A Review of the Science Programs in the Banff and Lake Louise-Kootenay-Yoho Field Units

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Introduction

Parks Canada has been developing toward becoming a more science-based organization. Science, as a valued activity, has been long established in Parks Canada's historic sites, with a focus on archaeology, history and artefact conservation. Since the 1970's the role of science in national parks has been continually increasing, although it is well recognised that further development is required (*see "Report of Minister's Panel on Ecological Integrity" and the response "Parks Canada Action Plan"*).

Reviews are a normal and important part of management, including managing a science program. University departments, commercial research programs and government departments all undergo periodic reviews of their science program. Conducting regular reviews in Parks Canada is thus a normal step in the development of a national park's science program. It should be noted there is a history of conducting reviews in the Banff and LLYK field units. the Mountain District did an annual review of science based projects between 1993 and 1996.

This report presents the results of a review of the science programs in the Banff and Lake Louise – Yoho – Kootenay (LLYK) field units. Specifically, our main focus was to evaluate the current capacity to deliver credible scientific advice to inform park planning, management and operational decisions. The new Canada National Parks Act and the recommendations from the Panel on Ecological Integrity of Canada's National Parks provide a context for this review. In addition, as Banff National Park's science program is in a period of transition after a focused period of intensive research, it was a suitable time to undertake this review.

This review is part of a broader project to periodically examine science programs at the field-unit level throughout National Parks. The Banff and LLYK Field Units were selected as the first sites to be reviewed as both have well-developed science programs and are dealing with a range of complex issues requiring scientific information. The Banff and LLYK Field Units are under significant pressure from a wide range of ecological stressors, with both internal and external origins. Banff, including Lake Louise, is the most visited National Park in Canada and is also bisected by major, national transportation corridors. Increasing urbanisation in adjacent areas is adding to the stresses existing within Banff National Park, thus heightening the importance of sound scientific advice to enable the maintenance or restoration of ecological integrity. The Banff-Bow Valley Study (1996) examined the issues in detail, and the directions it provided were generally incorporated into the Banff National Park Management Plan adopted in 1997. It is recognised that the science program in LLYK has had fewer staff and funding, and is in a different stage of development than that of the Banff Field Unit.

As Canada's most recognised National Park, Banff is under constant scrutiny by advocates on all sides of protected areas issues. In this context, other reviews have been conducted that are relevant to science management in the Mountain Parks. These include the Report of the Minister's Panel on Ecological Integrity (1999), the Banff Bow Valley Study (1996), a Review of the Research Management Framework (1995) and the Report of the Science and Protection Task Force (1990). The present review recognised the value of these earlier reports and built on their conclusions to provide a current assessment of the science programs in the Banff and LYKK Field Units.

Purpose and Scope of the Review

The purpose of this review was: i) to assess the current status of the science programs of the Banff and LLYK field units, and ii) to provide specific recommendations to managers to strengthen their programs. We focused primarily on natural sciences programs, including investigations of human use and its impact on ecological integrity. We did not review capacity and activities for archeological, historical, museological and education sciences. We recognise that implementation of any recommendation requires resources and that new resources are currently scarce in Parks Canada. We thus focused on making recommendations that can be implemented in the absence of major new fund appropriations.

Broader reviews of Parks Canada activities and management have noted a number of consistent areas requiring improvement in National Park science programs. Most recently, the Minister's Panel on Ecological Integrity (1999) noted major deficiencies in five areas related to science:

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

This review took these noted deficiencies into consideration and focused on the following questions and issues:

Scientific Capacity: Is the current scientific capacity (internal and external) sufficient to answer the range of management questions facing the field units? Is the science program able to provide

ongoing assessment of the state of ecological integrity in the park? Are the issues identified in the State of Protected Heritage Areas Report, the Park Management Plans and the Field Unit Business Plans being addressed? Are there sufficient connections to the external science capacity available at universities and other government departments? Is there sufficient internal capacity to manage these external relationships? Is the capacity at the service centre useful, relevant and sufficient to assist the two field units with their science issues?

Scientific Organisation: Are the science programs of the two field units efficiently organised, co-ordinated and delivered? Are the internal and external components of the science programs designed to test hypotheses for adaptive management of the park? Is a predictive capability built into each program? Are the science programs credible and publicly accountable? Are data management systems in place to store and retrieve information and make it accessible? Is science information used in public information programs?

Relationship to Decision-making: Is scientific information available to management for decision-making purposes? Are the pathways for science advice clear and trusted? Is science advice available for management decisions at all levels in the organisation? Do managers in an adaptive management framework use science advice? What are the results of this relationship for the maintenance or restoration of ecological integrity?

Science in the Federal Government

It is recognised that scientific information, including contributions from both the natural and social sciences, should be central to managing national parks for ecological integrity, and understanding a park's greater ecosystem. This is true both in Canada (e.g., Report of Minister's Panel on Ecological Integrity, 1999) and other countries (e.g., U.S. Natural Resource Challenge, 1999). More generally, the importance of scientific knowledge has been identified for all levels of the Canadian federal government (e.g., Report of the Council of Science and Technical Advisors, 1999; October 1999 Speech from the Throne). Scientific information is needed by government to support decision making, policy development and regulations; to support health, safety, and environmental needs; and to enable social and economic development. These keys roles are fulfilled by advancing knowledge; by evaluating the quality and validity of science input from outside sources; by improving the understanding of technological change; and by supporting public outreach and communications (BEST, 2000).

The Government of Canada has recognised that scientific activities led, or sponsored by the government, must change to meet public expectations and to better deliver the benefits of science to Canadians in a rapidly changing world. In response to growing public concerns regarding the use of scientific information for government decisions in the areas of natural resource management (e.g., fish stock assessments) and public health (e.g., blood safety), the federal Cabinet Committee for the Economic Union commissioned a study to examine means to improve its use of science advice in decision making. The recommendations of the Council of Science and Technology Advisors, (CSTA) in a report entitled Science Advice for Government Effectiveness (SAGE, 1999), identify a series of principles and guidelines to ensure that government decisions are based on sound science advice and, as a result, restore public confidence. The key message from this report was that the federal government must have the capacity to assess and/or deliver excellent science as the basis for decision making.

"Sound science is central to sound policy development and decision making."

(Government of Canada 1996)

Following are the six principles for sound science identified in the SAGE (1999) framework:

1. Early Issue Identification. "The government needs to anticipate, as early as possible, those issues for which science advice will be required, in order to facilitate timely and informed decision making." - Calls for research on emerging issues and applying science in formulating management plans.

2. Inclusiveness. "Advice should be drawn from a variety of scientific sources and from experts in relevant disciplines, in order to capture the full diversity of scientific schools of thought and opinion." - Invokes partnerships with universities, institutes, other government science agencies, science advisory boards and research fora.

3. Sound Science and Science Advice. "The government should employ measures to ensure the quality, integrity and objectivity of the science and science advice it uses, and ensure that science advice is considered in decision making." - Underpins the need for a significant internal science capacity working alongside decision-makers.

4. Uncertainty and Risk. "Science in public policy always contains uncertainty that must be assessed, communicated and managed. Government should develop a risk management framework that includes guidance on how and when precautionary approaches should be applied." - Highlights precaution leading to adaptive management for gathering knowledge while managing.

5. Openness. "The government is expected to employ decision making processes that are open, as well as transparent, to stakeholders and the public." - Underscores the vital role of documentation and dissemination of scientifically defendable methods, results and decisions through appropriate media.

6. Review. "Subsequent review of science-based decisions is required to determine whether recent advances in scientific knowledge have an impact on the science advice used to reach these decisions." - Speaks to currency in science, technical feed-back for appropriate consideration of ecological integrity in management planning, and sound scoping of emerging issues.

The CSTA published a second report entitled Building Excellence in Science and Technology (BEST, 2000), examining the role and capacity of the federal government in undertaking scientific activities. It emphasised the need for the government to undertake in-house scientific activities and recommended that government departments and agencies should have appropriate and robust capacity to provide a solid scientific foundation to meet their current needs and future challenges.

"The fundamental principles of alignment, linkages and excellence must be applied to the conduct of all federally performed and funded science and technology." (CSTA 1999a).

Science and Parks Canada's Mandate

The mandate of the Parks Canada Agency (PCA) is:

"To fulfil national and international responsibilities in mandated areas of heritage recognition and conservation; and to commemorate, protect and present, both directly and indirectly, places which are significant examples of Canada's cultural and natural heritage in ways that encourage public understanding, appreciation and enjoyment of this heritage, while ensuring long-term ecological and commemorative integrity." [Parks Canada 1994]

Parks Canada recognises that science information is an essential requirement in order to meet its' mandate. (Parks Canada Guiding Principles 1994)

The proposed broad federal science reform, described in the previous section, underlies Parks Canada's recently developed science strategy (Parks Canada, 2001) in which all roles relate directly to protected heritage area management. Ecological integrity and commemorative integrity are the key management goals for the agency, enshrined in law and policy. To achieve these goals, Parks Canada needs to develop

its science capacity for all its program areas, including national parks, national historic sites and corporate management. This has been recognised in a number of independent and internal reports, including:

- First Priority Report's Science statements - 2001
- Minister's Roundtable Science recommendations - 2001
- The Ministers Panel on Ecological Integrity - 2000
- The Praxis report on social science - 2002
- The Cultural Resource Management Policy

Methods

The project was undertaken by Dr. Stephen Woodley, Chief of Ecosystem Science for Parks Canada, and Dr. Gilles Seutin, formerly of McGill University and presently directing Parks Canada's Species at Risk Program. Both of the review team members are adjunct professors at Canadian universities and have been involved in a range of scientific projects and reviews.

The preceding sections on "Science in the Federal Government" and "Science in Parks Canada" set the standards against which the science review was conducted. The science issues were examined by the following:

Interviews - The team conducted 1-2 hour interviews with 29 people involved in both generating and using science in the two field units (Appendix A - Consultation List). Each interview consisted of a set of common structured questions, a set of questions specific to the position, and open discussions. By necessity, some interviews were conducted by telephone. The review team spent a week in the field units during the period of September 9-14, 2001.

Assessment of official management documents – The team looked at all relevant science planning documents, including conservation plans, ecological integrity statements, ecosystem conservation plans and park management plans. This was especially helpful in reviewing the issue of identification and prioritisation of science needs.

Assessment of scientific publications - The team examined a list of scientific publications produced by internal and external researchers over a 10-year period, including those in the grey literature. A sample was selected for further scrutiny, in particular to explore the issue of peer review.

Interviews allowed the examination of how peer review of publications was perceived by Parks Canada specialists and managers, and by other interested parties.

Assessment of science capacity – We examined current level and recent changes in staffing levels and science investments in contracts, university research, capital funds and O&M funds.

Assessment of database management and procedures - All procedures for data management for both internal and external researchers were examined.

Results and Discussion

The results of the review are provided below, grouped by relevant category. The order of presentation is not intended to reflect the degree of importance of the issues being discussed or the priority to be given to the recommendations.

1. Defining Science

Science is a formalised "way of knowing". It has been effective at this because it sets high standards for establishing knowledge in the context of problem solving, decision-making and education. When properly conceived, conducted, analysed, and communicated, science aids in the understanding of complex problems. Most importantly, science information predicts outcomes and, for a given course of action, the confidence level around the prediction. But scientific knowledge is more than experiments or the testing of competing hypotheses. Useable science knowledge also includes information from monitoring; insights derived from analysis and interpretation of data; and predictions using models.

Throughout our review, we found the term "science" was used in a variety of ways and in a variety of contexts. The range of use was so extreme that the word "science" tended to loose its value. For example, science was used by some to refer to management actions that used to be called "resource management" or "ecosystem management". It was even occasionally used interchangeably with "environmentalism" or "advocacy".

Science is perhaps best thought of as a verb rather than a noun. Science is a *process* for acquiring information and knowledge that enables learning; a means to make an uncertainty more certain by identifying patterns and testing explanations for observed phenomena. This understanding of "science" is

what informed our review. We hope that all those involved in future discussions of science issues in Parks Canada, including external parties, will be careful in not misusing the word "science."

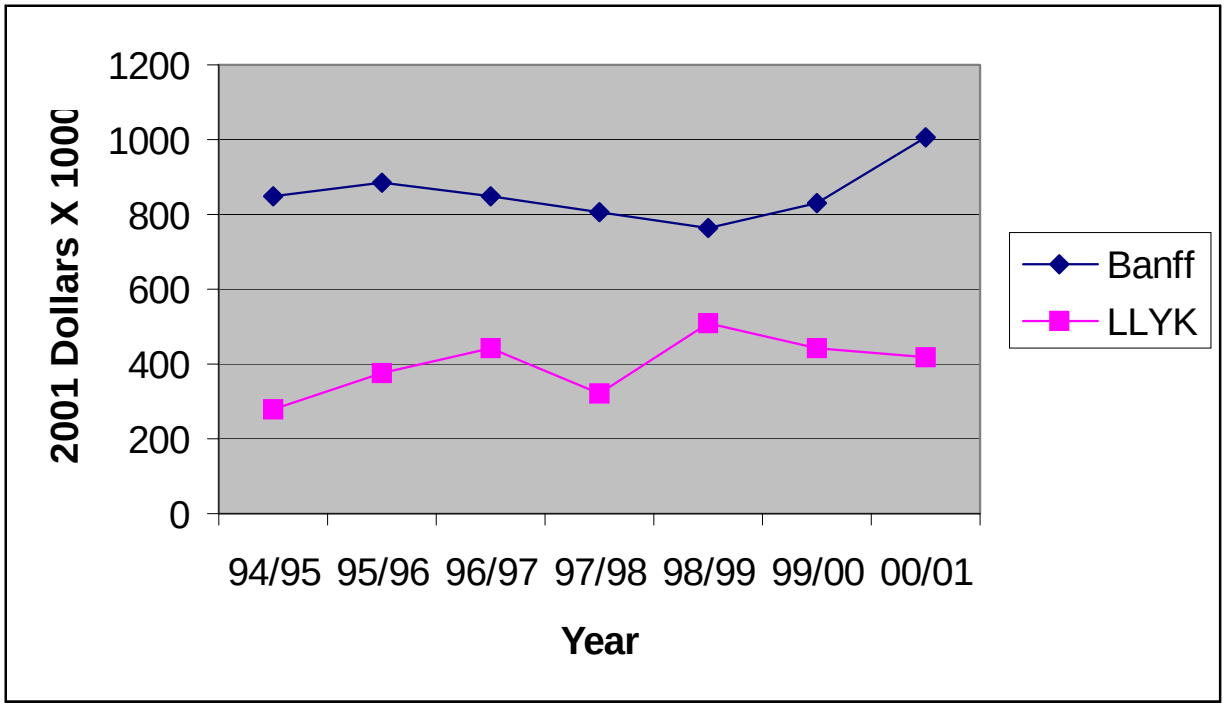
2. Level of Investment vs. Expectations

There are a wide range of expectations for the production and application of science in the Banff and LLYK field units. These expectations come from within Parks Canada, as well as from external sources such as universities, other federal government departments, provincial governments, and a host of non-government and special interest organisations and private citizens. Simply put, the expectations are diverse and complex. This is especially true in Banff National Park due to its 'icon' status, world reputation and powerful role as a tourism destination. Certainly, the expectations of how well the science programs of the two field units are fairing must be put in context with the level of investment.

From 1994 to present, the Banff Field Unit has invested on average 856 thousand dollars per year in ecosystem-based research projects, including ecological and human research. During the same period the LLYK field spent less that one-half that amount, at 399 thousand dollars a year on average (see Figure 1).

These figures represent only project expenditures and do not include staff salaries and their related overhead. Approximately 20 person years are dedicated to ecosystem management in Banff, of which conducting science is only a part. These figures do not include either the funds contributed by others, or funds put toward independent research projects not sponsored by Parks Canada. We also note that there should be some caution in interpreting the figures. Much of the research done in Banff is directly relevant to LLYK, and indeed to Jasper. Because the research is applicable, it tends to minimise the differences in expenditure levels.

Figure 1 – Project Expenditures in Banff and LLYK Field Units 1994-2001, in constant dollars.



At this investment level, the Banff and LLYK field units have been producing in the order of 10 peer reviewed publications per year, as well as significant, on-site science advice. In addition, the investment in science has been the basis for much of the public education program and the foundation for major eco-tourism initiatives such as "Year of the Great Bear".

Relative to its investment, both Banff and LLYK have a high level of science activity and the science is generally assessed to be of good quality. This is a consistent response (with only a couple of notable exceptions) received from both internal and external sources. It is clear that maintaining this high productivity and quality in the future will require, at a minimum, that the current investment be maintained. Gaps in the capacity to deliver sound science information and advice are addressed in the following section.

As shown in figure 1, science capacity in the LLYK field unit is much lower than in Banff. This is true for both internal capacity and contract funds, to be able to hire external researchers and engage graduate students. This inequity seems historical rather that based on a careful analysis of research need. This situation limits the ability of the two field units to co-operate effectively. Part of the solution would be to have a common science strategy.

As indicated before, high expectations arise from both within Parks Canada and from stakeholders. It is important that Parks Canada manages stakeholder expectations to avoid unrealistic pressure being placed on its specialists and managers. This is a role for communication specialists, discussed in a later section of this report. However, this first requires that Parks Canada better match its expectations for a science program, relative to its investment. Management agencies, including Parks Canada, typically have goals for their science programs stated in terms of having the "best available" and "peer reviewed" science. While these are laudable goals, they are not completely realistic given the history of the science program and the current level of investment. The distinction made earlier between science, as an activity leading to the generation of new knowledge and the use of science for management is central to this discussion. Parks Canada has almost exclusively hired biologists and social scientists to use science information for management, rather than to conduct research. This can be seen in the job classification of most specialists (e.g., biologists rather that researchers), and the lack of a formal science infrastructure to conduct and evaluate research. Government organisations that have a history of research activities use the scientific research job classification (SeRes), which allows evaluation based on peer-reviewed scientific output, and have research design committees and other supporting infrastructure in place. It is unclear to us whether Parks Canada will be able to maintain its current high productivity in scientific research if job descriptions and classifications do not better reflect the expectations put on its specialists, and if the criteria for performance evaluation are not revisited. This discussion needs to involve all levels of the Agency, not only the field units covered by this review.

During this review we heard criticism by one private citizen and the Officer for Association for Mountain Protection and Enjoyment (AMPEE) that some of the science done in the Mountain Parks is biased, poorly executed and without sufficient peer review. Such criticism is characteristic of many public policy debates on land use, but it is especially prominent in Banff. Part of the debate centers on different land use expectations, which is not the subject of this report. However, an important aspect of the debate centers on the kind of expectations placed on the science program. In ecosystem science, much of the confusion over expectations comes from (1) the inability of ecosystem science to make predictions of cause and effect with a level of precision typically required by land managers and users; and (2) weak linkages between science and management. The first element is discussed in the following paragraph and the second in the "Science Advice" section.

Ecosystem science rarely can predict cause and effect relations with the high degree of precision that are typically required by management. For example, consider the question of designing and maintaining wildlife corridors. Where there is considerable certainly that wildlife use corridors, it is generally uncertain what the exact dimensions of the corridor should be in order to function effectively. From a

management perspective, an extra 20 meters might be required to fit in a trail or a road into an existing corridor. But ecosystem science can rarely tell the impact of reducing the corridor width by 5, 10 or 20 meters with a high degree of precision. Predictive precision in ecosystem science is generally very time consuming and expensive to get, simply because of the large number of variables that must be accounted for in understanding cause and effect relationships. Thus, the concept of precautionary principle has been developed to help translate ecosystem science understanding into management prescriptions. The concept, as enshrined in the Declaration from the World Summit on Environment and Development (Rio de Janeiro, 1992) needs to be better explained to stakeholders.

Recommendations:

2.1 1f the field units want to have peer reviewed science as a requirement of their positions, there needs to be a review of the staffing and classifications used in the current warden service and ecosystem secretariat. It is an opportune time to review the needs of the positions in the context of the national classification review. Since the Banff and LLYK field units both have highly complex management issues, they need to staff and reward scientific expertise.

2.2 The current level of investment in science will continue to result in 1) a significant difference in capacity between the Banff and LLYK field units, or 2) an inability to fully use science to understand emerging issues or even the backlog of existing issues. This is undoubtedly obvious to the field unit managers and we recognize the funding pressures in all program areas. However, investment in science in the LLYK field unit has, in fact, been decreasing since 1998.

3. Capacity to Conduct Science

The science capacity of both Banff and LLYK field units was never designed to meet the specific needs of being a science-based organisation. Rather, science capacity evolved from a combination of warden service history and the development of ecosystem secretariats. There is currently a wide range of demands placed on the combined warden service-ecosystem secretariat for a comprehensive science program. A number of factors contribute to the disparity in supply and demand, including: (1) an ongoing set of commitments made in the Banff Park Management Plan for grizzly bear and elk management, fire management etc., (2) a constant stream of new issues and development pressures, and (3) the agencies recent commitment to ecological monitoring, which exceeds the field units capacity to deliver. These demands simply can not be met with the current level of staffing. The result is that staffs are under considerable pressure and are stressed out. In this section, we review current staffing levels and gaps, the need to further the education levels of specialists, the use of graduate students, and the science infrastructure.

There are pressures in all program areas, however we received consistent reports that the wildlife specialists were under the most pressure in both field units. This is not surprising considering that the largest portion of science project expenditures in the two field units goes toward terrestrial wildlife, primarily large mammals and especially large predators. Thirty to forty percent of the total research expenditures are spent on large carnivores in Banff, and twenty-two percent in LLYK. Yet staffing level is not commensurate to this investment, resulting in specialists being overworked. As an example, Tom Hurd, Banff's wildlife specialist, had 25 researchers reporting to him for a variety of projects, mainly graduate students and field assistants; he has only one warden (classified as GT3) to help with this workload.

There are some notable gaps in the natural science capacity within both field units. Capacity and investment is currently limited for research on mid-size carnivores, the aquatic domain and fire management, and is almost non-existent for research on plants, invertebrates, birds and small mammals. There is also a notable gap in the capacity of both field units to conduct long-term monitoring for ecological integrity, as most resources have been focused on research or operational issues. With the current staff configuration it is also difficult, or even impossible, to respond to new issues.

As the intensive research phase of the Human-Elk-Aspen-Wolves model and the East Slopes Grizzly Bear project is winding down there will be an opportunity to realign some research capacity. This is not to say that too much effort has been placed on large mammals, or that results obtained were not valid or

valuable. The need to re-consider the allocation of resources will become more critical should additional resources become available, as per the Ecological Integrity Panel's recommendations. Certainly both field units recognise they do not have the in-house capacity to deal with the range of research, advice and communications currently expected for their natural science program.

While natural science capacity in both field units reflects history rather than design, this is not true for social science capacity in the LLYK field unit. In this case a social science strategy was developed for the field unit before staff and fund allocations were made. This initiative responds to needs identified by the Bow Valley study, the Praxis report, and LLYK's own review of social science needs. This is commendable. In LLYK there are now three social science researchers where before there were none. We also note and commend the presence of a contract researcher in Banff who is developing a human use database. These are significant advancements.

As well as the need to increase in-house science capacity by adding and reallocating specialists, upgrading of current staff is needed. In the Banff field units, there has been a considerable amount of such upgrading recently through a return to university for advanced degrees. This is a credit to the individuals involved, as well as a benefit to the program. We commend the managers of both field units for having made that possible. However, there is not a clear policy for access to educational opportunities. The need for such a policy is larger than the two field units involved is this review. It was also identified as a need in the Parks Canada Science Strategy (2001), but has not yet been acted upon.

In addition to work done by Parks Canada specialists and contractors, much of the research capacity in the two field units has come from the use of graduate students. This approach has many benefits. Graduate students are a low-cost pool of talent, they are willing to work under sub-optimal working and housing conditions, and they work long hours. Graduate students also come with ready-made university standards for peer review, animal care, etc., and have access to additional capabilities at their home institutions, such as statisticians. However, there are drawbacks to building a very high proportion of a parks research program on graduate students. First, graduate students have a limited time in the field – 1 or 2 years for Master's students and 2 or 3 years for Ph.D. students. Second, despite the fact they are talented and motivated, they are also new at research and can make errors common to any persons new to a job. Third, their research designs are (rightly) centred on the needs of getting their degree rather than answering a particular research question for Parks Canada. Despite these drawbacks, we recommend that the two field units maintain the level of opportunities they currently provide for graduate student research, and potentially increase them for social science research. Managers need to be well aware of the need for

supervision of graduate students for research results to be useful to Parks Canada. They also need to provide specialists the means to assure this important function.

There is far more to building science capacity than simply hiring people with the appropriate degrees and training. Science capacity also means creating a science environment, which includes access to scientific literature, access to specialised advice, a collegial work environment that encourages and understands science, and appropriate levels of internal and external review. Many of these conditions are lacking or missing in both field units, making the pursuit of science more difficult. This is especially true in the LLYK field unit where scientists are isolated and have no access to journals, libraries, or a scientific work environment. As an example, the LLYK social scientist spends a minimum of twenty-five percent of his time driving, because of the geography and isolated nature of the field unit. It is difficult, perhaps impossible, for a young researcher to keep current and remain effective under these conditions. Banff is better off in this regard because of its proximity to Calgary, larger critical mass of researchers and library facilities. Both the field units and Parks Canada must pay far more attention to creating a proper research environment as its builds its scientific capacity. It must plan for journal access, collegial interactions in the planning and development of research designs, and access to specialised assistance.

There are many solutions to the problem of providing a science environment. Some solutions are as simple as using the web for on-line access to scientific journal articles. Field units must also decide if they need science advice, research, or a combination of the two. If a field unit requires research staff, perhaps it is best to place the researcher in a more “scientifically appropriate” work environment than the field unit. Data collection is a relatively small part of many science projects and it might best be accomplished with travel to the site from a central location such as the Calgary Service Centre. The field units should also be open to locating researchers in universities or within research groups in other government departments.

It should be noted too that basic facilities necessary to conduct science are sometimes missing in the two field units. The LLYK field unit for example is without a library or even a central registry. It is very difficult for the specialists in LLYK to conduct science without something as basic as a library. Such a facility needs to be created without delay to archive and make accessible all documents relevant to the field unit, and at least a minimum collection of science textbooks and relevant journals. The intent is not to replicate holdings of science texts available in the Banff library or by local universities. Instead, the focus would be on documents that are directly relevant to the management of field units, much of which is grey literature that typically does not make its way into academic or public libraries.

Another issue we noted was a disconnection with the National Documentation Centre, where all documents produced by the field units are supposed to be archived. The collection in the National Documentation Centre is spotty for both field units, housing less than forty percent of the reports listed in the Banff library and less than thirty percent of the documents from LLYK. It might even be possible to have many library functions taken over by the documentation centre or have the Banff Library take on responsibility for the LLYK field unit.

The final issue around capacity is that of the relationships between the warden service and the ecosystem secretariats. These two groups have at least partially overlapping responsibilities. In our interviews we received many suggestions on this ranging from amalgamating the two sections to further clarifying divisions of labour. In the end there was a relative agreement that the two entities worked reasonably well together, although the functioning seemed based more on individual good will rather that design. We have decided to stay out of any organisational comments in this review since the issue is the subject of a major on-going review of the role and functions of the warden service.

Recommendations:

3.1 If additional resources become available, or existing resources can be reprofiled, there are considerable gaps in the areas of ecosystem monitoring, and research on avifauna, aquatic sciences, invertebrates and botany.

3.2 There is a requirement to add additional resources to assist the combined operational and research roles taken on by the wildlife specialists in both field units.

3.3 More consideration should be given to locating park specialists outside the field unit in environments that are more conducive to scientific research. These could be universities, in the service centres or in other government departments through memoranda of understanding.

3.4 There is a need to standardise the access to university upgrading for specialists throughout Parks Canada to ensure that a consistent and fair set of rules applies. This is beyond the scope of the field units and should involve all instances of Parks Canada.

3.5 We recommend that the LLYK Field Unit establish as a matter of priority, a proper central library or documentation centre where all documents relevant to the field unit could be stored and consulted. The field unit should also enable suitable access to on-line journals through one of the service providers.

4. Co-ordination Between Field Units

Because of their contiguous geography, the two field units share many ecological issues and challenges. However, because lines of authority and budgets are distinct between the field units, too many science issues are tackled independently by each unit. This was identified as a problem by most Parks Canada and outside researchers we interviewed and we feel that the problem is real. In some cases it is relatively minor, like needing to secure two permits to undertake a single study. In other cases there has been a lack of sharing of data and information, for no apparent reason. In most cases, it is the uncertainty (about continuous approval and funding) that was identified as a source of unnecessary stress. Others have identified poor co-ordination as an impediment to the initiation of needed research because resources or equipment available in one field unit could not be accessed for research in the other.

Several interviewees identified the difference in grizzly bear adverse conditioning regimes between the two field units as a clear illustration of this lack of co-ordination. Indeed, it is unacceptable that the same bear could be exposed to different regimes in two parts of its home range. This is a management issue, not a scientific one, but we share the discomfort of biologists who pointed out that, since such decisions should be based on sound science, the managers' decisions should have been the same on both sides of the field unit's boundary.

Some have attempted to justify differences between field units by stressing that each unit faces a distinct set of problems, even for shared species like grizzly bears. This is not, for us, a satisfactory explanation. If two different problems exist, both should be addressed separately; but shared problems should be addressed in a co-ordinated fashion. Ecosystem secretariat managers also indicated that they regularly exchange views on research priorities and needs, but examples provided above illustrate that this informal process is insufficient. We therefore recommend that a formal research management board be established by the two field units to develop a joint science strategy and co-ordinate its implementation.

Recommendations:

*4.1 A formal mechanism (**a research management board**) should be established to develop a joint science strategy for the two field units, and co-ordinate all resulting research including natural, cultural and social. This board should co-ordinate and approve all steps of the scientific inquiry, including issue identification, project design, field activities and result sharing and archiving. All Parks Canada sponsored research, including research done by the Highway Service Centre, should be co-ordinated in this manner. The board should be composed of members of both field units as well as external science advisors from the academic community. The board should also be the key contact for Parks Canada to reach out to regional institutions such as the Bow Corridor Ecosystem Advisory Group, the Biosphere Institute of the Bow Valley etc.*

4.2 Management of large- scale research projects, such as grizzly bear research or watershed issues should be allocated to, and managed by, one field unit. The responsible field unit should be the one best equipped to manage each project. The field unit superintendent or the research management board can assign the research lead.

4.3 The process of allocating research permits should be streamlined between field units to make it easier for researchers and more efficient. This is a national issue as well as a regional one.

5. Issue Identification

Science is a process to test ideas and see if they hold up to formal scrutiny. However, before scrutiny comes the need to clearly identify the issues or questions. In our review we noted a deficiency in the area of issue identification for both field units.

Beginning in the 1980's, both field units used the former Natural Resource Management Planning Process (NRMP), which allowed a formal identification and ranking of "problems, issues and concerns". In the 1990's the Ecosystem Management Planning Process replaced the NRMP, but this is administered in more of an ad hoc manner, with the main planning focus now being on the Park Management Plan. However, most researchers who we interviewed felt that the Park Management Plan was not sufficient to provide detailed research direction. The more detailed Banff-Bow Valley study did provide a clear research agenda for Banff, but that report is now 7 years old and many of the issues have been solved or refocused. For instance, there has been considerable progress on the restoration of wildlife corridors.

Many of the needs identified by the Banff-Bow Valley Study are still valid, such as in the area of aquatic research. However, the general consensus of those we interviewed is that the process by which "problems that require science input" are currently identified and ranked is unclear, and that a new formal process is needed.

Certainly some valid efforts have been made in this area of issue identification, allowing significant scientific and public feedback. These include Banff's annual planning forum, and several specialist workshops (e.g., Elk Workshop). We also note the presence of the Ecosystem Advisory Board in LLYK, and the Aquatics Advisory Committee in Banff. We also congratulate the field units for the way they responded to many crisis situations, such as the winter 2001cougar human predation incident. However, this suite of initiatives does not provide a consistent process to identify new issues and to re-prioritise the existing issue set. We are thus proposing that the Research management board be asked to develop a new process to identify and prioritise issues and problems requiring science input.

A second component of issue identification is the need to co-ordinate and integrate activities of all elements of the field units, and activities related to both natural and social science. This applies for instance to the Highway Service Centre, where research needs were sometimes established independently and research projects were not always well co-ordinated with other research conducted by the ecosystem secretariats. This is not to fault the Highway Service Centre, rather to point out the need for better and more formal communication.

The need for consistent issue identification applies to both natural and social science specialists, as it is widely recognised that environmental management in Canadian national parks often comes down to human management issues. However, co-ordination between the two groups of specialists appears to be missing is some cases. The current project on assessing human disturbance on wolverine in the upper Kicking Horse Valley and adjacent upper Bow Valley is a good example of co-ordinated research where study goals, approaches and design have been articulated jointly by appropriate specialists. On the other hand, we note that independent studies were conducted on wildlife use of, and human disturbance at wildlife crossing-structures, which greatly diminishes the value of results gathered. Another example of uncoordinated efforts is the monitoring of grizzly bears and human use at Moraine Lake in the new context of the 6-people party rule.

It is the responsibility of managers in both field units to offer proper conditions and incentives for specialists to work together. A more open and inclusive process for issue identification and prioritisation (as discussed above) should facilitate the identification of multi-disciplinary projects. Specialists should then be given time to design, conduct and report jointly on these projects. For complex problems, like

those typically facing the Banff and LLYK field units, there is no economy to be achieved in the long term by conducting independent studies on various elements of a general issue.

Recommendations:

5.1 The Banff and LLYK field units have so many issues in common that they should have one joint process for issue identification and prioritisation. This would avoid duplication and ensure projects are identified and designed for best results at the start. We recommend a joint science strategy.

5.2 The field units have to ensure that issues requiring input from more than one element of the Agency, or from both the natural and social sciences are dealt with in a co-ordinated fashion, beginning right at the research design phase. Projects requiring a multi-disciplinary approach need to be designed conducted and reported jointly on, and specialists need to be given the opportunity to do so.

6. Project Design

The success of several recent research projects conducted in both field units is due, inter alia, to solid project design. This is a necessary, though regularly overlooked, prerequisite for successful research. Well-designed projects have a lower probability to fail, to have to be redesigned (with associated cost and loss of credibility), or to lead to debatable conclusions. Good design is especially necessary for ambitious and complex programs and the front-end investment in design should be commensurate to the complexity of the issue. In addition to recognised design standards (often set in the context of cost or results in peer-reviewed journals), rigorous tools are now available to help design solid projects (e.g., power analyses, simulations and modelling). Parks Canada biologists, both in field units and service centres should have, at a minimum, basic understanding of these tools. Managers should consider offering such training to their staff.

Many specialists and biologists we met with feel that procedures currently in place at Parks Canada do not necessarily ensure that projects are well designed, and they agree that this should be improved. Sound project design can be obtained through inclusive consultations as the project is developed, and through peer reviewing of proposed design before the fieldwork or analysis is undertaken. In complex cases, both consultations and peer reviewing might be warranted.

Many research projects supported by Parks Canada are also part of a university-based research program. Linkages with the academic world typically provide for adequate reviewing of project design. In that sense, Parks Canada has greatly benefited from these linkages. However, mechanisms for ensuring the quality of the design of other research projects are not well established. Contracts covering scientific activities in national parks either explicitly specify many elements of research design, or request that the design be developed by the contractee and approved by appropriate Parks Canada authorities before field activities or analyses are undertaken. Parks Canada employees in charge of such contracts have, in general, done an excellent job at defining and reviewing the design of the projects. However, with the constantly increasing diversity and complexity of issues to deal with, and the increasing sophistication of approaches and methods in natural and social sciences, it is unfair to expect that park specialists are in a position to assume these critical functions in all cases. We favour a greater front-end investment in project design, including contracting review of project design to competent peers and, in complex cases, the convening of expert workshops at the inception of a project to help set it on a sound scientific basis.

A number of research projects are also conducted in national parks that are neither initiated nor directly sponsored by Parks Canada. These projects still require a permit from Parks Canada to be undertaken, and the Agency should use that opportunity to review the soundness of project design. As established researchers propose most of these projects, this should not be an onerous task.

Recommendation:

6.1 Field units need to increase their investment in the early stage of research projects, especially by providing their biologists with resources to obtain advice on, and to review, the research design of new projects. Pre-project review should be an essential component of all research projects.

7. Peer Review

We reviewed the 261 and 263 publications from Banff and LLYK field units respectively, dealing with science issues. These samples were taken from library entries for science done by park staff, contractors or external researchers in the last 15 years, including interim reports, reports of ongoing monitoring and planning documents.

Forty-one percent of the Banff publications were peer reviewed (19% were published in primary journals, 9% were university theses, 5% were refereed conference proceedings and 8% were published in minor journals). Of the 263 publications from the LLYK library, sixteen percent were peer reviewed (7% published in primary journals, 3% were university theses, 3% were refereed conference proceedings and 3% were published in minor journals).

The level of peer review conducted in Banff is very high by any standards, especially given the management-oriented nature of most of the ongoing work and the fact that the sample was drawn from all reports. Banff's publication record reflects the fact that much research is conducted in collaboration with universities, and particularly by graduate students. We see this as extremely valuable. We also note that the collaboration with universities was done by design in an attempt to get high quality, innovative science done for a low cost.

The level of peer review of publications derived from projects conducted in the LLYK field unit is significantly lower than for Banff, at about a third of the rate. We suggest that this reflects a number of factors. Banff is closer to universities and is easier to access for university researchers and graduate students. Banff has also had historically much higher funding levels and has thus been able to enter into more fruitful partnerships. Finally, Banff has a history of being in the spotlight, being Canada's first and most recognised national park. Those reasons aside, the high level of peer-reviewed publications in Banff reflects a management team that has actively promoted peer-reviewed science and designed a research program with active involvement of graduate students. LLYK managers are increasingly promoting the same approach, and this should soon pay off.

There has recently been some public criticism of particular elements of Banff's science program, notably the East Slopes Grizzly project (ESGP). Of a list of 23 publications produced by the ESGP, fourteen (or 60%) were peer reviewed. In addition, a number of publications were submitted for peer-review when this assessment was made, or were still in a manuscript form. The ESGP is exceeding Banff's average publication rate and appears to be very productive.

We also examined levels of peer review in other work done by contract scientists. Contracts have been used by the Banff field unit to conduct some large-scale and long-term projects, notably the wolf and transportation infrastructure crossing projects. Both of these projects have resulted in a number of peer reviewed papers. Of special note here is the work of Dr. Tony Clevenger, who has exceeded all contract expectations by producing a number of research publications in highly respected scientific journals.

One of the deficiencies in the field units (and this generally applies to Parks Canada as a whole) is the lack of a formal internal peer-review process. Most science-related work done in the field units is not suitable or appropriate for publication in scientific journals, but would still benefit from peer-review. Examples include monitoring strategies, annual reports, ecosystem conservation plans and vegetation management plans. Currently there are both formal (various internal publications) and informal review processes used internally. A more formalised internal peer-reviewing process would benefit the program by providing transparency and rigor. The internal process would require a referee/editor to arbitrate on comments received.

In summary, the level of peer reviewing of science products in the Banff field unit is very high. The LLYK field unit has a significantly lower level, but is still producing significant levels of peer reviewed work. It must be kept in mind that these field units were never set up or staffed to produce peer-reviewed science (see section 1 on Expectations). The fact that there is a significant level of peer-reviewed science, especially in Banff, is a credit to the individuals involved.

Recommendations:

7.1 Parks Canada needs to develop a formal, internal peer-review process independent of that provided by scientific journals. The process could be managed by the research management board proposed in recommendation 4.1

7.2 Contract research should be encouraged to submit publications to peer reviewed journals as part of contract.

8. Science Advice

The parks' management table is typically described as overloaded, and having to react to a range of issues within very short time periods. Clearly, management decisions must be made in a timely manner and must take into account a range of factors including scientific, socio-economic and political considerations. However, given the legal requirement to manage national parks for ecological integrity, and the need to be clear about defining impacts on ecological integrity, there needs to be an enhanced focus on "science" and science advice within the Agency. This enhanced focus requires a more formal process for science advice than what exists at present.

All those we interviewed agreed that there is not a clear path for science advice to get to the management table, nor any clear record of what the science advice for a given issue was, and how it was used. We understand that both the Chief Park Warden and Manager Ecosystem Secretariat provide science information and advice at the management table in both field units. However, it is clear that the advice given is generally not provided in a detailed and formalised format. In our mind, this is a clear deficiency of Parks Canada management regime. This has many consequences including, most importantly, that management decisions are seen by many as lacking in openness and transparency. A consequence of this is a level of misunderstanding between managers and specialists, with the latter feeling that scientific information and advice they worked hard to produce was not appropriately considered by managers. A clear process for providing science advice to the management table would help resolve this problem.

In our view, detailed science advice needs to include (1) a statement of the hypotheses and predictions, (2) an assessment of the strength of existing scientific information, (3) an assessment of the levels of confidence around alternate predictions, and (4) an assessment of the risks associated with each prediction. We recommend that the science advice process be formalised in Banff, LLYK and indeed, in the rest of Parks Canada. This is consistent with the Federal Governments Council of Science and Technology Advisors SAGE report. This would result in better management decisions, less misunderstanding between specialists and managers, better transparency in decision making, and a greater opportunity to learn by doing (i.e. adaptive management).

Recommendations:

8.1 Parks Canada, not just the Banff and LLYK field units, needs to formalise its process for science advice. Advice should be recorded and include (1) a statement of the hypotheses and predictions, (2) an assessment of the strength of existing scientific information, (3) an assessment of the levels of confidence around alternate predictions and (4) an assessment of the risks associated with each prediction. This process will need to be carefully developed and will probably require several levels to accommodate projects of increasing complexity.

8.2 We recommend that a science advice workshop be organised for both field units. The workshop should be aimed at both scientists and managers and cover a) the scientific method and how it works, b) how science advice should be given and received, and c) understanding the interactions between science understanding, advice and values.

9. Data Management

Data management was not covered in a comprehensive way in this review. However, it is clear that there are major deficiencies in the way data are managed in the Banff and LLYK field units. We recognise that data management is a problem that, in large part, needs national resolution. Still, actions need to be taken at the field unit-level and we provide here, recommendations based on our preliminary observations.

The problems we encountered were lack of facilities, overall resource shortages, and standards not being applied consistently. Regarding lack of facilities, we mentioned earlier that the LLYK field unit for example is without a library or even a central registry. Another example is the lack of high-speed data lines within the LLYK field unit making it difficult or impossible to share large files, either within the field unit or externally. This has negative implications for partnerships with universities and other government departments. We recognise that this is a serious problem that needs resolution, but we are not in a position to provide a clear recommendation because of the highly technological nature of the issue.

Lack of resources also precludes appropriate storage and archival of data. Data storage budgets are in the order of $15,000 per year in both field units. Data are backed up on CD's and kept in a safe. This is only a short term-solution and not a proper method of archiving data. A more fundamental problem is the fact that much data never even gets to be put in the safe. Darrel Zell in Banff estimates that he is receiving only twenty-five percent of the data produced by external researchers, and fifty percent of the data from internal researchers. There is currently no rule in place to obtain copies of researchers' data and as such, the process is happening relatively randomly. When data are received from researchers, the data structure is often inadequate for long-term storage or metadata is missing. Part of the problem is that many of the researchers are graduate students. They collect their information in the parks and then head back to the universities where the data are coded and cleaned. Universities typically have no long-term data storage solutions for graduate student work, and data are then lost. A formal system needs to be instituted, similar to the models used by Kejimkujik or Jasper National Parks, to ensure that Parks Canada obtains copies of all relevant data collected during projects sponsored by the parks.

Metadata are essential to the long-term record keeping and usefulness of data sets. Parks Canada has a new directive on metadata and the standards that apply. Because the field units are overworked in the area of data management, currently metadata only exists for some core data sets. This is not an acceptable situation as data sets will degrade over time as they become harder to access, interpret and use. Some national parks (e.g., Kejimkujik) force researchers to develop an acceptable data structure, provide

metadata and submit data as a condition of their research permit. These standards need to be adopted in Banff and LLYK.

Both field units have experienced and talented people in combined data base management / GIS positions. The problem experienced in data management is not through any fault of this staff who actually provide exceptional service to both internal and external clients. But they are overwhelmed with the requirements of the job, and are often asked to take on other related tasks such as sign production and computer modelling. Field units as large and complex as Banff or LLYK should separate data base management and GIS positions because there is far more work than one person can reasonably handle. In addition, the GIS positions can be better utilised in working with researchers to develop spatial models etc.

Recommendations:

9.1 The data management systems in both field units are in need of considerable development, and the resources allocated to data management are insufficient. Both field units need to establish data management systems, using best practices. This will require investments in staff, software and hardware. However, it is the only reasonable way to proceed to manage the large and complex data sets now available for the field units.

9.2 In the short term, LLYK should establish a web site with high-speed lines to facilitate access of data by Parks Canada and outside researchers. This could be done in partnership with the Mistakis Institute at the University of Calgary.

9.3 Metadata, using the national SIMMS standard, is currently only available for the core or main data sets in both field units. This deficiency must be corrected to avoid long-term decay in the utility of the data sets.

10. Communications

For science to be useful for park management it must be communicated to managers, park staff, special interest groups and the public. Communication is part of the job of the scientists in parks and not only, the specialised work of heritage communicators and their partners. Both field units have recently had some great successes in using science in park management (i.e., elk out of the Banff townsite, fire ecology restoration, restoring large mammal connectivity). However, other projects have been questioned, and some have been shelved (e.g., restoration of the native fish community in Moraine Lake), partly because their scientific foundation was not sufficiently well communicated. We recognise that there has been some excellent work done to communicate science (i.e. the Banff Research Update Series) in both field units, but it appears to be insufficient to the scale of the challenge. Because Banff is a crucible of public debate about how the park should be managed, there is a tendency for all involved to either a) use science as a sledge hammer or b) vilify the producers of science when they produce non-supporting views. Both of these positions originate largely from a misunderstanding of either the role of science or the actual science results.

Communication efforts in a science-based organisation need to focus on presenting and explaining, i) the reasons and goals of scientific projects, and ii) the outcome of the research. Failure to properly communicate may lead to public – both local and national - questioning the need for the research and the financial investment, misunderstanding of the goals and approaches, and misrepresentations of the results. This can then fuel controversies over management decisions that are taken on the basis of the research results. We also noticed that public misunderstanding and misrepresentation of science goals and results has a demoralising effect on those who conduct research in the parks, especially Parks Canada staff who do not benefit from the stimulating environment of academia as much as external researchers do.

Both field units and Parks Canada in general, need to be far more active in communicating science issues and science results. It was strongly suggested by all the NGO's we interviewed that much of the mountain park controversy would disappear if there were better communication. In addition to communication on specific science projects, there is need to explain the science process and the way scientific information is taken into consideration in decision making. The adoption of a clear science advice process - discussed earlier - will help explaining this to the public.

There is need to communicate at all steps of the science process. This includes introducing and explaining research projects before they are undertaken. This should mainly target the local population and visitors, and can be achieved through printed material and personal-contact communication.

A variety of media should be used to present research goals and results, including printed material, fact sheets, short articles for visitor guides and frequent press releases. Press releases should be focused on science results, and the results of using science information in park management.

We recognise that implementation of each of these initiatives will require resources that are currently scarce. However, the cost of not communicating appropriate science goals and results is likely higher on the long term than that of implementing simple communication mechanisms identified above.

Recommendation:

10.1 Field units need to significantly build on the excellent work already ongoing in the area of communications, by communicating at all stages of the science process and using a range of simple tools such as fact sheets and press releases.

10.2 Parks Canada needs to more proactive in getting its "science story" out to the public. This means actively educating reporters, regularly issuing press release updates, and quickly correcting mis-information that comes from advocacy groups of all kinds.

11. Credible Science

The Banff and LLYK field units have come under some public scrutiny and criticism over the quality of some parts of their science. In many cases, science quality has seemingly become the focal point debate for the larger societal questions of the role of protected areas in general and Banff in particular. In our experience with the issues, the debates are rarely focused on the actual science content. Instead the debate often is ideological, value based and even personal. We have listened and read the advice of critics of the science program in the Mountain Parks and tried to distil out those issues that were truly science based. Allegations focus around 3 main areas:

1. The science is not credible because it is driven by researchers personal values, rather than objective analysis.
2. The science is not credible because it not peer-reviewed.
3. The science is not credible because it uses fundamental concepts that are invalid. These concepts might include the concept of ecological integrity or population viability analysis.

We examined each of these issues during our review and see no evidence of any systemic pattern of poor or biased science being done. Most (but not all) of the public debate centres not on the actual science (e.g. problem statements, methods, statistical analysis), but on the interpretation of what science results imply for management.

We can find no basis for the assertions that there is any systemic bias in the science used, contracted or developed in the two field units. Nor do we see any evidence that science is being used to further personal agendas or for personal gain, as was alleged. The two projects singled out for most criticism are the East Slopes Grizzly Bear project and the Banff Wolf Research project. It was outside the scope of this survey to conduct a detailed review of any one project. However, it is our opinion and the opinion of a range of scientists and professionals, both inside and outside Parks Canada that these projects have been managed on a reasonably sound scientific basis. Undoubtedly there are areas for improvement and there have been some holes in project design and peer review. For example, we note that the wolf friction model was not peer reviewed before being used for management decisions.

It is stating the obvious that scientists are also people, and like other people, hold personal views. There is real and perceived difficulties when personal views get entwined with professional conclusions based on science. The difference between must always be made clear. In the highly charged and emotional

atmosphere that characterises Banff, there has appears to have been some confusion between personal opinion and science.

As with all criticism, there are undoubtedly lessons to be learned from both a scientific and communications perspective. Parks Canada should continue to welcome external criticism and hold forums where alternate views can be expressed. The yearly Elk advisory workshops are excellent examples of open and transparent decision processes, where science results were discussed and evaluated. Other projects could benefit from adopting such a model.

Conclusions

The Banff and LLYK field units have a capable and dedicated staff that has responded to enormous challenges. They have upgraded their own capabilities, met many science challenges, and generally worked at levels far beyond what could be expected. The issues we note in this science review mainly result from two key conclusions. The first is that the collective expectations from Parks Canada, the public, universities and neighbouring agencies are far greater than the current program can deliver. Both field units are receiving good value for their science investments, but expectations need to be adjusted to the level of investment. In any review, it is easy to call for more dollars to fix problems. We have avoided that in recognition of the funding pressures in all program areas. However, without additional investments there will continue to be significant gaps in the ability of science to inform management in both field units.

The second key conclusion is that Banff and LLYK developed their science capacities in respond to crisis, rather than through deliberate design. As a result many of the processes and infrastructures necessary for a good science program are absent or weakly developed. Processes in need of development include project design, science advice, internal peer review and data management systems. Deficiencies in infrastructure include data management hardware, libraries and access to current journals. We note that many of the process issues are problems for all of Parks Canada, and not just the two field units

There are many ecosystem management success stories that need to be told from both field units, but Banff stands out in several key areas. These success stories are based on excellent science and are a credit to the individuals involved. We especially note the management of elk through the ecosystem modelling approach, the restoration of wildlife movement corridors, and the restoration of fire on the landscape. These are stories that Parks Canada needs to tell to the world. They are excellent examples of the idea that national parks can help us understand the ecosystem of which we are part.

We note that our conclusions are not new. In 1995, a review headed by Jillian Roulet arrived at similar observations. These included a need for a framework for the development of ecosystem strategies, enhanced information management and improved communications with respect to research proposals and findings both internally and externally. That review also called for an overall strategy for cultural resource management and research within the ecosystem context (i.e multi-park co-ordination). While progress has been made in all areas, these issues still remain problems.

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Appendix - Consultation List

Researchers and Contractors

Paul Paquet – Wildlife Biologist
Jalkotzy, Martin – Wildlife Biologist, consultant
Bob Sanford – Tourism Consultant
Tony Clevenger – Researcher and Contractor

Non-Government Organizations

Julie Canning – Director, Association for Mountain Park Protection and Enjoyment
Doug Leighton -
Peter Poole – BEAR Society
Mike McIvor – Bow Valley Naturalists

Journalists

Cathy Ellis – Rocky Mountain Outlook

Parks Canada

Alan Dibb – Wildlife Biologist, LLYK
Bill Fisher – Field Unit Superintendent, Banff
Bonnie McFarlane – Social Scientist, Parks Canada
Charlie Pacas – Aquatics Specialist, Banff
Charlie Zinkan – Executive Director, Mountain Parks, Parks Canada
Cliff White – Conservation Biologist, Banff
Darrel Zell – Geomatics Specialist - Banff
Dave Dalman – Ecosystem Secretariat Manager, Banff
Dave Gilbride – Geomatics Specialist, LLYK
Derek Peterson – Conservation Biologist, LLYK
Ed Abbot – Chief Park Warden, LLYK
Ian Syme, Chief Park Warden, Banff
Michel Boivin – Field Unit Superintendent, LLYK
Mike Gibeau – Carnivore Biologist, LLYK
Paul Galbraith – Regional Partnerships Coordinator, LLYK
Rob Walker – Fire and Vegetation Biologist, LLYK
Steve Wittingham - Ecosystem Secretariat Manager, Banff
Tom Hurd – Wildlife Biologist, Banff
Wayne Tucker – Visitor Management Researcher, LLYK