

# North American Protected Areas: An Ecological Approach to Reporting and Analysis

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## **A Widening Ecological Perspective**

FOR DECADES, ECOLOGISTS HAVE BEEN COMMUNICATING THE NEED for an integrated, all-in-one understanding of the places in which we and many other organisms live. Visual evidence of what ecologists had been saying—"our planet is one island of life in the void of space—one ecosystem"—seemed to become a self-evident truth with the early photographs of Earth from the moon. The distant view of Earth from space was compelling. It forced us to think of ourselves as part of the Earth's ecology, not apart from it. Yet three decades later, this integrated way of thinking about the ecosphere is still an emerging concept.

North America seen from space shows no boundaries, no languages, no politics, and no people! The continent is simply a whole entity surrounded by three major oceanic systems. Large stretches of the continent are occupied by distinctive patches, such as the prairies and the Arctic. There are large freshwater bodies and over 15% of the world's forests. Gigantic reserves of mineral and petroleum riches lie in the ground and under the continental shelves. El Niño, the Gulf Stream, and other weather and climate patterns affect the whole continent. And on the ground, there are assets virtually invisible from space: tens of thousands of species of plants and animals, richly varied regional ecosystems, and, indeed, 370 million human beings.

## **Shared North American Values**

Why should Mexicans care about the Arctic? Why should Inuit care about Baja California? Why should city people be concerned about the hinterland lakes and forests? North Americans are often insulated from

the varied ecosystems upon which they depend. After all, water comes from the tap, papers appear on the newsstand, and birds come and go with the seasons.

Even though people don't often think about it, ecological events and processes can often affect them over long periods of time and great distances. Prevailing continental patterns of winds, migratory bird routes, and ocean currents respect no borders. Perhaps most importantly, recent observations of stress-exposure-response cycles have shown that large parts of North America are vulnerable to detrimental impacts and that the assessments of those impacts can have complex sets of environmental and socioeconomic implications. Studies on acid rain, forest renewal, Arctic haze, and cod fisheries are examples.

In North America, our cultures and languages are regionally distinct. However, we share many similar values. As global citizens, Canada, Mexico, and the United States have shared interests in environ-

mental matters concerning ozone depletion, acid rain, Agenda 21 of the United Nations, the Biodiversity Convention, the North American Commission on Environmental Cooperation, the North American Waterfowl Management Plan, the North American Forestry Commission, and others. Whether the level of effort and means by which we address these matters will improve North America's situation over the coming decades will be a matter of record. However, there is already ample evidence that if integrated approaches do not include ecology, environmental conditions in North America will continue to get worse.

The countries of North America have similar and growing administrative needs with regard to cross-border cooperation and consensus building. Having information on national and continental scales would markedly improve decision-making capabilities. All three neighbors—Mexico, United States and Canada—can make significant contributions to the fuller understanding of North America as an ecosystem by further integrating information and expertise in a more structured manner. Some governmental and non-governmental groups in North America are incrementally responding to these needs.

### **The State of North America**

Objective reporting on the state of North American ecosystems is the first line of analysis in consensus building and action-plan development. Finding a consensus must be structured broadly to capture information on varied interest groups, different types of concerns and levels of scientific understanding. The approach to information gathering and then reporting on the findings in North America is to ask these fundamental questions: What is happening to the North American ecosystems? Why is it happening? Why is it significant? What is being done about it?

In 1993, a workshop on North American Environmental Information and Reporting (Ezcurra et al., 1993) brought together professionals from governments, non-governmental organizations and academic institutions in Mexico, Canada, and the United States. Workshop members were asked to examine the application of an ecosystem approach to North American reporting and then to propose actions that would lead to the development of an integrated information base for North America. Such an information base would ideally cover the overall stress-exposure-response continuum and must be seen from the local, national, international, and global scales.

Recommendations from the workshop led to the creation of a North American Steering Committee, which in turn created six tri-lateral working groups with representatives from the three countries. Each country was assigned to lead in two areas related to its current expertise. Canada coordinates the working groups looking at (1) Ecosystem Frameworks and Analysis and (2) Environmental Accounts. The USA takes the lead on (3) Data Issues and (4) Training. Mexico leads the groups assigned to (5) Environmental Indicators and (6) Institutions and Organizations.

### **A Concept, a Model and an Application**

The Working Group on Ecosystem Frameworks and Analysis was given three objectives:

- Review the concept of an ecosystem approach to the state of the North American reporting and provide a philosophic and scientific basis to integrating ecological information.
- Portray major continental-scale ecosystems. Maps at three different regionalized scales and integrated biological and physical data would be used to build the

initial model-framework for depicting ecosystems.

- Analyze the types and distribution of protected ecological areas and use this as an initial basis for promoting work on other topics of North American interest.

Of the work which has been undertaken on these three objectives, only the latter will be discussed in any detail in this paper. But the first two provide the context for the work; they are discussed in Omernik's article, below. With any of these objectives, we must capitalize on existing information and initiatives that already exist in Canada, the United States, and Mexico. This is in part why we are attempting to use THE GEORGE WRIGHT FORUM to canvass for additional input.

### **An Ecosystem Framework**

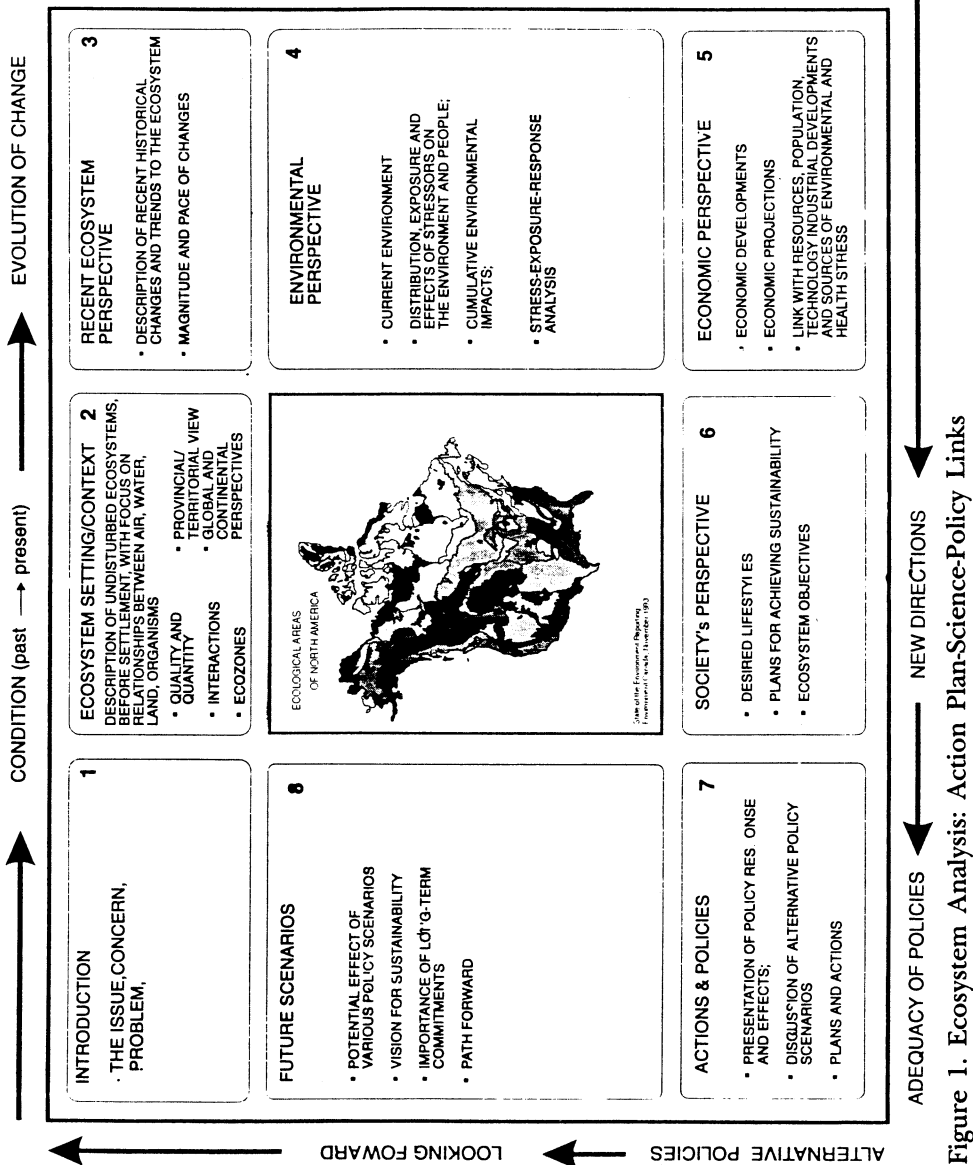
Working within an ecosystem model or framework requires more than just a conscious decision by individuals to change the way they think, plan, and act. At all levels of society, people need to be educated about the reality and extent of their partnership with nature. Building a capacity to operate within an ecosystem context cannot work without well-developed coordination mechanisms amongst countries, agencies, and professionals.

It is only in the last few decades that the world community has begun to express an understanding of and a means to deal with large ecosystems. Applying an ecological model (Figure 1) means seeing North America not just as a system in space; it also requires a vision of North America in time as well. An ecosystem approach realizes that environmental, social, and economic changes don't occur in isolation, and that relatively pristine ecosystems are not isolated from the influences of those which are strongly modified by human activities. Therefore, attention must

be given to identifying important linkages and relationships. In each country, descriptive information on existing and past conditions, as well as emerging social, economic and environmental issues, need to be assessed. This information provides clues as to national and global implications and provides a basis to evaluate the consequences of current and future actions.

But the various internal agencies and departments in all three countries have different and perhaps conflicting mandates. Environmental and socioeconomic data have often been collected independently by various agencies for different purposes. Typically, data are not integrated, and are not always comparable. With protected areas as an example, the work is not the singular responsibility of any one agency or group in a country. The responsibilities, information sources, mandates, roles, and jurisdictions involved are very fragmented across many agencies. Judging the overall adequacy or merely the state of a country's network of protected areas can, paradoxically, only be assessed through the sum of the parts.

The comprehensive picture for North America must grow from protected area information bases like those of the World Conservation Monitoring Centre (WCMC, 1994) and Canadian National Conservation Area Data Base (Turner et al., 1992). The NCADB grew, for example, from a national-government-based registry of 400 protected ecological reserves in the mid-1980s to a registry which currently contains over 14,000 protected areas of various types. Broadly based forums such as the George Wright Society and the Canadian Council on Ecological Areas (CCEA, 1994) are also vital mechanisms in building the larger country and continental perspectives.



## **Regionalizing Ecosystems**

There is a clear recognition that the complex and all-encompassing nature of the ecosystems can not be simply translated into units on a map. Formal decision-makers through to the concerned public, however, commonly plan and act in terms of spatial units—lots, townships, lease areas, properties. Regional depictions showing the mapped extent and variation of ecosystem types are very useful communication devices and convenient instruments in fostering the integration of biological and physical data. The need for a uniform and broadly based ecological regionalization of countries has had a long history (Wiken, 1986; Omernik, 1995). To be of wide value, the approach to regionalizing ecosystems units must be hierarchically based to respect different levels of planning needs and be founded on the integration of abiotic and biotic factors.

Ironically, many natural-region maps and ecosystem maps are not based on a holistic view. When the criteria for mapping and classification are examined, it often turns out that the map units are thematic delineations of a particular ecosystem component (e.g., depiction of the climate component or the vegetation component). Recognizing this fact is strategically important. The underlying notion of a comprehensive network of protected ecological areas is to secure and protect representative types of ecosystems. The key benchmark reference for such work must be a comprehensively based ecosystem map. The concepts behind the map and the units it characterizes constitute the cornerstones in assessing whether representativity has been achieved and how ecological integrity can be maintained.

An integrated classification of ecosystems is a challenge. The Working Group's challenge is to make the existing data that each country brings to the process fit together in a

manner that is useful to as many interests and stakeholders as possible. Canada and the United States have already been successful in this regard and work is being undertaken by the group to apply a similar classification to Mexico.

## **Protected Area Analysis**

Inside our borders, we have set aside areas as national parks, wetland conservation areas, forest reserves, wildlife sanctuaries, biosphere reserves, ecological reserves, marine parks, critical habitat areas, and so on. With some of the earliest designations, it was thought that protecting areas was largely a case of bringing the city to the wilderness. Parks, for instance, provided visitors with picnic tables, roads, and campgrounds so that the wilderness could be experienced with the remnant comforts of city life. Now, protecting areas is more closely equated with managing a future. Protected areas are increasingly being viewed as our remaining stock of ecological capital—nature's original venture capital and each person's biodiversity assets.

The extent, status, and trends related to North American protected areas are unclear. There is no easy way to provide a continental summation. Existing monitoring efforts have largely been set up to look at specific agency needs or at specific ecosystems, and existing protected areas efforts are not cross-indexed in some form of overall system. And consistent and comparable descriptions of data base variables don't yet exist. Canada is perhaps the most fortunate of the three nations at present.

Owing to the production of two national State of the Environment Reports, and the public interest in comprehensive and objective reporting, extensive cooperation has already taken place between agencies to build a central information base.

Of particular interest to readers of this issue is the Working Group's

proposal of a North American Protected Areas Database (NAPAD) with a set of standard attributes. From the outset, the NAPAD database must address the scientific goals of representativity and ecological integrity. It should be designed to meet the needs of North American reporting. But it should also have value in terms of its ability to address work on indicators and issues of biodiversity. The data base should also be able to address the needs of various industry-based sectors (e.g., forestry, agriculture), but at the same time assist in the development of systems-planning needs for particular conservation authorities.

The working group proposes that the North American Protected Areas Database contain the following variables as a minimum and be linked to a GIS.

- Designated or common name of the protected area (e.g., Banff National Park, Yellowstone National Park).
- Centroid (latitude and longitude).
- Size in hectares.
- IUCN category (under the new classification system).
- Location according to province, state, territory, and country. Protected areas can span jurisdictions, therefore a multiple designation capability is needed.
- Ecoregion/Ecozone. This variable should reference particular types of units.
- Jurisdiction: Ownership and management authority.
- Type or designation: A name which reflects the main rationale for establishing the area (national park, wildlife refuge, forest reserves—what's being protected).
- Boundary file: Polygon file describes boundary.
- The year the protected area was established or deleted.

- Change Indicator: Points to a file that keeps information on changes in size of the protected area, its designation, the date the record was last updated.
- Land cover information.
- Source(s) of attribute data.

The following points were considered to be of moderate priority for inclusion in the NAPAD:

- A memo field. It might include whether the protected area spans more than one ecological unit; comments about surrounding land use, such as zoning; special features and attributes, e.g. biological, physical, cultural.
- Assessed economic value.
- A recognition that changing technologies and the penetration of CD-ROM equipped multimedia computers may lead to the ability to include maps, videos, pictures, and sounds to the data base in the future.

Clearly, each country must designate central authorities to maintain and update this database. The Working Group could assist jurisdictions by providing guidelines on how existing categories of protected areas should be coded. The use of wide currency codes like the IUCN's categories should be mandatory so that there is a consistency across jurisdictions.

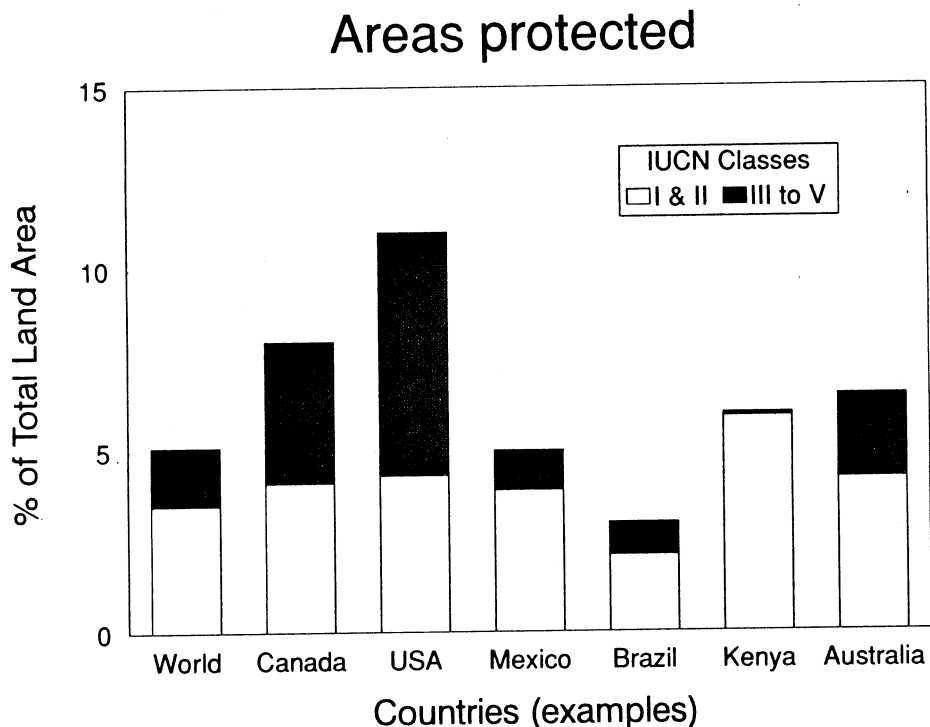
The Working Group acknowledges that initiatives to attempt some of this work are already in progress, some for many years. For example, the World Conservation Monitoring Centre (WCMC) in Cambridge, England, has been acting on a world level as a repository for data on protected areas, and the World Bank is conducting work in the Latin American countries. The North American Protected Areas Data Base would need to capitalize on existing country-level data sets,

and to build on initiatives that have shared goals. For example, the North American Forestry Commission (NAFC) has recommended the formation of a Canada-USA-Mexico joint commission to draw up, develop, and coordinate a Unified System for the management of forested protected areas in North America (USM-PRONA). The U.S. Gap Analysis project is working on related classification schemes.

### Current Status of North American Protected Areas

What progress has been made in North America? According to the WCMC (1992), roughly 5 percent of

the world's land mass is protected in IUCN management categories I to V. This figure parallels what is protected in Mexico; the USA and Canada exceed the average (Figure 2). North America itself would be slightly above the world average. Some agencies feel that the appropriate target for protected areas should be based on general percentages (e.g., 12%) of the Earth's surface, some feel it should be based on representation of regional ecosystem types, some feel it should be based on integrity considerations, and still others advocate the use of all of these factors.



Taken from WCMC (1992) data

**Figure 2. Some Examples of Protected Area Coverage**

How many protected areas do we have in North America? Oddly, the most accessible and comprehensive source of such information was held by the WCMC in Cambridge, England. While Canada had recently integrated data from many sources into the NCADB, Mexico and the USA did not appear to have a singular and authoritative source for all of the major protected area interests; the WCMC had indirectly merged some of the data for these two countries by acting as a host agency for contributions coming from different sources.

The WCMC information base, which mainly concentrates on larger properties, indicates that there are nearly 7,000 areas held by federal, state, and provincial governments. Canada and the USA have a similar numbers of sites according to this information base. In the last issue of THE GEORGE WRIGHT FORUM (Vol. 11, No. 4, p. 12) we attempted to plot the distribution of these areas. The plot of the centroids of these areas corresponds to a population map or, alternatively, a map closely tied to the cultural patterns of each nation. In Canada, the centroids hug the 49th parallel, where most people live. The U.S. pattern shows increasingly dense westerly waves. In Mexico, centroids are heaviest around the Mexico City area and radiate outwards; the region surrounding the city has been the core of human activities and culture for centuries.

The WCMC information base, like other information sources, oc-

asionally lacks key but simple codes (e.g., geographical references). About 17% of the Canadian centroids for sites (Table 1) were not coded, and 85% of the sites have missing data in the U.S. portion. Geographical coordinates are highly valuable in cross-checking the linkage between protected areas and ecosystem units or between protected areas and administrative boundaries. When the latitude and longitude are missing, the utility of the data becomes very limiting. Agencies should be encouraged to provide WCMC with complete data sets.

Many people associate protected areas with parks alone, but the types and, in effect, the interests are much broader. This is reflected in the range of "types" which have been identified. They are most varied in the U.S., with 85 types. General type designations such as wildlife area and nature reserve or other designations such as IUCN's management categories, can be confusing when used in isolation. IUCN category II (Amos, 1994) is typically associated with parks.

Particular parks may also serve as areas protecting key forest ecosystems, critical wildlife habitats, wetland ecosystems, and nature reserves. It is important to critically review how designations of any kind are applied and what they mean to the development of a comprehensive network of protected areas for a particular country or North America as a whole.

	No. of areas	Coded for reference	No. of types of protected areas
Canada	3,423	17%	52
Mexico	214	48%	30
USA	3,100	85%	85

Table 1. Examples of available North American data held by the WCMC



How do we evaluate some of the simple aspects of representativity? Some examples from the Canadian NCADB work are used here. There are roughly 3,500 government properties listed that amount to about 78,000,000 ha. Surprisingly, nearly 98% of this area is covered by just 628 of the properties (personal communications with Tony Turner, State of the Environment Directorate, Canada). These same 628 sites are also the properties which are greater than 1,000 ha—a figure which many feel is essential to have any hope of maintaining ecological integrity. The majority of these large areas are contained within only four geographical divisions—Alberta, British Columbia, Ontario, and the Northwest Territories. In the USA, Alaska would account for many of the larger areas. Canada has fifteen major terrestrial ecozones and five marine ecozones. Only two of these twenty units have greater than 12% secured in protected area status; most average below 3%.

What of the remaining 2,872 protected areas which are smaller than 1,000 ha? Because they largely consist of small areas, many of which are in the southern, populated parts of Canada, it places a great deal of importance on protected area strategies that are designed for fragmented landscapes. Beyond the 3,500 government properties, there are approximately 9,500 other sites held by non-government groups, and these sites amount to about

1,000,000 ha in total. Many of these are small areas as well.

### **Continuing Cooperation**

In the end, there is a vast amount of information available to decision makers and researchers in North America. Equally, there is a growing acceptance of the need for a broader view to the development of ecological approaches to issues of land use and management, and protection of biodiversity. The long-term goal should be to integrate data from numerous sources within all three countries in a consistent and comparable way. These actions are necessary to construct a foundation for ecosystem analysis and to promote basic operational efficiencies.

A continental network of protected ecological areas will ultimately depend on the synergy from widely different agencies and information sources. Decisions need to be connected with the data holders and knowledgeable professionals who have the information to support making informed choices. Integrating data, increasing the understanding of linkages, looking to the future, and recognizing differing perspectives all add up to the key principles of an ecosystem approach. The working group would welcome the help from agencies or individuals in furthering a comprehensive North American perspective on protected ecological areas.

### **From the Editors: How You Can Help**

The GWS has offered to help the Working Group on Ecosystem Frameworks and Analysis by acting as a clearinghouse for information that will further the inventory. We are also committed to communicating with our members and other readers about the inventory, and possibly assisting in other ways as well. The papers in this issue, and the introduction to the project which appeared in the last issue (Ed Wiken, Tony Olsen, and Miguel Esquiha-Zamora, "The 'Status of Protected Areas in North America' Project: An Introductory Note," Vol. 11, No. 4, pp. 10-11), are a first contribution to what will be a long-term project.

But of course the "we" of the GWS really means *you*. So we are asking for the help of all readers of THE GEORGE WRIGHT FORUM. If you have ideas for organizing the inventory of North American protected areas (both natural

and cultural), suggestions of data sources, insights into the process of inventorying protected areas—in fact if you have any suggestions at all—we want to hear from you. Send your thoughts to:

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