together to improve their feeding efficiency.

5.5.2 Spatial Distribution of Species

Together with the aforementioned grasses, the most common shrub and tall herb species in the grassland/brushland areas include: *Rubus parviflorus*, *Lonicera involucrata* (where sufficient moisture occurs), *Salix* spp, *Amelanchier alnifolia, Symphoricarpos albus, Rosa acicularis, Rubus idaeus*, *Epilobium angustifolium*, and *Heracleum sphondylium.* The driest sites also include *Sheperdia canadensis* and *Arctostaphylos uva-ursi.* Heavily browsed aspen suckers occur in the vicinity of larger aspen stands and individual mature or recently fallen aspen stems.

The distribution of these species over the open areas is not uniform. They often occur as discrete communities dominated by one of the species (whether grass or shrub), accompanied by varying amounts of the others, and with abrupt transitions between them. It is a visually striking feature observed at ground level, but it could not be reliably interpreted from either sets of aerial images, and therefore no temporal changes at this level of community structure could be determined. Except for some of the xeric or subxeric upper slope and crest locations, no significant conifer encroachment of the grasslands/brushlands was observed. The high density of the communities likely prevents seedling establishment after germination. Figures 11-17 provide visual examples of the variable structure and composition of the grassland/brushland areas.

Figure 11. Rich herb/grass meadow with some conifer invasion near SBS/ESSF boundary.

Figure 12. Grassland associated with a fan at toe of slope. Slender wheatgrass and Pumpelly brome are dense, plus diverse herb species. Poa species and bluejoint are prominent elsewhere in the opening. Aspen suckers and willows are heavily browsed.

Figure 13. Grassland/brushland complex with conifer invasion, both old dead and young live pine, old poor aspen, and old willow. A mosaic of distinct communities that all have rose, snowberry and grasses present, but are dominated by one or another.

Figure 14. Small opening in an expansive aspen stand. Saskatoon, snowberry, raspberry, thimbleberry and rose, diverse herb and grass species. Density of each species varies continuously through the opening.

Figure 15. Rich opening with old willow, with dense thimbleberry, snowberry and bluejoint, blue wildrye, and some Pumpelly brome.

Figure 16. Midslope grassland with scattered willow and aspen. Slender wheatgrass, blue wildrye, Pumpelly brome with fireweed, raspberry, snowberry.

Figure 17. Two images taken in different directions at same midslope location illustrating the abrupt changes in community composition. Most grass species are reduced to scattered stems where fireweed, snowberry or rose are prominent.

5.5.3 Stability over Time

Comparison of the cover types as they appeared in the 1960 aerial photography *versus* the 2012 photography indicated that most of the forested areas followed a “normal” trajectory of increasing height and crown sizes and reduction of density, with the exception of ingress of initially open stocked areas. Pine stands were killed by the mountain pine beetle epidemic in the mid-2000s. The remarkable feature was the lack of encroachment by either conifer species or aspen into the grassland/brushland areas. The vast majority of willow clumps and aspen copses within the grasslands in 2012 were present in 1960. Some short aspen copses present in 1960 have been continuously browsed and not grown above browse height or expanded in area. Only 9 ha underwent a significant change in the cover type between the open and forested condition, and that change occurred in both directions, with timbered areas also converting to open condition. Figure 18 summarizes the changes that occurred.

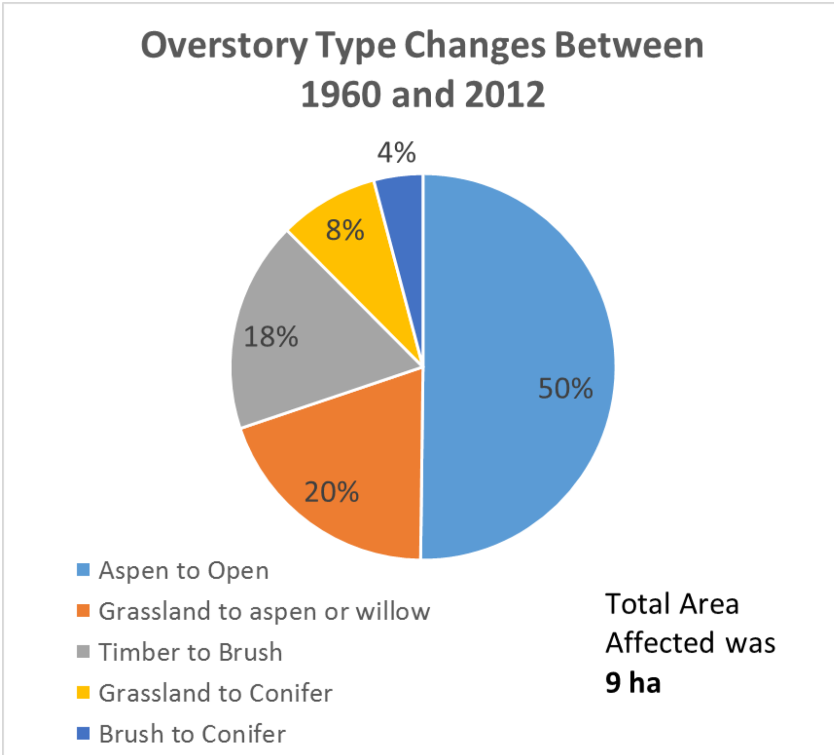

Figure 18. Overstory Type changes between 1960 and 2012.

The change from aspen to open occurred in two ways. Beavers deforested areas on the lower slopes, and suckers were prevented from growing by browsing. The aspen on steep, dry upper slopes is not vigorous. These stands may have declined due to a combination of droughty conditions and moose breaking and browsing the small stems. Figure 19 shows an example of the extent of change caused by beavers (with area on far right a rare example of change from grassland/brushland to conifer).

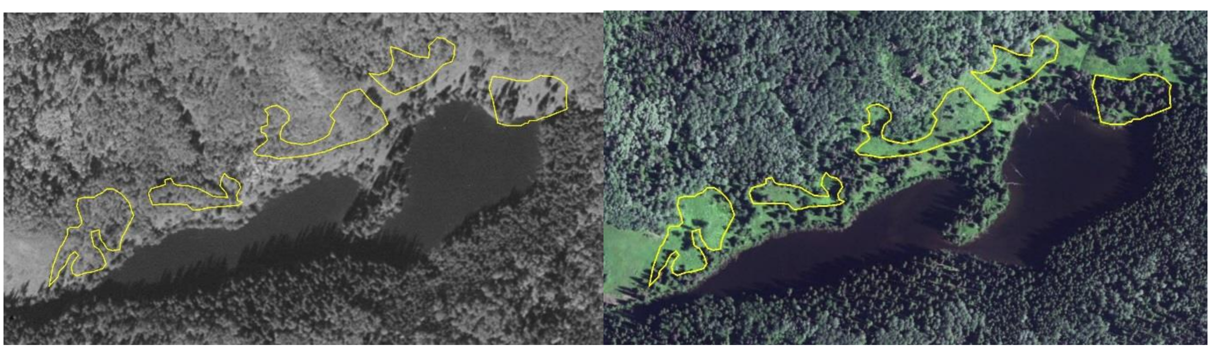
Figure 19. Changes from aspen to open caused by beavers, and encroachment of grassland by conifers.

The area that changed from timber to brush was affected by windfalls, and the dense cover of *Rubus parviflorus* has impeded the regeneration by conifers that were previously present.

Only about 2 ha converted from open to aspen. Some of these aspen stands are presently tall and vigorous, while others are small copses of short trees. These are clearly episodic encroachments rather than continual advancement from the edge of the established stands. This appears to be a rare event in this area, but one of the plots in dense grass near a mature aspen stand had new, thin aspen stems up to 50 cm tall that grew in 2014. These could become a new aspen copse if they escape browsing over the next few years, but given the almost annual browsing of nearby stunted and deformed aspen, this is considered unlikely. Figure 20 is an example of a change from grassland to aspen, but the apparent stability of the remaining grasslands, and the main change in tree cover being the crown size, is also striking. Of interest, the white flecks in the 2012 colour image are the flowers of *Heracleum sphondylium.*

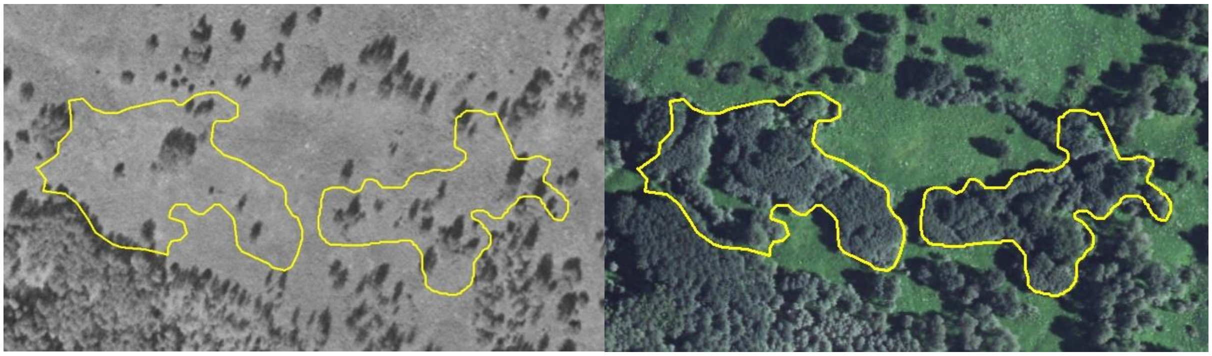

Figure 20. Change from grassland to aspen between 1960 and 2012.

5.5.4 Edge to Area Ratio

Visual inspection of the map in Figure 4 suggests that the perimeter/area ratio of the grassland/brushland areas is higher than for forested areas. This ratio averages 523 m/ha, and much of this area is adjacent to aspen cover. Note that the delineation of cover types could not capture all aspen copses within the open areas, so this value is underestimated. By contrast, aspen leading stands have a ratio of 269 m/ha, but this is not a directly comparable value because a large proportion of the edge is with *other forested types.* Further, because much of the open area adjoins aspen types, the edges of the aspen types are often well lit, and dense grass cover extends into the aspen stands. These are areas where the disturbance and feeding on grass seed by bears was particularly noticeable. The complex configuration of the grassland/brushland with the aspen is a particularly valuable attribute of this area.

5.6 Aspen Stands

Aspen-leading types occupy 45% of the project area. They are highly variable in density and vigour, with corresponding variability in the composition and vigor of the understory. The poorest areas are sparsely stocked with low vigor, poorly formed trees on dry steep terrain. Open stocked stands on more productive soils generally have dense shrub, herb, and grass layers. There are expansive areas of tall, densely stocked stands on rolling terrain, with rich and varied shrub and herb layers, but few grasses present, in contrast to dense stands on steeper slopes that have more grass in the understory.

Two features are common to all these stands:

1. Gnawing of bark by moose is universal and independent of tree size or age.
2. Conifer regeneration is low or absent unless there is a component of conifers in the stand that is of similar age to the aspen (and such stands are of limited extent).

Examination of photos taken during the reconnaissance shows that aspen trunk rot (*Phellinus tremulae*) is present in the larger stems (characteristic black, blind conks around branch stubs). The rot has not yet contributed to significant stem breakage in any of the traversed stands.

Suckers occur in the open areas outside these long established stands, but are heavily browsed, and few stems ever grow above browsing height.

While difficult to quantify from reconnaissance level observations, late summer game use (feeding, bedding) appeared to be higher where these stands are close to openings.

5.7 Steep Open Slopes

Areas with slopes approaching or at repose are common, and these are where the SBSdk/82 series is best expressed. The main observation of interest with respect to sensitivity to fire is that these areas typically have a large proportion of bare soil exposed. Other noteworthy observations are that aspen achieve their poorest form and vigour on these sites, and that these are the main sites where encroachment by conifers was observed. However, the rate of encroachment is slow, such that both Douglas-fir and lodgepole pine are widely spaced in sizes from saplings through poles. Grasses growing on these sites were found to be nipped, probably by deer. Figures 21-23 illustrate these attributes.

5.8 Invasive Species

Common chickweed (*Stellaria media*) was found growing on a trail at the valley bottom near the east end of the project area. It is part of the guide trail network, and it is likely that horses or humans are the source of the plants.

Figure 21. Steep south slopes with grassland/brushland or open forest have a high proportion of bare, exposed soils.

Figure 22. Aspen have poor form and vigour on steep, dry south slopes.

Figure 23. Steep open, dry slope with Douglas-fir, including saplings, saskatoon, juniper, kinnikinnick, and much bare exposed soil.

6 Discussion

A detailed, spatial record of observations and interpretations was assembled in a series of KMZ files and distributed to members and partners of SERNbc and BC Parks. Results were then discussed by a group including the perspectives of fire management, wildlife ecology, conservation, and general forest stewardship.

Two highly valued types of ecosystems, the Douglas-fir stands and the grassland/brushland complex, are present in the project area.

6.1 Ungulate Winter Range

Many large individual Fd and some groves of Fd survived the 1928 fire. The burned areas that subsequently regenerated to Fd (or mixes of Fd and other species) are developing into increasingly valuable stands that provide winter range for mule deer. The trend of climate change is expected to result in future conditions more like the Interior Douglas-fir (IDF) zone, to which these stands are better adapted than other species. Some of these stands currently have dry lower limbs and ladder fuels in the form of suppressed trees and are vulnerable to destruction by wildfire. This vulnerability is expected to decline as the Fd become larger and further suppress the lesser trees. These stands represent an opportunity to recruit future ungulate winter range from presently young stands. It is unlikely that mechanical methods would be used to reduce the vulnerability given the terrain and remoteness of the site. The main challenge would be to exclude fire from these stands until such time as low intensity maintenance burns could be used with low risk of damage.

6.2 Grassland/Brushland/Aspen Complex

Both the LRMP and the Park Management Direction Statement (MDS) mention the vulnerability of the grassland/brushland areas to encroachment by aspen. The field examination did not find evidence that such encroachment is systematically occurring. High intensity ungulate browsing effectively prevents most aspen suckers from growing beyond browsing height for moose or elk, and the dense shrub and grass vegetation seemingly prevents conifer invasion on most sites. Further, evidence from aerial photography shows there has been very little change in the gross cover types (i.e. open *versus* forested) for more than 50 years, suggesting stability in this system despite the exclusion of maintenance fires during this period. Note, however, that there was no way to determine changes in the relative proportions of shrub to grass cover in the open areas over time, and whether periodic maintenance fires set by native peoples in the past would have favored a different distribution of species. There is also no record of photo plots being established as suggested in the MDS for monitoring change in these communities.

The MDS mentions the value of "dry upland grasslands, scrub-steppe and open forests" in providing valuable spring forage, but this could be extended to include late summer and autumn, as indicated by the foraging of both bears and deer at this time of year. A significant contributor to the valued open forest conditions of the aspen stands is the large amount of edge along the grasslands due to the complexity of the shapes of the open areas. How this pattern arose is an important consideration for management of the area. Given the current effectiveness of browsing in preventing the encroachment of aspen into the open areas, it is likely that the 1928 fire created conditions that favored the recurrence of a pattern that was already dominated by aspen stands and open areas. Immediately after the fire, the large area of burned aspen would have suckered to an extent that overwhelmed the ability of ungulates to browse it all, thus restoring the previous general pattern on the area.

The present distribution of aspen stands and open areas does not appear to be at *immediate* risk of developing to a less desirable state. However, the aspen stands are becoming relatively old for this species, and the presence of *Phellinus* will eventually cause individuals and groups of mature stems to break. As this occurs, moose and elk are likely to browse the suckers, and the overall pattern of forested and open areas will begin to change. The timing (earlier or later), trajectory (rapid or extended duration combined with spatial distribution), and longer-term implications (habitat value for different members of the wildlife mix) of this change is unknown, but it would represent a departure from the fire cycle that is the likely origin of the present pattern.

If the management goal for this area is to maintain a semblance of the current distribution of open and forested cover types and species, a stand replacing fire, possibly on the scale of the 1928 burn will be necessary.

6.3 Fire Management Planning

One of the strategies listed in the park's MDS for protecting ecological values is development of a fire management plan. Such a plan would consider using prescribed fire and maintain natural fire cycles in fire-dependent ecosystems. No plan has yet been produced, yet no use of prescribed fire may proceed without one.

The Sutherland Protected Area is part of a network of parks and protected areas in a landscape where a large proportion of the area is being converted to early seral conditions by industrial harvesting. The role of these parks in the larger landscape context is a consideration for fire planning, as well as more local factors. For example:

- Most of the Douglas-fir stands in the project area are relatively young; efforts to maintain them on the landscape at this time would preclude fire.
- The aspen stands may be young in absolute terms, but are approaching old age for this species and will become prone to breaking up as they further age. Yet a burn would create an early seral condition within a landscape that is dominated by early seral types.
- There are stands of dead pine in the valley bottom that are candidates for burning for different habitat and safety reasons; action here would add to the early seral distribution.
- The large area of coniferous forest north of the project area is proposed for harvesting in the near future. While increasing the local area of early seral stands, by improving access, such development also provides a window of opportunity for control measures, so that a prescribed fire in the project area could be prevented from escaping to the northeast.
- Spring burning of aspen and open areas may have little effect on the general appearance of these types, but if there has been a buildup of dead woody material in the brushland areas, such fires may both rejuvenate the shrub species, and reduce the amount of very dry fuel available in an uncontrolled summer fire, possibly reducing risk to the Douglas-fir stands.
- We do not know the current trajectory of plant community development within the grassland/brushland areas.
- Due to risks to the northeast (Fort St. James), Wildfire Management Branch would act to control a wildfire in this area (i.e. build fire guards, etc).

There is a recent example of this last point that also serves to show how external factors influence the protected area: In 2013, the Peta Fire was suppressed at the park boundary. This was a crown fire that would likely have been a stand replacing event had it reached the grassland/aspen complex. As a further example, it was explained that given the conditions at the time, had the fire entered the protected area, the let-burn policy would have been disregarded and suppression activities would have been undertaken inside the protected area boundary in order to protect values elsewhere. This underscores the necessity for eventually conducting prescribed burns within the area if an approximation of the natural fire regime is to be maintained.

7 Recommendations

A fire management plan needs to be developed for this area as soon as possible. The values that society has recognized in this area cannot be conserved without recognizing the role of fire and planning for it.

Efforts to monitor plant community development need to be started as soon as possible. These may be as simple as establishing photo plots and regularly revisiting them, but without them the lack of both baseline and trajectory information will hinder effective management.

These two items are the minimum to enable managers to identify the optimum timing and scale of fire as a management tool, and the means to implement it.