Strathcona Elk Winter Range Restoration Project
2002 Annual Report

EXECUTIVE SUMMARY

This report summarizes Bridge Coastal Restoration Program (BCRP) funded habitat restoration activities in Strathcona Provincial Park between April of 2002 and March of 2003. Its intent is to highlight the restoration and monitoring techniques used, as well as to document the project team's efforts to raise the profile of Roosevelt elk and their habitat needs within the region.

The BCRP has provided funding for this project since the program's inception in 2000. Planning got underway that year with the identification of potential sites and review of available restoration techniques. In 2001, a detailed five-year implementation and monitoring plan was developed for 10 sites. BCRP funding of $85,300 was provided in 2002 for six sites, five in the Elk River Valley and one in Thelwood River Valley. The sites are situated from 60 to 80 km west of the town of Campbell River. Site elevations range from about 220 m to 280 m, placing them within the Very Dry Maritime Variant of the Coastal Western Hemlock Biogeoclimatic zone (CWHxm).

The overall objective of the 2002 work plan was to increase the carrying capacity for elk by increasing forage production and improving cover attributes. Forage production enhancement involved:

- enlarging existing gaps in the forest canopy (1 site)
- pruning tree limbs (1 site)
- browse plantings (3 sites)
- scarification and seeding with native and agronomic grass mixtures (2 sites)
- browse rejuvenation (1 site).

Cover attributes were improved by:

- pruning clusters of trees with good snow-intercepting qualities to create bedding sites (1 site)
- planting conifers to increase security cover (2 sites).

Restoration-related costs accounted for about 68 % (or $ 57,900) of the total budget for 2002. About 60 % of the restoration expenditures went towards labour while the remaining 40 % went towards equipment and supplies. Labour costs included:

- site layout, inspections and supervision
- falling, brushing and pruning
- planting and browse protection
- emergency watering.

Expenditures related to equipment and supplies included:

- excavator and mobilization costs
- native grass seed, shrubs, and trees
- browse protection fencing, and
- slow-release organic fertilizer.

Habitat manipulation to benefit elk has not been well studied in the coastal context. The experimental nature of the trials, and their potential utility to other land managers, necessitated a significant effort in documenting successes and failures. It should be noted that this project could well provide the foundation for government-supported Roosevelt elk enhancement elsewhere on Vancouver Island in the coming years (long-term funding to be provided through auctioning of elk tags). Total costs related to the monitoring program totaled about $ 18,500, or 22 % of the total approved BCRP budget. About half of the monitoring cost was associated with labour inputs, and the other half was related to equipment. Monitoring-related labour included:

- pre-restoration browse abundance/utilization (8 plots over 2 sites)
- pre-restoration winter pellet group counts (4 transects over 4 sites)
- herbage production studies (8 clipping plots over 2 sites)
- installation and maintenance of remote cameras (3 systems over 2 sites)
- periodic inspections of planted and seeded material
- GPS surveying of clearing boundaries and monitoring locations, and
- elk aerial census covering the two valleys.

The monitoring program involved 21 person-days of paid labour. Significant "in-kind" assistance with the above was provided by personnel from the Ministry of Water, Land & Air Protection in 2002 (in excess of 20 person-days).

Equipment costs included:

- construction of a 10 m x 10 m elk exclosure to study the growth of native grass seedrows in the absence of grazing pressure
- 4.5 hours of helicopter time to conduct two aerial surveys, and
- rental of three remote camera systems.

Approximately 10 % (or $ 8,900) of the total budget was expended on communications. In addition to this annual report, three quarterly progress reports were forwarded to the BCRP Program Manager for internal circulation. About one-third of the communications budget was expended on the development of two interpretive signs for the Strathcona Elk Portal. They feature information about Roosevelt elk natural history, habitat restoration techniques undertaken for this project, as well as information about the BCRP Program as a whole. Work on the signs was initiated in December of 2002. Other efforts to increase awareness of the project and Roosevelt elk habitat needs in 2002 included the following:

- Volunteer Work Party - members of the Willow Point Scout Troop in Campbell River assisted with the seeding and fertilizing of Site 1 on May 24, 2002 following a presentation on elk natural history.

- Project Information Sheets – 11" x 17" Project Information Sheets were posted at the each restoration site, the Elk Portal bulletin board, and at the Driftwood Bay and Ralph River campgrounds in August of 2002.

- Feature Articles - articles on the project as a whole and site-specific treatments were included in the Spring 2002 and Winter 2003 issues of *Environmental Management Bulletin*, the company newsletter of URSUS Environmental.

- Presentations - an information poster highlighting the work at Site 3 was prepared for the September 2002 meeting of the Nanaimo Field Naturalist Club. A Powerpoint presentation was given at the MWLAP Ecosystems Section Meeting in November of 2002.

- Site Tour - a field tour of Sites 1, 2, 4, and 5 was given to personnel from BC Parks, MWLAP Regional Headquarters and Western Forest Products Ltd. in mid-October of 2002.

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1.0 INTRODUCTION

1.1 Background

Elk winter range enhancement has been carried out for several decades in the B.C. Interior. However, relatively little is known about restoration techniques suitable for Vancouver Island and the adjacent Mainland coast, where a Blue–Listed subspecies of elk occurs (Roosevelt elk; *Cervus elaphus roosevelti*). Some winter forage restoration trials were carried out in the Campbell River Watershed during the mid-1980's (Janz 1982; Davies 1986) through the Habitat Conservation Fund. However, these were of short duration and had limited resources for monitoring. In 1993, BC Hydro commissioned a wildlife restoration study for the Campbell River drainage which outlined some possible means of restoring elk winter range in park and non-park land (Blood 1993).

In 2000, the creation of BC Hydro's Bridge Coastal Restoration Program (BCRP), a long-term fish and wildlife compensation program addressing footprint and operational impacts of hydro development, provided biologists with an opportunity to conduct operational trials on a range of enhancement and restoration techniques on Vancouver Island. Project planning got underway in 2000 with the identification of potential sites and review of available techniques (Materi and Blood 2000). A detailed five-year implementation and monitoring plan was developed for 10 sites in Strathcona Provincial Park in 2001 (Materi 2001). Funding for five sites in the Elk River Valley and one in the Thelwood River Valley **(Fig. 1)** was provided through the BCRP Program in 2002.

This report summarizes activities in the project area over the 2002 funding year, which extended from April of 2002 to March of 2003. Its intent is to highlight the restoration and monitoring techniques used, as well as to document the project team's efforts to raise the profile of Roosevelt elk and their habitat needs within the region.

1.2 Project Rationale

Since completion of the Strathcona Dam in 1958, about 31 km^2 (3,100 ha) has inundated in the Upper Campbell / Buttle system. Although no pre-flooding studies of habitat conditions were conducted, Canada Land Inventory mapping of adjacent areas suggests that the habitat capability for Roosevelt elk would have been high on the inundated lands. Preliminary estimates in Blood (1993) indicate that flooding reduced the total watershed's carrying capacity for elk by about 75 to 100 individuals. That investigator recommended that compensation measures be *"intensive and involve large areas of the remaining winter range in the area"*. Economic impacts of reservoir creation on elk hunting and viewing were estimated by Materi and Blood (2000) were estimated to be in the vicinity of $800,000.

Providing suitable winter range is a key factor in the long-term persistence of elk herds on Vancouver Island (Nyberg and Janz 1990). Winter and early spring can be periods of severe nutritional stress because most types of forage are generally of low quality at those times of the year. Although elk can digest forage of lower nutritional quality than deer, their social nature necessitates access to more concentrated forage resources than deer. This factor, and the fact that snowfall is considerably lower in valley bottoms than at higher elevation, makes rich valley bottom stands and swamps important winter habitats for elk. BC Hydro has recognized that the loss of valley bottom habitats to flooding as a factor limiting ungulate production in the BCRP Strategic Plan for the Campbell River watershed (BC Hydro 2000). In addition, the Strathcona Provincial Park Master Plan (BC Parks 1993) acknowledges that critical ungulate winter ranges have also been affected by other non-conforming activities within the park (e.g. mining, highways).

1.3 Project Objectives

The overall objective of the 2002 work was to increase the carrying capacity of valley-bottom habitats at six sites in Strathcona Provincial Park for elk. This was to be accomplished by increasing forage production and improving cover attributes. Forage production would be improved by:

- enlarging existing gaps in the forest canopy (1 site)
- pruning tree limbs (1 site)
- browse plantings (3 sites)
- scarification and seeding with native and agronomic grass mixtures (2 sites)
- browse rejuvenation (1 site).

Cover attributes would be improved by:

- pruning clusters of trees with good snow-intercepting qualities to create bedding sites (1 site)
- planting conifers to increase security cover (2 sites).

An important secondary objective was to increase public awareness of Roosevelt elk and their habitat needs in the park and surrounding areas.

It should be noted that the project will assist BC Parks in meeting wildlife-related objectives of the Strathcona Provincial Park Master Plan. That document makes reference to the desirability of restoring impacted habitats, conducting management-oriented research and providing information on vulnerable species to the public. The 2002 work plan addresses each of the above.

Acknowledgements

We are indebted to many for their assistance over the past 12 months. This project would not have been possible without the funding provided by BC Hydro's Bridge Coastal Restoration Program. Special thanks to BCRP Program Manager, Janice Doane, for keeping the paperwork moving. Substantial "in-kind" contributions for this project were provided by BC Parks. Rik Simmons and Brent Blackmun of BC Parks provided administrative support while Park Rangers Steve Pratt and Sheila Walda supplied invaluable assistance in the field. We are grateful for the technical advice of Kim Brunt, Ministry of Water, Land & Air Protection and Manny Vaartnou, M. Vaartnou Associates Ltd. Doulyn's Contracting of Campbell River generously donated 15 hours of machine time to meet our clearing requirements.

2.0 ENVIRONMENTAL SETTING

2.1 Location

Initially, four sites were proposed for restoration in 2002. However, a budget surplus allowed for the inclusion of two additional sites in the 2002 work plan. Five of the sites are situated in the Elk River Valley, which drains into Upper Campbell Lake **(Fig. 2A).** The other is located in the Thelwood River Valley, which drains into the southern part of Buttle Lake **(Fig. 2B).** The sites range from 60 to 80 km west of the town of Campbell River.

2.2 Terrain and Climate

The project area is situated in mountainous terrain within the Leeward Island Mountains Ecosection. Valley-bottom elevations in the study area range from approximately 220 m to 280 m. Elevations between 200 m and 600 m on this part of Vancouver Island fall into the Moderate Snowpack Zone described by Nyberg and Janz (1990). Within this zone, accumulations are usually shallow but persistent. However, "critical" snowfall accumulations (i.e. those >45 cm deep and persisting for four weeks or more) occur every 5 to 15 years on average. Review of snowfall data from a reporting station on Highway 28 near Crest Lake (elev. 270 m) indicates snowfall accumulations greater than 45 cm occurred in 19 of 30 years between 1955 and 1985 (MoE Water Management Branch 1985).

Two variants of the Coastal Western Hemlock (CWH) Biogeoclimatic Zone are present in valley bottoms within the project area. The lower elevation variant, the CWHxm2, is relatively dry and extends from the valley floor to about 300 m elevation **(Fig. 3).** The higher elevation variant, the CWHvm1, ranges to upwards of 650 m elevation, and is moister. It is expected that most elk winter range would be in the CWHxm1 and so most restoration activities have therefore been proposed for that subzone. Forests on zonal sites of the CWHxm Variant are dominated by Douglas-fir, western hemlock, and lesser amounts of western redcedar. Amabilis fir typically replaces Douglas-fir in the wetter CWHvm1 Variant (Green and Klinka 1994).

Within the project area, much of the valley bottom supports young seral stages as a result of wildfire, logging, and reservoir flooding. Based on vegetation plots in Materi and Blood (2000), plant communities associated with average to above average soil moisture and nutrient regimes occur within restoration sites (i.e. Site Series CWHxm1/01,07, 08, and 09). They estimated that about 200 ha of key valley bottom winter range occurs in the Elk Valley, with another 90 ha present in the Thelwood Valley.

3.0 RESTORATION ACTIVITIES

3.1 Overview

Restoration-related costs accounted for about 68 % ($ 57,890) of the total BCRP–approved budget for the 2002 funding year ($85,300). As indicated in Table 1, nearly 60 % of the restoration expenditures went towards labour while the remaining 40 % went towards equipment and supplies. Labour costs included:

- site layout, inspections and supervision
- falling
- brushing and pruning
- planting
- browse protection installation, and
- emergency watering.

Expenditures related to equipment and supplies included:

- excavator and mobilization costs
- native trees and shrubs
- native grass seed
- browse protection fencing, and
- slow-release organic fertilizer.

Site maps for the six areas where restoration activities took place in 2002 are given in **Figures 4, 5, and 6**. Summaries of the location, objective, treatment and cost for individual restoration sites are provided in the following pages, along with site photographs. It should be noted that planning labour has not been included in the above because it often involved several sites concurrently, and was organized to meet the requirements of BC Parks. A comparison of actual to budgeted project costs is shown in **Appendix A**.

Table 1. Summary of restoration-related BCRP costs in 2002 budget year.

	Item	Cost	Totals
A. Labour			
	Project Biologist	10,500	
	Contract Faller	2,880	
	Brushing & Pruning	13,200	
	Planting & Browse Protection	6,000	
	Emergency Watering	2,000	
			$ 34, 580
B. Equipment & Supplies			
	Excavator & Mobilization	5,000	
	Browse Plantings	9,418	
	Protective Fencing	1,659	
	Native Grass Seed [1]	5,604	
	Agronomic Seed & Fertilizer	1,174	
			23,310
TOTAL			**$ 57,890**

Notes:
[1] includes purchase of 51 kg of native seed to be used in 2003 (total cost $ 2,040).

3.2 Site 1

Location: BC Hydro Right-of-Way across fm BC Parks wildlife viewing platform off Hwy 28.

Size: 0.6 ha

Elevation: 270 m **BGC Zone:** CWHxm2

Site Series: N/A (disturbed) **Structural Stage:** 3 (Shrub/herb)

Pre-restoration Conditions: Dense patches of young Douglas-fir trees interspersed with a light cover of weedy forbs and grasses. Occasional large stumps.

Objective: Increase herbage production for late winter / early spring use.

Treatment:

- clearing and scarification using excavator on May 13/02.
- seeded at 60 kg/ha on May 26/02 with agronomic mix containing:
  - 25 % perennial late ryegrass
  - 20 % alsike clover
  - 15 % creeping red fescue
  - 10 % sheep fescue
  - 10 % red clover
  - 10 % birdsfoot trefoil
  - 5 % colonial bentgrass
  - 5 % timothy
- fertilized at 150 kg/ha using high phosphorus "turf starter" fertilizer (18-32-6) on May 26/02.
- watered three times in May using portable fire pump.
- fill-seeding with 8 kg of native grass mixture on Sept. 23/02.

Restoration Costs:

- Excavator and mobilization $ 1,000
- Seed and fertilizer $ 1,174

3.3 Site 2

Location: Alluvial fan due west of Tlools Creek.

Size: 4 ha

Elevation: 230 m **BGC Zone:** CWHxm2

Site Series: 01 (HwFd – Kindbergia) **Structural Stage:** 5 (Young Forest)

Pre-restoration Conditions: Relatively open stand of second-growth dominated by Douglas-fir trees. Canopy closure averages about 40 %. Moderately well-developed understory of huckleberry, blueberry, Oregon grape and salal. Elk browse species averaged about 17 % cover.

Objective: Increase browse production for winter use.

Treatment:

- selective falling of trees in 10 small clusters over Aug 1 -13/02 to create canopy gaps covering about 10 % of total site (0.4 ha).
- concurrent bucking and piling of downed trees to maintain elk access and facilitate browse production .

Restoration Costs:

- Falling $ 2,880

3.4 Site 3

Location: Riverside bench approx. 200 m east of Tlools Creek.

Size: 1.5 ha

Elevation: 230 m **BGC Zone:** CWHxm2

Site Series: 07 / 08 (Cw – Foamflower / High Bench floodplain)

Structural Stage: 5 (Young Forest)

Pre-restoration Conditions: Relatively rich and moist deciduous stand dominated by young big leaf maple trees and occasional large cottonwoods. Understory consists of a sparse cover of swordfern, vanilla leaf and grasses with patches of salmonberry. Herbage production hampered by dense forest canopy and high leaf litter.

Objective: Increase herbage production for late winter / early spring use.

Treatment:

- clearing, scarification, and leveling of 0.9 ha using a fully caged excavator from May 14 – May 17/02.
- seeded at approx. 90 kg/ha on May 27/02 with native grass mix containing:
  - 50 % Alaska brome
  - 20 % slender wildrye
  - 20 % Canada bluegrass
  - 10 % "Duncan"mix (Alaska brome, tufted hairgrass, slender hairgrass, blue wildrye and native red fescue).
- watered once/week from mid-June to mid-July using a portable fire pump.
- fill-seeding with 8 kg of native grass mixture on Sept. 23/02.

Restoration Costs:

- Excavator & mobilization $ 4,000
- Native grass seed $ 3,564

3.5 Site 4

Location: Alluvial fan on east side of Thelwood River Valley.

Size: 10 ha

Elevation: 220 m – 240 m **BGC Zone:** CWHxm2

Site Series: 01 (HwFd – Kindbergia) **Structural Stage:** 5 (Young Forest)

Pre-restoration Conditions: Stand dominated by young Douglas-fir with occasional cedar, red alder, and big leaf maple. Understory consists of dense patches of bracken fern, with some areas of salal and vanilla leaf. Canopy gaps are largely filled by juvenile firs and decadent willow.

Objectives: Increase winter browse production and diversity.
Improve security cover (i.e. screening) from roads
Create bedding sites in close proximity to forage production areas.

Treatment:

- brushed 3.1 ha using 3-person silviculture crew between Nov. 5 and Nov. 15/02. Douglas-fir trees < 15 cm DBH selectively removed in 29 work areas. Pruning of lower branches of all firs >15 cm DBH.
- browse rejuvenated by cutting down all deciduous shrubs > 3 m in height and maples < 30 cm DBH.
- wood debris piled outside of 20 m radius treatment areas to facilitate forage production and elk access.
- 100 browse plantings (1 gal.) installed in clusters of 10 at north end of site and fenced off using salmon-pen netting.
- Distribution of browse species was as follows:
  - 20 % big leaf maple - 10 % Saskatoon
  - 20 % black cottonwood - 10 % red-flowering currant
  - 15 % Scouler's willow - 10 % thimbleberry
  - 15 % Sitka willow

- 2 gal. to 5 gal. conifer planting stock installed along 250 m of roadway (individual cedars fenced for protection).

Restoration Costs:

- Pruning, brushing, & debris mgmt	$13,200
- Browse / security plantings	$ 2,996
- Planting & browse protection	$ 2,000

3.6 Site 5

Location: Riverbench near Hwy. 28 crossing of Elk River.

Size: 0.8 ha

Elevation: 280 m **BGC Zone:** CWHxm2

Site Series: N/A (disturbed) **Structural Stage:** 3 (Shrub / Herb)

Pre-restoration Conditions: Pavement underlying a thin veneer of gravelly soil and organic material. Sparsely distributed young cottonwood, willow and Douglas-fir trees. Trace amounts of grass, roses and weedy forbs.

Objective: Increase winter browse production and diversity.

Treatment:

- 410 shrub plantings installed in clusters of 7 in late Sept./02. The distribution of browse species was as follows:
  - 30 % black cottonwood
  - 20 % Scouler's willow
  - 20 % Sitka willow
  - 15 % big leaf maple
  - 5 % Saskatoon
  - 5 % red-flowering currant
  - 5 % thimbleberry

- entire site fenced off using approx. 400 lineal m of salmon-pen netting hung from poles.

Restoration Costs:

- Browse plantings	$ 1,500
- Fencing materials	$ 1,659
- Planting & fencing labour	$ 4,000

3.7 Site 6

Location: Recently decommissioned part of ERT Logging Road, from Eastern Park Boundary to Tlools Creek area.

Size: 2.0 ha

Elevation: 240 m **BGC Zone:** CWHxm2

Site Series: N/A (disturbed) **Structural Stage:** 1 (Non-vegetated)

Pre-restoration Conditions: Road gravel overturned and mixed with underlying soils to a depth of approx. 30 cm. Some gravelly pockets but overall suitable for planting.

Objective: Increase winter browse production and diversity.
Improve security cover.

Treatment:

- purchased 820 - 1 gal. and 2 gal. browse plantings on Dec. 10/02.
- browse species included:
  - 15 % willows
  - 13 % big leaf maple
  - 10 % red-flowering currant
  - 10 % thimbleberry
  - 10 % dogwood
  - 10 % Saskatoon
  - 6 % western redcedar
  - 6 % western hemlock
  - 6 % evergreen huckleberry

- purchased 90 – 1 gal., 2 gal. & 5 gal. screening cover plants (50 % Douglas-fir; 50 % Sitka alder).
- planting to be arranged in 2003 budget year.

Restoration Costs:

- Browse / security plantings $ 4,922

4.0 MONITORING ACTIVITIES

4.1 General

As previously mentioned, habitat manipulation to benefit elk has not been well studied in the coastal context. It should also be noted that the current project could well provide the foundation for government-supported Roosevelt elk enhancement elsewhere on Vancouver Island in the coming years (long-term funding to be provided through auctioning of elk tags). The experimental nature of this project, and its potential utility to other land managers, necessitated a significant effort in documenting its successes and failures.

Costs related to the monitoring program totaled about $ 18,500, or 22 % of the total BCRP budget. As shown in Table 2, about half of the monitoring cost was associated with labour inputs, and the other half was related to equipment. Monitoring-related labour in 2002 included:

- pre-restoration browse abundance/utilization (8 plots over 2 sites)
- pre-restoration winter pellet group counts (4 transects over 4 sites)
- herbage production studies (8 clipping plots over 2 sites)
- installation and maintenance of remote cameras (3 systems over 2 sites)
- periodic inspections of planted and seeded material
- GPS surveying of clearing boundaries and monitoring locations, and
- elk aerial survey covering the entire project area.

The monitoring program involved 21 person-days of paid labour. Significant "in-kind" assistance with the above was provided by personnel from the Ministry of Water, Land & Air Protection in 2002 (approximately 20 person-days).

Equipment costs included:

- construction of a 10 m x 10 m elk exclosure to study the growth of native grass seedrows in the absence of grazing pressure
- 4.5 hours of helicopter time to conduct two aerial surveys, and
- rental of three remote camera systems.

A brief discussion of individual monitoring activities in 2002 is given below.

Table 2. Summary of monitoring-related BCRP costs in the 2002 budget year.

	Item	Cost	Totals
A. Labour			
	Project Biologist	7,650	
	GPS / Mapping Contractor	2,000	
			$ 9,650
B. Equipment			
	Seedrow Exclosure	4,053	
	Remote Camera System Rental	300	
	Helicopter for Aerial Survey	4,500	
			8,853
TOTAL			**$ 18,503**

4.2 Browse Monitoring Plots

In order to track vegetation and use changes, browse monitoring plots were established in the two sites subjected to intensive stand-tending activities (i.e. selective falling, pruning and brushing). Four browse monitoring plots were established in each of Sites 2 and 4 in early July of 2002, prior to treatment (**Figs. 5 and 6**). Within each 5 m radius plot, coverage by individual browse species was estimated using comparison charts from Luttmerding *et al.* (1990), and their average heights were estimated. Browse forage utilization codes described by Luttmerding (*op. cit.* 1990) were assigned to each browse species appearing in a plot.

As indicated in Table 3, winter browse plant coverage in the Site 2 plots averaged about 17 %, with red huckleberry being the dominant browse plant. Utilization of huckleberry ranged from light to moderate at Site 2. Winter browse plant coverage in the Site 4 plots averaged about 6 %, roughly one-third of the Site 2 average. Red huckleberry and swordfern were the most abundant browse plants at Site 4. Utilization of huckleberry ranged from moderate to heavy here, while use of swordfern was slight to light.

Stand treatment at these two sites was carried out between August and November of 2002. All plots will be re-visited at the end of the 2003 growing season, primarily to document changes in shrub cover. Browse utilization will likely not be evident until the following season.

Table 3. Summary of pre-restoration browse abundance and utilization at Sites 2 and 4.

Restoration Site	Survey Station	Total Cover of Winter Browee Species (%)	Browse Species	Utilization Codes by Spp.[1]
2	i)	23	huckleberry / Oregon grape	2 / 1
	ii)	11	huckleberry / swordfern	3 / 1
	iii)	16	O. grape / huck./ swordfern	1 / 3 / 1
	iv)	17	huckleberry / Oregon grape	3 / 1
		Site 2 avg. = 17 %		
4	i)	7	willow / elderberry	1 / 2
	ii)	5	swordfern	1
	iii)	5	huckleberry / swordfern	3 / 2
	iv)	7	huckleberry / swordfern	4 / 0
		Site 4 avg. = 6 %		

Note:
[1] Browse forage utilization codes following Luttmerding *et al.* (1990):

Code	Class	% of twigs browsed	Code	Class	% of twigs browsed
0	Nil	0 %	3	Moderate	36 – 65 %
1	Slight	1 – 15 %	4	Heavy	66 – 80 %
2	Light	16 – 35 %	5	Extreme	> 80 %

4.3 Winter Pellet Group Counts

To provide an index of elk use prior to restoration, winter pellet group counts were conducted at Sites 1, 2, 3, and 4. The counts involved walking permanent transects from 330 m to 400 m in length and recording all winter scats observed within 1 m on either side of the transect centerline (**Fig. 17**). The counts were conducted in the early spring of 2002, prior to green-up on the forest floor. Since droppings may persist for more than one season, well-weathered pellets were recorded in field notes, but excluded from the final tally for the previous winter. All pellets were removed from transects to prevent double counting in subsequent years.

Table 4 suggests that elk winter use prior to treatment was fairly high at Site 1, moderate at Site 3, and relatively low at Site 2 and Site 4. Pellet group counts will be conducted again in April of 2003.

Table 4. Pre-restoration elk winter pellet group counts (May 2002).

Restoration Site	Pellet Groups Counted	Transect Length (m)	Pellet Groups per Lineal km
1	33	330	100
2	9	350	26
3	18	350	51
4	10	400	25

4.4 Herbage Production Monitoring

To quantify herbage production in seeded areas, four clipping stations were established across each of Sites 1 and 3 at the end of the 2002 growing season **(Fig. 18)**. All palatable forage within each 1 m x 1 m quadrat was clipped and oven-dried before being weighed. As indicated in Table 5, average herbage production at Site 3 exceeded that of Site 1 by about 25 % (940 kg/ha dry weight vs. 693 kg/ha). However, it should be noted that the two sites were seeded at different rates (Site 1@ 60 kg/ha; Site 3 @ 90 kg/ha), on significantly different soils (Site 1 - dry and gravelly; Site 3 - moist and loamy). Table 5 shows that a considerable degree of variation in production was evident between stations at both locations.

Perennial late rye grass and two clovers (red and alsike clover) accounted for the bulk of the forage production at Site 1. Other seeded species such as timothy, bentgrass, and fescue were generally present only as trace amounts at the site. As might be expected given its dominance in the native seed mix, Alaska brome was responsible for most of the herbage production at Site 3. A significant cover of Canada bluegrass was found at one station with gravelly soil. However, slender wildrye was the second most abundant herb at most stations in Site 3. Trace amounts of fescue were apparent at three of four stations within Site 3.

Table 5. Forage production of seeded sites in 2002.

Site / Location	Clipping Station ID	Dry Wt. of Forage at Station (g)	Avg. Forage Production in 2002
Site 1 – Hydro R-o-W	1-1	70	
	1-2	100	
	1-3	75	
	1-4	32	
			693 kg/ha
Site 3 – Tlools Cr. East	3-1	70	
	3-2	194	
	3-3	57	
	3-4	54	
			938 kg/ha

4.5 Remote Camera Systems

Remote camera systems were installed in seeded areas to document elk use patterns during late winter and early spring. Two TrailMaster TM 1500 units with infra-red sensors were placed at Site 3 and another unit was placed at Site 1 in February, 2003. Transmitter-receiver pairs were mounted on stakes about 50 cm above the ground surface across game trails at each site. The systems were programmed to record/photograph crossing animals continuously using weather-resistant 35 mm cameras.

Even though Site 3 had been heavily grazed in December of 2002, ungulate use of the site continued over mid-to-late February of 2003. Five visits by ungulates were recorded at Site 3 over this period; three by elk **(Fig. 19)** and two by black-tailed deer. Elk foraging groups ranged from 3 to 6 individuals while all deer records were of single individuals. Elk activity at Site 3 was recorded during the mid-morning and late afternoon periods while deer activity was recorded in the early morning hours (pre-dawn). Site 1 had apparently received heavy use by elk and deer by mid-February of 2003. Only two visits by ungulates were recorded at Site 1 over the late February to mid-March period. Both were night visits by a single black-tailed deer.

Remote camera systems will be maintained at both sites over April and May of 2003 to document ungulate and bear use during the spring green-up period.

Fig. 19. Remote camera system captures cow/calf group grazing at Site 3 (February, 2003).

4.6 Periodic Inspections

Restoration areas were visited periodically to monitor plant growth, elk use, and the integrity of browse protection fencing. Brief comments are provided below.

Site 1

- well-draining soils supported a sparse cover of herbaceous plants prior to restoration **(Fig. 20).**
- scarification improved conditions somewhat by mixing in organics from an adjacent slope face.
- overall, less than 1% of the plants produced seed heads in the 1st season.
- seeded cover at the end of the growing season ranged from 8 % to 39 %, predominantly perennial late ryegrass and red/alsike clover **(Fig. 21).**
- light grazing was evident in mid-January, by late February heavy use was observed across Site 1.

Site 2

- a group of 6 elk (all bulls) were seen due west of Site 2 in April 2002.
- a group of 7 elk (5 cows + 2 calves) were observed due north of Site 2 in October.

Site 3

- prior to restoration, dense growth in the canopy appeared to favour vanilla leaf over palatable herbs in the understory **(Fig. 22).**
- despite the late seeding date, all the native grass species in the seed mix germinated. Canada bluegrass was slowest-growing species.
- elk tracks and bear scats were recorded at Site 3 throughout the spring and summer, while grass was only 3 – 10 cm high **(Fig. 23).**
- heavy use by elk became apparent in October. While grasses in the exclosure averaged about 30 cm height, those outside were uniformly grazed to < 5 cm .

Site 4

- cover plantings appeared stressed by early autumn due to an extended drought.
- deer were able to damage many of the planted cedars due to the mesh used.
- browse protection fencing was damaged shortly after installation (probably by bears) but held up well through the rest of the winter. Fresh elk droppings were observed next to the fencing in January 2003.
- recent elk use was apparent in pruned areas in mid-January 2003.

Site 5

- cottonwood and maple plantings had large buds evident in October 2002.
- December storms brought parts of the fencing down, and at least one elk entered the planting area. No damage was seen on plantings although some pre-existing cottonwoods had been browsed.
- west end of fencing was repaired in January, but was vandalized in February.

4.7 GPS Survey

A GPS survey was conducted in January of 2003 to accurately determine the size of four treatment areas and facilitate long-term monitoring of the sites. Parallel Geo Inc. of Nanaimo was contracted to carry out the work. They used a back-mounted Trimble differential GPS unit **(Fig. 24)** to locate the following items:

- edges of forest clearings
- elk winter pellet group transects
- browse monitoring plots
- herbage production quadrats
- security cover plantings
- browse protection fencing, and
- pruning and brushing treatment areas.

The survey data was overlain on the 1: 20,000 TRIM map base using ArcView GIS software to produce Figures 2, 4, 5, and 6 in this report. UTM coordinates for selected site features are provided in **Appendix B** for reference.

Fig. 24. GPS survey conducted in January 2003 using back-mounted differential GPS unit.

4.8 Elk Aerial Census

The monitoring program included an annual aerial census to document elk herd size and composition in the two valleys during the late winter period. It is hoped that the effectiveness of the restoration effort will ultimately be reflected in annual increases in herd sizes and corresponding decreases in cow/calf ratios (indicating greater calf survival). It must be acknowledged however, that other factors such as winter severity and predator density can exert a significant influence of these two population parameters.

Two flights took place under clear skies on March 3, 2003 using a Eurocopter A-Star from West Coast Helicopters Ltd. The first flight covered the morning hours while the second covered the late afternoon period. In addition to the pilot, there were three observers aboard the aircraft during each survey. Flight speed during the surveys averaged about 50 – 60 knots. The aircraft was flown from 50 m to 100 m above the ground surface for the duration of the surveys.

The morning flight recorded a single group of 16 elk in the Lower Thelwood Valley. The group consisted of 3 mature bulls, 9 cows and 4 calves (cow-calf ration of 2.25 to 1). The elk were bedded down on the margins of beaver impoundment on the eastern side of the lower valley **(Fig. 25B)**.

A total of 21 elk were counted in the Elk River Valley during the afternoon flight. A group of 19 elk were observed on the Elk River floodplain, approximately 0.5 km east of its confluence with Cervus Creek **(Fig. 25A)**. This group was comprised of 3 spike bulls, 12 cows and 4 calves (cow-calf ratio of 3.00 to 1). A pair of mature bulls were observed about 2 km to the north, on a south-facing bluff at about 420 m elevation. Interestingly, one of these bulls had already shed its antlers, suggesting it was a successful breeder the previous autumn.

5.0 COMMUNICATIONS

Approximately 10 % ($8,900) of the total budget was expended on communications **(Table 6)**. Communications work included production of quarterly progress reports and this annual report. About one-third of the total communications costs were related to the development of two interpretive signs for the Strathcona Elk Portal. They feature information about Roosevelt elk natural history, habitat restoration techniques undertaken for this project, as well as information about the BCRP Program as a whole. Work on the signs was initiated in December of 2002 (draft material is given in **Appendix C**). Other efforts to increase awareness of the project and Roosevelt elk habitat needs in 2002 included:

Volunteer Work Party

Members of the Willow Point Scout Troop **(Fig. 26)** assisted with the seeding and fertilizing of Site 1 on May 24, 2002. They were given a brief presentation on elk natural history prior to the start of work.

Project Information Sheets

Project Information Sheets **(Fig. 27)** were finalized by BC Parks staff in July of 2002. Laminated 11" x 17" copies of the information sheets were posted at the each restoration site, the Elk Portal bulletin board, and at the Driftwood Bay and Ralph River campgrounds.

Feature Articles

Articles on the project as a whole and site-specific treatments were included in the Spring 2002 and Winter 2003 issues of *Environmental Management Bulletin*, the company newsletter of URSUS Environmental **(Appendix C)**. It is distributed to biologists, foresters, planners, and engineers on Vancouver Island.

Presentations

An information poster highlighting the work at Site 3 was prepared for the September 2002 meeting of the Nanaimo Field Naturalist Club **(Fig. 28)**. A half-hour Powerpoint presentation was given at the MWLAP Ecosystems Section Meeting in November of 2002. It was followed by a 15-minute question period.

Site Tour

A day-long field tour of Sites 1, 2, 4, and 5 was given to personnel from BC Parks, MWLAP Regional Headquarters and Western Forest Products Ltd. in mid-October of 2002 **(Fig. 29)**. Personnel from the North Island Woodlot Association, Ministry of Forests, Timberwest Forest Ltd. and Canadian Forest Products Ltd. were also invited, but were unable to attend.

Table 6. Summary of communications-related BCRP costs in the 2002 budget year.

	Item	Cost	Totals
A. Labour			
	Project Biologist	7,050	
			$ 7,050
B. Expenses			
	Interpretive Signage	1,755	
	Report Production	102	
			1,857
TOTAL			**$ 8,907**

6.0 NEXT STEPS

BCRP funding of $ 69,160 has been secured to continue the Strathcona Elk Winter Range Restoration Project in 2003. The funding will be used to extend the monitoring program and carry out restoration at four additional sites identified in the 2001 Implementation Plan (all situated in the Elk River Valley). Site treatments include the following:

- **Site A:** creation of forest canopy gaps over 5 ha and brushing to stimulate elk winter browse production.

- **Site D:** creation of forest canopy gaps over 4 ha to stimulate browse production; pruning over an additional 3 ha to enhance browse production and create bedding sites.

- **Site E:** creation of an artificial meadow 1 ha in size by clearing, scarifying and seeding with a mix of native grass seeds. This is intended to increase and diversify winter/spring forage abundance.

- **Site G:** Conversion of 1 ha of dense young alder stand to one dominated by elk winter browse species; creation of a 0.5 ha artificial meadow through clearing and scarification (i.e. fall native grass seeding trial).

The 2003 monitoring program will include:

- pre- and post-restoration browse abundance/utilization plots
- pre- and post-restoration winter pellet group counts
- herbage production plots
- periodic inspections of planted and seeded material
- elk aerial survey covering the entire project area.

We look forward to updating our progress in the 2003 annual report.

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