

**Fire-Maintained Ecosystem Restoration  
in the  
Rocky Mountain Trench**

**“A Blueprint for Action”**

**Prepared by:**

**Rocky Mountain Trench  
Ecosystem Restoration  
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**February, 2000**

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***Abstract***

The dry, low-elevation open forests and grasslands of British Columbia’s southern interior are defined by the Forest Practices Code Biodiversity Guidebook as Natural Disturbance Type 4 (NDT4), characterized by “frequent, stand-maintaining fires”. Seventy years of active fire suppression by the Ministry of Forests in the NDT4 has resulted in excessive tree recruitment in this zone, primarily by Douglas-fir. The consequences of this recruitment and the absence of fire maintenance has led to significant changes in the ecology of the NDT4 including; decreased forest health, reduced timber quality and quantity, degraded forage values for wildlife and domestic livestock, increased risk of catastrophic wildfire, and loss of critical habitat for wildlife.

In the East Kootenay region of the province, formerly fire-maintained Crown lands occupy about 250,000 hectares of the Rocky Mountain Trench (Trench), extending from the Montana border south of Cranbrook to Golden in the north. An estimated 3,000 hectares of the Trench are being converted each year from native grassland and open forest to a closed forest condition as a result of ingrowth and encroachment, with an estimated total of 114,000 hectares converted since 1952.

Since the 1970’s, the significant negative impacts of forest encroachment and ingrowth in the Trench have been an increasing concern to many interest groups, industry and government resource management agencies. Through the 1970’s and 80’s, progress on Trench rehabilitation was ad hoc. Although restoration treatments were proven feasible and effective, they did not occur at levels that would reverse the downward trends that were well known to most parties.

As a result of a series of planning and operational initiatives beginning in 1990 a shift from the ad hoc approach to a solidly constituted program for “ecosystem restoration” in the Trench has been achieved. The government has assigned responsibility for the delivery of a Trench Ecosystem Restoration Program to a Steering Committee made up of representatives from the full spectrum of interests both government and public. The program's objective is to remove excess immature and understory trees over the next 30 years to create a complex ecologically appropriate mosaic of habitats on the vacant Crown lands of the Trench to mimic the landscape under natural conditions when fire was an integral part of the ecosystem.

The need for immediate action has been identified. If the Steering Committee's vision is realized, by the year 2030, 135,000 hectares of the Rocky Mountain Trench will be characterized as a “restored ecosystem”. All sectors stand together and are committed to

undertaking the needed work. Success primarily hinges on willing benefactors (both internal and external to government) who will help determine whether the vision will be attained or not. To this end, there is no question that a coordinated and concerted funding effort on the part of all participants is absolutely imperative.

Failing to take action is not an option. The cumulative negative impact of changes to the NDT4 ecosystem is extensive and touches all aspects of East Kootenay industry and society. As such, the protection and maintenance of the Trench's unique ecology - its forests, grasslands, wildlife, clean water, and plant diversity – is too critically important to the region's economic and cultural future to not proceed.

## **1. Background – A Changing Ecosystem**

The dry, low-elevation open forests and grasslands of British Columbia's southern interior are defined by the Forest Practices Code Biodiversity Guidebook as Natural Disturbance Type 4 (NDT4), characterized by “frequent, stand-maintaining fires”. These forests and grasslands include three biogeoclimatic zones – interior Douglas-fir (IDF), ponderosa pine (PP), and dry variants of interior cedar-hemlock (ICH).

Low-intensity surface fires, occurring on a 5 to 20 year cycle, are part of the natural function of these ecosystems. Recurring fires help maintain a mosaic of grasslands and open forest, while at the same time promoting the development of fire-tolerant overstories of mature ponderosa pine, Douglas-fir and western larch, and improving the overall condition of the understory grasses and shrubs.

Seventy years of active fire suppression by the Ministry of Forests in the NDT4 has resulted in tree establishment in previously treeless openings (encroachment) and excessive tree recruitment has occurred in open forests (ingrowth) primarily by Douglas-fir. The consequences of both encroachment and ingrowth on the fire-maintained ecosystem has led to significant changes in the ecology of the NDT4 including;

- decreased forest health,
- reduced timber quality and quantity,
- degraded forage values for wildlife and domestic livestock,
- increased risk of catastrophic wildfire, and
- loss of critical habitat for wildlife.

An area known as the Rocky Mountain Trench (Trench) is located in the southern interior NDT4. In 1996, just over 60,000 people were living in the East Kootenay region, the majority of those in the Trench. Extending from the Montana border south of Cranbrook to Golden in the north, Crown forests of the Trench occupy approximately 250,000 hectares of land classified as “fire-maintained”. Historically, the region's economy has been dependent on the extraction, processing and management of natural resources, in particular forestry, mining and ranching. Over the past few decades, the economic

impact of the natural resource sector has been supplemented by tourism, recreation and other services which have grown in importance.

Since 1980, an average of 2,650 hectares of forest land has been harvested annually in the Trench. Despite this harvesting activity, it is estimated that about 3,000 hectares of the Trench land base are being converted each year from native grassland and open forest to a closed forest condition as a result of ingrowth and encroachment, with a total of 114,000 hectares converted since 1952. The resulting impacts are significant.

#### a. Forest Health

With the exclusion of fire, tree stocking and species composition have changed which in turn has altered insect predator/prey balances. Ingrown stands are more susceptible to disease and insect attack due to trees experiencing higher levels of stress brought on by overcrowded conditions and increased competition for light, moisture and nutrients.

Pests and diseases increasingly more prevalent in densely ingrown stands of the Trench include mountain pine beetle, Douglas-fir beetle, mistletoe and Armillaria root rot.

Noxious weed infestations exist and also negatively affect overall forest health.

#### b. Timber Quality and Quantity

The Trench is considered to be relatively poorly suited for timber production, especially on the driest sites. While there are some good timber-growing sites, large areas of the Trench are occupied by stagnant stands of closely spaced thickets of lodgepole pine, Ponderosa pine and Douglas-fir. These stagnant stands are frequently impacted by snow and wind which further contributes to their overall poor form and growth. If left to thin themselves naturally, these slow growing stands would not produce merchantable wood for decades. Research has shown that more intensive management of stagnant stands, such as spacing, can produce positive results in terms of residual tree growth. The outright fibre volume that is lost by reducing the number of stems is largely compensated for by greater growth rates achieved by the remaining residual stems.

#### c. Forage Values

In the transition from an open forest to closed forest condition, it is estimated that ingrowth has decreased the productivity of understory vegetation by as much as 75 percent due to less available nutrients, light and moisture. Ingrowth has also led to a loss in forage quality and palatability. Plants with relatively high protein values that dominate in open forest conditions are replaced under closed forest conditions by plants which have much less nutrient value. The implications of this successional change to wildlife and domestic livestock are profound. Not only is the carrying capacity for these species decreased in impacted habitats but, forest encroachment onto the native grasslands results in livestock and wildlife being concentrated on an ever decreasing land base. This often causes over utilization of the few remaining grassland sites leading to habitat degradation.

Noxious weed invasion has had severe negative effects on range quality in the Trench. Many exotic weed species have become established in recent years and flourish when left unchecked. Of particular concern with respect to noxious weed invasives are dalmatian

toadflax, diffuse and spotted knapweed and leafy spurge. These species are spread easily, are extremely aggressive colonizers of open ground, tend to vigorously compete with native vegetation and are completely unpalatable to wildlife and domestic stock. In addition, they are extremely difficult to control. Native plant species diversity and abundance will continue to decline in response to noxious weed competition unless there is continued long-term diligence and collaborative control measures on the part of the agencies responsible for control.

There are currently between 150 and 200 cattle ranching operations in the East Kootenay region, with farm gate receipts exceeding \$7 million in 1995. Most of the operations run livestock on Crown grazing tenures in the Trench with approximately, 8,500 head of cattle (of 12,000 total animals in the region) being dependent on forage generated on Crown pastures over the five month summer grazing season.

The changing ecosystem has significantly decreased the capability of the Trench to support cattle and overall ranching viability. It is estimated that ingrowth and encroachment combined are causing the loss of approximately 1,739 tons of forage each year in the Trench. The equivalent forage would support 810 cows for 5 months or 4,290 elk for 3 months.

#### d. Catastrophic Wildfire

Ingrown stands of the Trench are now highly susceptible to catastrophic wildfire due to the large amounts of flammable fuels that have accumulated on the forest floor. These multi-storied stands have created “ladder fuels” which allow surface fires to climb into the tree canopies and spread quickly as crown fires. Ingrown stands not only increase the probability that large amounts of timber will be destroyed, they also pose a significant threat to the many communities and rural residences and subdivisions in the Trench. Since the mid-1980’s, there have been many tragic examples in Canada and the United States of catastrophic wildfires occurring in what were previously fire-maintained forests after a long period of fire suppression.

#### e. Critical Wildlife Habitat

The Trench has been called the “Serengeti of North America” because, outside of Africa, no area of equal size in the world supports as many big game species inhabiting similar ranges. As such, Trench wildlife populations have a significant impact on the provincial economy with an estimated \$11.5 million being generated in 1995 from hunting and other uses of wildlife. Several wildlife species, some of which are red and blue-listed, also depend on this grassland/open forest habitat type including yellow badger, long-billed curlew, Lewis woodpecker and flammulated owl. The declining grasslands and the quality and quantity of forage has a significant impact on the ability of Trench ecosystems to continue supporting these important wildlife populations. This impact is heightened during the winter months when the majority of the animals migrate into the Trench from the adjacent, less productive higher elevation forest lands.

#### f. Threatened Grassland Ecosystems

In of themselves, the grasslands of the Trench are unique, vital and life-sustaining ecosystems that provide shelter, food and protection to a wide variety of plants, animals and insects. The Trench contributes significantly to the dwindling provincial land base once occupied by native grasslands. Over 76 percent of the province's native grasslands have been lost and more than 25 percent of the animal species on British Columbia's threatened or endangered species list are closely associated with grasslands. The impact of forest ingrowth has and continues to place the Trench grassland ecosystem in a threatened position from which recovery will be difficult if not impossible.

#### g. Cultural and Social Values

Apart from the region's economic dependence on natural resources, the rich and diverse ecology of the Trench is of major cultural importance. Native and non-native residents alike place a high value on the abundant wildlife populations, many culturally significant plants found primarily in the Trench and a relatively pristine environment. From a non-consumptive point of view, these natural elements are intrinsically seen as contributing to a high quality of life that Trench residents enjoy and are committed to maintaining.

## 2. Identifying the Need for Action

Since the 1970's, the significant negative impacts of forest encroachment and ingrowth in the Trench have been an increasing concern to many interest groups, industry and government resource management agencies. One key issue has been the allocation of forage on Crown lands, especially on grassland and open forest ecosystems in the Trench. Ranchers have sought to maximize the number of livestock on these lands while wildlife interests have advocated for ungulates and other wildlife species. Timber interests also enter the equation, sometimes in opposition to both ranching and wildlife interests.

While wildlife, livestock and timber interests have often lead the debate on actions needed to counteract the ecological changes occurring in the Trench, a number of other groups have also contributed to the discussion. Beyond the dialogue, there is clear consensus among all stakeholders regarding the need for immediate attention to this issue. Environmental, outdoor recreation, tourism and First Nation's groups (whose treaty process is still in progress thereby placing questions over land ownership) have all advocated for rehabilitation of the Trench.

Through the 1970's and 80's, progress on Trench rehabilitation was ad hoc. Although restoration treatments were proven feasible and effective, they did not occur at levels that would reverse the downward trends that were well known to most parties. In 1990, in an effort to ameliorate conflicts that were escalating between the ranching community and wildlife interest groups, the government formed the East Kootenay Trench Agriculture/Wildlife Committee (EKTAWC). The EKTAWC was a multi-sectoral group who were charged with identifying, designing and implementing a range of activities aimed at reducing conflicts between wildlife and ranching advocates.

The EKTAWC's final report was submitted to the government in 1998. The report summarized the committee's work and included a number of different operational and research activities. It also provided nine key recommendations to mitigate conflicts in the Trench through; improved inventory and monitoring of wildlife and range resources, better public education, assurance that government ministries and stakeholders operate in a coordinated manner, and the implementation of habitat and range enhancements aimed at increasing available forage. The government responded positively to the report and its recommendations.

A government led regional planning process encompassing the Trench was also initiated in the early 1990's through the Commission on the Resources and Environment (CORE) planning process. This was designed to develop a regional land use plan that would balance different interests and chart a course to guide "economic, social, and environmental sustainability". The CORE process, which had broad public stakeholder involvement, culminated in 1994. CORE put forward over 100 recommendations for land use and resource management in the East Kootenay region and divided the land base into a number of different land units with varying management emphases.

In particular, CORE identified forest ingrowth and encroachment as major resource problems and made a recommendation for rehabilitation of the Trench. To address the problems of ingrowth and encroachment, CORE recommended that a "coordinated and comprehensive East Kootenay Trench rehabilitation program be established for the purpose of aiding planning groups in rehabilitating the forage, forest, biodiversity and landscape values of the Trench".

Using the CORE recommendations as the foundation, in 1995 the government announced the strategic-level Kootenay-Boundary Land Use Plan (KBLUP). KBLUP was a comprehensive plan that included protection of sensitive environmental values, a secure land base for resource development, and an economic transition strategy. As well, the KBLUP put forward the concept of a Trench rehabilitation program to "increase forage production on a large part of the East Kootenay".

In 1997, a strategy to implement KBLUP was released by government. The KBLUP "Implementation Strategy" provided more detailed guidelines for implementing the land use plan and managing the land base, including provisions for biodiversity and a range of other resource issues requiring special attention.

Restoration of the Trench ecosystem was again identified as a high priority in the Implementation Strategy. A separate set of management guidelines were included in the strategy to address "fire-maintained ecosystem restoration". The guidelines, designed to deal with forest ingrowth and encroachment, were developed to "improve the productivity and health of fire-maintained forests and rangelands by restoring stand structure and species composition, through modern methods of timber harvesting, thinning, and prescribed burning". Restoration was to, "improve forest stand vigor, reduce the risk of catastrophic wildfires, and rejuvenate bunchgrass communities".

In 1998, acting upon the recommendations put forward by the EKTAWC and the KBLUP Implementation Strategy guidelines for fire-maintained ecosystems, the government proceeded with formally establishing a Steering Committee to direct and coordinate an Ecosystem Restoration Program in the Rocky Mountain Trench.

### **3. Program Delivery**

The government has assigned responsibility for the delivery of the Trench Ecosystem Restoration Program to a multi-sectoral Steering Committee made up of representatives from; the Ministries of Forests, Environment and Agriculture, the Columbia Basin Fish & Wildlife Compensation Program, the cattle industry, the timber industry, and the Rocky Mountain Trench Natural Resources Society (which is a spinoff of the EKTAWC). This cooperative approach between government, industry and the public is proving to be an effective mechanism for successfully implementing the ecosystem restoration program.

The mandate of the Trench Steering Committee is; to provide overall direction to two working level sub-committees in the North and South Trench, to approve a strategic restoration plan for the Trench, to review and approve annual sub-committee work plans, to coordinate and prioritize funding requests, to serve as a conduit in bringing operational problems forward to senior management, and to submit annual reports accounting restoration accomplishments.

The North and South Trench sub-committees have a similar membership to that of the Steering Committee and are responsible for operational planning and delivery of site specific restoration activities on the ground. The Ministry of Forests District Managers retain their legislated responsibility for authorizing and finally approving all works that occur on Crown forest lands.

Funding to undertake the various projects identified by the Trench Ecosystem Restoration Strategic Plan has been provided from a number of sources. The government has provided funds directly from its main vote via the ministries involved and Forest Renewal B.C., as well as, in kind support through it's many field staff who actively participate in planning and carrying out specific projects. Indirect government funding has been received from the Grazing Enhancement Fund and Habitat Conservation Trust Fund. Non-government funding has been provided by the Columbia Basin Fish & Wildlife Compensation Program and the Rocky Mountain Elk Foundation. Other non-government funding sources are actively being sought by the Steering Committee.

### **4. Restoration Objectives**

The primary objective of the Trench Ecosystem Restoration Program is to remove excess immature and understory trees over the next 30 years to create a complex ecologically appropriate mosaic of habitats on vacant Crown lands across the landscape of the Trench.

The mosaic will mimic the landscape under natural conditions when fire was an integral part of the ecosystem.

As identified in the KBLUP Implementation Strategy, four “ecosystem components” will be targeted and managed for in the Trench;

- “Shrublands” are naturally occurring areas of non-productive forest, wetlands and brush with high forage value but no timber value. Shrublands currently occupy approximately 5 percent of the Trench land base,
- “Open Range” include lands dominated by open grasslands with scattered trees (less than 75 trees per hectare), currently covering about 10 percent of the Trench land base,
- “Open Forest” are areas of open forest (76 to 400 trees per hectare, 10 – 40 percent crown closure) with significant range and timber values. Many of the open forest lands are now severely ingrown, and
- “Managed Forest” areas are those sites (with 400 to 5,000 trees per hectare, over 40 percent crown closure) mostly managed for timber value. Open forest and managed forest currently occupy about 85 percent of the Trench land base.

The target stocking standards for each of the ecosystem components and the proportion of the Trench land base they should eventually occupy at the end of the intensive 30 year restoration program is provided in Table 1. (\*It is important to note that these are preliminary targets based on current knowledge of fire-maintained ecosystems. They are intended to be modified through operational experience, long-term monitoring, and better scientific knowledge of fire-maintained ecosystems.\*) The bulk of ecosystem restoration will occur within the identified open range and open forest ecosystem components emphasizing the retention of the oldest and/or largest trees and recovery of the forage resource. The managed forest will default to status quo timber harvesting production.

Table 1. Restoration Targets at the End of 30 Years (ending in 2030)

<b>Ecosystem Component</b>	<b>Stocking Target (trees/hectare)</b>	<b>Current Distribution of Crown NDT4 (% of Trench)</b>	<b>Final Distribution Target of Crown NDT4 (% &amp; ha of Trench)</b>
Shrublands	0	5%	5% (12,500 ha)
Open Range	Less than 75	10%	23% (57,500 ha)
Open Forest	76 – 400	Combined Open & Managed Forest is	31% (77,500 ha)
Managed Forest	400 – 5,000		41% (102,500 ha)

A “cocktail” of treatments incorporating varying combinations of harvesting, spacing, post-harvest slashing and prescribed burning will be applied on the landscape to help achieve the restoration objectives outlined in Table 1. Once stands have received an initial restoration treatment, they will become components of a long-term cycle of harvesting, spacing, prescribed burning and monitoring to optimize biodiversity, ecosystem health and resource flow.

## 5. Program Management Principles

Project priority setting and funding allocation by the Trench Steering Committee is currently guided by several program management principles. Over the five-year period (1999/00 – 2003/04), project approvals by the Steering Committee will focus on:

- authorizing projects (and funds to complete them) in keeping with the relative proportions of Trench land base existing in the north Trench (~40%) and south Trench (~60%),
- key wildlife winter ranges and areas supporting red and blue listed species,
- cattle operations whose Crown land grazing operations are identified as being severely impacted by the loss of forage habitat or are at risk of being severely impacted in the near future,
- project works in the vicinity of rural subdivisions where the risk of catastrophic wildfire is high because of decadent, over dense stands,
- Trench areas which offer the most immediate return vegetatively and ecologically thereby having a high cost/benefit ratio,
- remaining native grasslands which are in jeopardy from forest encroachment, and
- forested areas where timber utilization and the resulting growth of residual trees can be optimized.

## 6. Establishing Restoration Targets

The Trench Ecosystem Restoration Program will continue for 30 years after which the Trench ecosystem should consist of a mosaic of habitats that are maintained indefinitely by successive re-entries for treatment purposes. At the end of the 30-year period (i.e. in 2030), approximately 135,000 hectares of the Trench land base will be either in an open forest or open range (grassland) condition.

In order to achieve the restoration target of 135,000 hectares an operationally and fiscally realistic level of activity must be maintained each year. As such, the level of treatment activities targeted for the five-year period (1999/00 – 2003/04) is shown in Table 2. It should be noted that in this first five-year treatment period, the majority of activity is focussed on “initial” restoration treatment of identified sites. Re-entries to maintain open range and open forest conditions created in the first treatment pass will begin around

2015 in most cases. Over the long-term, “maintenance” treatments will mainly involve prescribed burning targeted at approximately 4,500 hectares annually.

Table 2. 5 Year Treatment & Cost Summary to Achieve Ecosystem Restoration Targets

<b>Treatments</b>	<b>Land Base Treated in Current Year 1999/00 (ha)</b>	<b>Land Base Treated Annually (ha) (2000/01 – 2003/04)</b>	<b>Estimated Total Annual Treatment Costs (\$)</b>
Prescribed Burning	1,630	2,325	\$87,500
Spacing/Slashing	841	750	\$375,000
Harvesting – open forest & open range	943	600 – 1,200	N/C (cost of fibre)
Total:			\$462,500/year

## 7. On the Ground Delivery

All restoration activities are guided by Ecosystem Restoration Plans, which have been developed at the range unit scale for most of the Trench land base. These plans zone the Crown land into the four major ecosystem components and provide information about site specific treatment details, resident red and blue-listed species, long-term management of old growth attributes, mitigative control measures to pre-empt noxious weed infestations on restored areas, and treatments and scheduling. Approximately 75 percent of the Trench currently falls under a plan with the remaining areas to be planned as dictated by funding and human resources.

The contents of the Ecosystem Restoration Plans are the basis for most of the North and South operational sub-committees’ decision making. The spatial representation of restoration activities provides for meaningful stakeholder input at a local level and the roll-up of the individual plans provides a clear strategic vision of future condition for the Crown portion of the entire Trench.

The application of a long-term monitoring plan - guided by the Steering Committee - ensures that an appropriate level of feedback is available accounting the relative success of restoration activities in achieving prescription objectives. Applying the principles of adaptive management, Ecosystem Restoration Plans are updated as treatment techniques are refined or when field research results and monitoring information warrants changes. Academia and sharing knowledge with other jurisdictions are key components to the long-term research and monitoring strategy in the Trench.

## 8. Factors Limiting Success

Continued progress towards the implementation of the Trench Ecosystem Restoration Program has several potential stumbling blocks including;

- the relatively high cost of restoration treatments requiring adequate and consistent funding over the long-term,
- administrative issues surrounding the manner in which timber tenures and annual allowable cuts are managed by the Ministry of Forests,
- lack of markets for small-diameter trees (which is much of the wood fibre harvested during restoration),
- exacerbating the spread of noxious weeds through restoration treatments,
- public concern over smoke and burning,
- unanticipated results associated with the prescriptive restoration treatments and techniques associated with fire-maintained ecosystems,
- adjoining Provincial Parks and their need to recognize and implement a similar ecosystem restoration program, and
- inadequate resources within the Ministries of Forests and Environment to complete the required planning and operational activities associated with treatment options.

In response to these potential stumbling blocks, the Trench Steering Committee has developed an “Action Plan” which has charted a proactive approach to addressing each of these factors over the short-term to ensure restoration of the Rocky Mountain Trench ecosystem continues unimpeded.

## 9. Looking Ahead

The need for immediate action has been identified. The vision is clear – by the year 2030, 135,000 hectares of the Rocky Mountain Trench will be restored to an open range or open forest condition that will be maintained in perpetuity. The blueprint which will guide the actions needed to achieve this vision has been prepared and implemented. All sectors – government, industry, interest groups and the public – stand together and are committed to undertaking the work that has to be done. Success primarily hinges on willing benefactors (both internal and external to government) who will help determine whether the vision will be attained or not. To this end, there is no question that a coordinated and concerted funding effort on the part of all participants is absolutely imperative.

Failing to take action is not an option. The cumulative negative impact of changes to the NDT4 ecosystem is extensive and touches all aspects of East Kootenay industry and society. As such, the protection and maintenance of the Trench’s unique ecology - it’s forests, grasslands, wildlife, clean water, and plant diversity – is too critically important to the region’s economic and cultural future to not proceed.

**Rocky Mountain Trench Ecosystem Restoration**  
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