

Fire Salvage Project For Barney Lake Fire of 2004

**Prepared By
Fire Salvage Technical Working Group**



Picture of Barney Lake Fire on August 13, 2004

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1.0 Introduction

The 2004 Yukon fire season was one of the hottest and driest on record. As a result, there were a higher than normal number of large fires on the landscape. Some of these fires were remote while others were located close to existing roads or previously logged areas. Although fire does not represent a risk or threat to the northern boreal ecosystem, these fires do, on occasion, present economic opportunities to salvage wood when they are accessible and provide merchantable product. As a result, forest managers identified a requirement to assess these fires for potential fire salvage opportunities.

In the Kaska Traditional Territory (KTT) there were 44 fires with estimated area of 390000 ha. The Barney Lake and False Canyon Creek potential salvage areas total 5018ha, or 1.3% of the 2004 burned area in the KTT. A reconnaissance report was produced and presented to KFRSC providing recommendations on fire salvage for interim use and considerations for regional planning (Appendix 3). Fires WL-04-04 or False Canyon Fire and WL-04-29 or Barney Lake Fire was chosen for further work and development planning.

The Barney Lake fire estimated area was 51 900ha with an estimated 1043ha or 2% having potential for operational planning. The total gross estimated volume within potential operating units was estimated at 71 000m³. With an estimated 16 000m³ in stands with heights exceeding 17m.

Harvesting from fires requires planning to ensure that the products can be economically extracted without unreasonable environmental or social impacts. In this regard, a good plan will look for opportunities to improve the future use and expectations from the land base.

2.0 Objectives and Criteria

2.1 Objectives:

- Identify an economic wood supply and opportunity while ensuring that the social and environmental values of the area are respected. The planning objective would be met if the options were “economically viable”, “socially accepted” and “environmentally sound”.
- Consider fire and the landscape surrounding it. This is important to ensure habitats, key features and linkages are maintained in terms of the environmental and future economics of burned forest and adjacent unburned forest.
- Identify Areas for Operational Planning (site plans).
- Complete Environmental Assessment of Development Plan.

2.2 Criteria:

- Best growing sites first
- Prompt regeneration strategies
- Soil conservation strategies
- Protection of wetlands and riparian areas
- Remnant habitat features protection (fire skips)
- Avoidance of sensitive terrain (complex and steep areas)
- Operable land base identification
- Minimize roads
- Winter logging preferred season of operations

2.3 Principles of Planning:

The following general principles were considered during the planning process.

- Forest fuels burn at differing rates and intensities producing a complex mosaic. On large fires, this provides opportunities to maintain natural areas and some of the original fire attributes while identifying areas for harvesting.
- Fire is a natural disturbance event that has to be considered along with the proposed harvesting which is an additive human caused disturbance.
- Fire Skips are not the only key habitat features in a fire - but they are perhaps the most easily identified. All areas of the fire will likely be valued habitat as successional processes occur.
- Residual trees can be isolated in a patch or scattered over an area as a matrix.
- The operating areas as well as the adjacent remaining forested and non-forested areas have to positively interact for forest ecosystems to exist and function.
- Generally, the salvage opportunity for lumber will decrease over a 3 year period. If the interest is fiber, the loss of value is much more gradual and therefore fiber harvest can occur over much longer time frames.
- Access planning requires a vision or considerations beyond the time span required for fire salvage. An initial access into the area will have implications on forest harvesting in the adjacent forested areas as well as potential impacts on other values.
- The land base has been used by other people and care must be taken to protect past values and integrate present and future uses. An archeological potential assessment was undertaken to identify potential heritage sites.

3.0 Timber Salvage Planning Process

The assessment was done in 3 steps, namely:

1. **Initial Reconnaissance** to identify potential planning areas based on an initial consideration of wood supply, access and obvious environmental constraints. Two fires were selected for further work. These included the False Canyon Creek Fire #4 and the Barney Lake Fire # 29(Appendix 3).
2. **Development Planning** to define more details of the fire, forest and landscape issues as they pertain to development of the area. This step leads to the identification of operating units and management direction for the maintenance of values.
3. **Operational Planning** - Operational planning occur after the development plan is approved and is the most detail. The operating plan includes specific access and harvesting details based on stand and site information. Example site plan is found in Appendix 2.

The important point with these three steps is that one is very much dependent on the other -that is to say the only fires deemed to have potential at the reconnaissance stage will be considered for development planning, and only areas or fires that have a development plan will be subject to operational planning. This type of process focused our effort to areas of real opportunity, and provides several opportunities to integrate other resource values and interests.

At present, we are at step 2. The Initial Reconnaissance was completed in the fall of 2004 and two fires were selected for further work, these included the False Canyon Creek Fire (WL-04-04) and the Barney Lake fire (WL-04-29). The following information comprises the 'Development Plan' for the Barney Lake fire which is step two.

4.0 Fire Characterization and Descriptions:

Barney Lake Fire:

The Barney Lake fire (map1) is located approximately 80km east of Watson Lake. The fire consumed forest on both BC and Yukon. It was first reported on July 4, 2004 and was started from lightning strike(s). The fire was declared out on September 30, 2004. The fire size is estimated at 51 000ha.

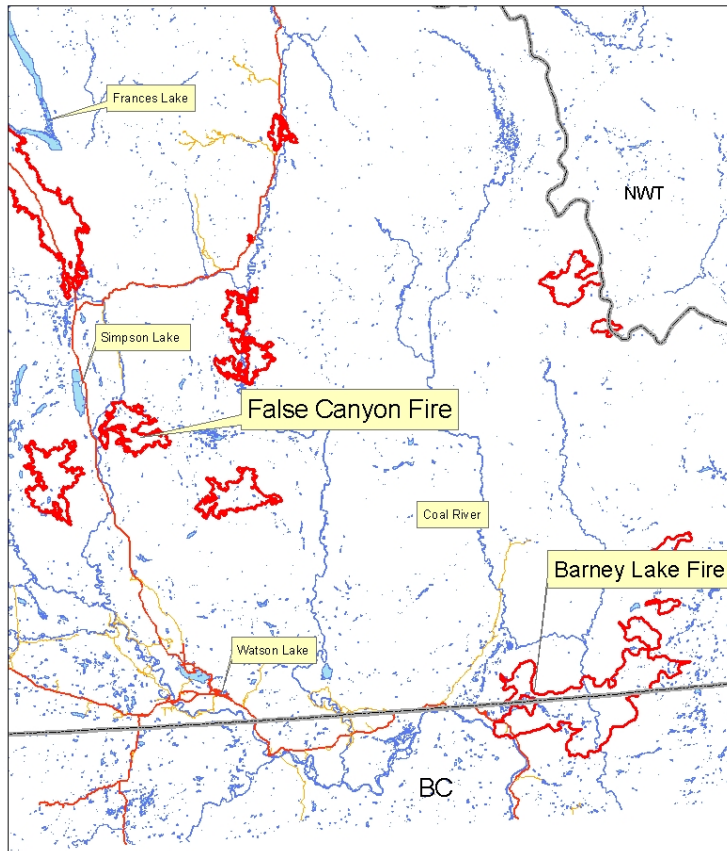
Fire severity is an important factor in assessment of the merchantability of the timber. Three general categories of fire severity occurred.

- Hot (initial starting point of fire) Fire Weather Index (FWI) was extreme, resulting in rapid crowning and expansion of the fire perimeter
- Mid-summer (drought code extreme)- symptoms of this type of fire behavior are consumption of forest floor fuels (LFH, needles, twigs) and large woody debris.

Fire characteristics were slower rates of spread and more surface fires and spotty crowning.

- End of summer(drought codes high) – drought codes continue to produce fire behavior which consumes forest floor fuels along with fine fuels (needles and twigs), large woody debris no longer burns extensively. Cool nights limit the fire from extensive crowning, fire smolders consuming forest floor fuels, roots and boles of trees. Some candling occurs.

Map 1. Overview of planning regions with respect to Watson Lake.



Map 1. Overview Map



5.0 Development Planning Process for Barney Lake Fire

The Barney Lake fire does not have comparable economic opportunities or available information as the False Canyon Creek Fire. The majority of timber is accessible from existing roads on the westerly section of the fire. A total of 2% of the burn area is within potential operating units.

Detailed mapping of the fire severity could not occur, with the heavy smoke and poor fall weather no suitable satellite imagery was available. Similar plan detail as the False Canyon Creek Fire could not occur. Nevertheless, overview flights, personal communication, vegetation inventory, archeological assessment and topographic information were used to direct planning.

Acquiring imagery when it becomes available will aid in field assessments. It is expected imagery will be available sometime in summer/fall 2005. By acquiring the imagery a more detailed fire boundary and severity could be mapped.

There will be some deviations when the Development Plan is brought down to the operational level. However, it is expected the intent and overall management strategies of the development plan will be met. It is anticipated that deviations will be 'refinements' largely the result of added detail at the stand and site level and these will be reflected in the site and access plans. By providing the boundaries for development it is hoped a proponent could conduct field assessments and ground work while directed by the development plan.

6.0 Summary of Barney Lake Fire Operating Units

In total an estimated 1043 ha (or 2%) of the burn is within operating units (Table 1). This is the gross area for salvage operations. When operational planning commences the net area harvested will be less.

Table 1. Gross merchantable volume estimates for Barney Lake Fire by operating unit and stands greater than or equal to 17m average height.

Unit	Total of Operating Unit			Stands > 17m		
	Area(ha)	Volume(m ³)	m ³ /ha	Area(ha)	Volume(m ³)	m ³ /ha
1	61	3,456	57	na	na	
2	151	21,054	139	81	15,045	186
3	831	47,425	57	8	1,416	177
Totals	1,043	71,935		89	16,461	

6.1 General Development Plan Guidelines:

These guidelines are provided to direct operational planning. These are prescriptions based on available information. When site visits and operational planning occurs (i.e. site plans) deviation can be expected. The best management will require integration of these guidelines with stand and site characteristics and as well consideration for retained features such as wetlands and riparian features.

- Operating units will be subject to Timber Harvest Planning and Operational Guideline practices (THPOG, DIAND) for riparian management zones(RMZ). When operational planning occurs, deviation from THPOG and harvest may occur if stand and site characteristics allow. In other words it may be that some of the RMZ can be salvaged logged.
- Stands within operating units identified as having height > 17m will be targeted first for operational planning.
- The remaining stands within the operating unit may contain additional harvestable volume. The vegetation inventory does not identify stands smaller than 25ha. Additional volume may be found within the smaller stands, however would need a field assessment to identify the location and quantity of volume. For this reason the operating units contain low volume stands.
- Area within the burn will be looked at for mortality. It is expected pockets of live trees¹, will be interspersed throughout the burn, during a reconnaissance flight in September 2004 the fire boundary was difficult to distinguish with extensive ground fire. Salvage is directed to fire killed stands. Within the fire, areas exist where partial burning may not have killed the entire stand. These areas may not contain sufficient dead volume to be viable for harvest. Partially burned sites require a field assessment to detail the amount of mortality. If the stand has less than 40% mortality it is not considered available for harvest. If more than 40% of the stand will not live longer than 10 years and not remain windfirm, the dead portion of the stand could contribute to salvage.
- Retention ranges are prescribed in section 6.3. Ranges are provided as the quantity of unmerchantable and live trees has not been determined. These are levels expected to occur for the operating units. Ranges are provided as base practices to provide flexibility without limiting potential salvage operations. It is expected that these values will change on an operating unit basis, depending on the quantity and quality of merchantable volume, after field assessment have been

¹ Live Tree: Trees which are not effected by fire, or trees which are effected by fire, however are judged to be windfirm and have green vegetation for 10 years.

completed. It is expected retention will provide potential forage and nesting site for fire associated species (see section 10.0). The retention will help provide habitat and bridge the harvested areas within the remaining burn. Inblock retention is expected to consist of unmerchantable stems and live trees interspersed throughout the block.

- Retention is thought to be more effective if connected to adjacent unharvested forest. Therefore the preference is near partially burned forest, islands of live trees or attached to RMZ.
- When lodgepole pine, birch and aspen occupy the site prior to burning, it is suspected they will re-establish naturally, these tree species are favored after disturbance. However, if spruce or fir occupied the site and no live trees capable of providing seed remain, natural regeneration may not be an option. A 5 year post harvest regeneration survey is required to confirm establishment. If poor regeneration, look at previous forest type to establish a similar species mix.
- Seasonal access and winter harvest is required to mitigate soil compaction and erosion often seen following fire disturbance. The frozen ground and snow cover will reduce the impact on mineral soil. No more than 5% of operating unit area should contain roads or landings. By limiting operations to winter, it is hoped vehicles will not be able to travel within the operating areas.

6.2 Sequencing of Operating Units:

There are economic and environmental factors affecting the development of the Barney Lake Fire. Direction is being provided for orderly development of units to limit loss of merchantable timber while allowing time for areas classified as partially burned to indicate the quantity of mortality. This will also provide time to acquire digital imagery so that the fire boundary and severity can be assessed. See development plan map in Appendix 4.

Priority is given to develop areas 1 first, followed by 2 and 3.

6.3 Operating Unit Prescriptions:

Refer to Development Plan Map in Appendix 4.

Labels:

White spruce- SW

Lodgepole pine- P

Alpine Fir- F

Black spruce- SB

White birch- W

Aspen- A

UNIT 1

Unit Number	Area (ha)	Burn Severity	Merchantability	Stands > 17m Area (ha) (%)	Terrain Features	Regeneration	Other Features
1	61	- Severity and exact fire boundary has not been determined, Overview flights suggested a mosaic of ground fire interspersed with patchy crowning.	- Low volume is expected in westerly section of unit. A portion of the unit has sawlog volume. A ground assessment would be required to validate volume and burn characteristics. Additional volume is expected outside > 17m stands.	0	- 1 stream crossing required on older access road. - If identified Riparian Management Zone required as per THPOG. - Excessive slopes on southerly section towards Barney Lake.	- Previous stand are mix of pine with remaining a mix of SW and SB. - Natural regeneration is likely comprising of P, W, AS. Adjacent stand and live trees may provide spruce seed.	- Target retention to RMZ. - check old blocks and roads for decommissioning and planting. - Seasonal access on old road system.

Operating Unit 1 Prescription:

Operating unit retention levels are expected to range from 10 to 50% as portions of the unit are expected to have islands and unmerchantable stands. When possible, operating unit retention should be in patches larger than 4ha having 10 trees/ha > 20cm DBH. Inblock retention is expected to consist of unmerchantable stems and live trees distributed in small patches or single stems. Preference for retention is near partial burn or attached to RMZ. Partial burn areas require additional survey for % live trees. If < 40% dead and dispersed throughout the stand then defer harvest; if aggregated, target harvest into clumps. If > 40% dead consider dead portion for harvest. A live tree is categorized as windfirm and likely to exist for 10 years. With lodgepole pine occupying the site prior to burning, it is suspected pine will re-establish naturally, a 5 year post harvest regeneration survey is required to confirm establishment. If poor regeneration, look at prior forest type to establish a similar species mix. Seasonal access with winter harvest is required. Review archeological assessment (Appendix 2) for potential areas, if soil based activity is to occur in high potential areas a detailed assessment is required (i.e. scarification, ground and soil disturbance). No more then 5% of operating unit area should contain roads or landings.

UNIT 2

Unit Number	Area (ha)	Burn Severity	Merchantability	Stands > 17m Area (ha) (%)	Terrain Features	Regeneration	Other Features
2	151	- severity and exact fire boundary has not been determined, Overview flights suggested a mosaic of ground fire interspersed with patchy crowning.	- Target > 17m stands first. A ground assessment would be required to validate volume and burn characteristics. Additional volume is expected outside > 17m stands.	81(54%)	- 1 stream crossing required on older access road. - If identified Riparian Management Zone required as per THPOG.	- previous stand are mix of pine with remaining a mix of SW and F. - Natural regeneration is likely comprising of P, W, AS. Adjacent stand and live trees may provide spruce seed.	- Target retention to RMZ. - Seasonal access on old road system.

Operating Unit 2 Prescription:

Operating unit retention levels are expected to range from 10 to 30% as portions of the unit are expected to have islands and unmerchantable stands. When possible, operating unit retention should be in patches larger than 4ha having 10 trees/ha > 20cm DBH. Inblock retention is expected to consist of unmerchantable stems and live trees distributed in small patches or single stems. Preference for retention is near partial burn or attached to RMZ. Partial burn areas require additional survey for % live trees. . Partial burn areas require additional survey for % live trees. If < 40% dead and dispersed throughout the stand then defer harvest; if aggregated, target harvest into clumps. If > 40% dead consider dead portion for harvest. A live tree is categorized as windfirm and likely to exist for 10 years. With lodgepole pine occupying the site prior to burning, it is suspected pine will re-establish naturally, a 5 year post harvest regeneration survey is required to confirm establishment. If poor regeneration, look at prior forest type to establish a similar species mix. Seasonal access with winter harvest is required.. Review archeological assessment (Appendix 2) for potential areas, if soil based activity is to occur in high potential areas a detailed assessment is required (i.e. scarification, ground and soil disturbance). No more then 5% of operating unit area should contain roads or landings.

UNIT 3

Unit Number	Area (ha)	Burn Severity	Merchantability	Stands > 17m Area (ha) (%)	Terrain Features	Regeneration	Other Features
3	831	- severity and exact fire boundary has not been determined, Overview flights suggested a mosaic of ground fire interspersed with patchy crowning.	-- Target > 17m stands first. A ground assessment would be required to validate volume. Additional volume is expected outside > 17m stands.	8(1%)	- no stream crossing. - lake on westerly section and stream on requires RMZ. - If identified Riparian Management Zone required as per THPOG.	- previous stand are mix of pine and SB leading with remaining a mix of SW and F. - Natural regeneration is likely comprising of P, W, AS. Adjacent stand and live trees may provide spruce seed.	- Target retention to RMZ. - High potential for archeological sites surrounding lake on west section of planning area. If soil disturbance is to occur in high potential areas a detailed heritage assessment is required.

Operating Unit 3 Prescription:

Operating unit retention levels are expected to range from 10 to 50% as portions of the unit are expected to have islands and unmerchantable stands. When possible, operating unit retention should be in patches larger then 4ha having 10 trees/ha > 20cm DBH. Inblock retention is expected to consist of unmerchantable stems and live trees distributed in small patches or single stems. Preference for retention is near partial burn or attached to RMZ. Partial burn areas require additional survey for % live trees. Partial burn areas require additional survey for % live trees. If < 40% dead and dispersed throughout the stand then defer harvest; if aggregated, target harvest into clumps. If > 40% dead consider dead portion for harvest. A live tree is categorized as windfirm and likely to exist for 10 years. With lodgepole pine occupying the site prior to burning, it is suspected pine will re-establish naturally, a 5 year post harvest regeneration survey is required to confirm establishment. If poor regeneration, look at prior forest type to establish a similar species mix. Seasonal access with winter harvest is required. Review archeological assessment (Appendix 2) for potential areas, if soil based activity is to occur in high potential areas a detailed assessment is required (i.e. scarification, ground and soil disturbance). No more then 5% of operating unit area should contain roads or landings.

7.0 Access Management:

Access development is required for timber harvesting to occur. Although access is a necessity, it does come with additive issues some of which are persistent and often more severe than the initial development itself. These access related impacts may include persistent soil problems such as erosion and terrain instability, drainage disruption or siltation and effects on fish and wildlife populations through increased hunter success rates.

Adverse impacts can be reduced by:

- Adhering to best practices during construction and use.
- Managing the use according to weather, season and duration of project.
- Ensuring that the roads and trail are reclaimed consistent with future use.
- By using natural barriers during road development.

The development plan includes several measures to reduce the negative effects and provide consideration of some potential positive implications as well: These include:

- Using existing road network.
- Use of winter road standards throughout planning area.
- Apply seasonal and final reclamation procedures consistent with the project and the identified potential use of the area.
- Consider the access requirements of trappers and wilderness operators that use the area.
- When possible, avoid key features such as wetlands, viewsapes and other identified features.

In total an estimated 15 km of road system is proposed. Depending on operational planning additional winter spur roads will need to be constructed.

The road system presented in the development plan is a draft network based on the available information. The subsequent field works at the operational planning level will likely result in changes in location.

When access crosses areas with high potential for archeological potential values, if ground disturbance is required for construction a field based archeological impact assessment for heritage resources is needed. Areas of high potential are depicted in Appendix 1.

7.1 Access Guidelines:

- Minimize stream and corridor crossings.

- Minimize soil disturbance (i.e. cuts)
- Minimize road building through green areas.
- Use seasonal access when ever possible.
- Utilize natural breaks to discourage continued access.
- Minimize building of landings and spur roads.

8.0 Heritage and Archeological Assessment:

A heritage potential mapping assessment was completed for the burn (Appendix 2). With extensive winter activity, and recent fire disturbance the probability of encountering and disturbing artifacts is quite low. The Archeological Assessment concentrated on identifying potential areas with buried archeological sites. A copy of the overview assessment is provided in Appendix 1.

High Potential Areas:

In the Barney Lake study area, heritage sites may be found on well-drained and elevated hills and terraces over looking wetlands, streams, lakes and ponds. Due to the limitations of the spatial analysis resources available for this study, the consultant cannot pinpoint any specific examples. It is suspected that sites will be located, but not limited to 100m of the waters edge and or edge of a terrace or hill that overlooks streams, wetlands, ponds and lakes.

Where the above is noted or areas identified in Appendix 2 and soil disturbance is prescribed in a high potential area, a field based archeological impact assessment for heritage resources is needed. Areas of high potential are depicted in Appendix 2.

9.0 Plan Lifespan:

In time, the burns will start to regenerate. If salvage logging within the burn has not occurred by the time regeneration heights exceeds winter snow pack, the plan will need to be re-visited, as regeneration and timber quality will affect logging practices and economics. It is at this point that new strategies may need to be adopted to protect natural regeneration and provide other harvesting opportunities

10.0 Wildlife Fire Specialist Species Management

Within the Yukon, species have adapted to fire, as it is a major forest renewal agent. Some species have become specialist, preferring post fire habitat to forage and reproduce. For example woodpeckers frequent burns to forage on wood boring insects. The 2004

fire season was exceptional and will provide increased habitat supply for fire-associated species.

Management for fire specialist species is focused on these issues (Exerts from Effect of Stand vs Landscape Level Forest Structure Abundance and Distribution, S. Hannon, SFMN, Jan 2005):

1. Fire specialist might be lost if salvage logging removes most dead trees, or fire is replaced by logging on the landscape.

Management: Within the KTT approximately 390 000ha of forest burned by 44 fires. The Barney Lake and False Canyon Creek Fire potential salvage areas total 5018ha or 1.3% of the burned area in the KTT. Within the individual fires 44% of False Canyon fire and 2% of Barney Lake fire respectively are included in potential areas.

Conclusion: The magnitude of the 2004 fire season provides habitat for fire specialist species.

2. Trees should be > 20 cm DBH to ensure high use by both insects and woodpeckers. Studies indicate the minimum area of patches where birds may nest is around 4ha (personal communication; Gill, M.).

Management: Retention within operating unit must be represented with > 20cm DBH trees @ 10 trees/ha. The retention would provide better habitat in aggregated clumps which are at least 4 ha in size. This would provide potential breeding habitat.

Conclusion: Stand level retention, corridor and leave areas will provide habitat supply for insects and woodpeckers.

3. Woodpeckers and secondary cavity nesters were more abundant in unsalvaged versus salvaged burns.

Management: Within the KTT approximately 390 000ha of forest burned by 44 fires. The Barney Lake and False Canyon Creek Fires potential salvage areas total 5018ha or 1.3% of the burn area in the KTT. Within the individual fire 44% of False Canyon Creek fire and 2% of Barney Lake fire are included in potential operational planning areas respectively.

Conclusion: The magnitude of the 2004 fire season provides habitat for fire specialist species.

4. To retain fire associated species, some recently burned forest should be protected from salvage and salvage should be delayed 3-4 years on others to allow wood pecker reproduction.

Management: Within the KTT approximately 390 000ha of forest burned by 44 fires. The Barney Lake and False Canyon Creek fires potential salvage areas total 5018ha or 1.3% of the burn area in the KTT. Within the individual fire 44% of False Canyon Creek fire and 2% of Barney Lake fire are included in potential operational planning areas respectively.

Conclusion: The magnitude of the 2004 fire season provides habitat for fire specialist species.

11.0 Environmental Assessment:

This Development Plan will be subject to an environmental assessment. The additional review and advice from the environmental assessment process will provide direction to government and proponents that are interesting in developing operational plans. Operational plans are identified as phase three of the process, and these plans are the most detail (see example Appendix 3). As well the operational plans are directed to meet development plan constraints and direction.

The advantage of putting the Development plan through the assessment process is that it will ensure that the proponents have a clear understanding on the most appropriate way to develop their individual project and avoid unnecessary negative implications.

As mentioned before, there will be some deviations when the Development Plan is brought down to the operational level, however, it is expected that the intent and overall management strategies of the development plan will be met. It is anticipated that deviations will be 'refinements' largely as a result of added detail at the stand and site level, and these will be reflected in the site and access plans. By providing the boundaries for development it is expected that a proponent can conduct field assessments and ground work while bounded by this development plan.

The KFRSC and Yukon Government recognize the value of advancing the fire salvage project in a timely fashion and as result, a 30 day referral is recommended to meet two objectives 1) to provide adequate time to gain additional information from stakeholders and the public to adjust the Development Plan, and 2) to complete the Development Planning process to allow interested parties the time to apply for and develop their individual project during spring and summer, for fall and winter operations in 2005.

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Appendix 1: Archeological Assessment

Archaeological Overview Assessment for Proposed Timber Harvesting of Fire Killed Stands in the False Canyon Creek and Barney Lake Areas, Southeast Yukon

1 March 2005

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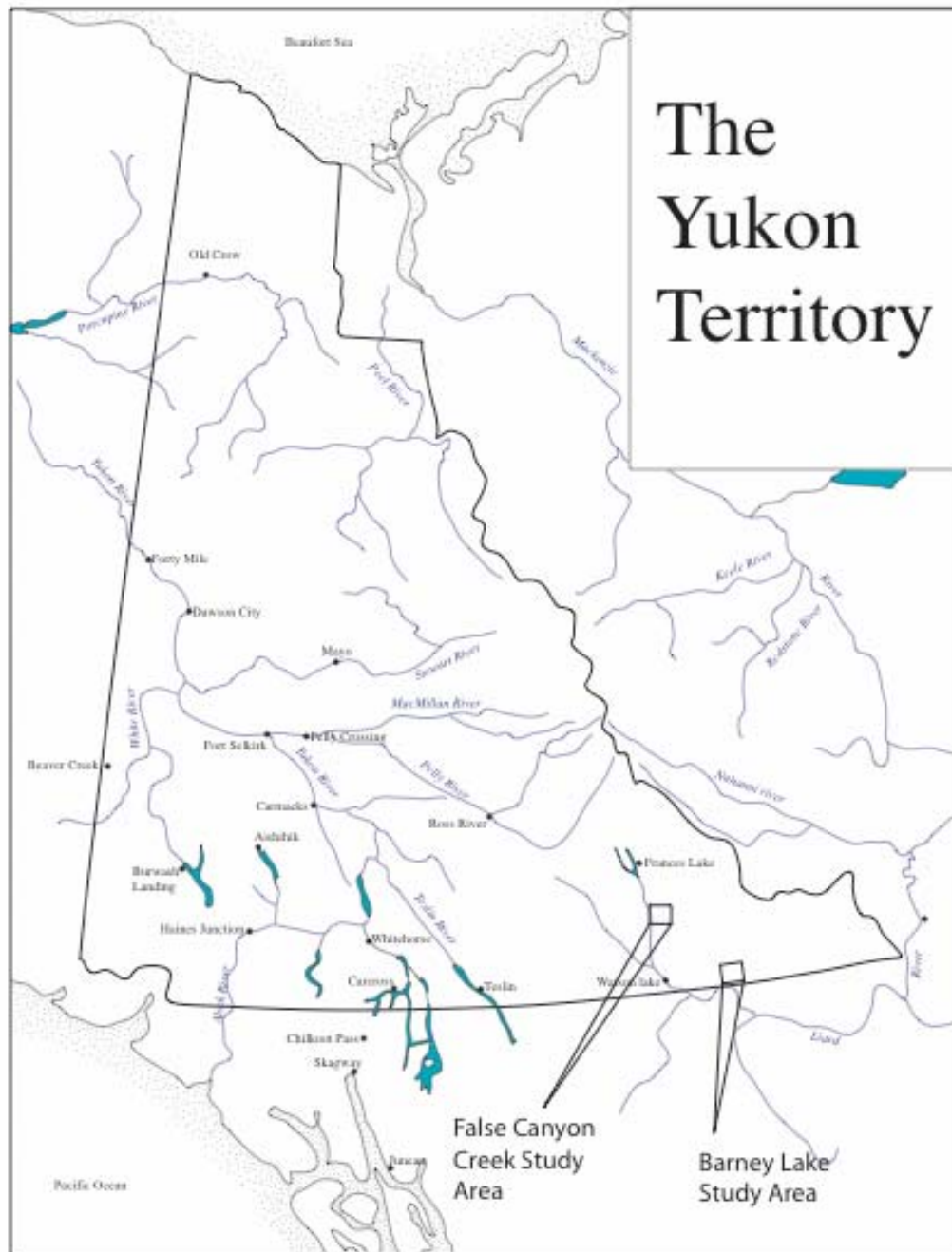


Figure 1: Map of the Yukon highlighting the study areas.

Introduction

The following report is the result of a desktop heritage overview assessment for two proposed timber harvest areas located in the southeast Yukon. The first study site is located in Forest Management Unit 3 on the east side of the Frances River to the south of False Canyon Creek (NTS map 105A). Forestry work in this area is designed to harvest

fire killed trees in an area extending roughly 16km to the east and 12 km to the south of the confluence of the Frances river and False Canyon Creek. The second study site is located in Forest management Unit 2, directly to the north and west of Barney Lake on the Yukon side of the border with British Columbia (NTS map 95 D). As in the above case, forestry activities are designed to harvest fire-killed trees.

The recommendations outlined in this report are not based on the results of a field survey or traditional land use studies, but rather, the interpretation of orthographic photos, topographic maps and published literature research. Local First Nations groups/organizations (such as *Liard First Nation* and *Kaska Tribal Council*) were not consulted for the purpose of this study as the developer undertook this component of the pre-development assessment.

Objectives

The objective of this report is to supply the *Forestry Management Branch of Energy Mines and Resources, Government of Yukon*, with a preliminary overview of localities in the above mentioned study sites that may have elevated potential for presence of heritage values (such as historic and archaeological sites) that may be impacted by future timber harvest activities. Because the areas in question have been affected by forest fires it is very likely that surficial heritage resources dating to the last 200 years have been destroyed, therefore, the principal objective of this overview is to identify areas with high archaeological potential. In this case ‘archaeological’ refers to buried sites containing the remnants of pre-contact (with Euro-Canadian people) era artifacts such as stone tools. Where areas have been deemed to have elevated potential, heritage management / conservation strategies will be recommended.

Methodology

The principal method employed in the present project is the detailed study of orthographic photos and topographic maps in order to identify geographic landforms that appear to be preferable for human habitation based on known archaeological site distributions and ethnographically documented land use patterns. This method involves studying orthographic photos using a stereoscope to observe prominent topographic features. In this instance the researcher is looking for prominent hills and terraces overlooking significant water bodies, wetlands or game habitat (Table 1); these types of localities tend to be focal land types for human occupation and land use and may have developed an archaeological component through short term or long term use. Orthographic photo coverage of the False Canyon Creek area was available at 1:40,000 scale. It should be noted at this time that the consultant was unable to locate orthographic photo coverage for the Barney Lake study area, so landform and habitat referencing was completed using only 1:40,000 scale topographic maps.

In combination with the above stated methods, the consultant also cross referenced the locations of known archaeological sites in the area 1) to identify conflicts between the present development and previously identified heritage sites; and 2) to observe the geophysical features associated with known archaeological sites so that similar features

can be identified in the study area. Table 1 lists the type of geophysical/biophysical site type commonly associated with archaeological sites.

Biophysical/Topographical Feature	Site Type
River or stream bank	Traditional or pre-contact era fishing or habitation site. May find historic or archaeological remains.
Confluence of a stream and/or river	Traditional or pre-contact era fishing or habitation site. May find historic or archaeological remains. Some such locations were targeted as the location of early fur trade era trade forts and as such became local trade centers.
Perimeter of a Lake	Traditional or pre-contact era fishing or habitation site. May find historic or archaeological remains.
Lake outlet or inlet	Traditional or pre-contact era fishing or habitation site. May find historic or archaeological remains. Fish bearing lakes usually have a high concentration of archaeological sites.
Terraces overlooking significant water bodies.	High terraces often served as good lookouts. Lookouts were either used to spot game, orient ones self on the landscape or search for signs of human activity. Archaeological sites are usually found at this type of location.
Hills, knolls and other elevated topographical feature overlooking wildlife habitat associated with lakes, ponds and wetlands	These types of locations were used as hunting lookouts. One usually finds archaeological remains at this type of site.
Valleys and water drainages	Historic and prehistoric travel routes followed water drainage systems. Short term habitation sites are found along these routes. These may include brush structures and other types of temporary dwellings.
Alpine and sub alpine game trails	There is generally a low potential for the recovery of heritage sites in alpine and sub alpine regions. However, sites include snaring and herding features such as game fences, that are usually located along game trails.

Table 1: Biophysical/topographical features that have high archaeological potential.

Background

Climate and Environment

The study area is in the Liard Basin ecoregion that spans the British Columbia-Yukon boundary to incorporate the Liard Plain, a broad, rolling, low-lying area mantled with glacial drift and outwash deposits in which the Liard, Coal and Frances Rivers are entrenched. The mean annual temperature for the area is approximately -3°C with a summer mean of 11°C and a winter mean of -18.5°C. Annual precipitation is 350-450 mm. The ecoregion is characterized by extensive stands of boreal forest composed of lodgepole pine, white and black spruce, and aspen. Dry sites support lodgepole pine; moist sites have black spruce and larch with Labrador tea, horsetail, and moss. Permafrost is scattered, confined mainly to lower north-facing slopes and sphagnum bogs. Characteristic wildlife includes moose, black bear, wood bison, wolf, beaver,

muskrat, snowshoe hare, waterfowl, crane, ruffed grouse, and other birds. (Yukon Ecoregions Working Group 2004).

Historic Context

Very few studies have focused on the archaeology or pre-contact history² of the southeast Yukon. As a consequence, the researcher must borrow from the archaeological record of adjacent areas as a method for extrapolating a possible sequence for the southeast Yukon. Two likely sequences that may pertain to this area are that of the southern Yukon and the southwest Mackenzie District or Mackenzie corridor. J. V. Wright (Wright 1995, 1999) has suggested that these two areas are do, in fact, have a similar archaeological sequence and has stated, as such, that the area falls into what is known as the Northwest Interior Culture.

Archaeological phases of the southern Yukon that may apply to the southeast Yukon are as follows. The earliest cultural occupation of the region likely followed the retreat of the Cordilleran ice masses at the end of the Wisconsin glacial event. The oldest of these cultures is known as the Northern Cordilleran tradition and is characterized by sites older than 7,000 to 8,000 years old (Clark 1983; Hare 1995). One site located near Beaver Creek has dated to as early as 10,670 radiocarbon years before the present (Heffner 2002). This archaeological culture is thought to pre-date the introduction microlithic technology from Alaska into the interior of the central and southern Yukon (Clark 1983; Hare 1995).

The Little Arm phase culture dates from 7,000 to 5,000 years ago and is heralded by the appearance of microlithic technologies that appear to have diffused into the area from the interior of Alaska to the west (Clark and Gotthardt 1999; Workman 1978). During the Taye Lake phase, after 5,000 years BP, microblade technology becomes sparse if not absent in Yukon, being replaced by a technology characterized by notched projectile points and a diverse variety of scraping and carving tools (Hare 1995; Workman 1978). The latest archaeological culture identified in the southern Yukon is that of the Aishihik phase (Workman 1978). This phase is thought to be a cultural development from the earlier Taye Lake culture (ibid.) though there are some differences in technology. The most notable technological advance made during the Aishihik phase was the introduction of the bow and arrow, which replaced a type of throwing spear known as an atlatl (Hare, et al. 2004). All Aishihik phase sites are found stratigraphically above a layer of White River Volcanic Tephra that is dated to about 1,250 radiocarbon years BP (Clague, et al. 1995).

It is not known to what degree all of the aforementioned archaeological cultures represent developments or advances within a single culture. It can be stated that there are geographical commonalities in the locations of archaeological sites from different eras. A number of archaeological sites have multiple occupations spanning thousands of years

² In this case, 'pre-contact history' implies that part of the history of the southeast Yukon, as would be studied using archaeological techniques, which occurred before contact between Kaska and Euro-Canadian Peoples in the early to mid-nineteenth century.

suggesting that there is some form of cultural relatedness spanning many millennia of the Holocene. Certainly, the later archaeological cultures such as Taye Lake and Aishihik are the ancestors of modern First Nations people in the area.

The indigenous inhabitants of the study area are the Kaska peoples that are now living in the modern communities of Watson Lake, Ross River, Faro, Lower Post and Dease Lake. Honigmann (1964) identified five (5) sub-groups of Kaska people living within this territory. These groups are as is described in the following:

1. The Upper Liard Kaska were called *Natitu?agotena* which can be translated as the “dwellers at a high sharp mountain where a little river starts” (ibid.:19). Their territories encompassed the upper Liard River drainage and Liard Plain, and are bounded by the Cassiar Mountains to the west and the Simpson Range to the east.
2. The Dease River Kaska was called the *Ki'stagotena*, which is translated as “Mountain Dwellers” (ibid.: 19). These people inhabited the Dease River drainage to the head of Dease Lake and the border of Tahltan territory including portions of the cordillera to the east and west.
3. The Nelson Kaska were called *Tse'lona* or “point at which is located the end of the world” (ibid.: 19) and were known to have occupied areas of the Kechika River and areas of the Liard river to the east of the *Ki'stagotena* people. This group is known to have trade at Fort Nelson, with the Nelson Slavey and Sekani, after it opened in 1800. They later resumed trading within Kaska territory with the opening of such posts as Chee House and Lower Post.
4. The (*E*)*spa'totena*, “Goat Indians” or “Dwellers among the wild goats” (ibid.: 20) lived in the mountain drainages to the north and northeast of the *Tse'lona*. Their territory encompasses the Beaver, South Nahanni as well as portions of the upper Nahanni rivers. Traditionally this group is known to have traded at Fort Halkett, Lower Post and Fort Liard. Gotthardt (1987: 10) has suggested that the *Espa'totena* could be the same as Campbell's *Abba-hou-eta*, or “Knife Indians.” A similar name is rendered as *Abbato-tena* by Dall et al. (1877) for the Kaska who inhabited portions of the upper Pelly and Macmillan rivers. If so, the *Espa'totena* territory could be expanded to include regions of the upper Pelly River; as such, they may be related to the “Pelly River Indians,” described by Poole Field (MacNeish 1957), who were attacked in a “Mountain Indian” war raid in the 1880s.
5. The Frances Lake Kaska were called *Tu'tcogotena* translated to mean the “Big water dwellers” (Honigmann 1964: 20). These people traditionally occupied the area surrounding Frances Lake and the Upper Frances River. The outward expanse of their territory also included the upper reaches of the Hyland and Smith rivers. *Tu'tcogotena* were know to also have used the upper Pelly basin and probably traded at Pelly Banks and Ross River (Gotthardt 1987).

Summaries of Kaska land use patterns tend to suggest that local populations were composed of small highly mobile groups of people that traveled on seasonal cycles and tended to use larger fish lakes as central habitation/meeting places. Their principal economic activities tended to revolve around hunting, fishing and trapping activities that

varied in importance depending on the season. Honigmann (1964) has described the Kaska annual cycle: hunting took place during all seasons though it was most intense during the late summer when game animals such as moose, caribou or sheep “had fattened” (Honigmann 1964: 31). Much summer hunting occurred in the high alpine where herd animals such as caribou, sheep and mountain goat went to pasture. In the winter, game animals tended to migrate and diffuse throughout the forested lowland valleys or plateaus. Trapping was an important winter activity and tended to be diffused throughout the Kaska territory. Trap lines generally radiated out from central habitation sites and followed the routes of waterways or lake chains. Most of the years trapping was done during the winter. In the winter most Kaska peoples would congregate around the important fishing lakes where a steady supply of fresh fish was harvested in order to supplement the winter meat caches. Beaver were hunted through out the year in wetlands as well as small lakes and ponds. It has been suggested that they were an important winter resource (the lodges were easier to access over the frozen ice), and thus, such locals were the focus of much winter trapping and hunting (Honigmann 1964). River fishing was common throughout the territory and was practiced at all times of year. In the Pelly drainage salmon were harvested, in rivers and side streams during the fall run, using nets, gaffs and fish traps. In the Liard drainage arctic grayling would be harvested while running up the smaller streams after spring break-up, while whitefish could be trapped while spawning during the fall.

General History of the Liard River Drainage Area

Euro-Canadian Traders first contacted the Kaska of Upper Liard River during the early 1800s. Before this time the trade of exotic goods, especially those of coastal or European origin, was very much controlled by Tahltan of the Stikine River who served as Middle Men to the Tinged (Wilson 1970). Direct contact was likely first established in the years from 1800 to 1820 during Kaska trade expeditions to Fort Simpson, Fort Liard or Fort Nelson (Honigmann 1949). The first trade post opened in Kaska Territory was Fort Halkett, at the mouth of the Smith River, in 1821. In 1838 a second post, Dease Lake Post, was opened at Dease Lake but was quickly abandoned (1839) due to trade related hostilities from the Tahltan people to the south. Fort Halkett remained open until 1865 when low trade profits resulting from intense competition led Hudson’s Bay Company managers to discontinue the operation. Subsequently, the Kaska people of the Liard drainage either traded indirectly with the coast or directly with HBC posts to the east (Fort Nelson, Fort Liard, Fort Simpson, Toad River Post etc.)

The northward expansion of the western gold rush prospectors was first felt in Kaska territory by the late 1800s. In 1873 the Cassiar Gold Rush created an influx of prospectors and, as a result, many Kaska were drawn south to McDame Creek Post to exploit related ventures. As a result, the Frances Lake Post was also briefly reopened in 1880. As well, Sylvester opened a small post at the mouth of the Dease River near the modern location of Lower Post shortly after 1873. In 1890 Chee River House was opened 50 miles up the Ketchika River. In 1887, Sylvester moved the newly dubbed “Lower Post” to its modern location, which was then sold to the HBC. Nine years later (1896) he would open a second post at the same locality. The Klondike Gold Rush of 1896-1898 would see a large number of prospectors move through Kaska territory along the old

Tahltan trail and on to the Kaska trail that led over the Frances River divide into the headwaters of the Pelly River. By this time regular contact between the Kaska and Euro-Canadian peoples was a fairly common event though it would not lead to a pervasive alteration of traditional life ways for another 45 years (Honigmann 1949).

Fur trapping was likely the predominant source of income for the Kaska of the southeast Yukon from 1900 to the early 1950s. The discovery of large deposits of gold in the western subarctic of North America as well as in South Africa effectively ended an economic depression in western Europe and the United States of America by the turn of the 20th century (McCandless 1985). This led to an increase in demand for consumer goods and resulted in massive increases in the value of wild furs. By the winter of 1919-1920 the price of furs was at its peak (ibid). The increased demand for trade furs resulted in significant alterations in indigenous land use patterns, people relied less on subsistence activities and focused more on fur harvest. The shift in economic focus extended trappers ranges greatly to areas that were more valuable for their fur resources than the traditionally valued subsistence resources, such as hunting and fishing sites. In effect, fur trapping shifted from a subsistence activity (cloths and food production) and means of acquiring exotic trade items (as in the northwest coast trade), to a primary means of making a living (Coates 1991). By the end of the Second World War the bottom had fallen out of the fur market. The major market furriers of Western Europe (particularly those in London) had sustained major wartime damage; the European post-war economy focused much of its financial resources on rebuilding and not on consumer goods (McCandless 1985). In the southern United States furriers were using more farmed furs for the production of consumer goods. As a consequence, the demand for Yukon wild furs was greatly reduced.

In 1939 the government of Canada committed to building a chain of airfields across the northwest under the Northwest Staging Route Program. The airfield at Watson Lake (named after California prospector Francis Watson) was a link in this chain and was constructed in 1941. The outbreak of the Second World War resulted in the construction of the Alaska Highway in 1942.

Overview Assessment

Identification of Heritage Potential

False Canyon Creek

The analysis of orthographic photos and topographic maps has resulted in the identification of several large areas that have elevated potential for the presence of heritage sites. Orthographic photo coverage of the area was limited to 1:40,000 scale images that have limited the consultant's ability to confidently isolate specific high potential landforms. For this reason recommendations presented herein can only be used in a broad sense as a guideline for prescribing more detailed assessment procedures, limiting the nature of developments within the development area or as a means of excluding regions from the scope of future developments.

Because forest fires impacted the area in the summer of 2004 it is almost certain that any surficial heritage sites such as cabins, historic era campsites, brush structures, and trails will have been destroyed. Thus, highlighted areas depicted on Figure 2 and 3 will have potential for the identification of buried sites such as archaeological sites and graves. Areas of high potential have been subdivided into three general types based on known historic land use patterns.

The area marked (1) on the Figure 2 is a portion of the France River where there are rapids. Areas such as this frequently have heritage sites because water conditions often force river travelers to portage around the rapids. Due to this type of activity there is an increased likelihood that campsites will have been established at or near the rapids. High potential for heritage site presence is expected within 100 meters of the rapids on both sides of the Frances River. The areas marked (2) on the Figures 2 and 3 indicate major local drainages systems that are likely to have been used frequently as transportation corridors and as habitation sites. The confluence of the Frances River and False Canyon Creek will have the highest potential for site presence. Heritage sites in areas marked (2) are likely to be within 100m of the river/creek edge or with 100m of all terraces overlooking the drainage systems or extinct channels thereof. Previous heritage sites survey has confirmed the presence of sites along the Frances River (Gotthardt 1987). The areas marked (3) indicate possible wetland habitat that will likely have been used either regularly or sporadically as seasonal hunting, fishing and trapping sites in the past. In these areas heritage sites may be present on well drained and elevated terrain features such as hills and terraces that over look wetlands and ponds or other habitat types that regularly attract traditional game resources such as moose, caribou (in the winter), beaver and muskrat.

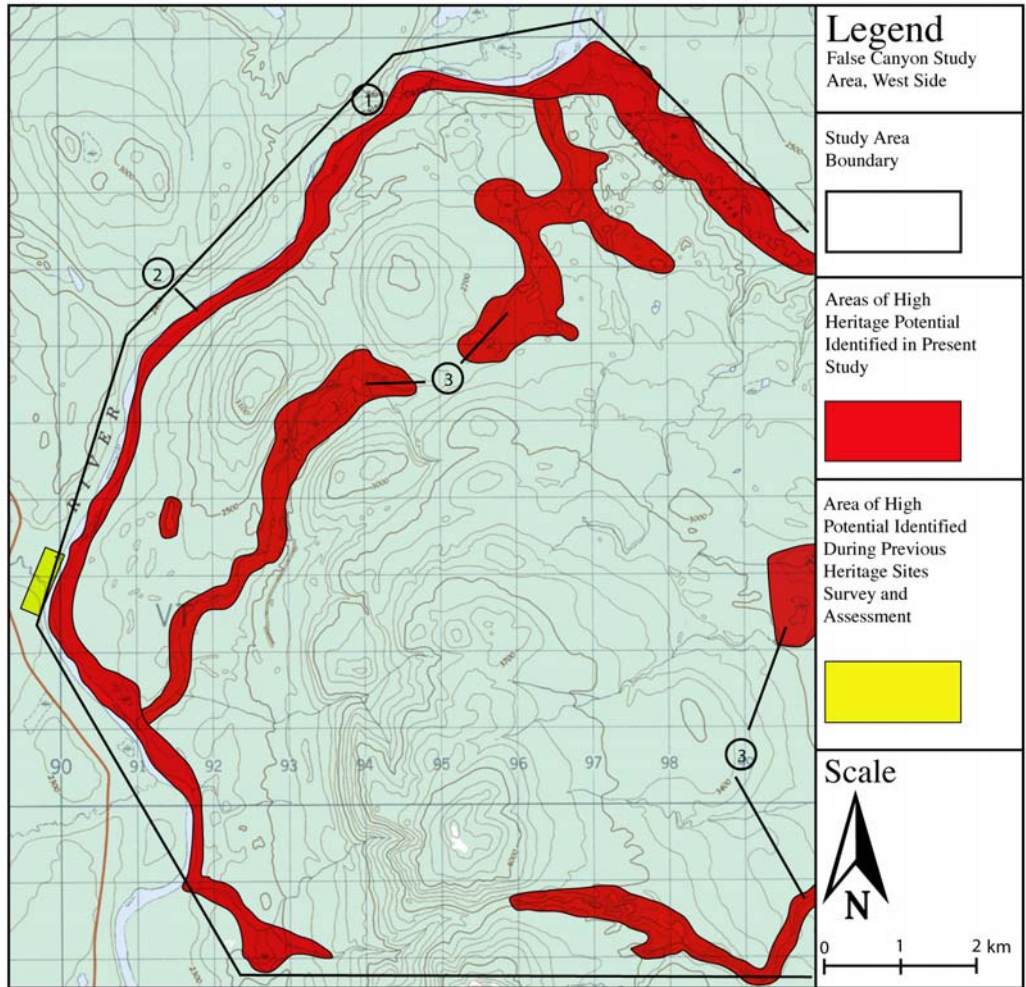


Figure 2: Map of the western portion of the False Canyon Creek study area depicting areas with elevated potential for heritage sites presence.

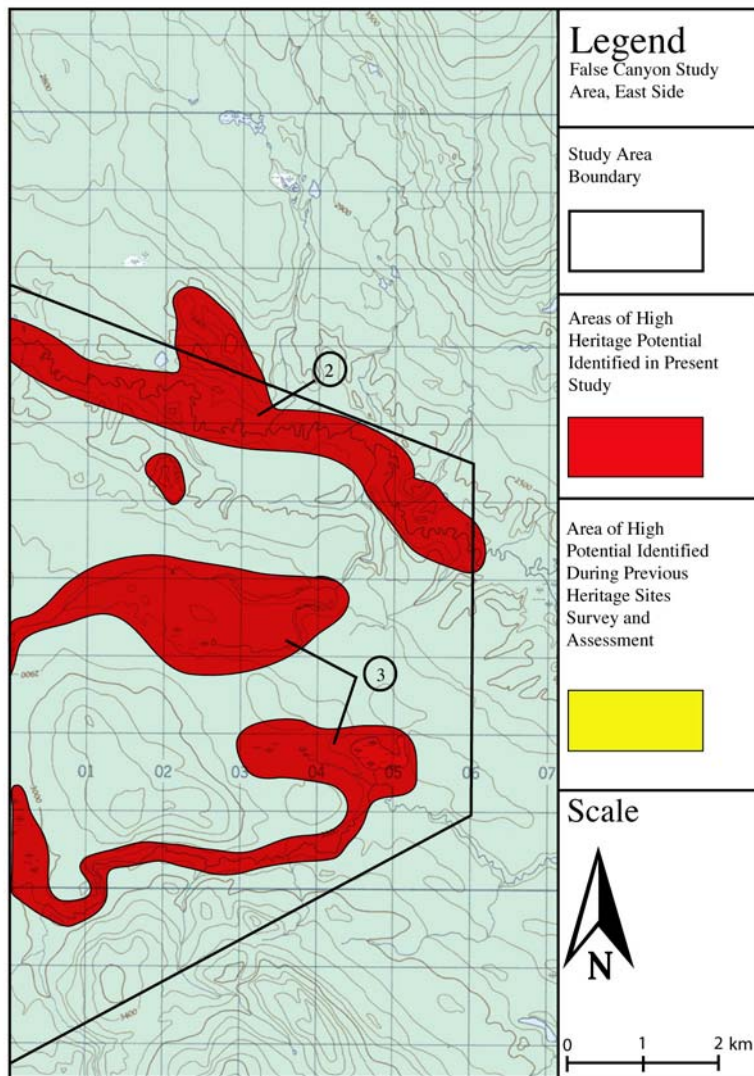


Figure 3: Map of the eastern portion of the False Canyon Creek study area depicting areas with elevated potential for heritage site presence.

Barney Lake

Analysis of the Barney Lake study area was limited to topographic map interpretation due to a lack of orthographic photo coverage for the region. Thus any landscape feature or habitat area interpretations discussed herein are based solely on information provided on NTS map sheets 95 D/3 and 95 D/4. Further to the last statement, the consultant cannot guarantee that potential for heritage sites is absent in all other areas of the proposed development. However, as in the False Canyon Creek case, much of the area to be harvested around Barney Lake has been impacted by forest fires that have likely destroyed any evidence of surficial historic sites; this event has reduced the overall

likelihood that the proposed development will impact heritage sites if the timber harvest is limited to burned areas.

Figures 2 and 3 highlight several broad areas that are considered to have elevated potential for heritage sites for a number of reasons. Firstly, Barney Lake and several other smaller unnamed lakes to the west and north are considered to be important natural resources that were likely used regularly throughout history for a variety of purposes ranging from semi-permanent habitation sites to seasonal fishing and hunting sites. Included in the study area are several seemingly extensive wetlands that include a multitude of small ponds and kettle-hole lakes. Sheila Greer (1984; 1985) conducted an archaeological survey in the Coal River Springs Park (directly to the north of the present study area) and has located several sites in similar geographical context. Oral history interviews conducted at the time indicated that the area is considered rich beaver habitat and was an important winter resource for local First Nations groups. In recent history these areas would have been used for economic fur harvesting. During the historic period pre-dating the western fur trade it is very likely that areas such as these would have been used for subsistence (food gathering) as well as for fur harvesting related to indigenous trade practices.

In this study area, heritage sites may be found on well-drained and elevated hills and terraces overlooking wetlands, streams, lakes and ponds. Due to the limitation of the resources available for this study the consultant cannot pinpoint any specific examples at this time. Where the above noted features are present, it is expected that sites will be located within, but not limited to, 100m of the waters edge and/or the edge of a terrace or hill that overlooks streams, wetlands, ponds and lakes.

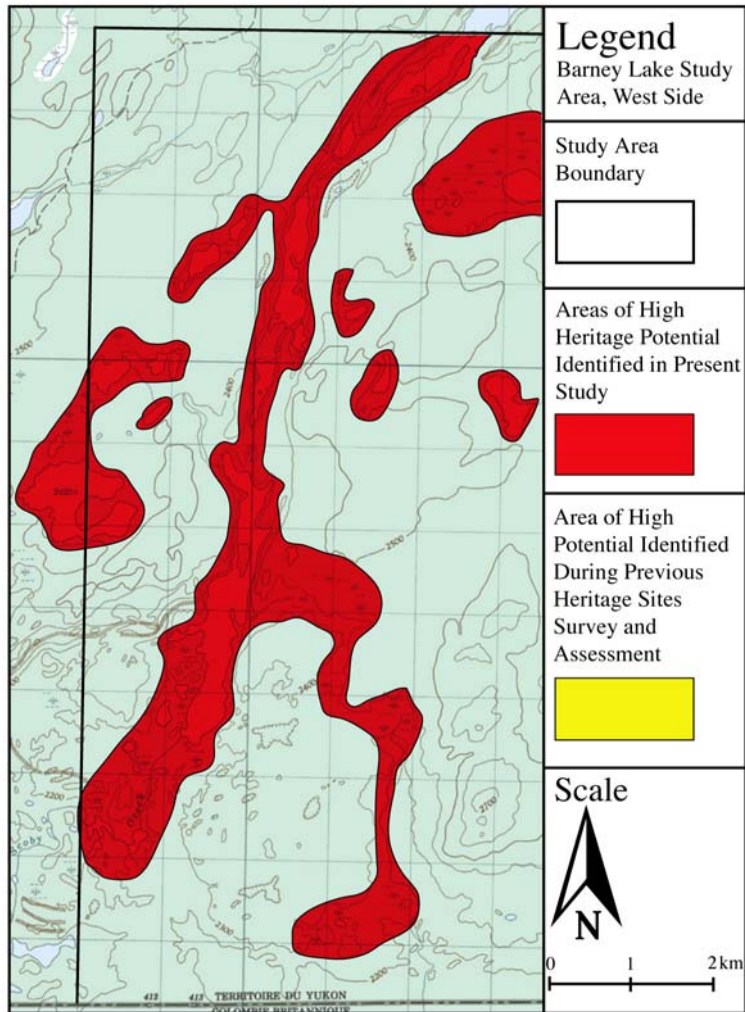


Figure 4: Map of the western portion of the Barney Lake study area depicting areas with elevated potential for heritage site presence.

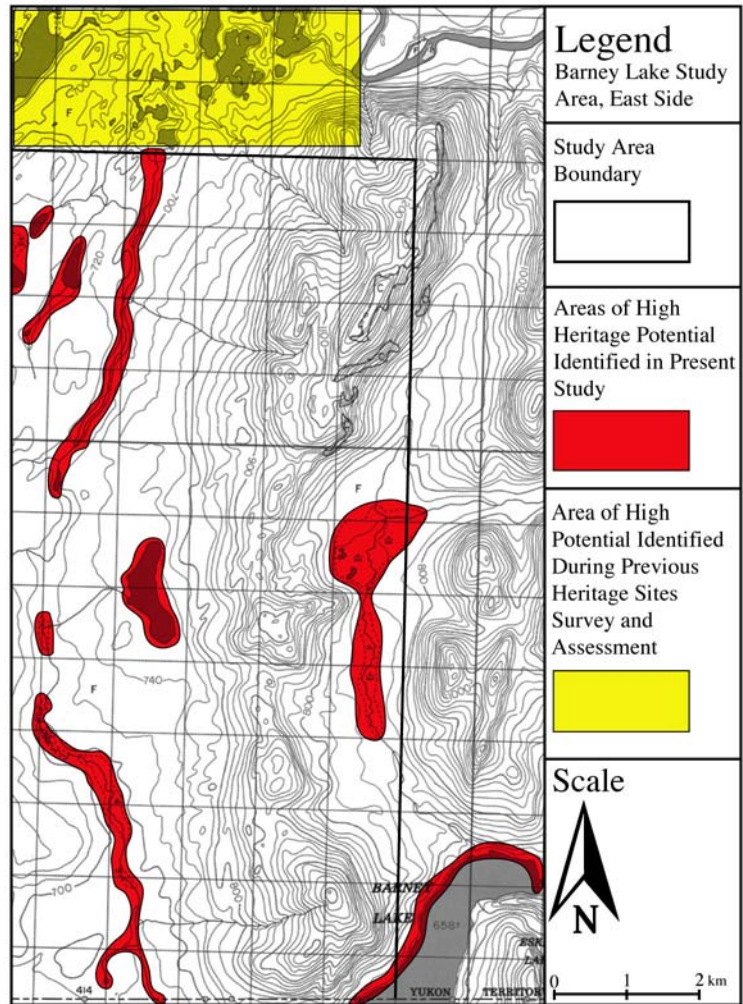


Figure 5: Map of the eastern portion of the Barney Lake study area depicting areas with elevated potential for heritage site presence.

Recommendations

The consultant recommends that the developer avoid areas where archaeological potential has been assessed. Avoidance is recommended because the limited resolution and absence of quality orthographic photo coverage of the study areas restricts the consultant's ability to present an accurate assessment of archaeological potential. Therefore, any major developments that conflict with high potential localities discussed in this report should be subject to higher resolution assessment study such as aerial reconnaissance or focused in field site inventories.

However, it is the consultant's opinion that timber harvest in both the False Canyon Creek and Barney Lake study areas can proceed as long as certain recommendations are observed. Firstly, since forest fires have likely destroyed any surficial historic sites that would have been sensitive to timber harvest it is the consultant's opinion that actual harvesting of trees will not impact any remaining heritages sites. However, buried archaeological sites may still be impacted by roadway expansion, landing construction

and mechanical ground treatments for reforestation. Where these types of developments are to proceed within highlighted regions the following actions are recommended:

1. Any roads or landings that are to be developed in the high potential areas depicted in Figures 2, 3, 4 and 5 should avoid the types of landscape features identified in Table 1. The consultant recommends a 100m buffer between roads and waterways, wetlands, lakes, and ponds as well as terrace and hill edges that overlook these localities. This will minimize if not negate the possibility of impacting buried archaeological sites.
2. If road and landing construction cannot meet with the above stated recommendation then an archaeological impact assessment will be recommended in advance of the development. Alternatively, non-intrusive roadway construction techniques may be an acceptable method of reducing or negating subsurface impacts in high potential areas. The use alternate road expansion techniques should be reviewed and commented on by *Heritage Resources Unit, Cultural Services Branch, Department of Tourism and Culture, Government of Yukon* proceeding with the development.
3. A map of all areas harvested (impacted) should be forwarded for review to the *Heritage Resources Unit, Cultural Services Branch, Department of Tourism and Culture, Government of Yukon* so that the resource managers can know the extent to which physical developments have conflicted with the areas of archaeological potential identified in this report.
4. In areas where developments have overlapped with areas of archaeological potential a post impact (post development) archaeological inventory is recommended pending the nature of the impact. In this case non-soil disturbing developments such as timber harvest, non-excavated winter roads and non-excavated landings are not seen as developments that impact buried sites. Developments such as summer access roads and lands that are excavated would be considered intrusive and warrant further assessment if avoidance and buffering is not a plausible method of mitigating the conflict.
5. If the developer is planning to pre-treat the harvest blocks for reforestation (mechanical scarification) then only non-intrusive ground treatments should be used on the type of features listed in Table 1 or those areas should be avoided. A schedule outlining the locations and types of ground treatment prescriptions should be forwarded to *Heritage Resources Unit, Cultural Services Branch, Department of Tourism and Culture, Government of Yukon* for review before ground treatments are to proceed. If conflicts do arise mitigation strategies should be arranged at that time.

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Appendix 2: Example Site Plan

Appendix 3: Reconnaissance Report

Kaska Forest Resource Stewardship Council Fire Salvage Report

1. Introduction

The 2004 fire season resulted in 12 larger forest fires in the Watson Lake area. Some of these fires were remote while others were located close to existing roads or previously logged areas. As a result, forest managers identified a requirement to assess these fires for potential fire salvage opportunities.

As well, forest managers invited discussion on how the fire salvage would interplay with the green wood harvest. The KFRSC is presently developing a 3 year interim wood supply (3years at 128,000 m³) and a regional forest management plan for the Kaska Traditional Territory.

The following report provides recommendations on fire salvage for interim use and considerations for regional planning.

2. Initial Reconnaissance

On August 31 and September 01, 2004 Ken Kiemele (Dept. Environment), Scott Cole (Watson District Forester) and Myles Thorp (Manager Planning FMB) conducted initial reconnaissance flights on twelve 2004 forest fires in the Watson lake district.

The purpose of the flights was to assess the potential for establishing fire salvage operations. Of the twelve fires seven were identified as having potential and therefore required an assessment. The other five were looked at, however, the terrain and remoteness of these fires precluded salvage opportunities in the near term (5 years).

For the seven fires that were assessed for the quality and quantity, the salvage value focused on saw timber (dbh 25+ cm and 18+meters height) and not pulp grade logs. In other words larger saw log material was considered for the near term out to five years as it was assumed that the timber would deteriorate below sawlog potential beyond that time. The smaller diameter timber that could contribute to longer term bio-fuel production was not considered at this time. If bio-fuel is the primary product, the outlook for salvage would change as there is considerable bio-fuel volume on each of these fires. Accessibility, terrain and stream concerns were considered for each fire.

A 1:250,000 scale key map was used for navigation for the overview flight. Forest cover maps for seven fires were used to focus the flights on the most relevant parts of each fire. It was difficult to determine fire skips from the air because all seven fires had extensive areas of ground fire. An on-the-ground field assessments would be required to delineate areas of ground fire and green or live tree retention. This work will be part of the requirements for laying out salvage on the two fires that the assessment team felt had potential.

3. Fire Assessments

Fire 04-04 Francis River east has two areas within it that have potential for saw log salvage. The first area is immediately across the Francis River and the second area is just south of False Creek.

The first area (Area 1 on the map) appears to have saw log timber with moderate to light ground fire damage. Approximately one kilometer of winter road with an ice bridge crossing is required to access this timber. There are some terrain issues associated with the areas to the north and up the hill as shown on the map.

The second area (Area 3 on the map) located south of False Creek at the north west end of the fire has saw log present, however, additional field work is required to better understand the economics of harvesting - return on investment. The area between the potential salvage area and False Creek is very broken and the terrain would not lend itself to salvage at this time. The forest inventory analysis supports the potential for salvage operations on this fire.

A third area (Area 2 on the map) has low potential for salvage and appears to have higher ecological value. The area contains large areas of multiple fire disturbances that have resulted in multiple story open pine stands with high lichen content. As well, there are small pond and wetter areas that add to the habitat diversity of this area.

WL-04-04 Gross Volume Estimate Summary (based on yield tables and forest cover data)

Area #	Description	Volume Estimate (m ³)
1	<ul style="list-style-type: none">• Lodgepole Pine / Black Spruce mix• Marginal salvage opportunity• Approximately 135 m³/ha• Site Index 17 m (base 100 years)	23,000
2	<ul style="list-style-type: none">• Low volume (<80 m³/ha)• Marginal salvage opportunity• Site Index 15 m (base 100 years)	8,600
3	<ul style="list-style-type: none">• Pine Leading stands• Approximately 170 m³/ha• Average Site Index 19 m (base 100 years)• Average age 100 years• Average Height 19 m	219,000
Total Estimate		250,000

If funding is provided for follow up ground assessment the cost of the road should be weighed against the volume to be extracted before any actual block layout is started as the costs may be too high for the salvage. The pine areas will likely regenerate naturally with the spruce aspen mix favoring aspen regeneration. There will be some requirement for spruce and fir planting on selected portions the mixed polygons.

Fire # 26 Tom Lake fire has potential for salvage operations. A review of this fire was conducted on September 24, 2004 by Myles Thorp, Bill Schmidt Industry Liaison and Ken Colbert Head of Fire Management.

Please note that the areas identified for salvage are outside the area shown on the fire boundary map. This is because the fire has continued to burn to this date and there are large areas of ground fire.

There has been considerable damage to the timber on portions of this fire. However, there is a large area along the north west end of this fire that has been affected by extensive ground fire. This area will have volumes of timber that would be of interest for salvage operations (see map). There is a large wet land complex in the valley floor adjacent to the areas that have salvage potential. Care will have to be taken to protect these wetlands and streams. The timber itself is situated on the upland slopes above the wet land and there are drainage patterns on each area that will provide for logical breaks between the blocks. The on block issues will likely be associated with soil conservation strategies. Regeneration strategies would include natural regeneration on the areas that contain aspen. The pine and spruce mixed forest areas will likely require planting if the harvest takes place. Artificial reforestation will have the best chance of success because it is likely that any seed that would fall from seed held on the burned trees may have burned in the ground fire or the soils will be so cool next summer that there will be low levels of germination.

Access to this fire is the largest hurdle to overcome. A possible route to the fire running south from the Se Dena Hess mine road is shown on the key map. This route will have to be assessed by a qualified logging road engineer. The route passes through areas that have good timber on them and this will help to off set costs for construction. Again the wet land complex adjacent to the fire will require a crossing that will have to be designed to mitigate impacts on the wet lands. A cost to volume analysis will be required to determine the economic feasibility of salvage on this fire.

Because this fire is the most difficult of the three possible fires for salvage, the recommendation for this fire is not to consider it for salvage at this time. The focus of the KFRSC and the Government should be on fires #4 and #29.

WL-26-04 (Tom Lake) Gross Volume Estimate Summary (based on yield tables and forest cover data).

Area #	Description	Volume Estimate (m ³)
Tom's Lake	<ul style="list-style-type: none"> • Lodgepole Pine / Spruce mixed stands • Average m³/ha of salvage opportunity areas is 165 m³/ha • Average site index is 18 m (base 100 years) • Average age is 100 years • Average Height is 18 m 	130,000

Fire #29 Soby Creek/Barney Lake fire has potential for salvage operations. Please note that the map location for the fire is wrong and the salvage polygons indicated on the map is correct. Roads exist right to the fire on the south west end of the burned area and access on the north end of the burn is within two kilometers. The north road would be constructed for winter access across a muskeg area on flat terrain. There is one creek along this route and it is anticipated that a snow fill would be an appropriate structure for the stream in question. This fire has good quality timber in it with relatively high volumes per hectare. There is a large amount of ground fire with light to moderate fire damaged timber. Some areas are highly damaged however; there is likely some good timber in these patches as well. The area is located on the mid slope on an east aspect. Soils look to be stable with some concerns for steepness with regard to on block road construction. The forest in this area is composed of a mix of conifer species and the silviculture regime for the planning unit will include both natural and artificial techniques. In those areas with pine and aspen natural regeneration will likely occur. For the areas dominated with spruce and sub alpine fir planting will be required. At the time of planting spruce would be the target species with subalpine fir naturals being accepted as it ingresses the stand.

WL-29-04 (Barney Lake fire) Gross Volume Estimate Summary (based on yield tables and forest cover data)

Area #	Description	Volume Estimate (m ³)
Barney Lake	<ul style="list-style-type: none"> • Dominated by Pine leading stands with some White Spruce leading stands • Average m³/ha for area of interest is approximately 200 m³/ha • Average Site Index is 19 m (base 100 years) • Average Age is 115 years • Approximate area within area of interest that is greater than 150 m³/ha is 200 hectares • Average stand height is 20 m 	33,000

The initial forest inventory analysis and the initial flight suggest that the Barney Lake fire provides a good opportunity for fire salvage given the access, timber quality and the proximity of the area burned. Further planning is recommended for this area.

Fires: #01 Hyland river north, #7 Hasselburg Lake, #10 Simpson Lake West, #13 Cantung road south, #17 Francis Lake, #18 Toobally west, #19 Toobally east, #20 Cantung road north and #37 south of Toobally west were assessed and the conclusion was that the trees were not large enough to meet saw log quality. There were patches of timber on each of these fires however; the amount of road and difficult terrain would render these patches uneconomic for saw logs. Therefore, these fires will not be recommended for salvage operations no further work will be done on these fires.

Environmental

The timber volume and quality suggest that fires 4 and 29 provide good opportunities to salvage timber, as well they appear to have no obvious significant environment or ecological issues. This is primarily because of two items: 1) these fire are very large and diverse and the proposed harvest is small in proportion to the fire area, and 2) the proposed salvage areas themselves do not appear to have unique features at the landscape level that would suggest the areas should be avoided.

This is not to say that there will not be requirements at the planning stage to avoid or maintain features such as wetlands, water and riparian habitat, wildlife corridors, and green areas etc but merely to indicate that there appears to be no compelling reason not to plan a harvest in these areas.

4. Integration of Fire Salvage and Interim Wood Supply Plan

At present IWSC is working on the interim wood plan for year 2 and year 3. Shifting priority to a fire salvage plan may have an effect on the delivery of interim wood and well as available volumes. Should planning of the fire salvage proceed in parallel or sequentially with the Interim Wood Supply plan for years 2 and 3 and what is the preferred allocation of green wood and fire salvage wood? Funding to do the planning will be an issue and senior management (YTG) support will be required to ensure work on the salvage plan can proceed.

A fire salvage plan for # 29 Barney Lake and # 4 Francis River is desirable provided there is interest and a market for salvage. What is the interest in salvage and to what degree?

KFRSC and the Timber Authority will have to be consulted on this process and a recommendation from them will be useful with regard to where to focus.

The salvage review team suggests it would be prudent to finish the work on interim wood and then shift to the salvage plan.

Integrated Wood Supply

This is a question regarding the proportion or allocation of green wood and fire salvage. In other words do we defer harvest schedules in the East Hyland interim wood area in favor of fire salvage and leave green wood on the shelf for future operations.

The scheduling of the sale of the interim wood and salvage wood can be made after the field planning is completed.

Permitting

Allocating fire salvage to interested parties leads to a number of questions.

- The question of who allocates needs to be addressed, should the forest branch issue the volume to parties or should the process wait on the timber authority and allow it to issue cutting authorizations.
- This leads to the question of salvage and its relationship with interim wood, is fire salvage part of the interim wood process or in addition to it.
- Options for disposal may include direct award to interested parties or set up tender packages and attempt to attract interested parties through competitive bidding.

5. Management Strategies and Policy Items

When large fires occur, the priority of harvest may change.

When stand replacing fires occurs:

- trees are killed and there is a volume loss along this line the current inventory process is to set the area back to NSR status where it stays until a reinventory is done. This can take several years and could result in downward pressure on the AAC determination when that determination is made.
- trees cure and wood quality drops, sawlogs degrade to fuel wood
- forest/stand silviculture moves to a natural regeneration with perhaps longer than anticipated regeneration delays. This is particularly true in the case of large and intense fires. The problem with this strategy is that it can lead to long regeneration delays which can contribute to downward pressure on AAC determinations.

Guideline: Forest fires should be assessed for salvage potential as soon as possible and if salvage is a reasonable option, the planning needs to be initiated.

Guideline: Harvest salvage products first provided the economic and environment benchmarks can be met.

Integrated Wood Supply - Allocation of Green and Fire Salvage in to the AAC.

The rate of loss of volume or quality in a green stand is generally much less than the loss and decline experienced with fire damaged wood.. Therefore, as much volume as possible should be taken from fire salvage as opposed to the green supply.

Guideline: Green wood is the growing stock and the dependence on this wood needs to be relaxed when fire salvage is available.

Guideline: At what point should the timber supply/green wood supply be recalculated?

Cost Recovery

Policy issue: It has been suggested that stumpage on fire salvage operations should be twenty five cents/m³. There will be costs associated with the salvage program that should be recovered. This is especially true regarding the silviculture costs and the cost of layout of roads and cut blocks. Stumpage will likely approach ten dollars/m³ if these costs are to be recovered. This item is a policy issue that the government needs to make a clear decision on. Therefore, a recommendation from the KFRSC on this would be helpful.

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Appendix 4: Development Plan Map