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RESOURCE CONSERVATION

Banff Field Unit


Photo: Dan Rafla/Parks Canada

Report from the Field - 2011

Parks Canada Parcs Canada

Canada

Cover Photo – Bear 122 a large male Grizzly Bear *(Ursus arctos)* feeding on a moose carcass near Healy Pits in the spring of 2012. This bear was later captured and radio-collared as part of a monitoring program for the CP Rail research projects (see description in this document). Photo by Dan Rafla, Parks Canada.

Back Cover – Wolf *(Canis lupus).* Photo by Dave Mitchell.

INTRODUCTION

Like all protected areas, Banff National Park (BNP) is a special place. In addition to breathtaking glaciers, peaks and turquoise lakes, it contains wolverines, grizzly bears, lynx, mountain goats, bighorn sheep, elk, native trout, endangered whitebark pine, some of the oldest Douglas fir trees in the world, and much more. Remarkably, it all exists within an hour's drive of the City of Calgary, one of the largest and fastest growing urban areas in the country.

BNP's accessibility, coupled with its position along a major transportation corridor and as an international tourism destination, results in some heavy pressures. Up to 30,000 vehicles a day travel through the park on the Trans Canada Highway. Kilometre-long trains trickle grain and other bear attractants along the railway tracks as they wind their way westward. Over 3.2 million tourists flock through the gates annually, affecting the water, air and wildlife as they paddle, drive, ski, hike, horseback ride and/or snowshoe their way through the Park. Additionally, managers are forced to grapple with the impacts of past decisions or lack thereof (e.g. persecution of predators in the 40s and 50s, the stocking of non-native fish in the 60s and 70s, the suppression of forest fires over the last century, and the inadvertent spread of non-native plants along roads and trails) as they juggle the problems of today.

These many challenges present us with the unique opportunity to develop, implement, and showcase ecological restoration efforts with the active involvement of Canadians. But without knowledge and understanding of the ecosystem itself – the lakes, rivers, trees and animals – how will we know where to focus our efforts and measure our successes or failures?

Such ecological knowledge and understanding is what this document – Banff's first Report from the Field – is all about. It is by no means comprehensive (there are a few projects that weren't included due to limited resources) and it isn't exhaustive. Nor will it ever be, for as the renowned ecologist Frank Eglar once said, "ecosystems are not only more complex than we think, they are more complex than we can think."

But that doesn't mean we shouldn't try to understand these complex ecosystems. Indeed, under the National Parks Act and the State-of-the Park reporting process, every national park is obligated to do so, and to report on our efforts. So here are a number of short summaries from various projects that represent our collective effort to better understand and manage this special place on behalf of all Canadians.

- Karsten Heuer, editor and Resource Conservation Officer, BNP.

ACKNOWLEDGEMENTS

The research summarized in this report is the result of a large collaboration with the following writers from the Resource Conservation section in Banff National Park: Chris Carli, Anne Forshner, Blair Fyten, Simon Ham, Karsten Heuer, Tom Hurd, Brian Low, Saundi Norris, Charlie Pacas, Jane Park, Kathy Rettie, Kimo Rogala, Cyndi Smith, Mark Taylor, Julie Timmins, Percy Woods, and Jesse Whittington. Significant contributions were also made by the following university and contracting partners: Dr. Michelle Bowman, Dr. Tony Clevenger, Scott Eggeman, Dr. David Hamer, Dr. Mark Hebblewhite, Dr. Dwayne Liptzki and Cam McTavish. Thanks to Dan Rafla and Amar Athwal for the use of their photographs. Karsten Heuer took on the challenging task of editing and laying out this document. Bill Hunt provided much needed initiative and editorial support.

Releasing two male harlequin ducks, after capture and banding, on the Bow River, Banff National Park.

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AQUATIC RESOURCES

AQUATIC BIOMONITORING

RATIONALE

Streams and rivers are good indicators of the health of an ecosystem. If properly monitored, they can inform us of pollution, contaminants and other problems upstream. Biomonitoring (measuring changes in fish, benthic invertebrates and/or algae communities) provides one of the best means of capturing this information and can often pick up effects from chemical interactions, contaminant pulses or unknown contaminants that might otherwise go unnoticed in routine chemical sampling. Biomonitoring also captures the presence of exotic species and is more likely to reflect impacts from habitat degradation, climate change and fluctuations in water volume.

The Canadian Aquatic Biomonitoring Network (CABIN) is a national program to assess aquatic ecosystem health. Developed by Environment Canada, it has been adopted by hundreds of groups and agencies at over 500 sites across the country (including many national parks) and feeds into a national database. It is primarily run by citizen scientists and volunteers who receive rigorous training on-line and in the field before beginning field work. It was piloted in the Banff Field Unit in 2011 for the first time.

OBJECTIVES

- Provide Citizen Scientists with the skills to sample and assess river and stream health in Banff Field Unit (BFU) as per the national CABIN protocols.
- Conduct CABIN aquatic sampling for a minimum of three years.

METHODS

Interested volunteers were recruited from BFU’s existing volunteer program and trained (via Environment Canada’s online modules and a 2-day CABIN field certification course conducted by Parks staff). Using their new skills, field teams consisting of 2 Citizen Scientists and a Parks Canada staff member visited and sampled 12 sites throughout the Park, as per the CABIN protocols.

RESULTS

Teams sampled twelve sites throughout Banff National Park, 6 of which occurred along the Spray River to monitor the effects of TransAlta's emergency discharge from Spray Lake earlier in the summer (see table below).

Date (September)	Location Sampled	Access
16	Spray River (two sites)	Helicopter
17	Cascade River (Flints)	Helicopter
18	Carrot Creek and Spray River	Hike
19	Forty Mile Creek	Hike
24	Cascade River (Stewart Canyon)	Hike
25	Brewster Creek and Healy Creek	Hike
27	Spray River (three sites)	Helicopter

Benthic invertebrates collected at each site were classified and counted as per the CABIN Laboratory Manual and taxonomic key and the resulting information was entered into the national database.

Because it was the first year, no trends are yet available. All of Parks Canada data, including site information, photos, and benthic taxonomy, are housed on the CABIN website http://cabin.cciw.ca/intro.asp.

Nine citizen scientists received CABIN field technician accreditation in 2011 and will continue to participate in the field next season. Each Citizen Scientist contributed in excess of 155 hours of training, on-line module completion, and field sampling from April-September 2011 for a total of more than 1,400 volunteer hours. Program design, training, and fieldwork consumed more than 500 hours of Parks staff time.

YEARS OF DATA COLLECTION

2011

PARTNER

Environment Canada

FUNDING

Parks Canada

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UPPER CASCADE RIVER FISHERIES RESTORATION

RATIONALE

Rainbow Lake (foreground) with Sawback Lake in the distance.

Native west slope cutthroat trout (*Onchorynchus clarki lewisi*) populations have been reduced by almost 80% of their range due to over- exploitation, habitat degradation, and hybridization/competition with introduced, non-native trout. The Alberta population has been assessed as 'threatened' provincially and nationally (COSEWIC 2006) and is being considered for federal listing under the Species at Risk Act. Approximately 12 genetically pure populations are believed to remain in BNP, mostly as severely fragmented, remnant headwater populations[1]. Among these are pure (or near-pure) populations in Sawback Lake, Cuthead Creek and the Upper Cascade River drainage. However, these pure populations are threatened by a non-native population of rainbow trout (*Onchorhynchus mykiss*) originating upstream in Rainbow Lake. Based on genetic analysis these rainbow trout have compromised cutthroat genetics in Sawback Creek and the Upper Cascade River by way of downstream movement and interbreeding.

OBJECTIVES

- Remove non-native rainbow trout from Rainbow Lake.
- Significantly reduce the abundance of non-native trout from Cascade River headwater streams (Rainbow Creek, Sawback Creek and Upper Cascade River).
- Re-introduce a population of west slope cutthroat trout into Rainbow Lake from pure source populations.

Rainbow trout from Rainbow Lake

[1] Locations include: upper Bow River, Cuthead Creek, Deer Lake, Elk Lake, Fish Lakes (2- Big and Little), Helen Creek, Moose Lake, Outlet Creek, Sawback Lake, and the upper Spray River

METHODS

Rainbow trout are being removed from Rainbow Lake primarily through trapping of fish at spawning grounds, gill netting and by shoreline electro-fishing. Non-native fish in the streams of the Upper Cascade watershed are being selectively removed by electro-fishing. Photographic records of all captured fish are being used to cross reference with genetic analyses to test if we can identify native-non-native hybrids in the field. Native west slope cutthroat trout will be captured from a source lake (e.g. Sawback Lake), transported via helicopter, and released in Rainbow Lake.

RESULTS

By the fall of 2011, we had removed 315 rainbow trout from Rainbow Lake using 27 gill nets (total coverage of over 1.76 km). These nets remained in Rainbow Lake over winter and will be checked following ice-melt in spring 2012. Parks Canada staff electro-fished the entire length (2,400 m) of Rainbow Creek and caught/removed a total of 96 rainbow trout. A total of 370 trout were captured in twenty-three reaches (4,600 m of a total 8,400 m of creek) of Sawback Creek (222 west slope cutthroat, 50 bull (*Salvelinus confluentus*), and 98 brook (*Salvelinus fontinalis*) trout. West slope cutthroat trout were tagged with a unique identification number and had a piece of their adipose fin removed for genetic analysis. Fifty-four of these fish were suspected to be hybrids, although genetic analysis to confirm hybridization will not be completed until spring 2012.

YEARS OF DATA COLLECTION

2011

PARTNERS

University of British Columbia

FUNDING

Parks Canada

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Enumerating fish, Sawback Creek

CASCADE CREEK RESTORATION

RATIONALE

Westslope cutthroat trout (*Onchorynchus clarki lewisi*) are listed as “Threatened” under Alberta’s Wildlife Act and are being considered for federal listing under the Species at Risk Act (COSEWIC 2006). Historically, they were extremely abundant throughout North America and the Canadian Rockies, but populations are now absent from 80% of their historic range. Part of this historic range was the lower Cascade River in Banff National Park (BNP), a watercourse that has since been reduced to a creek (from 8 m^3/s to 0.3 m^3/s) by the Lake Minnewanka Dam. In addition to this habitat alteration, brook trout were stocked historically in Banff National Park for sport fishing opportunities. Brook trout (*Salvelinus fontinalis*) are stronger competitors for food and habitat and, as a result, westslope cutthroat trout have been extirpated from Cascade Creek.

OBJECTIVES

This project is part of a larger Minnewanka Loop Restoration Project. The objectives for this portion of the project are to:

- Remove brook trout by block netting and electro-fishing sections of Cascade Creek.
- Re-introduce native west slope cutthroat trout into Cascade Creek.

METHODS

Eliminate all brook trout in all reaches of the lower Cascade system (from Minnewanka dam to area downstream of Cascade Ponds where creek bed dries up) by coordinating with TransAlta to reduce the flow of Cascade Creek out of Lake Minnewanka and then electro fishing and minnow trapping. All captured brook trout will be euthanized, weighed, measured and have otoliths removed to develop an age structure for the population. Monitoring will take place following fish removal and throughout the 2nd year to determine if all brook trout have been removed. When all brook trout have been eliminated, a genetically pure population of westslope cutthroat trout will be caught by live-netting and be transported to Cascade Creek. The cutthroat trout population will be monitored to determine the success of the transplant.

Backpack electro-fishing in Cascade Creek, fall 2011.

RESULTS

We initiated fish capture in November 2011and have removed 420 brook trout from the upper 700 m of Cascade Creek (total creek length = 7 km). Removal efforts will continue throughout the winter and intensify in the spring of 2012. Parks Canada is aiming to have all brook trout removed from Cascade Creek by May 2012.

Brook Trout removed from Cascade Creek in Banff National Park, fall 2011.

YEARS OF DATA

2011 - Although research on this system is extensive.

PARTNERS

TransAlta Power Corporation

FUNDING

Parks Canada

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BANFF SPRINGS SNAIL

RATIONALE

The Banff Springs Snail (*Physella johnsoni*) was originally discovered in 1926 in the thermal hot springs of Banff National Parks (BNP's) Sulphur Mountain but it wasn't until 1995 that focused research on the snail began. It was soon discovered that the snail had disappeared from four of the nine thermal springs where it historically occurred in BNP. These consist of 3 main areas: the Cave & Basin, Middle Springs, and the Upper Hot/Kidney Spring; all of which depend on thermal waters from the same source. Because of the snail's confined distribution, it's 10-fold fluctuations in population sizes each year, and threats from human disturbance, it was assessed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (1997). It was up-listed to Endangered in 2000. When the *Species at Risk Act* (SARA) came into force in 2003 the snail was listed as Endangered.

Snail habitat at the Middle Springs, where Parks Canada successfully reintroduced snails in 2002.

Parks Canada developed a Recovery Strategy and Action Plan (RSAP) for the Banff Springs snail (the first for any species under SARA), which delineates monitoring and reporting requirements for critical habitat. Monitoring is especially pertinent now, during the Cave and Basin National Historic Site redevelopment, which aims to increase human visitation to the area three-fold to 300,000 people/year.

Parks Canada has successfully reintroduced snails into former habitats at the Kidney Spring and the upper Middle Spring, and snails have also colonized two additional springs at the Middle Springs site. This results in four new micro-sites, although they are all dependent on the same water source. Genetic analysis is underway to assess the relatedness of these various sites in an effort to improve and inform our emergency response plan in the event of another drying event.

OBJECTIVES

To restore and maintain self-sustaining populations of *Physella johnsoni* within the species' historic range. This includes:

- Protecting populations and habitats by mitigating human and natural threats.
- Restoring self-sustaining snail populations and habitat within historic range.
- Increasing knowledge and understanding of snail ecology, thermal spring ecosystems and their threats.

METHODS

We monitor:

- Snail populations and micro-distributions by counting individuals visible on the surface and recording thermal spring water chemistry and habitat integrity every four weeks.
- Thermal spring temperatures via hourly data loggers.
- Thermal water discharge, turbidity, and air quality year-round.

RESULTS

Highlights for 2011:

- While the combined number of snails in the 7 monitored populations is relatively stable, individual populations continue to fluctuate 10-fold between summer and winter; often reaching very low counts (30 individuals) in the summer months.
- The redevelopment project at the Cave and Basin does not appear to have any effects on the snails or Critical Habitat components.
- An 8-12 week drying event (Feb. through May 2011) at Kidney Spring did not result in the extirpation of the re-established population of snails, as originally thought. However, such drying events continue to be the highest ranking threat to the species' survival.

YEARS OF DATA

1995-2011

PARTNERS

Dr. Dwayne Lepitzki, Wildlife Systems Research; University of Calgary; Geological Survey of Canada; University of Manitoba

FUNDING

Parks Canada funds this monitoring but broader research is supported by the partners.

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WATER QUALITY

RATIONALE

Mountain streams are naturally low in nutrients, so even very small inputs of manmade nutrients (in the order of parts per billion) can significantly increase algal growth and adversely affect invertebrate and fish communities. Phosphorus pollution from the treated wastewater of towns and outlying commercial operations is a particular concern in Banff National Park.

OBJECTIVES

- Monitor nutrient impacts on rivers and streams in Banff Park.
- Use the results to establish nutrient guidelines, management plans and effluent targets for wastewater treatment throughout the Park.

METHODS

Frontcountry water quality is monitored up and downstream of the communities of Lake Louise and Banff (Bow River), at Healy Creek near the Sunshine Ski Area, and Johnston Creek below the Canyon Resort. Backcountry sites include Brewster Creek below Sundance and Halfway lodges, Redearth Creek below Shadow Lake Lodge, and the Pipestone River below Skoki Lodge.

Annual samples for nutrient chemistry, benthic algae and invertebrate communities are taken in mid-October. Samples are collected in fast-flowing (~0.5 m/s), shallow (~0.3m) and cobble-bottomed (~20cm) riffles. Water samples are taken mid-depth. Benthic algal samples are removed from 3 randomly selected rocks with a scalpel. Benthic macroinvertebrates are collected by U-nets placed in three randomly selected locations.

Water chemistry and algal community indicators are calculated annually using benchmark reference points. These include phosphorus and nitrogen content of water and algal tissue, algal abundance (e.g., chlorophyll *a*, biovolume), and abundance and composition (i.e., % mayflies, % chironomids, diversity) of benthic invertebrates (BMI).

RESULTS

The Banff wastewater treatment plant phosphorus-removal upgrades completed in 2002-03 quickly resulted in significant declines of phosphorus concentrations in the Bow River downstream of Banff. Both algal and BMI abundance remained elevated between the Townsite and park boundary until 2009-10, when they also declined to background levels.

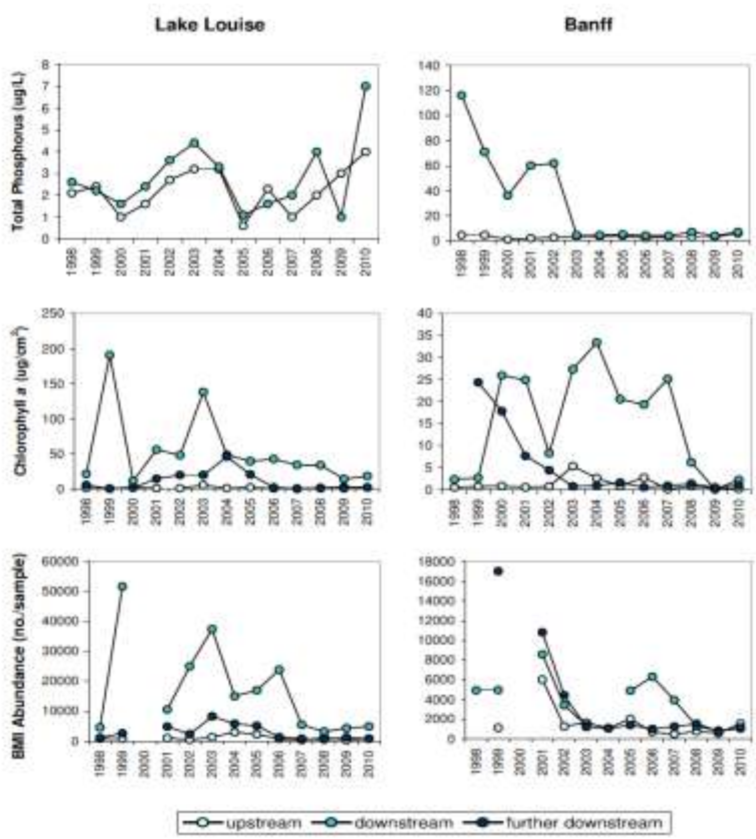
In the Bow River near Lake Louise phosphorus removal from wastewater was already efficient before the 2002-03 upgrades (note the different scale on the Y axis from Banff) so downstream phosphorus concentrations continued to fluctuate near background levels. However, even these low, sometimes undetectable, phosphorus levels continue to have downstream effects. Both algal and BMI abundances remain significantly elevated downstream but declined to background levels further downstream (i.e., near the confluence of Taylor Creek) in 2006-10.

Monitoring plans for other sites are evaluated annually. For example, favourable backcountry monitoring results (2005-07) resulted in decreased frequency of sampling, whereas small impairment to the ecological integrity of Healy Creek near the Sunshine Ski area was detected so monitoring has continued. We recently started collecting baseline data in Johnston Creek in anticipation of changes to facilities there.

A full report summarising the first ten years of the program is available. In addition to informing management decisions, water quality data from this program have been included in numerous scientific presentations and four peer-reviewed research papers.

YEARS OF DATA

1998-2011 (Bow River sites)
2005-2011 (backcountry sites)
2006-2011 (Healy Creek)
2010-2011 (Johnston Creek)



PARTNERS

Michelle Bowman (Forensecology), University of Alberta, Canadian Centre for Inland Waters, Dave Findlay and Craig Logan (taxonomists).

FUNDING

Parks Canada, Science Horizons, Canadian Circumpolar Institute, University of Alberta, NSERC Discovery Grants.

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CULTURAL RESOURCES

BANFF ARCHAEOLOGICAL INVENTORY

RATIONALE

Archaeological resources offer a window into history, giving us a glimpse of where, how and why people and animals used Banff National Park (BNP) and how they might differ from, or parallel, patterns today. In so doing, they inform us of how best to manage the landscape. For example, pre-contact pit houses and associated artifacts uncovered in the Red Deer River drainage confirm aboriginal peoples hunted bison deep within the mountains of Banff National Park hundreds of years ago. Such information is informing plans to reintroduce bison into BNP today.

Such information, and more, is contained within the Banff Archaeological Research Description Analysis. This living document contains an inventory of 679 archaeological pre-contact and historic sites in Banff National Park spanning the last 11,000 years and is being added to, with new finds and investigations each year.

OBJECTIVES

- Continue to build on over 40 years of archaeological investigation and place findings in the context of the cultural history of the surrounding plains and neighboring British Columbia Plateau.
- Identify areas within the Park, or time periods from the past, that are not well understood in order to focus future research.
- Identify threatened sites and sites that should be protected because of their high scientific significance.
- Provide a comprehensive, current, and easily accessible inventory of archaeological resources for Park Managers and those entrusted with their interpretation.
- Investigate and mitigate potential impacts on cultural resources that may, or may not, be affected by proposed developments and actions (via environmental assessments).
- Update site registers, collections, photo databases, and park-wide GIS maps of archaeology resources annually.

METHODS

Archaeological surveys and investigations typically take place during snow-free months. Depending on logistics, areas of interest are visited by car, foot, horse or helicopter. Standard field techniques are used to excavate, screen and map resources, in some cases employing the use of ground-penetrating radar. Finds are dated, stored and catalogued. This often requires the expertise of academic institutions and specialized equipment (e.g. radio-carbon dating and chemical and structural analysis).

RESULTS

For 2011 - 2012

- Participated in the Environmental Assessment for Vermilion Lakes Drive upgrading. The proposed development impacts a number of deeply stratified, pre-contact campsites.
- Monitored site 1210R, a unique pre-contact elk kill site on the Golf Course, to ensure hazard tree removal doesn't disturb archaeological deposits below the ground.
- Monitored the ruins of Lower Bankhead and tried unsuccessfully to relocate site 167R, a cabin foundation for which the location had been incorrectly recorded in the early 1980s. We observed that the Bankhead ruins need some maintenance to remove encroaching vegetation and removed signs of illegal campfires. Such simple actions will greatly prolong the life of the ruins.
- Monitored pre-contact campsite 1194R, on the north side of the walk-in camping area at Tunnel Mountain, after a hardened trail had been built through the site in 2010.
- Provided information on historic site 1412R at the base of the Sunshine Tee Pee Town chairlift to the consultant doing the cultural resource impact assessment, as part of an EA.
- Monitored Anthracite, after contaminated site tests were excavated throughout the area last winter. We were not able to monitor these sites as they were excavated, which would have been much preferred, but saw no historic artefacts exposed in the back dirt or spoil piles. There are a number of features relating to the mine and town site that have never been properly recorded, and we recommend spending time in 2012 to properly record them.

YEARS OF DATA

1969 to present.

FUNDING

Parks Canada

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CULTURAL RESOURCES – SPRAY RIVER

RATIONALE

Parks Canada is responsible for the protection and presentation of cultural resources under its jurisdiction, many of which were identified during 'first pass' archaeological surveys in the 1960's thru to the 90's. In many cases there has been very little follow-up since.

A pre-contact camp site, first recorded by Parks archaeologists in the upper Spray River in 1999 (site # 1988), falls within this category. Consisting of a wide scatter of flakes and stone tools, it was observed eroding from the horse trail south of Trail Centre as it passed through a large open meadow. The site stood out because of the number of artefacts and the variety of stone tool types observed, but we were unable to test the site until this past year (2011).

OBJECTIVES

- Survey and monitor test sites in the Spray/Fortune prescribed burn area.
- Excavate test site 1988R, recorded in 1999 in the meadow where Currie Creek joins the Spray River.
- If possible, include and involve volunteers and / or First Nations' participants.

METHODS

Standard archaeological survey and excavation techniques.

RESULTS

In September 2011, we returned to the site and conducted a series of shovel tests. One of these was particularly productive so we expanded the test into a larger excavation. The site proved to spread over an area about 200 m by 200m and to have a single occupation component. We did not find any time diagnostic tools, but we did find a cultural living floor with burnt bone, fire-broken rock from hearths, a large number of flakes made from a variety of stone materials, and a biface tool. The site is of moderate significance because of the quantity and variety of lithic materials present, and because it is an example of a camp site in a part of the park where most sites are much smaller (and indicate more fleeting occupations). The site is being impacted by the deeply incised trails that pass through the soft soils, and should be monitored every ten years.

While in the area, we also monitored three pre-contact sites that no one had looked at since they were first recorded in 1987. Two sites are west of Trail Centre cabin, where Big Springs Creek joins Bryant Creek; in an area currently designated as camping area Br9 (sites 1297R and 1298R). Modern hiking and use of the campground has trampled the ground surface, but we did not observe any archaeological artefacts or features that were being damaged. The third site was between Trail Centre and site 1988R, where the main trail drops down to a low terrace beside the Spray River. On this visit the site was stable, and not affected by riverbank erosion.

YEARS OF DATA

1999, 2012

FUNDING

Parks Canada

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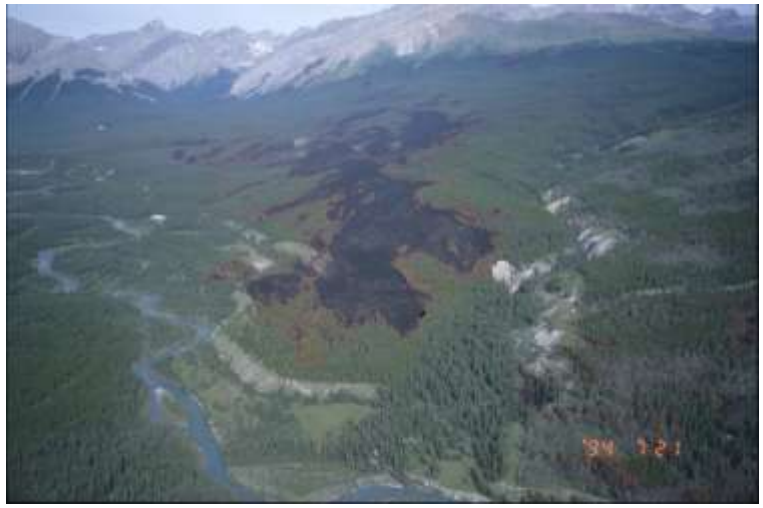
FIRE AND VEGETATION

FIRE EFFECTS - Red Deer Prescribed Burn

RATIONALE

The Banff Field Unit fire management program is mandated to emulate, as closely as possible, historic fire regimes through the use of prescribed fire and management of wildfire. Natural fire behavior and frequency differs across forest types, slope aspects and elevations and so, too, must prescribed burns if they are to mimic wildfire's influence on biodiversity. All prescribed fires, including the one in the Red Deer River this past summer, are evaluated within this context.



OBJECTIVES

- Retain 50% of upper sub alpine old growth stands
- Reduce canopy cover by 30% on south facing sub alpine slopes
- Achieve 60% mortality of regenerating lodgepole pine in previously burned areas
- Improve grizzly bear habitat

METHODS

Four forest plots (10m in radius) were set up prior to the burn. Within each of these plots the following characteristics were measured: slope, aspect, canopy closure, coarse woody debris, litter layer, ground cover, and for each tree (live or dead) height, HTLC, CBH, and diameter-at-breast-height. All four plots will be revisited one year post-burn (September 2012).

Five 100m-long transects were set up to measure regeneration in previously burned areas prior to the 2011 burn. Trees within 1m of the transect were identified to species and counted to determine density (seedlings per hectare). All transects will be revisited one year post-burn (September 2012).

Four grizzly bear habitat plots (30mX30m) were set up prior to the burn and the following measurements were taken in each: canopy closure, average height of dominant shrub, wildlife sign, bear activity, ant mounds/insect nests, soil texture and duff depth, and presence of bear foods. These plots were overlapped with the forest plots for efficiency. Bear plots will be revisited the first, third and fifth years post-burn. (2012, 2014, 2016).

RESULTS

Pre-burn data was collected before the prescribed fire in summer 2011 (total of 1,100 hectares burned). Results and analysis will be forthcoming once post-burn data begins to be collected in summer/fall 2012.

YEARS OF DATA

2011

FUNDING

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FOREST INSECTS AND DISEASE

RATIONALE

A lack of fire in the Banff ecosystem, combined with even-aged forests and warmer winters, have created ideal conditions for many forest insect species like the mountain pine beetle (MPB). Although the occurrence of such insects is natural, current and recent epidemics necessitate monitoring and management on behalf of Parks to minimize impacts on forestry outside of Banff National Park.

OBJECTIVES

- Map new red and fading MPB colonized trees within the Bow Valley and other valleys in the southern end of the Banff Field Unit
- Provide an annual R value for reproductive success
- Ground truth for other insect or disease species

METHODS

Aerial surveys are done in early August to count and map new red and other discoloured trees. Ground surveys are done in June, August and October to truth aerial surveys as well as look at development of the year's brood and density of attack. The number of live MPB under a 15 cm square area counted at breast height (1.37 m) on both north and south aspects of each tree and divided by the number of gallery starts over the same area to determine 'R'.

Aerial survey of discoloured, MPB-affected trees.

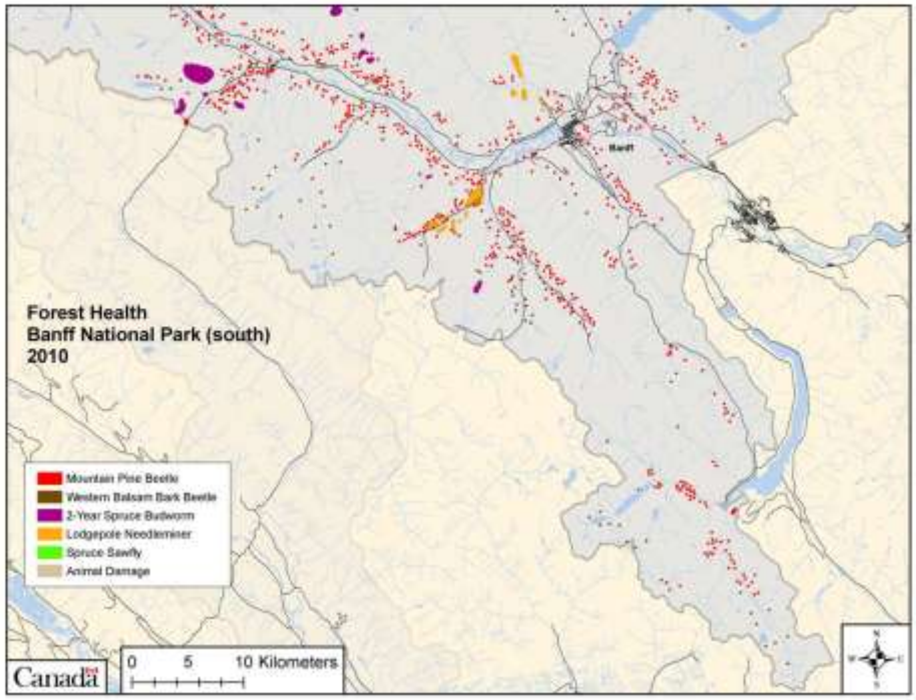
Mountain pine beetle galleries inside lodgepole pine bark.

RESULTS

- Approximately 11,000 newly infested mountain pine beetle trees were mapped in the southern section of the Banff Field Unit.
- R value (i.e. overwinter survival) of the MPB was 0.9 (90%).

YEARS OF DATA

1983-2011



PARTNERS

Gary Roke, Pacific Forestry Center, Canadian Forest Service

FUNDING

Parks Canada
Canadian Forest Service

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NON-NATIVE VEGETATION

RATIONALE

The World Conservation Union has identified invasive species as the second most significant threat to biodiversity after habitat loss. The Banff Park Management Plan recognizes this threat and identifies the spread of non-native species as a management priority.

Seventy-one invasive plant species have been identified in the park and, given worldwide trends, the list is expected to grow. Banff's non-native vegetation (NNV) program is currently focussed on 17 of the most invasive of these 71 species.

OBJECTIVES

- Identify new non-native plant infestations
- Control as many infestations of the 17 key invasive species as possible.
- Work with the BNP volunteer program to help monitor and control infestations.
- Map infestations throughout the Park, monitor spread and track the effectiveness of control measures.

Volunteers and staff pull weeds on the Legacy Trail.

METHODS

The management of non-native species in Banff National Park has been ad hock over the past few decades: some infestations have been mapped, others not; control efforts were inconsistently documented and/or monitored; and while some paper records exist many have been lost.

Thankfully all this has recently changed. As of 2010 a new, full-time position has been dedicated to non-native plant management in BNP along with a five month term position and one or two students each growing season. We are also consistently working with volunteer groups. Existing maps and records are in the process of being entered into a central database (same NNV database being used by Jasper and Waterton national parks) and, from that, a systematic monitoring and control plan will be put into place. Gaps in the NNV inventory will be identified and filled and a system to track infestations will be adopted, along with measures of effectiveness wherever control actions take place.

RESULTS

Tall Buttercup (***Ranunculus acris***) **infestation at Stoney Cabin, Cascade Valley.**

Much of the above work has already started. Over the past year we have identified and started to control one previously unreported non-native plant species (black henbane (*Hyoscyamus niger*)) that established itself both in the Cascade landfill and along the Banff Legacy Trail. We have mapped most of the north backcountry of the Banff Field Unit for NNV and plan to chemically control these infestations in 2012. We are also in the process of amalgamating existing NNV maps and inventories (like the one for the Minnewanka Loop below) into one centralized spatial database. Finally, we are working with contractors and the Environmental Assessment shop to establish best practices for soil disturbance remediation to minimize further NNV infestations in the Park.

YEARS OF DATA

1985-2011

PARTNERS

Volunteers
Rockyview County

FUNDING

Parks Canada

CONTACT

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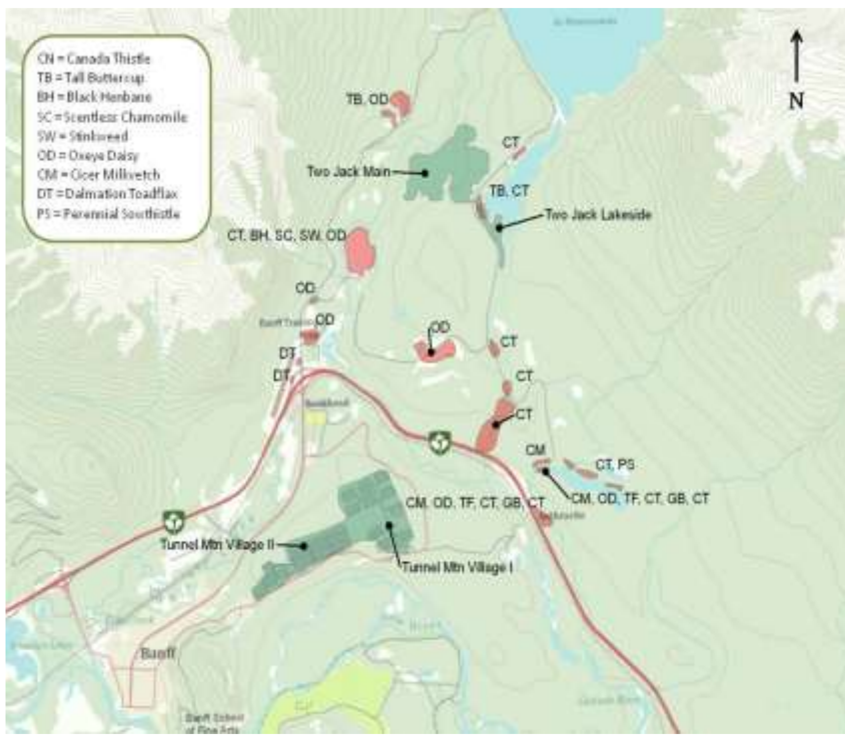


Invasive NNV infestations, Minnewanka Loop, BNP.

FIRE SEVERITY - Red Deer Burn

RATIONALE

The Banff Field Unit fire management program is mandated to emulate, as closely as possible, historic fire regimes through the use of prescribed fire and management of wildfire. Burn severity is one of four main characteristics of a fire regime, the others being fire size, fire cycle and season of burn. While all four characteristics are important, burn severity has the most direct link to observable changes in vegetation structure, soil chemistry, and ecosystem function.

Burn severity is directly linked to “area of disturbance,” a measure of ecological integrity in national parks. According to the 2008 Banff State of the Park Report, more fire restoration work is needed in the Main Ranges of BNP to better align with the historic fire cycle (Management goal of achieving 50% of the long-term fire cycle or approximately 1400 hectares (ha) burned annually). As of 2012, the calculated “area of disturbance” deficit is 18,800 hectares. All prescribed fires, including the one in the Red Deer River this past summer, are evaluated within this context.

OBJECTIVES

Objectives in the 2011 Red Deer River prescribed burn were as follows:

- Retain approximately 50% of upper subalpine old growth stands (>150 years old)
- Reduce crown canopy by approximately 30% on south facing sub alpine slopes
- Achieve 60% mortality of regenerating lodgepole pine stands that have grown since previous prescribed fires in the area (1991, 94 and 2005).
- Reduce downed and dead biomass from previous prescribed fires by 50%.

METHODS

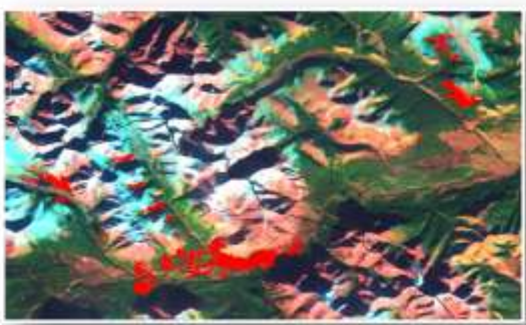
Burn severity can be measured at a landscape level using the Normalized Burning Ratio/Composite Burn Index (NBR). It involves use of Landsat infrared imagery (Bands 4 and 7) to determine the extent and degree of change from burning. The resulting image provides a quantitative representation of post-fire heterogeneity. Image calibration and verification of NBR values is ground-truthed to generate a composite burn index (CBI) or field

Good burning conditions in the 2011 Red Deer prescribed fire led to extensive mortality of regenerating pine trees.

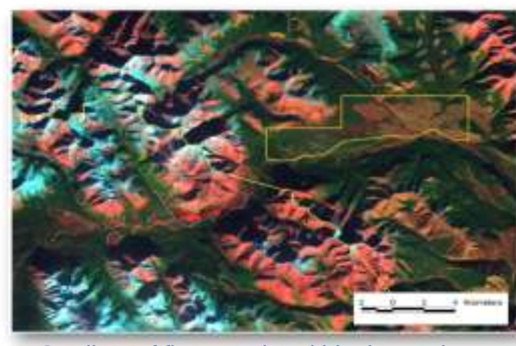
rating of fire severity. Burn severity mapping is then overlaid on existing stand age maps to determine the extent of change from the fire. These changes are also measured by comparing pre-burn plots to species composition and canopy cover with post-burn conditions as well as through plot photographs. Mortality of seedlings in areas of lodgepole pine regeneration are also measured using standard seedling density transects and compared to pre-burn seedling densities at fixed plots.

RESULTS

Given that the 2011 Red Deer fire only stopped burning in September, much of the above work is in progress, however direct observations suggest that all objectives were met (see photos). NBR work is underway (see images below) and the associated field work and ground-truthing is scheduled for summer 2012.



NBR imagery showing burned areas in the lower Red Deer River Valley (bright red). The 2011 burn is in the lower part of the picture (courtesy Darrel Zell, Parks Canada).



Gradient of fire severity within the total burned area perimeters (difficult to see at this scale). Yellow boundary is YHT Ranch.

YEARS OF DATA

The NBR/CBI methodology of analysing burn severity was incorporated as a standard fire effects assessment tool in BNP in 2001.

PARTNERS

Alberta Sustainable Resource Development

Darrel Zell, Geomatics Specialist, Parks Canada

FUNDING

Parks Canada, Action on the Ground.

CONTACT

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The 2011 Red Deer fire consumed large amounts of large diameter fuels left behind by previous prescribed fires. (Photos courtesy of Dan Rafla, Parks Canada)

WHITEBARK PINE

RATIONALE

Whitebark pine is a keystone species of high elevation ecosystems but is in steep decline over much of its range due to white pine blister rust, mountain pine beetle, and reduced wildfire. Stands in Banff National Park seem healthier than those in Yellowstone, Waterton Lakes, and parts of the Lake Louise-Yoho-Kootenay Field Unit but are being monitored for declines. A seed repository is being developed in case augmentation is required to save this species (and their important ecological role to bears, birds and other species) in the future.

Whitebark pine cone and seeds

Research during 1986-1988 established that Banff black bears eat whitebark pine seeds cached by squirrels, but their importance to Banff grizzly bears is unknown.

Black bear scat near squirrel midden in BNP, composed almost entirely of whitebark pine seed coats and seeds.

OBJECTIVES

- Monitor annual whitebark pine cone abundance on permanently marked trees at 4 locations in the Banff Field Unit.
- Determine red squirrel midden density (as a measure of attractiveness to bears) and midden use by bears in whitebark pine habitat in Banff National Park.
- Collect DNA from bear scats to determine whether Banff grizzly bears use whitebark pine seeds.
- Collect seeds from trees potentially resistant to white pine blister rust to add to a regional effort to obtain rust-resistant genetic material.

METHODS

Whitebark pine stands were identified from aerial surveys done in 2010, from knowledge of whitebark pine distribution in the park, and from observation from roads and trails. Belt transects conducted in whitebark pine habitat measured the density of red squirrel middens. The abundance of cones, midden size, site characteristics, and excavation by bears were noted at each midden. Cones on healthy trees in stands subject to blister rust dieback were caged to prevent predation by squirrels or birds and were collected later in the season. The assumption is that healthy trees in diseased stands may have genotypes with resistance to blister rust. Caging was done at 2 locations in Kootenay and Yoho national parks; cones were not collected in the Banff field unit because whitebark pines in Banff currently show little dieback. This may suggest that Banff trees are resistant to blister rust but a more conservative assumption is that the Banff genotypes have not yet been tested by this pathogen. Seeds collected will be used in future restoration projects within Banff and LLYK field units. Seeds are to be sent and stored at a genetic seed bank in New Brunswick.

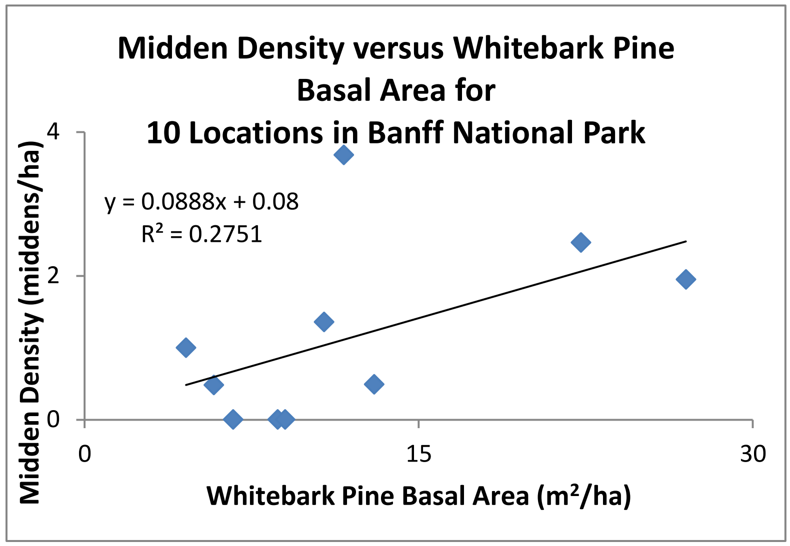
RESULTS

Cone-Counting

Ten trees were permanently marked in 2011 at the following locations: Sunshine, Boom Lake, Sulphur Mountain (west face) and Sulphur Mountain (northeast face).

Midden Survey

A total of 27 hectares were surveyed in 10 Whitebark Pine stands throughout the study area. Mean midden density was 1.14 middens per hectare. Eighty percent of the locations had evidence of use of Whitebark Pine by bears (seeds in scats and/or squirrel middens dug). Mean midden size was 106 m^2. Whitebark Pine comprised 37% of the total Conifer Basal Area in these stands.



Genetic Material

Two trees were sampled at Paget Peak in Yoho National Park (11 cones collected) and three trees on Mitchel Ridge in Kootenay national Park (33 cones collected).

YEARS OF DATA

2010 – 2011

PARTNERS

David Hamer, Whitebark Pine researcher, Parks Canada Research Permit BAN 2011-8155
Ian Pengelly, former Fire-Vegetation Specialist, Banff National Park (retired)

FUNDING

Parks Canada (Action on the Ground and Capital Projects)

CONTACT

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GRIZZLY BEAR FOODS - Grouseberries

RATIONALE

Grouseberry (Vaccinium scoparium) is a dwarf shrub that produces abundant small fruits that are eaten by many birds and mammals including grizzly bears. These fruits are important to bears, particularly when the larger buffaloberry crop fails or is only available for a limited time during the critical fall feeding period. However, little is known about the factors that influence grouseberry production.

OBJECTIVES

Monitor annual grouseberry fruit abundance and investigate the influence of past fires and other site conditions on fruit production. Attempt to answer the following questions:

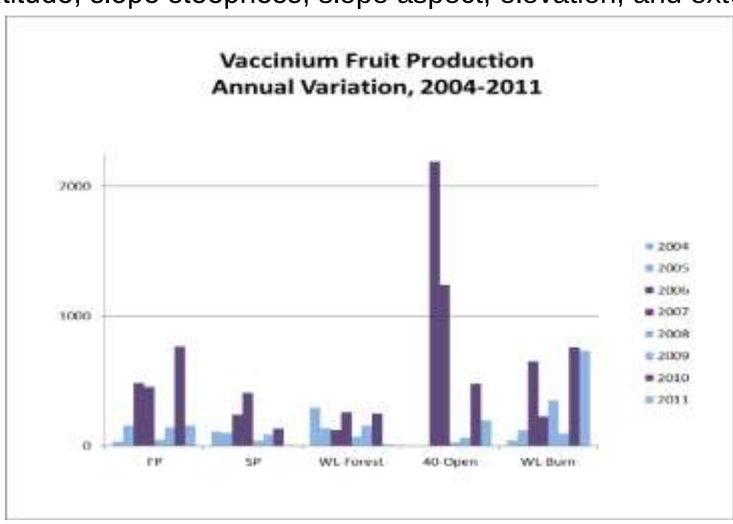
- Has the near elimination of wildfire from the park for much of the 20th century reduced grouseberry fruit production through forest in-growth?
- Does fruit production increase following prescribed fire?

METHODS

Fifty-seven 20m-long transects were established at 8 sites in Banff NP during 2004–2009. Six sites were in the Front Ranges and 2 in the Main Ranges. Two of the Front Range sites (Wigmore Lake (WL) and Palliser Ridge (PR)) were in 2001 prescribed burns. Transects at these burn sites were established in pairs, one inside and one adjacent to the burn. Fruit production was assessed annually by counting all grouseberries in 20 cm X 20 cm quadrats placed at 2 m intervals along the transect. Incoming solar radiation was calculated in 2006 using calendar date plus the transects' latitude, slope steepness, slope aspect, elevation, and extent of overshadowing by terrain and coniferous foliage.

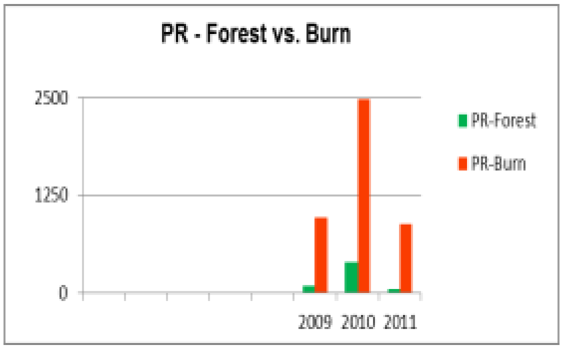
RESULTS

Grouseberries were abundant in 2006, 2007 and 2010 but in 2011 were abundant only in prescribed burn sites (see all graphs). Fruit production was generally higher in prescribed burns than in adjacent forested areas. This can be explained by the positive relationship

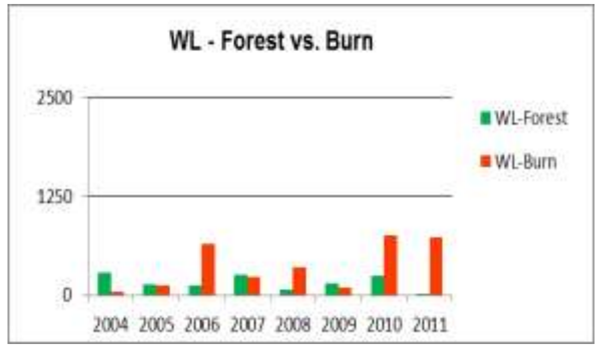


Grouseberry production across five study sites in Banff National Park (vertical axis is mean number of grouseberries/m^2 of *Vaccinium* cover.

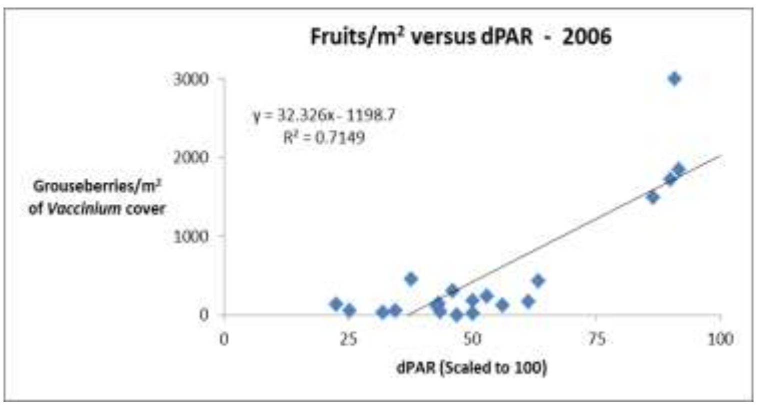
between grouseberry fruit production and direct, incoming photosynthetically active radiation (dPAR – see bottom graph).



Grouseberry production in forested and burned sites on the east-facing crest of Palliser Ridge (Cascade Valley). Vertical axis is mean number of grouseberries/m^2 of *Vaccinium* cover.



Grouseberry production in forested and burned sites on the west-facing slopes above Wigmore Lake (Cascade Valley). Vertical axis is mean number of grouseberries/m^2 of *Vaccinium* cover.



Grouseberry production and incoming direct photosynthetically active radiation (dPAR).

High variability between years necessitates long term monitoring of fruit production, specifically as it relates to prescribed burns. We suggest monitoring continue at the Palliser Range (PR) and Wigmore Lake (WL) sites.

YEARS OF DATA

2004-2011

PARTNERS

David Hamer, Grouseberry researcher
Ian Pengelly, retired Fire-Vegetation Specialist, BNP

FUNDING

Parks Canada

CONTACT

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DOUGLAS FIR TREE RESTORATION

RATIONALE

Douglas fir trees (*Pseudotsuga menziesii glauca*) are considered special resources in Banff National Park; some of the oldest specimens in the province are found around and east of the town of Banff, especially on the Fairholme Bench. These trees are dependent on frequent low-intensity fires to reduce competition and fuel loads on the forest floor. However, such fires have been rare over the last century due to fire suppression. As a result, today's Douglas fir stands are at risk from competition and devastating, high-intensity fires.

In light of these threats, low-intensity prescribed fires are Parks Canada's best tool for preserving the remaining Douglas fir grasslands in Banff National Park.

OBJECTIVES

- Develop various fuel treatment and ignition methods to reduce Douglas-fir mortality during prescribed fires.
- Restore open, Douglas-fir grasslands to the montane ecoregion.
- Restore fire to the montane ecoregion

Measuring plots on the Fairholme Bench.

METHODS

The project is located in the Fairholme Environmentally Sensitive Site, the largest tract of secure montane habitat in the park. Vegetation largely consists of lodgepole pine forests interspersed with open Douglas-fir grasslands.

In 2003, prior to the commencement of the prescribed fire, significant Douglas fir stands were mapped across the Fairholme site, resulting in 164 study plots. Plots were located in areas with mature, large-diameter Douglas fir trees, and consisted of a fixed plot radius of 15m centred on the largest tree in the plot. Plots were visited in 2004 and again this past summer (2011) to determine levels and causes of mortality. During each visit the following data were collected: photos from the 4 cardinal directions, tree species, status (live or dead), diameter at breast height, crown scorch and bark char code. In instances where trees had died, mortality factors were recorded and cores were taken to determine time of death.

RESULTS

Core samples are currently being analysed. A final report with recommendations is forthcoming in fall, 2012.

Sampling a tree core.

YEARS OF DATA

2003, 2004 and 2011

PARTNERS

Jenny Coleshill, Contract Technician

FUNDING

Parks Canada

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SOCIAL SCIENCE

HUMAN USE - FRONTCOUNTRY TRAILS

RATIONALE

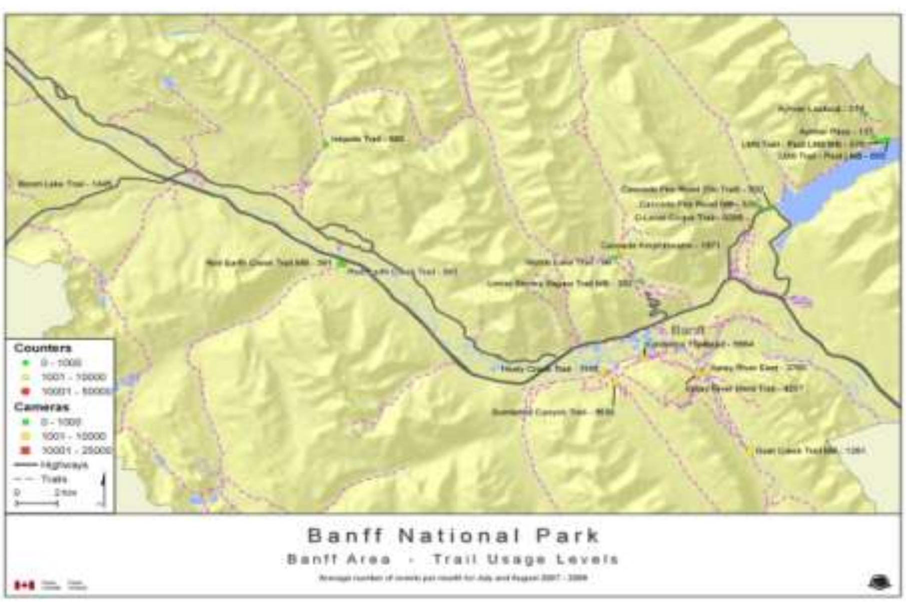
According to recent Ipsos Reid surveys, more than 70% of park visitors hike on a trail during their stay in the Mountain National Parks (2009). However, as of 2007, significant gaps existed in trail data, making park management planning difficult, especially with respect to grizzly bears. Under the current Park Management Plan (2010), BNP is required to maintain or improve grizzly bear habitat security levels in every landscape unit. To do this we need to know the types, levels and trends in trail use. This is even more important given recent visitation targets for national parks and recent research on the direct correlation between wildlife disturbance and hiking (see Rogala et al, 2011).

OBJECTIVES

- Monitor trail use to better manage human-wildlife conflicts, visitor experience and meet requirements for assessing grizzly bear habitat security levels.
- Inform management decisions linked to infrastructure reinvestments.
- Collect baseline data on levels of use and visitor experience.

METHODS

Trails were monitored from June to Sept using RECONYX brand infrared cameras and TRAFx brand infrared (IR) trail counters, magnetic vehicle counters, and magnetic mountain bike



counters. Data was analysed using RECONYX photo classification program and TRAFx reporter.

Baseline demographic and visitor experience data was collected from 1125 surveys completed in Banff and 4701 surveys across the mountain parks during the summer months (June to September) from 2007 to 2010. Data were analysed using IBM SPSS and inductive analysis of emergent themes. Results are not displayed below but are available by request.

RESULTS

Trail Cameras and Counters:

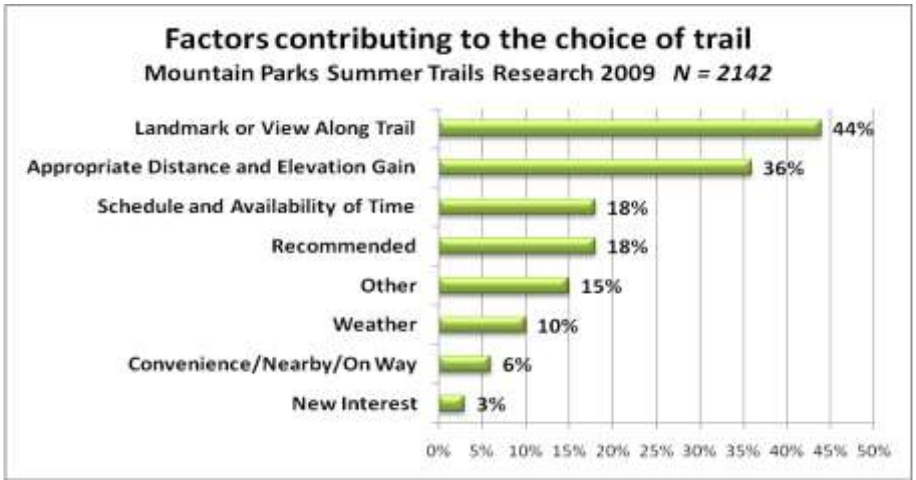
Summer use ranged from an average of 355 to 106,000 events per trail during the four-month summer season (Table 1). Use around Lake Louise and Moraine Lake was highest, followed by trails in the vicinity of the Town of Banff. All values were above the grizzly bear habitat security threshold of 100 humans/month, and are recognized as such in the current habitat security model. In fact, for many trails (e.g. Healy Creek, Goat Creek, Bourgeau Lake, Spray River Loop and all the trails around and near Lake Louise) the level of use exceeds the threshold by one or two orders of magnitude.

Table 1: Summer human use on 40 trails throughout Banff National Park. Numbers represent total use from June-Sept, averaged across 3 years (2007-2010). Note: 1 event = 1 trigger of the counter regardless of direction of travel.

Trail	Baseline Level of Use	Trail	Baseline Level of Use
Mystic Lake	**355**	Paradise Valley	**5000**
Alexandra River	**658**	Bourgeau Lake	**6250**
Aylmer Pass	**763**	Skoki Road IR	**5086**
Aylmer Lookout	**1000**	Temple Lodge	**5876**
Lower Stoney Squaw MB	**1170**	Helen Lake	**9182**
Red Earth Trail MB	**1183**	C-Level Cirque	**12495**
Glacier Lake Beyond Bridge	**3326**	Sundance Canyon	**13172**
Nigel Pass	**1838**	Spray River East	**14065**
Sunset Pass	**1863**	Spray River West	**20388**
Inkpots	**2271**	Consolation Lakes	**23451**
Glacier Lake	**3689**	Sundance Trailhead	**28213**
Past LM8	**2714**	Parker Ridge	**20518**
LM8 Trail past LM8 MB	**1537**	Bow Glacier Falls	**21633**
Mosquito Creek	**3632**	Larch Valley	**34366**
Redearth	**3680**	Plain of Six Glaciers	**69843**
Cascade Fire Rd. MB	**831**	Lake Agnes Trailhead	**97328**
Healy Creek near Sundance	**4817**	Mistaya Canyon	**93738**
Goat Creek Trail MB	**4489**	Lake Louise Chateau Trail	**101185**
Waterfowl Lakes Campground	**4633**	Mirror Lake	**105979**
Boom Lake	**4229**	Back of the Lake (Louise)	**134643**

Visitor Surveys:

51% of surveyed trail users were first-time visitors to the mountain national parks. 18% were from the United States, 31% from outside North America, and 51% from Canada (N=4272). Motivations for trail use varied according to the following figure:



YEARS OF DATA

2007-2010 (Power analysis suggests an 8 year monitoring plan (2 four-year data sets - separated by a few years of non-monitoring) would achieve an 80% certainty of measuring a 10% change in use).

FUNDING

Parks Canada

CONTACT

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Researcher installing an IR counter

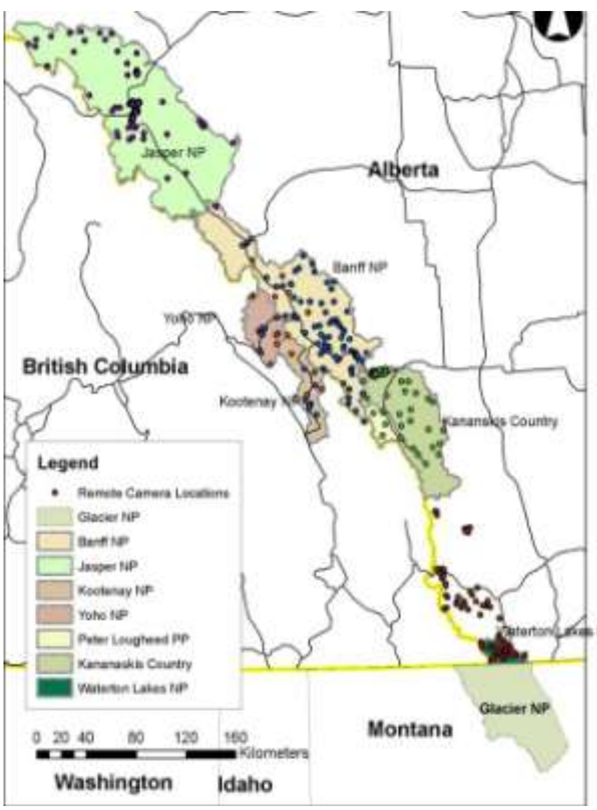
WILDLIFE RESOURCES

WILDLIFE OCCUPANCY - Remote Cameras

RATIONALE

Remote, motion-triggered cameras are powerful and non-invasive tools for monitoring changes in the distribution and relative abundance of grizzly bears, lynx, wolverine, wolf, and invasive white-tail deer populations, and for monitoring human use. Occupancy modelling is a new and powerful approach for analysing remote camera data with imperfect species detection rates. Banff National Park is collaborating with a number of partners (see below) to test and refine this low-cost and non-invasive method of monitoring wildlife populations over the long term.

One of several grizzly bears captured on a remote camera in the Red Deer River drainage in the northeast corner of BNP.



Remote camera locations

OBJECTIVES

- Assess the power of remote cameras to detect changes in the relative abundance of different species.
- Develop common sampling protocols and data collection techniques across jurisdictions.
- Identify factors affecting changes in species distribution and apparent competition effects at a large landscape scale (study area > 40,000 km^2).

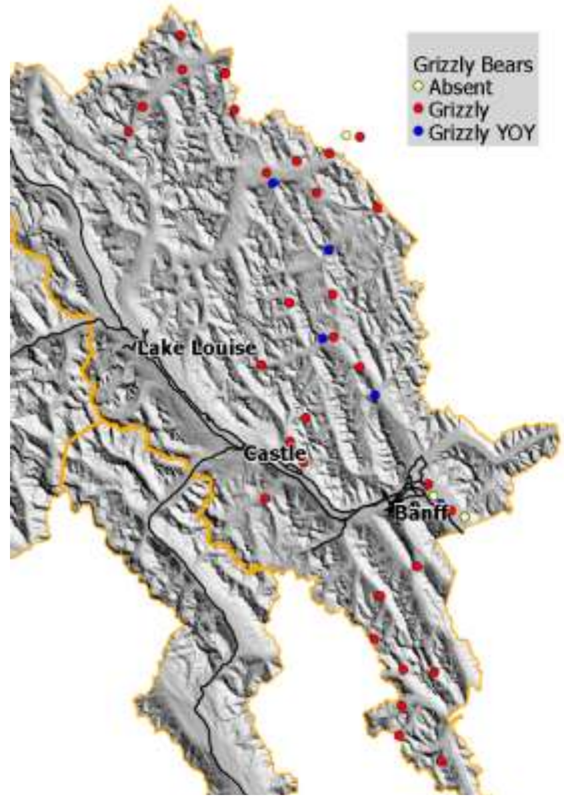
METHODS

Approximately 200 motion-triggered cameras were attached to trees or metal frames encased in rock cairns along hiking and game trails in high passes, canyons, and other potential squeeze points throughout the study area (see map). Data cards and batteries were changed in each camera approximately every 3 months. Events captured by the cameras were classified and results stored in a central database shared by all jurisdictions.

RESULTS

Data from this project feeds into a number of other monitoring and research projects found elsewhere in this report, including wolf monitoring, grizzly bear family group index, wolverine research and grizzly bear habitat security trends. In terms of occupancy modelling, only preliminary results are available (see map to right). A PhD student is currently conducting power analyses of 2010 and 2011 data and will recommend a modified sampling design in 2012**.**

Dramatic images captured for this project are regularly broadcasted on the internet and via Twitter. The project's Wild Images Gallery is the most popular website for Banff National Park. We will continue to expand public outreach and education in the coming year.



Grizzly bear presence at camera sites in BNP


A family of wolverines captured on camera at a pass in Brewster Creek, BNP

YEARS OF DATA

2010-2011

PARTNERS

Kananaskis Country; University of Montana; Yoho, Kootenay, Waterton and Jasper national parks.

FUNDING

Parks Canada, University of Montana, Kananaskis Country, Panterra Cameras.

CONTACT

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WOLF DENSITY & DISTRIBUTION

RATIONALE

Wolves exert large top-down effects on Banff National Park's ecosystem. Past research has shown that wolf density (number of wolves per 1000 km^2) affects the survival, fecundity, and population growth rates of most ungulates, including elk, deer, moose, and caribou. Wolves' effects on primary prey populations (e.g. elk) have cascading effects on herbivory rates, aspen regeneration, shrub growth, and bird and mammal communities. Large elk populations support large wolf populations. Less abundant prey species such as moose and caribou are negatively affected by higher predation rates associated with large, wide ranging wolf packs. High levels of human activity negatively affect wolf persistence but human-made trails increase wolves' ability to travel throughout their home. Maintaining viable populations of wolves is important for the ecological integrity of Banff National Park.

OBJECTIVES

Determine the number and distribution of wolves in Banff National Park.

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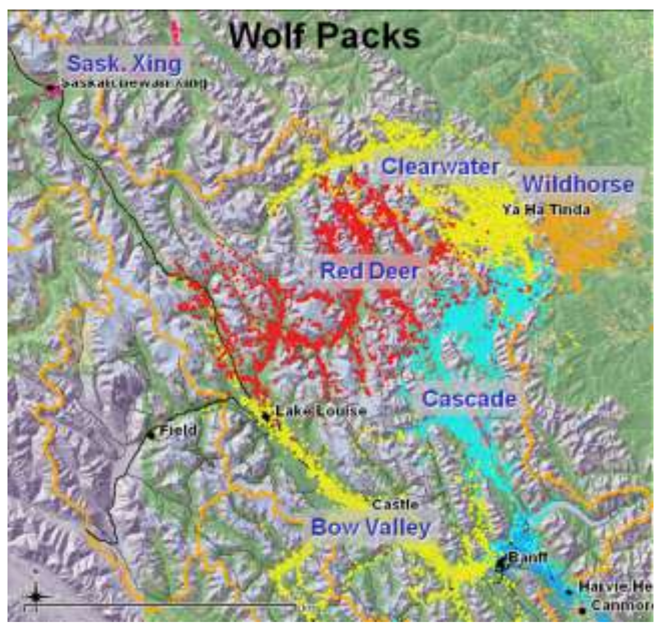
METHODS

Wolf density and distribution are simple measures that capture broad changes in wolf pack numbers and distribution over time. Each year we record the number of wolves, their distribution, and the presence of pups using data collected from remote cameras, snow tracking, wildlife crossing-structure monitoring, and direct observation. We do not conduct den site observations. We estimate wolf density trends by calculating the total number of wolves observed during late winter (February and March) within the Spray, Bow, Cascade, Panther, and Red Deer valleys and divide that total by the study area (4642 km^2 estimated from 95% MCP of radio-collared wolves). Our database builds on the 1986-2006 data compiled by Dr. Mark Hebblewhite (2006).



Traditional wolf pack distributions in Banff National Park based on data collected from radio-collared wolves.

RESULTS

Individual pack summaries for 2011 are as follows:

- Bow Valley: In April, the Bow Valley wolf pack consisted of 4 wolves including 2 radio-collared individuals. They denned in the Bow Valley where they produced at least 5 pups. Two pups died from collisions with vehicles and trains and two yearlings dispersed, one of which was killed on the highway near Deadman's Flats. As of January 2012, the pack consisted of 6 wolves (4 black and 2 gray).
- Spray: We were unaware of wolves denning in the Spray, but 5 wolves were detected by remote camera during the summer and tracks of 3 wolves travelled from Banff south over Palliser Pass. As of January 2012, tracks of single wolves have been observed.
- Fairholme: 3 adult wolves produced 6 pups. All members of this pack were gray.
- Cascade – Panther: At least 5 wolves from this pack likely denned in the Panther Valley. During late summer, 5 wolves (blacks and grays) were observed near Windy cabin. These wolves travelled into the Cascade but less frequently than summer 2010.
- Red Deer: In February, a pack of 7 wolves occupied the Red Deer Valley west of the Ya Ha Tinda Ranch. They denned in the Red Deer Valley. During summer, remote cameras recorded a large pack of 13 to 14 wolves consisting of approximately 1 white, 4 black and 9 gray wolves.
- Clearwater: A pack of approximately 8 wolves (1 white and 7 gray) likely denned in the Clearwater. The pack ranged both in and out of the Park.

Overall, the late winter density of wolves in Banff National Park remains less than 4 wolves per 1000 km^2, well below the 6 wolves per 1000 km^2 threshold where caribou reintroduction is deemed unviable. This is likely due to a 75% decline in elk populations in the Bow and Red Deer Valleys.

YEARS OF DATA

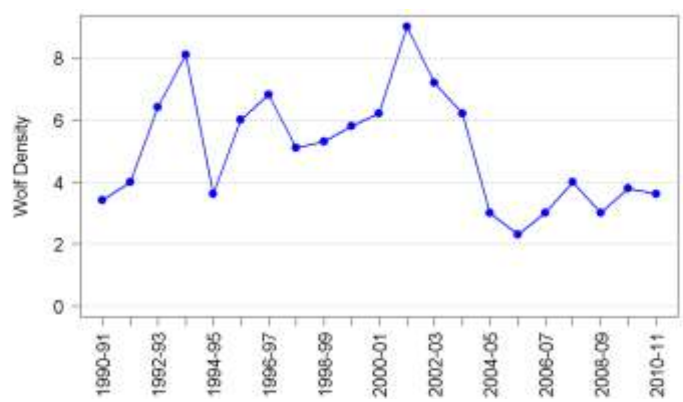
1986 – 2011

PARTNERS

University of Alberta, University of Montana

FUNDING

Parks Canada



Wolf density (number per 1000 km^2) in BNP.

CONTACT

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WOLVES AND VEHICLES

RATIONALE

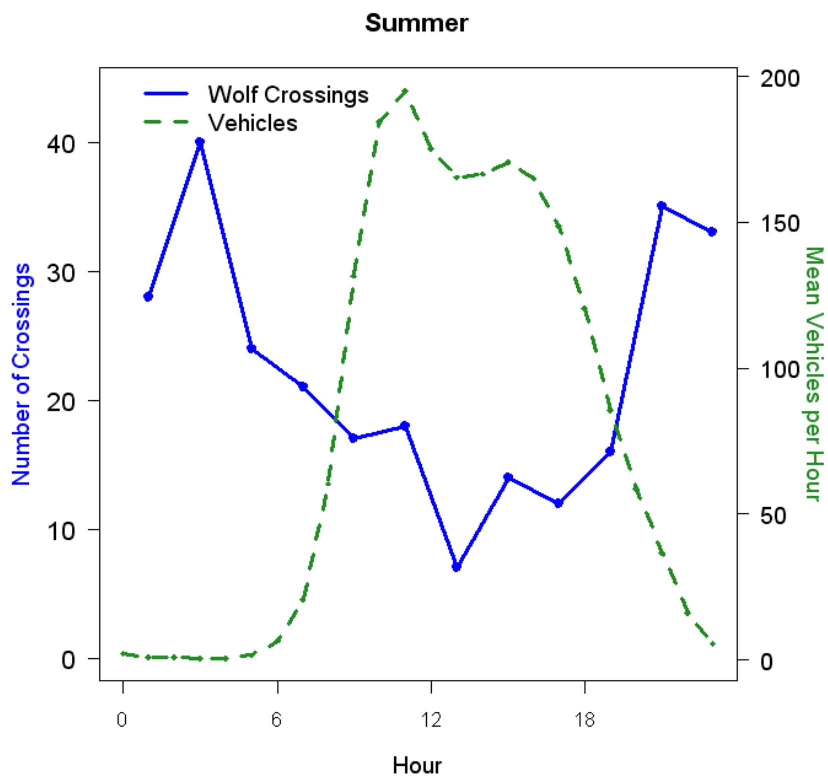
Past research has documented barrier and displacement effects of roads on wildlife in the Bow Valley, strongly suggesting that a vehicle traffic restriction on the Bow Valley Parkway would benefit wildlife. This is further supported by a large body of literature, however some stakeholders objected to such restrictions and requested site-specific evidence for management actions.

OBJECTIVE

Analyze existing wolf data to assess for barrier effects of vehicle traffic on wolf movement around the Bow Valley Parkway.

METHODS

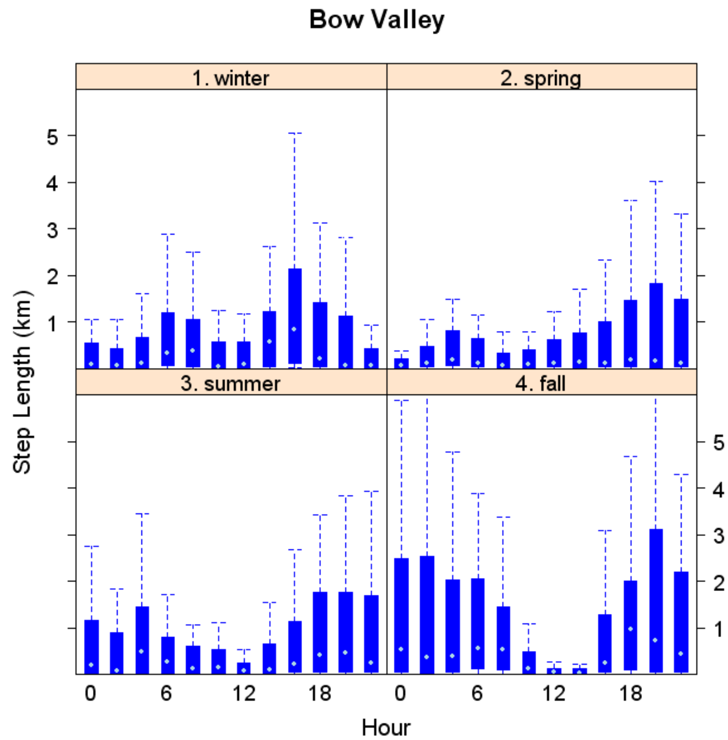
Vehicle traffic was measured with a highway traffic counter on the Bow Valley Parkway. Wolf data came from two GPS-collared wolves in the Bow Valley Pack: Wolf 87 (collared 2004-05) and Wolf 902 (collared 2009-10). We considered two factors in the analysis: time of day and traffic volume. We used match-case control logistic regression to determine whether wolves selected certain times of the day or night, or certain traffic volumes, to cross the road.



RESULTS

Bow Valley wolves preferred to cross the Bow Valley Parkway during low traffic periods at dawn, dusk and at night (see graph at right). At higher traffic volumes, the Bow Valley Parkway may act as a filter, allowing limited wolf movement (as evidenced by shorter distances travelled during midday periods of high traffic volumes – see step-length analysis at right).

In 2013, Banff National Park will implement a mandatory travel restriction from March 1-June 25, 8am-8pm, on the eastern portion of the Bow Valley Parkway. All overnight accommodations will remain fully accessible during this restriction. By restricting all travel on this portion of the parkway, we secure a portion of each spring day where wary carnivores can readily access critical and limited montane habitat.



Seasonal wolf activity patterns measured by step length (distance travelled between two GPS locations taken two hours apart).

YEARS OF DATA 2004-2010

PARTNERS

University of Montana, University of Calgary, University of Alberta.

FUNDING

Parks Canada, University of Montana, University of Calgary, University of Alberta.

CONTACT

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Four wolves *(Canis lupus)* travelling along the Bow Valley Parkway in Banff National Park.

WOLVERINE HIGHWAY INTERACTIONS

RATIONALE

The Trans-Canada Highway (TCH) has long been recognized as a lethal barrier to wildlife and an acute fracture zone for wildlife movement and migration in the Central Rocky Mountains. Wildlife fencing, underpasses and overpasses have helped restore connectivity for many species but little is known about their effectiveness for one of the most sensitive and wide-ranging animals in the area, the wolverine (*Gulo gulo*). Banff National Park's wildlife crossing structures are the first such structures within the range of wolverines in North America; monitoring their effectiveness and documenting wolverine occupancy and habitat relationships in BNP will contribute to our knowledge of this globally threatened animal. We do know that wolverines are seldom killed on the highway and seldom use the existing array of crossing structures. We hope to determine if the highway is a barrier to wolverine movements. This is especially important in light of another 30 kilometers of highway being twinned to the west of BNP (into Yoho National Park) in prime wolverine habitat over the next few years.

OBJECTIVES

Collect baseline information on wolverine occurrence and assess the potential effects of a major east-west transportation corridor on wolverine movements in the Canadian Rockies. Estimate population size, model habitat occupancy, and assess fine-scale genetic structure and gene flow across the TCH and other potential barriers.

METHODS

A 6,000 km^2 study area around the TCH was overlaid with a 12 x 12 km grid, resulting in 50 grid cells falling in parts of Banff, Yoho and Kootenay national parks. Noninvasive hair traps were located in each grid cell with additional sampling in select grid cells overlaying the highway. Hair traps consisted of a whole skinned beaver carcass nailed to a tree and barbed wire wrapped from the carcass down to the ground. Wolverines climbed the tree several times before removing the carcass, and in doing so left hair on the barbs. Remote infrared-operated cameras were also placed at each hair trap to document wolverine visits and behavior. Hair traps were set up for four months (Dec-March) and checked monthly.

Researchers baiting a hair trap.

RESULTS

Wolverine visitation rates to the hair trap sites increased during the three sampling sessions. More than 900 hair samples were collected:

- Session 1: 38% (18 of 47 sites) were visited by wolverines.
- Session 2: 71% of the sites (34 of 48 sites) were visited.
- Session 3: 79% (37 of 47 sites) were visited.

A wolverine *(Gulo gulo)* climbing a hair-trap tree to investigate the bait. Image captured using a remote camera.

Overall, 85% of the sites were visited during at least one session. Of 142 sampling opportunities during the three sessions, wolverines visited the sampling sites 89 times (63%). Seven sites were not visited by wolverines during the survey. To date, 19 different individuals (12 male, 7 female) have been identified in the study area. Of these, two males were detected by hair samples obtained on both sides of the highway.

Additional genetic data will be collected in winter 2012-13. We will then analyse the data for gene flow across the TCH and determine whether it creates any barriers to wolverine movement, dispersal and reproduction.

PARTNERS

Western Transportation Institute (WTI) at Montana State University, Woodcock Foundation, Miistakis Institute.

FUNDING

Parks Canada, WTI-Montana State University, Woodcock Foundation, Mountain Equipment Co-op, Patagonia Foundation, TD Friends of the Environment Foundation, McLean Foundation, Wilburforce Foundation, Alberta Sport Recreation Parks and Wildlife Foundation, Cameron Plewes, Lake O'Hara Lodge.

CONTACT

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HIGHWAY WILDLIFE CROSSING STRUCTURES

RATIONALE

The Trans-Canada Highway (TCH) has long been recognized as a lethal barrier to wildlife and an acute fracture zone for wildlife movement and migration in the Central Rocky Mountains. Mitigations in the form of wildlife fencing, underpasses, and overpasses have been very successful in restoring connectivity for many species in Banff National Park. Lessons learned here In Banff, are being exported throughout the world and are alsoinforming the design of new crossing structures as the TCH continues to be twinned through western BNP and into Yoho National Park.

OBJECTIVES

Monitor the Trans Canada Highway for:

- Wildlife use of crossing structures
- Habitat connectivity and genetic interchange for key species
- Population-level effects on wide-ranging species, particularly wolverine and grizzly bears

Cougar *(Felis concolour) exiting a wildlife crossing structure (underpass) on the Trans Canada Highway. Image captured using a remote camera.*

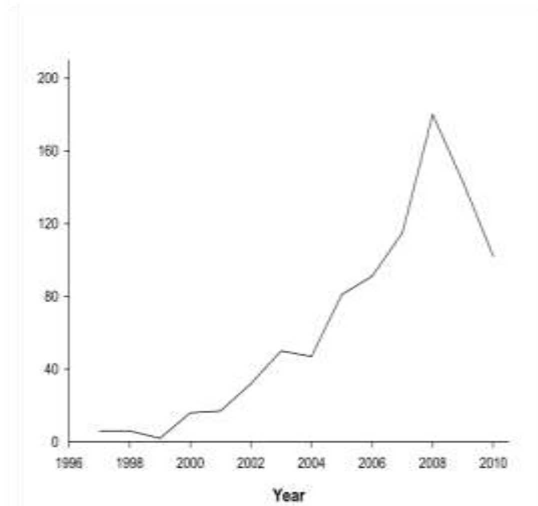
METHODS

The response of wildlife to different wildlife crossing structures is measured in two ways: (1) multivariate analysis of attributes of crossing structures that facilitate movement by large mammals, and (2) measuring behavioral responses of large mammals to different crossing structure design types from remote camera monitoring at entrances to crossing structures. Baseline data are collected for these analyses during routine bi-weekly checks of the crossing structures on the TCH.

RESULTS

- Over 200,000 detections of 11 species of large mammals have been recorded at the Banff crossing structures (Phase 1, 2, 3A and 3B) since monitoring began in 1996.

- Since 1997, grizzly bear use increased steadily and peaked in 2008 (n=180) (Graph1). At the peak two or more adult females with cubs used the crossing structures frequently. The current decline may be partially explained by the recent dispersal of the cubs and may represent only a temporary blip.
- Among large carnivores, most grizzly bear and wolf crossings are found at the two wildlife overpasses and the Healy underpass site, while black bear and cougar crossings are more dispersed among the crossing structures.
- During 2011, there was an increase in the use of crossing structures by grizzly bears and black bears with cubs of the year, while previous years there were none detected at the crossings.



Grizzly bear crossings at the Banff wildlife crossing structures, 1997-2010. The number of crossing structures was constant across years

- Some notable crossing events in 2010 and 2011 included 6 documented crossings by wolverines during winter: one time at the Wolverine wildlife overpass on Phase 3A and five times at different underpass on Phase 3A. Wolverines have been detected at the crossing structures only four other times since 1996.

YEARS OF DATA

1996 - 2011

PARTNERS

Western Transportation Institute (WTI) at Montana State University, Woodcock Foundation, Miistakis Institute.

FUNDING

Parks Canada, WTI-Montana State University, Woodcock Foundation, Mountain Equipment Co-op, Patagonia Foundation, TD Friends of the Environment Foundation, McLean Foundation, Wilburforce Foundation, Alberta Sport Recreation Parks and Wildlife Foundation.

CONTACT

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WILDLIFE CORRIDORS

RATIONALE

The Bow Valley of Banff National Park is topographically fragmented by high mountain ranges, roads, human development and increasing human use, particularly in critical montane habitat. This fragmentation has the potential to compromise ecological integrity as defined in Parks Canada Policy (1994) and the National Parks Act (1998).

This study was initiated in 1993 to identify and monitor wildlife constrictions that link good quality montane habitat. Results have led to corridor restoration in some instances (e.g. bison paddock, cadet camp and airstrip removal from the Norquay/Cascade corridor; Sulphur Corridor closed to human use; Golf course road closed in winter; Two Jack penstock buried and wildlife crossing structure installed). The study also provides a good (and non-invasive) indicator of wildlife use and corridor function in key montane areas of the Park.

OBJECTIVE

To monitor wildlife corridor function as it relates to prey availability, changes in human use, and resource management actions such as forest thinning.

METHODS

Twenty-five transects bounded by highway fences, cliffs and other barriers are hiked after snow events from Dec-March (see right). These include ‘control’ transects in undisturbed areas east and west of the town of Banff.

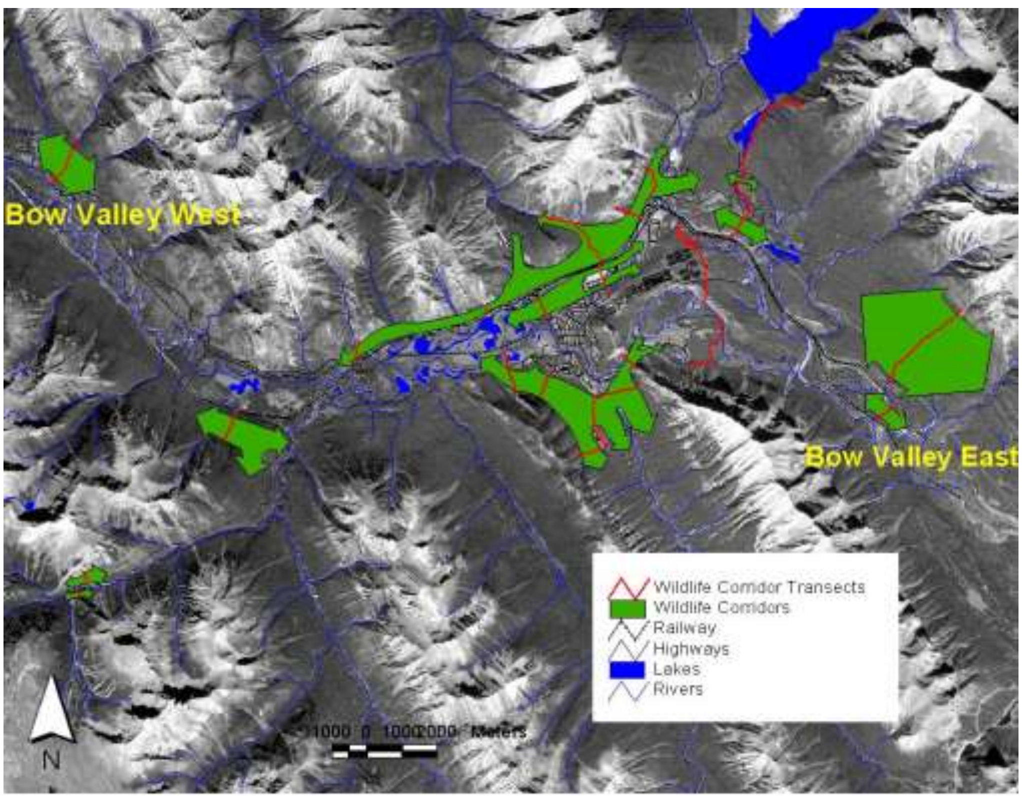

Figure 1. Map showing key wildlife corridors and monitoring transects in the Bow Valley of Banff National Park.

Tracks of all species equal to or larger than coyotes are recorded per 100m interval. When the tracks of large carnivores are detected (e.g. wolf, cougar, lynx, wolverine) they are backtracked and mapped using GPS. Twenty two infra-red trail counters monitor human use on trails within wildlife corridors. Two motion sensor cameras are used throughout the study area to supplement snow tracking data.

RESULTS

An analysis of ~15 years of wildlife corridor tracking data from both BNP and the Canmore area is underway this winter (Whittington et al, in progress). In the meantime we report on some of the major trends noted around Banff.

- Elk activity declined from a high in 1999 to relatively stable level in the last decade (Figure 2). This mirrors the trend in the central bow valley elk population. Deer and coyote activity has steadily increased over this same period.
- Carnivore activity has been mainly wolf and cougar with rare instances of lynx and wolverine. Wolf and cougar activity peaked almost simultaneously around 2000 and 2008 (Figure 3). These peaks coincide with corridor mitigations, high wolf pack numbers, bold wolf pack dynamics and dispersal. The central Bow Valley cougar population is difficult to accurately determine yet these peaks are thought to correspond to cougar numbers.

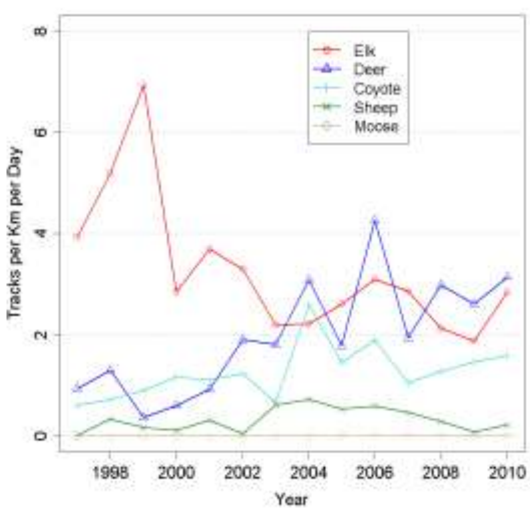

Figure 2. Ungulate and coyote track indices for all wildlife corridor transects.

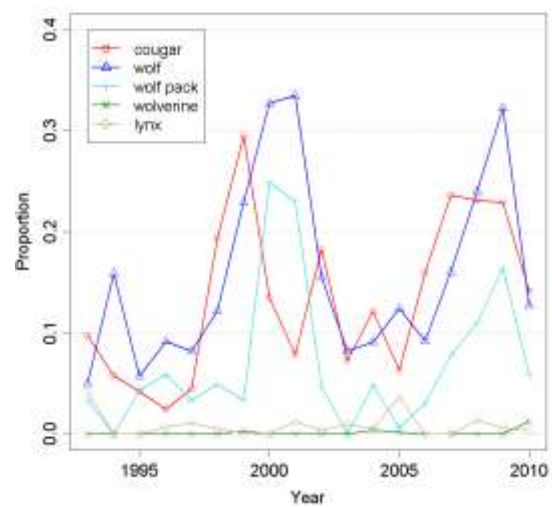

Figure 3. Proportion of carnivores detected.

Carnivore backtracking has consistently shown effective use of Sulphur, Two Jack and Norquay/Cascade corridors whereas use of the more constricted Golf Course and Fenlands/Indian Grounds corridors has been more sporadic (Figure 4). We have not observed any obvious avoidance by carnivores of recently thinned forest areas near town.

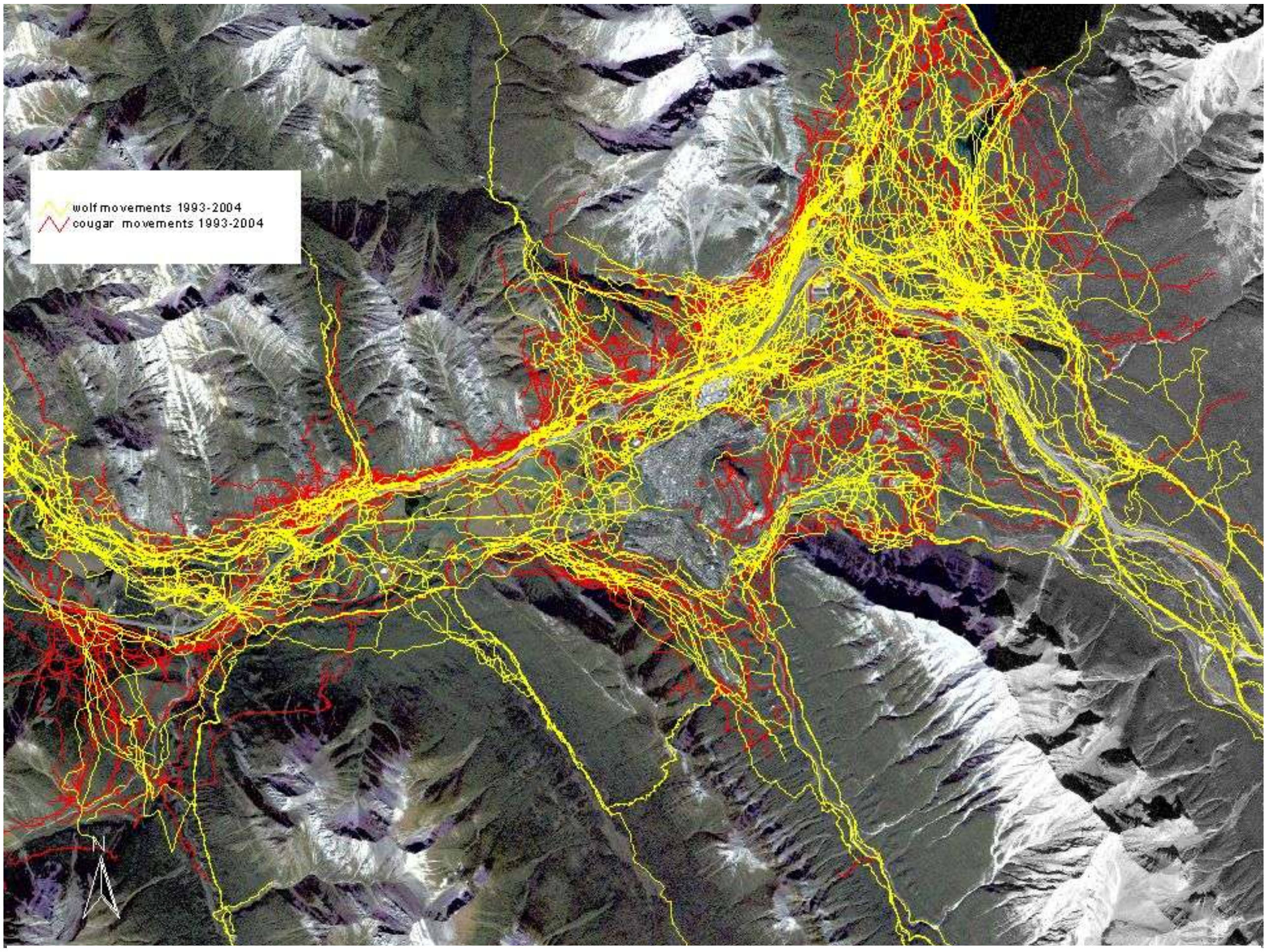

Figure 4.Wolf and cougar backtracking around the Town of Banff (1993-2004)

YEARS OF DATA

1993-2011 (ongoing)

FUNDING

Parks Canada

CONTACT

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BREEDING BIRD SURVEYS

RATIONALE

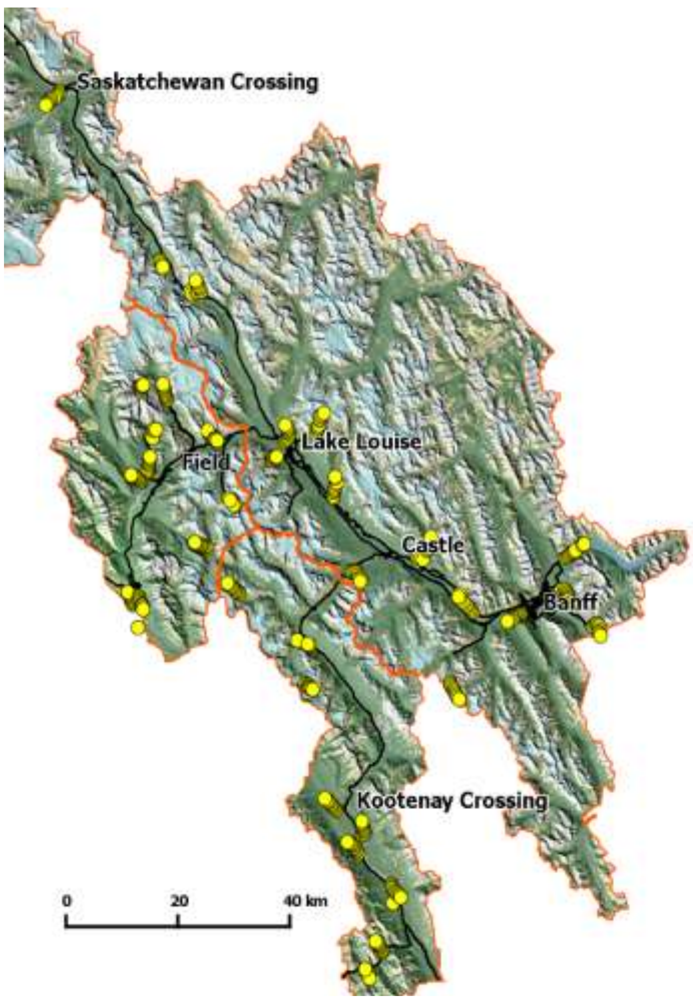
Forest song birds are an important component of Banff's ecological integrity monitoring because they are relatively easy to monitor and they respond predictably to stressors such as habitat loss and fragmentation. Monitoring forest song birds is important and advantageous for the following reasons: extensive knowledge about bird ecology facilitates the interpretation of the results; birds are highly diverse and provide more insights on biodiversity than any other group of terrestrial vertebrates; birds integrate processes at multiple scales (e.g. local / residents vs. large scale / migrants); niche specialization of certain species can make them sensitive to environmental change; existing data is extensive in many parks; field methods are well known and tested; and strong public interest fosters public engagement.

OBJECTIVE

- Monitor trends in forest song bird diversity.

METHODS

Fifteen breeding bird transects are distributed throughout Banff National Park in a variety of habitats (see map at right). Most transects are approximately 3 kilometres long and contain 10 "listening points" about 300 metres apart. Parks Canada staff visit these points at dawn during the June breeding season and acoustically record all bird songs for 11 minutes. A bird specialist later plays back the recordings and identifies all species recorded for each point. All mountain national parks follow the same protocols and data is pooled for large scale analyses.



Breeding bird monitoring locations in Banff, Kootenay, and Yoho National Parks.

RESULTS

All Mountain National Parks have collected 5 consecutive years of point count data following the same protocols. We will analyse this data in 2012 to assess our power to detect trends and our optimal sampling frequency. The number of bird species at each location ranges from 2 (on the Pipestone Trail) to 30 (near Vermilion Lakes) (mean = 12.2, SD = 5.1).

YEARS OF DATA

2006 – 2011

PARTNERS

Bow Valley Naturalists
Jasper, Yoho, Kootenay, Waterton, Mount Revelstoke and Glacier national parks.

FUNDING

Parks Canada

Monitoring equipment used to acoustically record bird songs.

CONTACT

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AVIAN PRODUCTIVITY & SURVIVORSHIP

RATIONALE

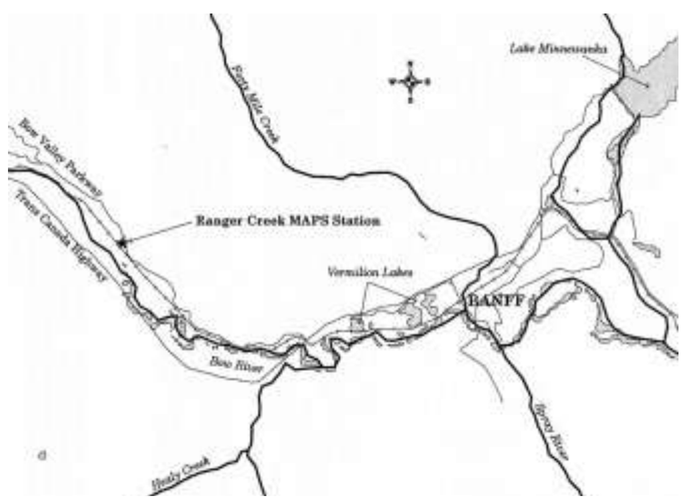
The Monitoring Avian Productivity and Survivorship (MAPS) program was established in 1989 by The Institute for Bird Populations, based at Point Reyes Bird Observatory in California. Its goal is to provide long-term demographic data on landbirds to help identify factors behind trends noted in other monitoring programs such as the North American Breeding Bird Survey and Christmas Bird Counts. It is a cooperative effort among public agencies, private organizations, and individual bird banders and has resulted in thousands of mist-netting stations being set up and operated during the breeding season across North America. The one in BNP, established in 1999 along the Bow Valley Parkway at Ranger Creek (see map) has been operated continuously since 1999. Parks Canada contributes to MAPS but the project itself is coordinated and run by the Bow Valley Naturalists, professional bird banders, and volunteers.

OBJECTIVE

Provide long-term population and demographic information on target passerine species through annual indices in adult population size, post-fledging productivity, survivorship and recruitment.

METHODS

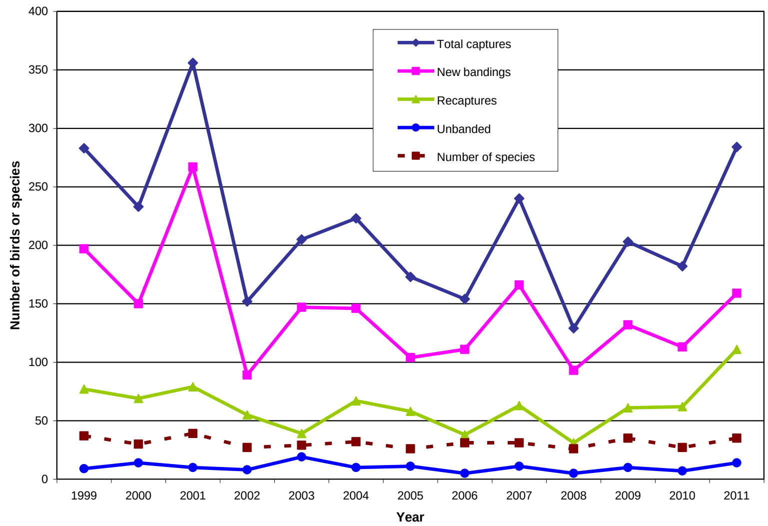
Forest songbirds are captured using mist nets at 10 day intervals from early June to early August and, after being identified to species, are aged, sexed, weighed and assessed for breeding and body condition by way of plumage, cloaca, body fat and brood patch indicators. Birds that are unbanded are fitted with a uniquely-numbered internationally-recognized aluminum leg band. Survival and productivity is estimated by analyzing bird ages, body condition and capture-recapture rates.



Ranger Creek MAPS site in Banff National Park

RESULTS

Between 1999 and 2011, 2,816 birds were captured at Ranger Creek. The busiest year was 2001, with 356 birds handled, but 2011 had the second highest number of captures, with 284 birds (see graph below). The site has the highest species richness (57) of the four stations in the mountain national parks (Jasper, Mt. Revelstoke, Banff and Waterton) and the second highest capture rate for adults (34.5/100 net-hours) and for juveniles (10.5/100 net-hours). One-hundred-and-nine birds of 21 species have been recaptured between years. One Orange-crowned Warbler (banded in 2004) was most recently recaptured in 2010, seven years later.



MAPS monitors 12 target species in this region, of which 10 occur at Ranger Creek (Swainson's thrush; American robin; Warbling vireo; Orange-crowned, Yellow, MacGillivray's and Wilson's warblers; Song and Lincoln's sparrows; and Dark-eyed junco). Of these, 7 showed negative population trends, two of which (Warbling vireo and Common yellowthroat) were substantial but not statistically significant. Substantial increases in Lincoln's sparrow were also noted. The 8-year trend for all species is a non-substantial and statistically insignificant (*P* = 0.867) decrease of -0.7% per year, suggesting songbird condition is currently stable at this site.

Four of the 10 species showed negative productivity trends and 7 showed positive trends but none were statistically significant. The pooled productivity trend for all species indicates an average annual increase of 0.030 (*SE* = 0.054) per year. The reproductive index (# young /#adults) shows a slight decrease from 1999 to 2010 (R^2 = 0.014). Annual adult survival ranged from a low of 0.252 for Yellow warbler to a high of 0.734 for Lincoln's sparrow (mean = 0.502).

Continued monitoring will increase the sample size and improve the statistical significance of all abundance and productivity measures over the long term.

YEARS OF DATA 1999 – 2011

Using mist nets to capture songbirds.

PARTNERS

Bow Valley Naturalists

FUNDING

Parks Canada

CONTACT

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BOW VALLEY ELK MANAGEMENT

RATIONALE

The Banff Park Management Plan endeavors to promote ecological integrity in part by restoring carnivore movement corridors and ensuring habitat security by managing development and visitor use. However, the Central Bow Valley elk *(Cervus elaphus)* herd generally selects wintering grounds near the town of Banff where predators are rare or absent, human use is high, and corridor restoration has been partially effective. The Banff Elk Management Strategy (1999, 2007), recognizes that continued emphasis on corridor restoration and carnivore habitat security is essential but acknowledges that hyperabundant elk around the Banff Townsite need to be managed for ecological reasons and to minimize risks to visitor safety from aggressive elk.

Park visitor gets too close to a bull elk *(Cervus elaphus)* in Banff National Park.

A comprehensive body of research in Banff National Park has greatly improved our understanding of the influence of people and large carnivores on ecosystem structure and diversity and has found that in the absence of predators, hyperabundant elk can overgraze vegetation, compete with other herbivores like beaver and moose, and alter long term ecosystem processes. More recently, the large herds of elk inhabiting predator refugia (e.g. near Banff Townsite and the Yaha Tinda Ranch) have been linked to high levels of wolf predation on secondary prey such as the threatened mountain park caribou.

The Banff Elk Management Strategy uses a variety of adaptive management tools including aversive conditioning, relocation and destruction, fencing of school grounds, and public education and awareness. Many of these actions are ongoing, specifically aversive conditioning of elk from the Townsite, temporary seasonal rail fencing to hold elk north of the Trans Canada Highway (to better expose them to natural predation pressures), culling elk with assistance of First Nations where natural predators are absent, assessing options to further improve wildlife corridors, and ongoing public communications.

OBJECTIVES

- Reduce elk density (to <2/km^2) and increase elk wariness and migration
- Reduce human-wildlife conflict incidents (by 75%)
- Maintain and restore wildlife corridors and habitat security
- Improve forest and grassland condition by reducing herbivory effects and restoring fire
- Continue communications and engagement to support ongoing science-informed actions.

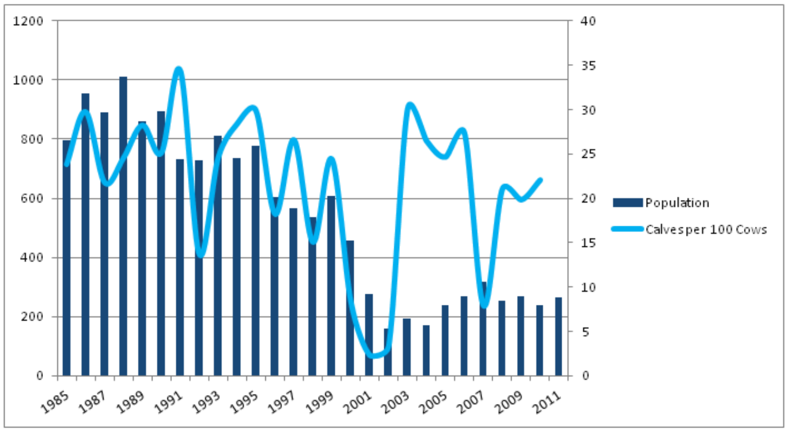
METHODS

Aerial and ground surveys of the elk population are done annually along with calf counts. A portion of the local elk population is radio-tagged to determine migrant/resident ratios. All human-wildlife conflicts are tracked using occurrence reports. Track monitoring of wildlife corridors occurs each winter for trends in predator activity (see Wildlife Corridors report, this document). Vegetation plots to assess shrub/forest condition relative to herbivory are conducted each year. Regular stakeholder/science advisory meetings are held to discuss results and future management.

RESULTS

Elk impacts on vegetation, other wildlife, and public safety have declined as the Elk Management Strategy has progressed through several phases under the guidance of stakeholder and science advisory bodies since 1997.

Elk numbers began to decline in 1985 in the western and eastern portions of the Bow Valley following natural recolonization of wolves in combination with several severe winters. In contrast, high elk numbers persisted in the central Bow Valley (townsite area) until 1999 when the first elk relocations took place as part of the new Elk Management Strategy (see graph).



Spring elk count and recruits (yearling calves), Bow Valley 1985-2011

Between 1999 and 2001, 217 elk were relocated to areas outside of the park, and the Fairholme wolf pack colonized the central Bow Valley resulting in a sharply reduced elk population of 172 animals (2003). The wolf pack dispersed from the area in 2003 and the elk population rebounded to 318 animals by 2007. Between 2007 and 2011 60 elk were culled to address the rapidly growing number of habituated, non-migratory elk that were not otherwise exposed to natural predation.

Recovery of willow at the First Vermilion Lake exclosure, BNP between 1999 and 2008.

The current Bow Valley elk population is 263 animals (fall 2011), 166 of which reside in the central Bow Valley. Elk culling in combination with some predation has limited the increase of the BV elk population; yet a high proportion of calves are recruited each spring, suggesting future growth, in the absence of natural predators.

Aversive conditioning of elk from the Townsite has reduced the level of elk habituation and increased elk wariness (increased flight distance). Incidents with aggressive elk have declined from an average of 100 a year prior to the Elk Management Strategy to 15-25 incidents per year. A growing proportion of the herd is also migrating away from the Townsite in summer, and temporary rail fencing on the Trans Canada highway crossing structures has held 50-75% of the central herd to the portions of their winter range where predators are active.

Research shows that vegetation recovery begins, on average, at an elk density of approximately 2 elk/km^2 or less. For the central zone, this would mean a population of approximately 116 elk (currently 166). Elk population simulations suggest that under the current elk management strategy, target elk density will be reached by 2019 assuming similar conditions of natural predation, winter severity, nutrition and management actions. We will continue to apply, adapt, and adjust the Elk Management Strategy based on input from stakeholders and monitoring results.

PARTNERS

University of Guelph, University of British Columbia, University of Alberta, University of Montana, Elk Advisory Committee (1997-2003) Montane Advisory Group (2007-2010)

FUNDING

Parks Canada

CONTACT

Tom Hurd, Wildlife Biologist, BFU
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Photo: Elsabe Kloppers

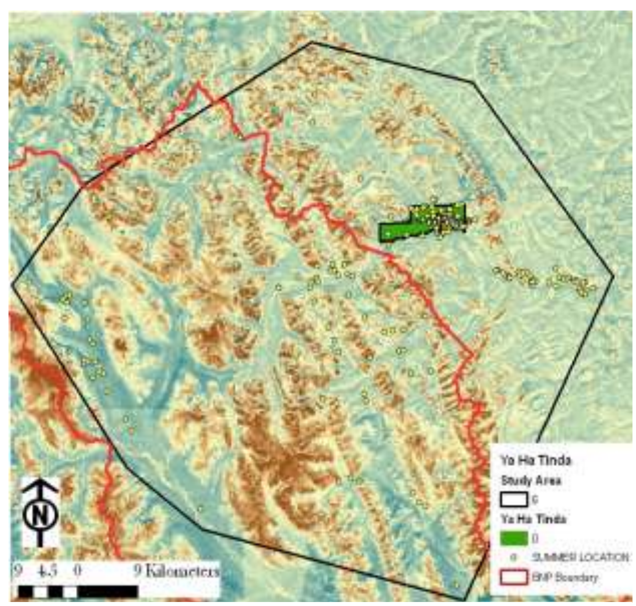
YA HA TINDA ELK

RATIONALE

Despite recent declines, elk *(Cervus elaphus)* continue to be the dominant herbivore in Banff National Park (BNP). This has repercussions for a number of other species, including wolves and caribou. All elk were migratory until a few decades ago but since wolves recolonized the area many elk now remain in either the Bow Valley or Ya Ha Tinda winter range year-round, resulting in partially migratory herds. Understanding how density-dependence affects these two strategies is important to the overall management of elk in the Park.

OBJECTIVE

- Determine whether migrant and resident elk are regulated more strongly by top-down (predation) or bottom-up (habitat) forces in a partially migratory herd over a 10-year period of declining elk density.

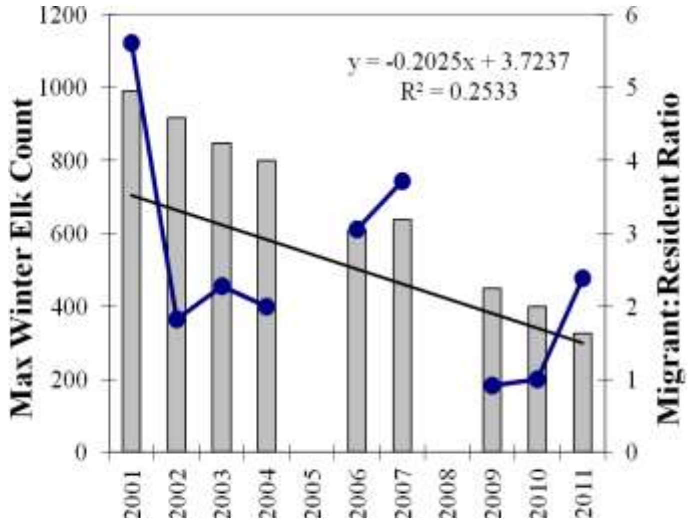


Study area and summer 2011 elk locations.

METHODS

A radio collared population of 55 adult female elk was maintained in a population of 325 animals (maximum 2011 winter count). Marked individuals were located via telemetry on average every 12 days throughout the summer (June 1 to Aug 31 2011). The majority of these locations were obtained by vehicle, foot and on horseback. Animals were observed whenever possible to see if they had calves. Whenever a mortality signal was detected the carcass and surrounding area was investigated for cause of death.

RESULTS



Proportion of migrants to residents (blue dots) against population size (gray bars).

Of 55 collared adult female elk, 39 (70.9%) migrated from the winter range on the Ya Ha Tinda Ranch. Of the 39 migrants, 21 migrated east towards the Wildhorse area and 18 migrated west into BNP.

We detected a total of 7 mortalities, 4 from marked individuals (2 migrants and 2 residents) on the winter and summer ranges and three unmarked individuals on the Ranch. The percentage of predator-caused mortality (43%) was similar to all other years of the study (36%).

We estimated calf:cow ratios for migrant and resident elk. We divided migrants into two subsets – western (Banff) and eastern (Wildhorse) – because the difference was interesting enough to report. Total calf:cow ratios were 16:100, resident calf:cow ratios were 9:100, and migrants were 39:100. If we split migrants between western and eastern directions, eastern migrant ratios were 45:100 and western migrants 24:100. Although we have not yet compared survival rates (pending calf:cow survey this upcoming winter) we expect differences between the Wildhorse and Banff migrant elk to be statistically and biologically significant, explaining the growth of the Wildhorse component of the YHT elk population over the last five years.

The general trend of declining population size appears to be continuing, however the proportion of migrants to residents appears to be on the rise since 2009 (see graph). This may be in response to increased predation on the Ranch during the summer and an increase in eastward migrants moving away from predation pressure and selecting for the 5-10 year old burns in the Wildhorse area. This is further supported by the high calf:cow ratios for these eastward migrants

YEARS OF DATA

2001-2011

PARTNERS

University of Montana, University of Alberta, Alberta Conservation Association

FUNDING

Parks Canada and Alberta Conservation Association

CONTACT

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PIKA POPULATION TRENDS

RATIONALE

American Pikas *(Ochatona princeps)* are an IUCN Red-Listed species with some subspecies in the United States listed as *Vulnerable* or *Near Threatened* but little is known about their status in Canada. Most of the declines in the US have been caused by hotter and drier summers, lower precipitation, warming temperatures, loss of vegetation, and timing of spring snow melt. Given the projected trend for a warmer climate, pikas face high risk of extirpation in many areas.

Pikas do not hibernate. Instead, they collect and dry their winter food supply through the spring and summer, building large and often easily observable haypiles beneath boulders. Research elsewhere in North America has suggested that late-summer surveys of such haypiles and whether or not they are active (i.e. contain green or brown vegetation) could provide a low-cost and repeatable index of whether or not local populations are going up or down.

OBJECTIVES

- Assess the potential for a citizen-science-based monitoring program for pikas in Banff and Kootenay national parks using haypile surveys.

METHODS

Twelve locations were surveyed in 2011 (see map). Surveyors (2-4 people) searched a given block of pika habitat (e.g. talus pile) for hay piles and pikas within 30m of the talus edge.   The locations of active and inactive hay pile clusters were recorded with a Global Positioning unit, as were observed pikas.

RESULTS

A total of 437 hay pile clusters (i.e. all hay piles in a 15m radius and assumed to belong to the same pika) were recorded in 2011, of which 63%, 30%, and 7% were *active*, *inactive*, and *not found* respectively (*not found* means pika seen but no hay pile observed). Fifty-eight percent of the “clusters” had 1 hay pile each but up to 9 were found clustered at some sites, an unexpected result given

Pilot study areas for pika hay pile monitoring in Banff and Kootenay National Parks, 2011.

the one-hay-pile-per-pika territory (25m radius) observed in the Ruby Mountains of SE Yukon Territory (D. Hik, pers. observation).

The difficulty in defining the boundary between pika territories, coupled with the difficulty in sometimes finding hay piles (especially in large, blocky talus) constituted our two greatest challenges. The magnitude of these challenges will directly affect the precision of population estimates and the power to detect trends over time. Based on our analysis and modelling of the 2011 results, the power to detect trends will likely be high but additional field work is required to estimate detection rates and to calibrate the number of hay piles with the actual number of pikas in a given area.

Monitoring success will also depend on the ability for surveyors to "find" the same hay piles between years. Given current GPS error (up to 5m) unobtrusive markings are needed at hay pile sites (e.g. small paint splotches on rock above) to facilitate monitoring.

This program shows great potential and there are plans to involve more citizen scientists next year as well as a post graduate student from the University of Alberta.

YEARS OF DATA

2011

PARTNERS

Dr. David Hik, University of Alberta
Bow Valley Naturalists

FUNDING

Parks Canada

Pika *(Ochatona pinceps)* in a talus slope in Banff National Park.

CONTACT

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CARIBOU REINTRODUCTION

RATIONALE

Woodland caribou *(Rangifer tarandu, caribou)* are declining across Canada including the *Threatened* Southern Mountain caribou herds of Banff, Jasper, Mount Revelstoke, and Glacier National Parks. Historically Banff had a population of 25-40 caribou. The population declined to 5-10 animals by the mid-1990s because of unnaturally high populations of elk and wolves. Then, in spring 2009, an avalanche killed the remaining four animals.

Five of 7 caribou populations in the Mountain National Parks have recently declined to less than 20 animals.

Caribou numbers in the Mountain National Parks (2011). In the last 10 years, the Tonquin population has declined from over 75 animals, the Maligne and Columbia North populations from over 60 animals, the Brazeau from over 40 animals, and the Banff population is almost certainly locally extinct.

OBJECTIVE

Determine the likelihood of caribou translocation success within Banff National Park and in the Maligne, Brazeau, and Tonquin regions of Jasper NP.

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METHODS

We used GPS, survival, and calf-recruitment data from radio-collared caribou in Banff (2003 – 2005) and Jasper (2001 - 2010) to assess the potential success for future translocations. Factors we investigated included the number of existing caribou (zero for Banff), wolf densities, caribou habitat quality, and the amount of time wolves spent in caribou range. In Banff we put a GPS radio collar on a member of the Bow Valley wolf pack (2009-2011) to determine how wolf-use of caribou range has changed with the 75% decline in elk and a concurrent decline in wolf densities. We also examined genetic connectivity among subpopulations of caribou, what source populations would be most genetically similar to the Mountain Park caribou, and examined the feasibility of a caribou captive breeding program as a source of translocation animals.

RESULTS

Caribou populations generally require areas with wolf densities lower than 6 wolves per 1000 km^2. Banff wolf densities have hovered around 2 to 4 wolves per 1000 km^2 since 2004, presumably because of a 75% decline in numbers of elk. Indeed, one analysis shows Banff to have plenty of high quality caribou habitat where wolves rarely venture. However, another analysis shows wolf-caribou encounter rates are 3 times higher in Banff than in the Tonquin area of Jasper. That analysis also shows that roads and trails in caribou range increase the probability of wolf encounters, especially in winter.

Translocation success and population viability will depend on the number of caribou translocated, their survival rates, the existing population size, and their learning period. Other translocation projects show that caribou are relatively elastic in their behaviour and adapt to their new environment quickly; their biggest challenge is in avoiding predators in their first year.

Our analysis suggests that at least 45 female caribou would be required for successful translocation to Banff at current wolf densities. Source caribou populations exist elsewhere in Alberta and in British Columbia and the Yukon however those in northern British Columbia are most promising because of their large population size (greater than 1000 animals), stable population growth rates, and access.

Given the low number of suitable source populations, we also assessed the feasibility of a captive breeding program at the Ya Ha Tinda Ranch, the University of Alberta's Ministik Research Station, and the Calgary Zoo Conservation Centre. The Calgary Zoo offers veterinary expertise, an existing facility, safety from predators, and public education and outreach potential. It is there that Parks Canada and the Province of British Columbia are now focussing their efforts. Source animals for such a captive breeding program could come from several genetically diverse wild populations.

Once caribou are available, Parks Canada will translocate them to the park or region that has the highest likelihood of success. In the meantime, Banff will continue to monitor factors such as wolf use of caribou range.

YEARS OF DATA

2001 – 2010

PARTNERS

University of Montana, University of Calgary, Government of British Columbia, Government of Alberta, Calgary Zoo, Environment Canada.

FUNDING

Parks Canada

Adult male caribou in the Tonquin Valley, Jasper.

CONTACT

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BISON REINTRODUCTION

RATIONALE

The 2010 Banff National Park Management Plan commits Parks Canada to "reintroduce a breeding population of the extirpated plains bison, a keystone species that has been absent from the park since its establishment." It also commits that Parks Canada will "work with stakeholders and neighbouring jurisdictions to address potential concerns through joint management strategies *before* reintroduction". This initiative nests within the Canada National Parks Act and the broader mandate to maintain and restore ecological integrity as a "first priority in the management of national parks." Ecological integrity includes more than just the composition and abundance of native species, of which bison *(Bison bison, bison)* are a part, but also includes maintaining and restoring natural processes. In this case we must consider the role of bison as both herbivores and as a prey species for larger carnivores. In addition we must strive to understand, and where possible accommodate, their natural seasonal use of the landscape.

Female bison with young-of-year calf.

Archaeological and historical evidence indicates that bighorn sheep and bison were once the dominant herbivores in Banff National Park (BNP) but that the latter spent much of their lives on the prairies (as evidenced by the presence of C4 grasses in their diet). It is not clear whether bison occupied BNP seasonally, or if they were pushed or attracted here, from the prairies, by First Nations as part of a hunting strategy. The absence of bison for the last 130 years means information about their ecology and their potential interactions in BNP must be derived from other wild bison populations like those in Prince Albert and Grand Teton National Parks. To better predict how bison will respond to specific conditions in BNP, a habitat assessment, range capacity estimate, and disease risk study are all underway to inform the public consultation and environmental assessment phases of the reintroduction process.

OBJECTIVE

Assess the habitat quality, carrying capacity, and disease transmission risk of bison in Banff National Park.

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METHODS

A 2006 elk foraging model, developed for Banff National Park, is being adjusted for bison to incorporate differences noted between the two species in other scientific studies (e.g. in Yellowstone and Prince Albert national parks). Banff-specific snow coverage and depths will be incorporated into the new model using MODIS (remote sensing) and Environment Canada weather station data. Predictive maps of summer and winter range will be generated by the end of May 2012 followed by ground truthing in the summer. Bison carrying capacity estimates (e.g. maximum number of animals the Park can support) will be generated from forage biomass equations developed for other free-ranging populations. Disease transmission risk is being assessed based on the status of source animals (Elk Island National Park), likelihood of bison excursions outside of Banff Park, and proximity to domestic livestock.

RESULTS

Results will be forthcoming in summer 2012.

PARTNERS

University of Montana, University of Calgary, University of Saskatchewan, Canadian Cooperative Wildlife Health Centre, Elk Island National Park.

FUNDING

Parks Canada

Male bison.

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GRIZZLY BEAR CUB-OF-THE-YEAR INDEX

RATIONALE

Unnatural sources of mortality (e.g. highway/railway collisions) coupled with increasingly industrialized lands around the national park, in addition to naturally low densities and low reproduction rates render Banff's grizzly bear *(Ursus arctos)* population amongst the most vulnerable in the world. It is for this reason that tracking grizzly bear trends is a priority in Banff National Parks' (BNP) 2010 Management Plan.

Over the past 30 years, Yellowstone National Park has used a female-with-cub-of-the-year index to track grizzly bear reproduction. The technique, which uses direct observations from park staff, researchers and the public, is simple and non-invasive. It was tested in BNP during the East Slopes Grizzly Bear Study (see Brodie and Gibeau, 2007) but results were limited due to small sample size and poor detectability. Since then remote, motion-activated cameras have been deployed throughout Banff's backcountry for a variety of wildlife monitoring projects (see wolf, caribou and wildlife occupancy reports within this document) and, collectively, could make a female-cub-of-year index more feasible.

OBJECTIVE

Assess the feasibility of a grizzly bear cub-of-the-year index by combining direct (staff and public) sightings with images from remote, motion-activated wildlife cameras.

Female grizzly bear *(Ursus arctos)* with three young-of-year cubs.

METHODS

Grizzly bear family groups were counted throughout BNP using public and staff sightings (as entered on park Bear Monitoring databases), ~50 motion-activated cameras located at pinch-points throughout the backcountry, and motion-activated cameras located at wildlife crossing structures along the Trans Canada Highway . Observations from all these sources were sorted and filtered using the following rule-set for determining discrete family groups (adopted from Brodie and Gibeau (2007) and Knight et al. (1995)):

- Once a female with a specific number of cubs was sighted in an area, no other female with the same number of cubs within 30km was regarded as distinct unless 2 family groups were seen by the same observer/camera on the same day, or by 2 observers/cameras at different locations but similar times, or 1 or both females were radio-marked.
- Because of possible cub mortality, no female with fewer cubs was considered distinct in that area unless she was seen on the same day as the first female or unless both were radio-marked.
- Cubs were classified from their size and, if known, the reproductive status of the female from the previous year. The maximum number of cubs observed was considered the litter size, although cubs lost early in the season would not have been recorded.

Annual counts of unique females-with-cubs-of-year were used to calculate population growth rates (λ) using the bias-corrected Chao population estimates (as per Brodie and Gibeau, 2007).

RESULTS

Six discrete family groups of grizzly bears were observed in Banff National Park in 2011 (Table 1). All were observed on remote cameras while 4 of the 6 were also observed by park staff and/or members of the public. All of BNP was not surveyed exhaustively and a number of areas remain where a family group of grizzly bears could exist undetected. This is therefore a minimum estimate/count.

Table 1: Unduplicated grizzly bear females-with-cubs-of-the-year observed in 2011, Banff National Park.

Discrete Family Groups	Remote Camera Observations	Verified Resource Conservation (RC) and public (PU) sightings
1. Female with 1 YOY – Cuthead	Cuthead camera; Aug 29, Sep 7	
2. Female with 3 YOY - #64 - Bow Valley	Elk Pass camera; Aug 21 Redearth overpass; Aug 7 Wolverine overpass; Aug 9, Aug 10	Bow Valley: (RC) Jun 28, Jul 2, Jul 9, Jul 12, Jul 15, Aug 19, Aug 20 Bow Valley: (PU) 16x
3. Female with 1 YOY - Fairholme	Fairholme camera; Jul 20	East Gate: (PU) Jun 9
4. Female with 3 YOY – Panther R.	Scotch camera; Jun 30, Aug1 Windy camera; Aug 18 Shale Pass camera: Sept 10.	Panther R; (RC) Aug 18
5. Female with 2 YOY - Sunshine	Healy overpass; Jun 27, Jul 6, Jul 11, Aug 10 Wolverine Ck camera; Jul 27, Aug 11 Wolverine underpass; Jul 27 Redearth overpass; Jul 21 Pilot culvert; Jul 16 Sawback culvert; Jun 29, Jul 2 Wolverine overpass; Jul 9, Jul 10 Massive culvert; Jun 29 Edith underpass; Jun 8, Jul 8	Healy Ck; (RC) Jun 28, (PU) Jul 19 Sunshine Rd; (RC) Aug 29
6. Female with 3 YOY	Watchman Lake; Aug 26	

The 2011 family group count was the same as what was detected in 2009 (N=6) and 1.5 times larger than what was detected in 2010 (N=4) (Table 2). As a point of reference, Gibeau and Brodie (2007) surveyed an area almost twice as big (included 50% of BNP) from 1993 to 2004 and reported 2-9 family groups, depending on the year.

Table 2: Number of unduplicated females with cubs of the year (M); total number (N) of sightings of M grizzly bears; number of M bears seen i times (fi), and number of females estimated from summation (Nˆ sum) and Chao (Nˆ Chao) monitoring-based estimators. Estimated population growth rate (λ) in year *t*.

Year	M	N	f1	f2	f3	f5	f>10	N^ sum*	N^ Chao	
2009	6	25		2	2	1	1	N/A	6	N/A
2010	4	13		2		1	1	N/A	4	0.67
2011	6	55	1	2		1	2	N/A	6	1.5

* the N^sum estimator requires a minimum of 4 years of data as it accounts for the breeding interval of female grizzly bears in the Canadian Rockies.

The bias-corrected Chao estimator (N^Chao) inflates raw counts of known family groups seen only once, but reduces this inflation by females seen twice or more. For the last three years all but one family group has been seen more than once per year, implying few escaped detection; thus, the Chao-estimated populations are largely the same as actual annual counts. Brodie and Gibeau (2007) acknowledge this may be a common scenario for small grizzly bear populations.

Three years of grizzly bear family group data (2009-2011) allowed us to estimate two annual population growth rates: 0.67 for 2009-2010 and 1.5 for 2010-2011. However these rates should be interpreted with great caution: small sample size and large variation in the two growth rates resulted in very large confidence intervals (95% CI = 0.006 to 1.3). The upper end of this confidence interval (1.3) is the maximum reproductive rate for all North American grizzly bear populations which, according to recent research, is highly improbable for the Banff grizzly bear population.

The high variation in grizzly bear family groups between years could be a function of differential reproductive success depending on the previous year's berry (*Shepherdia)* crop. This, along with naturally low sample sizes, is problematic in terms of statistical analysis. Brodie and Gibeau (2007) recognized these limitations and suggested they could partially be overcome as more years of data are collected and by minimizing

1Female grizzly bear *(Ursus arctos)* with a single young-of-year cub.

sampling variance between years.

Promising new methods of population abundance and growth estimators may be integrated with, or supplant, the above methods in coming years. For example, Parks Canada is developing a new camera research project to test the feasibility of indexing population growth for a variety of species using an emerging technique known as “occupancy modelling”. In this case, the research could be used to develop spatially explicit trend estimates of occupancy and density of female grizzly bears.

Additionally, researcher R. Sawaya (in press) recently completed a study within the Bow Valley of BNP which estimated, with excellent precision, grizzly bear abundance and population growth rates using DNA collected from hair found on bear rub trees. He used Pradel open population models with just 3 years of bear rub data. Surveying bear rubs for long-term monitoring of grizzly bear population growth rates shows considerable promise for all Mountain National Parks and will be evaluated for its future application once the work is completed and published.

YEARS OF DATA

2009-2011

FUNDING

Parks Canada

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Grizzly bears *(Ursus arctos)* using a rub tree.

GRIZZLY BEAR – RAILWAY INTERACTIONS

RATIONALE

Female grizzly bears *(Ursus arctos)* in Banff National Park (BNP) demonstrate an exceptionally late age at first reproduction (6.7 yrs), a long interval between litters (4.4 years) and few cubs per litter (1.8), making them the least reproductive of any studied grizzly population in the world. Meanwhile, the Canadian Pacific (CP) rail line has emerged as the primary source of human-caused bear mortality in the Park. Eleven grizzlies have died since 2000, including nine since 2005.

The BNP Park Management Plan (2010) focuses on reducing human-caused grizzly bear deaths. In 2010, the Canadian Pacific Railway signed a 5-year memorandum of understanding with Parks Canada and together the two agencies are funding and managing a research program to find on-the-ground solutions to grizzly bear mortality on the tracks.

OBJECTIVES

- Better understand the causes of train kills through focussed research.
- Develop and implement actions to reduce train-kills.

Grizzly bear *(Ursus arctos)* walking the railway tracks in Banff National Park.

METHODS

Experts in engineering, biology and transportation came together in Banff in September 2011 to discuss the issue. From these discussions came five factors thought to influence the risk of bear-train collisions and an associated suite of hypotheses for how we might reduce/resolve the problem:

Problem		Hypotheses
1. Unnatural Food	1a.	Grizzly foraging on the rail line will be reduced if grain/cereals leaking from rail cars is reduced to very low levels or eliminated, and/or by taste aversion conditioning to grains and other cereals.
	1b.	Grizzly foraging on the rail line will be reduced at specific sites if bears are excluded by measures such as exclusion fencing in conjunction with automated gates. This measure may depend on the effectiveness of 1a (above).
2. Natural Food	2a.	Grizzly foraging in the rail line right-of-way will decline if important foods like berries are removed, although attractive forbs and grasses will still be present.
	2b.	Grizzly bear foraging in the right-of-way will be reduced if equal or higher quality natural forage becomes more widely and predictably available away from the railway right-of-way through forest thinning, prescribed fire, and/or by seasonal intercept feeding using road/rail kill ungulate carcasses.
3. Track Design (Risk Zones)	3a.	Collisions will be reduced by mitigations that exclude bears from high risk sites along the rail line using measures such as fencing, automated gates, and peg-boards.
	3b.	Collisions will be reduced by mitigations that provide advance warning of a train's approach such as sight- line clearing at curves, and/or stationary noise/light emitters triggered by an oncoming train, slow zones, etc.
	3c.	Collisions will be reduced by providing travel routes for bears to egress the tracks where steep terrain and raised ballast exists.
4. Behaviour	4a.	Individual bears will learn to exit the rail line ahead of a train through aversive stimuli such as sound/light emitters, etc., mounted directly on trains. .
5. Movement	5a.	Grizzly bears can be excluded from travelling along the rail-line at specific sites (see 3a)
	5b.	Grizzly bears will travel less on the rail line if better off-site foraging opportunities are available (See 2b). To be effective this measure depends on unnatural attractants (1a) being removed.
	5c.	Grizzly bears will travel less on the rail line if alternative travel corridors are secured with low levels of visitor use and development.

RESULTS

Research proposals were evaluated by a team of technical reviewers in January 2012. Proposals were assessed on 5 criteria: leveraging/cost sharing, collaboration, project effectiveness, cost effectiveness and technical soundness. Based on these criteria, the technical review committee recommended funding a suite of projects designed to provide information on the root causes of bear-train collisions and projects that hold promise to reduce bear-train collisions immediately. The following projects are underway or will begin in 2012:

Project	Investigators	Affiliation	Duration
The effect of vegetation clearing on bear response to trains.	J. Park, R. Kubian	Parks Canada	2012-2013
The effect of off-site habitat enhancements (e.g. fire) to reduce use of the railway by grizzly bears	J. Park, Dr. S. Nielsen	Parks Canada Agency, U. of Alberta	2012-2014
Environmental and railway factors contributing to bear strikes and recommended mitigations. Evaluate grain spill rate from hopper cars and report trends and distribution of grain.	Dr. C. St Clair; Dr. A. Clevenger; Dr. S. Nielson, B. Dorsey	University of Alberta, Western Transportation institute, Montana State U.	2012-2016
Determine whether bears can learn to avoid railway-spilled grain by applying a Conditioned Taste Aversion trial.	L. Holmstol	Cascade Environmental Research, B.C.	2012-2013
Determine bear behaviour ahead of oncoming trains to determine feasible bear-strike mitigations (video data).	B. Burley, Dr. D. Draper	Parks Canada Agency, U. of Calgary	2011-2014
Fine scale spatial and temporal movement of grizzly bears relative to railway, roads, other rights of way and other disturbed areas (GPS collar data). Provide timely GPS data to other bear-train investigators to support their research.	T. Hurd, J. Whittington, S. Michel, H. Morrison, T. Kinley	Parks Canada	2012-2015
Develop and test fence-end mitigations to assess the feasibility of “hot-spot” exclusion zones on the railway.	To be determined		

In addition to the above new research projects a number of initiatives are well underway:

- Grain Monitoring Program 2007-2011 (see summary this report)
- Bear foraging rates, mortality, and train-spilled grain in Banff and Yoho National Parks (B. Dorsey, M. Sc. Thesis, Montana State University)
- Relative risk and factors associated with mortality for ungulates and bears along a railroad in the Canadian Rocky Mountains (B. Dorsey, M. Sc. Thesis, Montana State University)

YEARS OF DATA

2007 – 2011 (Ongoing)

PARTNERS

CP Rail, Western Transportation Institute at Montana State University, University of Calgary, University of Alberta.

FUNDING

CP Rail, Parks Canada, University of Calgary, University of Alberta, Montana State University, National Science and Engineering Research Council (pending)

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Grizzly bear *(Ursus arctos)* balancing on the rail, while walking the railway tracks in Banff National Park.

GRAIN ON RAILWAY TRACKS

RATIONALE

Trains represent the largest source of human-caused grizzly bear *(Ursus arctos)* mortality in the Mountain National Parks. In spring and fall, when there are few calorie-rich foods for bears to eat, grizzly bears can be seen on the railroad tracks consuming grain that has leaked from hopper cars. The spatial relationship between grain deposits and grizzly bear mortality is not statistically strong but past research has shown the amount of grain clearly correlates with the amount of time bears spend on the tracks. Indeed, grain has been found in the stomach contents of many train-killed bears.

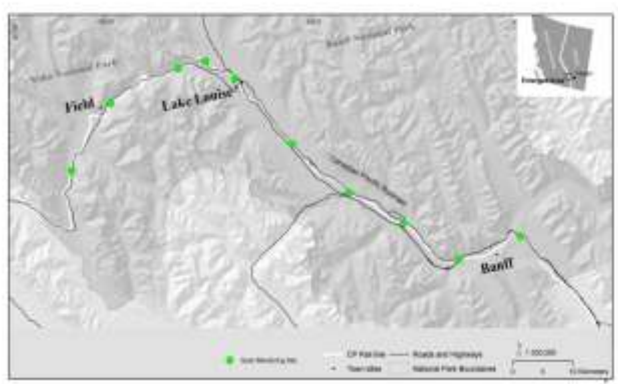
A large scale refurbishment program for railway hopper cars began in 2007. As of December 2011, 13,500 cars owned by the Government of Canada had been repaired, of which 5 – 6 thousand are being used by the Canadian Pacific Railway (which operates through Banff). These federally owned grain cars represent approximately 30 - 42% of the total grain hauling fleet used by CP Rail.

OBJECTIVE

Investigate the trend in train-spilled grain as it relates to season, the number and condition of grain cars, train speed, and track characteristics.

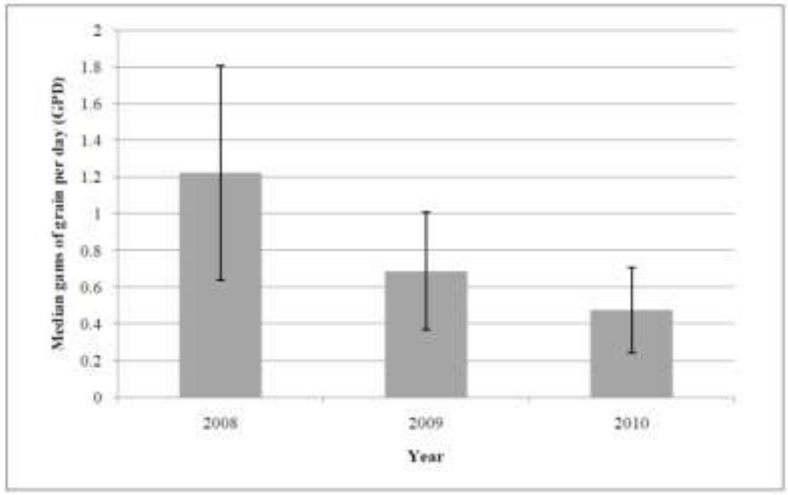
METHODS

Parks researchers monitored ten sites, located approximately 12km apart, along the CP rail line from 2008 to 2011 between the east boundary of Banff National Park and the west boundary of Yoho National Park (see map). They placed a sampling screen ($0.37m^2$) between the steel rails and grain was collected, sifted, dried and weighed off each screen approximately every four days, year round.

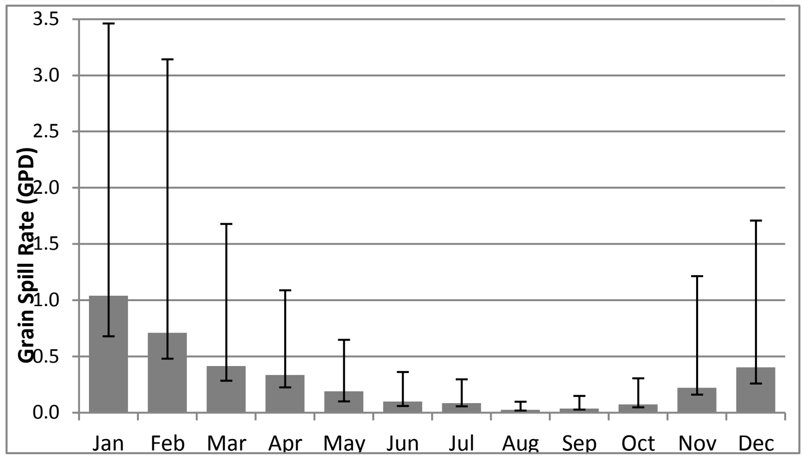


RESULTS

Grain spill decreased as much as 61% between 2008 and 2010, suggesting hopper car repair, along with vacuum truck cleanup, is having a significant effect. However, it is important to remember that this is directly related to the total volume of grain shipped.

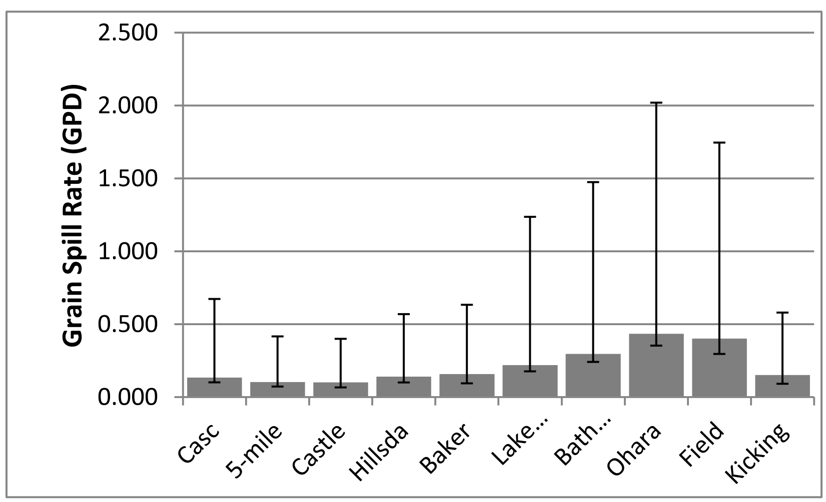


Grain spill was highest in Jan-Feb and lowest during the summer (likely an artefact of the winter grain hauling season). Such seasonality points to the value of timely reporting and cleanup as a means of reducing grain and bear conflicts.



Spills were greatest in the western portion of the study area between Lake Louise and Field, where increased grade and curvature result in lower train speeds.

Grain spill monitoring will continue, along with an analysis of how it relates to terrain features, train speed, and ongoing hopper car refurbishment. In 2012, this monitoring will be conducted by a third party as part of a number of other research projects that have started under a new CP Rail-Parks Canada research initiative to reduce grizzly bear mortality.



YEARS OF DATA

2008-2010 (Ongoing)

FUNDING

Parks Canada

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*This **"Report from the Field"** document is something new for Banff. Its purpose is to improve how we communicate what's happening with research, monitoring and restoration projects <u>currently</u> being undertaken in the Banff Field Unit, not just to residents of the Bow Valley but to all Canadians. The projects described herein are works in progress; data is often preliminary and in most cases hasn't yet undergone peer review. It is for this reason that these project summaries focus on who, what, where, when, why, and how. We've left conclusions and recommendations for our final reports and the scientific literature.*

By design, each of these projects is only briefly described. If this leaves you wanting more information, then we have succeeded in piquing your interest. To learn more, please contact the primary researcher listed at the end of each summary. For many of these projects we also prepare, more detailed, year-end reports that we can make available.

As this is a new document, I am interested in receiving any feedback that will help improve this summary in future years. I can be contacted at bill.hunt@pg.gc.ca.

Thank you,

Bill Hunt, Resource Conservation Manager, Banff Field Unit, Parks Canada