

## **Protected Areas in the Next Millennium: Managing for Ecological Integrity**

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### **Abstract**

The history of protected areas in Canada begins towards the end of the nineteenth century. Initial purposes of recreation for the wealthy with minimum of risk have been supplanted with notions of ecological integrity and biodiversity conservation. The example of evolving expectations for national parks reflects the changing values in Canadian society. Amendments to the National Parks Act in 1988 and governing operating policies introduced responsibilities for ecological integrity. A broader framework for these Canadian values is evident in the ratification of the International Biodiversity Convention, the preparation of a strategy for the conservation of biodiversity, and its implementation. Canadian protected areas are a prominent component of the strategy. Yet, internal stressors such as tourism and park management practices along with external stressors such as adjoining land uses are undermining the values placed on protected areas. In many protected areas, to maintain ecological integrity, active management must become the norm. It is only through applying principles of adaptive management that native biodiversity and ecological integrity can be maintained into and through the next millennium. A number of research topics are suggested to this end.

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### **Introduction**

Canada has a long history relative to other countries in the establishment of protected areas. The first protected areas in Canada were established in the latter years of the 19th Century. The first national park created was Banff. Its inception in 1885 was intended to preserve outstanding scenic areas, provide recreation and tourism as well as to protect wildlife habitat.

The central idea governing the establishment and management of national parks has changed over time. The shift reflects a change by Canadians in their expectations for their protected areas. As well, it reflects an increased scientific understanding of the principles of sustainable development and the role of protected areas. The Ontario Lands for Life (Anonymous, 1997) initiative of creating more protected areas and defining uses is an expression of this growing understanding. Over a century ago, parks were established primarily as pleasuring grounds for those who could afford the amenities. During this period of the national park movement, "improvements" such as killing predators, and the construction of hotels, golf courses, and other tourism infrastructures were actively pursued. Eventually, over time, the exploitation of natural resources through mining and logging was no longer considered acceptable. Also with time the natural role of predators and fire became accepted. They, like all the other functional and structural components of an ecosystem, were recognized as belonging in protected areas. In tandem to this line of reasoning, establishment

of parks began to be based on a system plan anchored in the concept of representation. Similar patterns of park establishment and management occurred within both Federal and Provincial jurisdictions.

This commitment to representation and protection of the range of Canadian ecosystems, from the cordillera to the boreal to the marine recognizes their Canadian heritage value. These broad ecological zones are the fundamental components that define Canada and continue to define its inhabitants and their culture. Canada has pursued the establishment of a system of national parks since the 1970s. Likewise provincial governments have fixed frameworks as the basis for establishing protected areas.

In the case of national parks there is widespread recognition of the heritage values within each of the National Parks. This assigns the responsibility and challenge to Parks Canada for protecting the ecosystems within each park in their integral form. It is a challenge indeed for all Canadian protected area managers if in the next millennium we are intent on meeting the legal obligations of ratified international conventions and Canadian legislation.

This paper reviews the context for the evolving values associated with protected areas with particular reference to national parks in Canada. The example of stressors facing national parks provides a backdrop for offering solutions to mitigating impacts and to restore the degraded.

## **Canadian Context**

### ***Canadian Biodiversity Strategy***

Canada has developed a Biodiversity Strategy. This activity flowed from Canada's decision to sign and ratify the International Biodiversity Convention. The formulation of a strategy was a complex undertaking for Canada, a federal decentralized country. A working group with members from federal departments and provincial and territorial governments was organized. To broaden the support for the Strategy, representatives drawn from regional and urban governments, private property owners, businesses, local and indigenous communities, conservation organizations, research institutions, foundations, and others were asked to form an advisory group.

They advised on the formulation of strategies to address specific Biodiversity Convention Articles. More importantly perhaps, direction was also given on how best to engage a majority of Canadians in responding to the challenges of conserving biodiversity. From the start, it was recognized that a wide-base acceptance, among all Canadians, was fundamental to realizing the Strategy's goals.

The actions in the Strategy are formulated under five goals:

- conserve biodiversity and use biological resources in a sustainable manner;
- enhance both our understanding of ecosystems and our resource management capability;
- promote an understanding of the need to conserve biodiversity and sustainably use biological resources;

- provide incentives and legislation that support the conservation of biodiversity and the sustainable use of biological resources; and,
- work with other countries to conserve biodiversity, use biological resources sustainably and share equitably the benefits that arise from the utilization of genetic resources.

The first goal's achievement is fully dependent on the implementation of ecologically based planning and management. It is a first step in achieving conservation and sustainable use of biodiversity. The success of the planning and management depends significantly on the completion of a network of protected areas. The Strategy builds on the notion that protected areas contribute to the conservation of biodiversity.

The Biodiversity Strategy provides direction on completing protected area systems and protecting such sites. Fundamental to protection is the institution of management regimes that incorporate the views of local and regional stakeholders on minimizing biodiversity losses and other impacts. There is full recognition in the Strategy of the role played by various levels of governments as well as non-governmental organizations in realizing this goal. In effect ecosystem-based management is proposed but, to be clear, this means management based on ecosystems for the purpose of maintaining native biodiversity.

#### ***Non-Federal protected area roles in biodiversity conservation***

Canada has approximately 800,000 km<sup>2</sup> (8% of Canada's area) of protected area (Table 1). Four percent of Canada is areas protected from all commercial extractive activities. National Parks take up approximately two percent or half of the non-extractive protected areas in Canada. A National Conservation Data Base maintained by the Canadian Council on Ecological Areas identifies 10,000 km<sup>2</sup> of the protected area total to be held by non-government groups.

<b>Category</b>		<b>Number</b>	<b>Area (ha)</b>
Ecological	Ecological Reserves	471	982,501
	Wilderness Areas	43	795,593
	Nature Trust	18	1,060
Parks	National	38	22,446,690
	Provincial	1,554	15,313,537
Wildlife	Bird Sanctuaries	102	11,356,904
	National Areas	46	317,901
	Other Wildlife Areas	240	23,569,230
Forest Reserves		70	2,519,100
Marine Reserves		15	1,000,000
Other		860	173,523
<b>Totals</b>		<b>3,457</b>	<b>78,476,039</b>

Table 1: Major Groups of Protected Areas Owned or Managed by Government in Canada (CCEA)

#### ***Private***

In Canada most non-government owned or administered land which could be categorized as protected is held by groups such as the Nature Conservancy, Federation of Ontario Naturalists, provincial based nature trusts, and Ducks Unlimited. The objectives for these lands vary from strict protection to

management for the enhancement of species, particularly those with exploitative potential. Approximately 8,600 sites encompassing over one million hectares are privately held under a protection regime in Canada.

### ***Municipal***

Each municipality or regional government in Canada maintains extensive green areas either as city parks or green belts. These are for the most part oriented for recreational purposes but do, to some extent, add to the overall Canadian biodiversity conservation objectives. Certainly, large city parks such as High Park in Toronto, Mont Royale in Montreal – Canada's first city park, established in 1872, Stanley Park in Vancouver and Point Pleasant Park in Halifax have intrinsic biodiversity values. These areas are poised to contribute a larger share as broader environmental perceptions and management objectives infiltrate the municipal levels. Ecological restoration activities are taking place. In Toronto's High Park, for example, restoration of an oak savanna is underway. The idea of restoration is spreading to smaller parks. Naturalization programs of municipal parks and even schoolyards are being sponsored throughout Ontario.

### **Provincial**

The provincial and territorial governments administer a number of categories of protected areas. The variety of these areas is exemplified by their purpose that varies from ecological reserve to roadside picnic areas. There are 1554 provincial and territorial parks totaling 15,313,537 hectares. In addition to these areas, 471 ecological reserves amount to 982,501 hectares. Another 43 areas totaling 795,593 hectares are designated as wilderness, and along with the ecological reserves are Canada's only protected areas fitting into Category I, the highest level of protection, under the IUCN system of protected area classification. Ontario has a variety of protected areas (Figure 1).

## **National Parks in Canada**

### ***System planning for the next millennium***

Canada's 38 national parks are all classified as Category II under the IUCN system of classification. National parks in Canada are established according to a plan devised and adopted in the early 1970s (McComb, 1994). Canada was divided according to vegetation and physiographic criteria into 39 Natural Regions. The objective is to protect outstanding representative sample areas within each of these 39 major Canadian landscapes. Presently there are 16 regions (40%) without representation. In 1990 the Government of Canada placed a time frame for completing this system (Anonymous, 1990). The present Government, re-elected in 1995, reaffirmed its commitment to this objective.

The process of establishment of a national park is a slow and often unpredictable process. Negotiations or feasibility studies are presently underway in areas of the North West Territories, Labrador, Manitoba and British Columbia. A similar process is underway in establishing marine conservation areas, intended to promote conservation and sustainable use of the natural marine environment. Currently five of 29 marine regions have representation.

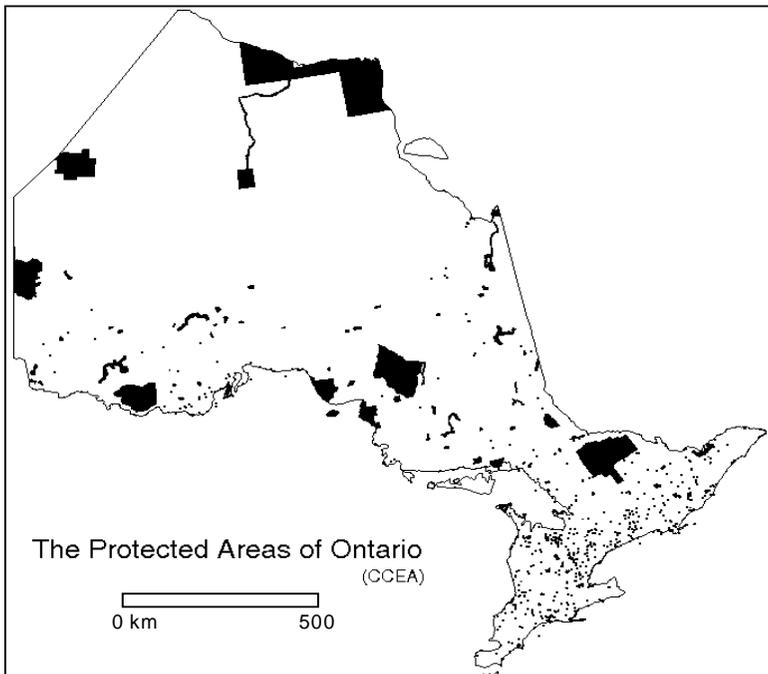


Figure 1: The Protected Areas of Ontario (Canadian Council of Ecological Areas)

### ***Societal context***

In a recent survey, national parks of Canada were identified as the third ranking Canadian symbol, after the flag and anthem. Yet, the average Canadian is not likely to differentiate national and provincial parks. This confusion could perhaps be excused given that all protected areas are but anthropocentric mechanisms of designating geographic areas on the basis of a value to society. Society is clearly not interested in who is responsible but rather that the protected areas are in place and delivering on their mandate. That is the source of pride.

Governments have been interpreting such values while leading in the establishment of parks. The initial values in Canada were centred on assuring recreation opportunities primarily for the wealthy. The frame of reference then was to provide a way to experience the values – initially, primarily aesthetic – offered by national parks with a minimum of risks. To assure the experience was rewarding, charismatic mega-fauna species were protected from predators and forest fires.

The governing Parks Canada Policy now has sections dedicated to eliminating anthropocentric biases and recognizes protection as the primary mandate (Anonymous, 1994). Yet, the fact that parks are for people as well as for protection is not obscured. It is one of the objectives of national parks. Indeed visitation continues to generally increase (Figure 2).

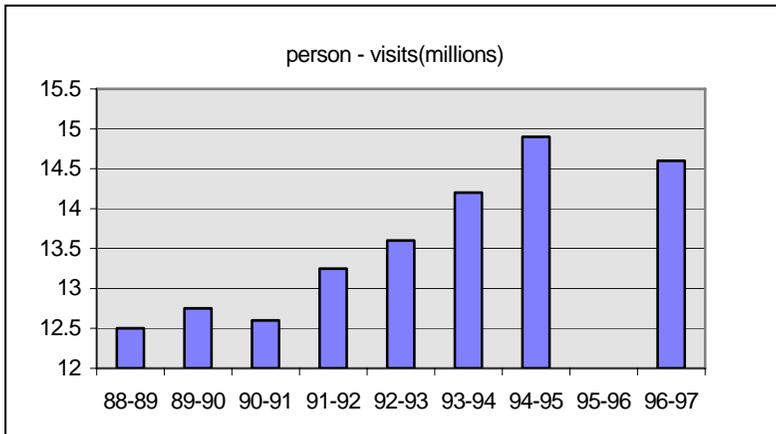


Figure 2: Trends in Attendance at Canadian National Parks (No data available for 1995-1996.)

The continued revision of policies and public debates is a characteristic of a politically accountable agency (Freemuth, 1989). NASA, in contrast, with its original mission of placing a man on the moon is an example of a professionally accountable agency where a task is assigned without direction on methods for achievement. However, Parks Canada managers, as part of a politically accountable agency and with a divergent set of objectives, must strive for consensus.

Consensus on the definition of objectives for a national park is reached somewhere along the pendulum swing between the recreational use of yesteryear and the complete closure to public access. The appropriate point must be determined by society. In this context, Freemuth (1989) argues that the role for science and technology is not to provide the basis for park management but rather to provide the means of building consensus among the differing interests in national parks. In Canada the consensus is derived through a process of consultation associated with the preparation of park management plans.

Once a national park is established, preparation of a plan is not a matter of choice. The 1988 amendments to the National Parks Act require that the Minister responsible for national parks tables a management plan in the House of Commons within five years of establishment. Each national park management plan is to be reviewed every five years. Previously, management plan preparations were laborious exercises to develop prescriptive plans mostly addressing developments. Now plans are to be prepared in one year's time, focus on the inter-relationships of the park with surrounding areas and be much more strategic in nature. Ecological integrity issues rather than development is now the focal point.

This shift in management planning reflects the shifting pendulum trace of park purpose. Purpose definition has never been stationary and it will remain a moving target. In the realm of the "protection" objective of national parks, Parks

Canada has traversed from the “let nature take its course” paradigm to one espousing scientific-based ecosystem management, ecological restoration and indeed the notion of change.

## Legislation and Policies

### *Ecological integrity:*

The societal contexts for national level protected areas are reflected in the governing “Guiding Principles and Operational Policies” and of course also the National Parks Act. The above factors, which affect the management for protection, must be placed in juxtaposition to the National Parks Act. The Act, amended in 1988, now states: “Maintenance of ecological integrity through the protection of natural resources shall be the first priority when considering park zoning and visitor use in a management plan”. A legal responsibility for maintaining ecological integrity has been established. Various definitions have been proposed (Woodley et. al., 1993; Anonymous, 1994). A simple definition for ecological integrity is a condition where the structure and function of an ecosystem are unimpaired by human activity and are likely to persist.

The simplest interpretation of ecological integrity is that there is now a requirement to protect and manage for “completeness or wholeness” in ecological terms, that is, a functioning ecosystem with all its parts including processes. In the context of native biodiversity, ecological integrity means the full complement of native life and its processes from genes to ecosystems. Maintaining ecological integrity is a mammoth task that Canadians have assigned Parks Canada. This assignment in fact is perhaps unrealistic where predators, disease or other ecosystem regulators have been tampered with or eliminated. In Point Pelee National Park the once ubiquitous bullfrog along with five other amphibians are now listed as extirpated.

In a world without artificial boundaries and drastically altered landscapes and where climate would change slowly and gradually, maintaining ecological integrity would be simple. It would be a matter of not interfering. Now, with natural processes modified, small protected areas isolated by surrounding non-conforming land uses and bombarded by long-range transported pollutants, benign neglect cannot and does not equate with ecological integrity.

An active management regime is the only recourse. Managers must decide how and when to manipulate. The activities of course must be in accordance with objectives of ecological integrity/biodiversity conservation, which are clearly stated in a park management plan, and thus publicly debated. Results of these activities must be monitored as the knowledge gained provides the basis for not only reporting but also for adjusting the objectives. In effect, adaptive management (Walters and Holling, 1990; Walters, 1997) is the prescription.

It would be inadequate to leave adaptive managers with only an institutional framework by which to define appropriate management objectives. An ethical framework must also be provided (Serafin et al., 1989). An ecological integrity framework must govern managing. The most complete representation possible must be the over-arching goal. Within such a framework, clear objectives of ecological integrity must guide management decisions.

## State of Parks Report

Canadians want to be kept abreast of the state of their national parks. In response, the National Parks Act was amended in 1988 to specify that a State of Parks report must be tabled in Parliament every two years. The first report was tabled in 1991 (Anonymous, 1991). The second edition was tabled in 1995, three years behind schedule (Anonymous, 1995). The second edition featured a summary of stressors facing national parks as compiled by Woodley (1992). The third edition is in the final stages of review and will also present the latest results of stressors affecting national parks (Figure 3).

A questionnaire, designed to assess the state of park ecosystems based on a "stress response" framework, was sent out to 34 national parks. Teams, consisting of three to five knowledgeable individuals at each park, completed the questionnaire on a consensus basis. The greater ecosystem within which the park is located was used as the framework in formulating the responses.

A stress is considered to have an impact if: 1) it is having a definite ecological impact; 2) it is having an impact upon an area greater than a local scale ( $> 1\text{km}^2$ ); and, 3) the trend in the intensity of the stress is either increasing or stable. The results revealed that common issues were affecting most national parks. Tourism infrastructure and exotic species were the top two stressors originating from within the parks. A particularly important result of the questionnaire is the realization that many of the stressors originate from outside the parks. Clearly, a park's ecological integrity depends on developing harmonized inter-relationships with its surrounding greater ecosystem.

In terms of impacts, the two primary results of the stresses were a loss of community structure and reductions of populations. Perhaps as revealing is that in many cases—one third overall—the impacts were reported as unknown. This is an acknowledgment of the complexity of assessing ecological impacts as much as a need for research.

The conclusion to draw from this is that ecological integrity is impacted within each national park. It further endorses the notion that active management is becoming a necessity if the National Parks Act is to continue being respected.

## Managing Canada's Protected Areas

### *Wilderness*

In North America, objectives for protected areas have traditionally flirted with the notion of wilderness. Wilderness, aside from its traditional qualities of vast remoteness, also is valued for biocentric and anthropocentric reasons (McCloskey, 1990). A common thread among most of the 118 papers delivered at the 1989 "Managing America's Enduring Wilderness" Conference (Lime, 1990) was the idea that wilderness areas once designated need only to be left alone. In effect, the argument is that this form of management, benign neglect or natural regulation would ensure ecological integrity, biodiversity conservation and thus "wilderness". Wilderness management for the majority of the presenters at this conference was a matter of resolving a people problem through education and/or restricting access or adjusting nefarious practices on adjoining land areas.

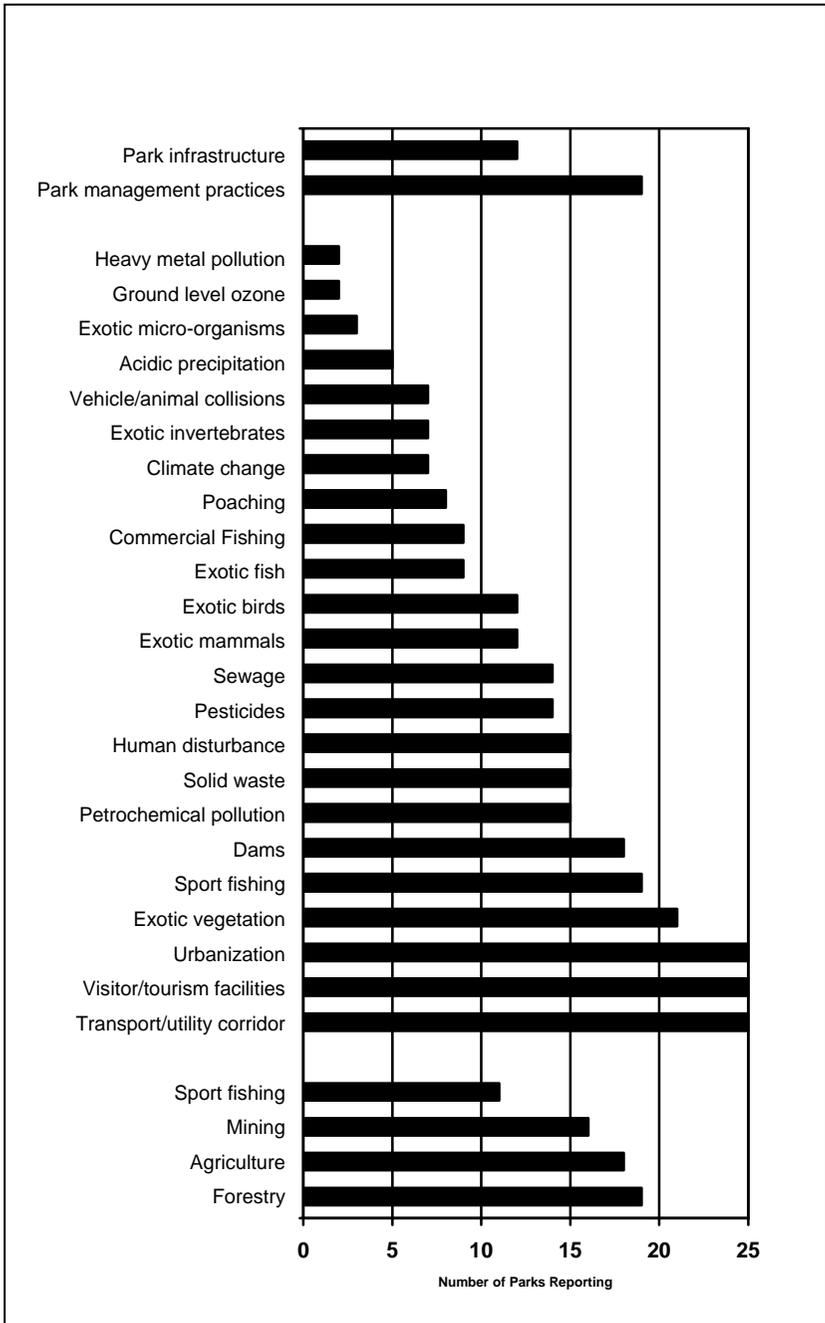


Figure 3: Number of Parks Reporting Significant Ecological Impacts from Various Human Stresses – 1996

The constituency of wilderness is clearly subjective (Lopoukhine, 1992) and as such dependent on temporal and spatial concepts. Within many countries, such areas are now designated and separated from people as much as possible. This kind of wilderness came about through the development of an agrarian society which went about separating the civilized from "uncontrolled" wild areas or, in the parlance of forestry, the unimproved. The paradox of "wilderness" is that civilization created it and now threatens its existence while setting up the conditions for its appreciation (Nash, 1983).

The word "wilderness" is an Anglo-Germanic word without equivalence in other languages. The etymology of "wilderness" is a place (ness) with wild (will) animals (deor) (Nash, 1983). Henberg (1994) suggests since humans are but another form of beast we should not be distinguishing one area of beast from others in defining areas. Separation of areas into wilderness is in direct contrast to the notion of one – inseparable – as viewed by many indigenous cultures including native North Americans (Martinez, 1993).

The indigenous culture, while viewing itself as linked to its environs, nevertheless practiced control, whether in the use of fire, harvesting of plant materials or hunting. Through these actions the North American landscape was shaped (Kay, 1994). There was control and human domination prior to Europeans' arrival on the American continents. Walpole Island, north of Windsor, Ontario, is the only place in North America where patterns of burning by humans have not been interrupted since Europeans stepped onto this continent (Martinez, 1993). Is it coincidence that this remnant controlled area under continued restoration is the sole locale for some 60 plant species listed as either vulnerable, threatened, or endangered by the province of Ontario? Is this domination or stewardship? Further, with the care being provided are they really endangered?

At the Managing America's Enduring Wilderness conference, one dissenting voice to the notion of benign neglect was a paper presented by DeBenedetti (1990). He argued that to maintain wilderness values in the Pinnacles National Monument, fire – the dominant natural process – had to be managed. This area, for which he was responsible, was too small and surrounded by inimical land uses to permit fire to occur randomly. In order to ensure ecological integrity and assure safety for occupiers of surrounding land areas prescribed fires were necessary.

It can be argued that the case of the Pinnacle National Monument is applicable to all protected areas. The stress results noted above (Woodley, 1992) are further proof of the barrage of problems facing protected areas with the responsibility of meeting objectives of ecological integrity. There really is no choice if you consider the reality of protected areas (Lopoukhine, 1990), namely:

- Parks do not exist in isolation from neighbouring lands and the impacts thereon.
- Park areas are not, nor ever were, established on the basis of functioning ecosystems.
- Most natural process management solely within a park is impossible.
- Parks represent nodes or anchors for dynamic species and processes which extended beyond the confines of a park area.

- Few, if any, parks contain unaltered ecosystems. All show signs of modification due to recent human activities.
- The vast areas of both land and water within even the largest of parks are profoundly altered by direct human intervention.
- Restoration of ecosystems to absolute pristine conditions is impossible. Furthermore, a definition of pristine for the areas now occupied by parks is impossible.
- Global-scale changes preclude setting inherited ecosystems or vignettes of past landscapes as a goal of perpetuation.

To some the idea of maintenance or active management is problematic, particularly if the governing definition for ecological integrity includes the notion of persistence. However, before rejecting this notion it may be worth reflecting on the mounting evidence that persistence in the past was in fact dependent on human maintenance. Ecosystems in the historical or the indigenous models were maintained. Where this is reality to assure “wilderness”, maintenance is unavoidable.

### *Flux of Nature*

Protected area agencies need to adopt and exhibit a culture that conserves biodiversity approaching the level of success exhibited at Walpole Island. It requires abandoning the balance of nature paradigm for the pursuit of adaptive management principles. One important principle is determining the objective for such management. The world has from time immemorial exhibited a variety of pathways of change and compositions. Glaciation, variable rates of vegetation migrations, climate and humans have all yielded variety over time. Fossils are physical proof of change over time. Which state to choose or how to consider defining an appropriate framework for such a state is an unresolvable riddle. Pickett (1994) suggests that to assume that there is only one ecologically legitimate or ideal system is a trap. White and Walker (1997) suggest that there is a constellation of possible states.

The specific dynamics of any one system will be contingent on its history, the accidents of arrival of species at the site, and the nature of the system's connection to its landscape or current influences. With this realization of course comes the fortunate or unfortunate realization that we must now also deal with choices. Nature provides a variety of choices and we as managers are faced with this cornucopia of choice. One option is to let things evolve under the current influences and so do nothing. This will encourage the loss of endemics – species and stages of development – and permit exotics to have their way. A second option is to resolve to take specific actions to achieve predetermined and approved objectives

The process of change is constant. Natural disturbances of course guarantee periodic change. However, on a more subtle scale, change is also to be expected since all ecosystems are open on a spatial and hierarchical scale. As such they are regulated from outside their boundaries. Thus multiple equilibria or end points are possible along a variety of multiple succession pathways. Furthermore, humans have and always have had an effect. These fundamental truths are the framework for the new paradigm, now also referred to as the “flux of nature”

(Pickett et al., 1992). It is in direct contrast with the old paradigm of balance of nature that focused on stasis and fixed equilibrium points.

The “balance of nature” metaphor that “nature has only one way to be” has been difficult to shed. In part because it is rooted in history traced back as far as Plato and even earlier (Egerton, 1993). Dan Botkin (1990) in his book *Discordant Harmonies* provides numerous examples where this perspective has led to many disasters – from park management to resource harvesting.

What relevance is this to Canada’s protected areas? Essentially this analysis leads to the conclusion that focusing on one stage within a limited time and spatial scale is inappropriate. The landscape must be kept in the context of our ecosystem management objectives. Botkin (1990) asks the question – if we can accept that for one species change is required then how can we reject any changes? The problem then becomes what change must we accept. Some are good and others are not. It is tempting to say that some are natural and others are not. In the case of groping with whether a fire’s origin is natural, Van Wagner (1983) answered this by in effect stating why bother, as if nature was a conscious entity that cared how a fire starts. The issue in fire and indeed ecosystem management boils down to what does society want our parks to represent – the results of a suppressed fire regime or one exhibiting ecological integrity.

The question we must invariably answer is what is the appropriate objective and how do we know it is the appropriate objective. This is a question that ecological restorationists must face in their pursuits (Whyte and Walker, 1997). Temporal and spatial variation in nature is a critical consideration in setting objectives. Analogs and historical variation based goals are the normal basis of determining restoration end points.

## **Ecosystem management**

Existing protected areas are rarely large enough to enclose the requirements of large mammals such as a population of grizzly bears. Areas burned by wildfires, if tracked over a decade or longer, will be found to fall in and outside of protected areas. Land uses in and around many of Canada’s protected areas are inimical to the purpose of protected areas, resulting in relatively undisturbed islands surrounded by developed lands. All of this creates the variety of ecological stresses depicted above. For these reasons, an ecosystem-based approach to management has become the latest policy instrument by which many protected area agencies are attempting to achieve goals of biodiversity conservation and ecological integrity.

Ecosystem management aims to integrate biological, physical and sociological information. It is a comprehensive way to deal with the host of environmental issues that seem overwhelming when considered separately. Ecosystem management is certainly a concept with a broader scope than ecosystem science. It has been interpreted to mean a broad, consensus-based approach to land management. Agee (1996) warns that ecosystem management is a paradigm under development, as yet to be proven, but holding much promise. Nevertheless, it is appropriate for us to apply it to park management.

Ecosystem management is a way to:

- integrate parks and protected areas into their surrounding landscapes and thus avoid isolation;
- account for the range of interactions that occur at spatial and temporal scales beyond the traditional scales used in park management; and,
- incorporate a range of human values into the protection and use of the landscape.

An ecosystem management approach is being attempted in and around many national parks. These efforts take many institutional forms. Some parks are part of the International Biosphere Reserve program, such as Waterton Lakes National Park. Waterton is part of a large ecosystem management program called Crown of the Continent, which involves the Provinces of British Columbia and Alberta, Glacier National Park in Montana, as well as private ranches. The significance of this area has been recognized recently by the acceptance of the area as a World Heritage Site.

Four national parks are part of Canada's Model Forest Network, including Fundy National Park in New Brunswick. While active forestry does not occur on parklands, Parks Canada provides research capability, public education and a core protected area that is an essential part of sustainable forestry. The Fundy Model Forest includes over thirty partners, including an international forestry company, a private woodlot owner's cooperative, environmental organizations, and recreation clubs.

Still other parks use ad hoc partnership arrangements to achieve the same results. Banff National Park is part of the Central Rockies Ecosystem project. This project includes provincial wildlife and forest management agencies, and universities, among others, in an effort to understand and protect populations of large carnivores and to clarify the role of wildfire. To achieve these goals, it is essential for partners to jointly define and work towards common goals.

## Conclusions

Canada is about to enter the next millennium with one of the world's premium systems of protected areas. Most importantly, Canadians value these protected areas. It is this value which causes Canada's government to commit itself to completing the system and to meeting biodiversity conservation objectives. Recent examples of this commitment are the soon-to-be-announced blue ribbon panel on ecological integrity as promised in the Liberal Government's election platform and Ontario's *Lands for Life* program with consultations leading to more protected areas.

What is becoming clearer to all those intimately engaged in the management of protected areas, is that issues are more complex than ever. This added complexity has led to the acceptance of an ecosystem-based approach to management of protected areas. With this however, comes the revelation that much information is lacking to assure that decisions are truly science-based and sound. Research has been given a clear role as a partner in dealing with these issues. Specifically research must yield information in regards to meeting a protected area's biodiversity conservation and ecological integrity goals. Ecological research must address issues of fragmentation, historical variation of

ecosystems, meta-population management and issues of connectivity among protected areas. Parallel to the ecological, social science research focused primarily on human use management must also be encouraged to assure that the principle of use without impairment is not compromised.

Michael Williams (1993) quotes Carl Sauer: "the cultural landscape is fashioned out of a natural landscape by a cultural group. Culture is the agent, the natural area is the medium, the cultural landscape is the result." Native American cultural landscapes were captured within many park areas. Now, in turn, these protected areas' management agencies are imposing their culture on these landscapes. To date it has been an anthropocentric-based culture. Management decisions are only beginning to reflect biocentric values.

This is perhaps understandable when we consider that our protected area management culture has been moulded by policies of recreation, predator control, natural regulation, and internal solutions to problems. It is only recently that we have begun to reshape our culture with notions of ecological integrity and ecosystem management at a regional scale. Now, we even have at our disposal the opportunities of using ecological restoration (Jackson et al., in press) to bring our culture to the point where biodiversity conservation is a reality from the landscape level down to the genetic level, and ecological integrity is maintained. In achieving this reality we will have entered the next millennium managing for "wilderness" as it should be and not as a romantic notion.

## References

- Agee, James K. 1996. Ecosystem Management: an appropriate Concept for Parks? In R. Gerald Wright. ed. National Parks and Protected Areas: their Role in Environmental Protection. Cambridge, USA, Blackwell Science.
- Anonymous. 1997. *Lands for Life: A Commitment to the Future*. Toronto, Queen's Printer for Ontario.
- Anonymous. 1995. State of Parks 1992 Report. Ottawa, Minister of Supplies and Services Canada.
- Anonymous. 1994. Parks Canada Guiding Principles and Operational Policies, Cat. No. R62-275/1994E, Ottawa, Minister of Supplies and Services Canada.
- Anonymous. 1991. State of Parks 1990 Report, Cat. No. R64-184/1990E. Ottawa, Minister of Supplies and Services Canada.
- Botkin, D. 1990. *Discordant Harmonies: A new ecology for the twenty-first century*. New York, Oxford University Press.
- DeBenedetti, S.H. 1990. Managed Fire in Wilderness: a Necessity at Pinnacles National Monument, California. In D. W. Lime. ed. *Managing America's Enduring Wilderness Resource: A Conference*. Minneapolis, MN. September 11-17, 1989, Tourism Centre, University of Minnesota, St. Paul, Minnesota: 401-407.
- Egerton, Frank, N. 1993. The History and Present Entanglement of Some General Ecological Perspectives. In M.J. McDonnell and S.T.A. Pickett. ed. *Humans as Components of Ecosystems: the ecology of subtle human effects and populated areas*. New York, Springer-Verlag: 9-23
- Freemuth, J. 1989. The National Parks: Political Versus Professional Determinants of Policy, *The George Wright Forum* 6(3): 26-39.

- Harper, J. L. 1987. Heuristic value of ecological restoration. In Jordan, W.R. III et al. ed. *Restoration Ecology: a synthetic approach to ecological research*. Cambridge: Cambridge University Press.
- Jackson, L.L., N. Lopoukhine and D. Hillyard. 1995. Ecological Restoration: a Definition and Comments. *Restoration Ecology* 3: 71-76
- Kay, C.E. 1994. Aboriginal Overkill: the role of Native Americans in structuring western ecosystems. *Human Nature* 5: 359-398.
- Lime, D. W. 1990. ed. *Managing America's Enduring Wilderness Resource: A Conference*, Minneapolis, MN. September 11-17, 1989, Tourism Centre, University of Minnesota, St. Paul, Minnesota.
- Lopoukhine, N. 1990. National Parks, Ecological Integrity and Climate Change. In G. Wall and M. Sanderson. eds. *Proceedings of "Climate Change: Implications for Water and Ecological Resources"* Symposium, March 15-16, 1990, University of Waterloo, Department of Geography Pub. Series, Occ. Paper No. 11.
- Lopoukhine, N. 1992. Resource exploitation vs. wilderness protection: Future Scenarios. In M. Ross and J. O. Saunders. ed. *Growing Demands on a Shrinking Heritage: Managing Resource Use Conflicts*. Calgary: Canadian Institute of Resources Law.
- Martinez, D. 1993. Managing a Precarious Balance: Wilderness versus Sustainable Forestry. *Winds of Change* 8(3): 23-28.
- McCloskey, M. 1990. The Meaning of Wilderness. In D. W. Lime. ed. *Managing America's Enduring Wilderness Resource: A Conference at Minneapolis, MN.*, September 11-17, 1989, Tourism Centre, University of Minn., St. Paul, Minnesota: 22-26.
- McComb, M. 1994. Completing the National Parks System. In *Forestry on the Hill: Protected Areas*. Ottawa: Canadian Forestry Association: 30-33.
- Nash, Roderick. 1983. Sorry Bambi, but man must enter the forest: perspective on fire and wilderness. In J. E. Lotan, Tech Coord. et al. ed. *Proceedings from a Symposium and Workshop on Wilderness Fire*, Report INT-182, Intermountain Forest and Range Experiment Station., USDA, Forest Service. Missoula, Montana: 264-269.
- Pickett, S. T. A. and V.T. Parker. 1994. Avoiding the old Pitfalls: opportunities in a new discipline. *Restoration Ecology* 2: 75-79.
- Pickett, S.T.A., V.T. Parker and P. Fielder. 1992. The new paradigm in ecology: Implications for conservation biology above the species level. In P. Fielder and S. Jain. ed. *Conservation biology: The theory and practice of nature conservation, preservation and management*. New York, Chapman and Hall: 65-88.
- Serafin, R., Balse, D., Slocombe, D.S., Woodley, S. 1989. *Ecological Integrity and Management of Canada's National Parks*. Unpublished Report. Prepared by University of Waterloo.
- Van Wagner, C.W. 1985. Does Nature Really Care Who Starts the Fire. In J. E. Lotan, Tech. Coord. et al. ed. *Proceedings - Symposium and Workshop on Wilderness Fire*, Report INT-182, Intermountain Forest and Range Experiment Station., USDA, Forest Service. Missoula, Montana: 98-100.
- Walters, C. J. 1997. Challenges in adaptive management of riparian and coastal ecosystems. *Conservation Ecology* [online], 1(2): 1. [<http://www.consecol.org/vol1/iss2/art1>]
- Walters, C. J. and C. S. Holling. 1990. Large Scale Management Experiments and learning by doing. *Ecology* 71(16): 2060-2068.

- Williams, Michael. 1993. An Exceptionally Powerful Biotic Factor. In M.J. McDonell and S.T.A. Pickett. ed. *Humans as Components of Ecosystems; the ecology of subtle human effects and populated areas*. New York, Springer-Verlag: 24-39.
- White, Peter S. and Joan L. Walker. 1997. Approximating Variation: Selecting and Using Reference Information In *Restoration Ecology* 5(4): 338-349.
- Woodley, S., G. Francis, J. Kay. 1993. *Ecological Integrity and the Management of Ecosystems*. Delray Beach, Florida: St. Lucie Press.
- Woodley, S. 1992. A Survey of ecosystem stresses in Canadian National Parks. Unpublished Data. Ottawa, Parks Canada.