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December 14, 1998

Summary of the Kootenay and Yoho National Parks Science Workshop October 16th, 17th, and 18th

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Executive Summary

The Yoho, Kootenay and Lake Louise National Park Field Unit of Parks Canada hosted a combined science workshop at the Panorama Resort, Invermere, B.C., on October 16, 17 & 18, 1998. The workshop brought together Parks Canada staff and scientists and researchers from universities and agencies with thematic expertise in the social, economic and ecological disciplines.

The key workshop objectives were:

- To provide a comprehensive identification and prioritization of science related issues.
- To assess the current science program and provide advice on adjustments.
- To provide direction on an appropriate framework for the management of the science program within a context of supporting decision making.
- To advance the integration of social, economic and ecological sciences as related to the management of Yoho and Kootenay National Parks.

The workshop had two key components. The first was an assessment of the current science program and providing advice and suggestions on adjustments which could be made. This was called the Issues, Research and Monitoring session. The second component dealt with direction on an appropriate framework for the management of the science program and was called the Integration and Decision Framework session.

Highlights From the Issues, Research and Monitoring Session

There were a number of recurring themes and recommendations from the session. The highlights are outlined as follows:

1. Focus on multi/interdisciplinary approaches as there needs to be integration between the human and ecological aspects of the science program.
2. Baseline Data collection is needed in both the economic/cultural and ecological fields.
3. Get the human dimension on the table and into the process.
4. Need to understand changing needs of the visitor and the greater public.
5. There are two main data issues:
   a) The data already collected is not being used.
   b) More time-series and longitudinal data is required (i.e. core set of research activities but add on module for specific issues).
6. Communications:
   a) Internal communications at several levels—between the two parks, between all mountain parks, between parks working groups and between all parks and Parks Canada Headquarters (Ottawa)—needs to be improved.
   b) Attention needs to be paid to passive use values. These should be used to improve public literacy about the parks.
7. There is a need to "get on with it" and to try out some of these ideas. Start small and test things out. Everything won't work but others will.

8. In terms of tools and methods, make use of a range of the available tools. Distribute support in various projects with different tools.
9. Involving the public in the management process is facing some challenges. There is a low level of public involvement and there are a number of reasons for this. The public will participate if the political will is perceived as being there.
10. Move away from annual funding and establish more multi-year funding strategies. Need to have ongoing and continuous research projects.
11. Continue to use newer techniques like mapping and Geographic Information Systems (GIS) on an ongoing basis.
12. Need for an overall comprehensive plan which will work to help contextualize management decisions.
13 Create a "Culture of Science" in the parks. This is very important and an emphasis on the culture of social science needs to be addressed.

Highlights From the Integration and Decision Framework Session

During this component of the workshop, participants were asked to comment on seven categories, including decision making, integration, priority setting, funding, opportunities for partnerships, stakeholder and public involvement and input into development of external research programs. Participants suggested an eighth category, performance measures. This session focused on future management directions for the science program,

The results are organized into three broad themes; planning, implementation and organizational challenges.

Planning
In terms of decision making it was suggested ecological integrity is the starting point for the science program and this must be defined. Alternatives to the existing planning structures were suggested as well as suggestions on the support required for the decision making process. The importance of integration of the science program at a number of levels in the parks program was reiterated as an important consideration. Suggestions were made for areas where a focus or priority is required. These included the park mandate, hot issues, stressors of the environment, long term goals, opportunities and multidisciplinary projects.

Implementation
Participants provided a number of suggestions for external research programs, opportunities for partnerships, priorities for funding and performance measures and feedback. Two important specialist positions were identified; a back country specialist tied to human use research and a human use specialist for each secretariat in each park. There is a need for a protocol for research including standards for data collection, publication and attribution.

Organizational Challenges
The two main challenges identified are: 1) to encourage a culture supportive of science as a means of improving the internal climate and encouraging external organizations to conduct research in the parks and 2) rectify organizational impediments which inhibit scientific research. Integration needs to be encouraged, role definition for the ecosystem secretariats and the warden service needs to occur, links to outside scientific communities need to be established and organizational stability needs to be achieved after years of changes and reorganization.

1. Introduction and Overview of Workshop

The Yoho, Kootenay and Lake Louise National Park Field Unit of Parks Canada hosted a combined science workshop at the Panorama Resort on October 16, 17 & 18, 1998. The workshop brought together Parks Canada staff from a number of national parks (Kootenay , Yoho, Banff, Jasper and Mt. Revelstoke and Glacier National Parks), Parks Canada staff from Calgary and Ottawa, scientists and researchers from universities and agencies and consultants with thematic expertise in the social, economic and ecological disciplines. It was an opportunity for Parks Canada to consult with external partners on issues of mutual interest and to obtain input to be used in the current management planning process. A full list of participants can be found in the appendices.

A resource binder of relevant information was sent to all participants in advance of the workshop itself. The resource binder contained the agenda, and overview of the context and resasons for the workshop, a series aof fact sheets outlining the existing research projects in the two parks; a series of management principles; the existing science program including the 98/99 process, capital funding spreadsheet, project descriptions and research permit summaries; and finally external research projects.

The key workshop objectives were:

To provide a comprehensive identification and prioritization of science related issues.
To assess the current science program and provide advice relating to required adjustments.
To provide direction on an appropriate framework for the management of the science program within a context of supporting decision making.
To advance the integration of social, economic and ecological sciences as related to the management of Yoho and Kootenay National Parks.

Praxis was contracted by Parks Canada to assist in the organization of the workshop, facilitate the plenary sessions and record and report on the process, content and outcome of the workshop. This document is the report on the outcome of the workshop.

The workshop was organized into two key components. The first was an assessment of the current science program and providing advice and suggestions on adjustments which could be made. This session occurred on Friday evening and all day on Saturday and was called the Issues, Research and Monitoring session. It involved a series of presentations to the entire group and small breakout group discussions. The second component was to provide direction on an appropriate framework for the management of the science program. This session was held on Sunday and was called the Integration and Decision Framework session. It also involved a series of presentations and small group breakout discussions.

This report focuses on presenting the results from the small group discussions in order to take advantage of the input from the assembled expertise.

2.0 Issues, Research and Monitoring Session Results

2.1 Introduction

This session commenced with opening remarks by Darro Stinson, Field Unit Superintendent followed by participants providing a brief introduction of who they or their group were and the focus of their current work. After outlining the context for the science program in Kootenay and Yoho national parks , there was a discussion of the objectives for the workshop. This was followed with a series of presentations to set the stage for the participants to break into small groups to review the current science program and develop recommendations.

Presentations to the Plenary Group:

Wildlife – Alan Dibb
Vegetation – Rob Walker
Aquatics – Charlie Pacas
Socio-economics – Derek Petersen
Cutural - Rod Heintzman
Vision and Principles – Rod Pickard

The participants were separated into four groups based on broad scientific themes: ecological, cultural, social/human use and economic. A fifth group was created near the end of this session with the participants from the cultural, social/human and economic groups to discuss joint or integrated concerns. The groups presented the results of their respective group discussions to the reconvened plenary session on Saturday afternoon.

Each of the groups was asked to:

- Comment on the vision and principles for Kootenay and Yoho National Parks.
- Scope and prioritize current and future issues for the science program.
- Comment on changes to the current science program relative to identified issues.

Section 2.2 contains a summarry of the common or recurring themes from all of the group presentations. Section 2.3 outlines the summaries of each of the groups presentations.

2.2 Summary of Common Themes for Issues, Research and Monitoring

Main Themes Summarized From Presentations and Discussions On Saturday

1. Focus on multi/interdisciplinary approaches – needs to be integration between human and ecological aspects.
2. Baseline Data collection – expected in the economic/cultural area but surprised to hear the same from ecological.
3. Get the human dimension on the table and into the process.
4. Need to understand changing needs of the visitor and the greater public.
5. Data issues –
   a) Not using data that's already been collected.
   b) More time-series and longitudinal data (i.e. core set of research activities but add on module for specific issues).

6. Communications –
   a) Internal communications at several levels, between the parks, between working groups between parks and Parks Canada Headquarters (Ottawa).
   b) Passive use values – marketing to improve park literacy.
7. Need to get on with it – need to try out some of these ideas.
8. Tools and Methods – don't put all the eggs in one basket. Distribute support in various projects with different tools.
9. Public Involvement – creativity or lack of it. People don't come out in droves. Good reason – burnout etc. People will participate if the political will is perceived as being there.
10. Getting away from annual funding crunch; getting into more multi-year funding strategies. Need to have ongoing research, continuous research projects.
11. New techniques – mapping, Geographic Information Systems (GIS), keep these going.
12. Management without context – have to get past this approach to management. Need for an overall comprehensive plan which will work to help contextualize management decisions.
13. "Culture of science" in parks – very important as well as the culture of social science needs to be addressed.

2.3 Summaries of Thematic Groups Presentations

2.3.1 Summary From The Ecological Thematic Group

Initially, the working group had some trouble defining what the scientific research objectives for ecology should be in Yoho and Kootenay Parks. This seemed to be the result of several factors. As some group members clearly had a vested interest in the outcome of this discussion, they may have been hesitant to appear as if they had an agenda. The remainder of the participants admitted that they did not have enough information to critique existing research projects. This led to a more general and philosophical discussion as to how the Parks system could be improved for research purposes.

i) Vision

The group made some specific suggestions on how to improve the vision statement as they felt that this was the basis for research in the parks.

1) **Establish a definition for ecological integrity** - It was acknowledged that this rightly should be the first priority for the parks; however, no *benchmarks* exist at the moment for determining the parameters of ecological integrity. These benchmarks must be derived from *baseline ecological data* which is not available in the two parks.

2) **Edit vision statement** - Participants in this group were discouraged that the vision statement gave the perception that tourism is the primary reason for the National Parks. Participants thought the vision did not work towards advancing scientific research objectives, or encouraging ecological integrity. Some of the critiques of the vision statement were:

   a) does not say that the Parks are a place where people learn about nature and how natural systems work;
   b) the protected areas nature of the Parks is downplayed severely;

c) the "spiritual" aspect of parks is neglected. One participant defined this as "the intrinsic and scientific value of finding your place in the natural ecosystem";
d) maintaining ecological diversity needs to be emphasized;
e) reads more like an advertisement rather than a vision.

In general, the vision statement does not concentrate enough on the true value of National Parks and why they exist. As the vision sets the stage for determining objectives then it has to be brought into synchronization with the concept of ecological integrity.

ii) Research Needs/Gaps

The group did identify several key ecological research needs for Yoho and Kootenay Parks. These gaps fall under three categories: flora and fauna, research tools and human use effects. Please note that this list was not ranked according to importance. The categorical numbering is arbitrary.

1) Wildlife - The group agreed that the majority of expenditures on wildlife research is focused on large mammals. The parks need to enhance knowledge of, status and threats to other species of wildlife such as aquatic species, small mammals, and birds. While it was acknowledged that large mammals, particularly bears, are key biological indicators because of their status at the top of the ecosystem food chain; an attempt should be made to include other species in the "current suite of indicator species." The parks also need to conduct an invertebrate inventory and ongoing monitoring (these include butterflies, dragonflies, snails, etc.). This research is necessary to identify which invertebrates or groups of invertebrates are good biological indicators.

2) Vegetation - Participants pointed out that vegetation studies are lacking in both parks. This research is important to understand the implications for habitat caused by fire (natural or prescribed burning), thinning of vegetation cover and climatic change. Attention should be paid to:
a) long-term changes and trends;
b) analyzing vegetation in terms of communities;
c) study of closed-canopy forests;
d) diverging trajectories between landscapes within and outside of parks - how this effects the park landscape and ecosystem;
e) White Bark Pine monitoring and restoration - may be a critical issue for grizzly bears that depend seasonally on pine nuts.

3) Aquatics - Although these habitats may be the most disturbed in the Parks, this functional category has been largely neglected. Much of the research presently consists of "fire-fighting" rather than a long-term, integrated research approach. The group suggested conducting a workshop to identify specific research needs for the aquatic ecosystems.

4) Endangered species and rare biological systems - This research area is particularly important given possible endangered species legislation. Parks will be required to identify rare and endangered species and develop management plans that priorize the endangered list. This will be expensive and will require time so it is important to be prepared. In addition, rare biological systems will help identify danger zones on an ecosystem level.

5) Exotics/alien species - This refers to animals and plants that are not native to the parks. Not enough is known about the establishment and effects of these species in the parks.

6) Maps - The issue of detailed maps necessary for research was raised repeatedly. Improved resolution is the first requirement referring to the *spatial scale* (e.g. moving from 1:50,000 to 1:10,000). Improving GIS (Geographical Information Systems) can partially address the issue of better mapping resolution. Participants stressed the need for *ortho corrected aerial photographs* of both parks at the 1:10,000 - 1:20,000 scale. These photographs provide accuracy of about five metres and are corrected for topography (hills, valleys, etc.) The second requirement is for a seamless map (from satellite imagery) for the entire region that cuts across jurisdictional boundaries (scale 1:50,000). This map needs to include several spatially explicit thematic layers including:

a) vegetative cover - need for a forest cover map and understory at various scales;
b) human populations;
c) road and trails;
d) topography - Digital Elevation Model or DEM;
e) avalanche chutes.

This map is essential for achieving long-term research objectives in the Central Rockies Ecosystem.

7) Scales - All research should focus on species and ecological processes that adequately represent different temporal and spatial scales. Research projects should strive to be complimentary with other projects for better efficiency and integration.

8) Improving models - Refers to models such as the wolf friction model, grizzly cumulative effect model and all habitat models in general that are used to assess elements such as habitat connectivity, habitat use and effects of human activity etc. These models need to improve the:

a) resolution - refers to spatial scale i.e. moving from 1:50,000 to 1:10,000 scale
b) parameters - ecological data used to develop coefficients used in models.

These models are an important component for decision support models that incorporate human dimensions. Good modeling is also necessary to prevent reactive management by providing long range forecasts.

9) Seasonal Research - Participants pointed out that Parks research focuses on the summer season. The grizzly bear, for example, is a good indicator only in the summer season. There is a need to extend "winter" research. Research is required on *subniveal* communities — species that live under the snow. These species are largely ignored because of lack of visibility. The research is important because of the snow compacting effects of winter activities (e.g. cross-country skiing, dog sledding, ski hills) which most likely causes habitat fragmentation caused by movement blockage. Finally, focusing on species and indicators that span multiple temporal and spatial scales will provide a more year-round perspective.

10) Highway/railway effects - These transportation systems through the Parks have profound ecological effects. The mountain parks must be prepared to address the issue of expansion and be able to forecast effects. Several subjects that require research are:

a) highway crossing points - for a variety of species, at a variety of scales
b) effects of mortality and habitat fragmentation - at a variety of scales
c) effects of salt and other toxic runoffs - pollutants from roads include salt, heavy metals and hydrocarbons.

11) Industrial Forestry - The effects of this industry are not limited to outside the park boundaries. The effects of forestry practices on hydrology within the park needs to be investigated.

In summary, the group referred to several recurring themes:

1) The need for all research to address different spatial and temporal scales
2) The need for collaboration between ecological and human use research.
3) The need for a protocol for systematically evaluating research issues and proposals.

Recommendations for Management Objectives and Priorities:

1) **Establish a planning structure or framework to guide research needs**

Participants suggested that an alternative to the traditional taxonomic framework (i.e. vegetation, wildlife, aquatics) was needed. Some suggestions were:

a) Population Viability - i.e. the probability of a group of animals surviving over a specified time. Population viability could be used as a super-category to provide organizational structure; however, this approach emphasizes ecosystem components (i.e. species such as carnivores, fish, and birds) and often ignores ecological processes (predator-prey relationships such as wolves killing elk);
b) Population Dynamics - may be a better choice because it is more process oriented. It refers to parameters such as birth rates, mortality rates, age of breeding etc;
c) Functional Links - stresses ecological processes. Could also be excellent indicators of ecological integrity or ecosystem health.

The group concluded that whatever framework is selected would have to capture ecological components, processes and patterns. Jasper uses an hierarchical approach with categories: genetics, population, communities and landscape.

2) **Encourage a "culture" of science**

Participants lamented that presently Yoho and Kootenay Parks do not have a corporate culture that supports scientific research. First, the Parks base many decisions on the false dichotomy between applied and pure science and similarly between research and monitoring. Part of a culture of science is realizing that these divisions work contrary to establishing a good science program. The second problem lies in the perception outside the Parks that it is very difficult to get approval to conduct research in the National Parks. This perception must change to encourage research. One participant suggested that management needed to view scientists as clients versus scientists as contractors. There were also suggestions for peer review of research, monitoring and publishing of results. There should also be rewards for risk-takers and good work.]

3) **Work towards 'integration' on various levels**
Integration needs to take place between research areas i.e. cooperation between ecological and human use research and focusing on both vegetation and wildlife. This interdisciplinary approach to research should also be reflected in management i.e. representatives from various fields in management or advisory positions. The geographical separation between the Parks should also be eliminated for research purposes. Thus, projects would focus on a four-mountain parks level, which encourages a "whole ecosystem" approach rather than the arbitrary boundaries established for bureaucratic governance of the Parks system.

4) **Structural difficulties that inhibit scientific research**
This subject is closely related to the previous one. If integration was encouraged, many of the structural difficulties would also improve. For example, the roles of the science secretariat and warden service need to be better defined. As the secretariat is meant to provide research direction, more scientific specialists (presently one biologist per secretariat) must be added e.g. at least one human use specialist. In addition, scientific ferment and communication would be greatly encouraged between the Parks if the study centres were located closer on a geographical basis or organizational level. In addition, links to outside scientific communities i.e. universities must be made.

2.3.2 Summary From The Social Thematic Group

Social science research in the Parks is more appropriately referred to as "human dimensions" that addresses issues of policy, organizational structure, public involvement as well as the visitor and user of park environments. The social group pointed out that, until recently, research of human dimensions has been sorely lacking. This research area requires fundamental baseline data as well as more sophisticated studies of visitor behaviour and management.

i) The Vision Statement
The group agreed that some revision of the vision statement was necessary. From a human dimensions perspective, the role of education needs to be made central to the vision of the Parks if ecological integrity is to be achieved. The group agreed that the following suggestions needed a higher profile in the vision:

a) Define what Parks Canada wants the visitor to come away with. The group acknowledged that this should focus on an appreciation and respect for the natural and cultural heritage of the National Parks.
b) Acknowledge the role of the Parks in educating the visitor and the general public about park issues that management faces.
c) Explain to the public the reasoning behind management decisions in the Parks such as user fees, assigning responsibilities to the park user, vegetation and wildlife management, and appropriate activities. This would be facilitated by addressing (ii).
d) Convey to the public the contribution that National Parks makes to the sustainability of regional ecosystems.
e) Increase the level of "park literacy" in society in terms of the roles that protected areas play and the contribution that they make to society's social, psychological, economic and environmental well-being.

f) Provide opportunities for positive visitor experiences that support Park values and ethics.

ii) Research Needs

The group identified three broad categories of research and related data requirements:

a) ongoing baseline research and data needs;
b) issue-oriented research and data needs;
c) strategic research and data needs.

In addition, a comprehensive and critical assessment of existing data is a precursor to a human dimension research program. This program must encourage consistent data collection, periodic reassessment of survey needs and replication of surveys and studies over space and time (longitudinal focus).

a) Ongoing Baseline Research

1. Collection of data relating to front and backcountry users;
   a) To recognize increasing importance of day users.
   b) Information on user numbers, profile characteristics of users;
   c) Fundamental user patterns in terms of activities engaged in, where, when, how long.
2. Analysis of more complex issues (beyond basic head-counting) regarding recreation demand including;
   a) what are the attributes of the physical, social and management setting that influence the quality of recreation experiences and satisfaction.
   b) what are the motivations underlying park visitation and what are the experiences being sought;
   c) what are the benefits derived from park visitation.
3. Collection of data that pertains to park visitor preferences and the factors that influence choices including decisions relating to activity substitution and displacement.
4. Gathering of basic data on visitor expenditures and the capturing of market values.

b) Issue-Oriented Research

1. Assessment of program effectiveness (e.g. interpretation program) in terms of stated mandate, including pre and post studies.
2. Examination of trade-offs in the context of alternative strategies and choices.
3. Social carrying capacity - as the basis for facilitating visitor management strategies such as Limits of Acceptable Change (LAC); Visitor Activity Management Process (VAMP); Visitor Experience and Resource Protection (VERP); Visitor Impact Management (VIM); Recreation Opportunity Spectrum (ROS).
4. Assessment of appropriate uses and activities within Parks in relation to National Parks mandate.
5. Human/wildlife interactions.
6. Assessment of user fees and willingness to pay studies including non-use values.

c) Strategic Research and Data Needs

1. Importance of marketing in promoting the appropriate park image. Use of demarketing where there are problems of over-use.
2. Application of marketing that place National Parks in a regional context - where necessary directing non-appropriate recreational uses to surrounding areas - in such a way that National Parks contribute to regional sustainable development. Proactive involvement by Parks Canada.
3. Identification of future trends in outdoor recreation based on demographics and other variables that influence recreation choice and decisions.
4. Examination of the potential role of collaborative partnerships with research to marketing of parks.
5. Development of performance indicators that can be used to assess relative success of program effectiveness.
6. Synthesis of social and ecological data that will contribute to protecting the ecological integrity of the park while providing a range of visitor - recreation opportunities.
7. Assessment of national parks futures in the context of regional growth patterns, tourism and land-use strategies and planning in adjacent areas.

d) Related Considerations

1. Greater attention to Park Management Plans being based on social research and related surveys.
2. Involving managers in survey design in order to ensure that the resultant data can contribute in a meaningful and timely manner to decision making.
3. Adoption of experimental approach including pre and post studies relating to visitor satisfaction in both the backcountry and front country. This would include methods of developing a better understanding of the day user.
4. Importance of transfer of knowledge and research findings between National Parks and collaborating agencies.

Recurring Themes:

- need for baseline research and data collection.
- collaboration/cooperation between social scientists and natural scientists.
- need for public education regarding the role of National Parks.

2.3.3 Summary From The Economic Thematic Group

The economic group identified an extensive list of research gaps.

i) Vision

The group did not critique the vision but viewed the research shortcomings as "constraints on the vision."

ii) Research Needs

knowledge of trade-offs (monetary and non-monetary).
poor baseline model specific to Park use and specific areas in Parks.
trend information to predict future use.
budget/staff resources
    lack of internal skill sets.
    lack of understanding of what skills are needed.
knowledge of "client" identity and expectations.
understand changes in regional land use and impacts on parks.
information on conflict in objectives between park managers and entrepreneurs (developers?).
political/bureaucratic will to forge solutions.
creative solutions to public involvement challenge.
microsite objectives.
knowledge of research and tool development in other areas.
technology transfer.
investment options.

The group proposed several short - medium term research projects to remedy the above research shortcomings.

iii) Potential Projects

a) Review/modify permit systems to build baseline information. The goal is to collect time series data for comparison and forecasting purposes.
- link system throughout mountain parks
- link to GIS/management zone/Bear Management Units.
- common data base design.
    e.g. origin, destinations, past use history, purpose of trip.

b) Consider experimental approaches to learn how to modify human use. The goal is to predict human use under various management approaches and to alter human behaviour, particularly site choice.
- differential fees.
- change in structure/facilities.
- tolls.

c) Build stewardship goals into land use tenure agreements.
- for example, introduce performance measures for ecological and experiential factors.

d) Understand the effects of marketing on park/season/choices etc.
- develop choice scenario modeling tools.

e) Forecast recreational demand for Park use.

The group concluded with a discussion on how the suggested research objectives could be achieved from a management perspective. These recommendations are presented in section II.

2.3.4 Summary From The Cultural Thematic Group

The current cultural research program consists of the following elements: collection management, built heritage (e.g. Skoki Lodge, Twin Falls Tea House), archeological resources, traditional knowledge and eco-history. The group identified the weaknesses in the program, how these weaknesses could be remedied and the reasons for supporting cultural research in Yoho and Kootenay Parks. Participants articulated the goal of the cultural research program: to apply human, land and resource models to inventory and describe the human use patterns of Yoho and Kootenay Parks to define the role of human use of the ecosystem.

i) Vision

This group did not critique the vision statement.

ii) Research Needs

The group identified the following weaknesses in the cultural research program:

- integration/cooperation with First Nations i.e. Ktunaxa Kinbasket.
- integration of cultural information with current management decisions.
- interpretation and analysis of existing cultural information.
- lacking links to place names, traditional use studies and archeological information.

Participants outlined the research required to fill the identified gaps:

a) Build relationships with First Nations to establish mutually acceptable objectives and joint research goals;
b) Conduct research to identify places, names, patterns of use, significant events, including spiritual and mythological events;
c) Obtain a comprehensive inventory of archeological, cultural and utilized ecological resources (e.g. biological, vegetation, palaeo-ecological, palaeo-climatological);
d) Conduct scoping study to inventory, determine significance and condition assessments of the Built Heritage of the parks including privately owned heritage facilities e.g. Field and OCA.

This research program was seen as influencing management's ecological and cultural resources decisions. First, cultural research would provide an historical perspective on the range of natural variability and contribute to the definition of the parameters of ecological integrity. Second, it would ensure appropriate management of cultural resources. Finally, the above strategy provides accountability for cultural protection.

2.3.5 Combined Group - Human dimensions Thematic Group

Some of the suggestions for research were:

Backcountry use – economics.

Need for front-country studies as well – day use, person corridors and campgrounds for data.

Park literacy – Parks are hesitant to get into marketing because it will increase visitors but this can be used in more positive ways to distribute impacts. Need to ensure that other agencies are also informed of what our marketing position is and the image we want to be presented.

Human use versus ecological – not versus but "combined" – where opportunity exists for cooperation this should be encouraged.

Look at potential park visitor and non-park visitors. Parks are huge generators of "passive use values". People are concerned about the welfare of parks without being visitors. Visitor values can be easily captured. Non-visitors contribute $ to parks i.e. Exxon Valdez spill – huge $ from outside to rehabilitate ecological area. A lot of good information/examples that demonstrate value of wildlife species. Non-market values often outweigh "next-best use". Need more research in this area.

Performance indicators – way of justifying programs in government – need to keep in mind that science data needs to be supportive of performance indicators i.e. science that supports indicators gets funded [but shouldn't it go the other way around as well—science needs to identify indicators to be funded]

3.0 Integration and Decision Frameworks

3.1 Introduction and Overview of Session

This session started off with Richard Roberts presenting a summary of the commonalties and differences from the previous day. This was followed with a series of presentations to set the stage for the participants to break into small groups to discuss and develop recommendations on Integration and Decision Frameworks for the Kootenay and Yoho National Parks Science programs.
Presentation of examples of integrative frameworks

- "No Net Negative Environmental Effects for Communities" – Dave Dalman
- Cumulative Effects Assessment – Jasper National Park Three Valley Confluence experience - Doug Hodgins
- Habitat Effectiveness – Al Dibb
- O'Hara – Derek Petersen
- Bow Valley Terrestrial Ecosystem Model – Dave Dalman

The participants were separated into three multidisciplinary groups for this exercise.

Section 3.2 outlines the results of the three working groups.

3.2 Summary of Comments and Recommendations for Integration and Decision Frameworks

For this component of the workshop, participants were asked to comment on the following seven categories:

a. decision making;
b. integration;
c. priority setting;
d. funding;
e. opportunities for partnerships;
f. stakeholder and public involvement;
g. input into development of external research programs.

Participants exhibited a great deal of energy and excitement during these group sessions.

An eighth category, "performance measures" was added based on feedback from participants. For the purpose of this summary, these eight topics are divided into two "super-categories" that pertain to the management function: 1) planning and 2) implementation. Note also that management level suggestions from Saturday's discussion are also incorporated. A third "super" category addresses issues pertaining to the parks as an organization.

1) Planning

One group summarized the focus of park research planning with the question: "what should Parks be?" Each group discussed the importance of a research mandate for the parks based on the vision statement. One group pointed out that the National Parks lack an overall philosophical framework to guide management decisions. The notion of ecological integrity was thought to provide some guidance but the term itself — as mentioned — needs to be better defined and understood.

a) Decision Making

If ecological integrity is the basis for decision making, the point of integrity must be identified. Participants agreed that this "starting point" must be derived from baseline data. The other impediment to decision making lies in the difficulty of interpreting federal policy for the individual park level. The comment was made that Yoho and Kootenay need federal policy to guide decision making but must also have the freedom to direct funds where necessary.

Quotable Quote: "Parks are the balance -- they should be as good as it gets!"

One group suggested a number of different planning structures to guide research needs as an alternative to the traditional taxonomic framework (i.e. vegetation, wildlife, aquatics). Jasper, for example, uses an hierarchical approach with the categories: genetics, population, communities, and landscape. Yoho and Kootenay's present structure prioritizes ecological concerns but a more holistic approach would improve management's focus:

a) Population Viability - i.e. the probability of a group of animals surviving over a specified time. Population viability could be used as a super-category to provide organizational structure; however, this approach emphasizes ecosystem components (i.e. species such as carnivores, fish, and birds) and often ignores ecological processes (predator-prey relationships such as wolves killing elk);
b) Population Dynamics - may be a better choice because it is more process oriented. It refers to parameters such as birth rates, mortality rates, age of breeding etc.;
c) Functional Links - stresses ecological processes. Could also be excellent indicators of ecological integrity or ecosystem health.

The group concluded that whatever framework would have to capture ecological components, processes and patterns.

To assist decision making processes, the Parks should look at decision support techniques such as computer decision making models. An example given was the CS project in Alberta

b) Integration

Participants suggested that integration needs to take place on various levels: Primarily research areas must begin to cooperate — i.e. ecological and human use research — focusing on vegetation, wildlife and human use. This interdisciplinary approach to research should also be reflected in management i.e. representatives from

various fields in management or advisory positions. The geographical separation between the field units should also be eliminated for research purposes. Thus, projects would focus on a four-mountain parks level, which encourages a "whole ecosystem" approach rather than the arbitrary boundaries established for bureaucratic governance of the Parks system:

a) contextualize the park within the broader landscape — i.e. concerns do not end at the park boundaries;
b) integration of disciplines - between management areas
integration of staff – more communication between staff and researchers. There was a suggestion to have monthly meetings over a beer
c) integrate review process at all levels of research: proposal, planning, implementation, evaluation. There was a suggestion on the need for a standard ***protocol*** for review

c) Priorities

Several research priorities were identified throughout the weekend. These were reiterated by Sunday's working groups. According to participants, the parks (and management in particular) must focus on the following areas:

a) Park's mandate -- Parks must decide the underlying mandate for research;
b) hot issues are (and will always be) a priority;
c) stressors on environment;
d) long term goals i.e. support for endangered species;
e) gaps: in knowledge necessary for management;
in data necessary for research;
human use research;
invertebrates;
non-large mammals -- search for useful indicators.
f) opportunities - consideration in setting priorities (matching funds, joint park projects);
g) multidisciplinary projects/research benefiting a number of areas — these projects are to be given priority.

One discussion regarding the strengths and weaknesses of parks and staff led to the suggestion to make the Parks a Centre of Excellence for select research topics. This would allow the Parks to focus on an area or number of areas that have particular importance or relevance to the Parks' unique environment. The parks could become known in the scientific community for this research.

Participants outlined a number of ways for management to go about setting priorities:

a) baseline monitoring and data collection - this preliminary requirement will lead to a better understanding of ecological integrity;
b) human use research i.e. garner human use data from a system of consistent permits across the Parks;
c) the Parks must accept that they can't do it all;
d) no net negative impacts - mentioned as a guide for management decisions;
e) client relationships/meeting expectations -- look to the visitors for guidance (see public involvement);
f) auditor general's report – contains a number of excellent suggestions for the National Parks.

2) Implementation

Participants gave a number of suggestions for external research programs, opportunities for partnerships, funding, and performance measures/feedback. Note that the first two categories have been collapsed into one and the last category was not presented to participants but was revealed by group discussion. Each group mentioned the importance of having a human use specialist on staff to ensure this research discipline is incorporated. Suggestions were to have a backcountry specialist tied to human use research; to have a human research specialist on each secretariat board; to have this person responsible for communication and education on human use issues within and without the organization. The second impediment to implementation that was recognized across the board is the lack of a general protocol for research, i.e. a standard for data collection, publication and attribution.

a) Funding

Participants identified certain topics that were in need of funding and gave suggestions for funding alternatives:

a) look for outside funding to continue research on large animals - this was seen as a research area that wins public sympathy; therefore, look to organization such as the World Wildlife Fund, corporations etc. to finance this research;
b) funding priority should be given to projects that are multi-disciplinary in their focus - taking advantage of economies of scale as well as good research tactic;
c) note that competition for funding not good for research – encourage collaboration;
d) partnerships with private sector for: visitor studies, expenditure analyses;
e) collaboration between government departments: share resources, instruments, data;
f) differential fees – use extra revenue for research;
g) examine ways to retain revenue over time and redirect to research;
h) CREE - potential funder.

b) Partnerships/External Research Program

The working groups were united in their suggestion that the Parks' science program needed better communication and interaction with the "outside world." The groups gave four remedies to this problem:

a) peer review — the research program needs to implement an independent peer review process both at the proposal stage and the product stage;
b) communication of results: the National Parks presently do a miserable job of making past research available.
   i)external publishing of research reports
   ii) web site: the participants noted several difficulties with this suggestion
      - lack of political will to release information to public
      - difficulty of getting "approval" for distribution of a single report i.e. Grizzly Bear Report
      - lack of funding for such a task;
   iii) advertise for research teams on "up and coming" research issues;
c) links to universities — the Parks are neglecting a very able and willing research resource e.g. Canadian Forest Service:
   i) sponsor a university chair;
   ii) hire graduate students;
   iii) create graduate program;

d) multidisciplinary advisory board — implement a board made up of internal and external specialists in all pertinent areas i.e. ecological specialist, human use specialist, to advise management at various stages.

It was noted by one group that the Parks need to keep *control* of research projects in all partnership situations.

c) Performance Measures/Feedback

This aspect of management, essential to achieving goals and planning for the long-term was seen as lacking in the present research structure. Participants gave several suggestions to improve the situation:

a) provide positive feedback to staff by acknowledging staff contributions. One participant pointed out that there is "no reward for taking risks.";
b) increased awareness of past and ongoing research – reiteration of need for a complete database or archive of past Parks research projects i.e. annotated bibliography or website;
c) use variable performance measures. Participants pointed out that ecological performance measures vary e.g. diversity, inter-species relationships, but also visitor satisfaction – must get a handle on these variables;
d) requirements for research integrity must be achieved. One participant pointed out that good research must conform to the following requirements:
   i) rigorous;
   ii) systematic;
   iii) repeatable;
   iv) documented and communicated;
   v) adaptive;
   vi) non-intrusive.

3) Organizational Problems

a) Encourage a 'culture' supportive of science

Participants lamented that presently Yoho and Kootenay Parks do not have a corporate culture that supports scientific research. First, the parks base many decisions on the false dichotomy between applied and pure science and similarly between research and monitoring. Part of a culture of science is realizing that these divisions work contrary to establishing a good science program. The second problem lies in the perception outside the Parks that it is very difficult to get approval to conduct research in the national parks. This must change to encourage research. One participant suggested that management needed to view scientists as clients versus scientists as contractors. Other ways to improve the research climate have already been noted such as implement the peer review process, monitor and publish research results, and reward risk-takers and good work.

b) Structural difficulties that inhibit scientific research - This subject is closely related to the previous one. If integration was encouraged, many of the structural difficulties would also improve. For example, the roles of the ecosystem secretariat and warden service need to be better defined. As the secretariat is meant to provide research direction, more scientific specialists (presently one biologist per secretariat) must be added e.g. at least one human use specialist. In addition, scientific ferment

and communication would be greatly encouraged between the parks if the study centres were located closer on a geographical basis or organizational level. In addition, links to outside scientific communities (i.e. universities) must be made. Finally, participants agreed that continuous reorganization of Parks staff must cease. The instability and cutbacks of the past few years have been devastating both for the planning and the morale of the science program.

Appendices

Appendices

Appendix One
Science Workshop Agenda

Key Workshop Objectives:

- to provide a comprehensive identification and prioritization of science related issues.
- to assess the current science program and provide advice relating to required adjustments.
- to provide direction on an appropriate framework for the management of the science program within a context of supporting decision making.
- to advance the integration of social, economic and ecological sciences as related to the management of Yoho and Kootenay National Parks.

Day One – Evening, Friday, October 16 (7:00 p.m. – 8:30 p.m.)

Objectives
To welcome participants
To communicate the importance of science to the management of Kootenay and Yoho NP's
To outline the role of science from a Parks Canada point of view
To identify the need for an integrated science program
To create an expectation for the results and outcomes from the workshop

- *To create a common understanding of the individual participants areas of expertise and current focus of their research*

- Opening remarks and challenge for the workshop – Superintendent
- Overall introduction to set the stage for the workshop
- current status of the science program including budget – Derek Petersen
- review of reference binders (as supplied to each participant) – Derek
- description of how the current science priorities were established - Derek
- relationship to Banff National Park program - Derek
- Management planning process – status, broad perspective of issues, and overview of fact sheets) – Rod Pickard
- Walk-thru of agenda - Richard Roberts
- Participant introductions – each to provide a very brief (2-3 minute) introduction and overview of who they, or their group is and their current work.

Day Two – Saturday, October 17

Issues, Research and Monitoring
Breakfast 07:30 - 08:30 Toby Creek Dining Room

Expected Results:

- comprehensive identification and prioritization of science issues;
- review of, and recommendations for, changes to existing science program relative to identified issues; and
- agreement on vision and science principles.

A. Plenary (8:30 a.m. – 10:15 p.m.)

Objectives

- *To provide the directions for the second day of the workshop.*
- *To provide participants with details on the current Science Program.*

Approach

3. Opening remarks and challenge for the day – Superintendent
4. Roles and process – Richard
5. Agenda discussion - Richard
6. Scope/purpose/objectives
7. Approach
8. Detailed review of existing science program and how it is attempting to address the identified issues – 10-15 min. thematic presentations by: Alan Dibb (wildlife), Rob Walker (vegetation), Charlie Pacas (aquatics), Derek Petersen (socio-economics), Rod Heitzmann (cultural) and Rod Pickard (vision and principles).

Health Break 10:15 - 10:30

Concurrent Thematic Sessions (Three Groups) 10:30 a.m. – 4:15 p.m.)

Lunch 12:00 - 1:00 Toby Creek Dining Room

Thematic groups to consist of:
heritage resources - ecological (resource people - Alan Dibb, Rob Walker, Charlie Pacas)(workshop leader - Paul Paquet) and cultural (resource person - Rod Heitzmann) - recorder - Andrea Matishak
social/human use (resource person - Derek Petersen)(workshop leader - Guy Swinnerton) - recorder - Shaunna McInnis
economic (workshop leader - Peter Boxal) - recorder - Stevie Coy

Objectives

- *To provide the opportunity to review and comment on the vision and principles.*
- *To provide the opportunities for in depth thematic discussions on the scoping and prioritization of current and future science issues within the parks.*
- *To have participants assess the adequacy of current research and monitoring in terms of providing an information base for management decision making.*
- *To have participants make recommendations on potential research which could be undertaken and what it could contribute.*

Approach

- Comments on vision and principles,
- Scoping and prioritization of current and future issues,
- **Comments on changes and prioritization of current science program (including specific research projects and monitoring initiatives).**

Health Break 3:00 - 3:15

Plenary (4:15 p.m. – 5:30 p.m.)

- group presentations on results from concurrent sessions

- general discussion

Dinner 6:30 Toby Creek Dining Room

Day Three – Sunday, October 18

Integration and Decision Frameworks

Expected Results:

- recommendations for an integrated framework for managing the science program

Breakfast 07:30 - 08:30
Plenary (8:30 a.m. – 9:30 a.m.)

Objectives

- *To provide the objectives for the final day of the workshop*
- *To outline relevant and related initiatives within Parks Canada*

Approach

- Opening remarks & challenge for the day – Superintendent
- Summarize Day 2 for commonalities and differences – Richard
- Agenda discussion for Day 3 - Richard
  - purpose/objectives
  - approach
  - expectations
- Presentation of examples of integrative frameworks used (or attempted) (10 minute presentations)
  - *Introduction - Derek*
  - "No net negative environmental effects for Communities" – Dave Dalman
  - Cumulative Effects Assessment – Jasper National Park Three Valley Confluence experience - Doug Hodgins
  - Habitat effectiveness – Al Dibb
  - O'Hara – Derek Petersen
  - Bow Valley Terrestrial Ecosystem Model – Dave Dalman

Health Break 10:00 - 10:15

Concurrent Group Sessions (Three Multi-disciplinary Groups) (9:30 – 12:00 p.m.)

Objectives
Discussion of an appropriate framework for managing the following components of the science program.

Approach

Each group to identify recommendations on :

- Decision making
- Integration
- Priority Setting

- Funding
- Opportunities for Partnerships
- Stakeholder and public involvement
- Input into development of external research programs

Lunch 12:00 – 1:00

Plenary (1:00 p.m. – 2:15 p.m.)

Presentations by each of the three groups

Health Break 2:15 - 2:30

Plenary cont'd (2:30 p.m. – 4:00 p.m.)

Objective

- To synthesize independent group comments for science program management (decision making, integration, priority setting etc.)
- To provide specific recommendations for an integrated science program and recommendations for research and monitoring.
- To obtain suggestions from participants on options for ongoing participation in the development and implementation of the Kootenay/Yoho Science Programs (development and peer review)

Approach

- Discussion on "An Integrated Management Framework for Science" - Richard
- Overall recommendations from participants
- Comments on current program and suggestions for changes
- Setting priorities for research and monitoring – both short term and long term
- Suggestions for ongoing involvement of the science community - Richard
- Where to next - Richard
- Distribution of workshop evaluation - Richard
- Concluding remarks -Superintendent

Closing (4:00 p.m.)

Appendix Two
Participant List

ECOLOGICAL

Academics

- **Paul Paquet** - University of Calgary
- **Rob Longair** - University of Calgary
- **Peter Achuff** - Parks Canada
- **Lee Jackson** - University of Calgary
- **Brendan Wilson** - University of Alberta
- **John Woods** - Parks Canada

SOCIAL

Academics

- **Guy Swinnerton** - University of Alberta
- **Bonnie MacFarlane** - Canadian Forest Service
- **Philip Dearden** - University of Victoria

Stakeholders

- **Eugene Thomlinson** - Parks Canada
- **Per Nilsen** - Parks Canada
- **Will Wistowsky** - Consultant

ECONOMIC

Academics

- **Kim Rollins** - University of Guelph

Stakeholders

- **Peter Boxal** - Canadian Forest Service
- **John Thompson** - Alberta Natural Resource Conservation Board

CULTURAL

- **Rod Heitzman** - Parks Canada
- **Wayne Choquette** - Ktunaxa/Kinbasket

Parks Canada Invitations:

- Darro Stinson, Steve Whittingham, Derek Petersen, Charlie Pacas, Alan Dibb, Rob Walker, Rod Pickard, Paul Galbraith, Dave Gilbride, Shaunna McInnis, Stevie Coy
- Dave Dalman
- Doug Hodgins
- Susan Hall
- Richard Roberts - Facilitator, Andrea Matishak - Praxis, Inc.

Appendix Three
Summaries of Pleanary Sessions and Individual Breakout Groups

Plenary Session
Saturday Morning, October 17, 1998
Panorama Resort

Steve Whittingham presented an overview of last night's session. The message from Darro Stinson for the Science Framework is for it to be simple, understandable and timely, and make wise use of resources. The workshop is an experiment

There is a common theme: A desire to see program integrated on a multidisciplinary level

Today is to take a look at the existing program in detail, identify strengths and weaknesses, changes to program, and things to continue.

Richard Roberts outlined there will be four major groups: economic, cultural, social, ecological We want each of these groups to work together, identify recommendations for prioritizing research in two parks The group work will occur this afternoon from 1 – 4:30. Tomorrow will deal with the management structure and address the question on how can we manage this program.

Park Management Planning Process - Rod Pickard

- Draft Vision: The Kootenay and Yoho National Park Management Cornerstone
- Preserve and strengthen the ecological integrity of both parks.
- Important part of the Rocky Mountain World Heritage Site.
- Important role in Central Rockies regional ecosystem.
- Limits to development and use are necessary if the legacy of both parks are to be passed on.
- Stress on the shared regional ecosystem.

Core Vision: protected areas; unbridled beauty; strong symbols of Canadian identity; recognized in Canada and around world for rugged mountains, rustic architecture, lakes, forests and wildlife; regional connecting people…

Key Themes:

Working with others – for management objective (motherhood) all levels of government.
Ecological integrity definition – various components of natural ecosystems are there, processes, i.e. fire, a perceptual definition.
Protection and integrity.
Development and Human Use.
Public Involvement.
Research and Science.
Partnerships.

Communication and Education.
Question or Comment. The idea of public involvement – opportunities to comment, or to participate? Will it make a difference? Do you envision the public as playing a more active role in management plan. If so, needs to be expressed. Answer: Worked hard to build a plan with people who are informed and interested. General public is involved in another phase. We do need to make that distinction.

Question or Comment. There's an entire science that evolves around partnerships – need to realign interests with resources available. If research and science as third point, might want to expand that section (don't just use terms loosely but realize that these points are part of science as well)

Question or Comment. Flesh out these areas as vision in these meetings – rather than the previous vision that is long and descriptive. More details are required. This is the important part of the vision.

Question or Comment. What's missing is the fiscal point – fundamental part of it. Funding will invite public review for example.

Question or Comment. Under research and science heading. Indicates that research and science is fundamental management tool. But basic mandate of parks should be research in general, not just for management purposes.

Question or Comment. Back to Communication and Education: Parks is going through a phase to strengthen this area. Has been cut severely. Need to work closer with businesses. Struggling right now in this area.

Question or Comment. This reads that education will achieve management objectives, but public education is also a fundamental enjoyment of parks visitors as well.

Question or Comment. A lot of things we've heard, is about visitors. There's a huge clientele that doesn't visit the park. Focus on non-visitors as well. Has to be some attention about the value of parks as park without having to be a visitor. Preservation values alone for future.

Question or Comment. Role the national parks play in a society and regional landscape. Role the parks should play in society.

Components of Vision - Rod Pickard

Adopt and integrated approach to decision-making for the Central Rockies ecosystem.
Develop a heritage tourism strategy that links human use and ecological concerns.
Establish clear limits to growth of Outlying Commercial Accommodations (OCA's) and Field community.
Develop human use framework for overnight and shoulder season use.
Develop science plan.
Implement cultural resource mgmt plan.
Adopt environmental stewardship strategy.
Implement controlled burn program.

Strengthen communications to better enhance understanding of the nature, culture and history of both parks.

Question or Comment. In making decisions for central Rockies ecosystem , how do you communicate the boundaries of area? How do you make decisions across boundaries? Can talk about science programs and about lower boundaries. Research programs need to be based on ecological relationships – note well the need to be able to communicate across these boundaries so that these scientific goals are carried across.

Question or Comment. This happens with human use issues also. i.e. trails in Banff are also linked to Yoho etc.

Question or Comment. There are some integrated groups for different ecological issues that include all the parks. Room for a lot of improvement.

Question or Comment. An are of interest for science/economic planning – developing stronger relationships here. This should be part of visioning process. Point out up front that we are part of a greater whole. Do what you can in your jurisdiction but work to integrate. Will distinguish you as catering mgmt plan to dovetail a greater management plan when other parks catch on.

Wildlife - Alan Dibb:

Projects, research, restoration

No. of species:	Yoho	Kootenay
Amphibians	4	4
Reptiles	1	3

All of species are at risk in one way or another.
Grizzly – threatened National List, Provincial List, Special Protection.
National (vulnerable) grizzly, wolverine, caribou, great blue heron, flamulated owl.
National Park List – grizzly, mountain sheep, mountain goat.
- this list protects species susceptible to poaching, and other dangers.

Major Issues

Highway, railway collisions.
Impacts of visitors: declining habitat, increasing shoulder use.
Wildlife habituation, facility redevelopment.
Landscape fragmentation and impairment of corridors
Loss or degradation of rare, low elevation habitats and winter range in the Columbia Valley.
Development around park boundaries; access management.
Information gaps.

1) Wildlife mortality – e.g. Elk population declined significantly, highway mortality has dropped however.
2) Habitat effectiveness - measures degree to which useable habitat for wildlife becomes unavailable for species due to human activity, Example – logging in valley between Kootenay and Yoho.

3) Protected areas – land use plan added some park area in 1991 – low elevation parkland is very small – 2 –3 %; Alpine – 30 – 33%; gap in ability to preserve habitat is difficult because of low amount of protected low area.
4) Road densities – not a lot of wilderness areas outside of Alpine zone.
5) Importance of Columbia valley – almost whole Columbia valley is occupied by one land use or another.

Wildlife program

Various projects – lynx ecology, badger ecology, grizzly bear research, Winter track surveys, CDC dragonfly, Radium Hotsprings wildlife, bighorn sheep, Central Rockies Wolf Project, Rocky Mountain Grizzly Bear Planning Committee (multi-jurisdictional collaboration);, Field Townsite Restoration.
Wildlife Monitoring.
Various projects – surveys, observation of different animal groups.

Issues:
Communication with parks and public – in terms of ability to inform and influence the public – how communication can be facilitated. Info and data management is also an issue. We don't want to be swamped with managing reams of data.

Question or Comment. Who sits back and synthesizes all of the information on ecology – this is an evolving function of our group. We do need some frameworks for this.

Vegetation Management – Rob Walker

Status and trends:
1. Fire – recent period of little area burned.
2. Other forest disturbances – mountain pine beetle, blowdown – as long as these are natural occurrences then we have a hands-off policy.
3. non-native species – over 100 mostly in restricted disturbed sites, small footholds of invasive species.
4. Question. Does park have policy for use of non-native species as biological control. Answer: it is an option available. Question. Are you including non-native species distributed through horse use? Answer: Yes. Question. Are we looking this in terms of getting rid of them? Answer: They're not native so they are a problem but it varies how we address them.
5. Diverging regional landscapes – extensive resource harvesting on adjacent lands, sharply defined boundaries, rapidly diverging trends. In whole corridor there are grave concerns about what this means to ecosystem function. More clearly defined boundaries as a result. Some of management approaches, there's a penalty to being a protected area.
6. Wildlife habitat – need to integrate the vegetation with ecological habitat in general; critical landscape components at risk from lack of fire (needed for rejuvenation), general loss of landscape diversity.

The Issues:
Increasing risk to facilities and public from wildfire.
Question or Comment. Already been studies of logging and underburning versus burning and effects on vegetation. Seen little difference. Answer: Some places its

acceptable. Logging is a whole different story. Burns are cheap and you get the full effects of the fire from this.
Other Forest disturbances – the "naturalness" of the current state of forest health
Non-native species – ecological consequences of continuing invasions by non-native species.
Diverging Landscapes increasingly divergent forest age.
Wildlife Habitat – Fire issue.
Knowledge Gaps – complex systems and interactions make defining detailed ecological objectives difficult.

Proposed Strategies

1. Annual program of fire introduction.
2. Focus the fire management program on priority ecological concerns, fuel management for values at risk and fundamental research.
3. Collaborative research to assess park's forest health i.e. mountain pine beetle
4. Annual program of non-native control.
5. Participate in regional multi-agency planning and management.
6. Conduct an annual fuels management program.

Aquatics Management - Charlie Pacas

National Parks Plan – provides strong foundation.
1981 – state of parks report – outlined various issues and status of these issues.
1990s – workshops dealing with threats and issues.
National Directive on Aquatic system.
General principles outlined in binders.
Foundation exists - need to concentrate of knowledge.

- biggest hindrance: scarcity of past data, past data collections inconsistent, data gaps exist.
- shortage of info., little on eco. Stresses, impact of logging.

Areas of concerns/opportunities

1.Aquatic biodiversity: fish stocking, competition from non-native, fishing, habitat change, pollutants.
note: aggressive stocking program has been detrimental. Was in an effort to attract people.
Stocking eliminated or partially supplanted native species.
Bull Trout – a lot of pressure on stocks.

2. Water Quality : urbanization of Field, Waste Water treatment (Fields', OCA's, B/C – non-existent), Monitoring H2O quality, Canadian Pacific Railway (CPR) Yards, Radium Hot Pool - discharges no longer a concern), Corridor Contamination/Spills, Logging in Kootenay Watershed
Banff Management plan – new higher standards for waste water treatment
Lack of bio indicators of highway use – i.e. exhaust, heavy metal etc.

3. Water Flows: transportation corridors - has been modified, water withdrawals/stream blockages.

Major concern – Trans Canada Highway and CPR may be twinned in future – what impact will this have on the aquatic system?

4. Human Use: Overfishing (i.e. Emerald Lake, Kicking Horse River), Vermilion/Kootenay/Kicking Horse Rivers – use levels (social and ecological impacts).
Note; no studies done at this time, they are needed.

5. Investments: aquatic inventory incomplete and out of date, genetic status unknown, monitoring program for aquatic indicators, standardization of data bases.

6. Threats – increased visitation, transportation (twinning), pressure on fish stocks and wildlife, activities in general.

Cultural – Rod Heitzmann

Human presence – last 10000 years in Yoho.
Cannot have complete understanding of ecosystem without humans effects - fire hazard/control programs, decreased wolf and affected other animal population, affecting vegetation, clearing and logging, settlement areas, established parks.
Park: responsible for multiple resource management i.e. heritage sites.
Cultural resource program – did basic inventory 1986-87 – archeological description and identification – not real detailed knowledge of what went on at these sites; impact assessments have taken place on various sites if they were seen to have an impact.
To understand role of humans: research program – Geographical Information Systems (GIS) analysis – want to create a model for screening mechanism, ecological data not specific enough to identify archeological data up until now.
Problem with different valleys – needed to be treated separately because of elevation.

Quartz crystal sites – human settlement goes back 4400 years ago – ties in closely to geological information, but don't know a lot about the people. Quartz used for stone tools.

1995 – what can archeology do to assist in understanding of ecosystem. Useful information – Aboriginal forest burning,
Most archaeological research – takes place at sites that are well stratified, intensively occupied and bone presence: most sites don't have those traditional components.
e.g. tools - blood and residue analysis – helps to identify animals hunted.

Dating of archeological materials also problematic – shallow sites, carbon samples difficult to identify – could have been burned. Use small pieces of bone for Radio Carbon Dating (RCD) – organic component often not identifiable or nonexistent.

Note – ecological returns are possible from archeological research i.e. meadow fire 8000 years ago – identified that this area was once forested.

Working with Aboriginal people to help understand cultural impacts of fire.

Columbia River – good source of archeological data – several sites were seasonally inundated by human use, abundance of stone tools – huge percentage of tool types that we don't normally find in the archeological record. A very complete bone record as well. Various types of animal bones.

Bison research - Lake Louise site where bison found in flood deposit. Bison occurrences – furthest north found here, known range of bison extended, grazing differences, a lot or research possibilities.

Major Literature Review of Ungulate Distribution

Archaeological and Historical. Research – trying to focus more on scientific issues as well as human use information.
Also taking advantage of chance discoveries like Bison find.

Socioeconomic Presentation – Derek Petersen

To achieve the draft vision, or obtain requirements of our mandate, there are a number of problems before us – there are some purely ecological and cultural problems before us.
Human problems – to illustrate the magnitude:
Current visitation at Banff (1996) – 9.5 million person entries; 4.3 million person visits
3 % growth rate – 2020 – 10.3 million visits
Kootenay – 1.86 entries, 1.18 visits; Yoho 3.3 ; 0.73
Important issues – estimates of 2.5% growth – recognition that we have a large social system that is entering this natural system. We do have a large land base but the reality is that we are injecting these visitor volumes into a topographically constrained area. These areas are most important for wildlife as well.

Within Yoho and Kootenay – no clear sense of how people are using the landscape, lack of understanding of detail.
Managing of trails – a lot of variability in how trail systems are managed.

Parks are broken into bear/carnivore management units – starting to look at these from ecological and social perspective – What are ecological constraints for these management units? – ecological constraints are first priority.
Question. Are you trying to understand what ecological conditions make people go one place over another?
Situational analysis (from ecological perspective).
Wildlife: corridors, habitat, mortality etc.
Cultural issues: a whole list of issues that cross over

Once we establish ecological needs we look at social needs – want to provide a range of opportunities for use.

Planning Units:
Visitor encounter expectations – what is a "high" encounter rate?
Parks Canada staff encounter expectations.
Management action for resources protection…
[want to let people know what they can expect – will help to help satisfy visitors' expectations from a tourism perspective].

Ecological Issue:
Effectiveness of bear management units.
Human use management is very reactive – i.e. area closures etc., beyond that we don't do much human use management beyond infrastructure.
Yoho and Kootenay contains little backcountry – much is accessible on day-use basis. This isn't as controllable.
Want to get out of regulatory control on people's activities – not supported by public.
Need to manage somehow – have to know how day users make their decisions
Also economic issues – fee structures, differential pricing – how do people react to this.
What tools do we have for managing access?

A lot of social research has been done. But we don't have strategic guidance for the program. Need social objectives and day-use management
Model.

Plenary Session
Sunday Morning, October 18, 1998
Panorama Resort

Session Introduction – Steve Whittingham and Derek Pedersen

Ecological vs. cultural/social group – the latter could more easily develop what the research could be because there is so little done in that area.
Goal for workshop – create a usable framework – take the next step.

1. framework
2. process "how do we do it?"
3. Projects – what should be done.

Today: take theme areas and integrate them

End of the day – will attach dollar amounts to projects.
How to priorize and where to invest the research dollars?

Comments on our process – what things do we need to do differently to get this job done.

Need to get ecological ideas flowing: lunch.

Summary of Main Themes from Saturday - Richard Roberts

1. Focus on multi/interdisciplinary approaches – needs to be integration between human and ecological aspects.
2. Baseline Data collection – expected in the economic/cultural area but surprised to hear same from ecological.
3. Get the human dimension on the table and into the process.
4. Need to understand changing needs of the visitor and the greater public.
5. Data issues –
   a) Not using data that's already been collected.
   b) More time-series data, longitudinal data i.e. core set of research activities but add on chunk/module for specific issues.
6. Communications –
   a) Internal communications at several levels, between the parks, and between working groups, also concern between parks and HQ (Ottawa).
   b) Passive use values – marketing to improve park literacy.
7. Need to get on with it – need to try out some of these ideas.
8. Tools and Methods – don't put all eggs in one basket. Distribute support in various projects with different tools.
9. Public Involvement – creativity or lack of it. People don't come out in droves. Good reason – burnout etc. People will participate if the political will is perceived as being there.
10. Getting away from annual funding crunch getting into more multi-year funding strategies. Need to have ongoing research, continuous research projects
11. New techniques – mapping, GIS, keep these going.
14. Management without context – has to get past this approach to management. Need for overall comprehensive plan will work to help contextualize management decisions.
15. "Culture of" science in parks – very important as well as the culture of social science needs to be addressed.

Group Discussion on Additional Themes from Saturday's sessions

Comment - don't get the impression that it will be easy to do the social science work that has been suggested. There are a variety of techniques that need to be used as well as a variety of disciplines that need to work together.

Economic group – paid attention to large issues as well as small issues that could be done to improve things greatly.

There is a lot of work that is being done in social area but there are so few people in this area. The problem is getting this information out to the community, and between those who are working in this area.

Science culture – talked about the two perspectives on science 1) science for Parks Canada – the obvious stuff 2) Parks for science – where the scientists are partners that come to us because they want to do something in the Park. This effects the way we want to develop the culture in Parks. One or 2-way street.

Question. Does park have research scientist classification? Answer: No. It's been intentional. "We don't do research." We may facilitate or manage it. This was a principle in the past but we've never moved past that. Maybe that's something that needs to be on the table. There's a lot of expertise around that isn't being used. Comes a lot cheaper than consultants. There's problem with trying to continually find people within the organization, exclusively use those people, or direct your research for those people: big problem is that research scientists fall behind the times.

What's the difference between a government research scientist and a university scientist? There are problems involved in just doing that redistribution, need to consider that as one option.

Need for concepts of partnerships. In the past this has been talked about with private sector. This could work with scientists as well: if science is for parks then the potential is there. These partnerships are going on now Canadian Forest Service and Sherk have an agreement. Answer - We don't have industry partners for some obvious reasons. They want to work outside the Park.

Doesn't mean you can't keep trying.

"No Net Negative Environmental Impact" –June 26, 1998 – Dave Dalman

- principle that encompasses the mandate of ecological integrity.
- performance measurement framework.
- applies only to National Park.

Achieved: collaboration between everyone!!!

Questions:

Question. – One of the assumptions is that things are ok in year 1. Has that been decided?
Answer: Underlying assumption is that if measurement identifies a negative result then that will be addressed. Would also hope that community plans would help.

Question. - What is the baseline? Are they already over the threshold?
Answer: e.g. Water – in pristine condition. This is the baseline. Will be translated through water quality standards that are set. Where that baseline is a good point to raise.

Question. - Term "compensation" Will that go both ways between commercial enterprises and non-commercial values? i.e. if the park does something and business needs to be compensated? Should business be paying compensation to the park as well?
Answer: That's a slippery slope.

Comment. - If it's going to go one way and not the other, then it's a dangerous route. It has to go both ways.

Question. - If this proves to be useful, it may be a way to approach relationships with highways and railways. Major stressors in park. Similar to a cumulative effects analysis. A way of applying cumulative effects.

Answer: We have those words "cum effects", and we don't want to introduce too many new terms.

Comment - Stress response framework is well known. If it's useful and simply then it can be applied to all sorts of things.

Comment. - Bottom line is that you can't make things work. Personally, I'd like to see things improve as well. Means that if you improve water quality in one area you can contaminate another to the baseline level.

Comment. - When you determine environmental costs, physical measurements will not do you any good. You are going to have to get into measure environmental costs.

Question. - Sounds reductionist (dollar values) but the problem is a common measurement scale. The Canadian Environmental Assessment act is full of holes, the private sector knows how to use it. Need to anticipate how to deal with it. To do that requires time and investment. What scale does this kick in? Or is it applied at a broader level? Could complicate any sort of change or development
Answer: Approach is to make communities accountable to what is being done.

Comment. - You might want to talk to Vic ? at U of A on non-monetary compensation. Might give you some ideas.

Habitat Effectiveness Model - Al Dibb

Comment. - You could do a lot with this model with a permit system. More people information could help with determining the human use.
Answer: Have to be careful with micromanaging something
This was a coarse scale. Difficult to make site-specific decisions with this information. Major limitation of the model is that it uses coefficients based on expert opinion.

Comment. - But even if your models aren't perfect, ours aren't either; but if we work together, don't have to wait until everything is perfect.
Answer: One of the other limitations is that the human use is modeled very coarsely. From testing different scenarios we've learned that it's really difficult to achieve some of these targets.

Comment. - At landscape scale you can make tradeoffs. Turn Lake Louise into high intensity use and discount completely for Grizzly use.

Cumulative Effects – Three Valley Confluence – Doug Hodgins

Attempt to indicate a suite of indicators – not just ecological issues. Trying to look at multiple scale, What can we do about all of this? Focusing on opportunities. Most gains will be in adjusting human use.

Question. - How do you incorporate measurement and process uncertainty in these models?

Answer: Some of them are apparent in grizzly bear models. This deals more at the structural level.

Question. - Two sorts of errors – calibration and measurement, but also processes you use to draw errors between the boxes. Are these deterministic or stochastic models?
Answer: Using radio telemetry data. Model assumed corrected and developed by expert opinion. A process of adjusting coefficients. This model is interactive and changes can be done quickly. They are also logged. Eventually the intent is to develop a stochastic model.
Trying to focus on Daro factor: putting together analytical tools that are meaningful in policy-decision making.

Comment. - In this cumulative effects there is an element of land use history.
Answer: All we can do is use the human features and existing disturbances and it is essentially a snapshot. Trying to assess the cumulative effects of all of that and trying to assess the cumulative effects from that.

Lake O'Hara –Socio-ecological Research Strategy – Derek Petersen

To provide Parks Canada with a decision model to provide strategy with dealing with human use.

Question. - What about the knowledge of substitute? You are taking someone who's already on the trail and telling them how suitable it is?
Answer: We identified the trail attributes and then asked what people are losing.

Question, - What you end up with is a series of management prescriptions. Were there some you arrived at that you wouldn't have got without the model?
Answer Yes, we did get some insights. Especially from counts and observation that we wouldn't have identified previously.

Question, - How well did the visitors respond to the trail closures? Was there enough to educate them why it was necessary.
Answer: Lake O'Hara has repeat, long –stay users. A lot of trails a day-hike trails. There was concern that different users would be impacted based on their use preferences. Part of strategy was to make there was a major communication effort. With the survey we asked a number of questions regarding management options. People were generally supportive.

Terrestrial Ecosystem Model – BOW Cumulative Effects Analysis

No notes from this session.

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pattern of aboriginal ignition is from known sources and what its characteristic should be in the Central Rockies. From examination of the fire histories in the parks, there are strong indications that aboriginal burning played a significant role in the montane areas of Kootenay and Jasper National Parks.

Another aspect of the archaeological component of the Ecohistory Projects was to assess known archaeological sites for their potential to contribute to a better understanding of the ecosystem. Over the last four years we have conducted test excavations at numerous sites in Kootenay National Park and at two sites just outside the park boundary in the Columbia Valley. The goal of these assessments was to develop a better understanding of how humans utilized the area of the Kootenay N.P. over time, what were the relationships of these occupations were to the known archaeological cultural affiliations in the surrounding areas and what animals and plants did they utilize.

Traditionally, most archaeological research of this nature has occurred at well stratified, intensively occupied sites with good bone assemblages. The testing of archaeological sites within Kootenay National Park demonstrated that the majority of sites were poorly stratified, occupied only intermittently and for short lengths of time, and had poor bone preservation. In fact, usually the only bone that survived was carbonized. To overcome this difficulty, I began submitting stone tools for blood trace immunological identification, a technique that has been used in forensic investigations for many years but has only been used in archaeological situations for the last ten years. Of the stone tools submitted, positive species identifications have made in approximately 25 % of the sample which is consistent with results from other studies where the technique has produced positive results between 25 and 40%. There are problems with this technique and if you're interested please talk to me later.

Blood residues indicate that a variety of species were hunted in the park in the past including bison, deer family, bear, canid and hare. In addition, identified bone of mountain sheep have been recovered at Sinclair Col and along Stottart Creek.

Dating of archaeological materials are most commonly done in two ways, use of lithic materials such as stone tool styles, materials and production technology to provide comparative dating to sites of known age and radiocarbon dating which provides a more exact date for a specific site. The difficulty of comparisons of Kootenay National Park materials is that the archaeological assemblages in the adjacent areas to the south, west and north are poorly understood. It is only to the east where extensive archaeological research has occurred along the Bow River near Banff and along the East Slopes of Alberta more generally. Even in that area, there is room for more extensive comparative study. Over the project, several projectile points have been recovered which have been useful for time comparisons. Most of these are from the late prehistoric period dating within the last 800 to 1000 years but one site yielded a projectile point that is likely to be 4000- 5000 years old. For much of the other stone tools recovered there just isn't enough comparative material in the archaeological literature.

Several samples of materials have been submitted for radiocarbon dating. In most cases I have tried to submit bone samples for AMS dating to ensure that I was dating cultural materials and not past wildfire burns. In some cases I have submitted carbonized wood when they were clearly cultural, such as, deriving from a hearth or when I wanted to date a particular burning event. The earliest date which I have obtained is 8580 +/- 60 yrs B.P. from a basal level at Sinclair Col which was not cultural but resulted from a burn of an alpine forest at a level at tree line today but in area that has been grass covered since that time.

As part of this project I hoped to do some consultations with the first nations groups near the park to obtain oral history and ethnobotanical data. When I talked to the Ktunaxa Kinbasket Tribal Council about this they had begun an oral history project of their own through funding from BC Forest Renewal. At about the same time, National Historic Sites Branch in Ottawa began a project to expand the commemoration of Aboriginal History within existing National Parks. This lead to several consultation sessions on the Paint Pots. In our discussions with the KKTC and Ktunaxa and Kinbasket elders several issues arose which are perhaps better dealt with through the management plan review currently underway. We did try to open improved communications with the KKTC and discussions were held with the KKTC archaeologist, Wayne Choquette about Kootenay Archaeology. In addition we employed two KKTC members as

Heitzmann, R.J. 1996 "Identifying Human Ignited Fires in the Central Canadian Rockies over the last Millenium." Paper presented at the Canadian Association of Geographers Conference, Saskatoon. Archaeological Services, Parks Canada, Calgary.

Heitzmann, R.J. 1997 "1996-97 Kootenay National Park Ecohistory Archaeology Project. Final Report. Archaeological Services, Parks Canada, Calgary.

Heitzmann R.J. 1998 "1997-98 Kootenay National Park Archaeology Projects. Final Report. Archaeological Services, Parks Canada, Calgary.

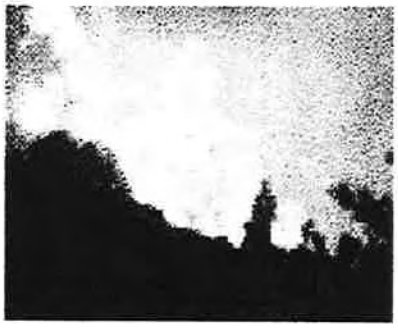
MacDonald, Graham 1998 Caribou and Human Agency in the Columbia Mountains: Towards the Environmental History a Species. Report prepared for Mt. Revelstoke/Glacier National Parks.

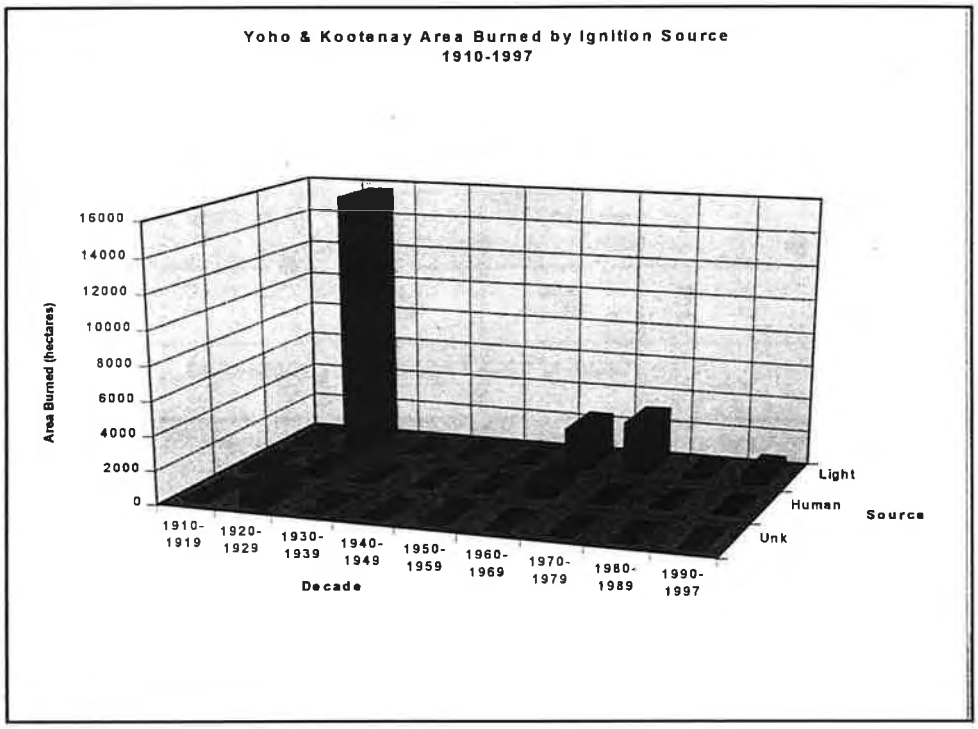
Vegetation Management Status & Trends

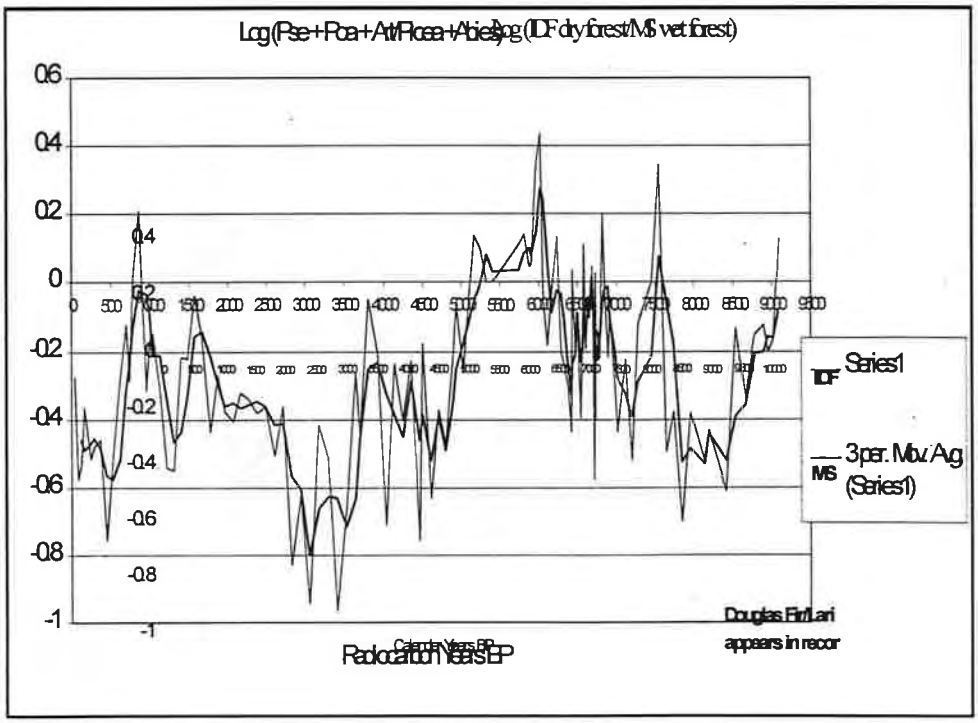
- Fire
- Other Forest Disturbance
- Non-native Species
- Diverging Regional Landscapes
- Wildlife Habitat

Status & Trends: Fire

- recent period of little area burned
- very active fire environment
- overall, vegetation composition within range of paleological reconstruction




Yoho & Kootenay Area Burned by Ignition Source
1910-1997
Area Burned (hectares)
16000
14000
12000
10000
8000
6000
4000
2000
0
1910-1919
1920-1929
1930-1939
1940-1949
1950-1959
1960-1969
1970-1979
1980-1989
1990-1997
Decade
Light
Human
Unk
Source


Log (Pse+Poa+AtlPosa+Abies)vs log (IDF dry forest/MS wet forest)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
Series1
3per. Mov. Avg. (Series1)
Douglas Fir/Larch appears in recor
Calendar Years BP
Radiocarbon Years BP

Status & Trends: Diverging Regional Landscapes

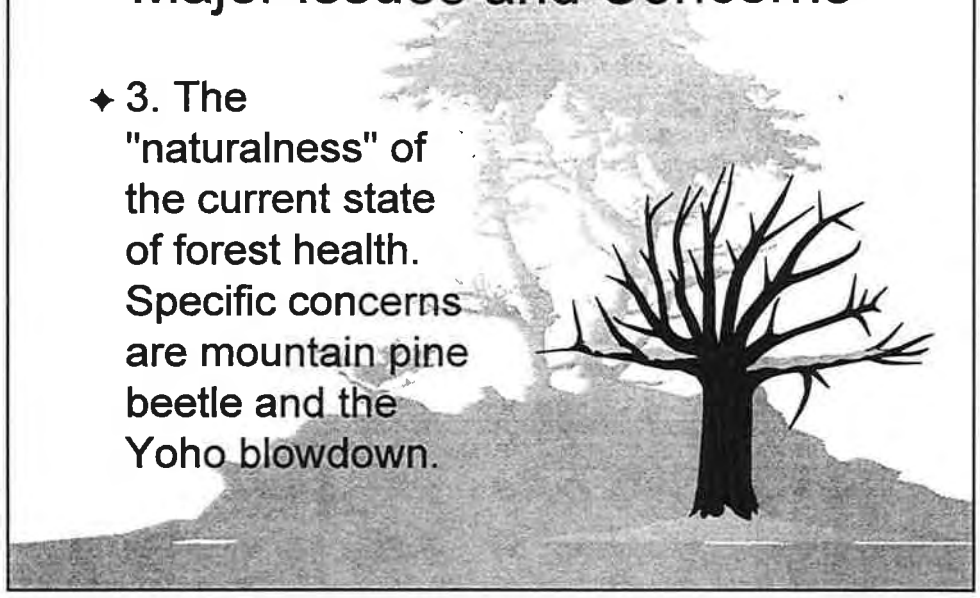
- extensive resource harvest on adjacent lands
- sharply defined boundaries
- rapidly diverging trajectories

Status & Trends: Wildlife Habitat

- critical landscape components at risk from lack of fire
- general loss of landscape diversity

Major Issues and Concerns

- 3. The "naturalness" of the current state of forest health. Specific concerns are mountain pine beetle and the Yoho blowdown.



Major Issues and Concerns

- 4. The ecological consequences of continuing invasions by non-native species. Specific concerns are leafy spurge and pine blister rust.

Proposed Strategies

- 1. Conduct an annual program of re-introducing fire into Park landscapes. The program should use a multi-faceted approach of using both lightning and management ignition prescribed burning.

Planned Ignition Prescribed Burns Proposed for Yoho & Kootenay Parks 1998-2003

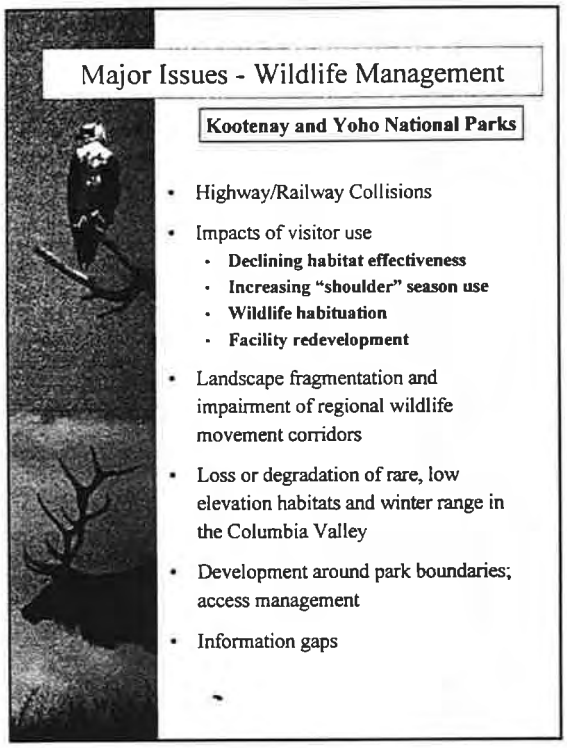
FMU	1998/99	1999/00	2000/01	2001/02	2002/03
3 McArthur					
5 Rockwall/ Ottertail		Whitebark Pine			
6 Kootenay	Daer/Pitts Montane Meadows	Daer/Pitts Simpson Anchor Montane Meadows	Daer/Pitts Montane Meadows	Daer/Pitts Montane Meadows	Daer/Pitts Montane Meadows
7 Columbia		Bighorn Range		Bighorn Range	
8 Yoho River				Bear Habitat?	
9 Yoho West			Whitebark Pine		
10 Kicking Horse	Montane Meadows		Montane Meadows		Montane Meadows

Proposed Strategies

- 4. Conduct an annual program of non-native plant control.

Proposed Strategies

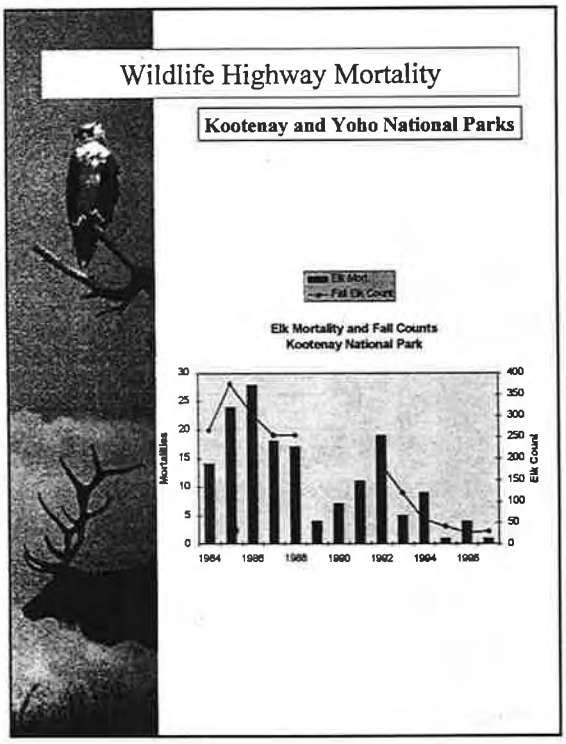
- 5. Participate in regional, multi-agency planning and management fora addressing every aspect of vegetation management. Use these linkages to anticipate new problems and develop solutions.



Major Issues - Wildlife Management

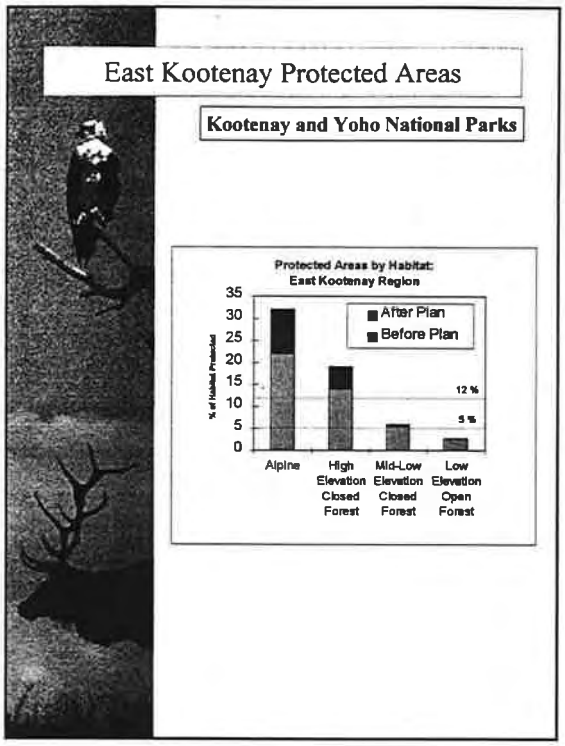
Kootenay and Yoho National Parks

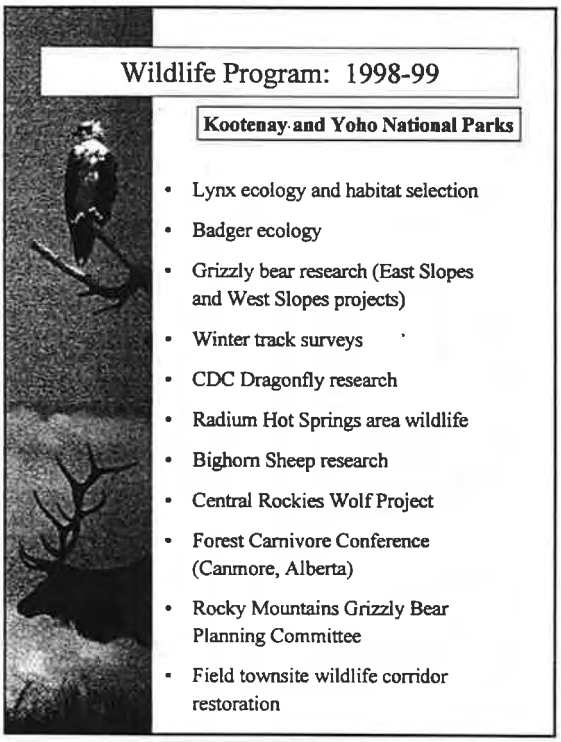
- Highway/Railway Collisions
- Impacts of visitor use
  - **Declining habitat effectiveness**
  - **Increasing "shoulder" season use**
  - **Wildlife habituation**
  - **Facility redevelopment**
- Landscape fragmentation and impairment of regional wildlife movement corridors
- Loss or degradation of rare, low elevation habitats and winter range in the Columbia Valley
- Development around park boundaries; access management
- Information gaps

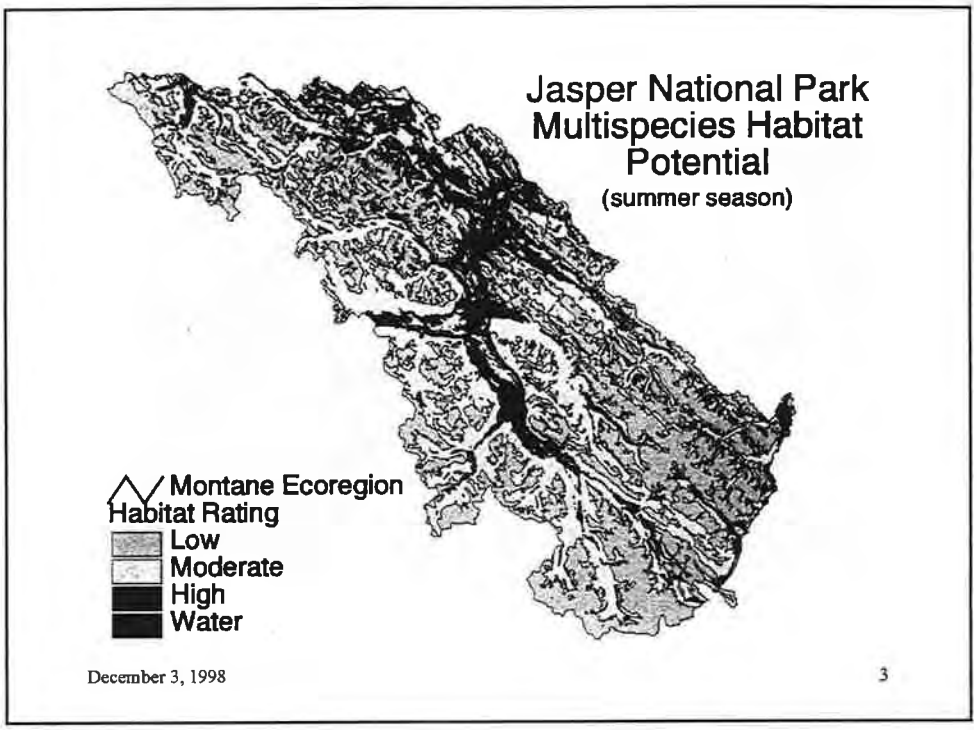


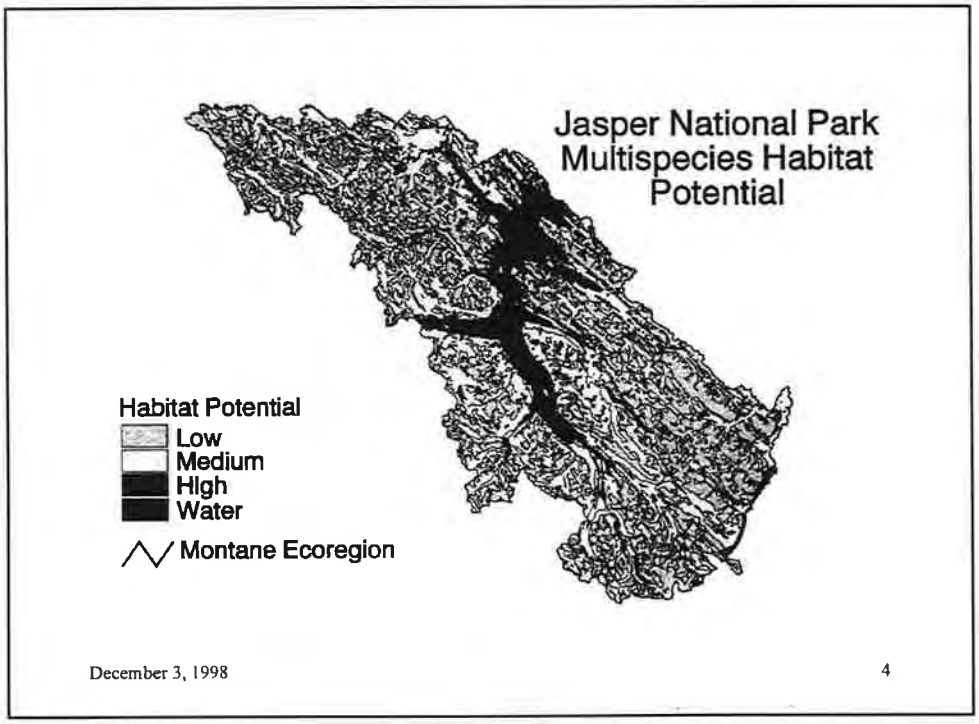
Wildlife Highway Mortality

Kootenay and Yoho National Parks


East Kootenay Protected Areas
Kootenay and Yoho National Parks
Protected Areas by Habitat:
East Kootenay Region
35
30
25
20
15
10
5
0
After Plan
Before Plan
12 %
5 %
Alpine
High Elevation Closed Forest
Mid-Low Elevation Closed Forest
Low Elevation Open Forest


Wildlife Program: 1998-99
Kootenay and Yoho National Parks
• Lynx ecology and habitat selection
• Badger ecology
• Grizzly bear research (East Slopes and West Slopes projects)
• Winter track surveys
• CDC Dragonfly research
• Radium Hot Springs area wildlife
• Bighorn Sheep research
• Central Rockies Wolf Project
• Forest Carnivore Conference (Canmore, Alberta)
• Rocky Mountains Grizzly Bear Planning Committee
• Field townsite wildlife corridor restoration


Jasper National Park
Multispecies Habitat
Potential
(summer season)
Montane Ecoregion
Habitat Rating
Low
Moderate
High
Water
December 3, 1998
3

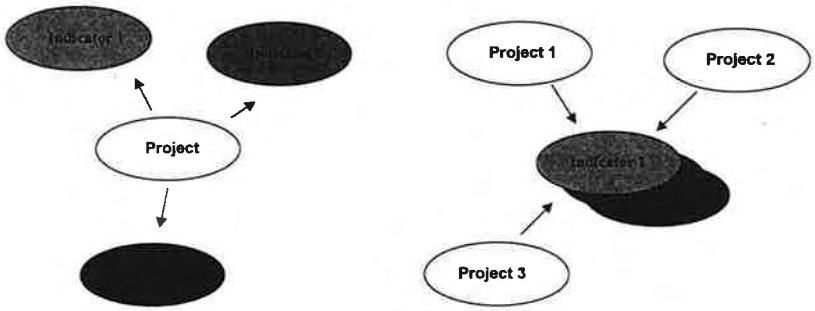

Jasper National Park
Multispecies Habitat
Potential
Habitat Potential
Low
Medium
High
Water
Montane Ecoregion
December 3, 1998
4

Cumulative Effects Analysis

- Developing a tool to support planning and decision-making.
- Using ecological and social indicators and computer modelling to approximate the consequence of management scenarios.
- Using existing data = inherent limitation
- Embarking on validating models with new data.

Cumulative Effects Assessment

Environmental Impact Assessment *includes* Cumulative Effects Assessment



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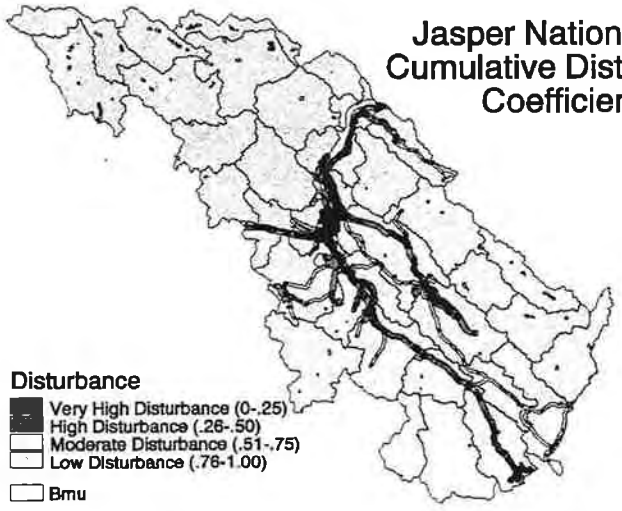

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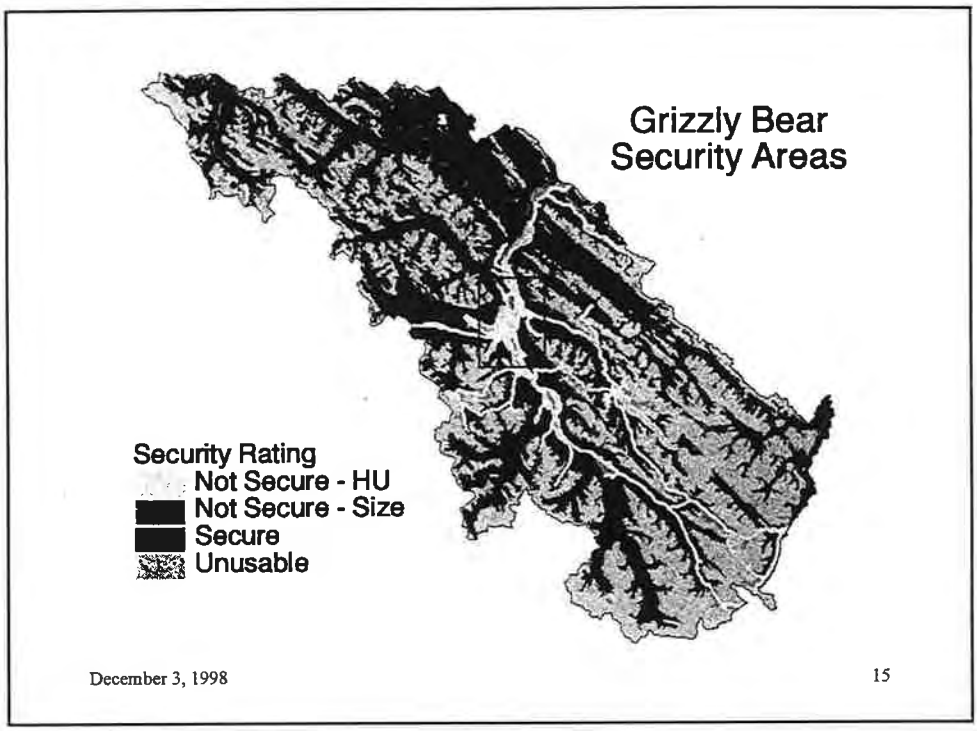
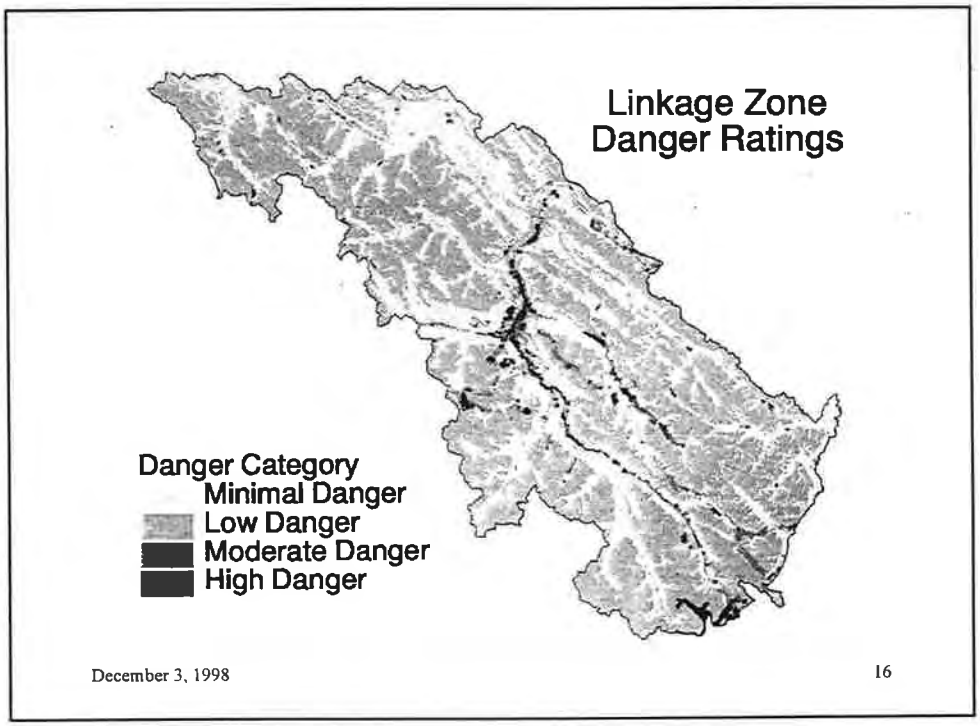

Grizzly Bear
Security Areas
Security Rating
Not Secure - HU
Not Secure - Size
Secure
Unusable
December 3, 1998
15


Linkage Zone
Danger Ratings
Danger Category
Minimal Danger
Low Danger
Moderate Danger
High Danger
December 3, 1998
16

Progress to Date

- Infrastructure
- Visitor/Resident Population & Experience
- Ecosite Representation
- Breeding Bird Habitat

- Good data & extrapolations to buildout conditions
- Poor data in all categories. Surveys in 98-99
- Model under development (MSc Thesis) - June '99
- Model under development (MSc Thesis) - June '99

Science Workshop - Speaking Notes

- Darro has made reference to the challenges and key objectives for the workshop. I will give some further context and background relative to these objectives; But first a couple of points of clarification:

housekeeping items:

- meal times and location of dining hall
- evening schedule - hospitality room #

Field Unit (it is important that our discussion is focused on the Yoho/Kootenay and regional ecosystem area and not allowed to lapse into the realm of protected areas generally)

- physical setting (section 2 in binder)
- organizational structure

- science is not just research. It also includes actions relating to monitoring, intervention and restoration

- there is an expectation from the public and our critics that science information will be used for decision making. This requires attention to timing, understandability and relevance

- very rarely is science timed perfectly with decision making (especially when we engage in cooperative research projects). This concern implies two things.

- that science is not an end in itself, but instead a means to an end; and

- that there is a need for the science program to be proactive. You are therefore being requested to review the existing and forecast for the future needs of the science program

- understandability will continue to be a challenge for those conducting the science - for the science to be used, it must be understood by a variety of audiences

- relevance is the key component

- there are no funds for anything other than applied and relevant

Science Workshop
Socio-economic Speaking Notes

- we are at the "mercy" of the economics group and are looking toward them to educate and recommend necessary economic analysis, research and monitoring.

    - present the economic section from the socio-economic reference document (portion included within "State of" document)

- present the integrated planning summary paper for the social perspective

    - discuss the issue with the changing structure of the service centers and the loss of some of the strategic focus, the champion and any critical mass - they seem to be focussing on providing support for specific projects (i.e. gate surveys, LL transportation studies, and national entrance surveys)

    - Eugene available to discuss specific projects

- existing program is largely ecological

- the ecosystem issue analysis looked at it from the perspective of human use, tourism and development and economics

- the biggest issue we have is that we must start integrating the activities of humans (and social systems) with the natural/cultural systems

    - this necessitates a need to understand humans from the physical side (levels, timing, types and locations of use) and the psychological side (motivations, expectations, benefits)

We have a human use model which was developed in 1995 based upon a subjective analysis - we are continually trying to validate the human use layer through trail counters and surveys (mention Waltho's work) - issues of shoulder season use - trends and projections

Our existing capital program is being directed towards resolving these data gaps (human use modeling, LL traffic survey, tourism survey (LL entrance and day use areas)

- social systems at work externally as well (motorized recreation, regional tourism, access)

- need to understand the social system on an individual and aggregate level

- need to consider the supporting infrastructure for human use (built

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REVIEW OF EXISTING SCIENCE PROGRAM AND HOW IT IS ATTEMPTING TO ADDRESS THE IDENTIFIED ISSUES:

CULTURAL ISSUES

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There has been a human presence in the ecosystem for the last 10,000 years. You can't have a complete understanding of the ecosystem without considering the effects that humans might have had on it. There are some general things that we can say about human impacts in the past. In general, humans prior to white settlement typically altered mountain ecosystems through a few mechanism:

- through increased fire ignitions,
- altered animal populations through hunting of prey and predatory species, and
- altered vegetation through harvesting activities.

The arrival of whites also furthered altered the ecosystems, in particular:

- changes in fire regimes through additional inadvertent ignition and then through fire control programs
- clearing and logging of selective areas
- clearing of areas for settlement
- construction of roads and railroads
-

Parks establishment and management further altered the ecosystems through policies of:

- fire control
- predator control
- hunting and plant collecting prevention

Most of the cultural research that has been conducted in Kootenay and Yoho National Parks have consisted of basic inventories to identify historic and prehistoric sites, and recording of historic structures. This was conducted for basic management purposes to identify what was present in the park areas, to identify areas of significance and to ensure their preservation. Much of this basic work is reported on in the ARDAs which were completed about 10 years ago now. We are planning to update these to make them more user friendly and to update the contents and analysis, especially to include GIS analysis.

In the Kootenay ARDA two sites on Kaufmann were identified as being threatened by impact of the campground locations adjacent to the lake. In 1994, I conducted limited assessments of these two sites as part of monitoring the impacts at them. One of the excavation units was located in the main trail to the lake where we encountered a quartz crystal workshop and hearth area which yielded a C 14 date of 4470 +/- 80 yrs B.P.

I subsequently wrote a paper on the distribution of quartz crystal quarries and archaeological materials in the Main Ranges of the Rocky Mountains. I believe that crystal quartz was an important material for making stone tools and that there may be a major quarry source in the Lake Ohara area and perhaps in Healy Creek in Banff N.P. This is a research area which remains to be investigated.

In 1995 Al Dibb approached me to prepare a proposal to identify a program of archaeological research which could contribute to his Kootenay N.P. eco-history project. We prepared a proposal for five years of research that focus on developing a better understanding of the role of humans in the ecosystem in the past. The project was supported by the park. This project was to include a review of the palaeoenvironmental, ethnographic and archaeological literature relevant to the area. (Slide 4) One of the products of this was a paper on the role of humans in fire ignition in the Central Canadian Rockies. This paper identifies what the

assistants for two years of the project. However, with shrinking budgets, this was no longer possible in the last two years, when I had to scale down my project.

Through the Ecohistory Project, I encountered an amateur archaeologist in Invermere who kindly let me photograph parts of his collection and showed me some site along the Columbia River which he was particularly concerned about because of the extensive erosion which was badly degrading these sites. From his collection and brief site inspection, I soon began to realize that there was considerable unique information being lost at these sites. So when research funding through the Living Landscapes Program (funded by Columbia Basin Trust and the Royal British Columbia Provincial Mueum) became available I submitted an application for funding. I have been awarded funding for a small research project which I am planning to conduct in March and April of 1999.

What makes this site so unique is that it is flooded by the Columbia River for much of the year. In this process bone and antler preservation is excellent and the record of animal species identified in his collection includes elk, deer, mountain sheep, mountain goat, coyote/dog, bear, bison and fish. Some of this bone has been manufactured into bone tools such as spears or harpoon points, awls, needles, wedges and other tools whose functions have not been determined. These are portions of the cultural assemblage that are rarely seen in non-saturated sites. This project will allow the determination of dates for this site plus cultural affiliations as well as a more detailed inventory of animal species represented.

One of the most significant discoveries that derives from archaeological research in the last few years is the increasing indications of the presence of bison in the Main Range, Kootenay and Columbia Valleys. At Lake Louise a complete bison skeleton was discovered during waterline trenching. This skeleton derives from a non-cultural origin and was likely buried by flooding shortly after death. The skeleton was radiocarbon dated to about 500 years ago. In the Kootenay Valley, one of the sites tested by the archaeology component of the ecohistory project yielded blood protein from a stone tool. This site is radiocarbon dated at 380 +/- 50 years. Finally, as mentioned above, a bison metapodial (foot bone) was recovered from the inundated site on the Columbia River. All of these are the furthest north and west distributions of bison in Canada. A bone sample of "Louise", the Lake Louise bison, has been submitted to Dr. Kooyman at the University of Calgary for examination of percentages of C3 and C4 vegetation diets. This will provide an indication of whether Louise was resident or transitory to the area.

Western Canada Service Centre historian Graham MacDonald, has been conducting a literature review of ungulate distribution in Kootenay National Park. This is modelled after his review of the distribution of caribou "Caribou and Human Agency in the Columbia Mountains: Towards the environmental History a Species.

In summary, archaeological and historical research directed at scientific issues has been focussed on using archaeological and historical data and techniques to assist in defining human activities in the park area for the last 10,000 years. This includes considering the issues of human fire ignition, as well as, stone, animal and plant use and distributions. The research has been directed at investigating specific issues, as well as, taking advantage of chance discoveries that could contribute to knowledge advancement such as "Louise the bison" and recording amateur archaeologists collections in the Columbia trench.

References

Choquette, Wayne and Daryl Fedje (1989) Yoho National Park Archaeological Resource Description and Analysis. Archaeological Services, Canadian Parks Service, Calgary.

Choquette, Wayne and Rod Pickard (1989) Archaeological Resource Description and Analysis, Kootenay National Park. Archaeological Services, Canadian Parks Service, Calgary.

Heitzmann, R. J. 1995 "Quartz Crystal Workshops in Kootenay National Park." Paper presented at the 28 th Annual Canadian Archaeological Association, Kelowna, B.C. Archaeological Services, Parks Canada, Calgary.

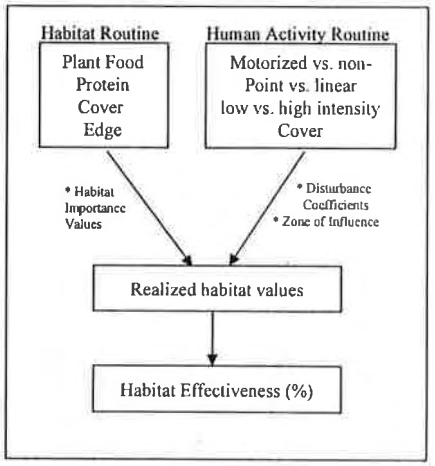
Habitat Effectiveness

Kootenay and Yoho National Parks

- Cumulative effects assessment of impacts of human activities on bears.
- Incorporates the following components:
  - **habitat quality assessment**
  - **human activity modelling**
    - motorized vs. non-motorized
    - point vs. linear
    - high vs. low intensity of use
    - non-cover vs. cover
  - **disturbance coefficients and zone of influence developed for each activity class**
  - **GIS analysis to apply disturbance coefficients over landscape to determine effective habitat value**

Habitat Effectiveness Modelling

Kootenay and Yoho National Parks



Management Planning Science Workshop

Yoho and Kootenay National Parks

Vegetation Management

Vegetation Management

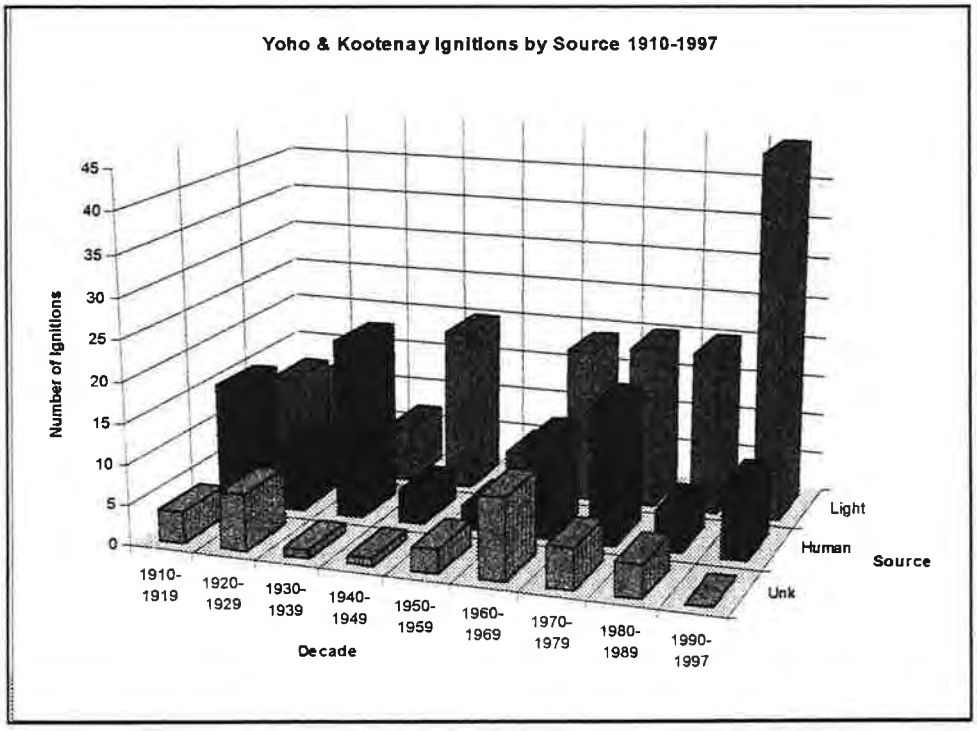
- Status and Trends
- Major Issues and Concerns
- Proposed Strategies

Estimated Fire Cycles for Kootenay & Yoho Parks

Park	Overall Fire Cycle (years)	Temporal Partition	Temporal Partition	Temporal Partition
Kootenay		1508-1778	1778-1928	1929-1988
	167[a], 110[b]	60[a]	130[a]	>2700[a]
Yoho		1520-1739	1740-1879	1900-1989
	132[c]	207[c]	178[c]	438[c]

[a] Masters 1990, [b] Van Wagner 1995 [c] Tymstra 1991,

**The most recent thumbnail calculation from the LLYK fire database shows an estimated fire cycle for Yoho and Kootenay Parks combined of 393 years (1910-1997).



Status & Trends: Other Forest Disturbance

- **mountain pine beetle persistent, historical component (1930-45, 1981-present)**
- **blowdown common**
- **highly visible and sometimes controversial**

Status & Trends: Non-native Species

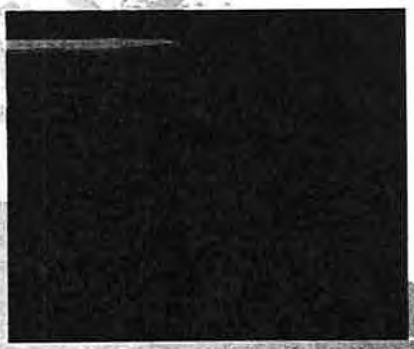
- over 100 non-native plant species mostly restricted to disturbed sites
- several small footholds by very invasive plant species
- other non-native species: e.g. pine blister rust

Major Issues and Concerns

- 1. Increasing homogenization of the forested landscape and the associated loss of floral and faunal biodiversity.

Major Issues and Concerns

- 2. Steady decline in the area occupied by specific ecosystem components such as open forest types, montane meadows and young forest stands.



Major Issues and Concerns

- 5. Increasingly divergent forest age class distributions and landscape structure between Parks and adjacent lands.

Major Issues and Concerns

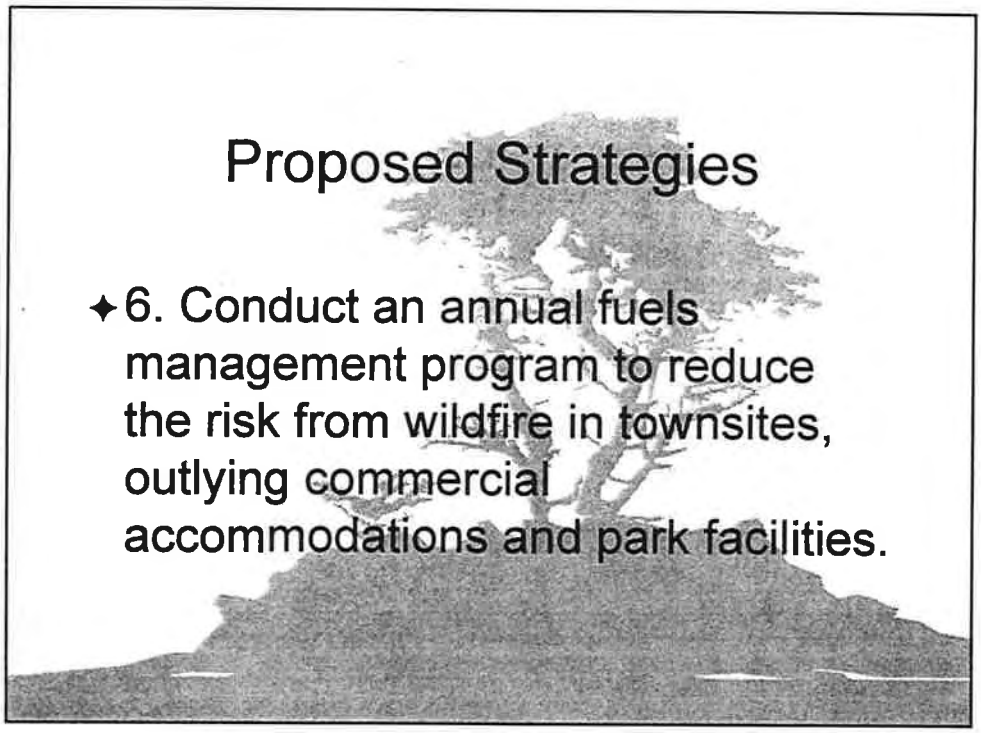
- 6. Eventually, increasing levels of risk to facilities and the public from wildfire if the current lack of fire continues.

Proposed Strategies

- 2. Focus the fire management program on priority ecological concerns, fuel management for values at risk and fundamental research required for refining ecological objectives.

Proposed Strategies

- 3. Engage in collaborative research to assess current Park's forest health priority issues such as mountain pine beetle and pine blister rust.


Proposed Strategies
✦6. Conduct an annual fuels management program to reduce the risk from wildfire in townsites, outlying commercial accommodations and park facilities.

restrial Vertebrate Species

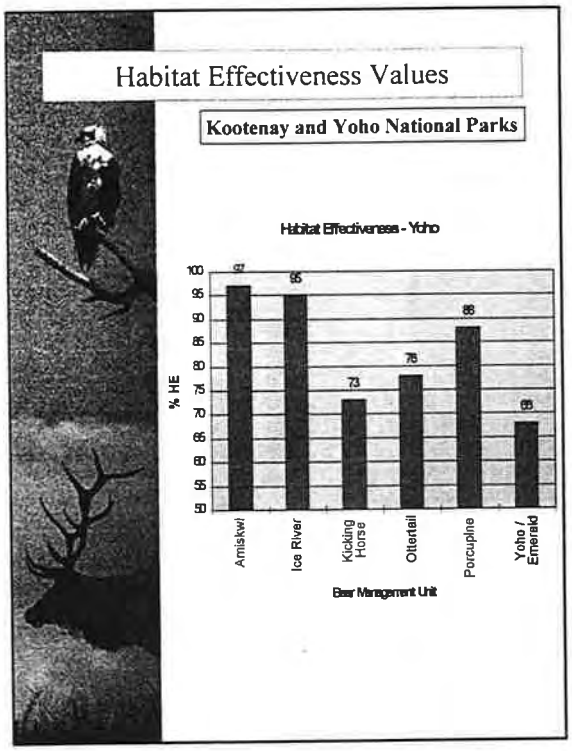
Kootenay and Yoho National Parks

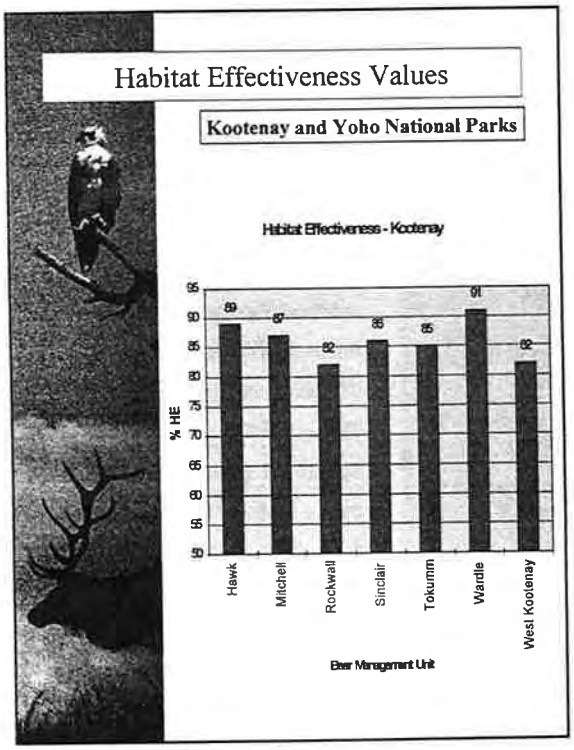
	Yoho	Kootenay
Amphibians	4	4
Reptiles	1	3
Birds	212	192
Mammals	54	57

Wildlife Species at Risk

Kootenay and Yoho National Parks

	COSEWIC	BC Provincial List	National Parks Act: Threatened and Endangered Species
Grizzly Bear	Vulnerable	Blue	Threatened
Wolverine	Vulnerable	Blue	
Caribou (YNP)	Vulnerable	Blue	Protected
Fisher		Blue	
Badger (KNP)		Blue	
Rocky Mtn. Bighorn Sheep		Blue	Threatened
Mountain Goat			Threatened
Elk			Protected
Black Bear			Protected
Cougar			Protected
Moose			Protected
Mule Deer			Protected
White-Tailed Deer			Protected
Wolf			Protected
Great Blue Heron	Vulnerable	Blue	
Flammulated Owl (KNP)	Vulnerable	Blue	
Peregrine Falcon (YNP)	Endangered	Red	
Ferruginous Hawk (YN	Vulnerable	Red	
Western Grebe		Red	
Prairie Falcon		Blue	
Upland Sandpiper (YNP)		Red	
Cape May Warbler (KNP)		Red	
Brewer's Sparrow		Red	

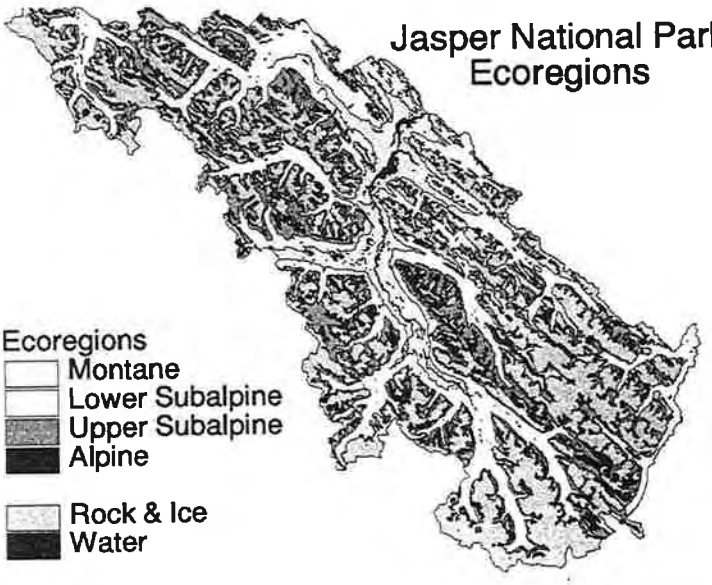

Habitat Effectiveness Values
Kootenay and Yoho National Parks
Habitat Effectiveness - Yoho
% HE
100
95
90
85
80
75
70
65
60
55
50
97
95
73
78
88
69
Amiskwi
Ice River
Kicking Horse
Otterfail
Porcupine
Yoho / Emerald
Bear Management Unit


Habitat Effectiveness Values
Kootenay and Yoho National Parks
Habitat Effectiveness - Kootenay
% HE
95
90
85
80
75
70
65
60
55
50
89
87
82
86
85
91
82
Hawk
Mitchell
Rockwall
Sinclair
Tokumm
Wardle
West Kootenay
Bear Management Unit

Wildlife Monitoring: 1998-2001

Kootenay and Yoho National Parks

- Wildlife Monitoring Program
  - **Large Ungulates**
    - Aerial surveys
    - Ground (roadside) surveys
    - Pellet transects
    - Citizen monitoring (Bighorns)
  - **Carnivores**
    - Winter track surveys
    - Hair snagging stations
  - **Avifauna**
    - Waterfowl breeding and migration surveys
    - Breeding bird surveys with CWS
    - Christmas bird counts
    - Pre- and post-burn surveys
  - **Other**
    - Beaver surveys
    - Random wildlife observations
    - Wildlife mortality



December 3, 1998

2

Jasper National Park: Three Valley Confluence

Indicator Approach

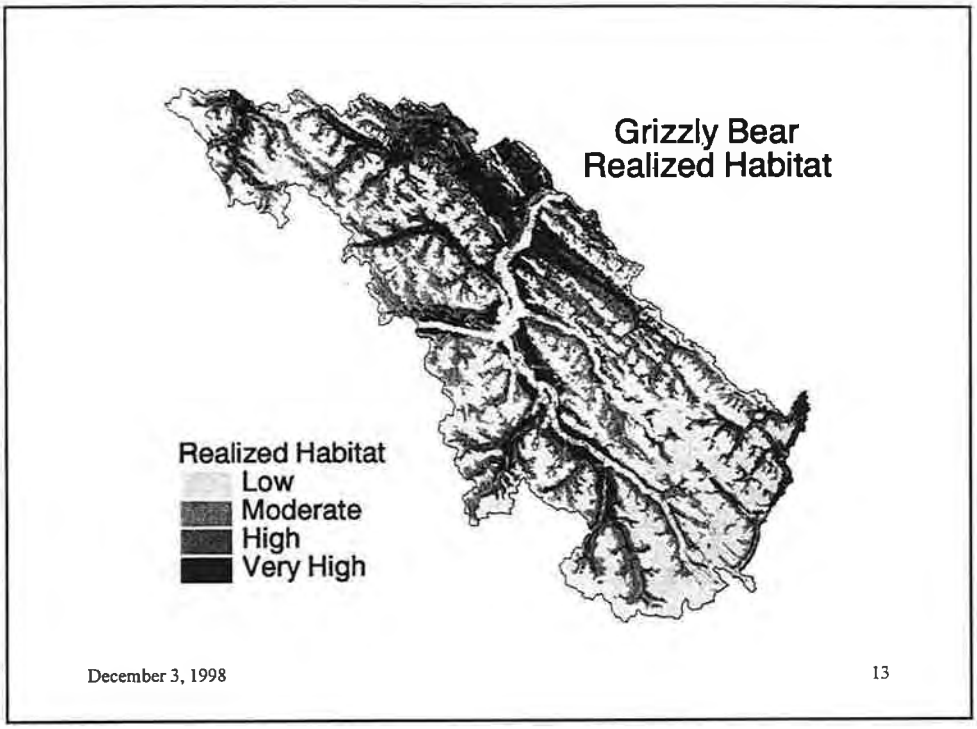
- Carnivores
- Wildlife-human Conflicts
- Vegetation Condition
- Special Features
- Resident/Visitor Experience

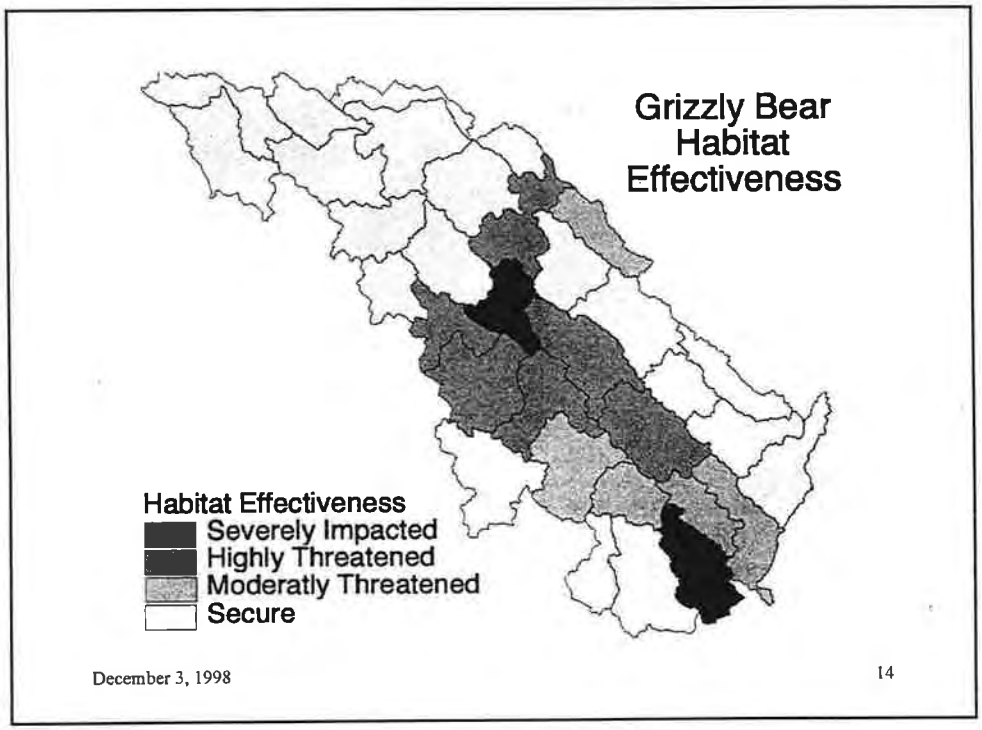
- HE; SA; LZ; Friction models
- Elk, Grizzly Bear, Black Bear
- Browse rates; non-native plants; disturbed terrain
- Rare Plants; nest & den sites; amphibians
- Overall numbers; perception of crowding; satisfaction; quality of life

Indicator Approach

- Water Quality
- Infrastructure
- Ecosite Representation
- Breeding Bird Habitat

- BOD; Phosphate; Faecal Coliform
- Power; Sewage treatment; Solid Waste Mgmt


Grizzly Bear
Realized Habitat
Realized Habitat
Low
Moderate
High
Very High
December 3, 1998
13


Grizzly Bear
Habitat
Effectiveness
Habitat Effectiveness
Severely Impacted
Highly Threatened
Moderatly Threatened
Secure
December 3, 1998
14

Jasper National Park Conceptual Wildlife Movement Corridors

- Pinch-points for animal movement
- Direction of movement (arrows)
- Waterbodies
- Areas of human activity
- Roads, trails & railway
- Wildlife movement corridors

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Progress to Date

- Grizzly Bear models
- Wolf Friction Model
- Wildlife conflict data
- Wildlife Movements

- Vegetation Condition
- Water Quality
- Special Features

- HE; SA and LZ running
- developed over winter
- analysis completed
- GIS map produced; data collection underway (in house & MSc Thesis (2)
- No substantial progress
- Good existing data
- No progress

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Presenter

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Science Workshop

Speaking Notes of Derek Petersen

science

- to be relevant it must bear some relationship to the prevalent issues in the Parks or in the broader regions.
- to assist us in ensuring that our science program is relevant, the identification and prioritization of the science issues is your first objective/task
- we want to focus on science issues at this workshop (as opposed to NP organization, policy etc.)

- We will now begin to take a look at our current thoughts on what the issues are in these Parks
  - SOP - broad perspective - problem with managers understanding and supporting concepts of stressors.
  - process used
  - full issues list
  - refinements since then
    - issue analysis (overhead)
    - Rod will present issues from a management planning perspective
    - tomorrow a.m. we will hear from a variety of specialists who will look at the issues in a bit more detail & then identify how our science program is specifically addressing them (or not).
  - but for the 98/99 program, our response was (present the remainder of the process sheet)
  - present budget

- so what's the problem?
  - we have generated an extensive and lengthy list of issues - how do we manage it
    - how comprehensive is the list
    - what are the priorities
    - how do we respond to the issues
    - how do we integrate the pieces
    - how do we manage the whole program

To answer these questions, we felt it necessary to get some external review and input

infrastructure, external development, and OCA's)

- need to understand the impacts of human activity on the environment

- we must start to actively manage human use

- our previous social research program seems to have been driven by one-off kinds of projects or issue specific.

- there has not been a solid link between the research and decision making - therefore senior managers do not see the full utility of investing in social research.

- like the remainder of the science program, there should be an obvious and explicit link between social science work and decision making.

The issues are:

- we have open social systems with projected increases in use - especially day use component as the fixed capacity for overnight (especially f/c) use has been reached and there are limitations on potential future development (OCA panel etc.) - increased regional development and growth.

- outside of the Bow Valley (other than responses to ecological issues within the BVS) we are not aggressively managing use, except with respect to overnight use (based upon infrastructure capacity), public safety responses, some sensitive and localized ecological concerns, and Lake O'Hara.

- we want to become proactive with our human use management (this is better accepted by the tourism sector and the public).

Response

- we are proceeding with an integrated management planning process

- this will involve identifying ecological/cultural constraints and then defining social objectives.

- this is being done by an internal Parks group and is then to be vetted through stakeholders

- use the chart to illustrate the social descriptors that we will be defining the objectives against. The real challenge will be to translate the descriptors into standards.

- the intent of this workshop is not to provide feedback on our integrated approach, but rather to understand where the direction of our social program is going and then to help define the research/monitoring that should support it

- the gap is that we are developing our social program subject to ecological objectives and constraints. We have not really approached it from a social perspective (i.e. motivations)

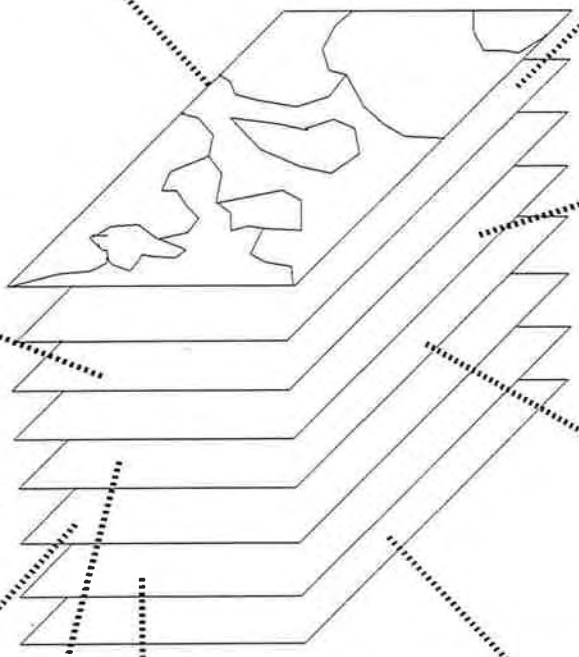
- the main science behind our efforts relate to ecological issues

ECOSYSTEM ISSUE ANALYSIS

Wildlife Issues
- corridors
- hwy/rwy mortality
- habitat effectiveness
- critical habitats
- habitat fragmentation
- wildlife/human conflicts
- habitat security
- hunting
- carnivore conservation areas

Vegetation Issues
- natural disturbance (fire, insect & disease)
- key/representative habitats (dry interior Douglas Fir, montane, aspen)
- harvesting external to parks
- landscape mosaic (forest type & age)
- non-native plants
- hazard abatement/fuel reduction

Development Issues
- existing built infrastructure (roads, trails, townsites, railway, campgrounds, hwy pull-offs & picnic sites and day use nodes)
- external development
- planned & potential development (internal and external)
- external access & road development
- outlying commercial accommodation



Aquatic Issues
- wetlands
- effluent
- flow regimes
- riparian

Human Use Issues
- level of use for trails and campgrounds (day & o/n)
- seasonality of use
- type of use
- external motorized recreation
- commercial vs. private use
- loss of experiential learning opportunities
- visitor expectations
- visitor satisfaction
- facility/infrastructure development
- accessibility
- motivations/benefits
- impacts

Economic Issues
- revenue generation
- investment strategies
- equity /incidence
- affordability
- pricing structures (fees, leases, licenses)
- socio-economic & performance measures
- cost/benefit analysis for CEA & land use allocation decisions
- relationship to individual decision making
- financial accounting
- costs (services & assets)
- local/regional economic impacts

Tourism Issues
- visitor experiences consistent with NP values
- heritage tourism strategy
- marketing frameworks
- regional tourism
- delivery of interpretation/messaging
- supply & demand management
- appropriate use
- relationship of marketing, visitor use and visitor experience
- delivery of basic/essential services
- setting of experiential objectives
- disabled access

Cultural Issues
- National Historic Sites
- FHBRO
- built heritage

PRESENTATION TO
KNP/YNP Science Workshop Oct. 18/98

No Net Negative Environmental Impact

What is it? No Net Negative Environmental Impact (to N.P. Communities) is a principle which when applied has a goal of achieving a "model community" encompassing the concept of sustainability. Essentially it is a performance measurement framework or an environmental auditing tool to be used every 5 years to ensure accountability of communities to Parks Canada's mandate of ecological integrity.

Where does it apply? It applies only to national park communities and it should be defined this narrowly. Outside of communities the principle of ecological integrity applies. The principle was established by the Minister and will be adopted in all national park Community Plans.

How will it be achieved? Achievement of NNNEI is a shared responsibility with the community, private sector individual visitors & residents & Parks Canada.

- leadership in environmental stewardship
- individual projects fully mitigated in accordance w CEA
- complete baseline measurement established in Year 1
- complete reassessment every 5 years as part of the Community Plan review (approved by Minister & tabled in Pa
- appropriate development & appropriate business activity

The Evaluation Framework: 3 key areas of measurement

- env. stressors generated within the community (e.g. solid waste, water, transportation)
- measurement of their impact in the community
- measurement of their impact on adjacent park resources

SLIDE 1

The impact of stressors will be measured via an array of indicators. If negative, corrective action can include:
- improved mitigation
- reduction or elimination of the stresse
- amendments to the PMP &/or Community

SLIDE 2

Process: Once the plan is approved, within one year:

- final identification of stressors & indicators
- for each stressor & indicator, identify appropriate measurement methodology, frequency and responsibility
- preparation of a technical "how to measure" manual to ensure consistency
- data collection (involving public & schools if possible)
- preparation of a baseline report

SLIDE 3

What are the Issues?

What are the indicators?
What are the threshold values?
How are they measured? - What gets measured, gets managed
Who pays? How will cumulative effects be measured?
Concept is value driven & is open to abuse.
Open-ended system without quotas on day use
Linking -ve change to a stressor
Trade-offs or Compensation as a form of mitigation
Consistency & Ability to effectively manage the issues.
Application of principles of precaution & adaptive mgmt.
Is our Legislation ahead of our science?

Whether a measurable change is an impact is a value judgement
separating natural variations (& evolution) e.g. frequentation licensed access

EVALUATION FRAMEWORK FOR NO NET ENVIRONMENTAL IMPACT

TOWN OF BANFF COMMUNITY PLAN
◇ Population limit (10,000) ◇ Commercial development limit and growth rate ◇ Residential development requirement limit and growth rate ◇ Unrestricted day use visitors ◇ Requirement for leadership in environmental stewardship ◇ Rigorous application of CEAA to projects

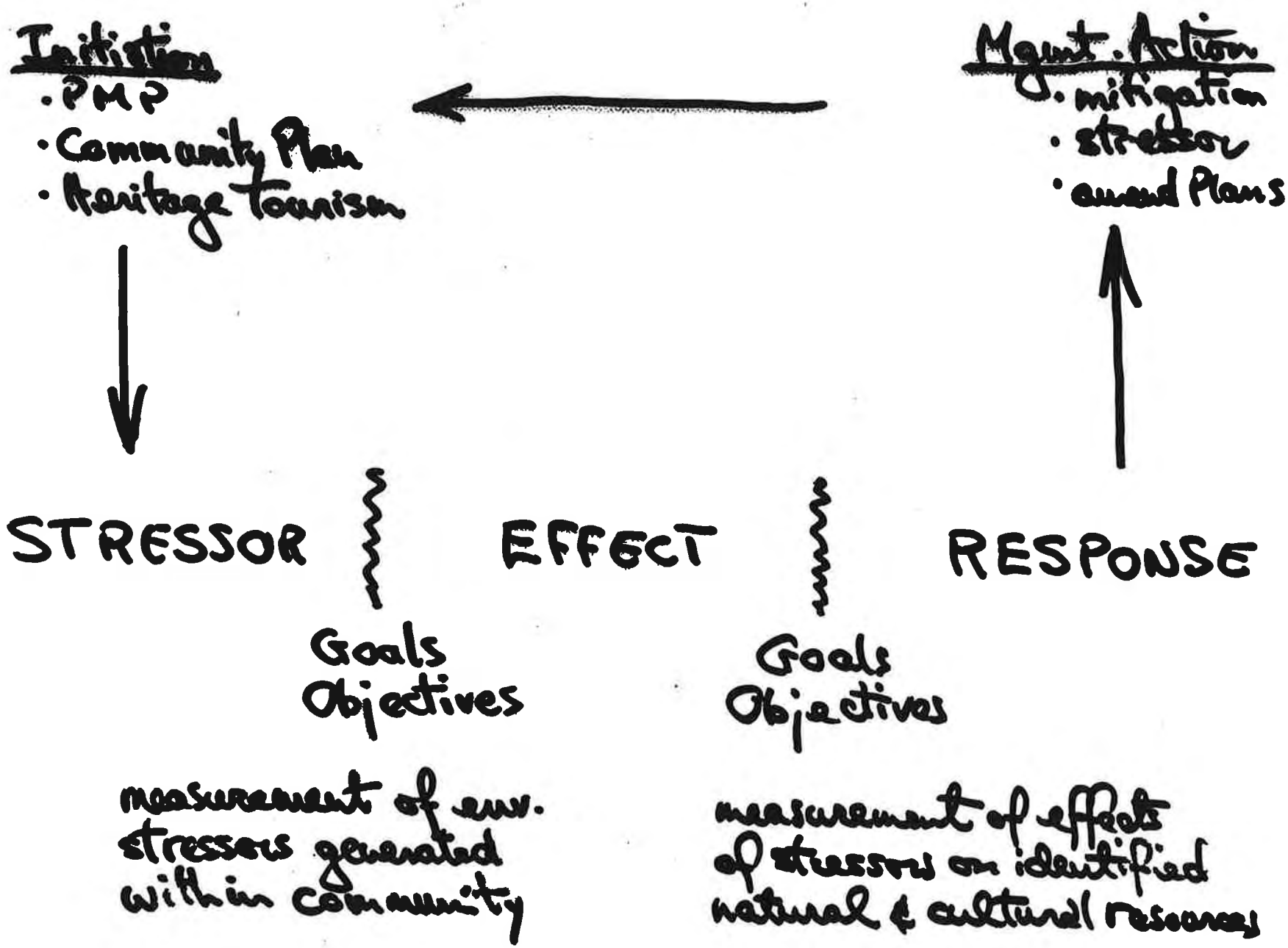
⇩

STRESSORS	
◇ Population ◇ Volume and type of solid waste ◇ Effluent ◇ Water demand	◇ Energy consumption ◇ Toxic spills ◇ Ambient light intensities ◇ Ambient noise levels

⇩

"STATE OF" INDICATORS	
TOWN OF BANFF	**ADJACENT NATIONAL PARK RESOURCES**
Flora	
Biodiversity of selected sample plots # of square meters of natural area	Biodiversity of selected sample plots
Fauna	
# of wildlife/human conflicts # of elk/sq.km status of threatened snail # and type of carnivors per sample month in Middle Springs Wildlife Corridor	# of wildlife/human conflicts # of human use infractions in Middle Springs Wildlife Corridor # of elk/sq.km # of carnivor predations adjacent to town mean monthly crossings of selected wildlife crossings # and type of carnivors per sample month in wildlife corridors (Cascade , Golf Course, and Middle Springs)
Water	
Ground water quality Water demand per resident	Water quality of river (upstream and downstream)
Atmosphere	
Air quality (eg: ground level ozone)	Ambient light intensities (humans) Ambient noise intensities (dBA)
Geology Geomorphology Soils	
# of toxic spills # of contaminated sites	
Built Heritage	
# of heritage structures protected # and type of environmental stewardship initiatives and technologies adopted.	

STRESSOR/EFFECTS MATRIX									
EFFECTS ⇒ STRESSORS ⇓	AIR	WATER	GEOL	FLORA	FAUNA	AQUATICS FLOR/FAU	BUILT HERITAGE	SPECIAL FEATURE	SOCIO ECONOMIC
LIGHT					med				med+
NOISE					med+				med+
AIR QUALITY	?			?	?				
SOLID WASTE			med		med				
WATER CONSUMPTION		low		?	?	low			med
EFFLUENTS		high				high			med
EXOTICS FLORA/FAUNA				low	exotic landsc.	Vermillion Wetlands			
DEVELOPMENT (construction)	tmp	med	low	high	high+	med			
DEVELOPMENT (Presence of)		med		high	high+	med	high	high	visual issue outside town
TRAFFIC	?				high				high, noise
VISITORS #s		low	low erosn.	med trampl.	high	med	med wear/tear	high	high
RESIDENTS		low	low erosn.	med trampl.	high	med	low/med	high	high
T.O.B. ACTIVITIES e.g.MAINTENANCE		high road mainten.	low	med	high	low	upgraded zoning		
PERIPHERY OUTSIDE BANFF	?	upstream w/quality			high regional issues	high water improvement			growth in Canmore Calgary
CONTAMINANTS	low	high	high	localize low	low?	low	?		high

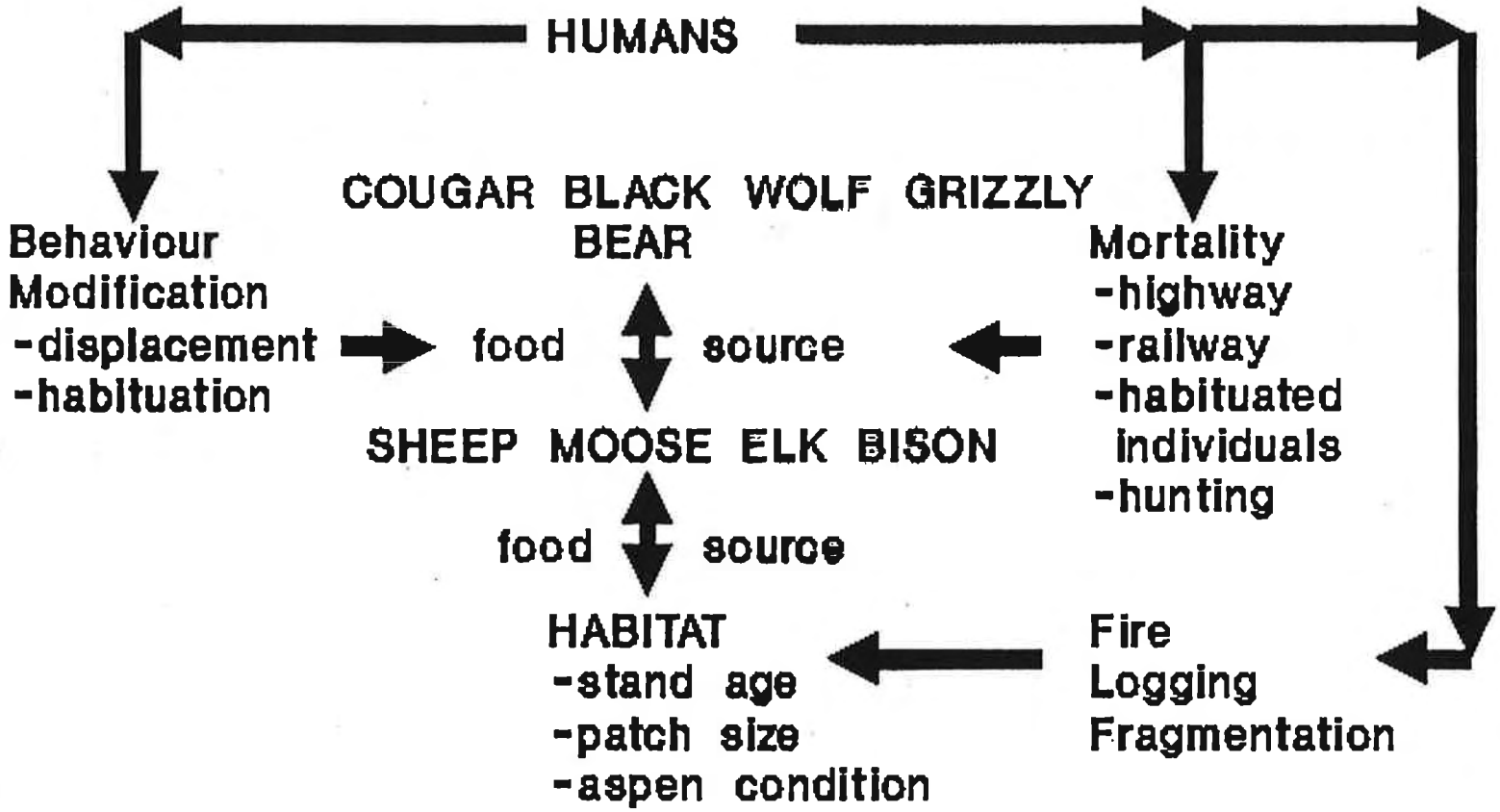

Initiations
· PMP
· Community Plan
· Heritage Tourism
Mgmt. Action
· mitigation
· stressor
· amend Plans
STRESSOR
EFFECT
RESPONSE
Goals
Objectives
measurement of env. stressors generated within community
Goals
Objectives
measurement of effects of stressors on identified natural & cultural resources

BOW-CEA

Project Overview

- Study area is Bow Watershed and CRE
- Ecosystem approach focussing on multiple indicators: humans, carnivores, herbivores
- Integrated into existing planning processes
- Budget: Parks 94/95:$330.0 95/96 $250.0
  Partners $500.0 TBA

CONCEPTUAL ECOSYSTEM MODEL
Banff and Central Canadian Rockies



BNP ECOSYSTEM ISSUES

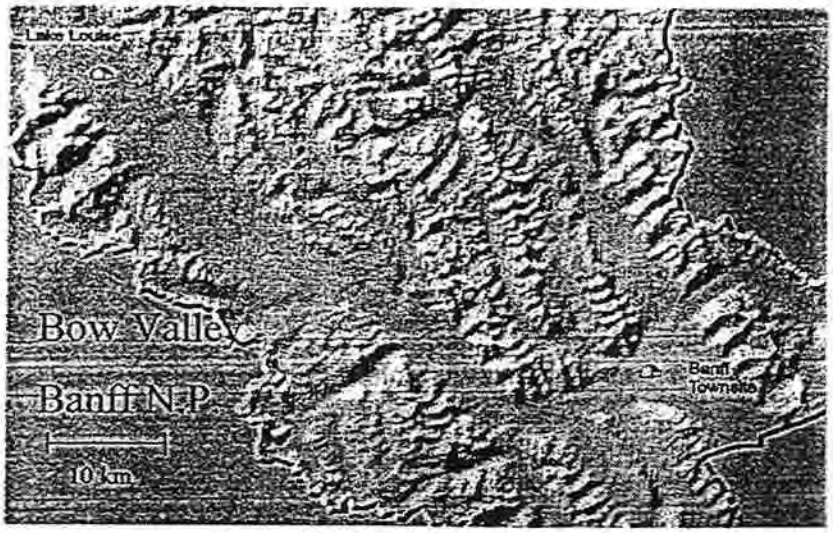
- OVERVIEW MODEL SHOWING KEY HUMAN IMPACTS (MORTALITY, DISPLACMENT, FIRE, AND HABITAT FRAGMENTATION)
- CARNIVORES (GRIZZLY, BLACK BEAR WOLF)
- HERBIVORES (BISON, ELK AND MOOSE)
- VEGETATION (ASPEN, OLD GROWTH AND FIRE)
- HABITAT FRAGMENTATION

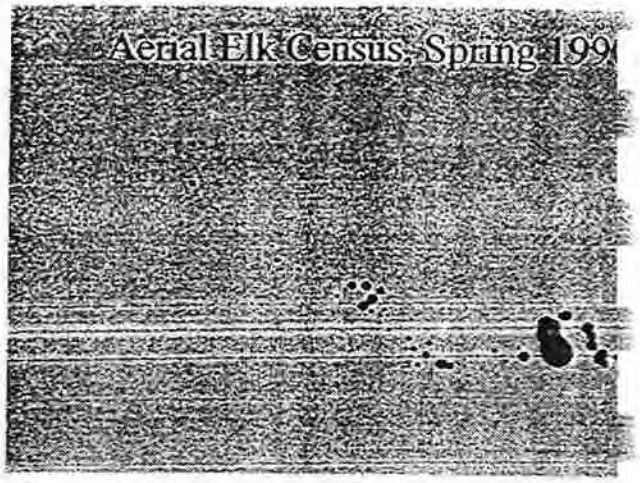
BNP ELK RESEARCH (1985-95)

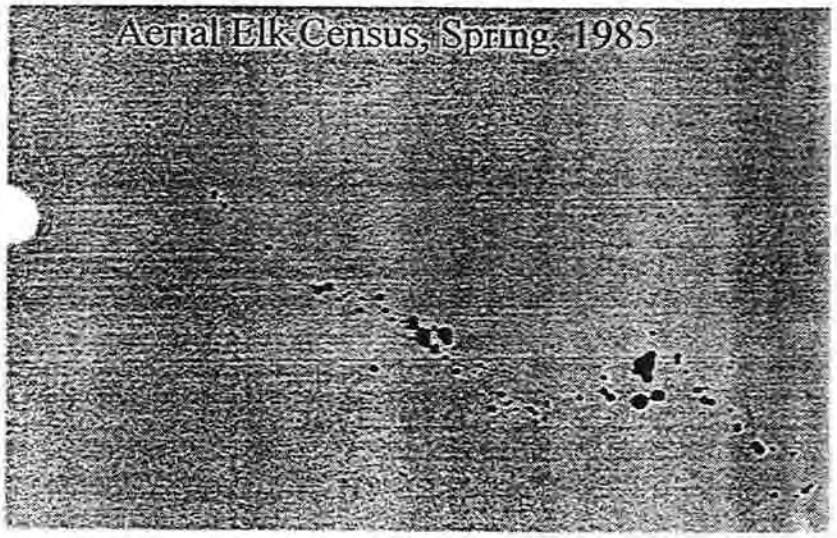
- WOODS HIGHWAY/ELK PROJECT- partially migratory, population history
- PAQUET WOLF PROJECT- predation, wolf/human use patterns
- WARDEN PROJECTS- elk habituation levels, dog herding, translocation responses
- KAY LONGTERM HISTORY- archaeology, early explorers, current predation, herbivory, fire interactions
- ASPEN/WILLOW- impacts on beaver, birds, small mammals

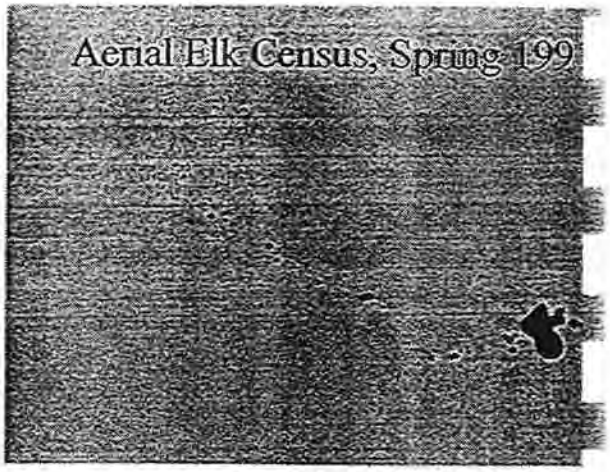
KEY ELK/ECOSYSTEM RESEARCH PROJECTS :

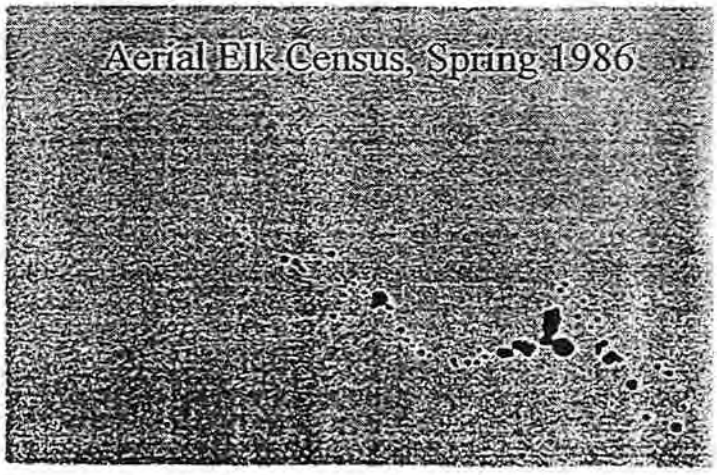
- Ecosystem History (Kay-Utah State, Cultural Resources-Calgary Service Centre)
- Humans/Wolves (Paquet,Callaghan- U Guelph)
- Wolves/Elk (Huggard-UBC, Hebblewhite- U Montana)
- Humans/Elk (Woods-UBC, McKenzie- U Guelph)
- Humans/Wolves/Moose/Elk (Hurd- UBC)
- Elk/Aspen/Humans/Fire (White- UBC)
- Elk/Beaver/Willow (Nietvelt- U Alberta)

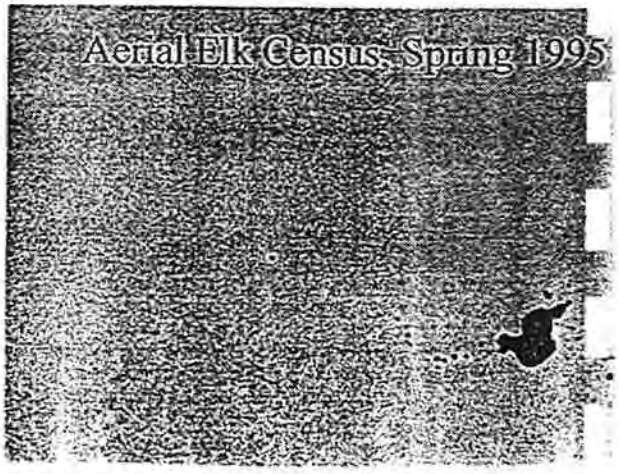

Lake Louise
Bow Valley
Banff N.P.
Banff Townsite
10 km


Aerial Elk Census, Spring 199


Aerial Elk Census, Spring, 1985


Aerial Elk Census, Spring 199


Aerial Elk Census, Spring 1986


Aerial Elk Census, Spring 1995

OPTION	NUMBER TOWN AREA ELK	ACTIONS
Public Safety (1990-1995 Direction)	600-800 (10+ elk per sq km)	-education/spring closures -site hardening - local fencing -relocate high risk elk (5-10 per year)
Carnivore Restoration (1995-2000 Direction) -wolves -grizzly/ black bear	300-600 (5-10 elk per sq km)	As above plus: -maintain Sulphur Corridor -restore Cascade Corridor -restore Rundle Corridor -human use management -upgrade TCH crossings -relocate problem elk (10-30 per year)
Vegetation Restoration (Future Option) -Aspen -Willow -Meadows	20-50 (1-2 elk per sq km)	As above plus: -build ungulate inhibiting but carnivore permeable fences at TCH crossings -relocate 100-300 elk - rest vegetation from heavy elk use for 10+ years -prescribed burning
Townsite Fence (Future Option)	0 in town 200+ near town	-fence town, relocate elk outside fence -strong bear deterrence program

?

BOW-CEA
Project Methodology

CEA METHODOLOGY

1) Define ecosystem model
2) Indicator selection
3) Indicator viability analysis
4) Landscape capability
5) Goals/thresholds

COLLABORATORS

-CREILG
-TCH STAKEHOLDERS
-BOW VALLEY STUDY
-EAST SLOPE GRIZZLY
-WILDLIFE CORRIDOR TASK FORCE

ECOSYSTEM MANAGEMENT OBJECTIVES

- MAINTAIN REPRESENTIVETY
- MAINTAIN CONNECTIVETY
- MAINTAIN VIABLE POPULATIONS IN LONGTERM PATTERNS OF ABUNDANCE AND DISTRIBUTION
- MAINTAIN PROCESSES
- DESIGN AND MANAGE FOR CHANGE
- ENCOURAGE COMPATIBLE HUMAN USES

APPENDIX II: DRAFT DISTRICT EAST WILDLIFE RESOURCE MANAGEMENT SCIENCE CAPITAL											
BANFF BOW VALLEY CUMULATIVE EFFECTS (BOW-CEA) PROJECT (BUDGET 1998/99)											
BUDGET(May 14, 98--DRAFT)			$K								
ITEM	GRIZ	MOOSE	WOLF/ELK	TCH	BLBEAR	ELK	CORRIDO	Other	TOTAL	Additional Funds	Sponsor
MULTISPECIES SUPPORT											
Vet (Shury)	8.1		4.0	3.9		4.0			20.0		
Leased Vehicles	0.0		4.0	16.0		4.0	0.0		24.0		
Vehicle Fuel	0.0		3.0	4.0		3.0	1.0		11.0		
Summer Fwing Monitoring	20.0		2.0			3.0			25.0		
Summer Heli Monitoring	10.0		2.0			3.0			15.0		
Winter Fwing Monitoring			2.0			2.0			4.0		
Winter Heli Monitoring			2.0			2.0			4.0		
Bow Cea O&M									0.0		
Monitoring Tech (Urquart)	4.0		3.0			3.0	see below		10.0		
									0.0		
GRIZZLY PROJECT									0.0	150.0	UIC, Uof C, AB F&W
Researcher (Gibeau)	50.0								50.0		Skiing Louise, Husky Oil,
Researcher (Theberge)	0.0								0.0		etc.
Tech Mamo	22.5								22.5		
Tech Whit	6.9								6.9		
Tech Stevens	20.5	0.0	1.8			1.8			24.1		
Trapping	4.0								4.0		
Kansas (Habitat)	0.0								0.0		
GIS	0.0								0.0		
Misc., Drug, Repair	4.0								4.0		
									0.0		
MOOSE									0.0	0.0	UIC, UBC, PLPP
Helicopter Survey									0.0		
Analysis		5.0							5.0		
GIS, Drugs, Misc									0.0		
									0.0		
WOLF PROJECT									0.0	42.0	UIC, RMEF, WWF
Researcher			14.4						14.4		
Tech/Vol/Ins/Accom			4.2						4.2		
Pers Veh Use			2.0						2.0		
GIS			2.0						2.0		
Groceries/Misc			1.7						1.7		
									0.0		
BLACK BEAR PROJECT					5.0				5.0	0.0	NSERC, UIC, UBC
Collars/Equip									0.0		
GIS									0.0		
Res/Tech/Vol									0.0		
Misc									0.0		
DNA									0.0		
									0.0		
ELK PROJECT									0.0	10.0	UofGuelph, RMEF
Researcher (Mackenzie)						18.0			18.0		
Techs						4.0			4.0		
Tech Support						1.0			1.0		
GIS						1.0			1.0		
Collars/Trapping						5.0			5.0		
Drugs/Misc/Repar						3.0			3.0		
									0.0		
WILDLIFE CORRIDORS									0.0	20.0	District W
Principal Researcher							12.6		12.6		
Tech Urquhart							20.0		20.0	10.0	Town of Banff
TEch Support							2.0		2.0		
GIS AND WRITE UP							8.4		8.4	6.0	TransAlta
Misc G&S							1.0		1.0		
									0.0		
TCH PROJECT									0.0	20.0	YNP,R&GNP, UBC
Researcher (Clev)				50.0					50.0		
Techs				36.0					36.0		
Multispp Monitor				24.0					24.0		
Carnivore Guild Tech				9.0					9.0		
GIS				1.0					1.0		
Travel&G&S				6.1					6.1		
									0.0		
Wild. Network Dist. Database								2.0	2.0		
									0.0		
Giant Liver Fluke Distribution									0.0		
									0.0		
									0.0		
TOTAL COST PER PROJECT	150.0	5.0	48.1	150.0	5.0	57.8	45.0	2.0	462.9	258.0	
PROJECT YEAR	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8			
Funding Source	fy 93/94	fy 94/95	fy 95/96	fy 96/97	fy 97/98	fy 98/99	fy 99/00	fy 00/01			
Banff Capital	25.0	135.0	110.0	210.0	197.0	305.3	250.0	250.0			
Green Plan	60.0	60.0									
TCH Monitoring/Research	40.0	105.0	100.0	235.0	265.0	150.0	150.0	150.0			
Regional Research Reserve	25.0	50.0	50.0								
PMP Implementation					22.0		30.0	30.0			
TOTAL FUNDING AVAILABLE	150.0	350.0	260.0	445.0	484.0	455.3	430.0	430.0			
UIC: Unemployment Insurance											
NSERC: Scholarships											
PLPP: Peter Lougheed Prov. Pk											
UBC: U of British Columbia											
UofC: U. of Calgary											
U Guelph: U. of Guelph											
RMEF: Rcky Mtn. Elk Foundation											