## 1.0 Introduction

The purpose of this document is to develop a strategic plan for the implementation of the Kootenay Boundary Land Use Plan NDT4 Guidelines. The intent of these guidelines is to "improve the productivity and health of fire-maintained forests and rangelands by restoring stand structure and species composition through modern methods of logging, thinning and prescribed burning". Previous resource uses and management practices, including harvesting, grazing, Christmas tree activities (appendix A) and suppression of fires, have resulted in excessive overstocking of pole sized Douglas-fir of low quality, lodgepole pine mid-seral patches and shrinking open grasslands dominated by lower quality grasses and shrubs. This plan covers the NDT4 portions of the Invermere Forest District from Dutch Creek north to the district boundary.

This plan differs from other ecosystem restoration plans in the NDT4 in that it covers more than one range unit. The reason for this is the north trench is very constrained in terms of how much land is available for ecosystem restoration activities. The primary constraints are land ownership, Christmas tree permits, high forest productivity, and narrow distribution of NDT4 in the central trench and the resulting proximity to private land and/or steep slopes.

## 2.0 Methodology

All land ownership, BEC information and tenures were overlaid on 1:20000 orthographic photos to identify a population of forest cover polygons that could be considered for ecosystem restoration activities in the NDT4 north of Dutch Creek. Ecosystem restoration activities include any treatments required to maintain or convert land to a more appropriate ecosystem component as defined in the Kootenay Boundary Land Use Plan Fire Maintained Ecosystem (NDT4) Management Guidelines (KBLUP Guidelines).

The following principles were used to determine whether ecosystem restoration activities were feasible and appropriate. This was determined through field reconnaissance. All of the land in the plan area was given an ecosystem component designation based on the KBLUP guidelines.

## 3.0 Guiding Principles

The following guiding principles were used to set treatment scheduling:

(a) The Kootenay/Boundary Fire-Maintained Ecosystem Restoration Components and Targets (Table 1) and the Kootenay Boundary Land Use Plan Fire Maintained Ecosystem (NDT4) Management Guidelines (Table 2) would guide, but not dictate, areas to be managed under each of the 4 ecosystem component types within any individual range unit. Rather the percentage of each component would be considered on for the entire NDT4 within the Invermere Forest District. This could mean that any given plan area could potentially exceed or lack in any given component.
(b) The current levels of crown closure, over the entire management unit, would be the maximum allowable over time.
(c) Current tenure holders would be respected in the development of the strategy.
(d) It is desirable to reintroduce fire into the OR and OF ecosystems in-order to keep crown closure in check, invigorate shrubs and grasses, and reduce the risk of catastrophic wildfires or pathogen outbreak.
(e) Stand tending activities and harvesting prior to initiation of burns, to capture existing volumes and avoid wasting current under sized volumes would be employed were possible.
(f) A goal of initiating burns, and thus all pre-burn activities, within 30 years, on all areas except managed forest areas, would allow for the capture of volumes existing on sites and also be a realistic time frame for implementation of this initiative. Once all units have reached desired stand structures a rotational prescription of burning, resting, stand tending and harvesting, to maintain desired stocking levels/crown closures would be implemented for OR and OF zoned areas.

(g) Harvesting could occur over time in all ecosystem components, however only MF and OF components would be harvested in the long term.

***Due to the highly constrained nature of the northern half of the NDT4 in the Invermere District, the area has been given a blanket designation of managed forest except where stated otherwise. The following treatment unit descriptions represent the specific opportunities to manage for ecosystem components other than managed forest. It is recognised that there is a need and desire to increase the open forest and open range components in the north trench, therefore, as constraints diminish areas will be revisited to explore opportunities. One such constraint to restoration is the preponderance of Christmas tree permits (CTP's). As CTP's revert to vacant crown land, ecosystem restoration will be considered before the CTP's are reissued.***

## TREATMENT UNIT ONE

Overview:

This 96 hectare area south of Rushmere is a very flat bench with scattered Douglas-fir vets, scattered immature Douglas-fir and mature lodgepole pine. The pine has been hit by mountain pine beetle, which has resulted in the larger diameter stems being killed and salvaged by local firewood cutters. The remaining pine is predominantly post and rail size pieces.

Stratum A:

The prescription for this area is to zone it as *Open Forest* and to harvest it down to open forest densities as defined in the KBLUP guidelines. The post harvesting condition will be a widely spaced Douglas-fir stand with irregular distribution. Lodgepole pine will regenerate after harvesting and is not a desirable tree species; also, immature Douglas-fir is dominating the understory of this stand. The unwanted lodgepole pine and Douglas-fir will be controlled through under burns for 30 years. In 30 years the decision should be made as to whether or not to cease burning to promote new recruits into the layer 1 forest. As open forest and open range is very underrepresented in the area covered by this plan, it is recommended that this relatively small area be managed as open forest in perpetuity. If the situation changes in a few decades the stand structure should be suitable to regenerate new recruits provided a break in burning occurs.

**TREATMENT SCHEDULE FOR TREATMENT UNIT ONE**

| Stratum | Ecosystem Component | Treatment | | Scheduling | | Objectives/Comments |
|---|---|---|---|---|---|---|
| | | | Early | Desired | Late | |
| A | Open Forest | Harvest | 1998 | 1998-1999 | 2007 | Create open forest conditions with irregular stocking o 300 fireproof stems (i.e. Fdi>40 years). Eliminate lodg pine component while salvaging fibre through special p sale with sawlog component. |
| | | Burn* | 2000 | 2000-2001 | 2009 | Eliminate all remaining lodgepole pine and layer 3 and Douglas-fir. Rejuvenate shrub layer and reduce fuels f subsequent burns. Some vets are likely to die in burn d fuels at the base. This is desirable snag creation. |
| | | Burns | 2008 | 2008-2010 | 2020 | Schedule burns as required to control ingress of conifer |

* Initiate burning 2 years after the preparatory harvesting has been completed. If funding and market conditions allow for an accelerated level of harvest burning should be moved up accordingly.

**TREATMENT UNIT TWO**

Overview:

This area west of Radium Hot Springs is located in Height of Land Pasture within the Frances Creek Range Unit. It is comprised of rolling terrain with variable aspects and small wetlands. The portion north of the Horsethief FSR is a mosaic of recently prescribed burned (1986) areas and recently selection harvested areas. The more open and recently burned areas are filling in rapidly with Douglas-fir thickets. The recently harvested portions are harvested to a density of mature Douglas-fir that is representative of the managed forest ecosystem component.

The portion south of the Horsethief FSR is a recently reverted Christmas tree permit. This area is a mosaic of Christmas tree size to pole size stems with scattered mature stems. A significant wetland comprises the east boundary of this portion of the treatment unit.

The recently harvested portions have full silviculture obligations that are inconsistent with the conversion to open forest and open range. These obligations need to be amended in order to meet the stated objectives.

Stratum A: Recently selection harvested. Slash and ladder fuels require some manipulation to ensure valuable crop trees are not burned. Some mortality may be expected with or without fuel manipulation. As stated above, the silviculture obligations held by Slocan Forest Products would have to be amended to allow for under burns and long term ecosystem objectives. Leave trees in these areas were left after harvest at a considerable harvesting cost. It is inappropriate to burn many of these trees due to the cost and effort of leaving them, therefore, fire intensity and reduction of ladder fuels in this stratum are primary concerns.

Stratum B: Mosaic of open areas, young thickets and wetlands. Some manipulation of fuels is required to ensure a burn carries through the Douglas-fir thickets. The area is currently at risk of losing high forage values for domestic livestock and wildlife to Douglas-fir thickets. The objective is to create an open forest and open range mosaic through this stratum. The south and west aspects are to be more concentrated to open range with the flat and north to east aspects concentrated to open forest.

**TREATMENT SCHEDULE FOR TREATMENT UNIT TWO**

| Stratum | Ecosystem Component | Treatment | | Scheduling | | Objectives/Comments |
|---|---|---|---|---|---|---|
| | | | Early | Desired | Late | |
| A | Open Forest | Space/Slash Manipulation | 1998 | 1998-1999 | 2000 | Fire proof crop trees through piling and burning of slas Pruning as required. |
| | | Burn* | 2000 | 2000-2001 | 2009 | Eliminate all remaining lodgepole pine and layer 3 and Douglas-fir. Rejuvenate shrub layer and reduce fuels f subsequent burns. Some vets are likely to die in burn d fuels at the base. This is desirable snag creation. |
| | | Burns | 2008 | 2008-2010 | 2020 | Schedule burns as required to control ingress of conifer |
| B | Open Forest/Open Range | Space/Slash Manipulation | 1998 | 1998-1999 | 2007 | Cut down 10 to 50% of Douglas-fir thickets to allow b carry through thicket areas and promote patchy opening |
| | | Burn* | 2000 | 2000-2001 | 2009 | Eliminate remaining lodgepole pine and layer 3 and 4 I fir. Rejuvenate shrub layer and reduce fuels for subseq burns. Some vets are likely to die in burn due to fuels a base. This is desirable snag creation. |
| | | Burns | 2008 | 2008-2010 | 2020 | Schedule burns as required to control ingress of conifer rejuvenate shrub component. |

**TREATMENT UNIT 3**

Overview:

This area is part of a 1994 wildfire north-west of Wilmer. Much of the area was managed as Christmas trees before the fire and was ecologically in bad shape. There was high stocking of immature Douglas-fir and a shortage of veterans over much of the area. The high Douglas-fir densities enable a crown fire to carry through this area and threaten timber and property values.

The area has been seeded for erosion control and planting is ongoing with conifers. Experimental forage planting is planned to improve forage and reduce browse on seedlings. The coniferous species being planted are adapted to low intensity ground fires with the exception of lodgepole pine. Lodgepole pine has been utilised for its frost tolerance in low lying areas. Eighty percent of planted stock is ground fire adapted species.

The plantation density throughout has been established with high numbers (1600 to 2000) to address the high mortality that is expected on drier aspects. The resulting survival will probably be a mosaic of densities from low to high numbers on a moisture continuum from dry to moist. The corresponding ecosystem management objectives will be a mosaic of open range to open forest along the same continuum.

The exact stratification of the open range and open forest densities will be dictated by site conditions and plantation survival. The seedlings will need approximately 30 years to achieve a state where prescribed burning is feasible. In 30 years land managers can determine whether the existing stand condition needs to be altered through spacing to achieve an open forest or whether timber values on site will predominate and stands can be managed at higher densities (i.e. >400 stems per hectare).

Due to the highly constrained nature of the northern trench in terms of establishing open forest and open range, this plan recommends stand densities from 75 to 400 with the lower densities on the drier aspects. The stand density decision can be practically deferred for 30 years. Underburns are recommended commencing in 35 years to control the inevitable ingress of Douglas-fir and to keep shrub communities healthy. No treatments are required for 30 years to achieve this target stand condition. Existing prescriptions and observed seedling survival are consistent with the above recommendation.

**TREATMENT SCHEDULE FOR TREATMENT UNIT THREE**

| Stratum | Treatment | | Year | | Objectives/Comments |
|---|---|---|---|---|---|
| | | Early * | Desired For Steady State Burn Levels | Latest Opportunity | |
| **A** | Complete planting | 1998 | 1998 | N/A | Continued planting with ecologically suited tree species and experimental shrub planting. |
| | Space | 2020 | 2020-2027 | 2035 | Make stand density decision and space accordingly. |
| | Burn* | 2030 | 2035-2040 | 2050 | Burn as required to control conifer ingress and rejuvenate shrubs. |

* Burning should cease for 30 years after 30 years of underburns to allow for recruitment of conifers into the upper layer of the stand. This allows for low intensity of harvesting of 20 to 40 cubic meters per hectare every 30 to 40 years commencing in 2090.

**TREATMENT UNIT FOUR**

Overview:

Treatment unit four consists of lands north of Stoddard Creek and south of Kootenay National Park, east of the highway on the west facing slopes. This area is a key winter range for the Radium Rocky Mountain Bighorn Sheep herd which has been experiencing habitat pressures for many decades. A comprehensive plan titled, Stoddart Creek Habitat Enhancement Plan, has been developed to address these habitat pressures. For detailed background on this area, it is suggested one refer to this plan and subsequent terrestrial ecosystem mapping (TEM), both of which are available from the Ministry of Environment and the Columbia Basin Fish and Wildlife Compensation Program. The following stratification and prescriptions for treatment are based on the very good work in the above projects. The enhancement plan was drafted in 1993 and largely shelved since 1993 due to the noxious weed, leafy spurge (*Euphorbia esula)*. At the time it was felt that enhancement treatments would aggravate weed problems and jeopardise winter range attributes indefinitely. An aggressive biological control program for leafy spurge has yielded excellent results, therefore, land managers feel it is appropriate to begin to implement the enhancement plan.

The following treatment summary makes reference only to the land in the Stoddard Creek area that are requiring treatments, other than weed control, in the next few decades.

Stratum A: Moderately sloped, dense, multi-aged stands of Douglas-fir with scattered lodgepole pine stems. These stands are classic examples of ingrowth resulting from fire exclusion. There are adequate mature and veteran stems to allow restoration of traditional, fire maintained stand structures while still providing a feasible logging chance. Due to the multi-aged nature of these stands, spacing and slashing will have to occur after logging. Proximity to private land and very small treatment areas limit the use of broadcast burns, therefore, some degree of piling and burning will be required to enhance winter range.

Stratum B: These areas are predominantly open, young Douglas-fir forests on harsh sites. These areas will require slashing to promote bunchgrasses. Currently, the stands are on the threshold of closing in to the point where desirable plants will begin to be excluded. The young stems of stratum B are generally on the hotter aspects and steeper slopes, while the more productive areas of stratum A are on cooler aspects and more gentle slopes.

Note: Stratum A corresponds closely to treatment units 1,2,4 and 6 from the Stoddart Creek Habitat Enhancement Plan. Stratum B corresponds closely to treatment unit 3.

**TREATMENT SCHEDULE FOR TREATMENT UNIT TWO**

| Stratum | Ecosystem Component | Treatment | | Scheduling | | Objectives/Comments |
|---|---|---|---|---|---|---|
| | | | **Early** | **Desired** | **Late** | |
| **A** | Open Forest | Harvest | 1999 | 1999 | 2003 | Remove Pli and over half of mature Fdi, leave vets. |
| | | Space/slash | 2000 | 2000-2001 | 2005 | Eliminate all remaining lodgepole pine and majority of and 4 Douglas-fir. Pile slash as required to meet forag objectives. |
| | | Burns slash | 2000 | 2000-2001 | 2006 | Burn slash piles at landing and spacing slash while min effects on adjacent habitations. |
| **B** | Open Forest/Open Range | Space/Slash Manipulation | 1999 | 2000-2001 | 2007 | Cut down majority of Douglas-fir stems. Leave imprac dense, large thickets untouched. Pile and burn only wh slash presents fuel risk. |
| | | Burns slash | 2000 | 2000-2001 | 2006 | Burn slash piles while minimizing effects on adjacent habitations. |