



Research Links

A Forum for Natural, Cultural and Social Studies

Shellfish Monitoring in Pacific Rim National Park Reserve

Heather Holmes

INTRODUCTION

Pacific Rim National Park Reserve (PRNPR) represents Marine Region 4, the West Vancouver Island Shelf, in the complex of Marine Regions of Canada. The Broken Group Islands is an area in Pacific Rim comprising approximately 100 islands and islets in the center of Barkley Sound (Figure 1). The outermost islands are fully exposed to the forces of the Pacific Ocean, but in their lee lies a maze of protected shorelines with an abundance and variety of life. Shellfish monitoring is one of the research monitoring projects in the Broken Group Islands.

The PRNPR shellfish monitoring project focuses on bivalves, molluscs with two shells closed together by a hinge. The purpose of the project is to gather baseline data on five species which are harvested both commercially and recreationally in British Columbia: butter clams (*Saxidomus giganteus*), littleneck clams (*Protothaca staminea*), manilla clams (*Tapes philippinarum*), Pacific or Japanese oysters (*Crassostrea gigas*), and native oysters (*Ostrea lurida*). From these data we can learn whether populations increase or decrease over the long term in response to human and/or natural disturbances.

The goals of the Shellfish Monitoring project are to:

- obtain scientifically defensible data to assist in sound decision making for marine ecosystem protection;
- work cooperatively with the Department of Fisheries and Oceans (DFO), and First Nations to manage resources in

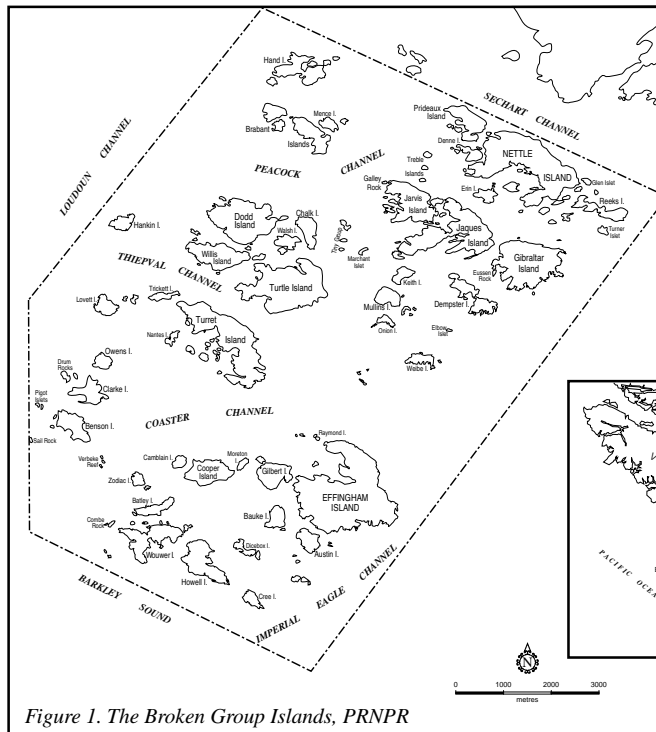


Figure 1. The Broken Group Islands, PRNPR

- a healthy and viable manner;
- quantify the impact of natural or human induced changes in the marine environment;
- provide information for a feasibility study on establishing the Broken Group Islands as a harvest refugium; and,
- provide a link to visitor use impact studies currently being conducted in the Broken Group Islands.

METHODS

Eight monitoring sites are selected based on the location of suitable clam and oyster beds.

Some sites are located close to campsites to measure the impact of recreational harvest by park users. A control site is located behind the floating warden station near the shores of Nettle Island.

A line transect method is used to record the abundance of each bivalve species. Five transects per site are used to sample a representative cross-section of the beach strata. A minimum of three randomly selected quadrats (0.25 m²) are sampled from each transect to a maximum depth of 25 cm. Manilla and Littleneck clams are sorted per species and measured in size classes (1-25 mm, 26-38 mm and >38 mm) to record the number of juveniles, sexually mature and harvestable individuals. We also record the distribution and abundance of native and Japanese oysters in each quadrat. From records of bivalve distribution and abundance we will be able to infer population, stock, recruitment and age profiles.

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Le texte de cette publication est offert en français. Vous pouvez l'obtenir en écrivant à l'adresse dans la p. 16

**SUBMISSIONS WELCOME
FOR THE FALL ISSUE. THE
DEADLINE IS MAY 31, 1998**

EDITORIAL

This issue of *Research Links* contains a variety of articles which at first glance do not share a common theme. Upon reviewing them however, the editorial board noted that they all have to do with people—their use of, their expectations for, and their impact on the resources of heritage places. If protection of ecological and commemorative integrity is to be achieved, more emphasis will have to be placed on understanding and managing human use.

There will be changes to the types of research required and the way in which the results will be used. Parks Canada must actively look at different management solutions. In the past research which supported decision making has typically had a resource focus and emphasized single species, objects or processes. The recognition of the role that people play as both stressors of ecological and cultural resources and supporters of those same resources means a greater emphasis on solutions which take into account both the people and resource considerations. There is a need for an interdisciplinary approach to generating solutions. Research will be required which provides information on the ecological and cultural resources, and the people who use and have impacts on the resources. Both will be required to implement effective management decisions.

There are also implications for researchers related to how the results of research will be integrated into the decision making process. It will be important for researchers to know how information will fit into the equation. We can all report on projects where the science clearly pointed in one direction, but values and mistrust made implementing solutions impossible. Scientists must understand the issues of concerns of those who will create workable solutions and how they may be of assistance in proposing and assessing those solutions.

The challenge for conservation and management involves a broader understanding by land managers, researchers, and the public of issues and solutions. Adaptive management in particular will require a new collaborative approach. Broad interdisciplinary problem solving teams are one option. Another is to increase communication of how issues are viewed and how solutions are developed.

A better understanding of how all parties develop and evaluate information would be useful. With that in mind, we have asked Elk Island National Park to be our guinea pig. The article by Norm Cool looks at the elk research conducted in the park and some of the management implications of the information. It looks at the subsequent review of that information by a multi-disciplinary group of researchers and managers. Finally it sets for recommendations for future management.

The editorial board would like your input into the usefulness of such reviews. If this format is useful, we would actively pursue parks and sites to regularly provide this type of article.

Gail Harrison
Ecosystem Services, Calgary, and Editor of Research Links

Bighorn In Our Backyard

Communities Working for Wildlife



Photo: Andrew Dickinson

Larry Halverson and Bill Swan

Rocky Mountain Bighorn Sheep of the Radium Hot Springs, BC area have been the focus of research, education and conservation efforts for several decades. International, national and provincial agencies, local rod and gun clubs, guide outfitters, natural history and environmental organizations, municipal leaders, contract biologists, community volunteers, teachers and students have all participated in projects that testify to the effectiveness of partnerships working to achieve common goals.

Bighorn In Our Backyard (BIOB) is an education and research project that builds on these past collective efforts to address current issues facing the Radium Hot Springs Bighorn Sheep herd and their winter range habitat in the Radium Hot Springs area.

While significant efforts have been made to protect and enhance the Radium Hot Springs Bighorn Sheep Band and their habitat in the past, few people in the surrounding community have a basic understanding of their biology, ecology, seasonal movements, habitat needs or the overlap between their community and the band's winter range. Some residents view the sheep as a nuisance. A regional atmosphere of accelerated human growth, forest encroachment on grasslands, habitat fragmentation, poaching, highway hazards, ATV-scouring of sensitive grasslands, outbreaks of non-native vegetation, stray dogs and contaminants increases the stress load on the wild sheep and their winter range ecosystem in the Radium Hot Springs area.

PROJECT BACKGROUND

The three year BIOB project was initiated and coordinated by Osprey Communications through funding from Kootenay National Park, and began in January 1997 with a focus on four broad objectives which include:

- Complete and present a comprehensive communications program about the local sheep band and ecosystem issues to be delivered to key audiences.
- Establish a wild sheep monitoring program that involves community residents.
- Begin an assessment to update winter range information about areas within and adjacent to Radium town site. Emphasis will be on identifying potential community-based habitat rehabilitation projects.
- Complete preliminary research and promote a Wild Bighorn Sheep Festival.

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What's New?

Gwaii Haanas' new RESEARCH PUBLICATION

The first issue of a new research publication, Gwaii Haanas CURRENTS (Volume 1, Number 1) was printed in February 1998.

Gwaii Haanas CURRENTS is a twice-yearly publication of the Gwaii Haanas Archipelago Management Board. The Board, comprised of representatives of the Government of Canada (Parks Canada) and the council of the Haida Nation, directs all management, operations and planning for the Gwaii Haanas protected area.

CURRENTS highlights recent research in the fields of ecological integrity, cultural resource management and visitor management in Gwaii Haanas, as well as their relationship to the sustainability of the greater islands ecosystem and culture of the Queen Charlotte/Haida Gwaii archipelago.

If you would like a copy of CURRENTS write to:

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Reserve/Haida Heritage Site
Box 37 Queen Charlotte BC
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Tel: (250) 559-8818

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Heritage Tourism Participation

by Visitors to Manitoba

Kelly J. MacKay

WHAT IS HERITAGE TOURISM?

Heritage tourism is a key growth area in special interest tourism. Heritage tourism encompasses natural, cultural, and historic resources that tourists visit to satisfy various motives such as education and nostalgia (Hall & Zeppel, 1990). The World Tourism Organization defines heritage tourism as “*an immersion in the natural history, human heritage, arts, philosophy, and institutions of another region or country.*” Those who study heritage tourism are interested in the activities of domestic and international tourists who seek to trace their heritage and/or reinforce their identity. Manitoba’s many museums, galleries, historic sites, Aboriginal heritage sites, and cultural festivals, as well as, parks and wilderness areas provide a natural and cultural forum for heritage tourism participation.

The specific purpose of this article is to examine heritage tourism in terms of participation, market characteristics, and marketing implications.

SURVEY METHODS

The 1995 Manitoba Tourist Exit Survey (MTES) was a joint project of Travel Manitoba, Canadian Heritage, Tourism Winnipeg, and the University of Manitoba’s Health, Leisure & Human Performance Research Institute. The MTES was the first provincial level survey of this type and the largest tourism study ever undertaken in Manitoba.

Basic visitor profile data were collected from non-resident visitors to Manitoba as they exited the province at Winnipeg International Airport and at six highway pull-off sites. Data were collected on 54 separate days between July 2 and September 26, 1995. Qualified respondents were non-resident visitors to Manitoba leaving the province for the last time on

Table 1. Response rates for the Manitoba Tourist Exit Survey

	Highway	Airport	Total
Intercepts completed	3955	468	4423
Questionnaires distributed	3488	403	3891
Questionnaires returned	2472	200	2672
Response rate	71%	50%	69%

their trip, and not commuting or moving. A five-minute profile questionnaire identified the travel party, its origin and destination(s), point of entry, reason for visiting Manitoba and time spent in the province. This process took under five minutes. Willing respondents were given a more detailed, self-administered questionnaire and asked to mail their responses to the research team. The survey received commendable response rates (Table 1). The mailed questionnaires are the data source for this article.

RESULTS

Most visitors to Manitoba were Canadian (72%), aged 35-64 (64%), married (76%), employed (61%), and have a University degree (33%). Annual household incomes of Manitoba travellers were typically \$40,000 - \$59,999 (28%) or over \$80,000 (20%). Visitors to Manitoba participated in a variety of activities, several of which have a clear heritage focus. Common heritage tourism activities were: visiting a national/provincial

park, museum, or an historic site; and attending a festival/special or cultural event.

Thirty-six percent (n=974) of visitors participated in heritage tourism activities. Of those, the majority participated in a single activity, while others visited several heritage attractions (Figure 1). Visitors who travelled to Manitoba by air differed slightly from those who travelled via highway as they tended to concentrate their heritage tourism activities in Winnipeg (Table 2).

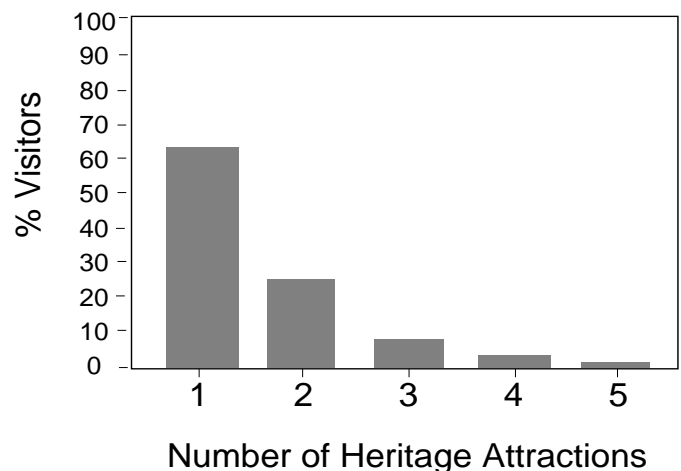


Figure 1. The percentage of heritage tourists attending 1, 2, 3, 4 and 5 attractions during a single visit to Manitoba (n=974)

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HELPINGHANDS

Earthwatch volunteers and grants for field research

David Lowe

What could be better than a few extra pairs of hands on a labor-intensive research project? How about a field grant to feed the extra hands' stomachs and house their weary bodies? This and more—funds for travel and equipment, a publicity network and educational infrastructure—could be yours if you have a captivating research project in archaeology, ecology, wildlife management, climate change, botany, ornithology, coastal resources, paleontology, forestry, community health, or cultural history and need non-specialist volunteers.

Earthwatch Institute is an international non-profit, non-advocacy organization dedicated to sponsoring field-based scientific research and public science education. It is headquartered near Boston, Massachusetts with affiliate offices in Oxford (UK), Melbourne (Australia), and Tokyo (Japan).

Earthwatch Institute volunteers—46,000 of them—have assisted 1,500 scientists and raised US\$37 million in grants for more than 1,000 research projects in the above fields in 118 countries during the past quarter century. Many of these projects have been in national parks, World Heritage Sites and other protected areas. In US national parks alone, 1,585 Earthwatch Institute volunteers generated US\$744,442 in grants for 28 projects, between 1972-1995. Earthwatch is one of the largest contributors to the World Heritage Site network. Over the past twenty-five years 2,335 volunteers have generated US\$1.7 million and provided valuable extra eyes, ears, and hands for

sanctioned research efforts at World Heritage Sites.

Our commitment to protected areas is strong. Earthwatch (renamed Earthwatch Institute in 1997 to unambiguously emphasize our education and research mandate) accepted 33 new projects for 1998, a third of these (11) occur in parks and protected areas.

Earthwatch attracted 4,000 volunteers and their \$3.0 million to 133 field projects around the world in 1997 and offers this recruitment muscle to projects in Canada. We eagerly seek new proposals from Canada, especially from researchers working in Canadian parks. We have a history of support for work in Canada—Earthwatch was conceived with a single project to study the solar eclipse in Prince Edward Island in 1972—but current Canadian involvement is limited (details in the shaded box below).

There are compelling reasons to invite volunteers to assist in research efforts in publicly maintained parks. Earthwatch-sponsored archaeologist, George Crothers of Washington University (St. Louis) could not have been more timely in his following comments. These arrived unsolicited, precisely as I began this article, on the PI-Exchange listserver—a discussion group created for Earthwatch investigators (PIs) to share among themselves their experiences, problems, and solutions involved

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Earthwatch Projects in Canada (1972 - 1998)

Alcan Total Solar Eclipse: Prince Edward Island (1972)
Study of Feeding Behavior and Activity Patterns of the Whales of Avalon, Newfoundland (1980-82)
Glaciers of the Canadian Rockies, British Columbia (1982)
The Snow Goose (1982)
Gray Whale Feeding Behavior and Prey Communities along Vancouver Island (1984)
Social Behavior of Western Atlantic Harbor and Gray Seals, St. Pierre and Miquelon Islands (1985)
Ecological Biogeography of Plants on Islands (1987)
Paleoclimate Studies and the Rise in Atmospheric CO₂ (1987)
Old-Growth White and Red Pine Forest Survey, Ontario (1990- present)
The Fiddle Music of Prince Edward Island (1991-92)
Ancient Coastal Temperate Rain Forests of Clayoquot Sound, British Columbia (1993)
Monitoring Songbird Migration at Long Point, Lake Erie (1993-95)
Environmental Vision for a Canadian Mountain Community (1993-95)
Iroquoian Ancestors in Canada: Excavations Along the Grand River, Ontario (1994)
River Development in Southwestern Ontario (1994)
Ecology and Management of Gray Whales (*Eschrichtius robustus*) Summering on the West Coast on Vancouver Island (1994)
Excavating Old Fort Churchill: A Hudson Bay Company Trading Post, Churchill, Manitoba (1994-95)
Behavioral Ecology and Reproductive Biology of Red-sided Garter Snakes from the Interlake Region of Manitoba (1996-98)
Winter Distribution of Atlantic Cod (*Gadus morhua*) in Cabot Strait and Approaches in Relation to Population Stock Structure (1997)
Characterization of Aquatic Ecosystems Using Adult Insects, Big Bend National Park, Texas and Churchill, Manitoba (1998)

Shellfish Monitoring

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The presence or absence of the Green crab (*Carcinus maenas*), is noted in conjunction with native oyster abundance. The Green crab is an introduced species currently found in California and Oregon where it is proving to be a voracious predator on shellfish. The Green crab's presence has not been confirmed in Canadian waters, but its early detection would be noteworthy.

RESULTS

The Shellfish Monitoring project was designed to be a long term study. However, preliminary data from 20 transects and 60 quadrats suggests that:

- all five species of shellfish are present in the Broken Group Islands
- the introduced Japanese oyster far out-numbers the native oyster (For example, 50 Japanese oysters and no native oysters were recorded in one quadrat.)
- healthy numbers of sexually mature clams occur at most beaches in the study area, but few individuals of harvestable size (>38 mm for Manilla and Littleneck, and >63 mm for Butter clams) have been recorded.

One particularly important result thus far is that the study was the first to document the presence of an introduced species of varnish clam (*Nuttalia spp*) for the west coast of Vancouver Island. DFO biologists are keeping track of the distribution of the varnish clam in Johnstone Strait and the Gulf of Georgia. They were very interested to learn that the clam is now found in Barkley Sound.

Each time an introduced species is found in an ecosystem there is some uncertainty regarding its impact. It is too early to anticipate the varnish clam's possible repercussions. However, as a



Photo: Heather Holmes

*Oyster Transect at Gibrantar,
Broken Group Islands, PRNPR*



Photo: Heather Holmes

*Shellfish sampling at Hand Island,
Broken Group Islands, PRNPR*

steward of land and marine ecosystems, it is Parks Canada's responsibility to monitor changes and manage appropriately. The results of this monitoring project will allow fisheries managers to quantitatively assess whether the varnish clam is having an impact on shellfish already present in the Broken Group Islands and in the wider reaches of Barkley Sound.

BENEFITS

This project represents a hands-on approach to marine resource management. The information gathered will assist park managers in determining the extent of illegal harvest and the feasibility of declaring this unit of the park a harvest refugium.

What are the densities of bivalves present in the Broken Group Islands? Are these high or low relative to other areas on the west coast? Are there any differences among sites? Are numbers lower near campgrounds? These are all questions that researchers endeavor to answer using the results of this long-term monitoring project. This is only the second season of the Shellfish Monitoring program, so it is not possible to infer population distribution, recruitment or visitor impact. However, the methods developed during this project in conjunction with DFO have enhanced our credibility within the scientific community. The data is scientifically defensible and in accordance with DFO methodologies for conducting shellfish surveys. Sharing data and resources in the marine realm is leading to future partnerships and positive networking with educational institutions, First Nations and other DFO scientists.

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Bighorn In Our Backyard

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PROJECT HIGHLIGHTS AND ACHIEVEMENTS

The BIOB has progressed toward achieving the above objectives. Significant actions include:

- Communicating with local, regional and international audiences to increase exposure through direct public programs to key audiences, printed media, television, video mail outs and trade fairs.
- Networking with other agencies and organizations conducting bighorn sheep and related ecosystem-based projects in the Kootenay region such as:
 - *East Kootenay Wildlife Association*: East Kootenay Trench Rocky Mountain Bighorn Sheep, Habitat and Population Assessment Project.
 - *Columbia Basin Fish and Wildlife Compensation Program*: Stoddart habitat enhancement plans for the Radium band.
 - *Forest Renewal BC's Ecosystem Restoration Program*: seeking conifer ingrowth pilot project areas.
- Involving the Community in a bighorn sheep monitoring program underway since October, 1997. Seventeen volunteers from Radium and area conduct regular sighting and occurrence reports on bighorn in and around their community. The information is added to an expanding bighorn habitat database and an ongoing mapping exercise.
 - *The Mayor, Council and Village of Radium Hot Springs administration* endorse and are participating in the program. The village of Radium aims to include the ecological needs of the Radium bighorn herd in its Official Community Plan.
 - *Radium Chamber of Commerce and Citizen's Group* seek to include bighorn sheep as a major component of the community visitor interpretive centre and as a central theme to a major Wildlife Art Festival for the community.
 - *Robert Bateman*, world renowned artist and conservationist, has produced an original painting of a bighorn sheep ram for the BIOB project. Funding is being sought to produce the painting as a limited edition print to further increase the impact of Bateman's contribution.
 - *Rick Taylor*, internationally recognized wildlife sculptor, seeks to produce a bronze bighorn monument in Radium Hot Springs. He is involved in discussions which may lead to that end. The monument would be part of the interpretive centre and would raise awareness and revenue for the BIOB project.
- Research and Field Work is ongoing and will be emphasized in the final phase of the BIOB project.
 - Winter habitat assessment, a winter range migration corridor census and a track census are underway.
 - Bighorn winter range values will be included in community planning for Radium Hot Springs. The Official Community Plan will be updated during the summer of 1998.
 - A one-day conference is planned to discuss current status and habitat enhancement programs on the Radium herd's winter range. We intend to include representatives from a wide range of backgrounds in this conference in keeping with the "partnerships for success" approach that has been emphasized throughout the BIOB project. The product will be a Bighorn Winter Range Habitat Maintenance and Enhancement Strategy.
 - Habitat enhancement work, land acquisition and community education programs will be coordinated based on the Enhancement Strategy mentioned above.



Photo: Andrew Dickinson

- *Albert Cooper*, respected guide-outfitter and life long wild sheep ambassador, supports the objectives of the BIOB project. Cooper discussed the project's achievements and objectives with the Eastern Chapter of the Foundation for North American Wild Sheep at their meeting in February 1998.

If you are interested in the Bighorn In Our Backyard project, please contact:

Bill Swan or Alison Candy

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Heather Holmes

An intrepid group of birders met the morning of December 18, 1997, to begin the Annual Christmas Bird Count in Pacific Rim National Park Reserve (PRNPR). Considering the weather, it was amazing that anyone showed up at all. The liquid sunshine of Pacific Rim was pouring in horizontally by the bucket while the wind lashed at the trees, bending them sideways and sending snapping branches flying.

BACKGROUND

The Christmas bird count is an annual event. The first records of bird species in Pacific Rim date back to 1967 when the area was known as Wickaninnish Provincial Park. Since then, many visitors to this coast have recorded their observations.

Formal bird surveys from 1972 and 1973 documented birds in all three phases of the national Park reserve throughout the calendar year. The data were published as "The Birds of Pacific Rim" (Halter *et al.* 1978).

The annual Christmas Bird Count contributes to the current data base of bird distribution and abundance for PRNPR. No experience is required to participate in the bird count. Most birders are park staff, but residents from local communities also take part. Novice birders were paired with knowledgeable birders, and all teams have at least one person with bird identification experience. One of the goals of this year's bird count was to foster a sense of ecological awareness and resource protection among park staff. Staff from a variety of areas within the park participated, including people from Facilities and Services, Administrative Services, Heritage Communications, Warden Services and the Ecosystem Secretariat. PRNPR Superintendent, Alex Zellermeier, is an experienced birder, and



Volunteers participated in the annual Christmas Bird Count, Long Beach, PRNPR

he shared his expertise with this year's participants.

STUDY AREA

The Long Beach Unit of Pacific Rim National Park Reserve (PRNPR) is a long, narrow strip of land that occupies the Esowista Peninsula. Long Beach is less than 5 km wide in some areas and fronts the open Pacific Ocean. It also touches on quiet, estuarine waters such as Grice Bay. The linear geography of this park unit presents a challenge when determining the study area. Most Christmas Bird Counts use National Audubon Society Standards which employ a circular census area with a 15 mile diameter. To use this methodology in PRNPR would encompass broad stretches of stormy seas which are virtually inaccessible in winter and not conducive to a Christmas bird count. Instead, 7 line transects were established, to sample representative habitats within Long Beach: (1) estuary—Grice Bay, and Lovekin Trail; (2) forest/shore ecotone—Schooner Cove, Combers Beach,

Willowbrae Trail, Goldmine Trail; and (3) one human created habitat—a sewage lagoon.

The Grice Bay, Lovekin Trail, Willowbrae Trail and Goldmine Trail census areas follow the same transects used in the original 1972-1973 surveys (Halter *et al.* 1978)

RESULTS

A total of 581 birds of 19 different species were recorded (Table 1). The top five birds observed in order of sheer numbers were:

Glaucous-winged Gull	375
Unidentified gulls	70
Black Turnstone	31
Northwestern Crow	26
Bufflehead (duck)	14

The Willowbrae Trail, within the forest/shore ecotone, had the greatest species diversity, with 9 recorded species. The habitat along that trail is mostly mature cedar-hemlock forest, except at Station 2 where the trees are smaller and

Beach Christmas Bird Count

the canopy more open under the influence of a nearby shore pine bog. There is a slight rise in elevation with better drainage approximately 400 m along the trail. A band of Sitka spruce marks the trail's end at the beach. From the beach, birders can observe a variety of shore and seabirds. With such habitat diversity along this transect it is not surprising that the greatest species diversity was observed here during this year's Christmas Bird Count.

Birders at Combers Beach, also within the forest shore ecotone, observed the greatest number of birds compared to other transects. They recorded 182 birds at the mouth of Sandhill Creek. Most of these birds were Glaucous-winged gulls that congregate in the fresh water of this creek to drink, preen and bathe.

Noteworthy sightings were 3 Trumpeter Swans at Grice Bay and 2 Ring-necked Ducks at Goldmine Trail.

HOW DOES THE 1997 COUNT COMPARE?

Compared to previous years fewer bird species were recorded. In 1991, 51 species were recorded, 36 species were recorded in 1993, and 30 species were recorded in 1994. Heavy rains, strong winds and thick fog all have negative effects on bird activity, and interfere with observations. (Any bird in its right mind should have been under cover on December 18, 1997!)

Despite the low counts, spirits were high. The Trumpeter Swans were back for the winter, the kinglets were busy foraging, and regardless of the dreary weather winter wrens were singing. Everyone learned how to identify a Golden-crowned Kinglet and a Barrow's Goldeneye. Next year we will learn new birds, and perhaps enjoy better viewing conditions. Birding anyone?

Table 1. Bird species observed during the Annual Long Beach Christmas Bird Count

Common Name	Scientific Name
Common Loon	<i>Gavia immer</i>
Eared Grebe	<i>Podiceps nigricollis</i>
Pelagic Cormorant	<i>Phalacrocorax pelagicus</i>
Trumpeter Swan	<i>Cygnus buccinator</i>
Mallard	<i>Anas platyrhynchos</i>
Ring-necked Duck	<i>Aythya collaris</i>
Bufflehead	<i>Bucephala albeola</i>
Hooded Merganser	<i>Lophodytes cucullatus</i>
Black Oystercatcher	<i>Haematopus bachmani</i>
Black Turnstone	<i>Arenaria melanocephala</i>
Glaucous-winged Gull	<i>Larus glaucescens</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Northwestern Crow	<i>Corvus caurinus</i>
Chestnut Backed Chickadee	<i>Parus rufescens</i>
Winter Wren	<i>Troglodytes troglodytes</i>
Golden-crowned Kinglet	<i>Regulus satrapa</i>
Varied Thrush	<i>Ixoreus naevius</i>
Rufous-sided Towhee	<i>Pipilo erythrophthalmus</i>

For more details and a complete list of sightings please contact Heather Holmes. Tel: (250)726-7165. Pacific Rim National Park Reserve. Box 280 Ucluelet, BC V0R 3A0.

REFERENCES

Hatler, D.F., R.W. Campbell and A. Dorst. 1978
 Birds of Pacific Rim National Park. Occasional Paper No. 20. British Columbia Provincial Museum; Victoria. 194 pp.

Heritage Tourism in Manitoba

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Table 2. Percentage of air and highway travellers attending heritage tourism attractions

Heritage Tourism Activity	Popular Activities or Sites	Total # Visitors	% Air	% Highway
Festival/Special Event Attendance	Folklorama Canada Day Celebration Winnipeg Folk Festival	243	13	87
Cultural Event Attendance	Folklorama Live Theatre	57	4	96
Museum Visitation	Museum of Man and Nature Manitoba Children's Museum Mennonite Heritage Museum	312	17	83
National/Provincial Park Visitation	Riding Mountain National Park Grand Beach Provincial Park Whiteshell Provincial Park	441	17	83
Historic Site Visitation	Forks National Historic Site Lower Fort Garry Provincial Legislature Building	309	19	81

HERITAGE PARTICIPATION VISITOR PROFILES

If we divide the visitors into two groups, those who visited a heritage attraction, and those who did not, we can see statistically significant relationships for gender, age, education, and employment. Heritage visitors were more likely to be female, aged 35-44 years, university educated, and employed. (These results should be interpreted with caution due to the large sample size which may reflect general population trends rather than trends specific to Manitoba heritage visitors.)

Other key characteristics that distinguish between visitors who participate in heritage tourism activities and those who do not were determined through a discriminant analysis procedure. Manitoba tourists who visited heritage tourism attractions were more motivated by educational experiences and an interest in local culture and history. Tourists who did not access heritage attractions were more interested in being pampered on their holidays.

Past experience, personal advice and Manitoba residents were the most common information sources cited by participants in heritage tourism activities

regardless of whether they travelled by air or highway. Other trends regarding key information sources for cultural attractions are listed in Table 3.

HERITAGE TOURISM ACTIVITIES AND TRAVEL BEHAVIOUR

Tourism professionals are interested in visitor satisfaction and drawing visitors back to destinations based on positive experiences from previous visits. First time visitors frequently differ from repeat visitors in terms of their expectations,

information needs, and motivation. This travel pattern has important implications for attracting visitors to return to the province. Similarly, whether or not a visitor would recommend the destination to others affects the number of new and repeat visitors.

More first time visitors to the province were attracted to many of the heritage tourism activities than were repeat visitors. Looking at the number of heritage attractions visited, the greatest proportion of first time visitors is in the

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Table 3. Information sources used by visitors to each of five heritage tourism attractions

Heritage Tourist Attraction	Most Common Information Source(s)
Festival/Special Events	Manitoba residents
Cultural Events	Auto Club† Restaurants† Tourism Winnipeg publications*
Museums	Travel guide books* Travel Manitoba Publications Hotels/Motels/Lodges†
National/Provincial Parks	All sources frequently used
Historic Sites	Tourism Winnipeg publications Past experience

* Popular source among air travellers only; † Popular source among highway travellers only

Heritage Tourism in Manitoba

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“5 heritage attractions” group. Results of the MTES show that a higher proportion of respondents who participated in the five heritage tourism activities would recommend Manitoba to their friends as a place to visit than would respondents who did not participate in these activities.

Travellers whose main destination was Winnipeg rated Manitoba’s heritage tourism attractions and services as more important to their destination choice than did respondents whose main destination was elsewhere. Similarly, visitors to Winnipeg rated Manitoba’s attractions and services more highly than did respondents with other main destinations. However, visitors with destinations other than Winnipeg considered visiting national/provincial parks and viewing wildlife more important destination attributes than did the Winnipeg visitors. Manitoba’s performance on these two items was rated equally highly by visitors to Winnipeg, and visitors to other Manitoba destinations.

SUMMARY AND IMPLICATIONS

Heritage activities attract approximately one third of Manitoba travellers, emphasizing their importance as tourist attractions. Personal information sources (e.g. past experience, advice from family and friends) have the greatest influence on heritage tourism activity participation, showing that Manitoba residents need to be informed of the Province’s heritage tourism activities, sites, and opportunities. Repeat visitors are less likely to visit heritage attractions, but are the majority of Manitoba tourists (83%). Therefore communication should stress the dynamic nature of many parks and historic sites so that more than one visit is warranted.

Heritage tourists are motivated by educational experiences, especially those relating to local culture and history. Therefore promotional strategies should stress these benefits and the opportunity to satisfy these motives. The destination

attribute importance ratings suggest that in Manitoba, heritage tourism is not critical to destination choice. However, the high level of participation in heritage related activities by Manitoba visitors and their positive ratings of our heritage tourism services show the significance of these attributes to Manitoba’s overall tourism experience.

Kelly MacKay is Assistant Professor, Acting Coordinator of the Recreation Studies Program at the University of Manitoba. She can be reached at tel: (204) 474-7058; e-mail: mackay@ms.umanitoba.ca

REFERENCE

Hall, M. and H. Zeppel (1990). Cultural and Heritage Tourism: The New Grand Tour? Historic Environment, 7, (3&4), 86-89.

Shellfish Monitoring

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CONCLUSION

The Ecosystem Secretariat and the Warden Service continue to work together on this project. With a view to the long-term, the objectives of the Shellfish Monitoring project are to:

- describe species distribution and abundance
- provide early detection of introduced, exotic species
- record the interaction between endemic and introduced species
- identify critical “seed” areas for possible restocking of non-protected shellfish habitats outside the National Park.



Photo: Heather Holmes

Clam sampling, Hand Island, Broken Group Islands, PRNPR

For more information on this project please contact Heather Holmes, Richard Lamy, or Rick Holmes at (250) 726-7165 Pacific Rim National Park Reserve, Box 280 Ucluelet, BC V0R 3A0

Helping Hands

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with leading volunteers. The larger discussion was about the quality of data collected by volunteers, but here reflects the benefits to public parks.

“...There is one other factor in our project’s equation. Mammoth Cave is a National Park, and their mission is threefold. They need research conducted in the park to understand the resource base, they are obligated to preserving that resource base, and they want park visitors to have a quality experience in their National Park. Volunteer projects fit these missions very well. So I get to do my research, the park benefits from that research and the positive response from volunteers. Earthwatch is contributing to both and providing volunteers with exceptional opportunities. That seems equitable to me.”

— George Crothers

As funding cutbacks challenge park administrators to manage their trusts more imaginatively, thoughtful superintendents and research directors have realized the additional benefits of inviting volunteers on research expeditions. In addition to the free labor and infusion of funds, this is an excellent opportunity to build a constituency for research-based management in public parks.

A recent example derives from an encounter at SAMPA III in Calgary in May 1997. Here I met the superintendent of Glacier National Park. Following our discussion about Earthwatch, he notified researchers in his jurisdiction. As a result, we received two proposals and have committed our support to one of them. Katherine (Kate) Kendall and David Schirokauer (US Geologic Survey/Biological Resource Division) will employ a new technique of counting previously uncounted, endangered (and dangerous to trap) grizzly bears in the park. The technique was pioneered by Canadian researchers Bruce McLellan (BC Environment) and John Woods (Parks Canada), and eliminates the need to capture bears, using DNA markers from hair and fecal samples instead. The bear counts should benefit management across the border too, as these bears are known to roam. Volunteers will help pack in and set up remote hair corrals and bait, and revisit corrals to collect hair samples.

Almost all Earthwatch volunteers are college educated and action-oriented. Most are professionally trained; forty percent have post-graduate training. Their expertise often benefits PIs’ research efforts in unexpected ways. Engineers have designed improved equipment for biologists and many a computer expert has solved researchers’ field data problems. Lasting bonds and collaborations have formed, and most researchers enjoy the connections they make and the opportunity to share their life’s work with interested strangers. Many Earthwatch volunteers and scientists stay in touch for years through newsletters and email.

You would like to know how to apply? There is a catch, of course. Your project must have charisma. We provide research grants in direct proportion to the number of volunteers we can recruit. We have no endowment to support our research program. To be funded, projects must have natural appeal. The lure may be working with or being in a location to observe incidentally

charismatic fauna (or flora) as in the example above. The location itself may be the draw—beautiful scenery or intriguing history. There may be a cultural appeal. Or the project may provide volunteers access behind the scenes to otherwise closed-to-the-public situations. Part of the thrill is working with leading scientists.

As we need to meet these expectations of our sponsors—the paying volunteers—and our own mandate to support cutting edge and useful scientific inquiry, we generally require that applicants have a Ph.D. or equivalent professional experience. An acceptable example would be a mid-career park researcher or resource manager with ten years of progressive field experience and a publication record.

All projects start with a two-page preliminary proposal submitted one year in advance of the first team to The Center for Field Research, the scientific affiliate of Earthwatch Institute. The preliminary proposal enables us to quickly assess the viability of a project idea prior to substantial investment. Many factors must be considered in addition to the merit of the proposed study. If the research seems appropriate to our program for the coming year, The Center for Field Research will request a full proposal. Full proposals run about 20 pages, half technical justification and description of the research endeavor, and half describing the logistical elements in detail: where will volunteers sleep, what will you feed them, how will the rendezvous work (volunteers arrive from around the world), what are the safety issues and precautions, what are the daily activities, how strenuous are they? Full proposals are sent to three to six peer reviewers. Our selection of preliminary proposals has a solid track record. Eighty percent of full proposals are supported.

Earthwatch teams go to the field throughout the year. Summer is most popular. Typical teams are 12-16 days long. You must gainfully use about 24 volunteers per year at minimum to have a viable project. These may be distributed among as many teams as is practical, for example, eight teams of three volunteers each or two teams of twelve each. Grants are usually \$500 to \$800 per volunteer for two week teams.

We prefer multi-year projects. To date, twenty percent of projects in the Earthwatch portfolio have run for five years or longer, ten percent for ten years or longer. Yet, up to a third of the portfolio turns over each year. So there is always room for new proposals.

For further information, please contact David Lowe: dlowe@earthwatch.org; Tel. 1-800-776-0188 extension 127 or 1-617-926-8200 x127. All our grants lists and application materials are available from our web site (<http://www.earthwatch.org/cfr/cfr.html>). If you would rather help on someone else’s research project or learn about our education initiatives visit <http://www.earthwatch.org/>.

David Lowe is the Program Director for Life Sciences at The Center for Field Research, Earthwatch Institute.

CASE STUDY

Elk Management in Elk Island National Park



Norm Cool

BACKGROUND

Elk Island National Park (EINP) is surrounded by a 2.2 metre high fence that prevents large animals from moving into and out of the park. EINP lacks large predators such as wolves and bears, and a rigorous fire management program combined with productive plant growing conditions over the last 10 years have created favourable range for herbivores. The park supports a very large elk herd that has been increasing at an average rate of 20% annually for several years. The present elk population is estimated at 1600 individuals. EINP cannot support a rapidly increasing elk population indefinitely, and this issue raises several management concerns which were addressed recently in conjunction with the State of the Parks report.

MANAGEMENT CONCERNS

The parks current habitat management program may be contributing to the growth of elk and other large herbivore populations. However, intensive grazing over the long term will negatively impact both plant and animal biodiversity. High herbivore densities within such a small land base may predispose populations to disease and could increase rates of infection. Specifically, the giant liver fluke (*Fascioloides magna*) carried in the elk population may stress the park's moose population. A significant rise in avian tuberculosis reactors in elk and bison has also been reported, and Bovine Viral Diarrhea (BVD), a cattle disease, has recently been confirmed in the park's plains bison herd. The long term impact of these diseases to elk and bison populations is relatively unknown.

Surplus elk have to be removed annually, therefore larger populations place a greater demand on park financial resources. Transplanting animals to the wild is the presently the only option available for removing surplus elk from the park. To move large numbers of animals EINP requires assistance from other wildlife agencies. Unfortunately, elk management is not a high priority with agencies in the area and requests could very easily be rescinded.

If the elk population continues to increase and exceeds the carrying capacity of EINP there may be a sudden increase in elk mortality. A large and highly visible elk die off may generate public controversy.

GOALS AND OBJECTIVES OF EINP ELK MANAGEMENT

For the last 10 years extensive research has been conducted to determine the ecological carrying capacity of the park based on the premise that ungulate populations would eventually self-regulate if allowed to increase with minimal management intervention. The following objectives were set :

- To protect from artificial change, actively manage, and where appropriate restore, the natural diversity within the park's vegetation communities, and natural heterogeneity of Elk Island's Parkland vegetation.
- To re-establish the natural process of fire as a major influence upon the natural vegetation dynamics, character and pattern.
- To protect and manage the native Aspen Parkland ungulate guild in as natural a state as possible.
- To allow each ungulate population to fluctuate around or reach a natural equilibrium level (ecological carrying capacity) and thus approximate the natural historic character of the native Parkland ungulate guild, intervening only when necessary to:
 - compensate for the lack of predation and movement
 - maintain populations within thresholds of over and under abundance
 - control/prevent outbreak of exotic or named diseases (diseases named by government legislation which are subject to eradication
 - simulate or replace large scale natural mortalities (those which are unacceptable to the general public)

INITIATIVES

Monitoring: Each winter an ungulate aerial survey records the number of elk, moose, deer and bison, including the age and sex of each animal. Through this survey, population dynamics are recorded. Habitat utilization is assessed annually by monitoring browse, grass and sedge use on established transects.

Removal Of Surplus Elk/Cooperative Agreements: Most of the park's surplus elk are released to the wild through cooperative

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Elk Management in EINP

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elk transplants with the provincial governments of Alberta and Saskatchewan. Over the last several years an average of 200 elk have been live trapped and transplanted for this purpose. Surplus elk have also been allocated to New Zealand, British Columbia, the Yukon and Kentucky. Initiatives currently underway include transplanting elk to central Ontario and to the Suffield military base in Alberta.

Transboundary Movement: A system of specialized jump rails has been placed along the south boundary of the park. These jump rails permit elk, deer and moose to move out of the park. This cooperative effort between Parks Canada and Alberta Environmental Protection Responsible for Forests, Fish and Wildlife was implemented to help control the elk and moose populations in the Wood Bison Area of the park.

Ecosystem Management Model: An interactive ecosystem management model was developed to predict population variables and assist in determining vegetation and ungulate management strategies. The model is being calibrated.

IMPLICATIONS

Surplus elk management: Performing cooperative transplants to reestablish wild elk populations in other wilderness areas is the only acceptable approach for removing surplus elk from the

park at present. Other alternative methods must be considered. In the past, receiving agencies imposed a moratorium on elk transplants from Elk Island National Park because of the recent discovery of the giant liver fluke in our elk. Rigorous testing and validating an experimental flukeicide were completed before surplus elk could be released. More recently the medical community has expressed concern of the possible link of avian TB and paratuberculosis with chrones disease in humans. This concern and other disease related issues would certainly make agencies reconsider accepting EINP elk. To date provincial governments receive most of their funding for cooperative transplants through non-profit organizations. Transplant efforts would be hindered if funding were discontinued.

Fire management: The effects of prescribed fire on plant biomass production and landscape fragmentation must be better understood with regard to ungulate carrying capacity and resource biodiversity. The relationships among these factors require further investigation. Over the past fifteen years, prescribed burns in the park have been rigorous and expansive.

Disease management: Further consideration must be given to disease management in large herbivores at high densities in a closed system. The long term implications of the endemic wildlife diseases and domestic diseases prevalent in our confined ungulate herds are not well understood. Acceptable

limits ("normal" vs. "higher than normal" rates of infection) must be defined.

Operational Costs: The cost for elk management has substantially increased over the last 10 years. The higher costs result from live trapping twice as many surplus elk. Costs include: staff salaries and wages, feed costs, general husbandry practices for captive animals, treating elk with antiparasitic agents and disease testing.

RECOMMENDATIONS

A decision was made to keep the current elk population between 900-1000 in the main park and between 300-400 in the Wood Bison Area until the park conducts a review of the current vegetation and ungulate management program.

A workshop involving a panel of multi-disciplinary experts was hosted in August of 1997 at the University of Alberta for the purpose of reviewing the parks resource management program.

Several recommendations were made to the park: 1) adopt a landscape approach, 2) ecosystem research and monitoring should focus on the major ecological disturbances (fire, herbivory, and water dynamics) and of their influence on biodiversity, 3) expand the focus of the current monitoring program to include more than ungulates, and 4) develop a science advisory committee consisting of academics and scientists from other jurisdictions to review and develop the resource management program.

A science advisory committee has been developed. Current initiatives include enhancing the park vision statement, developing permanent sample plots, developing a protocol for prescribed fire monitoring (pre- and post-burn). Future initiatives will integrate the effects of fire herbivory and water management into a biomonitoring protocol, develop a research agenda, and provide input for the park ecosystem conservation plan. New research and monitoring initiatives will also be in step with state of the park reporting.

Norm Cool is a conservation biologist working in Elk Island National Park.

REFERENCES

Telfer, E. S. 1994.

Cattle and Cervid Interaction on a Foothills Watershed in South Western Alberta. *Can. Field Nat.* 108(2) 186-196.

ELK MANAGEMENT IN EINP Summary of Facts

Ungulate population estimates and vegetation utilization estimates are presented in Figure 1.

Generally speaking the rate of increase has been averaging 20% annually over the last five years with no significant winter mortalities within this same period. The population has almost doubled in size since 1985.

There has been no indication of elk reaching their ecological carrying capacity in the main park and the herd continues to grow.

Elk have stabilized at around 500 animals in the south portion of the park. Jump rails were observed to be heavily utilized by ungulates in general over the last several years.

Moose densities in the park have stabilized over the last five years at lower population levels and no management intervention has been necessary since 1986.

Browse utilization has remained relatively high at an average rate of 40-50% with the exception of the period from 1992 - 1994 when utilization dropped to 20%. Most recent surveys indicate a 50% utilization rate. Range productivity utilization for upland grasslands has been at an average rate of 50%. Utilization decreased to approximately 47% in 1994. In 1996, total park wide grassland use is estimated at 62%.

In summary habitat use is high. Periodic declines in use could be attributed to the subjectivity of the current monitoring protocol in place; the prescribed burn program; fluctuations in annual precipitation influencing plant growing conditions; and elk emigration through jump rails. Telfer (1994) reports that a 48-53% carryover (47-52% utilization) was satisfactory in the year of greatest total ungulate use in the Streeter Basin Experimental Watershed Research Area.

In 1987 the giant liver fluke was detected for the first time in elk and moose. Liver fluke loads in elk and moose are relatively stable at present. However the first evidence of the giant liver fluke in plains bison was reported in 1996.

The incidence of positive avian tuberculosis reactors is up from 0% in 1985 to 10% in 1995 and continues to increase.

Pink eye in bison is also on the increase. Bovine Viral Diarrhea (BVD) has been confirmed in plains bison in 1996. Little information is available on the zoonosis of BVD and pink eye diseases in ungulates. Testing and vaccinating for BVD continues in bison herds.

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MEETINGS OF INTEREST

April 26-28, 1998

Water Resources into the Next Millennium: Alberta's Future, CWRA Alberta Branch Annual Conference. This conference is aimed at professionals and individuals involved in the management or use of Alberta's water resources. A panel discussion will feature David Manning, President of the Canadian Association of Petroleum Producers; Robert Page, Vice President of Sustainable Development, TransAlta Utilities; and Michael Percy, Dean of the Faculty of Business at the University of Alberta. To register, contact David Ardell, Registration, CWRA Alberta Branch Conference, c/o Alberta Environmental Protection. Tel: (403) 297-6582, fax: (403) 297-2749.

July 20-August 22, 1998

International School on Biodiversity and Systematics. Queen's University, Kingston, ON. This course provides a unique opportunity to meet and interact with decision-makers and experts in an informal setting, a balanced approach to the "phenomenon of nature," a forum for discussion of the issues, a spectrum of choices to be made and different perspectives on valuing biodiversity. For information or to register contact: Stephen Loughheed, Director, International School on Biodiversity and Systematics, Queen's University, Kingston, ON K7L 3N6. Tel: (613) 545-6128, fax: (613) 545-6617, e-mail: biodiv@biology.queensu.ca, website: <http://biology.queensu.ca/~biodiv>

August 30-
September 3, 1998

Community-based Integrated Coastal Management—Sharing our Experience—Building our Knowledge. Coastal Zone Canada '98 (CZC'98). Victoria, BC. CZC'98 will build on the results of the first two CZC conferences (1994 and 1996), and create a working forum where a broad cross-section of stakeholders in the coastal zone will define issues, share experiences and identify the range of alternatives for addressing Integrated Coastal management at the community level. Interactive workshops, round tables and some not-so-traditional communication sessions. Sessions will be supported by technical papers, posters and outreach and training opportunities. Representatives of community groups, resource harvesters, First Nations, international agencies, government organizations, natural and social scientists, landowners, business people, and other interested people are welcome. Contact: Coastal Zone Canada '98 c/o Institute of Ocean Sciences, 9860 West Saanich Road, Sidney, BC. V8L 4B2. Fax: (604)363-6479; e-mail: czc98@ios.bc.ca; website: <http://www.ios.bc.ca/czc98.html>

May 17-22, 1999

Wilderness Science in a Time of Change. Missoula Montana. This conference will present research results and synthesize knowledge and its management implications. This conference should result in a state-of-the-art understanding of wilderness related research. It will also improve our understanding of how research can contribute to the protection of wilderness in the 21st century. Considerable attention will be devoted to the ever-changing role of wilderness in society and the need to better integrate diverse social and biophysical sciences. Plenary sessions will explore: the values of the transactions between science and wilderness, the need to precisely define "wilderness" so scientific process can be effectively applied to wilderness management, the implications of increasing technological development and external pressures. For information contact: Natural Resources Management Division, Centre for Continuing Education, The University of Montana, Missoula, MT 59812. Tel: (406)243-4623 or (888)254-2544; e-mail: ckelly@selway.umt.edu