

# Research Links

*A Forum for Natural, Cultural and Social Studies*

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*Parks Canada, Western Region*

FALL 1993

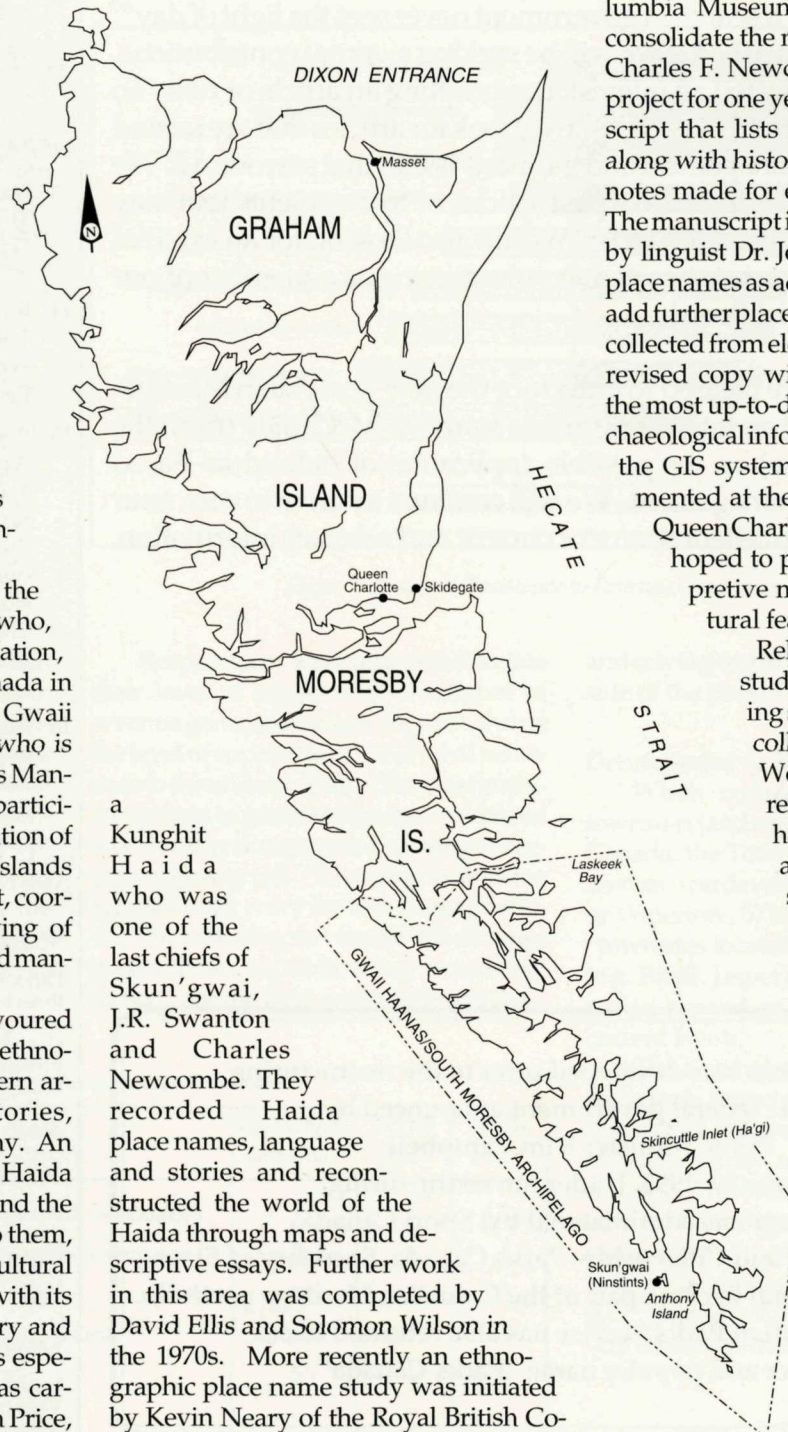
## Place Names and Myths of Gwaii Haanas

C.J. Taylor

The Western Region's Gwaii Haanas Ethnography project has focused on the cultural environment of the southern Haida. Historically, two groups of Haida lived in the Gwaii Haanas area: the Kunghit, centred at Skun'gwai (Ninstints), and another group centred in the Laskeek Bay area. Although these two groups were distinguished linguistically and culturally, they merged during the latter 19th century as disease brought about the abandonment of all the southern towns and villages. Eventually the survivors coalesced with other Haida groups at Skidegate, which is now the principal town of the southern Haida.

The project has incorporated the aims and concerns of the Haida who, through the Council of the Haida Nation, are equal partners with Parks Canada in the research and conservation of Gwaii Haanas. In particular Guujaaw, who is also a member of the Gwaii Haanas Management Board, has been a major participant in the design and implementation of this project. The Queen Charlotte Islands Museum is another key participant, coordinating the retrieval and archiving of materials collected for the project and managing the research contracts.

To date the project has endeavoured to retrieve a broad spectrum of ethnographic data relating to the southern archipelago including songs, stories, genealogies and cultural geography. An important initiative has been the Haida place name study. Place names, and the traditional information attached to them, are a significant aspect of any cultural landscape, and in Gwaii Haanas, with its strong associations to Haida history and traditions, the place name study is especially critical. Important work was carried out in the 19th century by Tom Price,



a Kunghit Haida who was one of the last chiefs of Skun'gwai, J.R. Swanton and Charles Newcombe. They recorded Haida place names, language and stories and reconstructed the world of the Haida through maps and descriptive essays. Further work in this area was completed by David Ellis and Solomon Wilson in the 1970s. More recently an ethnographic place name study was initiated by Kevin Neary of the Royal British Co-

lumbia Museum. Neary attempted to consolidate the notes and maps made by Charles F. Newcombe. We assisted this project for one year and received a manuscript that lists 500 Haida place names along with historical and ethnographical notes made for each site by Newcombe. The manuscript is currently being revised by linguist Dr. John Enrico to render the place names as accurate as possible and to add further place name data, which he has collected from elders in Old Massett. This revised copy will be incorporated with the most up-to-date geographical and archaeological information and included on the GIS system currently being implemented at the Gwaii Haanas office in Queen Charlotte City. Eventually it is hoped to produce a series of interpretive maps illustrating the cultural features of the area.

Related to the place names study, John Enrico is reworking some of the Haida myths collected by James Swanton. Working from the original rendering of spoken Haida, he is translating the texts according to his own unsurpassed knowledge of the language. The republished Haida myths and texts will form an essential background for the cultural landscape of Gwaii Haanas. There are numerous story towns or mythical places throughout the islands, but some of the most important are in Gwaii Haanas. So many places relate

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# EDITORIAL

The response to our inaugural issue of *Research Links* is most heartening. Our initial mailing list was intentionally short; in addition to the 225 copies distributed within Parks Canada, it included 173 people whom we believed would be interested in receiving a copy. Of those 173, 82 (47%) of you returned our sheet saying yes you wanted to continue receiving future issues of *Research Links*, only one asked to be deleted from the mailing list, and there were 52 additions.

Your comments indicated you "like the look" of this publication, remarking on its "well written articles", and applauding the initiative "since so much good research in government never sees the light of day". More than one of you asked if we will be seeking external contributions, and some of you indicated an interest in submitting an article or two. To this we reply "Yes, yes"! For each issue we look for articles that are related to science and park management and the many issues that surround it. We are receptive to short responses to past articles or to comments that may provoke dialog on any related topic. We are also looking for an external academic advisor who is interested in volunteering as a member of our *Research Links* Editorial Board.

In this issue we are pleased to introduce the new Ecosystem Management Specialists, and an interesting article from Dr. McCauley (from the University of Calgary) on the possible application of Individual-Based Models in resource management. We will continue to strive to earn your praise, and to be an excellent source of current and relevant information.

*P.A. Benson*

**Patricia Benson**  
Editor  
Parks Canada  
Western Region

**Research Links** was developed prior to the restructuring of the federal government announced by Prime Minister Kim Campbell on June 29, 1993. Under the restructuring, the programs administered by: Sport Canada, Multiculturalism and Citizenship, Parks Canada, Secretary of State, and Registrar General become part of the Canadian Heritage portfolio. The Canadian Parks Service has also returned to our former and popular name "Parks Canada".

## Research Links

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Printed on recycled paper using vegetable based ink.

### SUBMISSIONS WELCOME!

Parks Canada aims to produce *Research Links* three times annually. We welcome submissions from people working within and outside Parks Canada. Articles can be drawn from reports, presentations, material submitted to other publications, or written from scratch. The next issue will appear in mid-January, and the submission deadline is November 5.

### WRITE TO...

For more information or a free copy of *Research Links*, contact:  
Editor, *Research Links*, #520, 220 - 4 Ave. S.E.,  
P.O. Box 2989, Station M, Calgary, Alberta, T2P 3H8.

### FRANCOPHONES!

Le texte de cette publication est offert en français. Vous pouvez l'obtenir en écrivant à l'adresse ci-dessus.



# Canadian Attitudes Towards our National Parks

by Sylvaanna Hegmann with excerpts from a recent Angus Reid Group report

In early 1993, Parks Canada, Western Region (WR) commissioned the Angus Reid Group, a well-known market research firm with experience in conducting public opinion studies, to fill information gaps and allow managers to consider the views of the Canadian public.

The study consisted of two phases. The first was a telephone interview to recruit respondents and gather baseline information. The second was a self completed questionnaire that was mailed to all qualified participants.

A total of 3719 telephone interviews were conducted across Canada; from which 2403 Canadians agreed to complete the mailback survey. A total of 801 surveys were mailed in Alberta, 800 in British Columbia, 362 in Ontario, 263 in Quebec, 92 in the Atlantic provinces and 85 in Manitoba/Saskatchewan.

A total of 1365 completed questionnaires were returned in May 1993, giving an overall response rate of 57%. This is considered excellent for a survey of the general public.

Of the WR Strategic Plan objectives, "identifying and responding to future threats to park resources both within and outside of national parks boundaries", "promoting the benefits of environmental protection" and "managing the impact of visitors on national parks to ensure the protection of the parks" were rated as the top three priorities.

When asked which cost-recovery options for campgrounds should be considered by Parks Canada, "closing sections of campgrounds that are not sufficiently used", "charging campers for specific services in the campgrounds such as the use of firewood or showers" and "charging higher camping fees" were the most popular. "Closing campgrounds

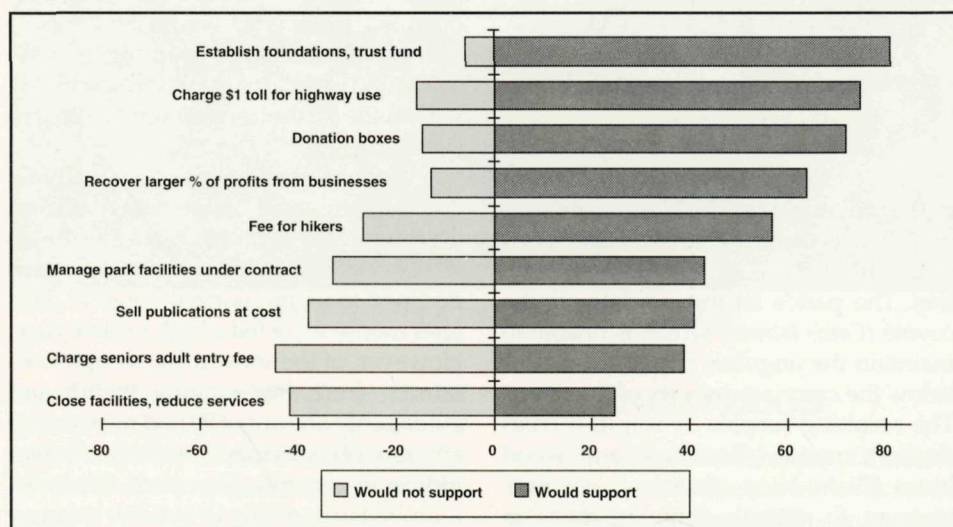


Figure 1: Support/Resistance to Revenue Generation Options

## RESULT HIGHLIGHTS

### Parks Management

Canadians overwhelmingly state that the main priority of Parks Canada is to "preserve and protect the natural environment within the existing national park boundaries". "Creating new national parks to protect ecologically significant areas" and "providing recreational opportunities for visitors" are the second and third priorities. Table 1 shows the ranking of Parks Canada's priorities by all Canadians, by western Canada residents and by the remaining provinces.

Respondents were also asked to rate their level of support for a number of revenue generation ideas. Figure 1 shows the level of support and the level of resistance to these ideas. Two of the most popular options to generate revenue are based on voluntary donations followed by charging a highway toll. "Charging seniors the regular adult entry fee and closing facilities" or "reducing services (if this does not pose a threat to public safety in national parks)" are the least acceptable options.

and relying on private campgrounds outside of the parks" was the least popular.

### Development in National Parks

When comparing national park townsites (and service centres) in western Canada, the Town of Banff is more often seen as overdeveloped than Jasper, Field or Waterton. 57% of Canadians feel that "townsites located within national parks (e.g. Banff, Jasper) should not be permitted to expand or develop beyond their current levels".

The two types of facilities which respondents (approximately half of Canadians) feel are the least appropriate for national parks are airstrips and golf courses. This number drops slightly for western Canada respondents. Hotels, gift stores and downhill ski areas were ranked next as being considered inappropriate (i.e., "should not be in a national park" or "currently too many of them").

Table 1: Ranking of Parks Canada Priorities

PARKS CANADA PRIORITIES	CANADIAN OVERALL	BC/AB ONLY	OTHER PROV.
Preserving/protecting environment within park boundaries	1	1	1
Create new parks to protect ecologically significant areas	2	2	3
Provide recreational opportunities for visitors	3	3	2
Work with groups/gov'ts on environmental issues	4	5	4
Provide learning opportunities for visitors	5	4	5
Work with groups/gov'ts on tourism issues	6	6	6

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# Identifying Stressed Wapiti and Moose

by Normand L. Cool and Robert J. Hudson



Elk Island National Park (located in central Alberta) is enclosed by a 2.2 metre high fence, limiting animal dispersal within the bounds of 195 square kilometres. The park's largest predator is the coyote (*Canis latrans*) which is unable to maintain the ungulate populations at or below the carrying capacity of the range. The resulting surplus of wapiti (*Cervus elaphus*), moose (*Alces alces*) and wood bison (*Bison bison athabasca*) are live-trapped to restock depleted areas in Canada. Plains bison (*Bison bison*) are sold to the public.

To determine the yearly ungulate surplus, park staff have used annual aerial and range surveys. However these tools have not been completely successful, and alternative methods to assess the balance of herbivores and their food supply were sought. The focus of this study was to determine if the analysis of feces and urine from ungulates can be used to identify animals under stress (a possible indicator of winter severity or carrying capacity).

Eight wapiti and eight moose calves were penned and fed a controlled diet. Feces and urine samples were collected and metabolic end products such as fecal crude protein (FCP), creatinine (a by-product of muscle metabolism), and urea; plus cortisol (a hormone which surges during times of stress) were measured.

## RESULTS

Fecal crude protein was positively related to nitrogen intake in both wapiti ( $P=0.002$ ) and moose ( $P=0.005$ ). However reducing the low protein (8.1 - 9.6% crude protein) diet to 50% did not cause a corre-

sponding drop in FCP. Thus, FCP concentrations were not significantly related to changes in body condition.

Creatinine was a satisfactory denominator for urinary metabolite ratios. Its daily excretion was relatively constant, and was not significantly affected by diet, ambient temperatures or daily urine volume.

Urinary urea excretion and urea: creatinine ratios (U/C) were positively related to nitrogen intake over a wide range of intakes. U/C ratios and FCP obtained from wild wapiti and moose also reflected changes in nitrogen availability. A rise in urea excretion associated with tissue catabolism was not detected in pen trials.

When animals were fed a low protein diet, lean animals had elevated cortisol excretion and cortisol:creatinine ratios (C/C). Cortisol excretion and C/C ratios declined to within normal range 14 days after moose were fed a high protein diet. However, of the snow urine samples obtained from free-ranging wapiti and moose only one out of 90 had measurable amounts of cortisol (adult males had lower indices in general). Therefore, this index is limited in its ability to monitor progressive changes in body condition during winter.

## FIELD APPLICATIONS

Urinations must be distinguished according to species because of differences in diet selection affecting digestive capacity, rumen efficiency and the inherent differences in nitrogen usage between species. If possible the age and gender of animals should be recorded because of differences in robustness and body condition when entering winter.

The sequential collection of snow urine is important when nitrogen use is being monitored through U/C ratios. Nitrogen excretion reaches its lowest point in February (during normal winters) and during this time urea may not be detected due to a decline in forage quality, availability and high nitrogen recycling. For example, in 1992, a severe winter, about 20% of the moose snow urine samples had no detectable amounts of urea. Monitoring for this low point reveals the period where there is an increased demand on body reserves.

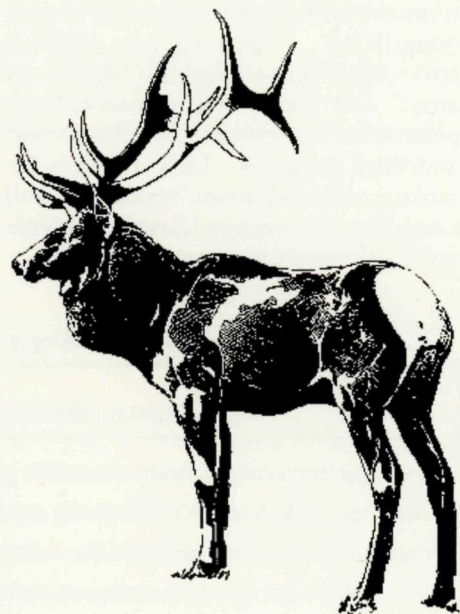
In conclusion, FCP and the U/C ratios offer a reliable index of changes in nitrogen availability and diet quality during winter. However, FCP is not a good indicator of changes in body condition. Low U/C ratios and/or the absence of urea in snow urine followed by rising U/C ratios with the presence of cortisol in snow urine is a definite signal of stress. U/C and C/C ratios over 30 and 10 respectively, clearly reflect a metabolic deficit of energy and nitrogen for penned wapiti and moose. Often visual signs such as pronounced angulation of the rump and emaciation are evident. However, field observations are subjective, not always possible, and are often complicated by other causes such as winter tick induced hair loss.

Currently, in Elk Island, snow urine samples from ungulates are being collected, on an annual basis, to determine winter condition of these animals. This information will help in the management of these ungulate populations.

For more detailed information contact:

**Normand L. Cool** who is the Faunal and Limnological Specialist in Elk Island National Park. Office tel: (403) 992-6380.

**Robert J. Hudson** is a professor in the Animal Science Department at the University of Alberta.





# Uncovering the Past at The Bar U Ranch

by Rod J. Heitzmann

The Bar U Ranch National Historic Site has been developed by Parks Canada to commemorate the significance of the ranching industry in the history of western Canada. Archaeological studies are an important part of the ground work necessary for new park establishment. These studies provide baseline data on site locations and a preliminary indication of their archaeological potential. They also assist site planning and development, help to ensure protection of these resources, and contribute to heritage communication messages. In 1992, a preliminary inventory and assessment of the Bar U Ranch was undertaken by Rod Heitzmann and Bill Perry. In 1993, Dr. Gerald Oetelaar, from the University of Calgary, Department of Archaeology, directed a Field School which conducted a program to test and further assess archaeological significance of the Bar U Ranch.

The ranch is located in the Pekisko Valley which is southwest of Calgary near Longview, Alberta. One can find the ranch headquarters 30 metres below the low rolling uplands and grass covered hills. The Pekisko Creek, bordered by cottonwood stands, meanders along the



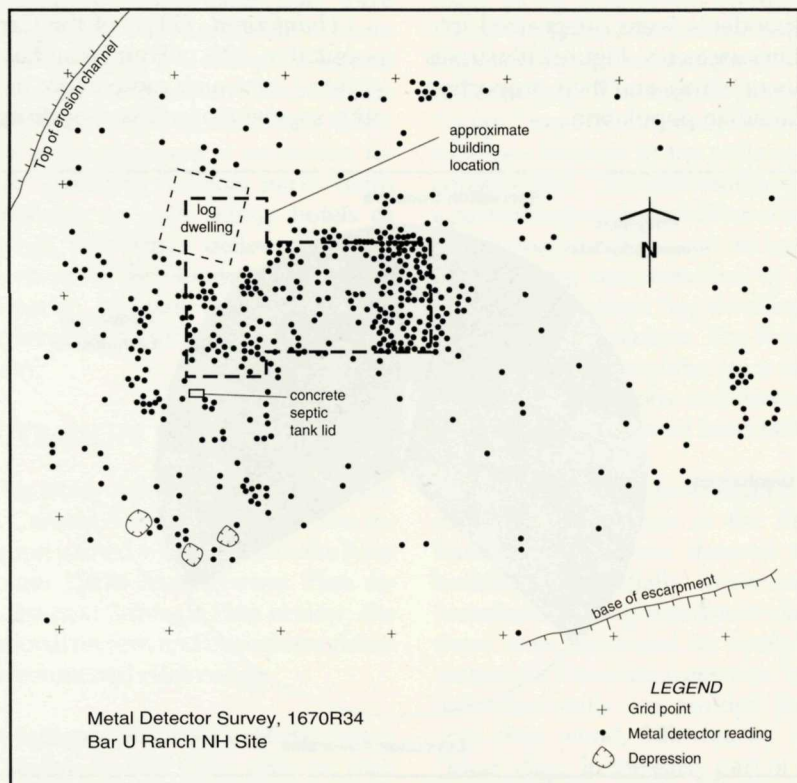
*The Bar U Ranch circa 1947. Courtesy of Lee Alwood.*

broad shallow valley floor. Several broad grassy terraces also exist along the creek valley and a wonderful view of the Rocky Mountain front ranges can be seen to the west.

## PRE-RANCH PERIOD

Prior to the establishment of the Bar U Ranch, the environment was ideally suited for the herds of bison which occupied the northwestern plains. Along Pekisko Creek native people established tipi camps, hunted game, possibly fished and used the other resources of the surrounding area. Evidence of native people's past use has been identified at five geographically separate locations on the Bar U Ranch. These were located utilizing small tests excavated with shovels. As of yet, none has been investigated in detail and it is not possible to assign precise dating to these sites.

In 1993, test excavations revealed that much of the ranch headquarters was used as a campsite by earlier people. Items recovered consist of by-products of stone tool production, fragments of rock used for stone boiling, and bison bone. To date, most of the stone flakes recovered are small "retouch" flakes indicating that stone tools were shaped into final form or were resharpened here, but early stages of tool production occurred elsewhere. At one locale east of the ranch headquarters the Field School carried out a surface collection, auger, and test excavation program. Cultural materials were found within and below the plough zone to depths of 90 cm.



*Figure 1: Locating a barn with the use of a metal detector*

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# Gwaii Haanas

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to Haida myth and history that Nathalie Macfarlane, Director of the Queen Charlotte Islands Museum, describes Gwaii Haanas as having a mythic resonance comparable to the Greek islands of the Aegean. Of the three principal mythic villages to which Raven families trace their origin, two are in Gwaii Haanas. Perhaps the most important of these is centred in the Skincuttle Inlet area. At Xa'gi (Ha'gi) the progenitors of the Raven lineage emerged from the womb of Foam-Woman. The story is part of a series detailing the beginning of the world and follows stories describing the islands emerging from the sea. In this instance the island Ha'gi is described as a reef and therefore is important as a transitional zone between the spiritual and physical worlds. It is described in a legend collected by J.R. Swanton and recounted in his *Contributions to the Ethnology of the Haida*:

When Xa'gi emerged from the waters, Foam-Woman was sitting on it. Around the edges of the reef were other supernatural beings, but she permitted none of them to come near. If any one attempted it, she looked at him and winked her eyes, when lightning shot forth and drove him back.

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Foam-Woman had many breasts, some say as many as ten on a side, at each of which she nursed a grandmother of one of the various Raven families among the Haida. When her first child was born, foam came from its mouth and nearly produced a second flood.

Other myths and stories, associated with sites in Gwaii Haanas, tell of mythical figures such as Master Carpenter, and historical events such as the raids of the Kunghit Haida on their northern neighbours. They also tell of the flora and fauna and describe characteristics of birds, fish and mammals. All serve to attach rich spiritual, social and historical associations to the landscape. It is these important links to the cultural landscape of Gwaii Haanas that the Ethnography project is trying to gather. Together with the natural and cultural resources these intangible intellectual resources form an invaluable part of the heritage of Gwaii Haanas. Eventually this knowledge may permit people to re-enter the physical landscape

of Gwaii Haanas with a different perspective from that of the 20th-century post-industrial world.

## READINGS

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*C.J. Taylor* is a historian in the Heritage Resource Conservation Directorate, Western Region and is the author of *Negotiating the Past*, the story of National Historic Sites in Canada. Office tel. (403) 292-4470.

## Canadian Attitudes

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### About the Respondents

Frequent users of parks differ significantly in demographics from the general population and from non-park users. Frequent park users are typically males with higher than average education and household incomes.

Respondents were categorized into five distinct segments. Figure 2 illustrates the segment names and their proportion of the Canadian population.

*Concerned Enthusiasts* (33% of the Canadian population, 27% of Four Mountain Parks visitors) are very committed to preserving the integrity of Canada's natural environment and enhancing it by creating new parks. They are enthusiastic about Parks Canada, but they are also disappointed in the perceived inability of Parks Canada to create new parks or to adequately emphasize natural resource protection. They are opposed to golf courses and most types of development, as they believe the parks are close to full capacity with regard to development. They are the most educated of all the segments.

*Education Advocates* (29% of the Canadian population, 35% of Four Mountain Parks visitors) are very supportive of Parks Canada, but are more interested in activities that educate the public and promote the Parks Canada mandate or persuade the public to support Parks Canada. This segment is the most likely to have and travel with children. They want to pass along environmental education messages to their children and thus, they enjoy park services such as movies and presentations. Although they view the protection of natural resources as more important than development or economic progress, they are more likely than Concerned Enthusiasts to feel that room remains for development in national parks.

*Uninformed* (24% of the Canadian population, 19% of Four Mountain Parks visitors) are much more likely than any other segment to feel that they do not have

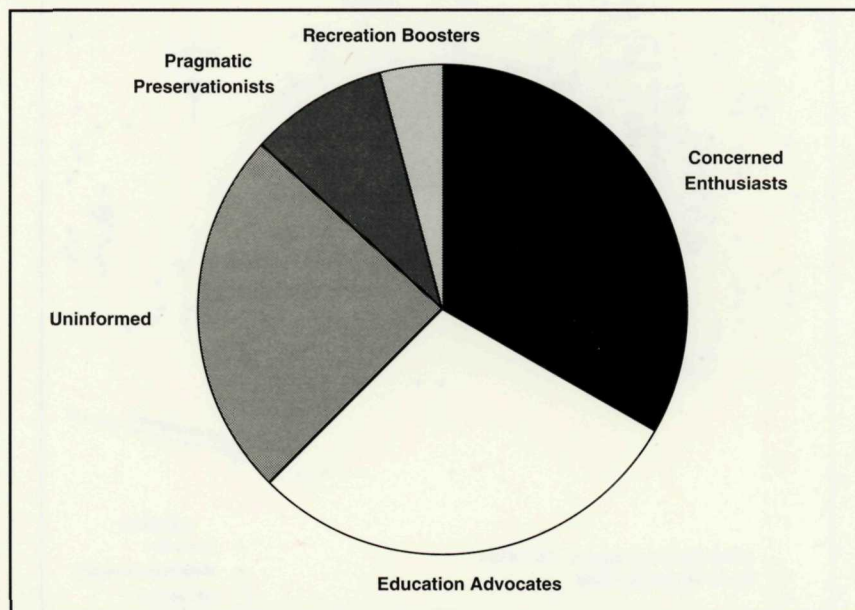


Figure 2: Attitudinal Segments



enough information to make environmental decisions. They are the least educated of any of the segments, and their views are less clearly defined on a variety of issues. They tend to be more traditional travelers, returning to familiar places, and using their motor association for information needs.

*Pragmatic Preservationists* (9% of the Canadian population, 9% of Four Mountain Parks visitors) seek to balance their desire for high levels of service and accessible recreation opportunities with their desire for preservation and protection of natural resources. They therefore favour user pay schemes and privatization of services to provide sufficient revenue to deliver both high service and environmental protection. They are less likely than any of the segments to believe that science and technology can solve environmental problems, and thus believe parks should still emphasize preservation rather than promotion for recreational activities.

*Recreation Boosters* (4% of the Canadian population, 10% of Four Mountain Parks visitors) are the smallest of the five segments, yet they have a disproportionately high impact on national parks. They have a predisposition to take advantage of recreational opportunities, and visit national parks more often than most other segments. They are also more likely to return frequently to national parks, and place greater demands on Parks Canada (in terms of services, facilities, etc.). They believe in development of recreation resources, including national parks (with an emphasis on golf, skiing, hotels or shopping), and firmly believe there remains room for development within national parks. In many respects, they do not believe that there is an environmental problem.

## DISCUSSION

This study was the first of its kind for Parks Canada, Western Region. The information gained will be used in the Four Mountain Parks Management Plan review, the next Strategic Plan review, the operational review, and initiatives related to environmental citizenship.

*Sylvanna Hegmann is the Senior Market Analyst in the Western Regional Office. Office tel: (403) 292-4503.*

## Bar U Ranch

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One significant surface find was the midsection of a projectile point which probably dates to the Middle Prehistoric Period (approx. 3300 - 2000 years ago).

## THE RANCH PERIOD

Ninety-eight historic archaeological features were identified in the 1992 inventory (Heitzmann 1993). These include archaeological materials associated with standing buildings, as well as the location of former buildings, corrals and middens (refuse dumps). Most of these were located by identifying surface features such as soil ridges, depressions and rough stone foundations. Many other features were identified through analysis of historic photographs.

In addition, metal detector surveys were conducted at the approximate location of several former buildings to more precisely locate these features. One such location was a barn or stable formerly at the east end of the ranch headquarters. The general vicinity of this former building was covered in long grass and no surface indicators were present. The area was gridded and a metal detector was used along systematic sweeps. Each "beep" indicated the presence of a metal object below ground and these were plotted on a map. The highest proportion of "beeps" most likely indicates former wall locations because of the nails used in its construction. This information provided a particularly clear definition of the barn's precise location (Figure 1). At least part of this building was disturbed by the construction of the later "log dwelling" on the west end of this feature. The Field School test excavated one of the areas of highest metal concentrations and uncovered a narrow sandstone wall foundation.

Students also investigated several other buildings such as the Percheron Barn. Investigations showed that this building was initially constructed on a foundation of rough sandstone slabs. Later these were enhanced by applying concrete to the foundation exterior. Inside the individual stalls were multiple floors: thin clay, then wood, followed by 10 cm of "blue" clay. In the early part of this century, the animal husbandry school recom-

mended clay floors for horse barns perhaps because it was partially resistant to water, more durable than wood, yet provided some cushion for horse's hooves. This kind of data will assist in the accurate telling of the story at the Bar U Ranch.

The pigsty was also investigated by the Field School. There were no surface remains of pens available but archaeological testing located several wooden sills outside the building foundation. A student, Amanda Dow, prepared a paper on the significance of this structure and related it to the archaeological testing completed at the ranch. She discovered that the Bar U Ranch pigsty is almost identical to an Illinois hog barn described in a barn building textbook (Sanders 1892). The pigsty at the Bar U Ranch was constructed by George Lane who travelled widely to agricultural fairs and exhibitions (Simon Evans, personal communication). This building is an indication of the "state of the art" agricultural practices that made the Bar U Ranch famous in the early part of this century.

## FUTURE RESEARCH POTENTIAL

The results of these preliminary studies indicate extensive archaeological resources at the Bar U Ranch. These resources can contribute significant information about the evolution and use of the site by prehistoric and historic people. It is anticipated that archaeological studies will continue to further identify and assess many of these resources, and will contribute to plans for site stabilization and restoration.

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- Rod J. Heitzmann is the Archaeological Resource Manager in Heritage Resource Conservation, Western Region. Office tel: (403) 292-4294.



# NATURAL REGION

## ECOSYSTEM MANAGEMENT SPECIALISTS



**CHARLES (CHUCK) BLYTH** has a B.Sc. in Botany from the University of Calgary (U of C) and a M.Sc. in Animal Science from the University of Alberta (U of A). He also has a Renewable Resource Technology Diploma and a Land Assessment Diploma from Lakeland College and Alberta Municipal Affairs respectively. In the summer of 1977 he was exposed to the warden service when he was a contracted researcher in the Banff National Park Grizzly Bear Project. This exposure encouraged a career in Parks Canada. From 1979 to present he has filled numerous positions from seasonal warden to Chief Park Warden at Elk Island and Nahanni National Park. He was also a resource management planner in Western Region and the National Warden Service Coordinator in Ottawa.

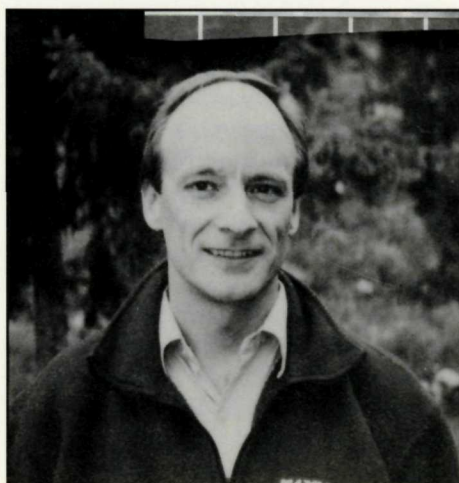
In May, Chuck assumed the official title of Ecosystem Management Specialist in Elk Island. Currently, Chuck is involved with several projects: ecosystem management modeling, climate change research, the annual ecosystem status report and the Beaver Hills ecosystem research program, just naming a few.

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**ALAN DIBB** holds a B.Sc. in Geological Sciences from the University of British Columbia (UBC); with additional specialization in Botany and Forestry. On top of all his work and family commitments, he is currently working on the completion of his M.Sc. in Computer Science (Remote

Sensing) at U of C. No newcomer to Parks Canada, Alan joined the warden service in 1982 and has worked in all functional areas. Prior, he worked for several years in visitor services and interpretation.

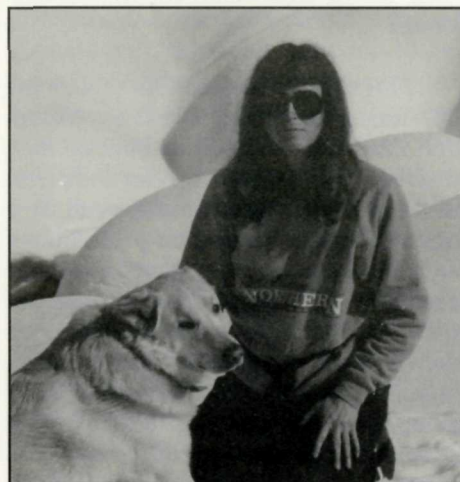
The start of Alan's job as Ecosystem Management Specialist in Kootenay coincided with the initiation of two important land-use planning processes in British Columbia: the Commission on Resources and the Environment (CORE) and the Protected Areas Strategy (PAS). Consequently, Alan has spent much of his time over the past year working in both of these processes, as well as working with local industry and government agencies on local issues.



His other responsibilities include ongoing assessment of the ecological components of the "State of Kootenay National Park", and coordinating the Geographic Information System and associated databases for the park. Alan's goals include establishing an integrated system for ecological monitoring and research in and around the park, and negotiations are already underway with several agencies and universities.

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**SUSAN HALL'S** Department of Environment experiences began in Conservation and Protection (E.P.S.) to which she brought a B.Sc. in Zoology and an M.Sc. in Ecology. Her work there was in environmental assessment, forestry, and follow-



up monitoring. She spent two years in Yellowknife developing sectorial environmental assessment guidelines. Before Yellowknife, she worked in the Maritimes, reviewing various potentially disastrous energy projects (Hibernia oil), and developing forestry guidelines to protect the diminishing stocks of Atlantic salmon.

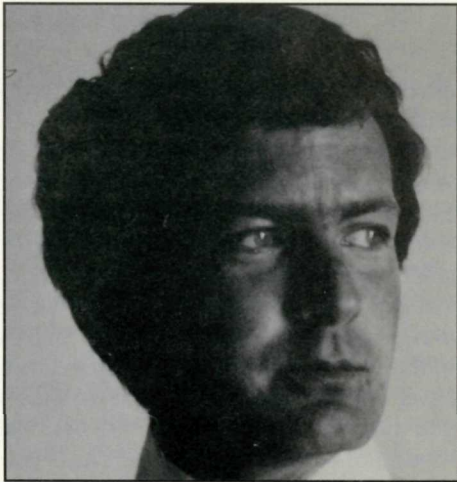
Sue came to Parks Canada six years ago to pilot the specialist position developing Mount Revelstoke/Glacier National Park's (MRGNP) ecosystem management program. This formerly controversial work has assured Parks Canada a role in land-use decision-making in the Columbia Mountains. Sue's work has involved forestry reviews, with the aim of maintaining caribou and grizzly populations that occupy the larger area surrounding the parks. More recently, she has been exhaustingly involved in BC's new land-use planning processes: CORE, and the Kootenay Region's Protected Areas Planning Team. Potential gains from these processes include an expanded network of protected areas aimed at achieving conservation goals, and adjacent lands zoned for special management of biodiversity.

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**JOHN McINTOSH** came to Parks Canada in 1984 as a Seasonal Park Warden at Pacific Rim National Park with a degree in Natural Resource Management from the Forestry Faculty at UBC. He worked previously for the Canadian Wildlife Service, the University of New Brunswick,



and Macmillan Bloedel Limited. While still a Seasonal Warden at Pacific Rim, John was sent to Queensland, Australia, as a Rotary International Scholar on a

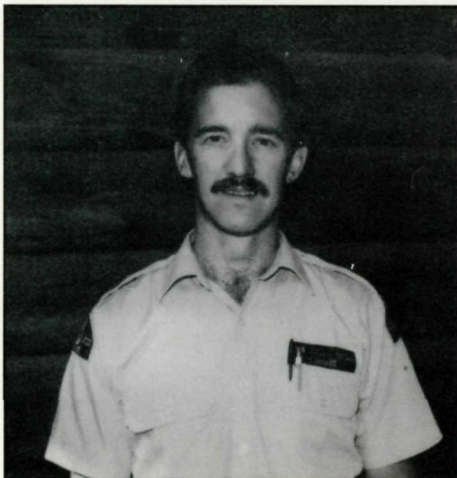


Group Study Exchange where he worked with the Queensland National Parks and Wildlife Service.

After spending four years in the Western Regional Office, as the Regional Forester and as a Resource Management Technician, John returned to Pacific Rim to take up the position of Ecosystem Management Specialist (EMS). The EMS position in Pacific Rim is proving to be an exciting one involving many cooperative efforts with outside agencies. The Long Beach Model Forest, PAS, and the Barkley Sound Sustainable Development Initiative all promise increasing opportunities for Pacific Rim to promote the concept of ecosystem management on a regional basis.

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**DEREK PETERSEN** has a Diploma in Renewable Resources Technology and a B.Sc. in Environmental Studies. His ten year tenure within the warden service has



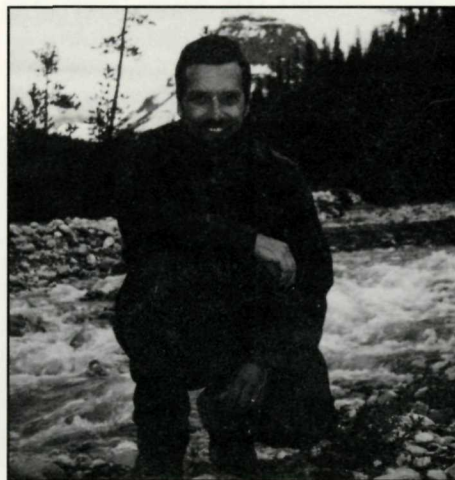
included postings at Prince Albert, Nahanni, and Jasper National Park. Most recently, he was assigned to develop an ecosystem management strategy and co-ordinate integration with the Green Plan Model Forest Program for Jasper.

Derek's position in Yoho National Park is tasked with increasing liaisons and co-operation with the adjacent land managers. This has included involvement with several BC Provincial programs: CORE, Forestry reviews (access management planning and five year plans), and PAS. In response to the upcoming Management Plan Review, Derek is also involved with a four mountain park ecosystem strategy.

Derek gives several field level research projects attention such as: cumulative effects analysis with Banff National Park and MRGNP, biodiversity research with Kootenay National Park and UBC, gap analyses with Banff, and grizzly bear research at Lake O'Hara.

Since the Ecosystem position fits within the structure of the warden service, park ecologists are required to maintain skills to meet operational needs. This is often difficult with existing work loads and time constraints, but will be a goal for Derek in Yoho.

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**KEVIN VAN TIGHEN** has a B.Sc. (Distinction) in Plant Biology from the U of C, specializing in grassland ecology and grasses taxonomy. He has authored numerous magazine articles and books on conservation subjects, and is the three-time recipient of Outdoor Writers of Canada Environmental Writing Awards.

He has worked in Western Region national parks since 1975. From 1977 until 1984, he served with the Canadian Wildlife Service on a series of biophysical (ecological) resource inventories in Jasper, Banff, Mount Revelstoke, Glacier, Elk Island and Kootenay National Parks. Since 1985, he has worked in interpretation and, more recently, Heritage Communications in Jasper, Yoho and the Western Regional Office.

To become oriented with Waterton Lakes National Park and to help during the peak summer months Kevin is currently performing Operational Warden duties. In the fall, he plans to develop a long-term ecosystem strategy for the park.

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**MIKE WESBROOK** graduated from the University of Guelph in 1984, with a B.Sc. in Physical Geography with emphasis in the biological sciences and geology. Since 1987, he has been a warden in Banff, Jasper, and Kootenay National Parks. He has also worked at Prairie and Northern Regional Office. His work experience has included two seasons as a research assistant, and he has been involved in environmental assessments for Parks Canada for four years.

Presently, Mike is on the project steering committee and is coordinating research projects for the Foothills Model Forest Program in Jasper. He also set up a River Use Study in conjunction with Peter Williams from Simon Fraser University. The project is currently overseen by Peter Clarkson. This fall, Mike is involved with a Database Workshop to provide a framework for long-term ecosystem monitoring.



*The Ecosystem Management Specialist positions in Banff National Park and Gwaii Haanas/South Moresby are not staffed. We hope to feature these people in future issues.*



# Individual-Based Models of Ecological Systems

by Edward McCauley

It is easy to paint an unhealthy picture of the interaction between applied and theoretical ecologists. Applied ecologists and resource planners frequently reject the utility of mathematical models because of their extreme simplicity, whereas theoreticians view this simplicity as a virtue enabling analytically tractable solutions. However, during the last decade much effort has been expended on trying to reconcile this dilemma through the development of alternative modelling frameworks for ecological systems that can be used to investigate strategic questions associated with environmental concerns such as habitat fragmentation, global warming, or the effects of contaminants.

Individual-based models represent an exciting alternative to classical theoretical approaches based on modelling population dynamics or population level ecological interactions (e.g. Metz & Diekmann 1986; Huston et al. 1988; DeAngelos & Gross 1992). (Space is too short to provide a detailed description of individual-based models and their applications; interested individuals are encouraged to read the recent edited volume by DeAngelos & Gross (1992).) In this modelling framework, the individual is the fundamental modelling unit. Rules for the growth, reproduction, survivorship, interactions with other individuals, or movement in space are specified at the individual level. These models treat the population as a collection or ensemble of individuals with explicit rules governing individual biology and interactions with their environment, and there is a diversity of model formulations that include both analytical and simulation approaches (Metz & Diekmann 1986; Huston et al. 1988; DeAngelos & Gross 1992; Wilson et al. 1993). Population-level phenomena (e.g. spatial or temporal dynamics) are inferred from the interactions among these individuals.

The added realism of these models offers advantages in studying applied problems such as predicting the effects of contaminants on ecological systems or habitat fragmentation. First, biologists often can only obtain data on the short-

term effects of environmental perturbations on individual biology. That is, we can conduct experiments to measure the effects of short-term exposure of toxicants on individual growth or reproduction, but assessing the chronic effects on population dynamics may be prohibitive. Individual-based models can be used to assess the consequences of these effects on individual energetics for population-level phenomena (several examples can be found in articles contained in edited volumes by Metz & Diekmann 1986, Ebemann & Persson 1988, or DeAngelos & Gross 1992 or references therein). These models enable us to connect phenomena at different levels of biological organization by providing, for example, explicit links between physiological ecology and population dynamics.

Second, these models can be used to understand how individual states affect behavioural and ecological interactions, individual movement or dispersal, that lead to larger scale spatial pattern (e.g. de Roos et al. 1991; McCauley et al. 1993). For example, an individual's response may depend on a combination of factors such as its age, feeding history, or genotype. In environments that vary spatially and temporally, individual histories may be relatively unique and ecological interactions may take on a local character. Individual-based models, which take into account these local state-dependent responses, enable us to study how habitat fragmentation might affect the genetic structure, persistence, or stability of populations of interacting individuals. These models of spatial dynamics compliment alternative approaches, such as metapopulation models (see Taylor 1990 or Karieva 1990 for recent reviews) in which the population is typically sub-divided into a number of explicit patches, which imposes a spatial scale on the system.

Of course the added realism associated with these individual based models does not come without a substantial penalty; it creates a voracious appetite for biological data in order to parameterize biological functions (e.g. age-specific ingestion rates, maintenance costs, energy

allocation) or to specify rules for individual movement and behaviour in spatially heterogeneous environments or landscapes. Indeed, the application of these models is often limited by the availability of "process" oriented data on age (or stage)-specific rates of energy acquisition, utilization or allocation. One surprising and productive offshoot of this problem is the necessity for the development of close collaborations between biologists and theoreticians interested in structured models of biological systems. These collaborations serve to narrow the gap between applied biologists and theoreticians.

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*Edward McCauley is an Associate Professor in the Ecology Division, Department of Biological Sciences, University of Calgary, Calgary, Alberta. T2N 1N4. Office tel: (403) 220-5583, fax: (403) 289-9311.*



# Using Satellite Imagery Analysis to Depict Coastal Ecosystems

by Dennis Jaques and John McIntosh

Like many of our national parks, Pacific Rim National Park has not obtained upland vegetation and forest inventory information for some time. Mapping obtained in 1972 was general in nature and useful for the purpose of setting the original direction for resource management in the park 21 years ago. However, recognizing that a more detailed and up-to-date inventory was needed for both within-park purposes and to assist in ecosystem management planning on a regional basis, the Park contracted Ecosat Geobotanical Surveys to analyze the appropriate satellite imagery.

To complete the task, Dennis Jaques is working with recent LANDSAT Thematic Mapper (TM) imagery which is merged with SPOT (Système Pour l'Observation de la Terre) Panchromatic imagery. This innovative technique allows him to take advantage of the strong points of each imagery before he performs his analysis. TM has a 30 m pixel resolution in six spectral bands, as well as a low resolution (120 m pixel) thermal infrared band for a broad digital range. SPOT Panchromatic mode provides a higher, 10 m pixel resolution though in a single band.

Preliminary analysis has provided up-to-date information on vegetation cover, composition and structural diversity of

old-growth forests. Upland forest and non-forest vegetation types have been mapped as well as near-shore intertidal and coastal cover types. Eel grass beds, large kelp stands and intertidal communities have received special attention to date.

Forest cover mapping has divided stands into broad age classes and compositional types. Young stands originated by clear-cut forest harvesting (up to 1972), blow-down or slumping on the sea coast have all been identified. Characteristic assemblages of forest cover on these sites have been mapped and show the regeneration of deciduous and coniferous tree species. Older stands of timber (25 to 100 years old) are biologically less diverse than the younger ones, but also vary significantly in types of vegetation that can be identified by satellite imagery.

Satellite imagery has also differentiated a great diversity of vegetation types in stands over 100 years old. Old-growth coastal stands of sitka spruce and western hemlock found at or near the shoreline are, for example, differentiated from adjacent transitional old-growth cedar/hemlock forests by composition, biomass and structural make-up. Twelve general classes of old growth forest were mapped by the satellite imagery and they vary in composition from lodgepole/cedar stands

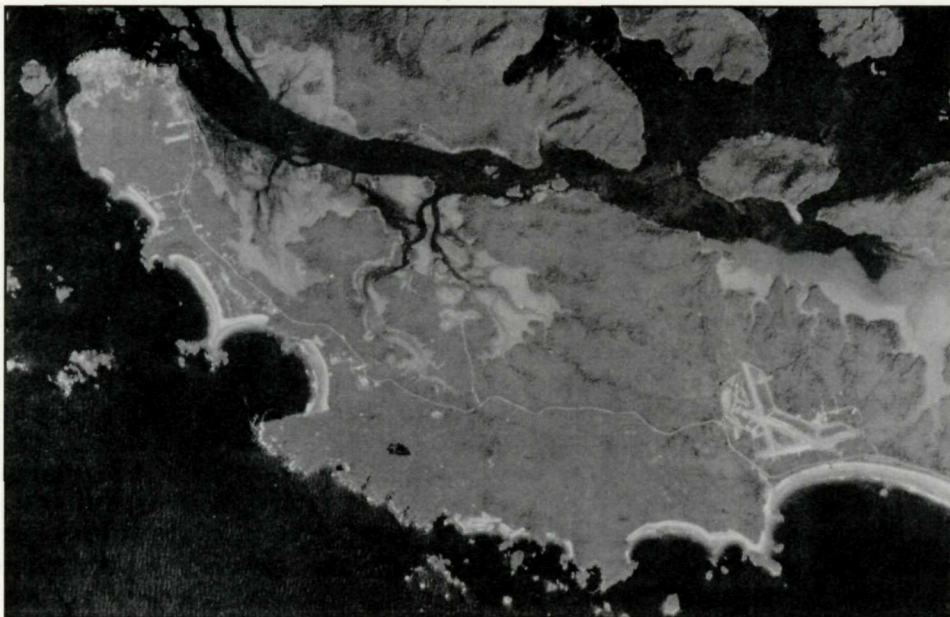
in bog environments, to transitional forests of cedar/hemlock, to sitka spruce coastal fringe forests, to cedar/hemlock/spruce/amabilis fir types in well-drained, upland areas. The volume of the standing timber ranges from about 550 cubic metres per hectare to over 1400 m<sup>3</sup>/ha.

Much of the old-growth forest surrounding the Park had been harvested, giving way to younger stands regenerated mainly by the planting of nursery stock. Therefore, the Park plays an important role as a sanctuary of biological diversity and genetic stock for the tree species of the region. Park visitors can easily observe examples of their old-growth heritage in the Long Beach Unit of the Park. At Schooner Cove, a 450 year old stand of 185 foot tall hemlock/cedar/sitka spruce exemplifies the cathedral-like dimensions of many old-growth stands found within the Park. Special effort is being made to determine the level to which the satellite imagery can be used to document and monitor the characteristics of all old-growth stands remaining in the Park and its surrounding environments.

The satellite data will be available to park staff to use with our own computer geographic information system (GIS) to assist in monitoring resources, impact assessment work, and interpretation to visitors. Both public and private land management agencies have expressed considerable interest in the project as well. Since satellite imagery is generally obtained every two weeks and the seven satellites which have been launched are planned to continue well into the 21st century, important monitoring work can be conducted in the future to aid in management decisions throughout the Park and the surrounding region. Some satellite data is also available from 1972. Thus, it could be used with current data to evaluate changes which have occurred over the past 21 years.

*Dennis Jaques is a satellite imagery specialist with Ecosat Geobotanical Surveys Inc. in North Vancouver, B.C. Office tel: (604) 980-8840.*

*John McIntosh is the Ecosystem Management Specialist with Pacific Rim National Park Reserve. Office tel: (604) 726-4712.*



*S.P.O.T. Panchromatic Image of Tofino area, 17 July 1992*



# Shrub Layer Dynamics: Elk Island National Park

by Charles Blyth

Resource specialists, managing for ecological integrity, commonly measure growth and reproductive rates of individuals, population dynamics of selected species, species composition of communities, and primary productivity of landscapes. Perhaps more important, but rarely available, is long-term monitoring of these attributes. These repeated measurements provide an understanding of

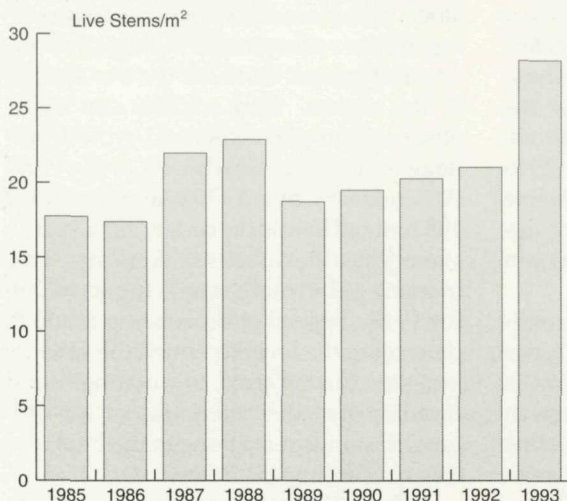


Figure 1: Stem density (live stems/m<sup>2</sup>) in the main park area from 1985 to 1993

and VanCamp (1974) of the Canadian Wildlife Service served as the basis for one of the first regularized monitoring programs in the park. These surveys measured key species that were available as browse to ungulates. After using this survey for several years, park staff (Olson and Blyth 1986) developed a new method which focused on all woody species comprising the shrub layer, not just those used by ungulates. This was the first comprehensive monitoring program of woody plant species comprising the entire shrub layer.

Although there are 21 years of data available, difficulties were encountered when comparing data obtained from different methodologies. The following results are based only on the data collected from 1985 to the present.

## RESULTS

Stem density, a measure of the shrub layer dynamics, has increased steadily over the

trends and random variability which foreshadows ecosystem sustainability.

At Elk Island, the woody plant species, comprising the shrub layer, play a significant functional and structural role in nearly every plant community. These species are an essential winter food source and provide protective cover for the park's ungulates. Some woody plant species, capable of becoming trees, are also key determinants of forest succession.

Since park formation in 1906, subjective judgements concerning ungulate use of the shrub layer have served as a basis for ungulate population management. In 1959, the first formal scientific measurement of woody plant use and shrub layer species composition was conducted by Holsworth (1959). Further studies conducted by Bouckhout (1971), Telfer (1972) and Telfer

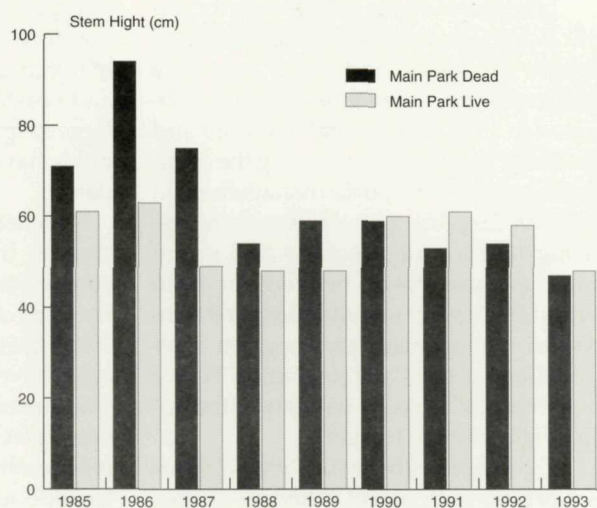


Figure 2: Stem height (cm) in the main park area from 1985 to 1993

last nine years (Fig. 1). Correlated with this, is a general increase in the percent of twigs browsed on average from each plant, and a slight decrease in height of the entire shrub layer (Fig. 2).

*Corylus cornuta*, *Rosa* spp. and *Rubus* spp. have continued to be the most abundant shrub species in the park. Species such as *Populus tremuloides*, *P. balsamifera*, and *Amelanchier alnifolia* have significantly declined in abundance compared to other shrub species. However, all species continue to be represented in the park and most appear to be stable in terms of their order of magnitude. Therefore, there has been no loss of biodiversity in this functional group at Elk Island.

Browse rates (total twigs browsed/total twigs available) appear to be generally associated with ungulate density (Figure 3); the exceptions being those years when winter conditions affects the availability of alternative food sources. For example, high browse rates were evident in 1991 and 1992 when severe winters limited access to other food sources, forcing the park's moose, elk and deer to forage almost exclusively on browse.

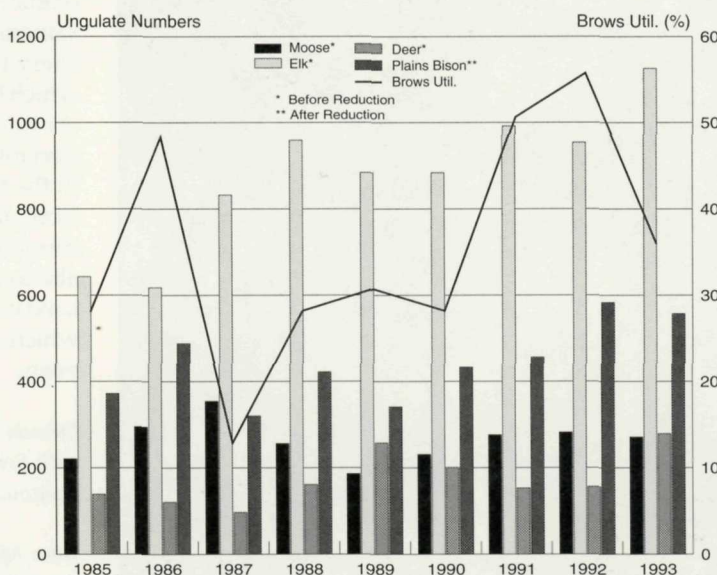


Figure 3: Ungulate population dynamics and browse utilization in main park area from 1985 to 1993



## MANAGEMENT IMPLICATIONS

In 1987, Elk Island began to replace its traditional 'game farm' style of management with that of an ecological carrying capacity - a state where the resource limitations of the ecosystem and not just man's actions of shooting and trapping determine the ungulate population levels. Although 'heavily browsed' in appearance the shrub layer at Elk Island has remained relatively stable in its species composition and has seen an increase in the total shrub population (as measured by stem density) despite the increase in ungulate density. Continued yearly monitoring will be necessary to determine if this current balance between the shrub layer and the

ungulate populations remains. As one of the longest uninterrupted monitoring activities of a functional group in the park, it will provide a benchmark by which to judge future ecosystem change.

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*Charles Blyth is the Ecosystem Management Specialist in Elk Island National Park. Office tel: (403) 992-6380.*

# Contaminated Sites: Yesterday's Solution / Today's Problem

by Bill Yeo

Yoho National Park and the Gulf of Georgia Cannery National Historic Site have at least one thing in common: a contamination problem. In both places this situation results from a long history of industrial activity. In Yoho, the yard and repair facilities of the Canadian Pacific Railway have been in operation since 1884. Petroleum deposits under the railway yards are now being tracked down and removed partly because of the potential contamination of the Kicking Horse River. On the other hand, at the Gulf of Georgia, the processing of fish and fish by-products, including blending of vitamin oils, occurred from 1940 to the early 1980's. Significant levels of Vitamin A in the blending room of the Gulf of Georgia Cannery represent a concern now that the site is being adapted for public use. Contaminated sites such as these can be perceived as a problem when the use of the land changes, or when the contamination threatens the surrounding environment.

However, some situations are more difficult to pin down. For example, a situation may arise when a site exhibits evidence of contamination (unusual soil staining, odour, buried waste material, or apparent secondary effects involving health or injury) without a ready answer as to how, why or when the site was affected. In contrast, an equally frustrating situation is the search for contaminated sites formed in the past. Awareness of past activity, such as road building in

the national parks, and the possibility that past management tolerated practices such as open dumping of wastes and on-site oil disposal, may start a search for hard to find contaminated sites.

To complicate matters further, questions can arise about how a contamination problem was allowed to happen in the first place. Who, if anyone, is liable for the cost of clean-up? Will the proposed clean-up procedure result in an unacceptable impact to cultural resources? What information is available about the site which can help to answer these questions?

Involving historians or archaeologists (or both) at an early stage in the site investigation will contribute to a more thorough understanding of the site's history. Documentary sources (business and administrative records, maps, photographs) and data from "reading" the cultural landscape (extent

and pattern of land disturbance) may reveal the nature of processes, activities that took place, who was involved and for how long, and the conditions, legal or otherwise, imposed on the operation.

*Bill Yeo is Chief of Historical Services in the Heritage Resource Conservation Directorate, Western Region. Office tel: (403) 292-4475.*



*Belinda Riehl-Fitzsimmons drawing a stratigraphic profile near the Field railway. She is wearing a canister mask to prevent inhalation of diesel and bunker C fumes*



# The Fight with the Kicking Horse River - und der Fluss siegte doch!

by Christopher Weaver

As the summer came to a close, Thomas Heinriech reflected on the adventures and challenges of Yoho National Park. Thomas is one of three German volunteers working on the Limits of Acceptable Change (LAC) program in the Yoho Valley. Presently attending Nuetingen Polytechnic, Thomas is studying environmental design. His arrival in Yoho came about after consultation with his professors and past volunteers. Under the supervision of Susan Kryss, the German volunteers collected data for LAC. This project included mapping backcountry campgrounds from aerial photos; drawing up an inventory of trails in the

Yoho Valley; and assessing the environmental impact of the campgrounds in this region. These activities have exposed the volunteers to the practical side of their studies. Encountering and solving new problems has been especially beneficial for Thomas. For example, Thomas had to compensate for discrepancies in aerial photos when mapping campgrounds. Overall, Thomas believes that foreign students are an asset to Parks Canada, because the exchange of different viewpoints allows for the development of innovative plans.

The Van Horne Range left a lasting impression upon Thomas. Every morn-

ing he gazed upon them while eating breakfast. Yet, Mount Burgess was the summit that he conquered. The German volunteers also followed in James Hector's historical footsteps. The canoe, rather than the pack horse, sent them into the chilling Kicking Horse River. Being rescued by the Warden Service, the volunteers assured themselves a place in contemporary Yoho history. Thomas concluded that, "There is nothing like plunging into a glacial-fed river after a long day of hiking in the Yoho Valley!"

*Christopher Weaver is a summer employee with Technical Services in Yoho National Park.*

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*For information and further listings contact Phyllis Kennedy, Administrative Assistant in Heritage Resource Conservation, Western Region. Office tel: (403) 292-6472.*



# PODIUM

## An Outside-in View of Park Management

by Paul A. Galbraith

You've probably heard it before: Parks Canada is devoted to protecting Canada's natural ecosystems and cultural heritage for the benefit of future generations. It is a noble mandate, with a long history. However, it simply is not enough anymore. Regional integration has been outward looking and usually addressed in a calculating, fragmented fashion, concentrating on specific issues such as transboundary movements of large herbivores, carnivores or tourism. This fragmented and park-centred approach has solved some problems, at least temporarily. Failures were attributed to lack of science or lack of effort. In simpler times, most of the land use outside the Park was similar to that inside. The practice of establishing Park level goals seemed reasonable. As changing land use throughout the natural regions continued to isolate the Parks as islands the "heritage fortress" response seemed appropriate, but the fundamental and far reaching question remains; how can we deal with threats to the ecological integrity of the Park? Minimizing threats at the Park boundary will have limited success. More than 70 threats to the wilderness have been identified and most of these originate outside the Parks. How can we mitigate against global climate change or airborne pollution at the Park boundary or by setting Park level goals?

Part of the problem and much of the solution is related to the way we think about parks and protected areas. If these areas are considered as "set-asides" or separate from the regional landscape, then the impact of Parks on the health of the larger landscape and over a longer time period may in fact be counter-productive. It would be unfortunate indeed if national parks and protected areas were seen as a solution to problem issues such as large carnivores, vermin, caribou or old growth forests. To some, the set-aside concept removes a certain level of societal guilt concerning the disruption of regional ecosystems. Cause and effect relationships suggest our attitudes towards the natural world have caused ecosystems and species to become threatened.

In a biological sense National Parks are not large enough or significantly diverse to guarantee long term survival of species that have evolved over half a continent and are now largely confined to mountain retreats. If present attitudes and trends continue, the protected areas will be little more than temporary pauses along the road to oblivion for many sensitive species.

must address the issues of the entire system if we are to achieve our mandate. Parks are a means to an end. The desired result is healthy regional ecosystems of which Parks are an important part.

"The fortress approach to preserving wilderness will not work. The only firm foundation for wilderness preservation is psychological and attitudinal."

Stan Rowe

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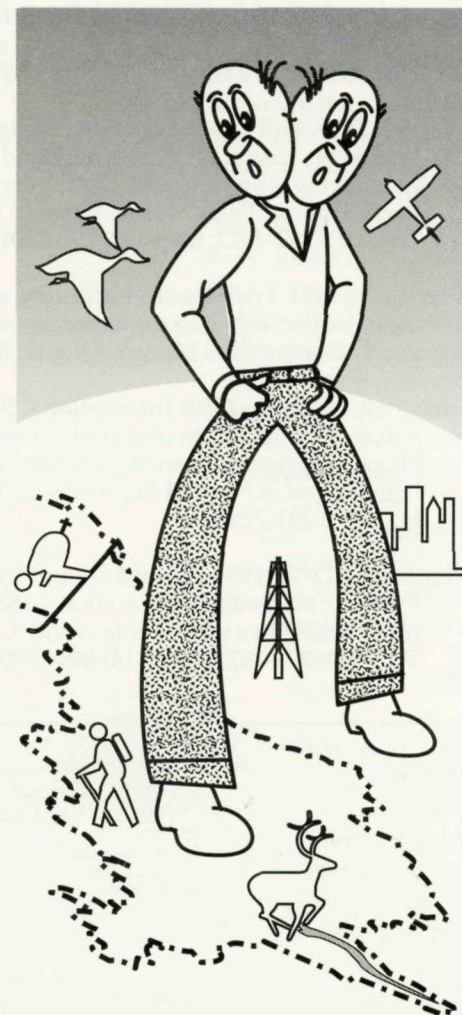
### *We need an eco-centric outside - in view of parks and protected areas*

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We need an eco-centric outside-in view of parks and protected areas. In contrast to the inside-out view, which is fragmented, cool and calculating, the outside-in or "regional ecosystem" approach to parks management is inclusive, integrating and inviting. It deals with issues in a holistic manner transcending jurisdictions and individual interests. This makes the eco-centric view of reality and the necessity of establishing goals at a regional level, reasonable goals to which protected areas (along with others) can contribute. The proper context for ecosystem integrity, environmental citizenship, and indeed merging ecological values and economic values is regional (in some cases global).

Parks and other protected areas play an instrumental role in this emerging context. They act as vivid reminders of the need for responding to the deterioration of regional ecosystems. They restore our public will to act. They remind us that natural boundaries are permeable and we

Paul A. Galbraith is Chief, Heritage Resource Conservation, Jasper National Park. Office tel: (403) 852-6161.





# MEETINGS OF INTEREST

**September 23-25, 1993. Science and Research Issues in Canadian National Parks Workshop.** University of Regina. Goals: to facilitate productive and positive dialogue on appropriate research and mechanisms for cooperative research opportunities in Western and Prairie and Northern Region National Parks. Contact Patricia Benson, Western Region, Parks Canada. Box 2989 Station M. Calgary, Alberta. T2P 3H8. Tel: (403) 292-4519, fax: (403) 292-4404.

**October 24-29, 1993 - Valuing Natural Resources.** The Banff Centre for Management. Topics: policy development and analysis, resource valuation and allocation, land management and land use, and the reconciliation of user/special interest group conflicts. Contact Debbie Stephan, The Banff Centre for Management, Box 1020, Station 45. Banff, Alberta. T0L 0C0. Tel: (403) 762-6133, fax: (403) 762-6422.

**November 11-14, 1993. Chacmool Conference.** University of Calgary. Topics: complexity in Archaeology - cultural complexity, social stratification, culture change, "complex" societies, ethnicity, gender, style, and broader theoretical questions. Contact The Chacmool Conference Committee, Department of Archaeology, University of Calgary. Calgary, Alberta. T2N 1N4. Tel: (403) 220-5227, fax: (403) 282-9567.

**January 17-20 & 21-22, 1994. Ecological Monitoring Workshop and Advanced Resource Management Workshop.** University of Waterloo. Purpose: ideas for monitoring strategies and implementation, peer review, quality control of monitoring science, on-site infrastructure, staff needs for science and management. Contact David Welch, Parks Canada. Jules Leger Bldg. 25 Eddy Street 3<sup>rd</sup> Floor. Hull, Quebec. K1A 0H3. Tel: (819) 994-5532.

**February 10-14, 1994. National Chief Park Warden Workshop.** Hecla, Manitoba. Agenda: TBA. Contact your Regional Chiefs for details.

**February 21-24, 1994. Eighth Annual Symposium and Exposition on Geographic Information Systems.** Vancouver, BC. Features: workshops, tutorials, demonstrations, panels, plenary sessions, keynote speakers, a job market, technical paper and poster sessions, plus a major trade show - GISExpo. Contact Brenda. Corby Suite 207 - 1102 Homer Street. Vancouver, BC. V6B 2X6. Tel: (604) 688-0188, fax toll free: 1-800-661-0044.

**March 18-23, 1994. North America Wildlife and Natural Resource Conference.** Anchorage Alaska. Theme: a management oriented conference with sessions on national refuges, biodiversity and sustainable ecological systems. Contact The International Partnership for Fish and Wildlife Management Institute, Suite 725, 1101-14 Street N.W. Washington D.C. 20005.

**May 5-7, 1994. Bull Trout Task Force.** Calgary, Alberta. Topics: bull trout biology, ecology, and life history; management strategies for recovery such as angling and land use regulations, results of creel censuses, role of enforcement, and culture and habitat enhancement projects; and identifying the attitudes of user groups such as anglers, industry, native groups and nonconsumptive users. Contact Percy Wiebe, Western Region, Parks Canada P.O. Box 2989 Station M. Calgary, Alberta. T2P 3H8. Tel: (403) 292-4512, fax: (403) 292-4404.

**May 16-20, 1994. Ecosystem Monitoring and Protected Areas.** Halifax, Nova Scotia. Focus: the role of research and monitoring in the management of the protected areas, and the role of protected areas as hosts for research and monitoring for the broader social good. Contact Neil Munro, Atlantic Region, Parks Canada. Halifax, Nova Scotia, Canada. B3J 1S9. Fax: (902) 426-7012.

**June 7-10, 1994. The Fifth International Symposium on Society and Resource Management.** Fort Collins, Colorado. Focus: successful integration of scientific knowledge about humans with information about natural science, which will lead to more effective agricultural and natural resource practices and policies. Contact Jennifer Pate, College of Natural Resources, Human Dimensions in Natural Resources Unit, 245 Forestry, Colorado State University, Fort Collins. CO 80523. Tel: (303) 491-2077, fax: (393) 491-2255.

**September 12-16, 1994. Second Global Conference: Building a Sustainable World Through Tourism.** Montreal, Quebec. Purpose: to identify and promote concrete actions that can be taken by the diverse sectors of the travel and tourism industry in contributing to a sustainable world. Contact L.J.D'Amore, 3680 rue de la Montagne, Montreal, Quebec. H3G 2A8. Tel: (514) 281-1822, fax: (514) 848-1099.

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