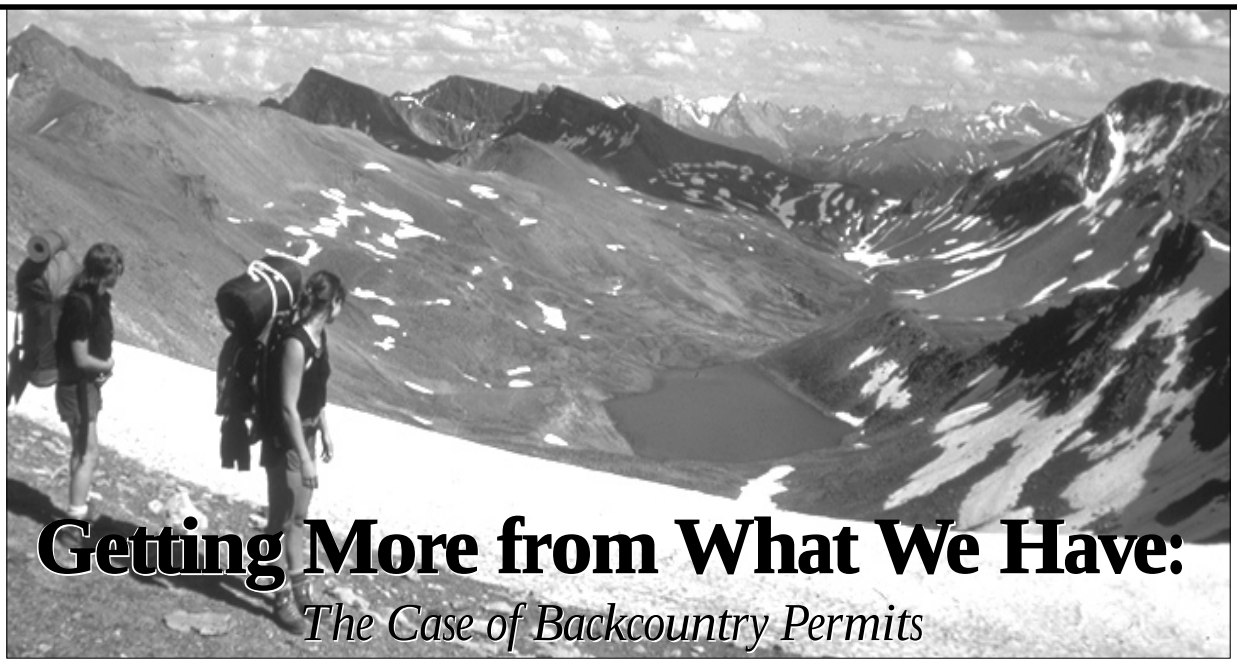
CANADA'S NATIONAL PARKS AND NATIONAL HISTORIC SITES
LES PARCS NATIONAUX ET LES LIEUX HISTORIQUES NATIONAUX DE CANADA

Research Links

A Forum for Natural, Cultural and Social Studies



Getting More from What We Have:

The Case of Backcountry Permits

Bonita McFarlane, David Watson and Peter Boxall

Human use (HU) management is a key issue facing many of Canada's national parks. To provide effective HU management it is essential that Parks Canada understand the demand for recreational opportunities, the characteristics of users, and the impact of management and policy changes. For example, we must first determine the number of people using an area, their demographics, preferences and other characteristics, and then examine how these factors change over time, and develop models to predict human behaviour in parks.

Despite the recognized need for use and trend data, studies of trends in backcountry use and user characteristics have been scarce, especially in Canada. Backcountry permits are potential sources of information that are readily available but currently under used in many parks. Permits are mandatory for everyone staying overnight in the backcountry. Mandatory permit systems generally have a very high compliance rate, making the permit information a reliable data source representative of backcountry users (Watson 1993).

We have found that in a number of jurisdictions managers use mandatory or voluntary permitting systems (e.g. Englin et al. 1996; McFarlane and Boxall 1998). In every case in which we have been involved, the information is merely stored for accounting purposes or some other legal requirement. As we have outlined above, however, this information base can also provide important HU management information. With a little ingenuity and some database skills, permit systems can be developed into modeling tools for economic analysis, for assessing user satisfaction, and the impact of management and policy changes.

Human use models can provide information on visitor satisfaction that may be more robust than attitudinal measures. For example, behavioural models that actually predict park or trail visitation levels as a mathematical function of trail or park attributes (e.g. prices, levels of encountering other hikers, forest characteristics etc.) can be estimated from user data. The probability of return visits to a park or trail are related to levels of user satisfaction based on the array of attributes they experienced. The models can also include substitute trails or parks depending on the level of analysis. If attributes at one place change, these models can predict where and how many times recreationists will visit among the group of parks or trails included in the model developed. Thus, satisfaction can be examined among a complex of recreation destinations through intentions or actual visitation at the level of an individual recreationist. Furthermore, the estimation of nonmarket economic values provides information on satisfaction through visitation levels and return visitation levels. Areas with correspondingly high economic values are more desirable and satisfying than areas with low values. In economics the satisfaction associated with consuming a good (e.g. a backcountry trip) is referred to as utility.

The Socio-economic Research Network of the Canadian Forest Service (CFS), undertook a study in Jasper National Park (JNP) to examine the usefulness of backcountry permit information in determining the amount of backcountry use and user characteristics and to evaluate permit information as a potential data source for modeling HU and as a monitoring tool for backcountry management (Watson and McFarlane 2000). This project was part of

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Research Links

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FEATURE ARTICLES

DEPARTMENTS

FRANCOPHONES

Le texte de cette publication est offert en français. Vous pouvez l'obtenixr en écrivant a l'adresse dans la p. 24

UPCOMING DEADLINES

Mar. 29, 2002—SUM/AUT 2002
July 26, 2002—WINTER 2002

EDITORIAL

I have recently joined Parks Canada Agency (PCA), Western Canada Service Center as an Ecosystem Conservation Specialist. Although, I'm still determining where this rather elaborate title will lead me, one specific task that I have been entrusted with is the editorship of *Research Links.*

Being new, my first task was deciding whether or not *Research Links* continues to fulfill its *Statement of Purpose* (i.e., communicate information about ongoing and recently completed research and scientific activities in Western Region, and their implications for management; reflect and strengthen growing ties between the academic/scientific community and resource managers). Over the past few months, I have discussed the role and value of *Research Links* with PCA management, colleagues and *Research Links* authors. Comments have been varied, although a consistent theme was that *Research Links* was often used to see "what was going on in other parks." Many comments applauded *Research Links* as a valuable tool to foster communication between managers and researchers. Based on these discussions, and reviewing the content in the past 9 volumes, it appears that *Research Links* is holding true to its original purpose. And so, for now, it seems prudent not to fix something that is not necessarily broken. Nevertheless, there is always room for improvement.

I encourage future authors to read the Submission Guidelines provided in this issue (page 20). Previous authors know that the editorial board adheres to a rigorous review process for all submissions, and I intend to continue to maintain the same high standards for publication that has served *Research Links* so well. I encourage authors to carefully craft their submissions, so that issues are clearly introduced, results are presented, analyzed and discussed, and logical conclusions drawn. Clear presentation greatly benefits a submission during the review process. Also, I encourage parks staff, managers and researchers to submit both current and historic work conducted in National Parks to *Research Links.* I know of several instances where important research results have not left the confines of the park. This seems very inefficient, especially when *Research Links* is available to make information *KNOWN* to a broader audience.

Many of the articles in this issue of *Research Links* deal with social sciences in National Parks and Historic Sites. These articles focus on assessing visitor-use patterns and resulting stresses on national parks and national historic sites. This type of research is particularly important since ecological integrity is now Parks Canada's "first priority." As we deal with the uncertainty of defining, measuring, monitoring and reporting on ecological integrity, we must not forget our client base. I've often felt that resource management, more than anything else, is basically people management. Researchers and managers have to appreciate how our customers view, use and abuse National Parks and National Historic Sites. These human-use patterns will help identify the suitable educational tools needed to teach the public about complex issues like ecological health and ecosystem integrity. In particular, human-use studies will help managers tease apart the subtleties of managing for both commemorative and ecological integrity in national historic sites. Finally, an informed public will more easily facilitate the acceptance of meaningful ecological policy in our parks and sites.

Thank you to all the authors who submitted their work to this issue of *Research Links*. Thanks also to Bob Coutts and John Woods for their valuable contribution to the editorial board over the past term. In turn, I would like to welcome Sharon Thomson and Micheline Manseau to the *Research Links* Editorial Board, I look forward to working with you both. As your new editor, I look forward to reading, discussing and sharing your ideas.

Sal Rasheed, Editor, Research Links. Tel: (403) 292-4748; fax: (403) 292-4404; sal_rasheed@pch.gc.ca

Gaining a Better Understanding of Fort Langley National Historic Site Visitors

using Pre-Visit and Post-Visit Surveys

Eugene Thomlinson

During the summer of 2000, Fort Langley National Historic Site (NHS) wanted to increase their understanding of their current visitors to improve management of the site. Managers determined that information regarding basic demographics of the visitors, their reasons for visiting, their perceptions of the site, their level of satisfaction with the site's facilities and services, and the impact of their visit on their level of understanding of the site's historical significance would allow them to better tailor the site facilities and services to the needs of their visitors. This information could also be used to increase the effectiveness of their programs for attracting visitors and communicating key messages of national significance.

METHODS

Pre-visit and post-visit surveys allow researchers to look at the impact of visits and changes in visitors' impressions and understanding of the site. The 2 surveys consisted of open-ended, multiple choice, and true/false questions with a combination of common and unique questions.

The surveys were conducted with a Palm Pilot® using specialized survey software. First, the Palm Pilot allowed the site to modify and customize the surveys up to the first survey day. Second, the Palm Pilot decreased the likelihood of data entry errors because data was entered directly into the dataset instead of onto paper. Third, the data was almost immediately available for analysis, shortening the turnaround time from survey completion to analysis and recommendations.

Visitors were approached in July and August of 2000 on days that were designated either a pre-visit or a post-visit survey day. Separate days were used to ensure that post-visit respondents would not be biased by the pre-visit questions. A total of 289 visitors agreed to answer the questions, with 148 people completing the pre-visit questionnaire and 141 completing the post-visit questionnaire.

RESULTS

Most of the respondents (58%) were Canadian with the majority coming from BC (45% of the total respondents). Twenty-six percent of the visitors were European, mainly from Britain and Germany. Americans made up 13% of the respondents. While a majority of the respondent's groups (54%) had 3 or more people, many (43%) had only 2 people. About 1/3 of the visitors had previously visited the site although most of these people (61%) had not visited Fort Langley NHS in at least 2 years.

The most common source of information about the site for respondents was friends and family (28%), followed by a travel guide (17%), brochure (10%), or other source (8%). Thirty-seven percent (37%) reported that they already knew about the site. None of the respondents mentioned using newspapers or the internet as their source for Fort Langley NHS information.

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ELK ISLAND NATIONAL PARK

Researchers at the University of Alberta and Elk Island National Park have recently concluded a study that compared Chinese and Euro-North Americans' visitors motivations. Of the 754 outdoor recreationists who completed the on-site questionnaire, 67 (9%) identified themselves as being Chinese, Chinese-Canadian, or of Chinese ancestry. Although the two group' ages and education levels were not significantly different, Chinese did report viewing wildlife and scenery as being their most important activities, while Euro-North Americans were more likely to report camping and walking as being their most important activities. Analysis suggested that Chinese and Euro-North Americans have different motivations for their outdoor recreation (MANOVA; $P<0.0001$). Overall, while parks protection mandate may not change, visitor services will have to in order to better meet the needs of visible minority groups in this country especially the Chinese, the largest and fastest growing group in Canada. A complete description of this study can be found in an upcoming issue of Leisure Sciences.

Gordon Walker
University of Alberta
(780) 492-0581
gordon.walker@ualberta.ca

Ross Chapman
Elk Island National Park
(780) 992-2975
ross_chapman@pch.gc.ca

Gaining a Better Understanding of Fort Langley National Historic Site Visitors

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When asked how long they expected to spend at the site, about 7% of the pre-visit respondents said they would be at the site less than 1 hour and 62% planned to spend 1 to 2 hours. However, when visit times were calculated for post-visit respondents, 15% were at the site for less than 1 hour and 59% were there for 1 to 2 hours, demonstrating that people were spending less time at the Site than they had planned.

When asked to choose from a suggested list of visit motivations, many of the respondents (39%) said they were visiting the site "for something to do." Thirty-one percent (31%) wanted to "learn about culture and history" and 23% visited the site to "spend time with family and friends." Eighteen percent (18%) of the people also said that the site was "an interesting place for children." Respondents could choose more than one reason for visiting. In a separate question, most of the visitors (86%) said that they hoped to learn something during their visit.

Pre-visit respondents were asked how they wished to experience the site. The main ways indicated were through exhibits (51% said this was very important), demonstrations (49% very important), people in period costume (43%), historic dramatizations or vignettes (41%) and self-guided tours (36%). Many respondents (36%) felt that guided tours were not important or not at all important for helping them experience Fort Langley NHS while only 18% believed guided tours were very important (46% were indifferent).

Most of the Site's facilities and services rated by post-visit respondents received high marks. Notably, 83% rated staff friendliness and courtesy as very good and 66% felt that the overall visit was very good. Directional signs to the site, and labels and signs at the site did not rate as highly however. Only 31% of respondents thought that the directional signs to the site were very good while 14% rated them as poor or very poor. Thirty-nine percent said that labels and signs at the site were very good and 9% thought they were poor or very poor.

All respondents were asked a series of six true or false statements regarding heritage presentation messages people are expected to learn at the site. Comparisons were then made between pre-visit knowledge/recognition and post-visit knowledge/recognition to determine the likely impact of their visit. For almost all of the statements, post-visit respondents were better able to choose the correct answer, suggesting an increase in knowledge because of their visit. The improvement in the percentage correct ranged from a small jump of 76% to 87% (11% improvement), to more than a doubling (36% to 76%) in the percentage correct. Only visitor perceptions regarding the main purpose of the site did not improve.

Respondents had the opportunity to express interest in potential evening programs and minimal support was offered (53% not interested and 12% very interested). They also showed their level of awareness of special events at the site. The best-known events included Brigade Days (15% awareness), Douglas Day (15%), and Canada Day (6%).

While visiting the site, respondents indicated several other activities they would be doing in the area. Almost 1/3 said they would be visiting Vancouver. Twenty-four percent were shopping in the area and 11% were visiting friends and family. Most were not eating in the area, with only 16% eating at a restaurant and 1% planning to picnic.

All respondents were asked to choose 3 words to describe their impressions of the site. Almost twice as many post-visit respondents were able to describe the site versus pre-visit respondents. Key words used by these visitors included interesting, historic, educational, informative, hard-to-find, unknown, boring, entertaining, quaint, and worthwhile.

See Table 1: "Recomendations for Management" on the opposite page.

CONCLUSION

A better understanding of Fort Langley NHS's visitors was obtained by surveying a sample of them. Pre-visit and post-visit questionnaires increased the depth of this understanding by demonstrating the impact of the visit on people's impressions, recognition and knowledge. The Palm Pilot® with the specialized survey software acted as the tool to make the research process more efficient.

Eugene Thomlinson, Parks Canada Client Research, Vancouver, BC; Tel: (604) 666-4873; fax: 604-666-0446; e-mail: eugene_thomlinson@pch.gc.ca

Gaining a Better Understanding of Fort Langley National Historic Site Visitors

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Table 1. Recommendations for Management
Based upon the research results, a series of recommendations were submitted to the management team of Fort Langley NHS:

Variable	Survey Result	Recommendation to Management
Source of Site Information (all that apply)	37% already knew 28% friends/family	Maintaining visitor satisfaction is the most effective marketing tool
Main Source of Site Information based upon origin	Vancouver-71% already knew Other BC-76% already knew Europe-43% travel guide US-27% brochure	Depending upon the site focus, different media would be more effective for targeting the various groups of visitors
Past Visit History	36% previously visited the site	Periodically change programming to keep visitors interested and learning
Visit Length	72% 2 hours or less	Use 2 hours as the maximum length for programming considerations
Reasons for Visiting (all that apply)	39% “Something to Do” 31% “Learn about culture and history”	Ensure that learning experiences are engaging but not overwhelming
Desired Ways to Experience the Site	51% exhibits very important 49% demonstrations very important	Provide visitors with quality exhibits nd demonstrations as a key to maintaining satisfaction
Desired Ways to Experience the Site	36% guided tours not important or not at all important 18% guided tours very important	Do not focus too many resources into guided tours for the general public
Satisfaction with Site	31% signs to site very good 14% signs to site poor or very poor 39% signs on site very good 9% signs on site poor or very poor	Improve signs to the site and on the site
Satisfaction with Site	83% staff very good	Staff is doing a good job of satisfying visitors and this should be communicated to them
Heritage Theme Communication	Minimum increase of 11% in correctly identifying 6 of 7 heritage presentation messages	Fort Langley is doing a relatively good job of getting many of its messages across to visitors
Awareness of Special Events	15% Brigade Days 15% Douglas Day 6% Canada Day	Raise the awareness of current site visitors to special events
Other Local Activities (all that apply)	24% shopping 19% visiting friends/family 16% eating in a restaurant	The most beneficial marketing partnerships would likely be with stores although restaurants may be interested in cooperating to increase their market share
Pre and Post-Visit Descriptions	Almost twice as many post-visit respondents were able to describe the site than pre-visit respondents	With many of people’s impressions of the site being created by their visit, the site has the opportunity and challenge to establish an identity for the site through an effective marketing program

Getting More from What we Have

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a study identifying potential criteria and indicators for sustainable forest management in the Foothills Model Forest.

METHODS

Backcountry permit information for the years 1994 to1997, inclusive, was obtained under a data sharing agreement between CFS and JNP. The 1994 and 1995 data were available on paper permits and were entered into a data base. The 1996 and 1997 data were entered directly into a data base by Parks Canada staff at the time of registration. The information collected on each permit included name and address, dates of the visit, number of people in the party, mode of travel, and camp sites. The permit data were supplemented with records on number of user nights (kept by the park since1963). This supplemental information allowed us to examine trends in backcountry use.

RESULTS

The data on user nights shows that use peaked in the 1970s, declined into the 1980s, and has leveled off or is declining slightly (Figure 1). Overall, the trend has been a decrease in backcountry use since 1975.

Visitor origin showed that most parties are from Canada and about 50% of all parties are from Alberta (Figure 2). Edmontonians comprised 20 to 25% of all parties and over 40% of Albertans. The average length of stay was relatively stable over the 4 years at 5.7 nights. The average group size was also consistent at 2.5 persons. Visitors to the backcountry travel in small groups with 52% traveling in a group of 2, single travelers comprised 17% of the registrations, and 3 person parties accounted for about 11%. Overall, approximately, 95% of the parties consisted of less than 6 people. User nights were calculated by multiplying the number of users by the number of nights. This information was examined for each trail providing a spatial analysis of use. Future analysis will plot dates of the backcountry trips and number of users or user nights to provide a temporal analysis of use and identify peak use periods.

The permit database was linked with other databases to enhance the amount of information and types of analysis possible. Because visitors must identify either the campsites in which they stay or the trails they are using, the permit data can be linked with GIS data. The GIS layer contains biophysical characteristics for each trail such as forest cover, ecosystem types, and elevation. In the JNP study, the permit data were linked with GIS information and random utility models were developed to predict the impact of management or policy changes in the backcountry. The models were used to examine the association between biophysical attributes of trails and trail choice. The analysis assessed the relative importance of old-growth forest and elevation in trail choice and examined user preferences toward forest and alpine ecosystems (McDonald 2000). Findings suggest that forest age and trail attributes significantly affect the utility and site choice of visitors. Forests become increasingly valuable with age. In particular, Lodgepole

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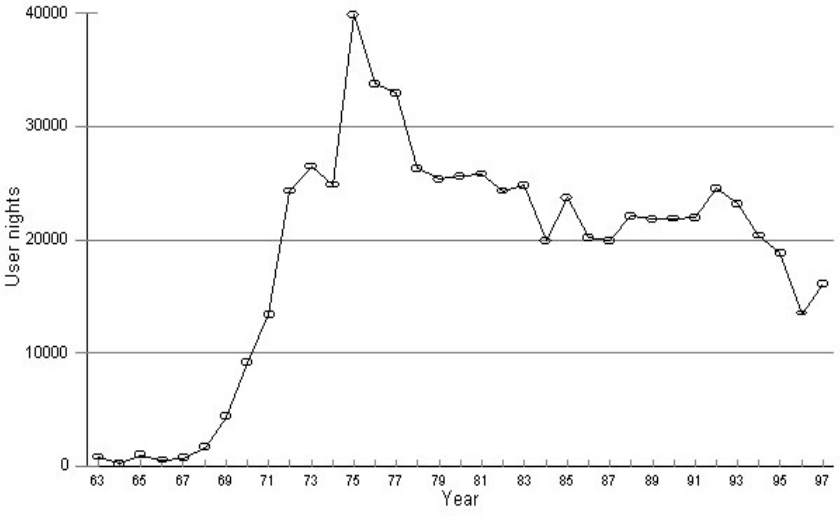

Figure 1. Backcountry visitor use in Jasper National Park, 1963-1997 (Source: Watson and McFarlane 2000).

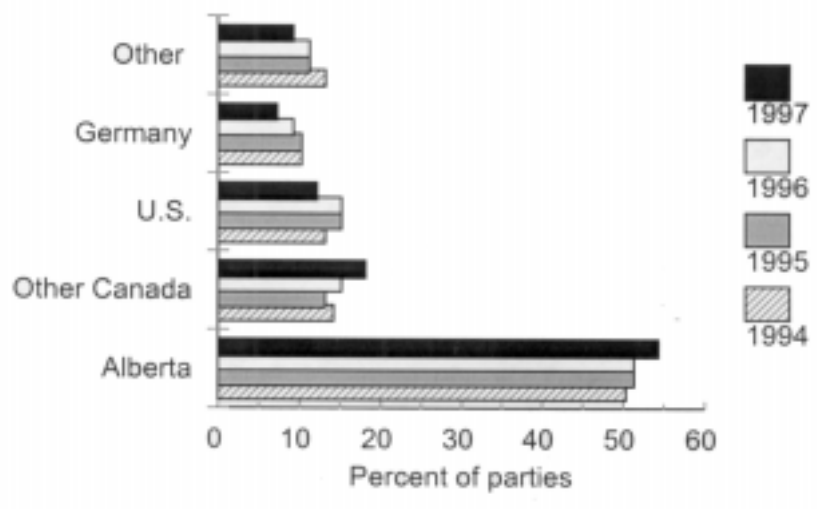

Figure 2. Origin of backcontry visitors

Getting More from What we Have

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pine forests become very valuable as old-growth. Tundra and alpine ecosystems provide positive benefits to users but the tundra ecosystem appears to more valuable than alpine. The model also proved to be a valuable tool for assigning nonmarket economic values to trails and trail attributes.

An important aspect of random utility models is their ability to analyze the effects of changes in trail attributes on the value users place on attributes. McDonald (2000) simulated the effect of a large crown fire on 3 trails: Skyline, Watchtower, and Jacques Lake. The value of the Skyline trail decreased, and Maligne trails increased the most in value. The simulation showed that a change in utility of one site changes the utility of other sites. This suggests that there is potential substitution between trails and random utility models may be useful in predicting the impact of a management change on the distribution (i.e., trail choice) of users in the backcountry. This modeling exercise was the first attempt at using Parks Canada permit data to model HU in the backcountry. Future analysis will include simulating the impact of management changes, for example, the impact of trail closures or other use restrictions on trail choice.

In addition to HU modeling, linking the permit data with GIS can produce a human use layer for the backcountry. This layer can contain, for example, occupancy data for each campsite, identify peak periods of use, number of people using the sites, visitor origins for each trail, and potentially delineate the direction of travel.

Another data source that will be linked to the permit data in future analyses is Statistics Canada census data. Using postal code conversion files, the permit data will be linked with census data to develop demographic profiles of visitors and visitor origins, particularly as they relate to the park region.

DISCUSSION

The current study has demonstrated the fact that some HU data currently collected by Parks Canada is under utilized. By analyzing the data beyond the calculation of user nights or revenue generation and linking with other data bases (such as GIS and census data) user characteristics, preferences, and trends can be examined and modeling tools developed. The study also highlights the need for a consistent and accurate permit database. A computerized backcountry registration system would provide a consistent and cost-effective means to collect user data. The success of such databases, however, is dependent on ensuring that information beyond mere accounting is collected. In essence, we believe that every administrative process that involves contact with a park user should be examined carefully to ensure that the effort expended to collect the data generates useful information. This information should include number of people in the party, address including the postal code, mode of transport, trails and campsites used, entry and exit points, and dates of travel. We suggest a number of features that park managers should consider for these types of information collection systems:

1. Key data elements must be collected every year in a consistent format. An example of this is a visitor's postal code or zip code.

2. The annual information should be stored in a database that is continually updated to allow managers to analyze temporal trends in use and changes in visitor origin.

3. Consideration should be made, and space on the permit be allocated, to allow managers to collect information of current topical use. This can involve a question or two on current management issues, or user opinions on potential changes in facilities or policies.

With the establishment of the data base used in this study, JNP now has baseline data which can be used for monitoring, trends analysis, and HU modeling. The success of such a database, however, depends on continued updating to include backcountry registrations in future years. Computerized permit entry at the time of registration would greatly enhance the efficiency of data entry and provide a readily available database. The study has also demonstrated how partnering with outside agencies and universities can extend the internal social science capacity of Parks Canada and greatly enhance research using existing HU data.

Bonita McFarlane is a client research specialist with Parks Canada, Canadian Forest Service, Edmonton. Tel: (780) 435-7383; fax: (780) 435-7359

David Watson is an economist with the Canadian Forest Service, Edmonton

Peter Boxall is an Associate Professor, Dept. of Rural Economy, at the University of Alberta, Edmonton

REFERENCES

Englin, J., Boxall, P. C., Chakraborty, K., and Watson, D. O. 1996. Valuing the impacts of forest fires on backcountry forest recreation. For. Sci. 42(4):450-455.

McDonald, J. M. 2000. Valuing the Ancient Forests of Jasper National Park: An Analysis of the Preferences of Hikers for Forest and Alpine Ecosystems. Unpublished master=s thesis University of Nevada, Reno.

McFarlane, B. L. and Boxall, P. C. 1998. An Overview and Nonmarket Valuation of Camping in the Foothills Model Forest. Nat. Resour. Can., Can. For. Serv., North. For. Cent., Edmonton, Alberta and Foothills Model Forest, Hinton, Alberta. Inf. Rep. NOR-X-358.

Watson, A. E. 1993. Characteristics of Visitors Without Permits Compared to Those With Permits in the Desolation Wilderness, California. USDA Forest Service, Intermountain Research Station, Ogden, Utah. Res. Note INT-414.

Watson, D. O. and McFarlane, B. L. 2000. Jasper National Park: A Descriptive Analysis of Backcountry Users, 1994-1997. A report prepared for the Foothills Model Forest, Hinton, AB and Jasper National Park.

Potential Road Salt Contamination of Wetlands Adjacent to Highways in the Banff Area

F. Colleen Wendeborn

The valley bottom in the Banff area contains alluvial wetlands transected by, or adjacent to, Highway 1 (Trans-Canada Highway—TCH) or Highway 1A (Bow Valley Parkway—BVP). The effects of large quantities of deicing salt runoff have been known for some time (Environment Canada 2000; Jones *et al.* 1986; Labadia & Buttle 1996). Recent studies indicate that lower concentrations of road salt can have subtle, long-term chemical effects previously unforeseen (Environment Canada 2000; Granato 1996; Howard & Sova 1993; Jones *et al.* 1986; Norrström & Jacks 1998).

The most important effect of road salt contamination is soil fertility depletion. Excessive exchangeable sodium (Na^+) accelerates calcium (Ca^{2+}) leaching, causing soil aggregate breakdown and loss of soil porosity and permeability (Labadia & Buttle 1996; Shanley 1994). Road salt has been linked to acidification via ion exchange of adsorbed Na^+ for hydrogen (H^+) ions (the "salt effect"; Nörrstrom and Jacks, 1998; Shanley, 1994). It has also been linked to colloid-assisted transport of formerly stable heavy metals, such as lead and cadmium (Howard & Sova 1993; Granato 1996; Nörrstrom & Jacks 1998). Salt-caused pH changes can contribute to heavy metal mobilisation (Jones et al. 1986; Nörrstrom & Jacks 1998; Amrhein & Strong 1990). Finally, high chloride (Cl^-) levels, >250 mg/L, can upset the electrolyte balance of aquatic invertebrates, and deprive plants of soil water (Jones *et al.*, 1986; Labadia and Buttle, 1996). Any or all of these effects can disrupt wetland functioning.

I sampled selected highway-adjacent wetlands in Banff National Park (BNP), looking for concentrations of Na^+ and Cl^- higher than normal. High levels of these ions could be natural (seasonal evaporation) or anthropogenic (road salt) in origin. One of the challenges of this study was to differentiate between these two possible origins for the wetlands sampled in the Banff area.

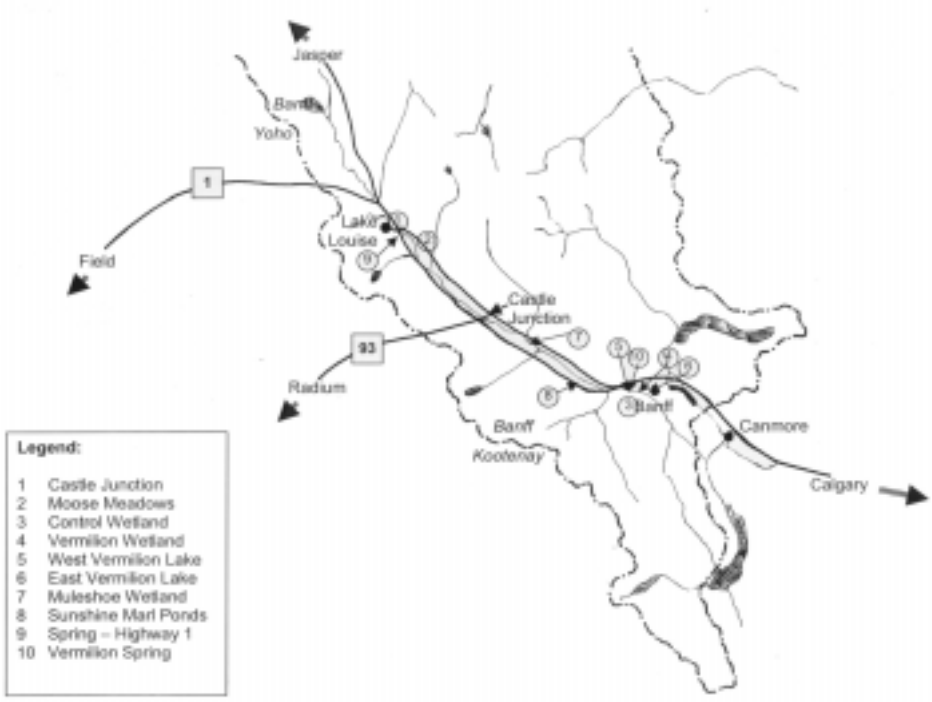

Figure 1. Map of sampling sites along Highway 1 and Highway 1A — Trans-Canada Highway and Bow Valley Parkway. (Map is for illustrative purposes only.)

METHODS

I selected nine sites plus a control (i.e., unlikely to receive *any* road salt runoff). All other sites were along the TCH and BVP from where Mount Norquay Scenic Drive crosses TCH to the east, up to where Highway 93 crosses the TCH and BVP to the west. The sites are indicated in Figure 1.

There were 3 sampling periods in 2000: April, during snowmelt; early June, approximately first runoff; and early September after the dry late summer. These periods should best represent seasonal changes in surface waters. To determine whether road salt was reaching the sites, sampling was done at a point near the road. I collected one set of surface water samples and one set of unstable parameters—e.g. pH readings. Chemical and isotopic analyses were carried out on all samples, and the road salt. Cations and silica were analyzed via atomic absorption spectrophotometry and anions via liquid column chromatography. Isotopic analyses were carried out on natural stable isotopes of oxygen, deuterium, carbon, and sulphur mass spectrometry methods and standards appropriate to each isotope.

As it was possible high Cl^- and Na^+ concentrations were evaporative, I estimated ion concentration difference between rainfall and each sample. Net precipitation was calculated and recent rainfall chemistry analyses from the Kananaskis Experimental Station (Myrick & Hunt 1998; Myrick 1995 & 1996) were used. The average monthly concentrations were multiplied by an evaporation factor—the ratio of net average monthly precipitation over average monthly precipitation (Environment Canada 2000). I used a method detailed in Appelo and Postma (1996) to calculate precipitation and sample chemistry differences, which were worked out in reference to Cl^-, a conservative ion. If elevated Ca^{2+}, Na^+, and Cl^- concentrations are due to surface water evaporation, they should be similar to values calculated using precipitation input and evapotranspiration loss—the highest values toward the end of August, when evapotranspiration effects are pronounced (Ozoray & Barnes 1978). Concentrations markedly different from calculated values indicate causes other than evaporation, such as anthropogenic input. If the increase in ions is from road salt, the

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Potential Road Salt Contamination of Wetlands

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greatest effects should occur in April, with initial snowmelt, and late May/early June, with runoff.

Ion exchange (Howard & Haynes 1990; Howard & Beck 1993; Pugh et al. 1996) recurs in the literature on road salt contamination. It occurs in a soil's organic A horizon, as most organic sediments adsorb the dominant Ca^{2+} preferentially from fresh waters. Water and dissolved salt transport occurs during spring snowmelt (Hawkins 1976), roughly mid- to late April. When Na^{+} and Cl^{-}-dominated runoff comes into contact with Ca^{2+}-dominated sediments, Na^{+} adsorption is favoured, releasing Ca^{2+}. As exchange occurs, the water changes from a sodium-chloride (NaCl) to a calcium-chloride ($CaCl_2$) type. Exchange reverses with refreshing—a process where Ca^{2+}-dominated fresh water flushes through the Na^{+}-enriched sediments (Appelo & Postma 1996). Refreshing occurs with the May/June runoff, which is Ca^{2+}-rich in the Banff area due to calcareous parent material. Subsequent exchange creates sodium-bicarbonate ($NaHCO_3$) type water. Identification of this pattern indicates road salt is a factor.

A final method tests for chemical reactions characteristic of saline intrusions during fresh/salt water displacements. The waters of the Control Site and the analyzed road salt solution were used, following a method detailed in Appelo and Postma

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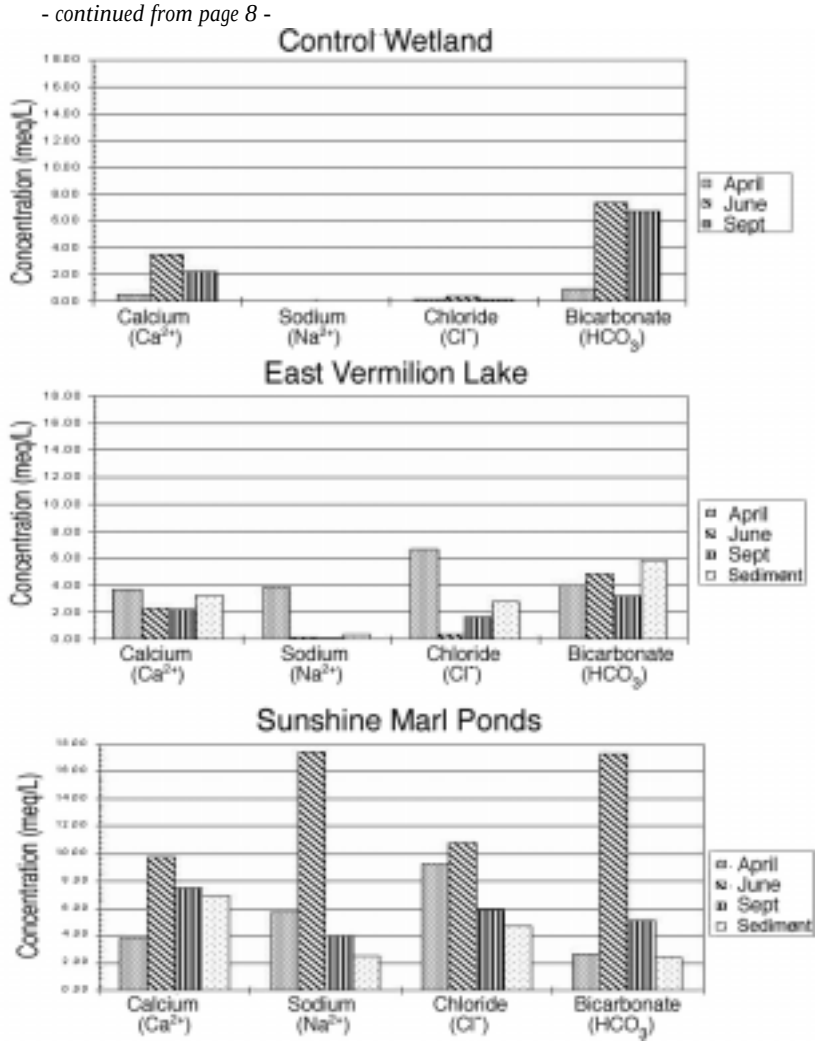

Figure 2. Concentrations of selected major ions at the Control Wetland, East Vermilion Lake and the Sunshine Marl Ponds

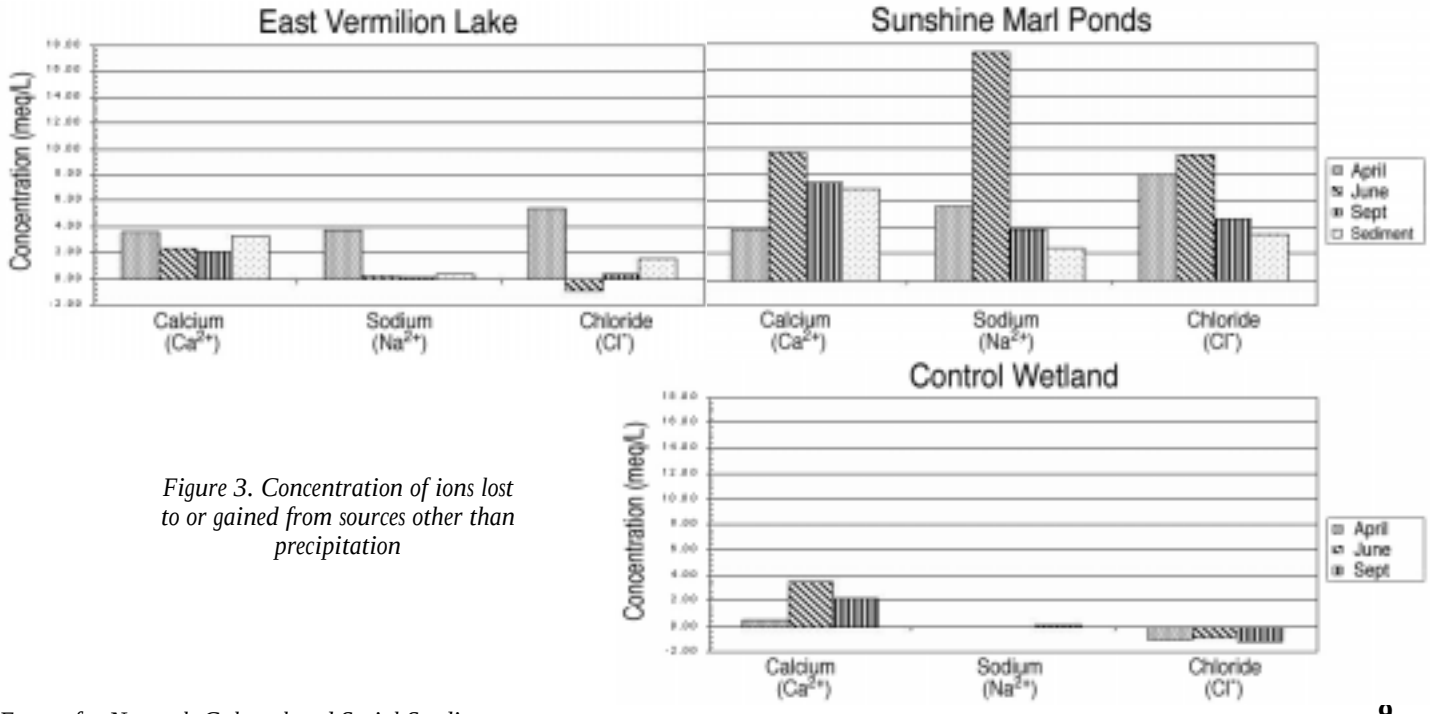

Figure 3. Concentration of ions lost to or gained from sources other than precipitation

Potential Road Salt Contamination of Wetlands

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(1996). A theoretical composition was calculated based on the conservative mixing of salt water and fresh water, then calculated concentrations compared with observed. The fraction of salt solution present is calculated based on a conservative parameter, the Cl^- concentration of the sample.

RESULTS

Road salt is rock salt (96.7% NaCl), with small amounts of other ions present and, depending on the source, treated with anti-caking agents (McCron, 2000; Sifto, 2000). The control wetland appears to be unaffected, with low to normal (≤ 20 mg/L) levels of Na^+ and Cl^-. Most other sites exhibited no unexpected levels of Na^+ and Cl^-. Two exceptions were East Vermilion Lake and the Sunshine Marl Ponds, which had Na^+ and Cl^- levels that fluctuated much more (10X to 20X) than other sites. These differences prompted me to examine the results more closely. (Statistical results were not performed as they would not be meaningful with this small data set.)

East Vermilion Lake and the Sunshine Marl Ponds had higher Cl^- concentrations during April than other sampling periods. April Na^+ levels, while elevated, do not balance the Cl^- concentrations. Conversely, the June samples have higher Na^+ and Ca^{2+} concentrations and lower Cl^- levels (Figure 2). These fluctuations in Na^+ and Cl^- concentrations throughout the year suggest ion exchange (Howard & Haynes 1990; Howard & Beck 1993; Pugh et al. 1996; Hawkins 1976). I took sediment samples in September to test for salt accumulation in pore waters. East Vermilion's pore waters had higher levels than the surface water, while Sunshine's had lower levels (Figure 2). Ion fluctuations indicate that saline groundwater influence is unlikely, but they do not point conclusively to anthropogenic contamination. The observed concentrations may have been caused by surface water evaporation.

Evaporation effects were examined using ion concentration differences between calculated and observed rainfall. Only East Vermilion Lake and the Sunshine Marl Ponds had Na^+ and Cl^- concentrations markedly different from those predicted (Figure 3). Cl^- levels peak at both sites, and a general loss of Na^+ occurs at the Sunshine Marl Ponds, except for a distinct peak in June. The aforementioned differences, with the fact that the highest Cl^- concentrations do not occur around late August as expected, indicate that evaporation was unlikely to have caused these Na^+ and Cl^- concentrations. Ion exchange caused by saline input is a more plausible explanation.

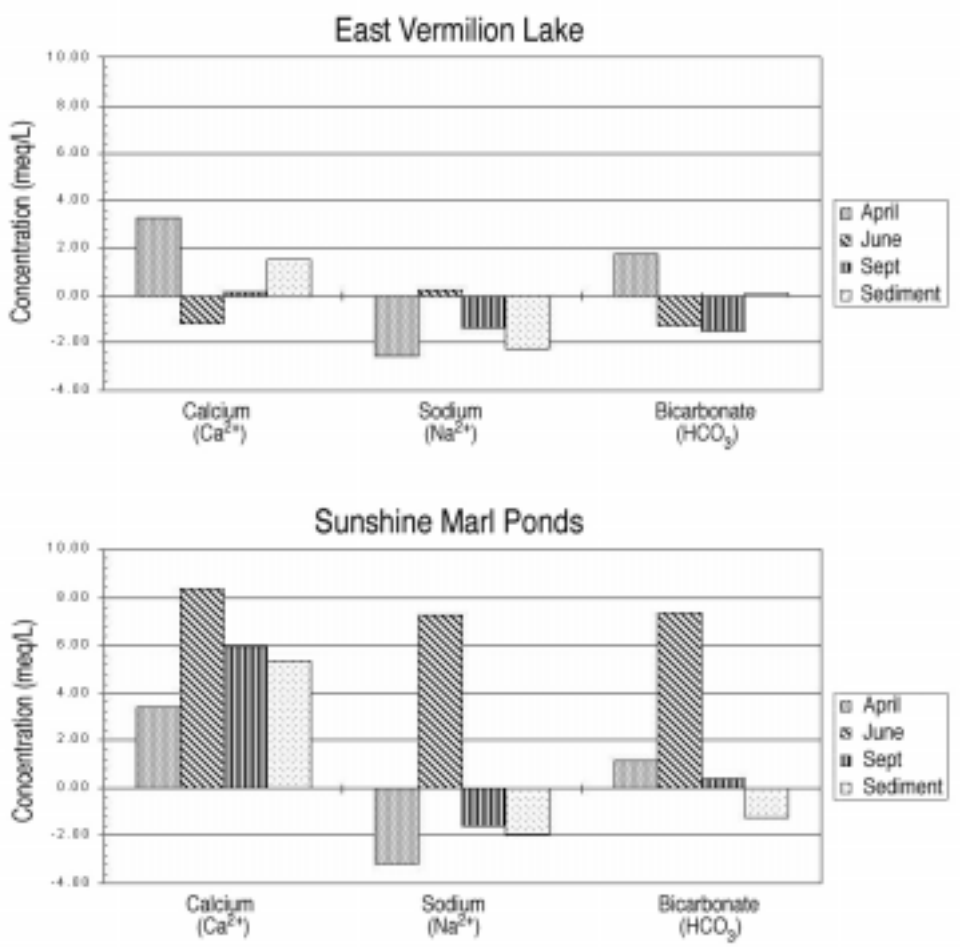

Figure 4. Quantity of ion gained or lost via reaction, calculated against Control Wetland and 0.1% salt solution

Are these patterns characteristic of the chemical reactions of saline intrusions? East Vermilion Lake and the Sunshine Marl Ponds show a peak of Na^+ in June and large losses of Na^+ the rest of the year (Figure 4). East Vermilion Lake fits the ion exchange pattern in that there is a corresponding loss of Ca^{2+} and bicarbonate (HCO_3^-) and a peak in Na^+ in June, the reverse of April. At Sunshine, Na^+ and HCO_3^- have large peaks in June, fitting the ion exchange profile, but there are no corresponding losses of Ca^{2+} from the system. There may be an influx at this site of Ca^{2+} from other sources.

It is likely that two of the TCH-adjacent wetlands, East Vermilion Lake and the Sunshine Marl Ponds, are contaminated with road salt. Physical factors which make these sites prone to contamination is that not only are they close to the road, they are both at the bottom of long, straight, steep, relatively unvegetated slopes. There are no barriers to runoff, meaning relatively undiluted saline runoff can rapidly reach

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Potential Road Salt Contamination of Wetlands

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the wetlands during snowmelt. The wetlands along the BVP do not show signs of salt contamination, in spite as-needed applications of sand and de-icing salt throughout the winter (Kerr 2000); possibly the heavily vegetated undulating slopes along the BVP mitigate contamination. One protective factor seems to be the Ca^{2+}-rich nature of the local bedrock and soils (Amrhein & Strong 1990). The flush of dissolved Ca^{2+}-dominated water through the system in late spring/early summer seems to reverse the leaching of Ca^{2+} from sediments, along with subsequent acidification and loss of soil fertility.

Continued monitoring of the wetlands along Highway 1 for increased or accumulating levels of road salt would be useful. The crucial period in contamination and ion exchange seems to be from the beginning of snowmelt to mid-July, and more frequent sampling of the waters (e.g., once a month) is recommended. If time and money permit, heavy metals and their mobilisation with Cl^- addition should be tested for, while monitoring of invertebrate populations should also be undertaken.

ACKNOWLEDGEMENTS

This project was fostered and completed with the help of many people at the University of Calgary. Ian Hutcheon, my supervisor, Maurice Shevalier, our resident lab guru, Mike Wieser, Steve Taylor and the staff of the University's Stable Isotope Laboratory, Bernhard Meyer and Steve Grasby (GSC) for miscellaneous details, and finally Ron Spencer and Larry Bentley, who reviewed my thesis. All of these people were gracious in agreeing to my requests for help or information and generous with their time and expertise. Also thanks to Charlie Pacas of the Banff Warden's office, who started this project and was patient with requests for information and deadlines. Finally, thanks to Parks Canada for funding this project.

F. Colleen Wendeborn is a Masters Student in the Department of Geology and Geophysics at the University of Calgary.
Tel: (403) 220-6544; fcwendeb@ucalgary.ca

REFERENCES

Amrhein, C. and Strong, J.E. 1990. The Effect of Deicing Salts on Trace Metal Mobility in Roadside Soils. Journal of Environmental Quality 19[4]: 765-772.

Appelo, C. A. J., and Postma, D. 1996. Geochemistry, Groundwater and Pollution. A. A. Balkema, Rotterdam, Netherlands, 536 pp. ISBN 90-5410-106-7.

Environment Canada and Health Canada. 2000. Canadian Environmental Protection Act, 1999: Priority Substances List, Assessment Report—Road Salts—Draft for Public Comments.

Granato, G.E. 1996. Deicing Chemicals as Source of Constituents of Highway Runoff. Transportation Research Record, no. 1533, pp. 50-58.

Howard, K.W.F. and Beck, P.J. 1993. Hydrogeochemical Implications of Groundwater Contamination by Road De-Icing Chemicals. Journal of Contaminant Hydrology, v. 12, no. 3, pp. 245-268.

Howard, K.W.F. and Haynes, J. 1990. Geochemical Alteration of Road De-Icing Chemicals by Sub-Surface Rock-Soil-Water Interactions. Environmental Research: 1990 MOE Technology Transfer Conference, Royal York Hotel, Toronto, Ontario, pp. 371-373. Technology Transfer Conference (11th), ORG Research and Technology, Toronto, Ontario.

Howard, J.L. and Sova, J.E. 1993. Sequential Extraction analysis of Lead in Michigan Roadside Soils: Mobilization in the Vadose Zone by Deicing Salts? Journal of Soil Contamination, v. 2, no. 4, pp. 361-378.

Jones, P.H., Jeffrey, B.A., Watler, P.K., and Hutchon, H. 1986. Environmental Impact of Road Salting—State of the Art, MTC Report RR 237. Research and Development Branch, Ontario Ministry of Transportation and Communications, Downsview, Ontario. ISSN 0228-7048, ISBN 0-7729-1790-6.

Kerr, Douglas. September, 2001. Electronic Communication. Parks Canada, Banff, Alberta.

Labadia, C.F. and Buttle, J.M. 1996. Road Salt Accumulation in Highway Snow Banks and Transport Through the Unsaturated Zone of the Oak Ridges Moraine, Southern Ontario. Hydrological Processes, v. 10, pp. 1575-1589.

McCron, J. 2000. Personal Communication. Highway Sales Supervisor, Sifto Salt.

Myrick, R.H. and Hunt, K.M. 1998. Air Quality Monitoring in Alberta: 1996 Data Report, Report No. 1494-A9803. Air Issues and Monitoring Branch, Chemicals Assessment and Management Division, Alberta Environmental Protection, Edmonton, 197 pp.

Myrick, R.H. 1996. Air Quality Monitoring in Alberta: 1995 Data Report, Report No. 1494-A9611. Air Issues and Monitoring Branch, Chemicals Assessment and Management Division, Alberta Environmental Protection, Edmonton, 195 pp.

Myrick, R.H. 1995. Air Quality Monitoring Data Summary for Alberta: 1993, Report No. 1494-A9413. Air Issues and Monitoring Branch, Chemicals Assessment and Management Division, Alberta Environmental Protection, Edmonton, 183pp.

Norrström, A.C. and Jacks, G. 1998. Concentration and Fractionation of Heavy Metals in Roadside Soils Receiving De-Icing Salts. The Science of the Total Environment, v. 218, pp. 161-174.

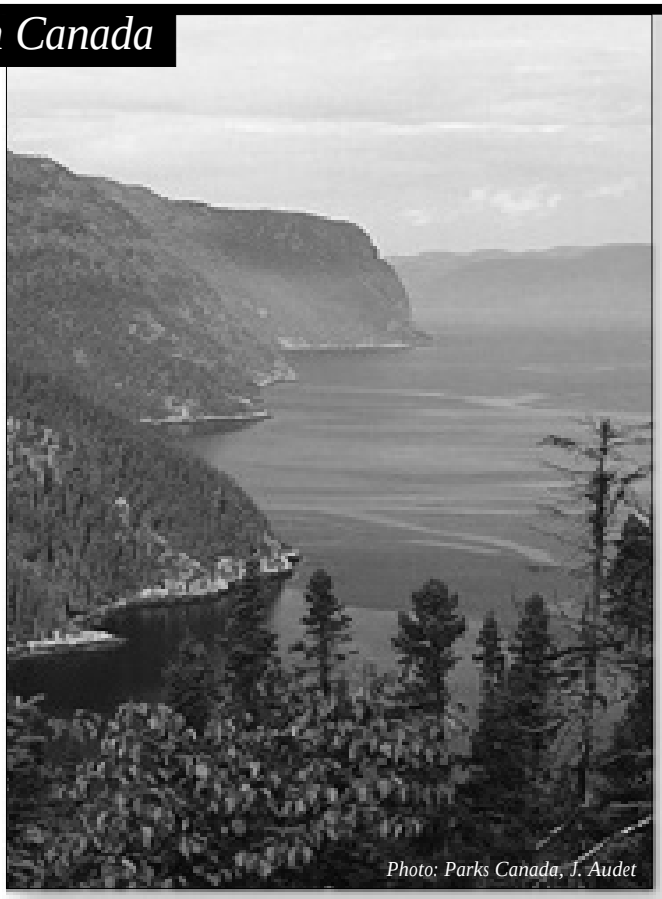
Ozoray, G.F. and Barnes, R. 1978. Hydrogeology of the Calgary-Golden Area, Alberta, ARC Report 77-2. Alberta Research Council (ARC), Edmonton, 38 pp., 1 map.

Parks Canada. 2001. Banff National Park - Weather. http://www.worldweb.com/parkscanada-banff/weather.html

Pugh, A.L., Norton, S.A., Schauffler, M., Jacobson, G.L., Kahl, J.S., Brutsaert, W.F., and Mason, C.F. 1996. Interactions Between Peat and Salt-Contaminated Runoff in Alton Bog, Maine, USA. Journal of Hydrology, v. 182, pp. 83-104.

Shanley, J.B. 1994. Effects of Ion Exchange on Stream Solute Fluxes in a Basin Receiving Highway Deicing Salts. Journal of Environmental Quality, 23[5]: 977-986.

Sifto Canada, Inc. 2000. Product Specifications and Material Safety Data Sheets.



Éternité Bay area, Saguenay-St. Lawrence Marine Park

RESEARCH

Ongoing Research
MAN AND THE MARINE ENVIRONMENT IN THE SAGUENAY-ST. LAWRENCE MARINE PARK

"In modern times the large mammals again beckon us to the mouth of the Saguenay, an ideal site for exploring the marine environment. This renewal of old friendships, however, also provides an opportunity to examine society's traditional ways of treating this environment and to discover other aspects of civilization and modes of thought that have made human activity more of a threat. For example, recent trends toward industrialization represent a major break with traditional approaches to the marine environment dating back thousands of years."

(Saguenay-St. Lawrence Marine Park, Management Plan, 1995)

Marine conservation areas highlight the acute need for collaboration among shore communities with respect to protecting these areas. Since 1996, the Saguenay-St. Lawrence Marine Park has been developing a social science research program designed to document paleohistorical and historical uses of the marine environment, as well as the perceptions of populations in different eras regarding such uses. The program draws attention to previous modes of occupation, the resulting environmental impact, and ideological contexts. Obviously, the goal is not to reenact practices that today are no longer desirable and even detrimental. Rather, we aim to increase people's understanding of how these activities were at one time useful, necessary, and even indispensable to developing shore communities, which protect the marine environment today.

This project is conducive to cooperative approach, and relies on bringing the marine park's "soft" and "hard" scientists together. To date we have drawn on the disciplines of archaeology, history, geography and anthropology for contributions that supplement the work of 2 researchers (an anthropologist and an archaeologist), who have been involved in the program on a more regular basis. We also seek involvement from the natural sciences. Data comes from sources including natural history treaties, the narratives of whalers, and the reports of fisheries inspectors, all such accounts provide useful information on the evolution of knowledge and sensitivities surrounding the marine environment and fauna, and of nature in general.

Researchers are pursuing several "main lines" of research: the Amerindian presence at the confluence of the Saguenay and the St. Lawrence before, during, and since contact; human exploitation of the marine environment, from the origins of man's presence to the present time; historical ecology, which includes descriptions from the first explorers concerning the status of the fauna, flora, waters and shoreline of the land inside the park (Cartier and Champlain abound with such descriptions); the impact of logging and industrialization in the area of the Saguenay-St. Lawrence Marine Park; and finally, the history of commercial and tourist navigation.

In addition to providing substantial content for the educational mission of the marine park, this research should produce original contributions to scientific literature on the marine environment—be they in archaeology, history, or anthropology.

Roch Samson, Anthropologist and Historian with Parks Canada, Quebec Service Centre
roch_samson@pch.gc.ca

HIGHLIGHTS

EVALUATING THE QUALITY OF VISITOR EXPERIENCE AT LAKE LOUISE

Lake Louise and Moraine Lake are two of the most heavily visited areas in the national parks with over 15,000 and 6,000 people per day visiting each location respectively. There is concern that the high number of visitors and vehicles is impacting the quality of visitor experience and threatening the area's ecological integrity. As part of an adaptive management approach, the Kootenay, Yoho and Lake Louise field unit is conducting research and monitoring on the quality of visitor experience and the viability of public transportation in the area. Intercept surveys are being conducted with visitors at both Moraine Lake and Lake Louise to better understand perceived crowding, visitor expectations and satisfaction, patterns of visitor use, as well as potential needs for public transportation. Approximately 900 visitors will be surveyed at each location throughout the spring, summer and fall. Results from this study will provide information for human use management and help managers design appropriate public transportation for Lake Louise.

Michael den Otter
Michael_den_Otter@pch.gc.ca

Moraine Lake, Banff National Park, Alberta

DEVELOPING ASSESSMENT METHODS FOR INSHORE ROCKFISH

Inshore rockfish are relatively shallow water, benthic species of the rockfish genus Sebastes and include yelloweye (*S. ruberrimus*), quillback (*S. maliger*), copper (*S. caurinus*), china (*S. nebulosus*), and tiger (*S. nigrocinctus*) rockfish. These species are found from California to Alaska, inhabiting sub-tidal rocky reefs to depths of 500 m. Yelloweye rockfish are the longest-lived inshore rockfish and can live beyond 100 years. By age 10, inshore rockfish begin recruiting to the fishery and by age 20, they reach sexual maturity. Although general life history traits are known for rockfish, not enough is known on the population status of inshore rockfish stocks along the Pacific coast. Extreme longevity and low rates of natural mortality suggest that these rockfish stocks exhibit very low productivity. Reproductive strategies limit them to intrinsically low rates of population growth that cannot sustain high fishing mortality.

In British Columbia, inshore rockfish are fished in commercial, recreational and Aboriginal fisheries using hook and line gear. Stock indices are derived using fishery dependent catch and effort data. They are useful for estimating relative stock abundance, but, there are no means of estimating absolute abundance for inshore rockfish. Inshore rockfish aggregate over very rugged rock bottom, therefore abundance can not be measured or assessed using standard area swept trawl surveys or hydro-acoustic techniques. There is a need to develop new survey methods to directly assess rockfish absolute abundance and their associated habitat.

As part of a multidisciplinary research survey in August 2000, Fisheries and Oceans Canada together with Gwaii Haanas National Marine Park Reserve/Haida Heritage Site, developed in-situ survey methods for the direct estimation of inshore rockfish abundance. Using the 2-person (observer and pilot) submersible DELTA, 19 dives and 20 line transects were conducted over 5 days in Gwaii Haanas. Rockfish were counted by the observer, through a starboard porthole, during the 25 minute transects. Post-processing of videotapes from a starboard mounted camera were used to verify the direct fish counts and determine the habitat type. Videos from a forward-looking camera were used to count fish that were on the survey transect line but avoided the moving submersible. Detection functions modelled from the fish count data will be used to estimate rockfish abundance.

The relationship between the new in-situ estimates of fish abundance and the traditional fishery dependent catch indices will be compared over various levels of fish abundance. This relationship or 'catchability' could then be applied to the fishery data over other areas of the coast to estimate stock abundance and ascertain stock status. Further enhancements could incorporate habitat information, particularly the proportion or area of rocky reef habitat.

In-situ survey methods are particularly useful for the monitoring and assessment of areas closed to fishing, such as, Rockfish Protection Areas and no-take Marine Protected Areas. These non-intrusive, fishery-independent methods are also useful to describe benthic fish and invertebrate distribution, abundance, ecological relationships and marine habitats. Visual in-situ data offer an ecological perspective to traditionally fishery based stock assessment methodology and allow the direct estimation of abundance for inshore rockfish.

K. Lynne Yamanaka, Research Biologist,
Department of Fisheries and Oceans
YamanakaL@pac.dfo-mpo.gc.ca

ABCs of Backcountry Monitoring

in Riding Mountain National Park

Kelly MacKay and Michael Campbell

In the summer of 2000 the University of Manitoba conducted a pilot program to develop a backcountry impact monitoring strategy for Riding Mountain National Park (RMNP). The approach was based upon the Limits of Acceptable Change (LAC) model (see: McCool & Cole, 1997) and adapted to the needs of RMNP to include abiotic, biotic, and cultural (A-B-C) factors in one monitoring program. In the past, RMNP has made several attempts to initiate backcountry monitoring but these were never fully realized due to complicated methods and the large time commitment required. The premise underlying this project was that surrogates for larger impacts could be identified. These elements could then form the basis of the monitoring program, thereby reducing time and training requirements and increasing the likelihood of sustained implementation.

METHODS

As suggested by the A-B-C approach, multiple methods were used to generate the data. We analyzed camping permit data and surveyed backcountry users, then combined this information with data concerning abiotic and biotic impacts at backcountry campsites. Each stage of the project was done in consultation with RMNP backcountry staff and the RMNP Backcountry Working Group.

Abiotic conditions at backcountry campsites were measured through soil penetrometer readings to measure soil compaction, plus visual identification and photographic verification of soil erosion and social trail development (i.e, trails created by users rather than Parks Canada that frequently develop between tent-sites and campsites and water bodies). Soil penetrometer readings were taken at 1 m intervals along 2 orthogonal transects spanning the entire campsite. The azimuth (compass direction) for the initial transect at each campsite was randomly generated. Soil penetrometer readings provide evidence of soil compaction and, when measured after heavy precipitation, some indication of susceptibility to erosion. In addition, evidence of bank failure and slumping was recorded for campsites located near bodies of water. For each campsite, we conducted a descriptive survey to record social trail development, litter (garbage), and trail braiding. Each campsite was also videotaped.

Biotic measurements focused on recording percentages of vegetation type based upon area of coverage. Exposure of bare soil was measured as one component of the biotic component. Using the same transects identified for penetrometer readings, we measured vegetation cover over nine 1 m^2 quadrats located equidistantly along the transects. Vegetation samples were collected for identification. We also monitored campsites for damage to bordering vegetation (e.g., nails in trees, evidence of horse browsing, branches cut off, etc.). All campsites were visited at least once early in the summer. Some campsites (those where there appeared to be significant damage) were re-visited later in the season.

Cultural impact monitoring included analysis of backcountry camping permits, and a backcountry trail user survey. We analyzed a sample of 399 permits from 1995-1999 to examine backcountry user and trip characteristics. The purpose of the survey was to assess backcountry users' perceptions of impacts on the trails and/or campsites that they used. The backcountry user survey was a self-administered questionnaire distributed at selected trailheads. Of the 181 surveys distributed, 76% (137) were returned.

RESULTS AND DISCUSSION

Abiotic Factors

In general, abiotic impacts of trail and campsite use were limited to trail erosion and braiding (particularly in wet and muddy sections), social trail development at campsites, and increased soil density/compaction and exposure of bare ground at heavily used campsites and corrals. Each of these factors affects the others and ultimately increases potential for soil erosion

Soil penetrometer readings provided an indication of soil strength and the degree of soil compaction, however soil penetrometer readings alone do not indicate erodibility. Soil erodibility is a result of relative soil strength, cohesiveness, and ground cover. All discussions of soil penetrometer readings should be considered in light of ground cover conditions. Factors influencing soil susceptibility to erosion can be viewed as either passive or active. Passive factors are environmental conditions that do not change appreciably with time (e.g., soil type, slope), active environmental conditions change in type and intensity over time (e.g., precipitation, mass movements).

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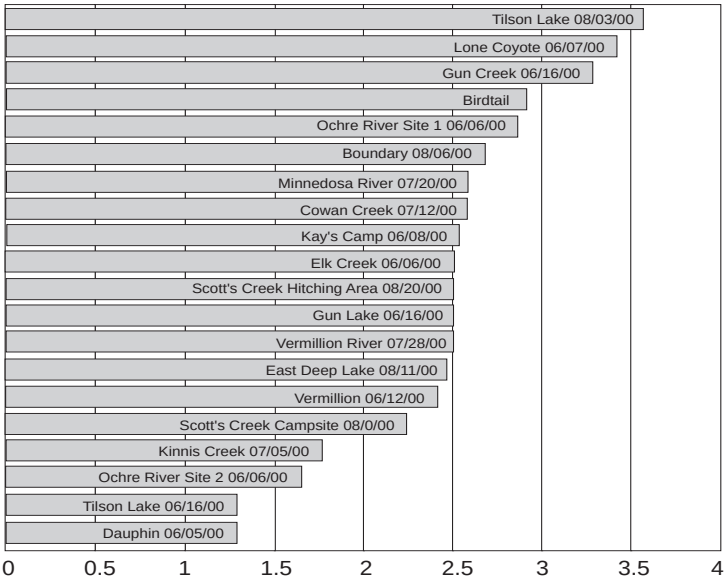

Figure 1. Soil penetrometer readings kg/cm^2

ABCs of Backcountry Monitoring

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Average soil penetrometer readings for all sites ranged from 1.31 to 3.54 kg/cm2 (average 2.55 kg/cm^2; Figure 1). Penetrometer readings for surrounding non-campsite areas were not taken because different vegetation associations covered those areas. To develop a surrogate measure for non-campsite areas, we averaged penetrometer readings from the margins of campsites (1.48 kg/cm^2). Using this number, we estimate that human activity in and around campsites increases soil compaction by approximately 1 kg/cm^2.

Given that most campsites were only sampled once and that there was no pre-existing data concerning soil compaction or vegetation cover, we cannot draw conclusions regarding soil compaction and vegetation change with use. However, general trends in soil penetrometer readings (Figure 1) and vegetation cover suggest that some impacts occurred at the primitive campsites and that these changes are a result of use type, intensity, and timing. Furthermore, on sites where comparison is possible, soil compaction is related positively to percentage of bare ground, conditions that predispose a site to erosion in events of significant precipitation. Overall, soil compaction is greater at frequently used sites, and greater still where horse use is predominant.

Biotic Factors

The dominant vegetation types at all backcountry campsites were non-native species (e.g., grasses, dandelion, yarrow, clover, plantain). Most of these are species that prefer disturbed sites, which is precisely the nature of backcountry campsites. The sites are repositories of non-native seeds. We are uncertain whether, with time, succession, and natural or management-initiated disturbances (e.g. fire) these sites will return to more natural vegetation associations like those surrounding the campsites. Bare ground showed strong recovery in a number of sites over the course of the sampling. A combination of factors could be responsible for the growth including, season of sampling, degree and nature of prior use, degree and nature of intervening use, and the impact of the summer's high precipitation levels.

Backcountry areas are most susceptible to impact when moisture levels are high in the early spring and following periods of intense or sustained precipitation. Fortunately, very few people visit the area during those seasons. Additionally, sites where horse use is heavy showed far greater impacts (high penetrometer readings, reduced vegetation cover, a greater percentage of non-native species and damage to trees) than where horse use is low or non-existent.

Figure 2. Number of horses at backcountry campsites 1995-1999

Year	Mean	Standard Deviation	Mode	Minimum	Maximum
1995	9.5	6.4	8	2	30
1996	10.6	6.1	2	2	19
1997	7.0	4.1	8	2	20
1998	9.7	5.5	4	2	18
1999	6.4	4.4	3	2	20
All years	8.1	5.2	8	2	30

Cultural Factors

Backcountry Camping Permit Data

Most backcountry campers visiting RMNP were independent parties (91%) (i.e., not in an organized group) and from Manitoba (89%). Many were repeat visitors to RMNP (68%). The number of people in a camping party is consistently either a small party of 1 to 2 people or a large group of up to 30 campers. Just over half of the backcountry users hiked in. Approximately 25% of the users rode horses, while 21% cycled. The number of horses, wagons, and/or bikes used by a camping party ranged from 2 to 30 horses, 1 to 6 wagons, and 1 to 14 bikes. July (23%), August (25%), and September (22%) were the busiest months. Campers stayed between 1 and 23 nights, and most often just 1 night. The 3 most popular backcountry campsites were Whitewater (12%), Gunn Creek (10%), and Gunn Lake (8%) (Figure 2).

Backcountry Trail User Survey

The backcountry trail user survey captured both day users (no permit required) and those who were camping in the backcountry. Day users of backcountry trails accounted for 47% of respondents. Slightly more than half of all backcountry users were repeat visitors (55%) and almost all were Canadian (92%). Less than 1% of trail users were over 65 years old. Travel parties of 2 people were most common, but groups ranged from 1 to 17 people. Half of the respondents had a university education. The top 5 reasons backcountry users reported for visiting RMNP were to: enjoy nature, experience fresh air, enjoy quality time with friends and family, exercise, and relax. Hiking was the main activity of many respondents (51%); others were cycling (29%) or horseback riding (20%) (Figure 3).

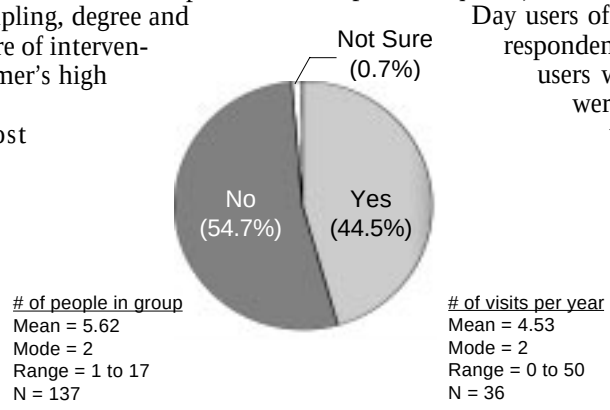

Figure 3. Backcountry trail user information. Responses to the question "Is this your first time on a backcountry trail in the park?" are depicted.

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ABCs of Backcountry Monitoring

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Backcountry users at RMNP (84%) disagreed that trail use is likely to cause damage to the Park's environment. The same was true for campsite users. When asked how many people they encountered on the trail, 47% replied zero and 77% reported seeing no one else at their campsite. Furthermore, when asked whether they noticed any specific physical impacts on the trails, 74% replied that they did not see any negative impacts. Of the 23% who did, garbage/litter was most often cited, followed by soil erosion (14%), ATV tracks (14%), and horse ruts (14%). Similarly, most campers (83%) did not notice any negative impacts at the campsite. Of the 16% who did notice something, garbage/litter was again the most frequently mentioned (Figure 4).

CONCLUSION

These pilot study findings can serve as a baseline against which future measurements can be evaluated. Overall, physical and social data collected during the study suggested that the impacts of people seeking recreation in the backcountry of RMNP, at current levels of use, are minimal. Impacts at most campsites appear to have reached a plateau and peak use periods do not correlate with peak potential for impact. However, some sites exhibit signs of stress and the potential to deteriorate rapidly given relatively small changes in use level, pattern, or intensity. Patterns of use are particularly germane in RMNP because backcountry users appear to travel in pairs or large groups. As a result, the number of visitor nights may provide a misleading picture of use. It is important to monitor the timing of large groups travelling in the park because they have the potential to impact a campsite significantly in a short period of time, particularly when soil is saturated (penetrometer readings less than 2.0 kg/cm2). Horse activity should be as confined as possible at campsites to prevent further soil compaction. We recommend that backcountry users be educated about low impact camping principles, and that they be encouraged to concentrate use in already heavily used areas. In pristine areas dispersal is the preferred option.

Figure 4. Backcountry users' opinions on trail use and impacts

Trail Impact Opinions

(based on a scale where 1 = strongly disagree; 5 = strongly agree)

Trail use causes damage to environment	1.6
Trail is suited to the Park's landscape	3.8
Others on the trail reduced my enjoyment	1.4
Trail signs were helpful	3.9
Maintenance crew on trail reduced my enjoyment	2.2
Encountered too many people on the trail	1.3

By integrating abiotic and biotic trail/campsite data, we concluded that backcountry users were unable to recognize impacts such as erosion, trail braiding, and non-native vegetation. Our survey results support providing signs in town and at trailheads, and printing information on camping permits to show all users what impacts to look for and how to report them for monitoring purposes. A backcountry user survey should be conducted every 3 years to complement permit data information and document day user data. Survey data can also be employed to target specific groups such as: day vs. overnight stays; hikers vs. cyclists vs. horseback riders.

To improve usefulness of permit data for backcountry monitoring purposes, RMNP would benefit from a software program that provides direct database entry from permit information. Permit information should also be standardized with an option to include additional questions of interest on years when a survey is not undertaken. In this way the data can be used more effectively to document patterns of use, analyze trends, and develop targeted communication for users.

Results of this monitoring study demonstrate how physical and social information can be incorporated into a comprehensive backcountry monitoring program and highlight areas of emerging concern. The strategy developed for RMNP is simple, effective, and provides a coarse filter for identifying impacts. Finally, the strategy links patterns of use to changing backcountry conditions, specifically vegetation cover and soil compaction, thus allowing for proactive management. We recommend taking an adaptive management approach, using some sites as benchmarks for recovery and ability to withstand use.

Kelly MacKay and Michael Campbell are with the Health, Leisure and Human Performance Research Institute, Faculty of Physical Education and Recreation Studies, University of Manitoba. Kelly MacKay works with Parks Canada in a joint position agreement with the University of Manitoba. Tel: (204) 474-7058; fax: (204) 261-4802; mackay@ms.manitoba.ca

REFERENCE CITED

McCool, S. F. and D. N. Cole. 1997. Proceedings – Limits of acceptable change and related planning processes: Progress and future directions. *USDA Forest Service General Technical Report INT-GTR-371.* Intermountain Research Station. Ogden Utah.

TRADITIONAL KNOWLEDGE AS A CONTRIBUTION TO NATIONAL PARK ECOLOGICAL INTEGRITY

"A strategic objective of the Kluane Ecological Integrity Statement [EIS] is to recognize the aboriginal cultural landscape as both an integral part of the Kluane region ecosystem and through the expression of Southern Tutchone traditional knowledge, a significant contributor to ecosystem management."

- Kluane EIS draft, 2001

David Neufeld

Parks Canada's mandate for National Parks in Canada is to achieve and maintain ecological integrity. This new charge rises from our heritage as a land management agency as well as broader social and cultural awareness of the importance of the state of our environment. The purposes and character of Parks Canada's management have changed over time — national parks have been perceived as examples of God's wonders on earth (high alpine and rugged landscapes), tourist entertainment venues (bears and golf courses), healthy and energizing recreation sites (hiking and paddling), and now as working examples of regional ecosystems.

The latest iteration of this mandate however, contains some significant differences from previous versions. Previously the primary management focus was on providing worthwhile visitor experiences, now and into the future. With ecological integrity, it is the ecosystem itself that is the primary, and some might add the only, client. This change has implications in a number of areas. These include a focus on ecosystem management that reaches beyond park boundaries and mandate to work towards a challenging and as yet a vaguely understood end—ecological integrity.

Ecological integrity is our primary responsibility in resource management. Resource management is a decision-making process, defined by attributed human values and driven by an understanding built on structured information, ways of knowing, that we trust. Where can we obtain this knowledge? Who are the creators or carriers of this structured information?

There are two primary sources for knowledge about the functioning of ecosystems. Our primary source for the past 30 years has been the natural science research community, widely recognized as providing useful, increasingly reliable information about ecosystems. A second source of information, one used very little in national park management to date, is naturalized knowledge. Naturalized knowledge is gained through use of, and cultural engagement with, an ecosystem by a community and its members over very long periods of time.

Lydia Thomas' spring camp on the Old Crow Flats. Vuntut National Park is currently working with the Vuntut Gwich'in First Nation on a major oral history project. The results of this work will provide information for the preparation of local school curriculum, foster Gwich'in language retention, support aboriginal heritage presentation and develop community infrastructure and knowledge sets to contribute to national park management.

The character of naturalized knowledge is broad and comes from and reflects a diversity of experiences over time. Peter Usher (2000) describes four categories of naturalized knowledge, the divisions based upon the source and character of each category.

- Category 1 is "factual/rational knowledge about the environment." It is based upon personal experience, both as individual observations or generalized familiarity with place, and on personal experiences reinforced by accounts of others, both living and dead. Category 1 may be generally compared to the natural sciences.
- Category 2 is also factual knowledge describing past and current land and resource use and thus the interests and rights of the holders. This knowledge set might be equated with the western legal and resource management systems.
- Category 3 knowledge includes culturally-based value statements and lays out the ethical and moral framework guiding human relations with the world around them. The social sciences and humanities would be a familiar example of this category.

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TRADITIONAL KNOWLEDGE AS CONTRIBUTION TO ECOLOGICAL INTEGRITY

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- Category 4 "is a culturally based cosmology — the foundation of the knowledge system" underlying the first three categories. This category is generally expressed as religious beliefs or articles of faith.

All of these categories contribute to a fuller understanding of the natural processes and human valuations present in an ecosystem and are integral elements of resource management. In this paper only that naturalized knowledge of aboriginal peoples, also known as traditional knowledge, is considered.

Western natural resource research and management incorporate a host of western cultural values. These cultural values and associated social, economic and political assumptions are often invisible to managers or seen as separate from their work, thus leading to misunderstandings when working in a cross-cultural environment. These difficulties of working within one category of knowledge while aboriginal partners are often more consciously invoking two or more categories of knowledge are compounded by two themes underlying western management approaches. First, government administration systems established in the "new world" emphasized development and resource-use. This emphasis on development was not explicitely shared by the Yukon aboriginal culture. For example, although the Yukon aboriginal culture valued trade, a "life spirit" was attributed to all elements of nature (Cruikshank 2000).

Second, for at least a century, newcomer administration has avoided or taken limited responsibility for aboriginal culture. Typically, management emphasized european values and understandings. As a result, aboriginal cultural issues were often set aside in management considerations, creating real challenges for aboriginal people to retain their cultures and express their distinct ways of knowing.

Aboriginal people in Canada put great effort into perpetuating their culture. First Nation cultural identity and sharing of knowledge is closely tied to the land and its resources. In many ways the land is the First Nation university. It is the core of their cultural heritage and the chance to guarantee cultural survival (Council for Yukon Indians 1973). With the participation of aboriginal elders in resource management, First Nations are committing their most knowledgeable and experienced people to working on their highest priority. However, they have a tough job. First Nations are separated from their land through resource and land management, particularly through restrictions on and competing uses for the same resources (Lotenberg 1998). Newcomer resource management has, perhaps unintentionally, undermined aboriginal involvement in resource management.

The value of aboriginal traditional knowledge, however, is widely recognized in science. Resource management interest in traditional knowledge, both in natural and cultural heritage, have thus focussed on the aboriginal past, its collection and preservation, rather than on questions of cultural continuity (Weinstein 1997). If cross-cultural joint management is to have any hope of success this basic principle of resource management needs to be changed.

Internationally, the Government of Canada recognizes the important contributions to resource management made by indigenous peoples. The 1992 UNESCO Convention on Biological Diversity and the 1995 Seville Strategy for Biosphere Reserves acknowledge both the importance of indigenous communities to biological diversity and their dependence on traditional access to local resources. (UNESCO 1992 and UNESCO 1995) Within Canada, the aboriginal land claim agreements in the Yukon and western Arctic similarly recognize these aboriginal contributions with a variety of co-management boards and committees. However, the agreements are more than this. They are carefully negotiated cultural accommodations between aboriginal and newcomer societies. Governments have accepted a range of obligations to facilitate the creation of a joint society respectful of all cultures (Council for Yukon Indians 1993 and Worster 1992). The agreements outline a range of government obligations to ensure the cultural vigour of aboriginal peoples is enhanced.

Perhaps one of the main differences still separating newcomer and aboriginal approaches to management in North America lies in the perceived role of humans. From the newcomer viewpoint, management, a word derived from the L. *manus*, meaning hand, speaks to a form of control or perspective from outside, periodically reaching in to make fine adjustments. Aboriginal people far more often speak in terms of what westerners know as stewardship, a pair of Old English words *stig*, house or great hall and *weardian*, guardian. The meaning here is clearly one from inside, an ongoing participating service by community members that maintains order and adapts to change. Managers from different cultures have distinctly different perspectives on issues, so it is only with great effort that traditional knowledge is heard within management institutions that arise from the former tradition.*{See Neufeld (under review) for a detailed report on the traditional knowledge of the Tr'ondëk Hwëch'in in central Yukon.}*

To ensure that traditional knowledge can contribute effectively to management it is necessary to have healthy and vibrant traditional knowledge practitioners meeting with newcomers at the management table. There need to be changes in two areas of management processes to reflect this cultural element. The first is active support for the aboriginal connection to place. This connection provides the continuing richness and depth of traditional knowledge that contributes to ecological integrity in important ways. The second is a broader understanding of management.

The Yukon Field Unit is currently working with First Nations neighbouring National Parks to develop methods to address these two needs. At Kluane

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National Park & Reserve, Parks Canada and the Champagne and Aishihik First Nations are adopting the idea of the aboriginal cultural landscape as a way of acknowledging the close relationship between the Southern Tutchone and their homeland, fostering the cultural reproduction objectives of the land claim agreement and supporting the ongoing vivacity of their traditional knowledge. (Draft Ecological Integrity Statement for Kluane National Park & Reserve 2001. The cultural re-integration section was prepared by Sheila Greer for the Champagne and Aishihik First Nation and the author for Parks Canada.)

The aboriginal cultural landscape concept is an attempt by Parks Canada to recognize and value aboriginal relationships to land and traditional knowledge. It offers similar opportunities for appreciating and understanding the importance of aboriginal cultures in ecosystem management and community health. We are at the very early stages of understanding how this concept will enable more culturally inclusive management forms to evolve at Kluane National Park & Reserve. Nevertheless, in other areas of the Yukon *(note the paper on Tr'ondëk Hwëch'in mentioned above),* these elements include placenames, landscape features with associated stories/myths, linguistic structures, in-situ cultural resources and continuing use.

The gradual exclusion of aboriginal people from parts of their traditional cultural landscape through this century has eroded the cultural connections between the Southern Tutchone and the lands now in the national park. The consequent loss of naturalized knowledge has impaired Parks Canada's ability to understand and move towards a state of ecological integrity in Kluane National Park & Reserve. The health and vibrancy of the Southern Tutchone community has also suffered by exclusion from lands and resources in the park and reduced opportunities on their traditional lands for the transmission of experience and wisdom to younger community members. In this scenario both the Southern Tutchone and Parks Canada lose.

The sustainable relationship the Southern Tutchone had with this part of their cultural landscape needs to be re-established and fostered. Activities that enhance and pass on Southern Tutchone traditional knowledge within the First Nation communities must also be encouraged. Parks Canada and the Southern Tutchone are working together to strengthen the regional aboriginal cultural landscape and thus the contribution of traditional knowledge to ecosystem management.

Parks Canada's primary goal in working with the Southern Tutchone on their cultural landscape in the Kluane National Park & Reserve region is not to get a better understanding of traditional knowledge for management purposes. Rather it is to support the continuing health of the Southern Tutchone culture and foster a strong sense of cultural identity so that members of that culture are capable of bringing their traditional knowledge to the management table and effectively contributing to the work on ecological integrity. This work will also demand a deeper understanding of the western cultural traditions shaping resource management by contemporary National Park managers. The right answer at the management table will not be defined solely by ecological indicators, it will be found when we affirm the ways of knowing of both First Nation and newcomer societies and respect the relationship among all cultures and the land.

David Neufeld is the Yukon & Western Arctic Historian for Parks Canada. Tel: (867) 667-3913

REFERENCES CITED

Council for Yukon Indians, *Together Today for our Children Tomorrow*, Brampton, 1973.

Council for Yukon Indians. 1993. Umbrella Final Agreement between The Government of Canada, The Council for Yukon Indians and The Government of the Yukon.

Cruikshank, J. 2000. Glaciers and Climate Change: Perspectives from Oral Tradition. Paper presented at 51st Arctic Science Conference, September 2000.

Lotenberg,G. 1998. Recognizing Diversity: An Historical Context for Co-managing Wildlife in the Kluane Region, 1890-present.Manuscript for Parks Canada.

Neufeld, D. (under review). The Hän Cultural Landscape of the MIddle Yukon River Valley - Tr'ochek Heritage Site (Parks Canada, Submission Report - Site to Historic Sites and Monuments Board of Canada, September, 2001)

Parks Canada, 2001. Ecological Integrity Statement for Kluane National Park & Reserve - Draft.

UNESCO 1992. Convention on Biological Diversity <www.biodiv.org/chm/conv/default.htm> and

UNESCO. 1995. Seville Strategy for Biosphere Reserves <www.unesco.org/mab/stry-1.htm>

Usher, P.J. 2000. Traditional Ecological Knowledge in Environmental Assessment and Management. *Arctic* 53(2).

Weinstein, M.S. 1997. Getting to Use in Traditional Knowledge Studies. Paper presented at The Society for Applied Anthropology.

*Worster, D. 1992.*Grounds for Identity, *Under Western Skies: Nature and History in the American West.* New York.

Research Links
Submission Guidelines

PUBLICATION OVERVIEW

Research Links is a peer reviewed research publication aimed at professionals, park managers and academics interested in research activities in Western Canada's National Parks and National Historic Sites. It is a multidisciplinary publication that highlights research from the natural, cultural and social sciences, and reports this research to a wide audience. *Research Links* focuses on research activities and needs in Western Canada and accepts articles from other regions which may be of interest to readers. The content of *Research Links* focuses on research results and park/site management impications. Please note that although this is not a "refereed" publication, articles are peer reviewed by our Editorial Board, which consists of experinced parks staff and an academic expert, who together represent various disciplines.

CONTENT

Research Links accepts several types of articles for review:

Feature Articles: maximum length 1500 words, including references (see "A. Feature Articles" for details)

Research Highlights: length approximately 250 words (see "B. Research Highlights" for details)

Book/ReferenceReviews: approximate length 750-1000 words

Podium Pieces: These are opinion pieces on topics relevent to research in national parks/historic sites; approximately 1000 words;

Other Information: Meetings of Interest, news of relevent events, a variety of information on individuals' activities and accomplishments

A. FEATURE ARTICLES

Research Links publishes rigorous articles that:

- describe ongoing and recently completed research and scientific activities in Parks Canada, and highlight the implications of this research for management
- communicate requirements for natural, cultural and social research initiatives
- reflect and strengthen ties among academics, researchers and managers within and outside park boundaries
- reflect science and its application in resource management in a manner that encourages subsequent dialogue and debate
- illustrate how research is used to assist in the management and operations of protected areas (mainly national parks and national historic sites)

Research Links DOES NOT feature articles that:

- are purely descriptive
- focus on methodology rather then results
- merely report on the status of a situation/species
- do not address any particular conservation, research or management question

Questions to Guide Preparation (of Feature Articles)

Authors should consider these questions while preparing feature articles for submission:

- What is the significance of this research to resource management or scientific/historic knowledge?
- What are the key ideas you would like to communicate to park researchers and managers?
- What successes or ongoing challenges are illustrated by your work?
- What new issues have been identified?
- How are your thoughts or data used in management or creation of protected areas?
- How are your research results communicated to local individuals and communities?
- What are the highlights of your experience or research which can benefit others?

Criteria (for Feature Articles)

- A concise description of the problem/management question that prompted the research.
- A thesis statement/hypothesis regarding the contribution of this research to the management question.
- A BRIEF METHODS section and DETAILS regarding the relevance of your RESULTS to the management question. *Research Links* is not a field manual. Contact information at the end of your article will enable those with questions about your methods to contact you.

Length

Feature articles should not exceed 1500 words.

Format Guidelines

Many authors make simple errors in manuscript preparation that result in frustration for the Production Editor and Editorial Board. To make the editorial process run more smoothly, please use the following guidelines:

- Provide contact information in your article: name, position/job title, e-mail address, phone/fax number. We will always send you the final version of your article for approval before we go to press.
- PLEASE DO NOT include figures imbedded in your text. Instead, attach each figure in a separate file and/or send hard-copies by mail (see "Illustrations" below).
- Paragraphs should be separated by hard returns (not tabs or spaces). Only one space should be inserted after punctuation. References and point form lists should be written as straight text, separated by hard returns.
- There should be no running footers, headers or page numbering, and no set paragraph indentation or columns. Hidden/special formatting in the text can cause problems for our graphic artist.
- Ensure your introductory paragraph contains a "thesis statement" or a statement of your research goals/objectives. Your hypothesis should also be clear early in the article.
- When subject matter permits, organize your article so it flows in the following order: introduction, methods, results, discussion/conclusion. An article that combines methods and results or results and conclusions can be difficult for readers to follow.
- Avoid using point form, numerous acronyms and jargon wherever possible.

Illustrations

Illustrations should be submitted as JPEG, TIF or GIF files (scanned or created for output at 300 dpi). Figures that cannot be converted to any of the above formats should be sent by mail as laser-printed hard copies. Line drawings, charts, graphs, colour/black and white prints and slides are all acceptable. Electronic figures created in software we do not have, encoded figures and large graphic files can cause delays in the editing and production phases of publication.

Include a caption/description for each illustration that describes the relationship of the illustration to the article.

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Submission Guidelines

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Author Information

The author's name, title, mailing address, telephone number and electronic mail address should be included with all submitted material.

B. RESEARCH HIGHLIGHTS

Each submission for the Research Highlights section of *Research Links* should be approximately 250 words, and should describe the following concisely:

1. Problem/issue/subject of research
2. Methods
3. Results
4. Implications of this research for protected areas management

Please provide a contact name and e-mail address/phone number with each highlight.

DEADLINES

Research Links is published three times per year, with submission deadlines as below:

Issue	*Published*	*Deadline*
Spring	March	Late Nov.
Sum/Aut	July	Late March
Winter	November	Late July

REVIEW PROCEDURES

Prior to submitting an article to *Research Links*, Parks Canada authors must obtain review and comment from their supervisor/ superintendent.

Submitted manuscripts are edited for stylistic consistency, clarity, grammar , length and relevence to protected areas. Authors should expect comments and questions following the Editorial Board meeting, and will likely be asked to revise their initial submission. If revisions to content are needed, the article may be reviewed/edited a second time. The author will be contacted to approve the article prior to publication.

CORRESPONDENCE

Send all correspondence and submissions to:

Research Links
Parks Canada WCSC
550, 220 - 4th Avenue SE
Calgary, AB T2G 4X3

Tel: (403)221-3210
Fax: (403)292-4404
Research_Links@pch.gc.ca

Recently In Print

Apps, C.D., B.N. McLellan, T.A. Kinley and J.P Flaa. 2001. Scale-dependent habitat selection by Mountain Caribou, Columbia Mountains, British Columbia. Journal of Wildlife Management 65(1): 65-77

Apps, C.D., A. Dibb, and A.J. Fontana. 2000. Lynx Ecology in the Southern Canadian Rocky Mountains: Preliminary Results and Conservation Implications. In: Darling, L.M. ed. Proceedings of a Conference on the Biology and Management of Species at Risk, Kamloops, BC. Volume 2: 15-19. February 1999. BC Ministry of Lands and Parks, Victoria, BC and University College of the Caribou, Kamloops, BC. 520 pp.

Apps, C.D., B.N. McLellan, T.A. Kinley, and J.A. Flaa. 2001. Scale-Dependent Habitat Selection by Mountain Caribou, Columbia Mountains, British Columbia. Journal of Wildlife Management 65(1):65-77

Clevenger, A.P., B. Chruszcz, and K.E. Gunson. 2001. Highway mitigation fencing reduces wildlife-vehicle collisions. Wildlife Society Bulletin 29 (2): 646-653

Flaa, J.P. and B.N. McLellan. 2000. Population Characteristics of the Lake Revelstoke Caribou. In: L.M. Darling, ed. Proceedings of a Conference on the Biology and Management of Species and Habitats ar Risk, Kamloops, BC. 15-19 Feb. 1999. Volume 2.B.C. Ministry of Environment, Landa and Parks, Victoria, BC and University College of the Caribou, Kamloops, BC. 520 pp.

Gloyne, C.G. and A.P. Clevenger. 2001. Cougar *Puma concolor* use of wildlife crossing structures on the Trans-Canada highway in Banff National Park, Alberta. Wildlife Biology 7(2): 117-124

Kinley, T.A. and C.D. Apps. 2001. Mortality patterns in a subpopulation of endangered mountain caribou. Wildlife Society Bulletin 29(1):158-164

Regehr, H.M., C.M. Smith, B. Arquilla and F. Cooke. 2001. Post-Fledging Broods of Migratory Harlequin Ducks Accompany Females to Wintering Areas. The Condor 103: 408-412

Wendeborn, F.C. 2001. A Study of Potential Road Salt Contamination of Highway-Adjacent Wetlands in the Banff Area. Bachelor of Science Thesis. The University of Calgary, Department of Geology and Geophysics. 62 pp.

*To submit to **"Recently In Print,"** please send reprints, copies or signed title pages of articles and theses published in 1999 or later to the address on page 24.*

POD

Cultural Research in Supp

Gwyn Langemann

Last April, I participated in a national workshop on the research that underlies commemorative integrity. The workshop, titled "Communicating the Past, Understanding the Present /Transmettre le passé, comprendre le présent", brought together researchers, policy makers, and field unit representatives. Most sessions dealt with strictly cultural issues, trying to ensure that presentation of commemorative integrity is based on the best available historical, archaeological, and ethnographic research. The session I was invited to chair had a different emphasis: the role that cultural research can play in ensuring the strongest possible scientific basis for ecological integrity. This is the introduction I gave to the session. Articles by two of the participants are included in this issue of Research Links.

Ecological integrity is the issue driving the national parks today. It is the primary consideration in management plans, it will be reinforced by the new science strategy, training sessions will ensure that all employees are exposed to the ideas, and funding will be correspondingly allocated.

Cultural research also has something to say to ecological integrity. National Parks are not in fact a wilderness. They have been populated for 11,000 years, ever since the glaciers first retreated and left habitable land, much longer in the Yukon refugium. People have been a part of the ecosystem for all of this time; their behaviour is shaped by the ecosystem, but they have also played a role in shaping the ecosystem. This has been done through the choice of animals to hunt, plants to gather, and most dramatically perhaps through the use of fire. The frequent, small scale, deliberate burning practiced by aboriginal people had a tremendous impact on shaping the vegetation communities and landscapes that were observed and recorded at the time of the first European contact (Turner 1999; LaLande and Pullen 1999). A prescribed fire programme is seeking to re-establish fire as a part of the ecology in many national parks; in part, this is explicitly because anthropogenic ignition must have been an important ecosystem feature in the past (Wierzchowski et al. 2002). The thickly forested mountain slopes that we admire as wilderness in Banff National Park today are in fact an artifact of the park boundary, a modern cultural landscape created by a century of vigorous fire suppression.

Ecosystems have integrity when they have their native components (plants, animals, micro-organisms) and processes (growth, reproduction, migration) intact. They are dynamic and multi-scaled, and parks must work as part of a larger regional ecosystem, in a network of protected areas. The 1997 Banff National Park management plan contains goals such as "to maintain, and where feasible, restore native vegetation communities to reflect the long-term ecosystem states and processes". How do we know what the long term states and processes are? What is the acceptable range of variation? Studying a modern community of plants and animals is certainly one vital part of ecological research. But what of the past? Archaeological, ethnographic, and historic data provide the time depth that is so vital to establishing past ecological conditions, and establishing the range of variation there has been over time.

Time depth is also preserved in the traditional ecological knowledge of Aboriginal communities, and the naturalized knowledge of communities who have long lived in an area. If an ecosystem has been shaped by human use over the millennia, if animal and plant communities have evolved in a long time relationship with humans, and if these humans have been excluded from the ecosystem for the last few generations, then the absence of human activity is in fact working against ecological integrity. Management plans must consider how to reconnect people and their environments. In the draft Kluane management plan, the absence of regional First Nations from their traditional lands, and the erosion of their traditional knowledge base because of this absence, have been identified as environmental stressors. This is a significant recognition of the interconnectedness of people and their land.

The remains preserved within archaeological sites, and the patterning of sites on the landscape, give us one very good way to assess the changing nature of ecosystems over time. Floral and faunal material preserved in sites can speak to animal and plant communities in the past, and to palaeoenvironmental conditions. Chemical analysis of animal bones can speak to their diet; zooarchaeological analysis can tell us about the population structure of the animal communities; the patterning of sites on the landscape can speak to resource locations and geomorphological processes in the past. Many historic sites commemorate a moment in time when ecological conditions were dramatically changed by the advent of new people, with new ways of living on the land. The changes from a hunting economy to an agricultural or an international trade economy are present in the archaeological record.

Some of us who do cultural research in the national parks, as well as in the national historic sites, have been concerned by what appears to be an entrenched split between ecological integrity (EI) and commemorative

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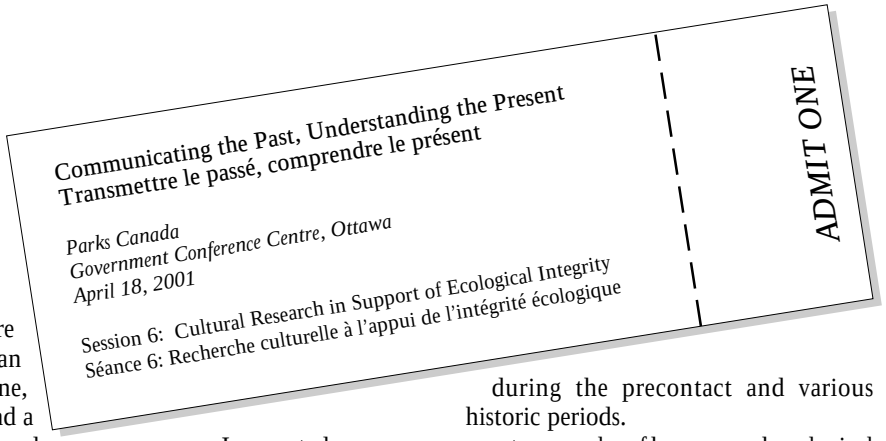
As Defined by the National Parks Act and Cultural Resource Management Policy...

"Ecological Integrity means, with respect to a park, a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes."

"Commemorative Integrity defines the health and wholeness of a national historic site. A site is said to possess commemorative integrity when the resources that symbolize or represent its importance are not impaired or under threat, the reasons for its national significance are communicated to the public effectively, and all its heritage values are respected."

Level I national historic significance is the highest level assigned to a cultural resource in the custody of Parks Canada. A resource is considered to be of Level 1 significance if it is integral to the designation of a national historic site.

Level II is the designation given to cultural resources that are not of national historic significance but nevertheless have historic value. A resource may be included in this category by virtue of its historical, aesthetic or environmental qualities. Buildings that are recognized in accordance with the Federal Heritage Buildings Policy are usually considered as Level II cultural resources.



integrity (CI). Both are laudable concepts, surely. But there is much more to cultural resource management (CRM) than CI. The division between EI and CI is a seductively tidy one, and CRM concerns are often lost in this divide. I have had a park manager say to me, "But of course we have considered CRM; we spoke of the Federal Heritage Buildings, and there are no national historic sites. What else is there to do?" Well, in the park in question, there are also some 200 recorded archaeological sites, and a rich history of observations made by traders and missionaries about the surrounding peoples and environment. Clearly there is a good potential here for better understanding the relationships between humans and the environment as they have changed over time, and presenting an integrated and fascinating story. We as cultural researchers obviously need to spend more time with the park staff, letting them know about our work, and exploring the ways to work together on regional issues. The formal CRM training courses can not do this adequately.

The CRM policy does recognize the importance of ecological factors, and the natural surroundings are often recognized as an important part of the historic place. There is the opportunity to work towards EI and natural resource preservation at the national historic sites, some of which have a considerable land and resource base. However, the EI and environmental assessment processes are not yet so good at recognizing the importance of cultural research.

Since archaeological and historical research is formally housed in the National Historic Site directorate, much of the cultural policy emphasis is necessarily on CI, dealing only with the Level 1 resources, which again leaves a large number of cultural resources in limbo. In Banff National Park, for example, there are about 700 archaeological sites recorded: two of these are National Historic Sites. That leaves a very large number of Level 2 sites to deal with; CI is of little use to the majority of cultural resource management issues that face us in Banff. Here, we have to frame our cultural research in the regional and local context, as the CRM policy encourages us to do. Often, the local context is one of ecological research priority.

We in the Western Canada Service Centre have been trying to work with National Park staff to get our cultural research projects put into the ecological research programmes. We get our funding from the parks now, and so we have to tailor our projects to the priorities of the park. And we have had considerable success here; many research goals of joint cultural and ecological interest have been addressed. These range over questions of land use history, fire management, defining the past range of species, palaeoenvironmental restoration, and understanding the historic reasons for some of the long-standing patterns of human use that are now causing management problems. We have been trying to bridge the two solitudes of EI and CI, through cultural research.

In this workshop session, four speakers from across the country presented various ways in which ecological integrity has been served by cultural research. Roch Samson (see page 12 in this issue), a historian from the Quebec Service Centre, presented an eloquent plea for the value of integrating natural and cultural research, using the relationship between the relatively newly established Saguenay – St. Lawrence marine park and its riverine communities. There is no conceivable way of protecting the marine environment without a deepening public awareness. A multidisciplinary research programme has sought to document the long history of people in the marine environment, as it changed during the precontact and various historic periods.

I presented some more concrete examples of how zooarchaeological data can be used to help define past ecological conditions in the mountain parks. Banff National Park and Waterton Lakes National Park are considering a restoration of free-ranging bison, once a major component of the ecosystem. Archaeological research can speak to the past range, diet, population structure, and human exploitation of these animals (Langemann 2000).

David Neufeld (see page 17 in this issue), a historian from the Western Canada Service Centre, posted in the Yukon Field Unit, spoke to the role that cultural researchers can play interpreting traditional knowledge to park managers. Traditional knowledge is recognized as a key element in maintaining EI, as well as in maintaining community health, but Parks Canada is just beginning to work this out in practice. Cultural researchers can play an important role here, mediating between visions of man's place in nature, and ways of knowledge that are often mutually incomprehensible, if not actually opposed.

Finally, Geoffrey Hancock, the CRM specialist for Gros Morne NP, discussed L'Anse aux Meadows NHS. This site combines a land base, a marine component, historic structures, archaeological resources, rare plants, and a community with the naturalized knowledge of the environment that comes from a long-established relationship with the land. The management challenge is to bring all these interests together, so as to ensure both EI and CI.

The session provided an opportunity for people in the cultural resource business throughout the parks system to reflect on ways in which we can work with our ecological colleagues, towards what must surely be our common goal: a better understanding and presentation of the long and complex interaction of people and their environment.

Gwyn Langemann is an Archaeologist, Cultural Resource Services, Parks Canada Western Canada Service Centre, Calgary. Tel: (403) 292-4692. gwyn_langemann@pch.gc.ca

REFERENCES CITED

LaLande, Jeff and Reg Pullen 1999. Burning for a "Fine and Beautiful Open Country"; Native Uses of Fire in Southwestern Oregon. In *Indians, Fire and the Land in the Pacific Northwest*, edited by Robert Boyd, pp. 255-276. Oregon State University Press, Corvallis, Oregon.

Langemann, E. Gwyn. 2000. Stable Carbon Isotopic Analysis of Archaeological Bison Bone; Using Zooarchaeology to Address Questions of the Past Ecology of Bison. *Research Links* 8(1):4,12.

Turner, Nancy J. 1999. "Time to Burn"; Traditional Use of Fire to Enhance Resource Production by Aboriginal Peoples in British Columbia. In *Indians, Fire and the Land in the Pacific Northwest*, edited by Robert Boyd, pp. 185-218. Oregon State University Press, Corvallis, Oregon.

Wierzchowski, Jack, Mark Heathcott, and Michael D. Flannigan. 2002. Lightning and Lightning Fire, Central Cordillera, Canada. *International Journal of Wildland Fire*, In Press, Volume 11.

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Parks Canada
#550, 220-4 Ave. SE
Calgary, AB T2G 4X3

Research_Links@pch.gc.ca

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MEETINGS OF INTEREST

November 23-December 3, 2001 — 14th Biennial Conference on the Biology of Marine Mammals. Hosted by The Society for Marine Mammalogy and the Vancouver Aquarium Marine Science Centre. Vancouver Conference and Exhibition Centre, Vancouver, BC. The conference will feature research on whales, dolphins, seals, sea lions, and other marine mammals. Contact: mmconf@vanaqua.org; www.smmconference,org

January 30-February 2, 2002 — International Conference of Monitoring and Management of Visitor Flows in Recreational and Protected Areas. Vienna, Austria. Hosted by the Institute for Landsscape Architechture and Landscape Management, University of Agricultural Sciences and its partners. Areas of high ecological value experience increasing pressures from recreation and tourism. New technologies make remote areas increasingly accessible, which leads to extensive ecological impacts and increasing conflict among user groups. This conference aims to be a step toward thorough exploration and discussion of efficient monitoring and recording methods and associated analysis, with input from practitionners and researchers alike. Contact: DI Arne Arnberger; tel: ++43-01-47654-7205; arnberg@edv1.boku.ac.at; http://ifl.boku.ac.at/veranst/mmvconference

February 25-26, 2002 — Working Forests in the Tropics: Conservation through Sustainable Management. University of Florida Campus, Gainesville, FL. Tropical fore conservation is highly complex because the forests perform so many different functions and because of the variety of stakeholders involved. Less than 10% of the world's tropical forests are likely to be preserved as legally protected areas, so conservation of the remaining 90% will depend on making the products and services of these working forests competitive with alternative land use options. This conference was conceived to identify opportunities to make that happen, as well as obstacles that must be avoided or overcome. Contact: Sharon Borneman, Conference Co-ordinator. Tel: (352) 392-5930; fax: (352) 392-9734; spborneman@mail.ifas.ufl.edu; http://conference.ifas.ufl.edu/tropics

March 7, 2002 — Sixth Annual Roads, Rails and the EnvironmentWorkshop. Revelstoke, BC. Presentations will be on a variety of environmental issues affecting the operation of railways and highways, with a focus on western Canada. A speaker list and registration information is in preparation. If you would like to make a 20-25 minute presentation or seek further information contact the CMI office: Jackie Morris, Tel: (250) 837-9311; cmi@revelstoke.net; www.cmiae.org

May 28-30, 2002 — Environmental Studies Association of Canada (ESAC), 9th Annual Conference. University of Toronto, Toronto, ON. This conference will consist of organized panel discussions and paper presentations, with a special session devoted to Parks and Protected areas: "Learning from the Past, Looking to the Future. Topics to date may include First Nations people and protected areas, adaptive management, species at risk management, socio-economic analysis of parks and environmental education/heritage interpretation in parks. To contribute or register contact John Sanlos or Yolanda Wiersma: jsandlos@yorku.ca; ywiersma@uoguelph.ca; http://www.yorku.ca/esac

September 6-10, 2002 — Ecological and Earth Sciences in Mountain Areas - The second in the five-year Mountain Communities Series. The Banff Centre for Mountain Culture, Banff, AB. The international Year of Mountains (IYM) provides excellend impetus for ecological and biophysical researchers and managers to review the state of knowledge about these important and understudied systems. The objective of IYM is to promote conservation and sustainable development of mountain regions. This conference will relate to the following themes: Biodiversity, Climate, Risks and Hazards, Water and Forests. Contact: Leslie Taylor, Banff Centre for Mountain Culture: leslie_taylor@banffcentre.ca; www.banffcentre.ca/cmc

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