ER 390 Final Project Report

Project Title:

St. Mary's Reserve Ecosystem Restoration Planning
Cranbrook, BC

Prepared for Restoration of Natural Systems Program
University of Victoria

Thomas Munson
UVIC # 9814161

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List of Tables

Table 1: Summary of Ecological Information and Site Characteristics
Table 2: BEC Classification of Rare Natural Plant Communities
Table 3: Important Identified Wildlife Species on SMR-1
Table 4: Checklist of Restoration Planning Information

List of Figures

Fig. 1: St. Mary’s Reserve and Racetrack Timber Block
Fig. 2: TEM Site Series Polygon Map – Racetrack Block
Fig. 3: Aerial Photo of Racetrack Block (Year 2000 coverage)
Fig. 4: Hiking a Wildlife Trail – SW Side of Racetrack Block
Fig. 5: High River Bluffs on SW Side of Racetrack Block
Fig. 6: TEM Plot 1 Photo – PPhh2-01 Site Series
Fig. 7: TEM Plot 3 Photo – PPhh2-01 Site Series
Fig. 8: TEM Plot 6 Photo – PPhh2-01 Site Series
Fig. 9: TEM Plot 7 Photo – PPhh2-01 Site Series
Fig. 10: TEM Plot 2 Photo – PPhh2-02b Site Series
Fig. 11: TEM Plot 5 Photo – PPhh2-02b Site Series
Fig. 12: TEM Plot 8 Photo – PPhh2-02b Site Series
Fig. 13: TEM Plot 4 Photo – PPhh2-03 Site Series
Fig. 14: TEM Plot 4 Photo – Ingrown Lodgepole Pine
Fig. 15: Photopoint Plot 1 – PPhh2-02b Site Series
Fig. 16: Photopoint Plot 2 – PPhh2-01 Site Series
Fig. 17: Photopoint Plot 3 – PPdh2-03 Site Series
Fig. 18: Photopoint Plot 4 – PPdh2-01 Site Series
Fig. 19: Wildlife Tree Plaque on Pine Veteran
Fig. 20: Pine Veteran Wildlife Tree
Fig. 21: Danger Tree Flagging

List of Appendices

Appendix 1: Ground Inspection Forms – Field Data
Appendix 2: Wildlife Tree Assessment Field Forms
Appendix 3: Racetrack Unit Composite Field Data Map

Abstract

A Restoration Plan has been completed for the Racetrack Block, a 58 ha. management unit located on the St. Mary’s Indian Reserve northeast of Cranbrook, BC. The Racetrack Block consists of open grassland, open forest and closed forest ecosystems in the Ponderosa Pine (PPdh2) Biogeoclimatic Zone of southeast BC. Fieldwork completed prior to preparation of the Restoration Plan included field reconnaissance of the management unit; an Archaeological Overview Assessment; completion of Ground Inspection Forms and Site Series identification; Terrain Ecosystem Mapping of ecological polygons; establishment of Photopoint Monitoring plots and wildlife and danger tree assessment, marking and mapping. Local restoration experts were interviewed regarding restoration planning objectives for the PPdh2 ecosystem. Restoration recommendations for silviculture treatments include: maintaining the widely spaced large diameter remaining trees where possible; re-establishing a lower density understory in the open forest; removing encroaching conifer trees from grassland areas and ingrown conifers from wooded areas; maintaining existing levels of coarse woody debris (CWD); and retaining large diameter wildlife and dead-standing trees. Prescribed burning is recommended following silviculture treatments, to enhance prime ungulate winter range and grassland species potential.
Introduction

The St. Mary's Indian Reserve (SMR-1), located 8 km. northeast of Cranbrook, BC, consists of over 7460 ha. of open grassland, open forest and closed forest ecosystems in the Ponderosa Pine (PPdh2) Biogeoclimatic Unit of BC. SMR-1 is located in southeastern BC in the Rocky Mountain Trench Ecoregion. Timber harvesting occurred on a large scale on the Reserve in the 1930 - 1950's, but since that time there has been only sporadic Christmas tree and firewood harvest. The grassland ranges have been grazed actively since the early 1930's. Very little active resource management of forest or range values was carried out until a Forest Management Plan was prepared in 1988 (Thomson et. al., 1988); this plan has been updated as a result of a Timber Resource Inventory and Range Assessment Project completed in the summer of 2001 (Warden et. al., 2001; Ross, 2001).

Following on the work of the recent Integrated Resource Management inventories of 2001, proposals were submitted and funded by St. Mary's Indian Band and the Ktunaxa Kinbasket Development Corporation (KKDC) to assess a number of timber treatment blocks on the Reserve, for timber removal and thinning, followed by prescribed burning. An Environmental Assessment Plan Report was completed in 2002 to meet the requirements of the Department of Indian Affairs for carrying out any resource management activities on the St. Mary's Indian Reserve (Hall, M., 2002). The Restoration Planning work to be undertaken in this project will complement the other resource inventories and forest plans, and provide direction from an ecological and restoration perspective to St. Mary's Band members involved in resource management on their Reserve.

The Racetrack Block chosen for this research project is one of three timber treatment units assessed in previous studies: by Warden et al. (2001) as part of the timber reconnaissance of the entire SMR-1; by Ross (2001) in completion of Range Assessments on three Pasture Units on SMR-1, and by M. Hall (2002) in completion of the EIA for proposed terrestrial ecosystem restoration. The Racetrack Block is a 58 ha. management unit consisting of open and closed forest ecosystems and grassland, located on the southwest side of SMR-1 (Figure 1). It is bounded on the west side by a public access road through SMR-1, on the north side by a BC Hydro Right of Way, and on the east and south sides by high ancient bluffs of the St. Mary's River valley.

The research work to be completed to complement existing recent assessments on the Racetrack Block was the following fieldwork:

- Recce’s of timber treatment units (spring/summer 2002);
- Archaeological Overview Assessment (summer 2002).
- Site series identification and GIFF forms (fall 2002);
- Terrain Ecosystem Mapping of ecological units (fall 2002);
- Establishment of Photopoint Monitoring Plots (fall 2002);
Methods

(i) Field Reconnaissance of Management Unit

The initial forays into the Racetrack Block consisted of two field reconnaissance trips in the spring and summer of 2002, to know the lay of the land, and to roughly map out boundaries of ecosystems, using the baseline information from Ross (2001) as the map guide. The researcher hiked throughout the Racetrack Block accompanied by two members of the St. Mary's Indian Band – Vic Clement and Ray Warden. Photographs were recorded of significant ecological features such as prominent wildlife trees, past traditional or historical use areas and sites, and Block boundaries. A short summary report of the field trips was submitted to the KKDC for resource planning use (Munson, 2002a).

(ii) Archaeological Overview Assessment (AOA)

As part of the field assessment of the Racetrack Block for inclusion in the EIA Report (Hall, M., 2002), an Archaeological Overview Assessment and field reconnaissance was completed. This work consists of preliminary review of large-scale maps and aerial photos of the treatment blocks, to identify areas or features that could have potential for archaeological significance. Features to look at include ancient watercourses, riparian areas, glacial terraces, historic trails, existing archaeological sites, etc.

Following review of maps and photos, Archaeologist Barry Wood, contractor for Eaglevision Geomatics and Archaeology Ltd., completed a field reconnaissance, accompanied by the principal researcher and Vic Clement of the St. Mary's Indian Band. Investigations usually associated with the field component include but are not limited to close visual examination of natural surface and subsurface exposures, vehicle trails, ditch cuts and back slopes, bare unvegetated ground, cattle trails, borrow pits, historic use sites, etc. Of particular importance is the search for archaeological materials on or near the surface. The results of this field reconnaissance are found in Wood (2002).

(iii) Site Series Identification and Terrain Ecosystem Maps

To complete the Terrain Ecosystem Mapping work, colour air photos at 1:20,000 scale were viewed to note prominent landform features and vegetation type boundaries on a preliminary basis. Several base maps were produced by
Ktunaxa Kinbasket Treaty Council (KKTC) GIS staff to be used as templates for marking field notes, survey plots and TEM polygons.

In the field in October, Ground Inspection Forms (GIFO) from MELP/MOF (1998) were used to record all field data at a series of TEM plots. A total of eight field plots were completed on the treatment block. Elevation and geographical coordinates were recorded for each field plot using a GPS unit. Slope and aspect were recorded with a clinometer and compass. Soil pits were dug at all plots with the exception of three; two plots had soil pits already present, and one was located near an exposed bluff cutbank. Soil profiles were sketched for each field plot. Plot units of 20 x 20 m² were used as the basis for vegetation inventory. Species and percent cover in the forest canopy, shrub and herbaceous layers were all inventoried. Plant specimens were collected for any herbaceous plants not known, and later identified with reference to Parish et al. (1996) and with assistance from Ethnobotanist Michael Keefer of the KKTC Traditional Use Program.

Soil Moisture Regime and Soil Nutrient Regime were determined using charts from MELP/MOF (1998) and Braumandl et al. (1992); this information led to the Site Series classification for plots and polygons. Site series polygons were recorded on the base maps, and information reviewed by RPF Mark Hall of Jaffray, who had completed the EIA Report for the block.

A final field recce was completed in November to confirm Site Series polygon boundaries, noting features such as terrain and landform changes, aspect and vegetation type boundaries on the ground. A final report was completed as part of the requirements for ER 312B course work at the University of Victoria (Munson, 2002b). A final TEM map was produced, showing the location of field plots and Site Series polygons (Figure 2).

(iv) Photopoint Monitoring Plots

Four photopoint monitoring stations were established in Racetrack Block in October of 2002, based on methodology from the US Department of Agriculture (Hall, F., 2002). The objective was to record representative examples of forest ingrowth and grassland encroachment prior to restoration treatments. Photos were recorded in closed Douglas fir forest, in open grassland encroached upon by Douglas fir and Ponderosa pine, and in ingrown Ponderosa pine forest. The location of the photopoint monitoring stations is noted on the final Racetrack Unit field map (Appendix 3).
(v) **Wildlife Tree Assessment and Mapping**

In March of 2003, the entire Racetrack Block was walked to record and map all wildlife and danger trees. Field methodology was based on Ministry of Forests and Ministry of Water, Land and Air Protection guidebooks (BC Ministry of Forests, 1996). Normally, sample wildlife tree plots are established in a forest stand; for the purposes of this study, all trees in the Racetrack Block were surveyed, in other words, 100 percent sampling coverage. Peter Davidson, a Forest Ecosystem Specialist with the Ministry of Water, Land and Air Protection, and Dan Wigle, a field technician for the St. Mary’s Indian Band, accompanied the researcher to complete the wildlife tree assessments.

In the initial recce, all wildlife and danger trees encountered were recorded on Tree Attributes for Wildlife field forms and locations marked on a base map; on the second field trip, prominent wildlife trees were marked with a WLAP plaque, GPS coordinates were noted, and all danger trees were ribboned with tape. Additional Wildlife Tree Data Sheets were completed for inclusion in WLAP files.

**Results and Interpretation**

(i) **Field Recce of Management Unit**

**Traditional Use and Historical Activity**

*Figure 3* shows the aerial photo for the Racetrack Block. Traditional use activities by St. Mary’s Band members on the Racetrack Block include elk hunting, scouting of the St. Mary’s River valley from the high bluffs, and timber and firewood cutting. Previous logging activity took place on the unit in the mid 1980’s, removing large diameter Douglas-fir (V.Clement, *pers.comm.*). Several old log landings and skid roads exist within the block. An historic refuse dump site is present in the southwest corner of the block. A water dugout was constructed in the late 1980’s, to provide a water source for the west side of the larger Racetrack Pasture Unit on SMR-1. (V.Clement, *pers.comm.*) This dugout has completely grown in again with one of the few stands of Lodgepole pine trees on SMR-1.

**Key Ecological Values**

- Excellent winter range for St. Mary’s Reserve elk and whitetail deer;
- Extensive ungulate use of management unit, with game trails along bluffs (*Figure 4*);
- Ingrowth of Douglas-fir has changed site classification from Open Forest to Closed Forest in many sections;
- Age Class 5-6 Douglas-fir available for timber harvest.
Positive Features of Restoration Treatment

- Potential for timber harvest of Douglas-fir (Fd), Lodgepole (Pl) and Ponderosa pine (Py) to recover some costs of treatment;
- Potential for rejuvenating water dugout for use by cattle;
- Restoration treatment could fireproof an area targeted for residential housing development above the bluffs to the east;
- Substantial wildlife values in management unit would be enhanced by removal of ingrown Fd and Py;
- Area is well bounded by natural and man-made barriers for future prescribed burn.

(ii) Archaeological Overview Assessment (AOA)

The area of highest archaeological potential on Racetrack Block is restricted to the high terrace margin above the bluffs, which forms the southeastern and south-western boundaries of the Block (Figure 5). This terrace provides a significant viewpoint of the St. Mary’s River valley, and is heavily used by ungulates in the winter. Examination of this area on foot uncovered no archaeological or traditional use sites, nor any archaeological materials. The heritage values within the treatment block are considered to be low (Wood, 2002). No further archaeological fieldwork was recommended prior to timber treatment.

(iii) Site Series Identification and Terrain Ecosystem Mapping (TEM)

Three different Site Series were observed in the eight GIF plots completed in the Racetrack timber block. The results are summarized in Table 1 below. GIF field forms are appended to this report. Figure 2 maps the Site Series areas in Racetrack Block. GIF Field Data is included in Appendix 1.

Table 1: Summary of Ecological Information and Site Characteristics

<table>
<thead>
<tr>
<th>Plot Number</th>
<th>BEC Zone/Subzone**</th>
<th>Site Series</th>
<th>Soil Moisture / Nutrient Regime</th>
<th>Soil Texture**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PPdh2</td>
<td>01</td>
<td>3 / C</td>
<td>SiL</td>
</tr>
<tr>
<td>2</td>
<td>PPdh2</td>
<td>02b</td>
<td>2 / B</td>
<td>SiL</td>
</tr>
<tr>
<td>3</td>
<td>PPdh2</td>
<td>01</td>
<td>3-4 / C</td>
<td>SiL</td>
</tr>
<tr>
<td>4</td>
<td>PPdh2</td>
<td>03</td>
<td>4 / C</td>
<td>SiC</td>
</tr>
<tr>
<td>5</td>
<td>PPdh2</td>
<td>02b</td>
<td>2 / B</td>
<td>Si</td>
</tr>
<tr>
<td>6</td>
<td>PPdh2</td>
<td>01</td>
<td>3-4 / C</td>
<td>SiL</td>
</tr>
<tr>
<td>7</td>
<td>PPdh2</td>
<td>01</td>
<td>3 / C</td>
<td>SiL</td>
</tr>
<tr>
<td>8</td>
<td>PPdh2</td>
<td>02b</td>
<td>2-3 / B</td>
<td>SiL</td>
</tr>
</tbody>
</table>
**Table 1 Code: PPdh2: Kootenay Dry Hot Ponderosa Pine variant**

Si: Silt texture  
SiL: Silt loam soil texture  
SiC: Silt clay soil texture

The BC Conservation Data Centre lists all of these Site Series as Rare Natural Plant Communities for the Cranbrook Forest District. (BC-CDC 1998). The characteristics of these Site Series are noted below in Table 2. As well, a number of rare species (Red and Blue-listed) are known to occur on SMR-1; these are shown in Table 3; many other rare species are likely to occur in these Site Series but have not been observed and recorded.

**Table 2: BEC Classification of Rare Natural Plant Communities**

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>BEC Code / Site Series</th>
<th>BC Conservation Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pinus ponderosa – Psuedoroegenria spicata</em> - Lupinus</td>
<td>Ponderosa pine – bluebunch wheatgrass – lupine</td>
<td>PPdh2 – 01</td>
<td>Red (threatened)</td>
</tr>
<tr>
<td><em>Pinus ponderosa – Psuedoroegenria spicata– Koelaria macrantha</em></td>
<td>Ponderosa pine – bluebunch wheatgrass – junegrass</td>
<td>PPdh2 – 02a/02b</td>
<td>Interim Red (threatened)</td>
</tr>
</tbody>
</table>

**Table 3: Important Identified Wildlife Species on SMR-1**

<table>
<thead>
<tr>
<th>Species Common Name</th>
<th>Species Scientific Name</th>
<th>CDC Listing*</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Badger</td>
<td><em>Taxidea taxus</em></td>
<td>Red</td>
<td>Known</td>
</tr>
<tr>
<td>Long-billed Curlew</td>
<td><em>Numenius americanus</em></td>
<td>Blue</td>
<td>Known</td>
</tr>
<tr>
<td>Turkey Vulture</td>
<td><em>Cathartes aura</em></td>
<td>Blue</td>
<td>Known</td>
</tr>
<tr>
<td>Swainson’s Hawk</td>
<td><em>Buteo swainsoni</em></td>
<td>Red</td>
<td>Potential</td>
</tr>
<tr>
<td>Lewis’ Woodpecker</td>
<td><em>Melanerpes lewis</em></td>
<td>Blue</td>
<td>Known</td>
</tr>
<tr>
<td>Peregrine Falcon</td>
<td><em>Falco peregrinus anatum</em></td>
<td>Red</td>
<td>Potential</td>
</tr>
<tr>
<td>Prairie Falcon</td>
<td><em>Falco mexicanus</em></td>
<td>Red</td>
<td>Potential</td>
</tr>
<tr>
<td>Flammulated Owl</td>
<td><em>Otus flammmeolus</em></td>
<td>Blue</td>
<td>Potential</td>
</tr>
<tr>
<td>Western Screech Owl</td>
<td><em>Otus knncicott macfarlanei</em></td>
<td>Red</td>
<td>Potential</td>
</tr>
<tr>
<td>Sharp-tailed Grouse</td>
<td><em>Tymanuchus phasianellus</em></td>
<td>Blue</td>
<td>Known</td>
</tr>
<tr>
<td>Red-tailed Chipmunk</td>
<td><em>Tamias ruficauaudus ruficauaudus</em></td>
<td>Red</td>
<td>Potential</td>
</tr>
<tr>
<td>Grizzly Bear</td>
<td><em>Ursus arctos</em></td>
<td>Blue</td>
<td>Known</td>
</tr>
<tr>
<td>Painted Turtle</td>
<td><em>Chrysemys picata</em></td>
<td>Blue</td>
<td>Known</td>
</tr>
<tr>
<td>Northern Leopard Frog</td>
<td><em>Rana pipiens</em></td>
<td>Red</td>
<td>Potential</td>
</tr>
<tr>
<td>Tailed Frog</td>
<td><em>Ascaphus truei</em></td>
<td>Red</td>
<td>Potential</td>
</tr>
</tbody>
</table>
* Red listing – threatened

Blue listing - vulnerable

Site Series Descriptions (generalized)

PPdh2 – 01:
Soils are predominantly Silt-Loam, with 20-40 % coarse fragments, mostly cobbles and gravels. The dominant overstory vegetation of this ecosystem was historically Ponderosa pine (Pinus ponderosa); however, in the absence of stand – maintaining fires (due to fire suppression), Douglas-fir (Pseudotsuga menziesii) has grown in both overstory and understory layers. Selective timber harvest over the years has removed much of the older trees of both species, leaving mostly small diameter in-grown Pole-Sapling or Young Forest successional stages. A large number of old wildlife tree snags remain, some killed by previous fires; these provide valuable woodpecker and raptor habitat.

The understory vegetation, when not restricted by small, in-grown trees, is dominated by prickly rose (Rosa acicularis) and snowberry (Symphoricarpos albus) in the shrub layer, and bluebunch wheatgrass (Pseudoroegneria spicata) and junegrass (Koelaria macrantha) in the herb/grass layer.

Field photos from Plot 1 (Figure 6), Plot 3 (Figure 7), Plot 6 (Figure 8) and Plot 7 (Figure 9) are appended to this report.

PPdh – 02b:
This plant community is either open grassland or treed – grassland ecosystem, thriving on dry river terraces with south or southwestern aspect. Soils are submesic to mesic and composed of layers of aeolian silt overlaying gravels and cobbles. In the absence of natural disturbance, some portions of the ecosystem are being encroached upon by Pinus ponderosa and Pseudotsuga menziesii. The natural shrub layer here contains antelope-bush (Purshia tridentate) and rabbit- brush (Chrysothamnus nauseosus); herb and grass layers are dominated by pasture sage (Artemisia frigida), arrow-leaved balsamroot (Balsamorhiza sagittata), pussytoes (Antennaria sp.) Pseudoroegneria spicata, and Koelaria macrantha. Due to the distance of these grasslands from a natural or man-made water supply, there has been minor grazing impact by cattle on this end of the Racetrack Pasture Unit. This habitat is prime winter range for herds of elk and white-tailed deer.

Field photos from Plot 2 (Figure 10), Plot 5 (Figure 11) and Plot 8 (Figure 12) are appended to this report.

PPdh2-03:
A small unit of this Site Series was found near an old agricultural dugout, in the northwestern corner of the Racetrack timber block. This ecosystem is found at the base of a sharp slope, and contains soils with higher moisture and clay.
content than found elsewhere in the block. Although normally dominated by *Pinus ponderosa* in the overstory, this Site Series unit is covered with closely packed Lodgepole pine (*Pinus contorta*), one of the few locations for this species on SMR-1. Trembling aspen (*Populus tremuloides*) is common in the overstory as well; prickly rose (*Rosa acicularis*) and kinnikinnick (*Arctostaphylos uva-ursi*) dominate the shrub layer.

Field photos from Plot 4 (Figures 13 and 14) are appended to this report.

(iv) Photopoint Monitoring Plots

Representative photos from the four photopoint monitoring plots are shown in Figures 15 - 18. Initial photopoint plots were established in October 2002, and repeat photos were taken in March 2003.

(v) Wildlife Tree Assessment and Mapping

A total of 58 wildlife and danger trees were recorded in the 58 ha. Racetrack Block. Of this total, 11 trees were left with a Wildlife Tree plaque (Figure 19), mainly trees close to access or skid roads that might be susceptible to firewood cutters, plus the largest wildlife trees with existing nesting activity observed in them (Figure 20). The desired density of wildlife trees in the PPdh2 site series in the Rocky Mountain Trench, for restoration and ecological purposes, averages about 1 tree/ha. (P. Davidson, pers. comm.) In most parts of the valley floor of the Trench, wildlife tree density is far less than the desired number. Having the desired density on Racetrack Block, and on the SMR-1 in general, is testament to reduced firewood cutting than in areas off the Indian Reserve. These trees provide an important historical legacy of the fire history and ecological quality of trees that were produced in the Rocky Mountain Trench.

Danger trees were marked with appropriate flagging (Figure 21), for protection of the future timber harvesters and field crews. Marking of wildlife trees and danger trees also affords the opportunity to educate St. Mary's Band members about the importance of protecting these valuable wildlife and biodiversity values. Field data forms for wildlife and danger trees are included in Appendix 2.

Discussion

Good inventory and assessment work is a mandatory precursor for any restoration, but uncertainty in the natural system and its' responses to restoration are a given. It is perfectly acceptable and ecologically correct to set restoration goals as ranges or thresholds rather than as specific numerical targets (Gayton, 2001).
In preparation for completing a restoration plan for the Racetrack Block, the researcher interviewed three restoration practitioners who prepare such plans for timber licencees and government agencies. These practitioners were:

(i) Jeff Allen – RPF and consultant who has produced ecosystem restoration plans for Tembec Inc. and Ministry of Water, Land and Air Protection;
(ii) Tim Ross – P. Ag. and consultant who has produced ecosystem restoration plans and range assessments for many clients;
(iii) Mark Hall – RPF and consultant who prepared the Environmental Impact Assessment Plan for the SMR-1 for St. Mary’s Indian Band.

The objectives of the interviews were to determine what baseline information is used to prepare restoration plans. Following is a summary table of information ideally available to prepare restoration plans, with a checklist of whether this information is available for the existing Racetrack Block:

Table 4: Checklist of Restoration Planning Information

<table>
<thead>
<tr>
<th>Restoration Planning Information</th>
<th>Information available for Racetrack Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kootenay Boundary Land Use Plan guidelines for Natural Disturbance Type 4 ecosystems</td>
<td>Yes</td>
</tr>
<tr>
<td>BEC Zone Site Series</td>
<td>Yes</td>
</tr>
<tr>
<td>Soil types</td>
<td>Yes</td>
</tr>
<tr>
<td>Understory and overstory vegetation cover</td>
<td>Yes</td>
</tr>
<tr>
<td>Landforms and geologic history</td>
<td>Yes</td>
</tr>
<tr>
<td>Climatic data (historical)</td>
<td>Yes – from Cranbrook Airport</td>
</tr>
<tr>
<td>Logging history (historical / current)</td>
<td>Yes – anecdotal</td>
</tr>
<tr>
<td>Historic and current air photos</td>
<td>Yes</td>
</tr>
<tr>
<td>Ethnographic or traditional use information</td>
<td>Yes</td>
</tr>
<tr>
<td>Stump densities / snag densities</td>
<td>Yes for snags</td>
</tr>
<tr>
<td>Fire history dendrochronology</td>
<td>Yes, for nearby areas</td>
</tr>
<tr>
<td>Archaeology information</td>
<td>Yes</td>
</tr>
<tr>
<td>Ungulate winter range tree stocking standards</td>
<td>Yes</td>
</tr>
<tr>
<td>Rare species inventory</td>
<td>Partial listing</td>
</tr>
</tbody>
</table>

The three restoration practitioners were also asked what resource management objectives guide existing ecosystem restoration planning in the Rocky Mountain Trench. There are a number of possible objectives that could guide such plans:

- Restoration to a previous historical ecological or ecosystem state;
- Restoration toward a desired future ecological or ecosystem state;
- Restoration for purposes of improving range and wildlife habitat;
- Restoration to achieve a silvicultural or timber harvest objective;
• Restoration based on tree stocking standards.

The requirement for timber production on all categories of habitat type in the timber harvesting land base (Open Range, Open Forest, Closed Forest, Managed Forest, Riparian Areas, etc.) is a constraint on applying more ecologically-based restoration objectives on Crown land (J. Allen, pers. comm.) This requirement predetermines that one of the overriding objectives of any restoration plan will be the timber stocking standards (targets of stems/hectare). Fortunately, strong representation by wildlife managers in pushing for ungulate winter range management objectives, which favour grass production over tree production, have ensured that objectives for improving grassland and wildlife habitat are also prominent in restoration planning (P. Davidson, pers. comm.).

In order to use a previous historical ecological state as an objective for restoration planning, more historical ecological information is needed than now exists for the Rocky Mountain Trench (J. Allen, pers. comm.), and for the SMR-1 lands. A severe fire burned most of the RMT in successive years in the early 1930’s, destroying much of the evidence of previous ecosystems. While it is possible to gather data from the remaining large snags and stumps, there is no record left of how many small diameter trees existed between the larger trees in past decades.

The most important application of historical information is to ensure that restoration plan objectives fall within the historical range of ecological variability (M. Hall, pers. comm.) Historical range of variability (HRV) refers to the full spectrum of ecosystem states and processes encountered over a long period of time, usually the 1600-1880 time period. Ecosystems may be healthier and more sustainable if we manage them so that their current natural disturbance regime falls within the historical range of variability (Gayton, 2001).

Despite limitations on historical information sources, with careful examination of site characteristics and factors such as geological history, soils, landforms, slope and aspect, climate, and vegetative cover, restoration plans can be based on what the site potential is, or what the ecosystem could be or wants to evolve to (T. Ross, pers. comm.) Using this approach, the conclusions of Site Series designation and of Terrestrial Ecosystem Mapping are crucial in establishing the baseline ecological factors of the ecosystem to be restored; this baseline information leads to understanding the sites’ capability and what it is likely to evolve to under known successional patterns.
Recommendations

(i) Restoration Plans by Site Series – Racetrack Block

PPdh 2 Ecosystems

In the PPdh2 ecosystem, Ponderosa pine forms the climax forests; these are long-lived forests with a life history of 250-500 years. Natural stand-thinning processes, such as fire and drought, keep tree densities relatively low. Ponderosa pine trees are shade-intolerant conifers and require mineral soils and high light environments to regenerate. Site productivity is relatively low due to dry conditions. Idaho fescue (*Festuca idahoensis*), rough fescue (*Festuca campestris*), and bluebunch wheatgrass (*Agropyron spicatum*) are the climax grass species in the PPdh2 ecosystem. These grasses are also negatively affected by shading and ingrowth, and are adapted to frequent low-intensity fires (M. Hall, 2002).

Partial cutting, timber harvesting, slashing, and thinning of Ponderosa pine and Douglas-fir in the PPdh2 ecosystem are all silviculture practices consistent with natural disturbance processes. Important considerations on the SMR-1 Racetrack Block include maintaining the widely spaced large diameter remaining trees where possible, re-establishing a lower density understory in the open forest, removing encroaching conifer trees from grassland areas, maintaining existing levels of coarse woody debris (CWD) and retaining large diameter wildlife and dead-standing trees. These large wildlife trees are most likely to contain the potential red and blue listed cavity-nesting bird species that have yet to be recorded on SMR-1.

The Natural Disturbance Type (NDT) framework is an attempt to categorize the frequency and severity of disturbance events prior to European settlement. The PPdh2 ecosystem falls into the Natural Disturbance Type 4 classification: ecosystems with frequent stand-maintaining fires (Gayton, 2001). Following the silviculture plans with prescribed burns at a low intensity level will rejuvenate the suppressed grass species and herbaceous plant communities. As fire has not been allowed for many decades on SMR-1, early spring burning and removal of a high percentage of small diameter trees prior to burning will reduce the potential hazard of a moderate to high intensity fire occurring.

The Racetrack Block contains Class 2 ungulate winter range for elk (high capability) and Class 3 ungulate winter range for white-tailed and mule deer (moderate capability); therefore the stimulation of grassland forage is a prime objective of the restoration plan; the proposed restoration treatments will enhance the capability of the Racetrack Block to provide prime native bunchgrass forage, close to adjacent forest cover.
The following recommendations for restoration planning by Site Series are partially derived from the Silviculture Prescription contained in the EIA Report for SMR-1 (M. Hall, 2002). The BC Conservation Data Centre lists all of these Site Series as Rare Natural Plant Communities for the Cranbrook Forest District. (BC-CDC 1998).

Site Series PPdh2 – 01:

This Site Series is classified as Open Forest/Closed Forest habitat. In the absence of natural thinning disturbances, this habitat has become ingrown, predominantly with small diameter Ponderosa pine (Py) and Douglas-fir (Fd). The understory vegetation of grasses and shrubs are in decline due to reduced light through the forest canopy. Plant community and wildlife habitat diversity are in decline due to forest ingrowth. Historical timber harvest has removed a high percentage of older veteran Douglas-fir, leaving the remaining forest as younger age Py and Fd trees; nonetheless, a high number of wildlife trees remain, dominated by older Py veterans.

**Restoration Objectives**

(a) **Restore Open Forest** stand characteristics by:

- Marking leave trees prior to harvest
- Leaving 30-50 stems/ha of mature Py and Fd trees
- Reserving 90 % Py and 10% Fd in overstory
- Slashing all trees under 1.3 m. tall
- Opening up understory bunchgrass, shrub and forb communities

- Retaining all large-crowned veteran trees and standing dead trees
- Prescribed burning 1-2 years following silviculture treatment, to reduce encroachment and seedling regeneration

(b) **Retain mature trees for:**

- Species and stand structure biodiversity
- Wildlife and old tree recruitment
- Maintenance of open forest stand conditions
- Future timber potential

© Protect existing wildlife trees by:

- Marking wildlife trees clearly following wildlife tree assessment
- Raking duff and needle litter accumulations away from the base of live and dead wildlife trees prior to prescribed burning
- Slashing immature trees 10 m. around all wildlife trees to prevent fire crowning onto wildlife trees
Site Series PPdh2- 02b:

This Site Series is classified as Open Range or Treed Grassland habitat. In the absence of natural disturbances (fire), conifer trees are invading portions of this habitat, and the native grassland species are in decline. Plant community and wildlife habitat diversity are in decline due to this forest encroachment along the edges of the open grassland. Older wildlife trees remain along the perimeters of the grassland habitat.

Restoration Objectives

(a) Restore Open Range site characteristics by:
   • Marking leave trees prior to harvest
   • Leaving 1-5 stems/ha. of mature Py and Fd trees
   • Slashing all trees under 1.3 m. tall
   • Removing all conifers in the understory layers
   • Opening up understory bunchgrass, shrub and forb communities
   • Retaining all large-crowned veteran trees and standing dead trees
   • Prescribed burning 1-2 years following silviculture treatment, to reduce encroachment and seedling regeneration
   • Leaving a forest canopy of less than 10% cover
   • Promoting regeneration of native grasses and forbs
   • Controlling any noxious weed invasions post-treatment

(b) Protect sensitive soil characteristics by:
   • Maintaining a 10 m. no-machine zone along the high terrace bluffs on the south side of the Racetrack Block
   • Restricting any timber harvest operations to winter conditions (frozen soils and at least 0.3 m. of snow if possible)
   • Minimizing the construction of bladed skid roads

Site Series PPdh2 – 03

This Site Series is classified as Open Forest Habitat. On the Racetrack Block, in the absence of natural disturbance processes, this small unit has been almost completely overgrown by Lodgepole pine (PI). Plant community and wildlife habitat diversity are in decline due to forest ingrowth.

Restoration Objectives

(a) Restore Open Forest stand characteristics by:
   • Hand removal of ingrown PI to density of 30 stems/ha.
   • Slashing all remaining conifers under 1.3 m. tall
   • Opening up understory bunchgrass, shrub and forb communities
- Retaining all large-crowned veteran trees and standing dead trees

(b) Protect rare plant community characteristics by:
- Retaining all Aspen (*Populus tremuloides*) trees
- Protecting the site from prescribed burning with a fire guard
- Ensuring all work is carried out by hand, machine-free

(ii) Recommendations for Archaeological Values

The reliability of the AOA survey is considered to be high, with results based on examination of numerous exposed soil surfaces. The area of highest archaeological potential along the south side ancient river bluffs is to be protected by a machine-free buffer zone. In the unlikely event of any archaeological materials or sites being encountered, the archaeologist provides the following recommendations (Wood, 2002):

- All ground disturbance in the immediate vicinity of the site or cultural materials be halted at once; and
- The St. Mary's Band Council be notified immediately about the discovery of any sites or cultural materials.

(iii) Recommendations for Rare Species

The grassland vegetation that occurs in these ecosystems is critical to wintering ungulates (including elk, white-tailed and mule deer), and to many small mammals, birds and raptors; the threatened Red-listed and vulnerable Blue-listed species identified as known or with potential to be resident on SMR-1 are associated with the rare plant communities that have been observed in the Racetrack Block. Examples include the yellow badger, Lewis' woodpecker, and turkey vulture. The removal of forest ingrowth in open forest, and conifer encroachment on grasslands, and the subsequent enhancement of grassland potential will be beneficial to such species that favour grassland habitats and open forest.

Nonetheless, timber harvesting activities must be scheduled in the winter months to avoid negative impacts on the nesting and mating activities of birds and wildlife. Maintaining the dead standing wildlife trees, coarse woody debris and large mature conifers is important for maintaining structural habitat diversity, and critical for identified wildlife species such as Lewis' woodpecker (M.Hall, 2002).

The effect of prescribed burning on wildlife will primarily be secondary effects. Most of the wildlife species on SMR-1 are adapted to or are dependent on fire-adapted plant communities. Fire will create, or enhance favourable habitat (food supply or cover), potentially resulting in long-term increases in wildlife species
adapted to fire. (M. Hall, 2002). Extensive studies have been done on the effects of wildfire on individual species of flora and wildlife. Brown and Smith (eds.) (2000) and Smith (ed.) (2000) provide excellent summary reports on this aspect of restoration in Ponderosa pine ecosystems.

(iv) Restoration Monitoring

Photopoint monitoring stations have been established at four sites, to monitor the long-term impacts from timber harvest and silviculture treatments. Additional steps that should be taken to provide short term and long term monitoring include:

- A post-harvest inspection by an RPF following logging and spacing to ensure that harvest and silviculture objectives were met;
- A post-burn inspection to monitor intensity of burning on vegetation and soil types;
- A tree stocking survey conducted 2 years following treatments to assess conifer density and survival following prescribed burning;
- If resources exist, construction of a 3-way range exclosure on open range within the Racetrack Block, to begin long-term range recovery monitoring.

(iv) Completion of Restoration Treatments

For silviculture treatments, St. Mary’s Band members should be given priority in employment for slashing, thinning, timber harvest, firewood cutting, etc. Involving the local Indian Band membership encourages resource stewardship of the natural resources, and ensures that the benefits of restoration work remain in the local community. Ktunaxa Kinbasket Development Corporation can manage the restoration contracts and hire crew supervisors as needed. A pre-work meeting is recommended with all labourers, loggers and contractors to ensure that restoration plan prescriptions and objectives are understood.

For prescribed burning, a Ministry of Forests prescribed burning plan must be completed prior to any burns taking place. Active cooperation of the local MOF office is necessary, to ensure proper burn plans are in place, to ensure that the proper wind ventilation index is good for the day of the burn, and to provide trained fire suppression personnel for the burn. Adjacent landowners, the local airport officials, MOF and Ministry of Transportation and Highways must be notified in advance of the prescribed burning.
Summary

“A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it does otherwise.”

- Aldo Leopold

Resource managers, ecologists, ranchers and other residents of the Rocky Mountain Trench have been advocating for restoration and prescribed burning for fire-maintained ecosystems for many years. The Racetrack Block restoration plan would complement work being done on Crown land in the Trench, and provide an opportunity for the St. Mary’s Band to fully participate in ecosystem restoration on their own lands. This work would satisfy Aldo Leopold’s credo.

Acknowledgements

The researcher would like to thank restoration planners Jeff Allen, Tim Ross and Mark Hall for their time and expertise in interviews regarding ecosystem restoration planning; Biologist Peter Davidson for field expertise in wildlife tree assessment; and St. Mary’s Band members Vic Clement and Ray Warden and Resource Technician Dan Wigle for assistance in field reconnaissance.

References

BC Conservation Data Centre. 1998. Rare Natural Plant Community Tracking List – Cranbrook Forest District.


Figure 1: St Mary's Reserve and Racetrack Timber Block
Figure 2: TEM Site Series Polygon Map - Racetrack Block

Block Boundary
TEM Plot Number - 3
Figure 3: Aerial Photo of Racetrack Block (Year 2000 coverage)
Figure 4: Hiking a Wildlife Trail – SW side of Racetrack Block

Figure 5: High River Bluffs on SW Side of Racetrack Block
Figure 6: TEM Plot 1 Photo – PPdh2-01 Site Series

Figure 7: TEM Plot 3 Photo – PPdh2-01 Site Series
Figure 10: TEM Plot 2 Photo – PPdh2-02b Site Series

Figure 11: TEM Plot 5 Photo – PPdh2-02b Site Series
Figure 12: TEM Plot 8 Photo – PPdh2-02b Site Series

Figure 13: TEM Plot 4 Photo – PPdh2-03 Site Series
Figure 14: TEM Plot 4 Photo – Ingrown Lodgepole Pine

Figure 15: Photopoint Plot 1 – PPdh2-02b Site Series
Figure 16: Photopoint Plot 2 – PPdh2-01 Site Series

Figure 17: Photopoint Plot 3 – PPdh2-03 Site Series
Figure 18: Photopoint Plot 4 – PPdh2-01 Site Series
Figure 19: Wildlife Tree Plaque on Pine Veteran
Figure 20: Pine Veteran Wildlife Tree
Figure 21: Danger Tree Flagging
List of Appendices

Appendix 1: Ground Inspection Forms – Field Data
Appendix 2: Wildlife Tree Assessment Field Forms
Appendix 3: Racetrack Unit Composite Field Data Map
Appendix 1: Ground Inspection Forms
### GROUND INSPECTION FORM

**Project No.:** 4  
**St. Mary's 1**  
**Surv.:** T. M. Wilson

**Map Sheet:** B2G042  
**Plot #:** 7  
**Poly. #:** 8

**UTM Zone:** 9  
**Lat./North:** 115° 40' 30"  
**Long./East:** 115° 43' 41"

**Aspect:** N-NW 340°  
**Elevation:** 820 m

**Slope:** 4%  
**SNR:** 3-4  
**SNR:** 16

**Mesic:**  
**Slope:** Crest  
**Position:** Upper slope  
**Drainage:** Very rapidly  
**Mineral Soils:** Sandy (LS, S)

**Organic Soils:** Organic Soil Texture  
**Surface Expression:** Fibrous  
**Soil Horizon Thickness:** 5-40 cm  
**Root Restricting Layer:** Depth: 40 cm

**Coarse Fragment Content:** 20-35%  
**Humus Form:**  
**Texture:** Clayey (SICL, SC, SIC)

**Terrain:** Component: TCI  
**Component:** TCI  
**Component:** TCO  
**Component:** TC2

**Ecotone:** Component: ECI  
**Component:** EC2  
**Component:** EC1

**BGC Unit:** PBd 2  
**Site Series:** B 1  
**Structural Stage:** PS - 4

**Scree:**  
**Crown Closure:** 10 - 15

### DOMINANT / INDICATOR PLANT SPECIES

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**Tree Mensuration:** 45

| Spp. | DBH | Ht. Calculation to DBH | Ht. to DBH | Total Ht. | BH | Path | Y/N |

**NOTES (site diagram, exposure, gleying, etc.)**

![Site Diagram with Aspect and Soil Pit](image)
### Ground Inspection Form

**Project No.** 4  
**Site Name.** ST. MARY'S 1  
**Surv.** T. Maison  
**Plot #** 7  
**Pou.** # 8  
**UTM Zone** 9  
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**Subclass.** 15  
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**Drainage** 17  
**Subsoil** 18  
**Moisture** 19  
**Texture** 20  
**Oven** 21  
**Humus** 22  
**Coarse Fragment** 23  
**Terrain Texture** 24  
**Surface Expression** 25  
**Geomorphic Process** 26  
**ECOSYSTEM** 27  
**BGC Unit** 28  
**Site Series** 29  
**Structural Stage** 30  
**Ecosystem Polygon Summary** 31  
**Terrain Polygon Summary** 32  

### Dominant/Indicator Plant Species

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### Tree Measurement

- **Spp.**  
- **DBH**  
- **Ht. Calculation to DBH**  
- **Ht. to DBH**  
- **Total Ht.**  
- **BH Age**  

### Notes (site diagram, exposure, gleying, etc.)

![Diagram](attachment:diagram.png)
Criteria:  
>725 cm DBH  
Wildlife use

March 14/03  Race track Block
Page 1

### British Columbia  ER 390

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### Tree Attributes for Wildlife

- Fire scars (50 yrs)
- Broken top (80 yrs)
- Fire scars (90 yrs)
- Broken top (100 yrs)
- Dead (145 yrs)

D.T.

*Appendix 2: Wildlife Tree Assessment*
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**March 14, Page 3**
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**Comments:**
- Broken top (223 cm)
- Broken top (740 cm)
- Broken top (90 cm)
- Broken stump