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Reporting on North America: Continental Connections

Introduction

Conservation of biodiversity at any level—genetics, species or ecosystems—is an issue of high priority today, since the level of our success will help to determine our own future and even that of nature itself. Evidently, we face enormous challenges. The numerous and complex difficulties inherent in how to protect our natural resources are matched by the variety of approaches that have been taken since the modern ecosystem crisis began. Events such as the toxic leaks from a chemical and plastics dump at Love Canal in 1978, the brown snow in Chesterfield Bay in 1988 (NAEWG 1997), the threat to Arctic ecosystems and marine species from distant pollutant emissions (Wiken 1996), and the dangers associated with ozone depletion are some examples among many that point to the global character of ecological problems. The numerous international agreements created in the five years since the Earth Summit in Rio de Janeiro testify to how the world's ecosystems and environmental resources have recently become of major importance in the eyes of governments, societies, and individuals.

Among the many problems related to changes in nature and the uncountable ecological problems that we face is the loss of biodiversity. Its effects in the short as well as the long term are not to be neglected. As one of the first responses to the loss of natural areas that are storehouses for biodiversity, protected areas were created in many places all over the world. Prevailing conditions and

views determined the different criteria by which they were designated (Phillips 1998; IUCN 1985). The first protected areas in North America were of variable origin and purpose: the USA's Yellowstone National Park was created in 1872, Canada's Last Mountain Lake Wildlife Sanctuary in 1887, and Mexico's El Desierto de los Leones National Park in 1917 (Secretaría de Medio Ambiente Re-

cursos Naturales y Pesca 1996).

Ecosystem Approach

Ecology deals with several levels of complexity, all of which are equally important. However, as recognized by many scholars, ecosystems are the conceptual backbone of ecology (Evans 1956; McIntosh 1985; Wiken 1996). The ecological framework (Wiken 1996) is based on a holistic approach to defining ecosystems and is recognized as a standardized method for classifying and understanding landscapes as well as seascapes. Other "natural" means of organizing information, such as by watersheds, have also been used effectively (Master et al. 1998). From a spatial perspective, the organization, by ecosystems, of data on environmental and socio-economic conditions is useful for the analysis of complex interactions and linkages. These evaluations are not only useful to understanding nature; they are increasingly important to understanding people and the surroundings of which they are a part. In this sense, an ecosystem perspective is a powerful tool for the identification, establishment, monitoring, and management of protected areas.

The delimitation of natural ecosystems is a main element in the discipline of ecology and in the conservation of nature (Primack 1993). Techniques and concepts have varied through the years and have been influenced by many schools of thought,

from natural sciences through economics. Ecological classifications were originally based on the result of the interaction and mix of biotic and abiotic components of a natural unit. However, human impacts can, and have been, so pronounced that in many instances it is simply impossible to describe an area without assessing the roles, effects, and risks of human activities (Hirvonen et al. 1995; Omernik 1995; Government of Canada 1996; NAEWG 1997). Indeed, this is the essence of the current-day ecological perspective.

North America: A Geographic, Ecological, Political, Commercial, and Environmental Entity

In many ways, North America is a keystone case for the comprehension and implementation of a holistic approach to conservation. It is a rich continent, in which most of the world's climatic types can be found. Furthermore, it has very complex topography that includes low valleys—one of which is the world's lowest elevation—and high mountain ridges and extended plateaus. Indeed, it possesses many unique natural features of worldwide significance, some of which are safeguarded in national parks and wildlife areas (NAEWG 1997; National Geographic Society 1995). A very high level of biodiversity is associated with its varied ecosystems and huge extent. Biodiversity generally increases as

one moves south from Canada to Mexico, reflecting an overall equatorial gradient in species distribution. The high level of biodiversity in Mexico reflects its unique geographic position, straddling Nearctic and Neotropical ecosystems, as well as the large number of ecosystems embedded within its highly varied topography. Mexico alone, as one of the world's twelve so-called megadiversity nations, contains 10% of planetary biodiversity (Instituto Nacional de Estadística Geografía e Informática and Secretaría de Medio Ambiente Recursos Naturales y Pesca 1998). Endemism is also especially high in Mexico (Figure 1), where as many as 40-50% of flowering plants and more than half of the reptiles and amphibians are considered endemic (Flores-Villela and Gerez 1989).

The primary threat to North America's biodiversity is related to human activities and the loss and degradation of habitats they cause. It has been estimated that about half of the continent's most diverse ecosystems are now severely degraded (Ricketts et al. 1997). Habitat loss and degradation (Figure 2) particularly threaten freshwater fish.

North America's natural wealth is partially protected through wildlife areas, ecological reserves, parks, and many other types of protected areas. Because protected areas are often established to secure both representative and pristine portions of major ecosystems, it is appropriate to assess

them against an ecological framework (Wiken and Gauthier 1997). Figure 3 shows a point form location of North America's national, provincial, and state parks, superimposed on a map portraying 15 major ecological regions. About two-thirds of these types of protected areas are located in three ecological regions: eastern temperate forests, Great Plains, and the northern forests. Although there are fewer parks in the northern quarter of the continent, given their size (which is not represented on the map), these form the bulk of North America's larger parks.

Mexico, the USA, and Canada are linked through common terrestrial and aquatic ecosystems. Working with this perspective, a tri-national team of scholars classified the continent's ecosystems in a project coordinated by the Commission for Environmental Cooperation (NAEWG 1997). The team sought a common ecological language for the continent.

In addition to their biophysical connections, the three countries are increasingly related through economic and cultural exchange. The 1994 North American Free Trade Agreement (NAFTA) is the first trade agreement to include environmental considerations. Its reference to sustainable development goals and the pronouncement that countries should work together to enhance the safety and protection of the environment provide a conceptual foundation for environmental cooperation

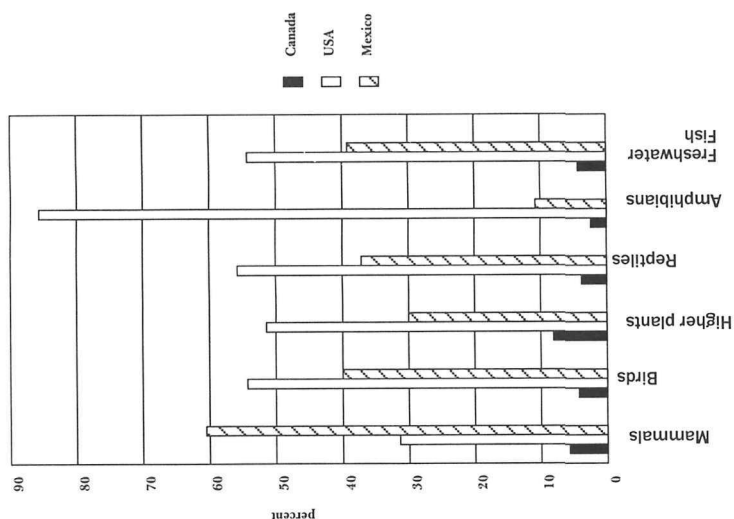


Figure 2. Percentage of threatened species in North America, by country.

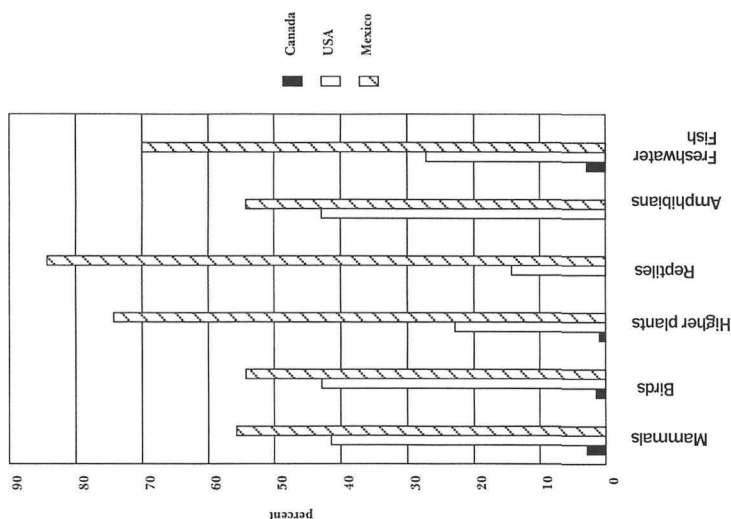


Figure 1. Percentage of endemic species in North America, by country.



Figure 3. National, provincial/state parks, and Level I ecological regions.

(Johnson and Beaulieu 1996). The intensity and the relevance of the environmental debate during NAFTA negotiations prompted the governments of the three countries to sign a supplemental North American Agreement on Environmental Cooperation (NAAEC), which entered into force on 1 January 1994 (Johnson and Beaulieu 1996). The NAAEC can be considered the first document that establishes environmental commitments and responsibilities for countries participating in a commercial agreement, making it unique in this sense (Bustani and MacKay 1996; Ludwizewsky and Seley 1996; Richardson and Beaulieu 1996). The NAAEC created an intergovernmental Commission for Environmental Cooperation (CEC), one of whose projects has been the investigation of the environmental effects of freer trade in North America (CEC 1999). The CEC has a very broad mandate, however, that does not limit it to dealing with trade-environment issues. Rather, the NAAEC confirms the goal of sustainable development and the essential role of cooperation in the conservation, protection, and enhancement of the environment in the territories of the three countries.

Migrations and Protected Areas: Birds, Butterflies, and Marine Species

Habitats, ecosystems, and migratory species all cross political

boundaries—another illustration of how the three countries are connected. A number of species migrate within North America, including birds, bats, butterflies, fish, whales, and other marine mammals. For example, 14 land-based threatened species are shared by all three countries, 35 by Mexico and the USA, 15 by Canada and the USA, and 7 by Canada and Mexico (CEC, in press {a}). The significance of migrations for North American ecosystems is twofold. First, the loss or degradation of only one refuge—a staging, nesting, or wintering habitat, for example—in one of the three countries that is visited by a particular species can threaten its very survival. Second, local or national measures alone may be inadequate to protect the many forms of biodiversity that cross human-delineated borders.

Birds. Seasonal habitats create seasonal resources, but conservation needs are not restricted to any specific season. If migratory species are not to disappear, their habitats and ecosystems need to be preserved, even during their temporary absence. An estimated 2 to 5 billion birds pass from North America into the tropics each year (Greenberg 1990). Migration is most common among species that breed at high latitudes, including both landbirds and seabirds. In fact, virtually all landbird species in North America have at least some individuals that migrate during the course of the year. Conservation strategies to

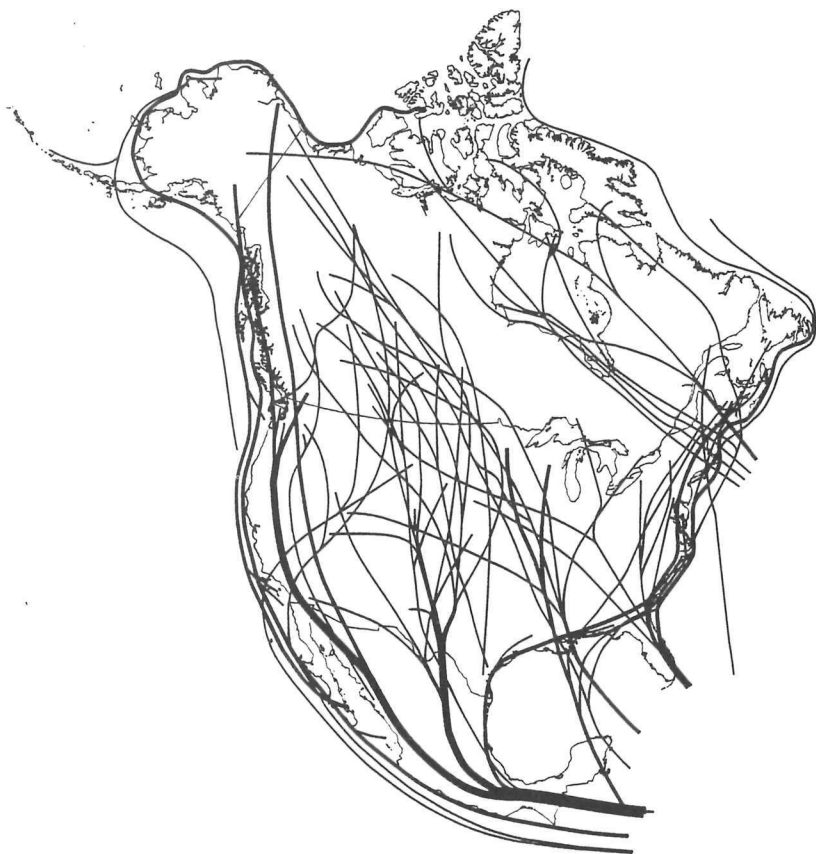


Figure 4. Main migratory bird routes in North America (after data produced by the National Geographic Society)

protect them and their homes throughout the year are significant challenges due to the complexity and distance of their routes (Figure 4).

Fortunately, the need to protect habitats and ecosystems of migratory species has been clearly understood by many activists, academics, and governmental representatives. Some successful initiatives are taking place. It is now understood that efforts made for the conservation of a particular species can fail completely if habitats are not protected and managed throughout the whole migratory range, no matter how many countries are involved.

The development of the North American Waterfowl Management Plan (NAWMP) is an example of how multilateral conservation strategies can be successful. It was signed by Canada and the United States in 1986. The addition of Mexico in 1988 further enhanced the potential for protecting migratory waterfowl and their critical habitats and ecosystems throughout the continent. The NAWMP is a continent-wide collaborative effort to secure, enhance, and manage wetlands across North America. Through the use of a wide range of conservation area types, from national wildlife areas through private land stewardship projects, it aims to reverse the alarming decline of ducks noted in the mid-1980s and to restore waterfowl populations in North America to 1970s levels (Environment Canada 1997). NAWMP

features specific strategies to recover declining waterfowl populations and to reverse the decline in wetland surface (Graziano and Cross 1993). Wetland protection has significantly improved the recovery of unhealthy duck populations.

Another promising North American initiative is the Important Bird Areas (IBA) project. Initiated by BirdLife International, the IBA project has been widely supported and adopted in many places. It recognizes the need for a set of sites through the range of distribution of both resident and migratory birds. Thus, it aims to create an international network of key habitats and protected areas. It was designed more specifically for species whose characteristics and the particular threats to them are best addressed with an integrated approach. An important bird area can be a roosting, reproduction, nesting, or feeding place. It can aim to protect a few individuals of a very endangered species, or many individuals of a healthy population that could be endangered if a particular area is disrupted.

The first step of the project is the identification of IBAs according to the ecosystem approach. Conservation strategies are then designed locally, a process involving local inhabitants and all other stakeholders. In some cases, educational programs are needed and are enough to establish simple conservation measures that can protect an IBA. In other

cases, deep, radical measures, such as the creation of new protected areas, are required to protect habitats. Through the participation of many organizations in a regional, trilateral commitment, a network of North American IBAs has been identified (CEC, in press [b]).

The conservation and protection of IBAs needs to be based on sound ecological and scientific studies, on the active involvement of local inhabitants, and on international agreements and compromises. The three countries have different legislation for the conservation and protection of birds, and the way society participates in such issues differs widely within and among them. For example, bird watchers are very numerous in the USA and Canada, and millions of dollars are spent annually on bird-watching activities (field equipment, birdhouses, bird feeders, field guides, meetings, etc.). The same is not the case in Mexico, where there are no bird-watcher associations. In the USA and Canada, bird hunters are organized through multiple groups. Some, such as Ducks Unlimited, are also involved in the protection of birds and their habitats. In contrast, there are no national hunting societies in Mexico, where hunting birds still represents a way of obtaining food or animals for sale, and is not a popular, commercial sport. Despite these and many other deep differences, the general criteria adopted for the definition and identification of IBAs

can be applied to the three countries and adapted to local, national, regional, and continental levels.

General agreements and common criteria and indicators can lead to a new and successful period of bird conservation. Protecting the habitat of endemic species also frequently includes the protection of migratory species. An ecosystem approach for the design of IBAs as protected areas that fall under different legal regimes is a very promising idea. It has the added advantage of protecting habitats of non-targeted species that would otherwise remain totally unprotected. Of course, an element in the conservation of any area or species is the necessary compromise between conservation strategies and the satisfaction of the local community's needs, which must be determined, established, and respected to make conservation viable.

Butterflies. The conservation of the emblematic North American monarch butterfly and its extraordinary migration routes (Figure 5) presents its own particular difficulties. The northern part of the monarch migratory range has been affected by the use of pesticides and by some reduction of the *Aesclepias* species populations on which the monarch larvae feed and from which they derive the chemical protection that defends them from bird predators. The monarch butterfly habitats in the USA and Canada that are frequented from late spring to early autumn are very

diverse, and include badly disturbed areas. The butterflies return to them regularly, year after year, after overwintering in warmer places. However, wintering sites are also badly degraded. The southern Californian landscape, where the western popu-

lations live during winter, has been severely altered from its original condition (Primack 1993). The establishment of monarch colonies in newly restored forests has been but partially successful in the best of cases (Leong 1997).

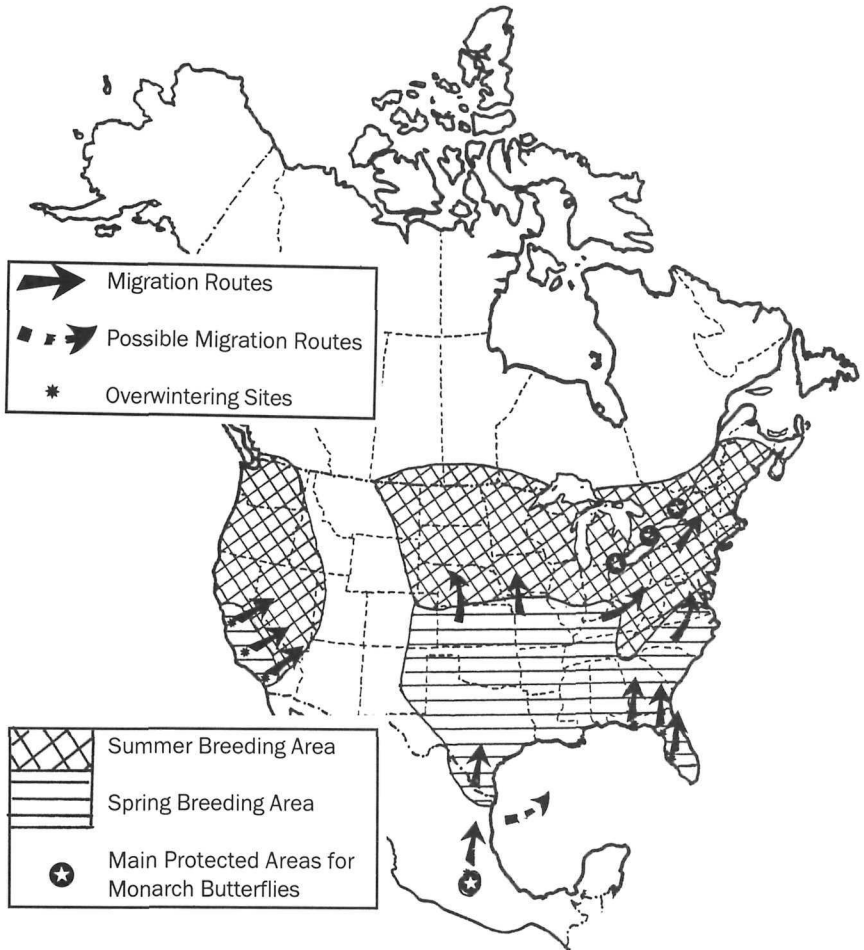


Figure 5. Migration routes of the monarch butterfly

All the eastern populations congregate in a very restricted area in central Mexico (Brower 1997; Hoth 1997; Merino 1997; Oberhauser 1997) and are only afforded a few protected areas in Mexico and Canada (Wiken and Gauthier 1998). Here, they form very numerous and dense colonies in the fir (*Abies* spp.) forests, but these habitats have been drastically reduced because of unsustainable forest practices. The overwintering region in Mexico is very densely populated (150 inhabitants per sq km) by impoverished, indigenous peasants who have lived there for centuries (Merino 1997). If the Mexican overwintering habitats disappear, we risk losing this migratory phenomenon forever.

The creation of protection and conservation strategies demands creativity and imagination as well as respect and compromise from the three countries interested in protecting monarchs and their migration. Until now, the highest social and financial costs of conservation have been borne by Mexico. Due to conservation policies established during the early eighties, overwintering habitats still receive millions of monarchs every November. Despite the huge efforts made, however, the region's characteristics have made success extremely difficult, and international concern is justified. New commitments to preserve the integrity of the ecosystems that harbour the winter populations, as well as a better

awareness of the multiple risks monarchs face in their northern habitats, will lead to a real possibility of conserving this insect and its unique migration. New proposals based on an understanding of the importance of preserving ecosystem integrity are being considered in an effort to design a better conservation strategy than the one implemented eleven years ago (L. Bojórquez, personal communication). Legal caveats are also being reviewed to make conservation activities and protected areas more fair to the local communities than they have been in the past.

Marine species. Oceanic pelagics, including swordfish and a number of species of tuna, as well as salmon, migrate long distances and some species are of major importance to commercial fisheries and are harvested over broad areas of ocean. Marine mammals such as whales, dolphins, and porpoises also range the North American sides of the Atlantic and Pacific oceans and onward to the Arctic Ocean. National systems of protected areas have concentrated on terrestrial zones, but increasingly, the three North American countries are turning their attention to the designation of marine protected areas to protect these ecosystems, species, and habitats. Dwindling stocks or the endangered nature of a number of these species compound problems associated with managing them across international boundaries.

Invaded Habitats

Non-seasonal migrants are also an important transboundary issue for biodiversity conservation. Increased travel and trade have increased the chance of the intentional or accidental introduction of opportunistic species to natural areas. Exotic species can be extremely disruptive for the ecosystems and habitats they colonize. They pose serious threats to native biodiversity and ecosystem integrity due to competition, predation, disease, parasitism, and hybridization. Like extinction, successful biological invasions are irreversible (CEC, in press {a}).

Freshwater species are much more vulnerable to extinction than are their marine counterparts, and North America has witnessed the invasion of several species, including the zebra mussel, that have wreaked havoc in many freshwater habitats. Within North America, the USA is of global significance in its diversity of freshwater species. It once contained the world's greatest diversity of freshwater mussel species. More than 65% of these species are now extinct or threatened, however (Master et al. 1998). If we are to be successful in conserving biodiversity in protected areas, therefore, it is crucial to keep them free of exotic species.

Protecting Permanent Residents

Even though ecological principles for protected areas are well-known, the establishment, management, and evaluation of protected areas are bi-

ased by many factors. For example, North American forests are very important natural resources for all three countries, and the forest industry accounts for a considerable percentage of the Gross Domestic Product, approximately 2.4% in Canada in 1997 (Natural Resources Canada 1999) and 1% in Mexico in 1994 (Segura 1996).

Boreal, temperate, and tropical forests face different risks and pose different conservation challenges. If a regional strategy for the conservation of North American forests is to be designed, the different land ownership regimes must also be considered from the start. In Mexico, 80% of forest lands are communal property, 5% are federal, and 15% are privately owned (Segura 1996). By law, communal forest lands cannot be sold. This fact alone creates a unique condition for the design of conservation policies in Mexico. In addition, there exist significant differences in the public ownership of forest lands in Canada and the USA, where 94% and 2% of productive timber areas, respectively, are publicly owned (CEC, in press {a}). An additional difference of prime importance is that most of the Canadian forest lands are not inhabited, while Mexico's are densely populated. The USA has an intermediate general pattern.

Despite these and many other differences, conflicts such as those that developed between the Canadian province of British Columbia and the

American states of Washington and Oregon could probably be avoided if common transboundary sustainable-use practices and reporting prevailed instead of shorter-term commercial ventures. The prime role forests play in the long-term health of the biosphere and of societies and their economies should be a strong enough impetus to improve the way we manage them. This understanding has prompted different international agreements for habitat and biodiversity conservation and reporting, but many of these have yet to show marked success.

Reporting and Information:

A Right and a Need

Any conservation strategy needs to be founded on as much information as is available. The computer revolution makes this easier than it was when databases and other information management systems were the only tools. The North American countries need to acquire and share information to make the right decisions for their shared ecosystems. One initiative that exemplifies this kind of cooperation is the North America Biodiversity Information Network (NABIN). A database for the protected areas of North America is being prepared by governmental, non-governmental, and academic organizations under the coordination of the CEC and the Canadian Council on Ecological Areas (CCEA 1999). Fair sharing of information

and responsible reporting mechanisms can help to create an improved scenario for the conservation and protection of the natural richness of the North American continent.

A Final Comment

Common ecosystems, communities, and species represent common resources and common responsibilities. Birds that overwinter in Mexico are not Canadian or American birds any more than the monarchs that fly northwards at the onset of spring are Mexican butterflies. These are North American species, relying on North American ecosystems, and they all constitute a part of North America's heritage. Their protection, conservation, and use must be based on respect for individual sovereignties and comply with the local laws of each of the countries the migratory species visit. This does not exclude the need for compromise. Cooperative programs between the three North American countries can lead to a system of protected areas which ensures the survival of genes, species, and ecosystems throughout the continent. The protection of North American ecosystems and natural resources must be based on cooperative strategies built upon solid scientific knowledge and that respect national laws and policies at the same time as they enhance regional opportunities. This is a major ecological challenge set by globalization trends that cannot be postponed using

commercial or political arguments. Sharing resources implies sharing responsibilities, improving reporting capabilities, and selecting meaningful indicators.

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