CHAPTER 4: BUILDING CAPACITY FOR LEARNING AND EDUCATION

Children participating in an interpretation program about aquatic insects. P. Wright

Parks Canada currently lacks the necessary capacity in both the natural and social sciences to effectively manage for, and inform society about, ecological integrity in national parks. With notable individual exceptions, all levels of Parks Canada lack a well-established culture for conducting, using, and appreciating science as part of park management, interpretation and regional integration. Knowledge derived from the natural and social sciences, including Aboriginal peoples' naturalized knowledge, should be the basis for informed decisions, management actions and education within parks and beyond park boundaries.

"The use of science in the management of Canadian national parks has had a very uneven history. Given the dramatic changes that are occurring in the Canadian landscape, the parks will not survive as intact ecosystems unless steps are taken to use science in their management. This can achieved only by improving the quality of the Canadian Parks Service science program, and upgrading the understanding by park managers and planners of the importance of using science in their work."

David Lohnes,
former Director Resource Conservation, Parks Canada (1991)

A Science Vision for National Parks

The Panel believes that national parks can play a key role as centres for learning and educating about Canada's natural environment, specifically contributing towards the maintenance of biodiversity in all protected areas embedded within a sustainably-managed landscape. Our vision for a new role for Parks Canada and for national parks — placed in the future, five to ten years from now — is as follows:

Ecological understanding and education are seen as important purposes for national parks. National parks are known as "centres of ecological understanding," where science knowledge is incorporated into park management, and is used to understand human impacts inside and outside of protected areas.

Parks are viewed as living laboratories where Parks Canada staff pursue active partnerships with Aboriginal peoples, social and natural scientists from universities and other science-based agencies, industry, provincial and territorial authorities, and regional and local communities, to enhance society's knowledge of natural ecosystems. National parks information forms an integral component of Canada's educational system, from primary to university levels.

Canadians look to parks to help them understand the state of the country's environment. National parks have become benchmarks with which people can understand human impacts on an ecosystem scale, and take action to ensure sustainability. National parks are part of a cross-country system of benchmarks that monitor such things as the persistence of species at risk, changes in biodiversity, and the impact of climate change.

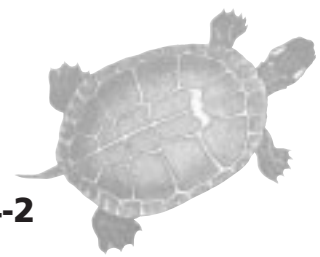
Parks Canada fosters a culture of continuous learning about the natural world and its conservation. National parks provide a stimulating and rewarding environment, thereby attracting new and energetic people to form a dedicated workforce. By policy, each park makes efforts to integrate its planning and management with the surrounding region to understand the greater ecosystem encompassing each national park, and to contribute to environmentally astute land management. To achieve this goal, each park, in collaboration with its partners, monitors ecological integrity in a regional context.

Science is understood and appreciated as a key process for embracing natural complexity and as the basis for policy decisions, management actions, and education.

Science as Necessary Information

Science is a process for acquiring information and knowledge that enables learning, a means to make an uncertainty more certain. Scientific information, including the natural and social sciences, should be central to managing national parks for ecological integrity and understanding a park's greater ecosystem. The importance of science knowledge has been identified for all levels of the Canadian federal government (for instance, the Report of the Council of Science and Technical Advisors, 1999; the October 1999 Speech from the Throne) and for parks agencies in other countries (U.S. Natural Resource Challenge, 1999).

When the necessary information does not exist, the precautionary principle should be invoked to ensure that Parks Canada is successful in maintaining ecological integrity (Chapter 1). Applying the precautionary principle ensures that activities will not adversely affect the environment.



Learning Together: Naturalized Knowledge Systems and Western Science

Much has been written about the differences between naturalized knowledge systems and Western science. The controversy has tended to reduce the rich histories of both systems to contests about whose care, and whose knowledge, can best manage of Canada's shared natural resources.

A naturalized knowledge system (also known to many non-Aboriginal people as "traditional ecological knowledge") comprises four basic phases that roughly parallel an individual's growth throughout life:

- innate knowledge with which one is born;
- intuitive knowledge about how and why things "are";
- empirical knowledge that is collected by experience and which might contest intuitive knowledge;
- harmonious or spiritual knowledge realized when conflict between empirical knowledge and intuitive knowledge is reconciled and better understanding is achieved.

Like naturalized knowledge, Western science is "a way of knowing." Using this knowledge system, people grope for better understanding of the world by testing intuitive knowledge (current, best understanding about why things "are") with observations (new empirical information). The two often have to be reconciled, and are sometimes harmonized with previous knowledge. Western science is often represented by its fiercest proponents as more rigorous — and thus producing better knowledge — than other ways of knowing.

Both systems use the assimilation of new knowledge to improve understanding of the world — that is, learning. By recognizing this similarity, instead of emphasizing differences, Western and Aboriginal cultures may agree upon the shared goal of learning to improve responsibility for the natural world.

Science as a Key Part of Park Management and Education

The Panel saw many examples where science contributed critical information to managing for ecological integrity. Below are just a few examples of the role science can play towards learning about park ecosystems and providing information for education and outreach:

- in Fundy National Park, the Greater Fundy Ecosystem Research group used the results of 30 research projects to develop a set of biodiversity guidelines for forest management. These guidelines are being applied in the Fundy Model Forest on lands surrounding the park;
- in prescribed burn areas in La Mauricie National Park, scientific monitoring of white pine is providing Québec foresters with important information on how to regenerate white pine for commercial purposes;
- in Kluane National Park Reserve, an interdisciplinary assessment of wilderness river use preferences, bear habitat, and bear risk potential, is being used to develop a revised pattern of rafting use for the Alsek River. This assessment has enabled the park to assure bear habitat and movement while maintaining important elements of the wilderness rafting experience;
- in Banff National Park, a habitat effectiveness model for grizzly bears is being used to plan visitor use allocations for backcountry areas.

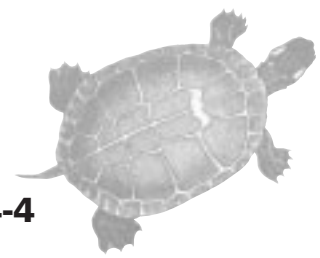
Science contributes information and knowledge of ecological integrity in several key areas:

- Canadians need to understand the state of the ecosystems in which they live. Canada's parks can play a key national role as centres of understanding of biological diversity and the ecological condition of Canada. Individual parks can be sentinels for the ecological condition of their region by systematically monitoring various aspects of ecological integrity (Chapter 6). Some parks are already part of the fledgling Environmental Monitoring and Assessment Network administered by Environment Canada to track change toward understanding the impact of global climate change;
- science capacity is necessary to understand the degree of uncertainly around a decision and the risks inherent in a decision. Park managers often must make decisions in the face of uncertainty. The best response to dealing with the complexity of nature is to embrace uncertainty through a combination of adaptive management (as explained in Chapter 3) and the use of the precautionary principle (Chapter 1). Politicians and managers cannot be held accountable for failure to predict the future. However, they can be held accountable for failing to adopt adequate procedures to evaluate policies and management actions for achieving specific goals, and for failing to choosing the most precautionary option;
- knowledge gained by scientific research within national parks and their greater ecosystems should be communicated to visitors and the public via professional interpreters and outreach specialists (Chapter 10). Some national parks now include participation by scientists in interpretive events as a condition of their research permit. As well, development of new techniques for improving ecological integrity can be shared with regional partners;
- parks are living laboratories that should be widely used by educators, through direct experience or via electronic media (Chapter 10). Participation of non-scientists (such as local citizens and students) in park science programs introduces the public to the role of scientific research in understanding the natural environment. Many universities currently include studies in national parks as components of their curricula.

In the Absence of Scientific Information

As introduced in Chapter 1, the precautionary principle should be invoked when changes to the environment are contemplated in the absence of information about whether the changes are likely to have negative environmental consequences. Experience indicates (as in the example of the Banff-Bow Valley Study) that the principle is readily misunderstood and misrepresented as a blank cheque for anti-business interests to derail development without any serious scientific research and analysis. That the precautionary principle is, in fact, well-grounded in "good science" requires clarification.

Proponents and critics of the precautionary principle alike often invoke the idea of "scientific proof" of negative environmental effects. Proponents argue that absence of "proof" dictates caution; critics argue that absence of "proof" is a green light for development. On this count, both are incorrect. Contrary to popular appreciation about how reliable scientific knowledge is actually gained, it accumulates by a process of "disproof" — that is, science is limited to demonstrating what is false. It is not actually possible to "prove" that something is true.



The precautionary principle is scientifically valid, and has force as a conservation tool, precisely because it is founded on this essential philosophical distinction between the ability (available to science) to disprove false information and the ability (not available to science) to prove true information. Thus, the precautionary principle places the burden on proponents to demonstrate that development will not have alleged negative effects. In the context of the definition of ecological integrity advanced by the Panel, for example, proponents of development must show that projects would not cause a park to be different from the desired state.

One way to reduce controversy that invoking the precautionary principle out of necessity sometimes entails, is to treat it as a last resort and, instead, invest pro-actively in acquisition of knowledge about natural systems so as to be able to address head-on the criticism that lack of knowledge is being used to stall progress and development.

Realizing a new role for national parks as centres of ecological and biodiversity understanding perfectly combines policy, need and opportunity for Parks Canada. This new role will provide an opportunity to organize around a vital purpose that is directly aligned with conserving ecological integrity, promoting conservation advocacy and providing vital knowledge to Canadians.

However, before this can happen, there needs to be a significant effort to build internal and external science capacity within Parks Canada.

Parks staff undertaking research on black bears.
J. Pleau/Parks Canada

Building Science Capacity

Interpretation programs, such as this one in Forillon National Park, must be based on sound science.
P. St-Jacques/Parks Canada

We define science capacity as the capability of Parks Canada to acquire and use scientific information relevant to managing and educating for ecological integrity. The capability should be a combination of internal staff (natural and social scientists, interpreters, wardens, and outreach specialists) and experts from organizations and governments external to Parks Canada. These would include provincial, territorial and other federal agencies, universities, Aboriginal peoples, non-governmental organizations, corporations and industry associations. Volunteer organizations, both local and national, could provide assistance and also act as venues for education concerning ongoing research.

At a minimum, Parks Canada must have the internal ability to understand and communicate scientific information, apply it to park management, and know where and how to seek additional scientific information. It is obvious that an organization managing 39 national parks, protecting nearly 250,000 square kilometers of land and receiving over 14 million person-visits annually requires a substantial science capacity to plan, implement and integrate research necessary for management, visitor education and outreach. As the system grows, so will the need.

According to its guiding policies, Parks Canada has the clear intention of using science in its management and education as well as maintaining a capacity to acquire scientific information. However Parks Canada has not developed the capacity to support its stated policy goals. Certainly Parks Canada has undertaken some excellent scientific work and in some cases scientific knowledge is being applied to decision-making, as is evident in the Banff Management Plan. Currently, however, knowledge gained about the natural environment is not consistently incorporated into park management, nor is it widely disseminated to the public or regional partners, due to insufficient expertise. We noted major deficiencies in five areas:

- internal and external capacity to conduct science and provide science advice;
- understanding and support of science within management;
- using existing scientific knowledge for park management, education and regional partnerships;
- using science to understand and monitor ecological integrity;
- management of data and information.

Comparing Science Capacity

To illustrate the current level of science capacity in Canada, compare Canadian national parks with similar parks in the United States. Both Yellowstone National Park (Wyoming) and Glacier National Park (Montana) are comparable to Jasper National Park in terms of ecosystem diversity, resource management issues, geographic area, and visitor numbers and activities. Glacier National Park currently has a scientific staff of nine -— eight professional scientists and one technical/administrative support person. Yellowstone National Park currently has 11 scientific staff -— eight professional scientists and three technical/administrative support staff. These parks receive additional professional scientific support from a regional ecological science center in a wide range of physical and biological sciences. Each park also has a number of ranger staff (six in Glacier and seven in Yellowstone) who work full-time on natural resource studies, for a total of at least 15 science staff in Glacier and 18 in Yellowstone.

In contrast, Jasper National Park currently has a comparable staff of four.

Internal Science Capacity: Insufficient to Support the Mandate

Historically, Parks Canada has not had a significant science capacity and thus has little experience using science in management. There have been some past efforts to increase science capacity, but they have tended to be sporadic and not sustained. There was little attempt at developing an internal ability to understand park ecosystems until the late 1960s, when the first park naturalists were hired and began communicating information about ecology to the public.

In the 1970s, the first true internal scientific capacity was developed with the Resource Inventory Task Force, which established biophysical inventories for the existing national parks. This was a groundbreaking approach that was halted by budget cuts. Currently, newly established parks continue to be hampered by the lack of comprehensive biophysical inventories. From the 1960s until the early 1980s, the Canadian Wildlife Service provided some dedicated scientific advice to parks, but this too was eliminated. In addition Parks Canada has generally been unable to manage, understand or fully utilize this scientific advice.

Beginning in the 1980s, Parks Canada has slowly upgraded its internal scientific capacity, hiring wardens with university training (though not a formal requirement of the position) and establishing dedicated park ecologists in the East and conservation biologists in the West. This trend continues today with 11 Ph.D.-level ecologists and 40 staff with Master's degrees out of a total work force of 2100. This capacity-building is a positive trend, but it is not sufficient to meet the challenge of managing for ecological integrity. Having a single park ecologist or a single conservation biologist in a large or highly stressed park is not commensurate with the scope and magnitude of the issues facing Canada's parks. In addition, responsibility for new federal initiatives, such as the "Species at Risk" legislation (Chapter 5) add extra duties to all levels of Parks Canada, but there are no additional funds or personnel to manage these new actions.

The communication of scientific knowledge to various public audiences is also critical. In the downsizing of the 1990s professional interpreters were largely lost from the system, and with them the ability to reach broad audiences (Chapter 10).

In practice, the lack of science capacity expresses itself in many ways. Few park managers are able to give defensible statements on the state of ecological integrity within their parks. All park managers state that they would like to be conducting a full set of monitoring programs, but lack the scientific capacity. Both deficiencies leave the park vulnerable to inappropriate development. A lack of scientific capacity also hurts existing research efforts. Resource staff, such as wardens, Ecosystem Secretariat staff and park interpreters, cited a lack of science training and upgrading as an important impediment to carrying out the ecological integrity mandate. There are too few opportunities for resource staff from parks across the nation to exchange ideas and experiences on how to best maintain ecological integrity. There is also a lack of regional and national level co-ordination to assess the larger

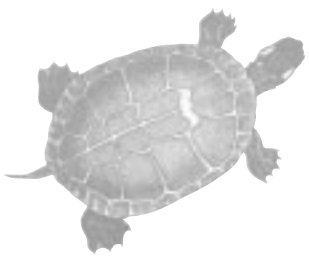
Social Sciences

The social sciences are the disciplines of science that study humankind in relation to cultural, social, and physical environments. In the academic world, social sciences are one of the three main divisions of human knowledge (the others being the natural sciences and the humanities) although there is considerable overlap between the three divisions.

The United States National Park Service (NPS) has a plan for furthering the social sciences in national parks. The vision for social science is, simply stated: "The objectives of the NPS social science program are to conduct and promote state-of-the-art social science related to the mission of the National Park Service, and deliver usable knowledge to NPS managers and the public." Usable knowledge includes information, insights, predictions and solutions for understanding visitors and their impacts. Usable knowledge must be provided at the proper point in the decision-making process in park management and it is based on state-of-the-art science, which include both basic and applied research.

The National Park Service lists the following disciplines as being commonly considered as social sciences: anthropology, archaeology, economics, ethnography, human geography, psychology, political science, and sociology

from Machlis (1996)



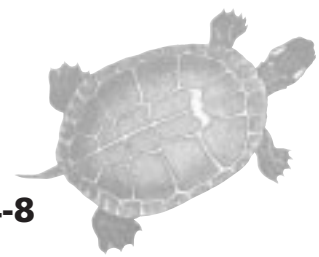
Kejimkujik National Park.
W. Barrett/Parks Canada

scale, multi-park projects and resultant data. In addition, lack of a national leader responsible for management of ecological integrity has hampered the use of science in decision-making (Chapter 2). These situations have contributed to the high levels of frustration and stress experienced by national park staff.

Much of the research carried out by Parks Canada is not viewed by the larger science community as properly designed, implemented or analyzed. Research designs are often inadequate to answer the questions posed. There is little use of basic scientific tools, such as statistical models. Few internal park research projects are ever published in refereed scientific journals. Many reports are not circulated to other ecological integrity practitioners, let alone to the public. There is even a misunderstanding within the organization of the term "peer review." Peer review refers to a blind, impartial review of reported research results by other scientists. It does not mean getting a colleague look at your work.

Science capacity is also required for science advice — value-added guidance based on scientific theories, data, findings and conclusions, provided to inform policy and regulatory decision-making. Included is the ability to receive and interpret science from external specialists. Science advice for national parks is limited, because the few existing internal specialists cannot be expected to provide knowledgeable advice on the wide range of issues facing parks.

That being said, national parks have a better capacity for science advice in the natural sciences than the social sciences, where science advice capacity is extremely weak. Given the range of human management issues facing parks, the lack of sound social science advice is particularly worrying. The Panel noted that many initiatives, such as visitor demand management, are being developed without appreciation of the existing state of theoretical knowledge in the field.



Scientists are also needed to develop strong partnerships with local communities, to understand the local community's values and work towards building sustainably-managed landscapes. The Panel also noted a huge gap in the expertise required to develop interpretation programs, both within the park and for outreach to a wider audience.

We did note some very good scientific work going on in the national parks, Service Centres and the National Office. Examples include the research on rare plants and arctic hare in Gros Morne National Park, and fire history patterns in Banff National Park. Individually, Parks Canada staff have been recognized for their excellent research programs. In November 1999 Kejimkujik National Park and its ecosystem science manager received the Canadian Council on Ecological Areas' Gold Leaf Award for the park's "exceptional scientific contributions" to conservation.

However, these good efforts tend to be patchy and based on individuals with knowledge, passion and commitment. A system-wide, co-ordinated program to deliver the amount and quality of science required by national parks is lacking.

Scientific capacity is required at all levels of Parks Canada. However, the capacity required is different at each level and must be strategically placed to achieve maximum benefits.

Science Capacity at the Park Level

Scientific capacity must start at the park level. To fulfill its ecological integrity mandate, a park must be able to:

- provide an ongoing assessment of the state of ecological integrity of the park in the greater ecosystem;
- provide science advice for park management;
- communicate meaningfully with scientists conducting research in the park and assess programs;
- be a credible scientific voice on regional ecological issues (Chapter 9);
- conduct active ecosystem management initiatives such as prescribed fire and wildlife management (Chapter 5);
- develop and implement appropriate monitoring programs, thereby acting as ecosystem benchmarks (Chapter 6);
- develop expertise in geographic information systems, and data and information management (Chapter 6);
- translate scientific information on ecological integrity into formats understandable by non-scientists, and communicate important ideas to visitors and the public to further their understanding of ecological integrity (Chapters 10, 11 and 12).

With few exceptions, the capacity to fulfill these needs does not currently exist at the park level.

Science Capacity at Regional Service Centres

Science capacity is also very weak at the regional Service Centres. The regional Service Centres have been greatly disrupted by the past five years of budget and staff cuts to Parks Canada. There are very few scientific staff left in the regional Service Centres. The Panel also found that regional Service Centres had almost completely lost their co-ordination roles and capacities, leaving a huge gap in regional program co-ordination. Many strategic issues, which could be managed on a regional basis, are being dealt with at the park level in an unco-ordinated manner. The Panel noted that many parks are completely without any regional level support. There is also no strategic plan for what kind of science capacity should exist to meet regional needs, nor is there capacity to work with regional municipalities, nor to promote appropriate federal-provincial initiatives.

The Rise and Demise of Parks Canada's Atlantic Ecosystem Science Fund

In order to improve the quality of science supported by Parks Canada, ecosystem management staff of the Atlantic region requested stable funding for ecosystem science projects and long-term ecosystem monitoring programs. Ecosystem science professionals wanted a funding arrangement that did not have to compete with the often-urgent highway and visitor facilities requirements. In 1995 an Ecosystem Science Strategy was approved, with an ecosystem science fund with minimum allotment of $1.5 million per year, which reflected the amount Atlantic Field Units were allocating to ecosystem science projects. A Scientific Advisory Board, which reviewed all projects using a blind peer review process, administered the fund.

The fund functioned for only two financial years, with full funding only in the first year. Before the beginning of the third year some Field Unit managers convinced Parks Canada senior management that all funds should be allocated to Field Units without the independent review of the Science Advisory Board. Funds were included in Field Unit appropriations without a requirement for review by peers. The Board now reviews all science projects, but only after the funding has been allocated.

submission to the Panel

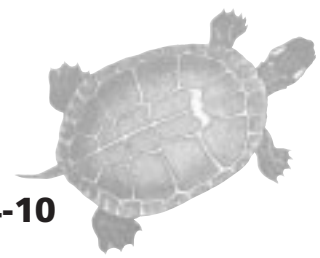
The Panel supports the revitalization of regional Service Centres to carry out the following tasks:

- provide specialized scientific expertise on park-based issues;
- co-ordinate regional science programs and guide research projects;
- provide or facilitate peer review;
- compile information on larger multi-park scale;
- provide support for protected areas management and key regional ecological issues;
- provide negotiation skills for appropriate provincial-federal or territorial-federal issues explicit to science;
- provide program development and evaluation;
- provide credible assessment of ecological integrity for the park-level State of the Park reports recommended in Chapter 3;
- work with Aboriginal peoples.

Science Capacity at the National Level

In Parks Canada's National Office, there has been an ongoing attrition of staff and capacity over the last five years due to budget reductions. Currently there are simply too few bodies, spread too thinly, to provide the kind of quality science capacity that is required for Parks Canada to be a credible science-based organization. Chapter 2 discusses the need for a national-level scientist on the Executive Board, to successfully implement the ecological integrity mandate. The National Office must be able to:

- provide current, high-quality science advice to senior managers and the Executive Board;
- provide a credible national assessments of ecological integrity for the legally-required national State of Parks Report;
- provide science advice and analysis to new park establishment initiatives (Chapter 8);
- provide scientific expertise in the area of marine protected areas establishment and management;
- form partnerships with universities and other science-based departments, industry and Aboriginal peoples on national and large-scale issues such as visitor management, climate change, long-range transport of pollutants, and fire effects;



- provide specialized scientific expertise on park-based issues, such as preservation of species at risk (Chapter 5);
- ensure compliance with relevant federal legislation such as the Canadian Environmental Assessment Act, Migratory Bird Act, the Canadian Fisheries Act and the proposed Species at Risk legislation;
- work with Aboriginal peoples to incorporate naturalized knowledge (Chapter 7).

In part, these tasks are not being done now because the level of investment is not sufficient. For example, at the national level only one-quarter of one person's time is currently devoted to visitor management issues, despite the fact that significant visitor impacts are reported at 24 national parks (State of the Parks 1997 Report).

The role of Parks Canada's National Office in directing science and management for ecological integrity is inconsistent and generally weak. The Panel found that:

- there is no national science policy or strategy;
- there are no career paths for hiring scientists, or for developing and retraining existing staff;
- while several Parks Canada staff have returned to university to attain advanced degrees, there is no consistency in terms of support, including financial support;
- with the exception of the National Fire Management Network, there are no operating networks at the national level to manage national issues. (A number of these networks existed in the past, such as wildlife management, but seem to have disappeared during the past five years.)

We heard repeatedly from park staff that they need national direction and national science networks if they are going to be successful in managing for the protection of ecological integrity. A National Science Strategy would inject certainty of purpose, and eliminate ambiguity regarding the intent and direction of Canada's national parks.

One possible profile of Parks Canada as a science-based organization is presented in Figure 4-1.

RECOMMENDATIONS

4-1. We recommend that Parks Canada significantly upgrade internal learning capacity, including the natural sciences and social sciences, planning, interpretation, environmental assessment, and the capacity to effectively build regional liaisons (Figure 4-1).

This upgrade will require an investment similar to the magnitude of the national park allocation of the Green Plan. Parks Canada cannot hope to understand and manage for ecological integrity with current level of investment in science expertise. Upgraded internal science capacity is required at all levels — the National Office, regional Service Centres and park level. The Panel estimates the cost of this significant upgrade in science capacity to be $28 million per year in additional funding (Chapter 13).

In the Panel's opinion, improving Parks Canada's science capacity is a critical step. Methodological issues such as monitoring, data management and research will automatically improve once science capacity is upgraded. (These issues are discussed further in Chapter 6).

4-2. We recommend that Parks Canada manage and upgrade its science capacity by:

- developing a National Science Strategy including external national and regional Scientific Advisory Boards to guide national park use of science, including acquisition and evaluation of scientists, funding of science, and standards such as peer review;
- revitalizing the regional Service Centres as regional Ecological Centres to support park programs and develop and implement regional integration programs;
- creating a clear path for internal upgrading of existing national park staff to attain advanced degrees and help fill the science needs of Parks Canada, including a formally supported education leave program (estimated cost $2 million per year to allow 20 staff to take advanced degrees at one time);
- hiring scientific staff positions using external competitions, to rapidly upgrade scientific capacity and access to the best possible expertise.

Figure 4-1. Recommended Profile for Parks Canada as a Science Based Organization – Internal Capacity

Organizational area	Level of Dedicated Internal Science Capacity							
	natural science			social science		other disciplines		
	Ph.D.	Masters	tech	Ph.D.	Masters	planner	EA specialist	data/GIS manager
Small parks, minor to moderate ecological and social issues*		at least 2	3		at least 1	at least 1 regional planner Master's level	1	1
Large parks with minor to moderate issues **	at least 1	at least 2	3		at least 1	at least 1 regional planner, Master's level	1	1
Small parks with difficult internal and external issues ***	at least 1	at least 3	4		at least 1	at least 1 regional planner, Master's level	2	2
Large parks with difficult internal and external issues †	at least 3	at least 6	12	at least 1	at least 2	at least 2 regional planner, Master's level	2	1
Regional Service Centres ††	at least 3	at least 6		at least 1	at least 2	1 planner for provincial issues	1	2
National Office †††	at least 4	at least 10	at least 5	at least 2	at least 2	ecological planning/ design team	2	co ordinator

* such as Waterton, Terra Nova, Fundy
** such as Prince Albert, Wapusk, Nahanni
*** such as Revelstoke, Georgian Bay, Point Pelee
† such as Banff, Jasper, Riding Mountain
†† Regional Service Centres also require at least one senior negotiator for federal-provincial issues
††† National Office also requires one person in the role of Chief Scientist or Director of Ecological Integrity, plus one person in the role of monitoring co-ordinator

A student at an archaeological site in Vuntut National Park.
W. Lynch/Parks Canada

External Science Capacity: Making Science Connections

External science expertise is used extensively by national parks across the country. The Panel saw many examples of partnerships with universities, other federal agencies, provincial agencies and industry. Many of these partnerships have yielded important scientific findings, and have contributed to ecological integrity, both within the parks and on a larger regional scale. Examples include:

- the Greater Fundy Ecosystem Project (Fundy National Park) and the East Slopes Grizzly Research Project (Banff National Park), both of which include Parks Canada staff, industry, government and university partners;
- some parks are acting as a focus of scientific research in a particular scientific field, such as Jasper (natural disturbance regimes in the boreal forest) and Kejimkujik (long range transport of pollutants);
- the Columbia Mountains Institute of Applied Ecology associated with Glacier National Park;
- many parks have scientific advisory committees composed of scientists from universities and other government departments; Elk Island National Park is an example. These committees review research proposals, help set the parks research agenda and advise on issues such as ecological monitoring;
- a few staff in parks, Service Centres and the National Office have adjunct professor status at universities and have graduate students;
- the excellent ongoing connection between the University of Sherbrooke and Kouchibouguac National Park.

Despite these good examples the level of connection to external research is patchy and inconsistent. Even where there is a good connection, many of these studies are not integrated into the general understanding of ecological integrity, management decisions, or Park Management Plans.

The Panel noted many barriers to more active partnerships with external scientists. Certainly one of the most pressing is the availability of research funds. Presently there is not a pool of dedicated funds for "Protected Areas" research in any of the federal granting agencies, although Natural Science and Engineering Research Committee (NSERC) has targeted funds for research on climate change and biodiversity. This may offer opportunities to university scientists for future park-based research. An initial barrier is matching research interests to park needs. It is currently very difficult for researchers to find out about national parks' research needs. The Service Centre in Cornwall, Ontario, took the initiative of putting information about research in Ontario's national parks on a web site. Such actions raise the profile of national parks among researchers and graduate students.

National park research permits present another barrier. We noted several problems:

- once a researcher decides to work in a national park, there is often confusion over the need for a research permit. At present, research permits are offered on a park-by-park basis, and there is inconsistency over how to apply and what type of research is permissible; there is no national standard for what type of research is acceptable. Researchers report that they often receive arbitrary determinations of what is appropriate, based on individual park managers' perceptions;
- there is no mechanism for a researcher to apply for a multi-park research permit — a researcher must make multiple applications and often receives different answers from different parks;
- researchers do not feel welcome. Most parks cannot offer physical support for research, such as accommodations or laboratory facilities. Many researchers can not afford to carry out research without these facilities. Most parks have not even taken basic steps to facilitate researchers, such as providing information kits for researchers on data availability, or brochures on how to apply for a research permit. While national parks make extraordinary efforts to welcome many types of visitors, researchers commonly find themselves being regulated rather than welcomed. To be fair, research is often carried out during peak summer seasons when park resources and personnel are stressed, and thus researchers can be disruptive to park operations.

Parks Research Forum of Ontario

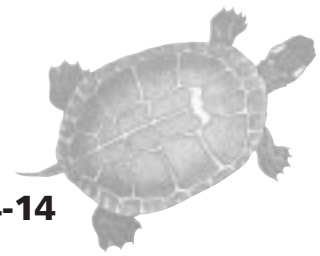
With considerable foresight and seed money from Parks Canada, Ontario Region, people from federal, provincial and municipal governments, universities, non-governmental organizations and the private sector met near Peterborough, Ontario in 1996, to establish communication and collaboration among parks and protected areas researchers. They agreed to an ongoing forum and the annual Parks Research Forum of Ontario was born. It is sponsored by national parks in Ontario, Parks Canada and three universities, and organized by the Heritage Resources Centre, University of Waterloo.

The goal of the Forum is, broadly, to encourage a wide range of research in the natural and social sciences that applies to parks and protected areas, to:

- improve understanding, planning, management and decision-making for parks and protected areas;
- encourage educational and training activities relating to parks and protected areas;
- facilitate co-operation in parks and protected areas research.

The Forum hosts state-of-the-art workshops and publishes the proceedings of their meetings.

With a relatively modest initial investment, Parks Canada stands to reap large returns in terms of cultivating partnerships and sharing technical advice that Parks Canada could not otherwise afford and which will facilitate management of national parks in the context of greater ecosystems.



Co-operative Ecosystem Study Units

An interesting development in the United States is the recent establishment of Co-operative Ecosystem Studies Units (CESU – see http://www.cesu.org/cesu for more information). The U.S. National Park Service, in partnership with the U.S. Forest Service, U.S. Geological Survey, Department of Energy, and others, has established the CESU network in four biogeographic areas throughout the U.S., involving 20 universities in 13 states. The vision is to develop an innovative way for federal agencies and universities to work together to deliver sound scientific information to federal resource managers.

One of the best assets that national parks can offer to researchers is a comprehensive biophysical and social science database. While most national parks have at least partial databases, they are generally not easily accessible to researchers. Some parks have worked to make their data available, but generally a researcher must contact the data base manager or geographic information system specialist personally and request custom information, resulting in delays and frustration. Most parks do not have data catalogues and data sets that are accessible through easy formats such as the Internet. Providing easy accessibility to park data would enhance research opportunities and be a net benefit to the park.

A lack of simplified funding arrangements to provide support to researchers and graduate students is another barrier. We noted these problems:

- there is usually no carryover beyond a single season, as funds have not been allocated on a multi-year basis. This creates problems for the multi-year funding needed to support graduate students;
- currently, support for university researchers is most often through contracts, which presents several difficulties:

    - contracts are inflexible, usually requiring deliverables (results, reports, and so on) at prescribed times;

    - universities usually take a percentage of the contract funding to cover overhead costs. Research overhead varies from 15% in some western provinces to 65% in Atlantic Canada;

    - government contract rules stipulate that all information collected is the intellectual property of the Crown.

Funds provided as grants (as opposed to contracts) are not subject to university overhead and allow researchers needed flexibility.

At present, there are a number of separate agreements between Parks Canada and universities. These arrangements generally take the form of a memorandum of understanding and provide a general model for co-operation but the agreements are extremely variable. From 1983-1993 the University of Waterloo (Heritage Resources Centre) and Parks Canada had a formal agreement that allowed for staff exchange. This arrangement generated numerous research studies, as well as national park staff training and outreach. Although this successful co-operative venture was beneficial for Parks Canada, it was a casualty of Parks Canada budget cuts.

Parks Canada also has historical and current linkages with researchers in other federal departments, such as Natural Resources Canada. Currently there are no memoranda of understanding between Parks Canada and these departments or even key sections of these departments, such as the Canadian Forest Service or the Canadian Wildlife Service. While some level of joint work and co-operation is ongoing, these relationships could be considerably strengthened through formal linkages. Relationships with other agencies — such as federal, provincial and territorial museums for taxonomic expertise, and Statistics Canada for data management — need to be established. Parks Canada should

In Pacific Rim National Park Reserve, Aboriginal knowledge could help park managers protect ecological integrity. P. Wilkinson

consider support for taxonomic facilities, such as the Canadian Museum of Nature, as taxonomic expertise is becoming severely limited within Canadian institutions, but Parks Canada's need for taxonomic validation will increase in the future.

There is also potential for a major partnership with the Canadian Biodiversity Office, whereby national parks can act as centres of understanding of changes in biodiversity in Canada. Currently, Environment Canada has a nation-wide network studying impacts of climate change, with a large Climate Change Action Fund. A target area is "Science, Impacts and Adaptation." National parks would be obvious candidates as benchmarks in this national system to assess climate change impacts.

Another important source of information on ecological integrity is the conservation expertise of Aboriginal peoples and environmental non-governmental organizations such as the Canadian Nature Federation, the Canadian Parks and Wilderness Society, and World Wildlife Fund. Many Aboriginal peoples and non-governmental organizations are keenly interested in contributing to national park management and ecosystem conservation. Although there have been some attempts to incorporate Aboriginal knowledge, integration has had little success throughout Parks Canada. Parks Canada has made more progress in working with non-governmental organizations, but overall this remains an untapped area of expertise.

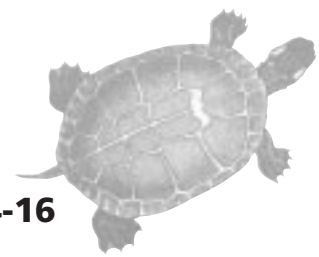
Resource industries, such as forestry and mining, are actively promoting the importance of protected areas to provide benchmarks against which to evaluate extraction or reclamation activities, and have participated in numerous initiatives promoting sustainability (Chapter 9). These industries have expertise, data bases, specialized technologies and an interest in co-operative science. National parks could benefit from partnerships with industry.

Parks Canada must raise its profile as a science-based research agency to improve its access to external science capacity, but first Parks Canada must upgrade its internal science capabilities so the organization can be a more effective participant in the larger scientific community. There will always be a need for external scientific expertise to deal with the range of issues relevant to ecological integrity. However without significantly upgrading its internal scientific capacity, Parks Canada will be unable to ask the correct questions, evaluate external research or know the best external resources to contact for a particular issue.

Industry Leadership

Parks must become centres of learning and study of ecological processes to provide answers for those who wish to manage in the best ecological way possible. Parks must create research groups in partnership with universities and industry to build the body of knowledge necessary.

industry association, submission to the Panel



RECOMMENDATIONS

4-3. We recommend that Parks Canada significantly increase formal contact with Canadian universities by establishing a system of 10 co-operative study units specializing in ecosystem science and protected area management (estimated cost $3 million per year, Chapter 13).

These units should include partnerships with conservation-mandated agencies such as Environment Canada, Canadian Forest Service, Canadian Wildlife Service, as well as appropriate provincial and territorial agencies. Parks Canada should seek to establish Chairs of Protected Area Management including ecological integrity, human dimensions, and interpretation, financed through the creation of new research Chairs announced in the October 1999 federal Speech from the Throne.

The role of these co-operative study units would be to connect Parks Canada to the larger research community, provide science advice to park managers, provide training for Parks Canada staff, and conduct high quality research on key issues. The development of co-operative study units could be further enhanced by:

- inviting universities to submit proposals to a national program, which would be partially funded by Parks Canada. Host universities should be chosen from those that have a diverse faculty with a commitment to conservation research, a history of Parks Canada involvement, and a supportive administration willing to modify accounting and tenure practices to ensure the unit's success. Each university participating in co-operative study units would have a Unit Chair who would be jointly supported by Parks Canada, its partners and the host university, with respect to salary and grants to support research and students;
- creating a new National Science Advisory Committee, headed by the National Science Advisor or Director General of Ecological Integrity (Chapter 2) and including the Unit Chairs;
- forming partnerships with other relevant conservation-oriented governmental and non-governmental agencies with mutual interests (such as Environment Canada, Natural Resources Canada, North American Wetlands Council of Canada, Model Forests, World Wildlife Fund) in supporting co-operative units. This approach has been used successfully by the United States National Park Service;
- inviting Aboriginal peoples to be an integral part of co-operative units, to provide expertise and open lines of communication through joint understanding of park ecosystems;
- emulating existing successful models, including the NSERC/SSHRC Industrial Chair program. A possible template could be the NSERC Industrial Chairs sponsored by the Canadian Wildlife Service (Environment Canada), which resulted in the Atlantic Co-operative Wildlife Ecology Research Network.

4-4. We recommend that Parks Canada facilitate contact with the larger university and education community by:

- amending Parks Canada's financial procedures to allow grants to university graduate students and researchers, as opposed to contracts;
- establishing a student internship program to provide seed funding for research in protected areas and increase the profile of Parks Canada to all students (39 graduate internships — one for each existing park — of $10,000 each, and 39 university and high school internships of $3000 each for a total cost of approximately $500,000/year. This figure will increase as new parks are added to the national system);
- requiring all parks to post updated lists of their key research needs on the Internet;
- revising the current national park research permit to create a nationally standard document with clear rules and procedures designed to assist researchers, and recognize the regional Service Center as the official links with universities;
- having accessible and well-documented data bases for use by external researchers;
- using the proposed "Exchanges Canada" presented in the October 1999 federal Speech from the Throne to introduce students to parks throughout Canada.

4-5. We recommend that Parks Canada re-establish and/or revitalize memoranda of understanding or research agreements with government research agencies to expand research capacity and ensure that joint projects receive stable funding.

4-6. We recommend that Parks Canada establish partnership agreements with interested Aboriginal peoples, enabling national parks to co-operate with Aboriginal peoples to increase knowledge and understanding of ecological integrity in national parks and historic sites.

4-7. We recommend that Parks Canada work with partners in provincial, territorial, and municipal park systems, universities, non-governmental organizations and the private sector to collectively fund the systematic establishment of regional science advisory committees, and to participate in annual "Parks Research Forum" series across Canada, based on the Ontario model.