

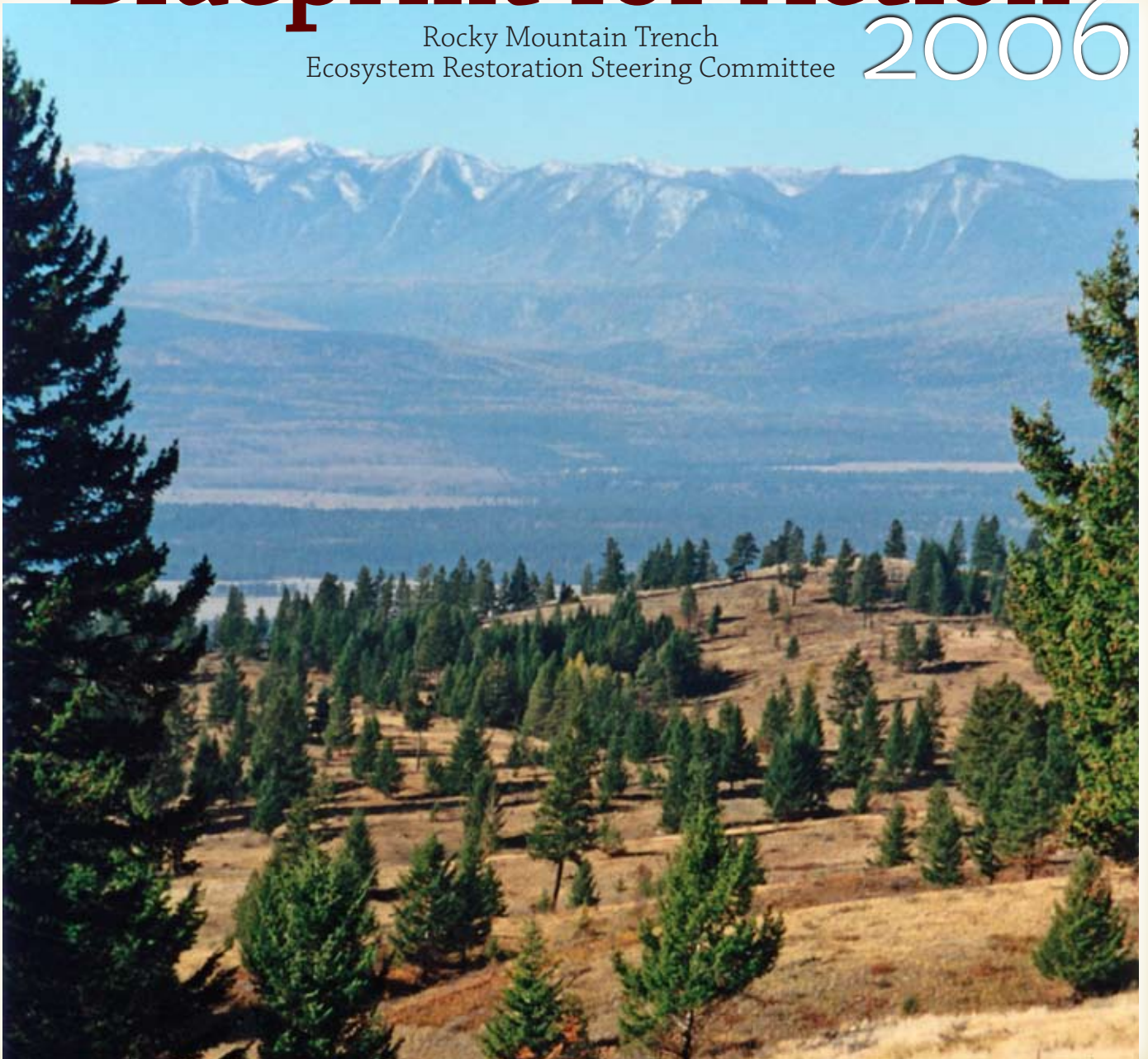
Fire-maintained Ecosystem Restoration in
BC's Rocky Mountain Trench

PRINCIPLES, STRATEGY, PROGRESS

Blueprint for Action

Rocky Mountain Trench
Ecosystem Restoration Steering Committee

2006





DEDICATION

David White

June 22, 1966 – February 24, 2001

As a silviculture forester with the former Invermere Forest District, Dave was instrumental in getting the ecosystem restoration program underway in the Rocky Mountain Trench.

Front Cover Photo: A view across the Rocky Mountain Trench from Premier Ridge. This designated ungulate winter range was one of the first areas treated under the ecosystem restoration program. Purcell Mountains in the background. (Maggie Dickeson photo)

Blueprint for Action 2006 and an Executive Summary are available online at www.for.gov.bc.ca/drm/ or by contacting:

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A Blueprint for Action (2000) is available at www.trenchsociety.com

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Norbury Pasture, south of Fort Steele, an island of restored open forest in a sea of untreated forest ingrowth.
— Rocky Mountain Forest District photo



Pre-burn



During burn



Two days post-burn



Thirteen months post-burn

Prescribed burn, Burlotts Pasture, Newgate Range Unit, April 2004 – May 2005

– Mike Daigle photos



1. INTRODUCTION

...the invasion of open or semi-open areas by tree growth, with consequent reductions in grazing capacity and usefulness as early range is a common phenomenon over much of the [BC] interior...it seems to be mainly a natural return of trees to areas deforested in the past by repeated fires.

DR. EDWIN TISDALE, RANGE AGROLOGIST, 1950

The central problem in the East Kootenay agriculture/wildlife conflict ... is a shrinking forage resource [due to] forest encroachment....All measures to resolve conflict between ranching and wildlife are of necessity palliative, a cure for symptoms unless forest encroachment is rolled back.

DR. VALERIUS GEIST, WILDLIFE BIOLOGIST, 1979

...knowledgeable observers pointed to the buildup of fuel in British Columbia's forests as one of the reasons for the severity of Firestorm 2003....High fuel loads are not the only consequence of skipping [fire] disturbance intervals. Recent research shows that biodiversity and forage production are reduced, wildlife habitats are altered and the forests become susceptible to insects and diseases. Fuel buildup is particularly severe in the Rocky Mountain Trench.

THE HON. GARY FILMON, CHAIR, FIRESTORM 2003 PROVINCIAL REVIEW

The need for recovery of the rangelands of the Rocky Mountain Trench has been evident since the 1950s. Over the decades, at least 31 reports, studies and inquiries—including an investigation by the provincial ombudsman – have documented deteriorating East Kootenay rangeland conditions and the attendant economic, social and ecological consequences.

Many of these publications focused on resolution of the high-profile agriculture/wildlife conflict. Most recommended various remedies. Some of these were never implemented, others were adopted and then abandoned, a few evolved and remain part of resource management practice today. Nevertheless, the decline of the dry, low-elevation forest and grassland ecosystems of the Trench continued apace with the conflicts and consequences.

After four contentious decades, the prospect of a lasting remedy emerged when resource users and managers alike embraced the concept of ecosystem restoration as a means of returning ecological function and structure to Crown rangelands. The destructive impact of forest ingrowth would finally begin to be effectively addressed in the 1990s.

EAST KOOTENAY* PROFILE

LOCATION

southeastern British Columbia, Canada

AREA

2.83 million ha (28,300 sq km)

CLIMATE

semi-arid in the Trench

MUNICIPALITIES

Canal Flats, Cranbrook, Elkford, Fernie, Invermere, Kimberley, Radium Hot Springs, Sparwood

POPULATION

59,334 permanent + 10,000 seasonal (2003 estimates)

MAJOR ECONOMIC DRIVERS

mining, forestry, tourism

* defined by Regional District of East Kootenay boundaries

A rare white Rocky Mountain elk photographed with another female of normal coloration. The white cow elk has frequented Premier Ridge since about 2002.

— Paul Visentin photo

STAKEHOLDER FINDINGS The first breakthrough came in 1990 with a BC Government initiative that created the East Kootenay Trench Agriculture/Wildlife Committee (EKTAWC). This group, similar in composition to the Ecosystem Restoration Steering Committee, was charged with: (1) implementing a strategy for reducing wildlife and livestock conflicts, and (2) developing an action plan to protect property and agricultural values, maintain wildlife and wildlife habitat, and manage Crown rangelands for the benefit of all users.

Given these objectives, and recognizing that reliable information was essential if stakeholders were to devise real solutions, the committee commissioned surveys of elk populations and elk damage to private land, and sponsored small-scale pilot projects that employed a variety of methods to enhance cultivated pasture and Crown range.

The EKTAWC undertaking that provided the most useful knowledge, however, was a comprehensive study that (1) identified grassland plant species grazed by both wild and domestic ungulates, (2) measured forage production and utilization, (3) tracked year-round grazing patterns, and (4) determined the cumulative impacts of these factors on Crown range.



The study found that combined wildlife and livestock forage consumption was 60% averaged across monitored sites, well in excess of the 50% “safe use” rule of thumb, and confirmed anecdotal evidence that grazing was well beyond the sustainable threshold. The study concluded that sustainable forage management would not be achieved until the supply of forage and demand by grazers were managed in equilibrium, that is, according to rangeland carrying capacity. Forest ingrowth and encroachment were identified as the primary contributors to reduced carrying capacity.

In 1997, the EKTAWC published a final report that recommended implementation of fire-maintained ecosystem restoration as “the best and most lasting solution to the agriculture/wildlife conflict.”

Meanwhile, in 1992, the BC Government established the Commission on Resources and Environment (CORE). Charged with developing a province-wide sustainable land-use strategy, CORE focused on three regions with longstanding histories of resource-use conflict (Vancouver Island, Cariboo-Chilcotin and the Kootenays). The land-use plans that emerged were formulated largely through a process of public participation at multiple-stakeholder negotiation tables.

The East Kootenay table met through 1993-94 and was notable for reaching agreement on more issues than any of the other regional tables. Among its recommendations was establishment of a coordinated and comprehensive Trench ecosystem rehabilitation and management program focusing on forage, forest, biodiversity and landscape values.

GOVERNMENT ACTION The CORE process produced land-use plans for the East Kootenay and Kootenay-Boundary regions. These in turn lead to the 1997 Kootenay/Boundary Land Use Plan Implementation Strategy which set out management and operational guidelines for fire-maintained ecosystem restoration. (The BC Government made restoration and maintenance of fire-maintained ecosystems a legal objective in 2001 when it released the first Kootenay Boundary Higher Level Plan under the Forest Practices Code.)

Ecosystem restoration became a concrete reality in 1998 when the government established the Rocky Mountain Trench Ecosystem Restoration Steering Committee. Formation of the Steering Committee meant that restoration, previously carried out sporadically and ad hoc, would now follow a program planned and guided by stakeholders. Several concurrent developments contributed to building a solid footing for restoration at an effective landscape level.

Ecosystem Maintenance Burning Evaluation and Research, a prescribed burning project initiated in 1993 by the Nelson Forest Region, had by 1996 expanded into an assessment of the feasibility and effectiveness of various restoration treatments. The Forest Practices Code of 1995 introduced new standards for managing Crown forests and range. In addition, several sources of funding became available in the 1990s to provide the means for on-the-ground restoration operations.

The groundwork for an operational structure was laid in 1997 as part of the former Invermere Forest District's Enhanced Forest Management Pilot Project. Invermere district staff developed and implemented a prototype ecosystem restoration plan for the Sheep Creek North Range Unit that was eventually applied to all range units in the Trench. (Restoration activities summarized in *Blueprint 2006* date from the 1997-98 Invermere project.)

All of the developments described here played a role in the Steering Committee's adoption of a strategic 30-year plan to restore fire-maintained ecosystems on Crown forest lands in the Trench. The plan was published in 2000 as *A Blueprint for Action*.



People coming together to talk over their differences, work collaboratively on solutions and strive for a common goal were the driving force behind ecosystem restoration in the Trench. Ranchers, hunters, environmentalists, scientists, politicians and natural resource managers have contributed to the restoration program and continue to do so.

— Susan Bond photo

2. FIRE-MAINTAINED ECOSYSTEMS: THE ZONE OF TENSION

By

DON GAYTON, MSc., P.Ag.

Don Gayton is an Ecosystem Management Specialist for FORREX and a former member of the Steering Committee.



The tree-grass interface on a southwest-facing slope south of Ta Ta Creek. Blooming arrow-leaved balsamroot and budding bitterbrush (antelope-brush) in foreground. Ponderosa pine at right and interior Douglas-fir on the brow of the hill.

— Susan Bond photo

Ecologists define the edge between forest and grassland as a “zone of tension.” Here, trees and grass compete, and their boundaries overlap. Climate, fire and other disturbances continuously alter the location of that broad and fuzzy boundary. This ancient, seesaw battle between trees and grasses goes on in many parts of the world, wherever a grassland or prairie is next to a forest.

The tree-grass interface is not only a zone of tension, it is an area rich in resources and biological diversity. Many animals, plants and insects recognize the advantages of living on the boundary between two ecosystems where they can draw on the resources—and the protection—of both.

The tree-grass boundary, also known as parkland or savanna, attracts humans as well. Most of the urban communities of BC’s southern Interior, including those in the Rocky Mountain Trench, are located in the savanna zone, which is also highly favoured for agriculture, rural living and recreation.

But human actions over the past century or so have fundamentally changed the nature of the savanna ecosystems of the Rocky Mountain Trench, creating a series of critical environmental, economic and social problems for the region. To understand these problems requires some ecological background.

FIRE IN THE TRENCH The savanna landscapes of the southern Rocky Mountain Trench are found along the bottom of the broad valley of the Kootenay and Columbia rivers, stretching some 350 km from Golden to the US border.

BC’s Biogeoclimatic Classification System identifies the bottom of the Trench as a combination of Ponderosa Pine and Interior Douglas-fir ecological subzones. Each of these subzones contains a range of moisture regimes, but collectively all of the ponderosa pine and the dry portions of the interior Douglas-fir areas are classified as “fire-maintained ecosystems.” BC’s Forest Practices Code Biodiversity Handbook further defines these dry forests as Natural Disturbance Type 4 (NDT4), where the characteristic natural disturbance is “frequent, stand-maintaining fires.” In other words, fire was an integral part of the functioning of these ecosystems.

Historically, the tree-grass boundary of the Trench experienced fire events very frequently—on average about every 20 years. A growing body of documentation shows that the dry, low-elevation valleys of the BC Interior were exposed to these frequent fire regimes prior to European

settlement. Much of this documentation comes from the science of dendrochronology.

Trees lay down growth rings every year, and dendrochronology is the science of dating those annual rings. Fortunately for scientists, mature trees can be found that contain a partial record of old fires, in the form of fire scars. Using dendrochronology, ecologists can actually fix the year of occurrence for fires that left scars.

We know from contemporary records of lightning-caused fires that there simply aren't enough lightning strikes to generate a fire frequency of 20 years. By deduction we know there was another ignition source: the aboriginal use of fire, for various land-management activities. Thus, before European contact, frequent fire regimes were a combination of lightning strikes and First Nations' fire-starting activities.

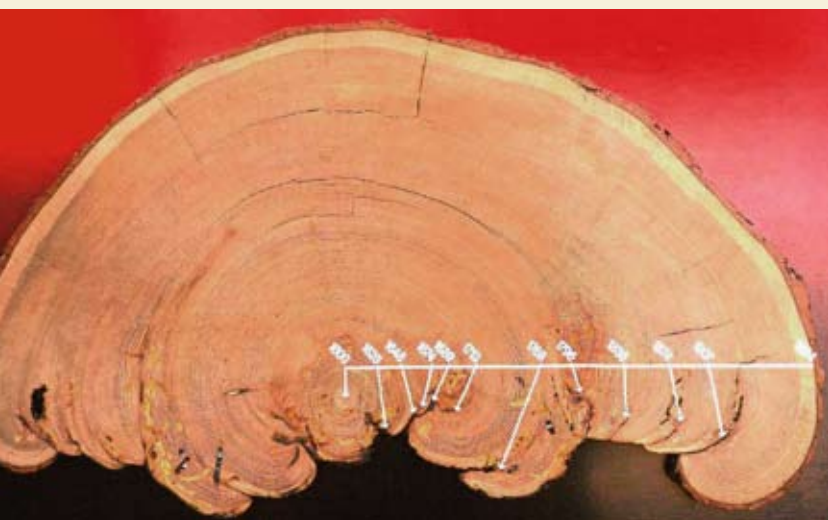
THE FIRE-MAINTAINED LANDSCAPE The enduring paradox of fire is that the more often it occurs, the less intense and less damaging an individual fire event becomes.

In wet forest types, fuels in the form of downed trees, branches, needles and dead grass are quickly broken down and incorporated into the soil as humus. In dry forests, the micro-organisms that do this work are far less active, so woody fuels persist. In dry forest types, fuel accumulation is a



The classic "catface" pattern of fire scarring on a ponderosa pine near Grasmere.

— Don Gayton photo



A 400-year-old western larch showing 10 fire scars between 1628 and 1907. The tree germinated near Canal Flats in about 1590. This cross-section was cut in 1994.

— Don Gayton photo

continuous process, interrupted only by fire. But the frequent fire intervals of the pre-contact period allowed little time for fuels to accumulate, so fires tended to be of low intensity, patchy and ground oriented.

A typical low-intensity, ground-based fire moved quickly across the terrain, killing tree seedlings, consuming grass and downed woody fuels, and generally not affecting mature trees. But due to the random nature of fire and the variability of Trench terrain, some tree seedlings always survived. The result was a landscape mosaic of grassland and open forest: an open savanna-type stand of mature, widely spaced trees; lots of sun-loving grasses, wildflowers and shrubs in between; and always a few surviving tree seedlings scattered about.

It is an axiom of nature that if a periodic disturbance like fire occurs over a long enough period, ecosystems adjust to accommodate that disturbance, and then evolve to *depend* on that disturbance. Such is the case with the fire-adapted ecosystems of the tree-grass boundary of the Trench. Bunchgrass-dominated grasslands, bitterbrush shrublands, ponderosa pine forests and dry Douglas-fir forests can all withstand frequent, low-intensity fire, and actually derive multiple benefits from that fire regime. One of the primary benefits is thinning.

Ponderosa pine and Douglas-fir, on the forest side of the savanna boundary, produce far more seedlings than are necessary for normal replacement. If all these seedlings grew to maturity, the forest stand would become overdense. So in dry forest types, fire is a stand-thinning tool.

INGROWTH & ENCROACHMENT When fire is removed from a fire-maintained forest stand, waves of new tree seedlings establish and grow up to pole size. The open savanna gradually changes to a closed forest canopy, in a process known as forest ingrowth. In a parallel process known as forest encroachment, new seedlings establish beyond the edge of the traditional forest, and the tree-grass boundary is shifted into areas that were once open grassland.

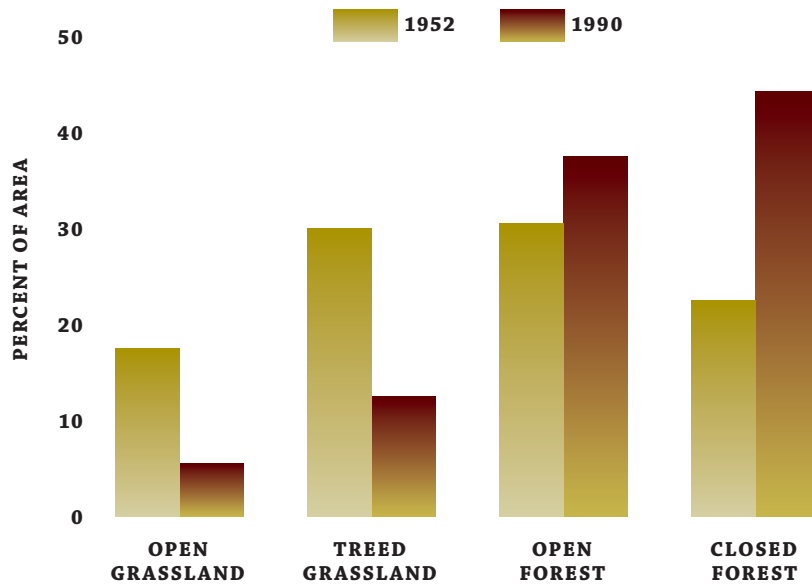
With total fire suppression, open grasslands become treed grasslands, treed grasslands become open forests, and open

forests become closed forests. These gradual changes lie at the core of the problems the Trench is experiencing.

Beginning in about 1890, the tree-ring record shows a dramatic decrease in the frequency of fires in the Trench and elsewhere. We can attribute this decline to several factors. With the introduction of cattle and horses, a lot of the fine grassy fuels that normally carried fires across the Trench landscape were consumed. Then came disruption of traditional First Nations' land-management practices. By the 1940s, organized fire suppression had become highly effective, and that caused a further reduction in fire frequency.

We came to see fire as incompatible with our interests, and did our best to eradicate it from the landscape. While this approach has undoubtedly saved millions of dollars of investment in homes and infrastructure in the short term, we are now grappling with its unintended long-term consequences.

FOREST INGROWTH: ROCKY MOUNTAIN TRENCH*



** Pooled results of an airphoto stratification analysis of three representative Crown NDT4 sites in the Trench (Baynes Lake, Old Kimberley Airport area and Columbia Lake East), totalling 30,000 ha. All three sites were within the Interior Douglas-fir or Ponderosa Pine subzones. Areas experiencing timber harvesting, wildfire or prescribed burning were removed from the calculation.*

ECONOMIC VALUE OF HUNTING & RANCHING IN THE EAST KOOTENAY

RESIDENT HUNTING

Gross economic value \$20.3 million (2003). Elk hunting provided \$5.8 million of this total.

GUIDE-OUTFITTING

Gross economic value \$8.1 million (2002). Deer & elk hunting accounted for 49.6% of non-resident hunt days, more than in any other BC region.

CATTLE RANCHING

Gross economic value: \$25 million (estimate based on 2001 data).

This remnant fire-maintained stand near Wycliffe Prairie shows the classic architecture of large, well-spaced veteran trees, little seedling regeneration, and abundant grass and herbaceous cover.

— Don Gayton photo



An ingrown dry forest east of Wycliffe. The dense, layered tree canopy inhibits growth of shrubs, forbs and grasses on the forest floor.

— Susan Bond photo



THE IMPACTS The East Kootenay has a long-established ranching industry and very significant resident and non-resident big-game hunting and wildlife-viewing industries. In fact, the region's exceptional diversity of habitat types and wildlife species makes it unique in a province which itself is the most biologically complex in Canada.

Elk, bighorn sheep, mule deer, white-tailed deer and domestic livestock are all heavily dependent on the forage produced along the tree-grass interface. Elk and deer in particular tend to graze and browse in open areas close to the hiding cover of an adjacent forest.

Cows, elk and bighorn sheep are primarily grass eaters, and since their ranges overlap in the Trench, these animals compete for the same forage resources. All three species particularly seek out the sun-loving native bunchgrasses—bluebunch wheatgrass, Idaho fescue and rough fescue—which have high nutritive values. The wild ungulates especially depend on these nutritious grasses to sustain them over the winter months.

Using values for productive sites, total forage production in a treeless native grassland is on the order of 1,000 kilograms per hectare (kg per ha); moving into the open forest (less than 15% tree cover), forage production actually increases to around 1,500 kg per ha. Moving further into denser forest, forage production drops quickly to around 500 kg per ha, then falls to a token amount under a completely closed forest canopy. So the consequences of forest ingrowth on forage production can be dramatic.



At left: rough fescue in early summer. At right: bunchgrasses in early spring after a winter of grazing by elk.

— Susan Bond photos



The plant communities of grassland/open forest ecosystems not only provide forage for domestic and wild ungulates, they also provide the essential living conditions for a rich array of other species. When forest ingrowth and encroachment take over, a cycle of interacting consequences is triggered.

Cows and elk compete for increasingly limited forage resources. Overgrazing results, and grassland conditions deteriorate. The weakened and heavily disturbed native plant community becomes susceptible to takeover by invasive plants (noxious weeds), which causes forage availability and palatability to decline even more. As the native plant community declines, habitat and biodiversity values suffer correspondingly. (Grasslands represent less than 1% of BC's landbase but provide habitat for more than 30% of the province's at-risk species.)

Ecosystem degradation on this scale takes its toll on people, too. The ecological zone of tension becomes a human zone of conflict. Hunters blame ranchers for depriving elk of Crown range grazing. Ranchers blame hunters for inflated elk populations which "homestead" year-round on their cultivated hayfields. Naturalists and environmentalists decry the loss of grassland-dependent birds, small mammals and plants. Foresters are confronted with dense stands of unhealthy, pole-sized Douglas-fir ingrowth with little commercial timber value.

Human life and property are at risk when forest fuels, which have been accumulating for decades, create prime conditions for unprecedented wildfire. Fires occurring now would not be the ground-oriented, *stand-maintaining* type described earlier, but rather the intense *stand-replacement* crown fires normally associated with higher elevation closed forests.



Elk grazing on private pasture land at the foot of the Rockies near Fort Steele.

— Ministry of Agriculture & Lands photo

BENEFITS OF FIRE-MAINTAINED ECOSYSTEM RESTORATION

- Enhances biodiversity and improves ecological balance by restoring species-rich savanna ecosystems.
- Restores habitat for identified species at risk in the Trench, including: American badger, Rocky Mountain bighorn sheep, Columbian sharp-tailed grouse, Lewis's woodpecker, flammulated owl, long-billed curlew, arrowhead blue butterfly, scarlet gaura and Spalding's campion.
- Enhances the longevity of veteran, large-diameter wildlife trees which provide valuable nesting and perching sites for a variety of birds and bats.
- Improves forest health by thinning overdense, stagnated stands that are prone to insect and disease attack.
- Improves long-term timber harvest values by concentrating site growth potential in fewer, larger-diameter trees.
- Safeguards residential and other developments by reducing excessive fuel loads and fuel continuity that heighten the probability of catastrophic wildfire.
- Provides more natural forage, thus contributing to sustainability of wild and domestic ungulate populations essential to the economic viability of the ranching, guide-outfitting and resident hunting industries.
- Improves the aesthetics of savanna areas for outdoor recreation.



Wildfires burned in the Trench through the summer of 2003, as they did in much of BC that year. The Lamb Fire burned 11,882 ha southwest of Cranbrook, forcing rural residents from their homes and threatening the city. The Plumbob Mountain fire, pictured above, burned 4,018 ha southeast of Cranbrook and put rural residents on evacuation alert for days. Ecosystem restoration can reduce the risk of such catastrophic wildfire.

— Rocky Mountain Forest District photo

CONFRONTATION & CONSENSUS The initial impetus for identifying and confronting ingrowth and encroachment came from the ranching and wildlife communities in the Trench. Traditional rivals, each sector wished to maintain or even increase existing cattle and elk populations, both for the economic activity they generate and the way of life they represent. Although it took many decades, these rival camps came to recognize that the consequences of forest ingrowth were not a partisan issue of concern to them alone, but a broader societal problem.

In the East Kootenay, most human activity and the greatest concentration of flora and fauna exist in the low-elevation grassland/open forest ecosystems of the Trench. Thus the impacts of forest ingrowth affect everyone who lives, works and recreates here. As this became increasingly apparent, all affected parties came forward to work together to address the problem.

Out of this crucible of confrontation and consensus came a practical solution—fire-maintained ecosystem restoration—directed at restoring the dynamic tree-grass balance. In time, nature's zone of tension may once again be in equilibrium in the Rocky Mountain Trench.



3. THE RESTORATION PLAN

VISION

A restored Trench landscape functioning at its ecological potential and thereby supporting: the native and historical matrix of trees, plants and animals; a sustainable forage resource for wild and domestic grazing ungulates; and the social, economic and cultural needs of stakeholders as they relate to the open range and open forests of the Trench.

MISSION

- (1) Progressively restore the designated 118,500 ha of the Trench to an ecologically appropriate fire-maintenance condition by 2030, in accordance with tree stocking targets for open range and open forest sites.
- (2) Maintain the restored 118,500 ha in an open range or open forest condition in perpetuity.

The Steering Committee is responsible for strategic planning and delivery of the ecosystem restoration (ER) program in the Trench. Committee members represent government ministries and agencies, the local ranching industry, timber licencees, restoration program funders, range users, hunters and guide-outfitters, environmentalists and other citizen stakeholder organizations.

THE STRATEGY The committee's strategic 30-year plan (2000 – 2030) is based on the Kootenay/Boundary Land Use Plan Implementation Strategy which identified 250,000 hectares (ha) of Crown land within the Rocky Mountain Forest District as fire-maintained, or Natural Disturbance Type 4 (NDT4). These 250,000 ha are further classified into four ecosystem components: shrublands, open range, open forest and managed forest. The restoration strategy is targeted at the open range and open forest components. By 2030, 118,500 ha, about 47% of the Crown NDT4, will be restored to open range or open forest condition, and then maintained in that condition in perpetuity.

(The strategic plan published in 2000 identified an estimated 135,000 ha to be restored. The current figure of 118,500 ha more accurately reflects conditions on the ground as determined by maps and restoration plans available since 2000. At present it is the best available figure but is likely to be further refined using a GIS-based mapping/project tracking database currently being developed. This database will enhance planning and scheduling processes to a significant degree.)

DISAPPEARING GRASSLANDS

Several studies have sought to quantify loss of Trench grasslands. Limited baseline data is one obstacle. Another is the dynamic nature of grasslands, which are subject to a variety of influences that determine their distribution and extent.

Researchers have compared archival with contemporary airphotos to determine the approximate rate and extent of forest ingrowth and encroachment in the Trench. Airphoto data, combined with other sources of information, provided the first practical basis for developing targets for restoration.

A 1997 analysis examined grassland/open forest that had converted to closed forest condition between 1952 and 1990. Extrapolating data from three representative sites, the study arrived at an estimated conversion rate for the period of up to 3,000 ha per year. A 1998 study of another site concluded that open and treed grassland had decreased by more than 50% between 1952 and 1992.

The Grasslands Conservation Council of BC (GCC) completed a province-wide mapping project in 2004 that identified 44,000 ha of remaining native grassland in the East Kootenay. Of this total, 41,000 ha occur in the Trench. Of the Trench total, 25,800 ha are Crown land, of which 22,800 ha are under livestock grazing tenure.

The GCC report said Trench grasslands, defined as open range and open forest with less than 10% canopy closure, have been lost to ingrowth; agricultural conversion; urban, industrial and recreational development; and the Libby Dam reservoir (Lake Kooanusu).





A visual record of landscape change in the Trench. At left: Premier Ridge in 1954. At right: the same area in 1994. Light areas are grassland, dark areas are forested.

— BC Ministry of Forests & Range airphotos

RESTORATION TARGETS The following table shows legislated tree stocking ranges, stocking targets set by the Steering Committee, and distribution of the four ecosystem components over time.

Ecosystem Component	Tree Stocking Range/ Targets (stems/ha)	1997 Distribution (% of total)	2004 Distribution	2030 Distribution Target
Shrublands*	0	5%	1%	5% (12,500 ha)
Open Range	<75 sph TARGET: 20 sph	10%	12%	17% (43,500 ha)
Open Forest	76–400 sph TARGET: 150 sph	Combined Open & Managed Forest = 85%	26%	30% (75,000 ha)
Managed Forest	400–5000 sph		61%	48% (119,000 ha)

* Extent of shrublands was estimated in 1997 and is subject to ongoing verification.

- **Shrublands** are non-productive forest, wetlands and brush with high forage values.
- **Open range** is grassland with shrubs and a scattering of mature trees. The driest of the ecosystem components, open range includes south- and west-facing slopes where soil moisture is the major limiting factor. Open range sites provide critical winter forage for wild ungulates and the earliest spring forage for cattle. The goal for these sites is to restore 100% of range value by maintaining crown closure of 10% or less.
- **Open forest** describes areas with significant values for both range and timber. The goal is to evenly balance tree/grass production by manipulating tree distribution and maintaining crown closure at 40% or less. Treatments in both open range and open forest require retention of a proportion of the largest trees on site.
- **Managed forest** is tended primarily for commercial timber values, although some interim forage benefits do follow for 10-30 years after harvesting.

RESTORATION PRIORITIES Selecting sites for restoration is guided by the following considerations:

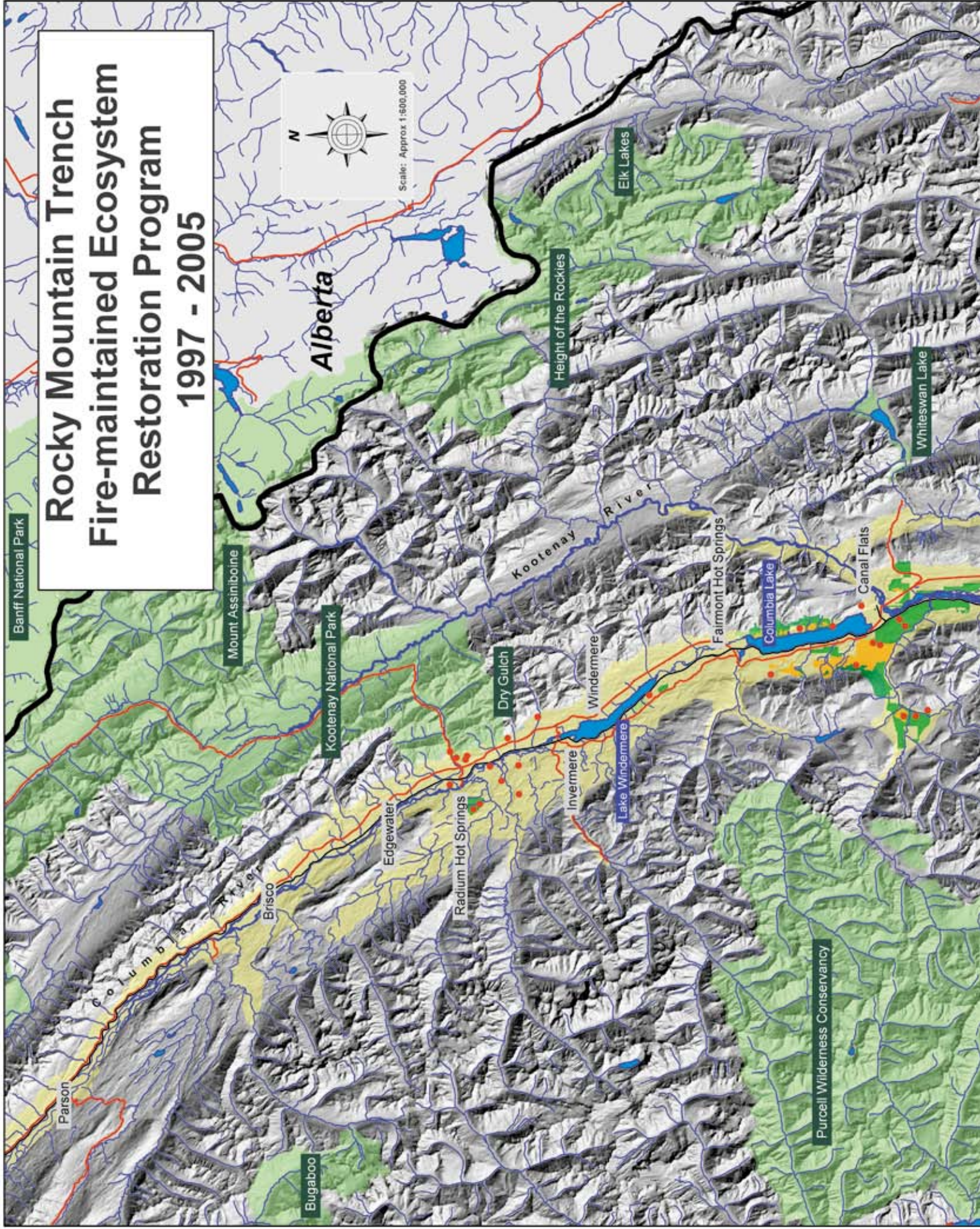
- key wildlife winter ranges and areas supporting red- and blue-listed species
- ranching operations with Crown land grazing tenure that is severely impacted, or at risk of being severely impacted, by loss of forage
- rural subdivisions at high risk for wildfire because of proximity to ingrown stands
- areas that offer the most immediate vegetative and ecological returns, thus having a high cost/benefit ratio
- remaining native grasslands in jeopardy from forest encroachment, and
- forested areas where timber utilization and growth of residual trees can be optimized.

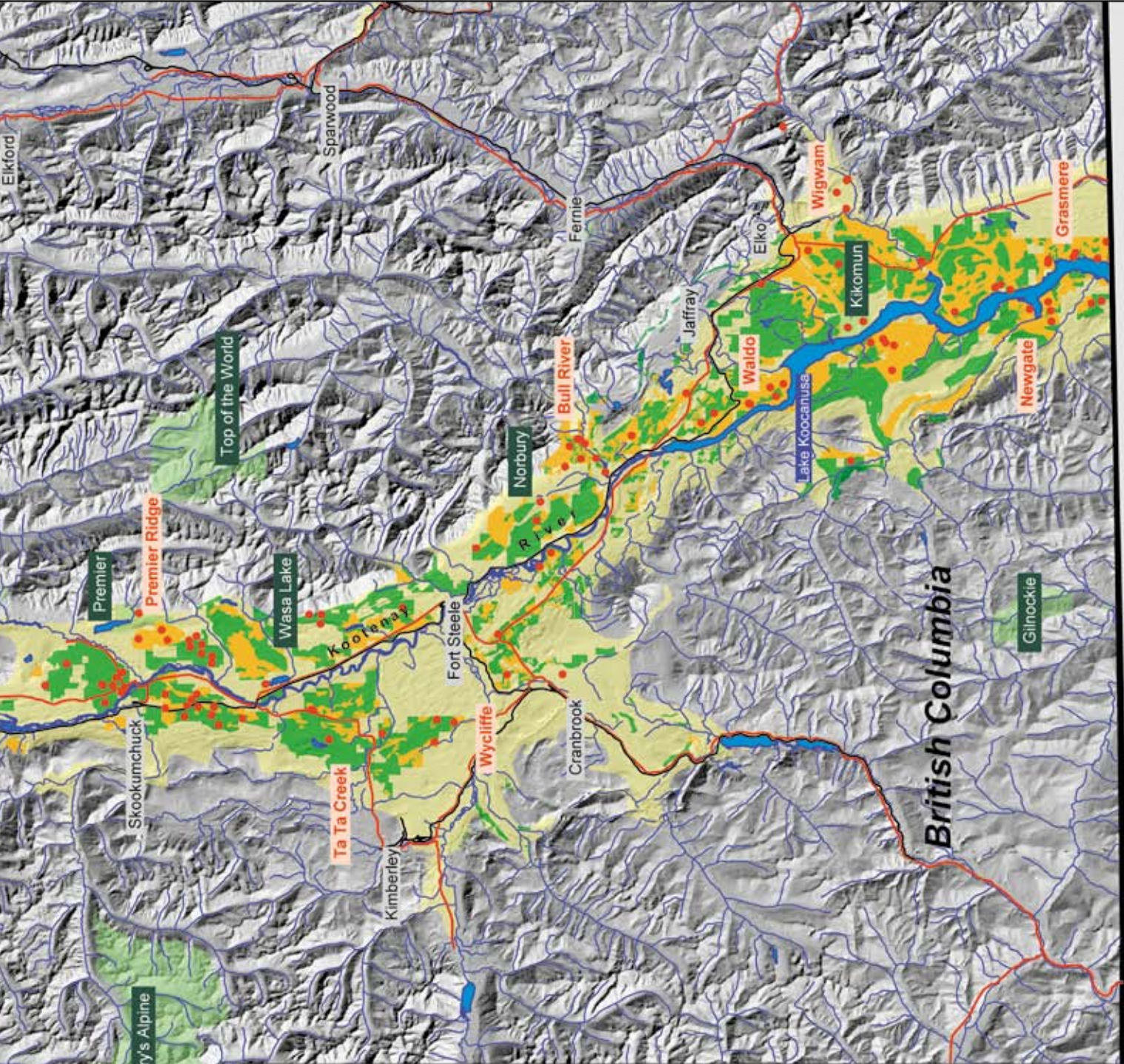
Foraging and nesting requirements of the Lewis's woodpecker are taken into account when planning restoration treatments on sites where the bird is present. This at-risk species requires large areas of very open forest or grassland for foraging. It also needs standing dead or declining trees, such as the ponderosa pine snag at left, to create cavities for nesting.

— Richard Klafki/Mark Nyhof photos



Rocky Mountain Trench Fire-maintained Ecosystem Restoration Program 1997 - 2005





Legend

- Town Sites: A
- Railway: —
- Major Highways: —
- Provincial / State Boundaries: —
- Creeks and Rivers: —
- Lakes: —
- Parks: —
- Park Names: A
- Restoration Project Areas: A
- Restoration Project Sites: •
- Open Forest: —
- Open Range: —
- Fire-maintained Ecosystem: —

ECOSYSTEM RESTORATION PROGRAM FUNDING SOURCES 1997-2005

The Steering Committee acknowledges with thanks the following funding sources for their support of the ecosystem restoration program. Their contributions have paid for slashing and prescribed burning treatments, and other program activities such as research, monitoring, mapping, public outreach and communications.

Columbia Basin Fish & Wildlife Compensation Program	\$ 824,592
Forest Renewal BC	259,020
FRBC Terrestrial Ecosystem Restoration Program	306,100
Grazing Enhancement Fund	417,735
BC Ministry of Forests and Range	363,023 *‡
MoFR Enhanced Forest Management Pilot Project	53,525
Habitat Conservation Trust Fund	402,166
Rocky Mountain Elk Foundation	237,474
Columbia Basin Trust	126,500
Premier's Special Sheep Permit Fund	94,765
Land Use Coordination Office	60,000
BC Ministry of Agriculture and Lands	50,000 ‡
BC Ministry of Environment	50,000 ‡
Beef Cattle Industry Development Fund	48,500
Total	\$ 3,293,400

* Includes grants to the Rocky Mountain Trench Natural Resources Society and Kootenay Livestock Association designated for Steering Committee use.

‡ Ministry funds do not include in-kind support costs such as staff time for program planning, coordination, supervision and prescribed burning.

ADAPTIVE MANAGEMENT The Steering Committee uses an adaptive management approach in planning and implementing restoration activities. The implementation strategy guidelines were meant to provide a starting point; it was expected they would be refined and improved over time using knowledge gained from operational experience, research projects, monitoring of treated sites, and changing social and economic imperatives. This has been the case, as the following examples illustrate.

- 1) The habitat needs of nine wildlife species and seven ecological communities are incorporated into restoration prescriptions where appropriate as a result of a 2004 report on habitat attribute targets for selected at-risk species in the Trench. Forest cover is the habitat attribute directly manipulated by restoration so developing a more complete understanding of optimum target stand conditions across a variety of sites remains a key ongoing task.
- 2) The tree stocking target for open forest sites has been revised downward – from 250 to 150 sph – as a result of Ministry of Forests & Range modeling that forecasted the effects of tree density and crown closure on timber volume and forage production.
- 3) Monitoring has been used to evaluate treatment effectiveness primarily in the context of vegetation response. Data show that results are variable; increases in forage production can occur sooner or later following treatment, depending on a variety of factors. Change in species composition, however, is always a slow process and is often affected by soil type on the site. This information is important in managing expectations.

TREATMENTS TO DATE The following table shows the Steering Committee's initial treatment targets and actual treatments applied during the restoration program's first eight years. An estimated 20,000 ha are now considered to be in open range or open forest condition. Once sites are in this condition, they will be maintained primarily through prescribed burning. Maintenance re-entries are expected to begin in 2006. The committee's current treatment target is 4,500 ha per year.



Treatment	Target ha/yr	Actual 97-98	98-99	99-00	00-01	01-02	02-03	03-04	04-05	Total Treated
HARVEST	600-1200	N/A	1328	940	475	623	1238	1125	800	6,529
SLASH	750	64	978	1002	2420	2733	600	731	843	9,371
BURN	2325	720	1465	1470	2041	1589	359	370	3908	11,922
									GROSS TOTAL	27,822* hectares

* Approximately 60% on open forest, 40% on open range sites. Each time a hectare is treated, whether by harvesting, slashing or burning, it is included in the total for that treatment category. Thus, the sum of the three categories does not represent actual number of hectares treated.

As the table shows, initial harvesting and slashing targets were met or exceeded in most years whereas the prescribed burning target was reached only once in the eight-year period. This reflects prescribed burning’s inherent operational obstacles.

Prescribed burns are lit only when a number of prescription parameters are met on the same day. To date, burns have been conducted in the spring when conditions in the Trench generally are most favorable. Nonetheless, on average only three burning days present themselves each spring. Some years there may be more; when particularly poor burning conditions prevail, there may be none. Experience in the northwestern United States shows that burns can be successfully and safely carried out in the fall when site and weather parameters present themselves. The restoration program has planned fall maintenance burns but thus far weather and ground fuel conditions have prevented them from being completed.

OTHER RESTORATION PROGRAMS While the Steering Committee operates on Crown forest lands, other agencies are undertaking restoration on private and protected lands in the Trench. The Nature Trust of BC, the Nature Conservancy of Canada and The Land Conservancy of BC are restoring private lands under their stewardship, while Parks Canada and BC Parks have launched parallel restoration projects in federal and provincial parks.

BC Parks staff in the East Kootenay were the first to initiate ecosystem restoration in a British Columbia provincial park with their pioneering Kikomun Creek pilot project, approved in 1996. A noteworthy innovation allowed the project to use logging revenue to finance restoration activities. The project’s successes have since been incorporated into BC Parks’ current Tree Removal Policy.

Between 1997 and 2005, 283 ha have been treated within four provincial parks in the Trench: Kikomun Creek, Norbury Lake, Wasa Lake and Dry Gulch. Treatments cover the full range of harvesting, slashing and prescribed burning. Combined project costs of about \$719,000 include planning, mapping, prescriptions and research/monitoring.

In Kootenay National Park, Parks Canada has launched a multi-year ecosystem management project in and around Redstreak Campground at Radium Hot Springs. The Redstreak project aims to (1) improve critical winter range habitat for a local band of Rocky Mountain bighorn sheep, and (2) protect park facilities and the local community from the risk of catastrophic wildfire. The project, started in 2002, will eventually treat about 400 ha. Provincial Crown lands adjacent to Redstreak have also been treated to further increase the contiguous area that has been restored.

The Land Conservancy of BC has commissioned a restoration prescription for 365 ha of native grassland on St. Mary’s Prairie at Wycliffe. Objectives are to restore a functional grassland ecosystem where appropriate, and increase forage production for wild ungulates and livestock.

The Nature Conservancy of Canada has completed or is currently developing restoration strategies for three properties in the vicinity of Canal Flats: Thunder Hill Ranch, the Griffiths Covenant and Kootenay River Ranch.

In 2004 The Nature Trust of BC (TNT) initiated its first ecosystem restoration project on approximately 300 ha of upper benchland habitat on the Cherry Creek conservation property, located southeast of Ta Ta Creek above the Kootenay River.

Concurrently, TNT began the first phase of a restoration program on approximately 200 ha of the Columbia Lake West conservation property. This phase was completed in mid-2005. Stewardship strategies and applicable habitat management prescriptions related to the second phase are being developed, and it is anticipated this phase will begin in the fall of 2006. A portion of the treated area will be included in a prescribed burn planned on adjacent Crown lands in the spring of 2006.

Through a partnership with the Columbia Basin Fish & Wildlife Compensation Program, TNT is also currently engaged in a 185-ha project on the 4,037-ha Hoodoos conservation property near Fairmont Hot Springs. A similar project there is scheduled for 2007. Yet another project was recently completed on 25 ha of TNT’s Big Ranch in the Elk Valley.

The agencies noted above consider their individual restoration projects to be part of the region-wide effort to restore grassland/open forest ecosystems at a landscape level.



4. RESTORATION OPERATIONS

By
DENIS PETRYSHEN, R.P.F.

Denis Petryshen is Chair of the Operations Committee and Stewardship Supervisor at the Rocky Mountain Forest District.

Operational planning and delivery of site-specific activity on the 118,500 ha targeted for open range and open forest restoration are the responsibility of the Operations Committee, a sub-committee of the Steering Committee.

The Operations Committee prepares five-year plans that identify and prioritize sites for treatment, then develops and recommends annual workplans for Steering Committee approval. Final approval of on-the-ground restoration work rests with the District Manager of Rocky Mountain Forest District (RMFD).



Members of the Operations and Steering Committees touring Deep Springs Pasture on St. Mary's Prairie Range Unit about six weeks after an April 2005 prescribed burn.

— Susan Bond photo

RESTORATION PLANNING The restoration program uses the BC Forest Service-administered range unit/pasture system to facilitate planning and operations. Range units are the recognized planning units used to allocate Crown grazing tenures. They vary in size from 1,000 to 15,000 ha and each contains from 3 to 12 fenced pastures. Most of the 48 range units and 300 pastures in the RMFD are located in the Trench.

The strategic plan's four ecosystem components – open range, open forest, managed forest and shrublands – have been mapped on individual restoration plans (scale: 1:20,000) developed for each range unit. Using these broadly defined plans as a starting point, restoration treatments are planned on a pasture-by-pasture basis.

RESTORATION OBJECTIVES Once a pasture is scheduled for treatment, a stand management prescription is developed. These restoration prescriptions provide detailed direction on how to achieve clearly stated and measurable objectives. Site-specific objectives vary according to a site's slope, aspect, soils, forest cover, grazing tenure, archaeological features, First Nations' concerns and wildlife species.

While the overarching goal is to restore open range or open forest ecosystem conditions, many local variations within that broad ecological spectrum will exist on any given site.

Objectives might include no mineral soil exposure, a reduction in canopy cover, increase in biodiversity, reduction in fire hazard, increase in prime habitat condition for a threatened species, increase in quality and quantity of bunchgrass or forage plant communities, or a mix of these outcomes.

Prescriptions must also conform to legislated requirements such as the Forest & Range Practices Act and Regulations, Forest Practices Code, Kootenay Boundary Higher Level Plan and Higher Level Plan Orders. The latter include ungulate winter range orders that establish in law that forage production and habitat condition are management priorities.

As results flow from the restoration program's own ongoing monitoring, and modeling from other jurisdictions becomes available, site objectives and prescriptions will continue to be refined over time.



(left) Burning in a sloop is a low-impact way to dispose of the small trees cut during slashing. Sloop-burning produces less smoke and less soil damage than burning slash in piles on the ground. Sloops used in the ER program are made in the East Kootenay from ore cars once used underground in Kimberley's Sullivan Mine.

(below) Lighting up a prescribed burn on Colvalli Pasture in Colvalli Range Unit. Burns of less than 100 ha are ignited with hand-held or quad-mounted drip torches. Larger burns are lit with ignition devices mounted on helicopters. Prescribed fire objectives are to kill tree seedlings, rejuvenate fire-adapted grasses and shrubs, recycle nutrients and reduce hazardous forest fuels.

— Rocky Mountain Forest District photos

COSTS & TREATMENTS Annual workplans specify site location and size, treatments to be applied, broad objectives, cost estimates and available funding. The proposed workplan for 2005-06, as excerpted from the five-year plan, lists the following:

- 20 harvesting blocks, approximately 1,000 ha in total, logged to open range or open forest prescription, no cost to the restoration program
- 10 slashing projects, 2,435 ha in total, estimated costs of \$354,200
- 9 prescribed burns, 3,433 ha in total, estimated costs of \$135,000
- continuation of a restoration monitoring project, \$6,200
- development of a restoration prescription, \$5,000.

Whether proposed projects are completed and planned sites actually treated in any given year is dependent on several factors, including funding, timing and constraints on the landbase.

To date, at least one restoration treatment – harvesting, slashing and/or prescribed burning—has been applied to about 90 of the 300 pastures in the RMFD. An estimated 30 pastures totalling about 20,000 ha have been restored to proper ecological function and are now in a maintenance cycle. About 200 pastures totalling roughly 80,000 to 90,000 ha still require significant restoration treatment.

OPERATIONS ISSUES Long-term operational planning is essential to the success of the restoration program. Treatments must be applied in the right sequence and in a timely manner if they are to be effective in restoring ecological function.

If the pasture to be treated is used for cattle grazing, for instance, the site is rested from grazing a year or two prior to a prescribed burn so grasses and other fine fuels can accumulate in sufficient quantity to carry the fire. This requires planning and cooperation from the range tenure holder. Grazing by wild ungulates, which cannot be similarly controlled, adds significant complexity to burn planning and the ability of target areas to adequately carry a surface fire.

In the usual restoration cycle, and depending on desired outcomes, a site is treated in the following sequence:

- 1) commercial logging to reduce overstory tree density



- 2) hand or mechanical slashing of small stems in the intermediate and understory layer to further achieve appropriate tree stocking targets
- 3) prescribed burning to remove seedling regeneration, rejuvenate understory vegetation and recycle nutrients.

The restoration program has relied on licencees such as BC Timber Sales, Tembec, Canfor and Galloway to harvest on designated open range and open forest sites within their operating areas. The success of this depends on whether these sites contain merchantable wood. Many do not, and therefore have low or no priority for logging by licencees.

Tembec Industries Inc. harvested this site to an open forest prescription in 2004. Open range and open forest stocking targets give the private sector specific guidelines for logging in areas identified for restoration.

— Tembec photo

Greater assurance in scheduling and more directed harvesting is critical to the ongoing success of the program. The Ministry of Forests & Range Chief Forester recently announced new five-year allowable annual cuts for the Cranbrook and Invermere Timber Supply Areas, effective November 2005. The allocation provides 28,000 cubic metres a year directed to fire-maintained ecosystem restoration objectives in the Trench. This is the first allocation of this nature in the province and will be pivotal in advancing the restoration program. Over the next five years, this harvest volume will be targeted at treatment areas previously overlooked due to poor harvesting chance.




Tembec initiated a restoration project in 2004 to test the operational and economic feasibility of utilizing small-diameter trees and waste wood. After logging 635 ha to open forest stocking standards, the company used a whole-log chipper (left) and a hog-fuel grinder (right) to produce value from every harvested tree. Sawlogs were sorted and shipped to dimensional-lumber mills. Undersize stems were stripped of limbs and bark then processed as chips for Tembec's nearby pulp mill, or as fines for export to a Montana pressboard maker. Residual wood waste was ground into hog fuel for the pulp mill's co-gen electricity plant. Such projects need strong pulp markets, large timber volumes and low transportation costs to make money.

— Tembec photos

5. RESTORATION RESULTS

By
JOHN KREBS, R.P.Bio., MSc.

John Krebs is a member of the Steering Committee and senior wildlife biologist for the Columbia Basin Fish & Wildlife Compensation Program.



What are the measures of success for the ecosystem restoration program in the Trench? Are area-based targets sufficient? At the broadest level, the number of hectares treated provides a simple measure of progress toward ecosystem component targets. But these numbers on their own say little about the biological conditions and characteristics of the restored habitat: Are bunchgrasses increasing? What are the sizes, distribution and density of residual trees? Is ecosystem health improving? In other words, is the program effective in delivering desired results?

Positive outcomes are not assured; restoration treatments also carry risks such as invasive plant infestation, prescribed fire escape and unexpected vegetation response. Monitoring sites before and after treatment provides valuable feedback on what is happening on the ground and, most importantly, assists in refining future treatment prescriptions.

MONITORING OBJECTIVES Selecting meaningful indicators is a critical first step in any monitoring process. In 2002 the Steering Committee commissioned an effectiveness monitoring plan that identified 13 restoration objectives with associated response variables which should be used to track and measure results. The committee distilled these to eight objectives. The following four are considered high priority for monitoring restoration program results:

- 1) Stand structure and overstory vegetation: crown closure, tree density, diameter, species and decay class.
- 2) Understory structure and composition: grass, herb and shrub percent cover by species, species richness and composition.
- 3) Forage production: kilograms per hectare by species, grazed and ungrazed.
- 4) Status of invasive plant species: percent cover by species, number of species.

Wildlife species response, coarse woody debris, soil conditions and forest health objectives were not included at that time; they were considered to be of lower priority due to high costs of monitoring for them. Reduction in fuel hazard and risk of catastrophic wildfire are not currently monitored.

Monitoring, then, is focused on measuring the response of understory and overstory vegetation. Changes may be rapid (such as invasive plant infestation) or gradual (such as shifts in species composition), therefore monitoring must be conducted over a sufficient time frame to match potential changes. Four measurements taken over a 10-year period following treatment (years 1, 3, 5, 10) are considered adequate to measure response.

MONITORED RESULTS Short-term monitoring results are available for treated sites on Cherry Tata, Sheep Creek North, Stoddart Creek, Waldo, Wolf-Sheep Creek, Fontaine North, Skookumchuck and Rushmere. Results from BC Parks' Kikomun Creek project and The Nature Trust's Cherry Creek property are not included in this summary.

All sites were overstocked with conifers and had suppressed understory vegetation. Although prescriptions varied, the desired post-treatment stand densities of between 75 and 275 stems per hectare (sph) were mainly within the open forest stocking range. At Fontaine North near Bull River, slashing reduced the density of small and intermediate stems substantially. At Stoddart Creek near Radium Hot Springs, tree density of stems 5-15 cm in diameter (at breast height) and larger declined from 246 to 63 sph following logging and slashing treatments. At Miller Road on the Cherry Tata



Logging, slashing and prescribed burning at Miller Road reduced forest canopy from 30% to 10%, resulting in 100% increases in forage production.

— Tim Ross photos

Range Unit near Ta Ta Creek, tree cover declined with treatment, especially within harvested units. Prescribed fire not preceded by harvest was less effective at reducing conifer cover.

The crux of ecosystem restoration effectiveness is in the response of understory vegetation. Does reduction in overstory canopy cover automatically mean an increase in understory forage? How do preferred forage species respond to treatment? Can treatments effect change in species composition? Given the variation in site conditions—climate, slope, aspect, tree cover, soils and management history—it is not surprising that treatment responses also varied.

FORAGE PRODUCTION At Miller Road, forage production increases attributed to treatments were approximately two-fold. Some of this increase may have been due to better growing conditions (temperature, precipitation), however, because production over the same period also increased at the untreated control site, albeit not to the same degree.

On Waldo Range Unit pastures near Elko, logging over the winter of 2002-03 reduced stand density to 250 sph. Residual trees were distributed in three different ways: evenly, in clumps, and by logger's choice. This was the restoration program's first study to compare the effects on forage production of varying post-harvest tree distribution.

Pre-treatment data collected in 2000 showed forage standing crop averaged slightly less than 140 kg per ha. Pinegrass contributed 42% of the forage production while bunchgrasses contributed 20%.

By 2005, forage production had increased to approximately 760 kg per ha, on average. Pinegrass production increased by seven times and bunchgrass production increased by six times. Species composition was unchanged from 2000; pinegrass still averaged about 40% of total forage.

While significant increases in forage standing crop were observed at all treatment sites, the largest increases came in the clumped and logger's choice sites where production was almost 980 and 1,200 kg per ha, respectively, in 2005. At least two years were required for treatment effects to manifest themselves.

Growing-season precipitation may have enhanced treatment effects. Precipitation was 47% of the long-term normal in 2000, 80% in 2003, 130% in 2004, and 100% in 2005.

In contrast to the results described above, neither the Sheep Creek North/Wolf-Sheep Creek sites near Premier Ridge nor the Fontaine North site have experienced significant increases in bunchgrass production following treatment. At the last-named site, growing-season rainfall during the monitoring period was 25-40% of the long-term average.

At Stoddart Creek, positive response was clearly evident in bluebunch wheatgrass, but not in other species. Bluebunch wheatgrass also responded favourably to a prescribed burn at Johnson Lake Pasture near Skookumchuck but fescue continues to lag pre-treatment levels. Both bluebunch wheatgrass and fescue have increased at Rushmere, a positive early result.

Restoration treatments consistently reduce shrubs, and slow recovery in most of these browse species was apparent. But it is still early in the restoration cycle; it will likely take an additional 5-10 years to ascertain ultimate treatment effects on vegetation.

In summary, positive vegetation response is not certain and is dependent largely on remnant vegetation species, extent of overstory cover and moisture. Drier sites with existing bunchgrasses may meet expectations, depending on climate conditions and degree of disturbance. Moister, pinegrass-dominated sites will require longer response times and may not meet bunchgrass production increase expectations. Objectives around shrub production may have to be refined to focus on maintenance rather than increase.

DISTURBANCE EFFECTS Restoration treatments can “release” undesirable plants, just as they release desirable species such as bunchgrasses. Thus, post-treatment monitoring and management are important tasks. Invasive non-native plants often follow soil disturbance. Restoration treatments, especially overstory harvest, have the potential to release these aggressive alien species on disturbed soil along skid trails, roads and landings. Hence, many sensitive sites are treated during the winter months when the ground is frozen.

In addition, cattle and wild ungulates can spread invasive plants from site to site via their foraging activities. At Fontaine North, where cattle grazing occurred annually during and after restoration treatments, sulphur cinquefoil and Dalmatian toadflax increased, whereas the ungrazed Stoddart Creek site remained virtually free of such undesirable perennials following treatment. Black medic, an annual non-native species, increased significantly on Springbrook and Johnson Lake Pastures following prescribed fire, but is expected to decrease over time as the understory recovers.

Resting sites from cattle grazing for at least one growing season following treatment is a possible means to minimize opportunities for invasive plant establishment and to allow native vegetation to recover. Wild ungulate grazing cannot be similarly managed.

COMPLICATING FACTORS In the years since the restoration program was launched, extreme weather variability, increasing populations of wild ungulates, and livestock grazing have interacted to affect results in the Trench.

Variable precipitation is the most important factor in masking or enhancing treatment effect. Between 2000 and 2005, average April-October



Ponderosa pine seedlings and coarse woody debris were reduced dramatically following a prescribed burn at Wolf Creek in 2004. The site was logged in 2000 to reduce tree density from 513 to 192 sph, opening up the canopy by 30%. Pinegrass is currently the leading understory plant species.

— Rocky Mountain Forest District photos



THE FORAGE DEFICIT

WHY DO RESTORATION RESULTS SO OFTEN FOCUS ON FORAGE PRODUCTION? TWO REASONS.

1) The plant communities that make up the forage resource not only support wild and domestic ungulate populations, the biggest consumers of forage, they represent biodiversity. If grassland/open forest plant communities are healthy, all wildlife species that depend on them will be healthy too.

2) Forage consumption measured against forage production indicates rangeland carrying capacity. Range scientists have determined a “safe use” level for rangeland sustainability: 50% of available forage can be consumed, 50% must be left untouched, if the forage resource is to remain abundant and secure into the future.

Safe use is often exceeded in the Trench. A major 1992-94 study of three range sites revealed a forage deficit of significant proportions. Combined consumption by cattle and elk exceeded safe use at all sites in all years, ranging from a low of 50% to a high of 73% and averaging 59%.

precipitation recorded at the Cranbrook Airport ranged from 12.65 to 30.67 cm. The long-term average is 23.71 cm.

There are insufficient data to determine the exact elk population in the East Kootenay, however, it is clear that elk populations in the southern part of the Trench have been increasing since 1998. Biologists estimate steady growth from a low of 16,500 elk in 1997 to possibly 23,000 in 2003. Indirect measures of population growth such as high cow/calf and cow/bull ratios have been documented in surveys in 2002, 2003 and 2004.

An estimated 8,500 to 9,000 cow/calf units, that is, mother cows with nursing calves, graze on Crown ranges in the Trench for approximately five months of the year. These numbers have remained fairly constant for a number of years.

The impacts of weather, elk and cattle grazing, combined with the cumulative effects of forest ingrowth, have contributed to the decline of range productivity and produced an ever more urgent need for the restoration program to offset these pressures.

While all stakeholders recognize that ecosystem restoration is a long-term solution, some are adopting, others considering, short-term strategies to address current range condition. In 2005, the Ministry of Environment introduced additional antlerless elk hunting opportunities on Crown land in the southern Trench to reduce pressure on overgrazed native grasslands and alleviate depredation of private pasture lands. A 2005 range strategy report recommended managing domestic and wild ungulate populations within the limits of sustainable Crown range carrying capacity. This advice reiterated one of the key recommendations in the 1997 East Kootenay Trench Agriculture/Wildlife Committee final report.

Ranchers with grazing tenure on Crown land are required to develop range use plans that specify pastures to be grazed, duration of grazing and number of animals. Moving cattle from pasture to pasture, and resting some pastures altogether, reduces grazing impacts and contributes to maintaining range health.



THE BOTTOM LINE The big-picture perspective often masks what is happening at the site level. The restoration program is built on the premise that if sufficient sites are treated, positive results will accrue over time.

The guidelines for ecosystem restoration laid out a 30-year timeline in which initial treatments were to occur at “break-even” levels to offset historic rates of ingrowth. The restoration program has treated a substantial number of hectares in its first eight years but has not met the target of 4,500 ha per year that has been set to match the desired ecological condition by 2030.

Current range conditions are being described in deficit terms. Given that the original impetus for ecosystem restoration was resolution of the longstanding elk-cattle forage conflict, then in that context, the restoration program in the Trench must be escalated to achieve sufficient ecosystem improvements to meet demands.

This need is recognized by resource managers and users who are calling for substantial increases in the level of restoration activity. The 2005-09 East Kootenay elk management plan, for instance, says that efforts must increase by several times the

level achieved to date if ongoing social and economic upheaval, and significant worsening of ecological conditions, are to be avoided over the next two to three decades.

The Steering Committee’s restoration program has been in operation for less than 10 years, while the productivity and vigour of rangeland plant communities has been gradually declining over many decades. It is unrealistic to expect significant improvement in a brief period. The reality is that there is no quick ecological fix.

We are left to answer two questions:

- 1) Are restoration treatments effective at meeting site-level forest and understory production expectations?
- 2) Are sufficient sites being treated to meet big-picture expectations of better range conditions, reduced agriculture-wildlife conflict and increased biodiversity?

The answer to the first: partially.

The answer to the second: not yet.

The next section outlines a series of initiatives that addresses the questions posed above. In five years’ time, we anticipate the answer to both questions will be an unqualified “yes.”



Ranchers in the Trench have turned to wildlife fences to keep elk and deer off their cultivated croplands and pastures. From 2001 to 2005, 239 km of fencing was erected on 88 properties to enclose 4,635 ha of private land. Total cost was just over \$3 million. Between 2002 and 2005, ranchers documented, and the Ministry of Agriculture verified, close to \$2 million worth of losses to crop depredation by wild ungulates. This prevention, mitigation and compensation program, known as the East Kootenay Agriculture Wildlife Project, is cost shared by participating ranchers, the BC agriculture ministry, and Agriculture and Agri-Food Canada.

— Susan Bond photo

6. THE WAY AHEAD

By
GREG ANDERSON, BSc.F., MSc.F.

Greg Anderson is Chair of the Steering Committee and Operations Manager at the Rocky Mountain Forest District.



The Bull Mountain area in the Power Plant Range Unit provides high quality winter range for deer, elk and bighorn sheep, and is used for livestock grazing by two ranching operations. The restoration priority was to return the site to high forage production. Several at-risk wildlife species have also benefited from restoration treatments applied here.

— Rocky Mountain Forest District photo

The need for fire-maintained ecosystem restoration in the Trench has been identified by government, industry and the public, and continues to be embraced in all quarters. Ecologically, restoration is the responsible thing to do, and in the process generates multiple social and economic benefits. The collective effort of the many agencies, groups and individuals passionate about restoration of the Trench has resulted in success that is unparalleled in British Columbia or Canada. Our success is due solely to a collective, non-partisan approach that is largely unique to the East Kootenay.

That said, the successes are admittedly not sufficient for all; there is much work to be done to further improve and expand on the current process and results. While the Steering Committee's vision remains constant, achieving our 118,500-ha restoration target prior to 2030 is a desirable goal – and realistically achievable if enabling conditions, primarily financially related, present themselves.

Over the next five years (2006-2010), the Steering Committee will actively pursue the following initiatives.

1. PROGRAM PARTICIPATION

In its formative years, the restoration program purposely focused on extensive areas of forested Crown lands generally removed from population centres. At the behest of various funding sources, project decisions were often driven by the condition of the forage resource. As a result, significant portions of the Trench's fire-maintained ecosystems have either not been considered or were targeted by other parallel, and at times competing, initiatives. Synergistic opportunities have not been fully developed.

A focus of the Steering Committee, therefore, will be to broaden our mandate and scope in order to adopt a demonstrably holistic approach to restoration. We will encourage and accommodate active participation in the Trench program by the following: Parks Canada (Kootenay National Park); BC Parks; Urban Interface Fuel Hazard Reduction Program (Protection Branch, Ministry of Forests & Range); First Nations; and The Nature Trust of BC, the Nature Conservancy of Canada and The Land Conservancy of BC.

2. PLANNING, MONITORING & REPORTING

The Operations Committee will be directed to complete a “rolling” Five-Year Treatment Plan that identifies strategic project priorities and manages treatment regimens to ensure optimum results

and timely follow-through. Project selection will be guided by the principles established by the Steering Committee and outlined in Section 3. The Operations Committee will be responsible for reporting on results and updating the plan annually.

The Operations Committee will be directed to complete the database project by the fall of 2006 in order to document and track restoration projects undertaken by all agencies and groups in the Trench. The deliverable will be an interactive Web-based map and database, maintained bi-annually, that can be queried online by all interested parties. This product will become an important strategic planning tool for both the Operations and Steering Committees.

With approximately 20,000 ha now in a maintenance state, the Operations Committee will be directed to complete a rolling Ten-Year Maintenance Plan. This plan will identify sites in a maintenance state and schedule re-treatments (most commonly, prescribed burning in the fall of each year) to ensure restored sites retain their open range or open forest condition in perpetuity. Maintenance treatments will commence in the fall of 2006.

As part of the maintenance plan, the Operations Committee will be responsible for installation of long-term monitoring sites to adopted standards, reporting out on results, and modification/refinement of restoration treatment practices in response to results.

3. TREATMENT TARGETS

The Chief Forester's determination to allocate 28,000 m³ of the allowable annual cut in the Rocky Mountain Forest District to fire-maintained ecosystem restoration provides a mechanism for applying treatments on a larger scale than previously. This allocation, the first of its kind in the province, presents tremendous opportunities for innovation and leadership and, in itself, could propel the program significantly forward in terms of actual hectares treated.

The Steering Committee will be recommending to District staff how this allocation can be used most effectively to enhance the restoration program. The District's success in using the allocation will be reviewed by the Chief Forester in 2010.

While the current treatment target of 4,500 ha per year will be maintained as a minimum goal, targets will be expanded if the Steering Committee secures dedicated Ministry of Forests & Range staffing and long-term funding for the program. We will work to achieve stable staffing and funding by continuing to bring the program's positive economic, social and environmental outcomes to the attention of senior levels of government.

If our efforts are successful, treatment targets will be expanded, thus reducing the long-term treatment horizon from 2030. If unsuccessful, the program's achievements will be judged against the 4,500 ha per year minimum target.

4. PUBLIC EDUCATION & COMMUNICATION

The restoration program necessarily involves radical changes to familiar forest vistas as well as short-lived but potentially intense periods of smoke. Though the program has earned support across all sectors, it is critical to continue efforts to inform the general public of its benefits. Public education and awareness initiatives coordinated by the Rocky Mountain Trench Natural Resources Society (the Trench Society) on behalf of the Steering Committee will continue and be expanded as resources permit.

5. FORAGE PRODUCTION & ALLOCATION

The majority of sites now considered in a maintenance state are located within identified wild ungulate winter ranges which overlap with long-term livestock range tenures administered by the Rocky Mountain Forest District. As described in previous sections, wild and domestic ungulates have been competing for a diminishing natural forage resource for decades, a conflict which largely prompted implementation of the Trench restoration program.

While the forage resource typically responds to treatment by increasing in quantity and vigour, monitoring has shown that vegetation response can vary widely. The timing of the contribution that treated areas make to increasing rangeland carrying capacity is correspondingly variable.

In anticipation of expected increases in carrying capacity, the Steering Committee will commence allocating funding to initiate forage productivity assessments (completed to District standards) to confirm and document the extent of forage production. Assessment data will be provided to the Rocky Mountain Forest District, which will devise and adjudicate a process to fairly allocate future forage increases to wildlife use (as represented by the Ministry of Environment) and range tenure holders (as represented by the District's Range Advisory Committee).

6. ADAPTIVE MANAGEMENT

Under the auspices of the Steering Committee, the Trench Society's Waldo North Demonstration Project on the Waldo Range Unit will be completed. The 1,700-ha project, launched in 2004, is designed to develop and test a model for enhanced large-scale restoration operations in the Trench. Methods include applying integrated treatments across the entire project area, harvesting trees to optimum open range/open forest stocking standards using a temporary licence to cut, generating partial self-financing by marketing harvested wood, and conducting studies to determine overall cost effectiveness and plant community response. The Steering Committee intends to apply the learnings from the Waldo North project in other appropriate locations in the Trench.

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- Agriculture in the East Kootenay: www.agf.gov.bc.ca/resmgmt/sf/agbriefs/
East Kootenay profile: www.rdek.bc.ca/
- Ecosystem restoration in the Rocky Mountain Forest District, including monitoring results from Premier Ridge: www.for.gov.bc.ca/drm/erp/erp.htm
- Fish and wildlife conservation and enhancement projects in the Canadian portion of the Columbia Basin: <http://www.cbfishwildlife.org/>
- Kootenay Boundary Higher Level Plan, including Kootenay Boundary Land Use Plan Implementation Strategy: srmwww.gov.bc.ca/kor/hlp/main.htm
- Species and ecosystems at risk in BC: www.env.gov.bc.ca/wld/serisk.htm
- Ungulate winter ranges in BC: www.env.gov.bc.ca/wld/uwr/index.html

ABBREVIATIONS USED IN THE TEXT

AAC	allowable annual cut
cm	centimeter (1 cm = .394 inch)
CORE	Commission on Resources & Environment
EKTAWC	East Kootenay Trench Agriculture/Wildlife Committee
ER	fire-maintained ecosystem restoration (<i>range, rangeland, open range, grassland, open forest, savanna</i> and <i>NDT4</i> are used interchangeably to identify the ecosystems being restored)
ha	hectare (1 ha = 2.471 acres)
kg	kilogram (1 kg = 2.205 pounds)
km	kilometre (1 km = .621 mile)
KBLUPIS	Kootenay Boundary Land Use Plan Implementation Strategy
m ³	cubic metre
NDT4	Natural Disturbance Type 4
RMPD	Rocky Mountain Forest District

ROCKY MOUNTAIN TRENCH ECOSYSTEM RESTORATION STEERING COMMITTEE

CHAIR: Greg Anderson, Operations Manager, Rocky Mountain Forest District

MEMBERS: Edward Abbott, Manager of Resource Conservation, Lake Louise, Yoho and Kootenay Field Unit, Parks Canada

Maurice Hansen, Coordinator, Rocky Mountain Trench Natural Resources Society (an umbrella organization representing the Cranbrook Archery Club, East Kootenay Wildlife Association, Kootenay Livestock Association, Rocky Mountain Naturalists, Southern Guides & Outfitters Association, The Land Conservancy of BC, Waldo Stockbreeders Association, wildsight and Windermere Farmers Institute)

Lonnie Jones, Chair, Range Advisory Committee, Rocky Mountain Forest District

John Krebs, Senior Wildlife Biologist, Columbia Basin Fish & Wildlife Compensation Program

Mike Malmberg, Agrologist, Kootenay Livestock Association

Denis Petryshen, Stewardship Supervisor, Rocky Mountain Forest District

Andy Pezderic, Past President, East Kootenay Wildlife Association/Chair, Land Use/Forestry Committee, BC Wildlife Federation

Chris Stagg, Chief Forester, Western Canada Operations, Tembec Industries Inc.

Greg Tegart, Regional Manager, Central BC, Ministry of Agriculture & Lands

Irene Teske, Wildlife Biologist, Ministry of Environment

OPERATIONS COMMITTEE

CHAIR: Denis Petryshen, Stewardship Supervisor, Rocky Mountain Forest District

MEMBERS: Doug Adama, Contract Biologist, Columbia Basin Fish & Wildlife Compensation Program

Sue Crowley, Wildlife Biologist, Environmental Stewardship Division, Ministry of Environment

Mike Daigle, Compliance & Enforcement Officer/Prescribed Burn Coordinator, Rocky Mountain Forest District

Cam Donaldson, Forest Planner, Galloway Lumber Co. Ltd.

Mike Gall, Conservation Specialist, Parks & Protected Areas, Ministry of Environment

Gerry Grady, Practices Forester, BC Timber Sales, Rocky Mountain Forest District

Maurice Hansen, Coordinator, Rocky Mountain Trench Natural Resources Society

Larry Ingham, Project Biologist, Columbia Basin Fish & Wildlife Compensation Program

Jodie Kekula, Range Supervisor, Rocky Mountain Forest District

Rieva McCuaig, Resource Stewardship Agrologist, Ministry of Agriculture & Lands

Anne Skinner, Range Agrologist, Rocky Mountain Forest District

Steve Temple, Area Forester, Kootenay-Columbia Region, Tembec Industries Inc.

Failure to take action is not an option.

The cumulative negative impact of changes to the fire-maintained ecosystem of the Rocky Mountain Trench is extensive and touches all aspects of East Kootenay industry and society. Restoration and maintenance of the Trench's unique ecology — its forests, grasslands, wildlife and plant diversity — are too critically important to the region's economic and cultural future not to proceed.

— A BLUEPRINT FOR ACTION (2000)

GRASSLAND SPECIES AT RISK IN THE TRENCH



*Bluebunch wheatgrass ecological communities
— imperilled.*

— Susan Bond photo



*Arrowhead blue butterfly
— of special concern.*

— Paul Opler photo



Long-billed curlew — of special concern.

— A. Wilson photo



*Rocky Mountain bighorn sheep — of special
concern.*

— Rocky Mountain Forest District photo



*Columbian sharp-tailed
grouse — extirpated in
the Trench.*



American badger — endangered.

— Richard Klafki photo

