Provincial Museum of Alberta

ENDANGERED SPECIES IN THE PRAIRIE PROVINCES

Natural History Occasional Paper No. 9

1987

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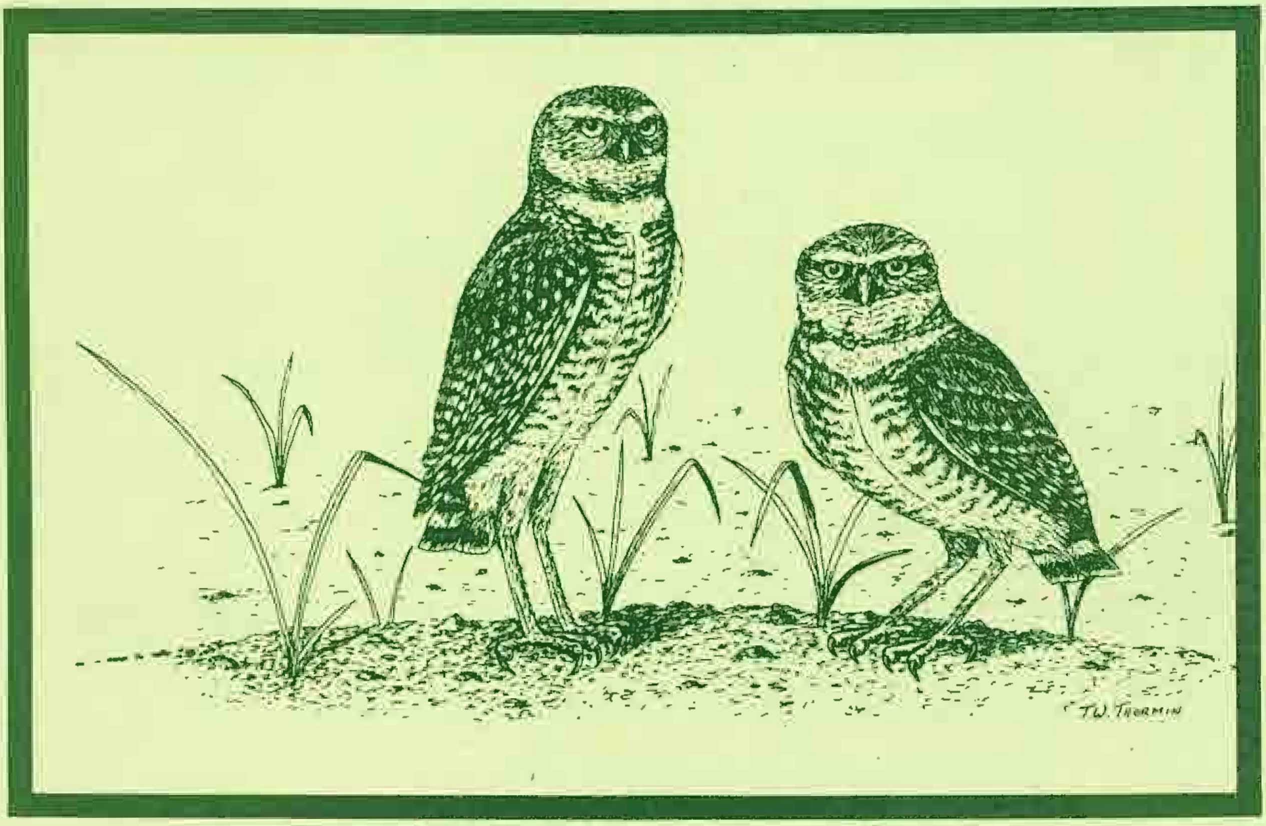
W. Bruce McGillivray
Philip H. R. Stepney
David M. Ealey
Garry C. Trottier
Kevin E. Eberhart



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24-26 January 1986

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1987

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This workshop was the annual meeting of the Federation of Alberta Naturalists hosted by the Edmonton Natural History Club. As the plans for the workshop developed in 1985, the need for a major gathering of endangered wildlife and habitat specialists became apparent. It was also obvious that many people would contribute time and energy to such a workshop. By September, 30 speakers were booked; by December that number had grown to 90 in 32 sessions. The workshop was attended by 400 participants and 4,600 members of the public visited the museum that weekend to hear plenary talks and view the special displays. The organizing committee thanks all those speakers and agencies who contributed to the success of the workshop.

Major funding for the workshop and these proceedings was provided by Environment Canada, Canadian Wildlife Service; Provincial Museum of Alberta, Alberta Culture; World Wildlife Fund (Canada); Alberta Forestry, Lands and Wildlife, Fish and Wildlife Division; Federation of Alberta Naturalists; and Saskatchewan Renewable Resources, Wildlife Branch. To these agencies and all groups who contributed in other ways, we express our sincere thanks.

Many people contributed time and energy to register delegates, orient visitors at the museum and ensure a successful conference. Most of these are members of Friends of the Provincial Museum, Edmonton Natural History Club, and Edmonton Bird Club. We thank these groups and people for their efforts.

These proceedings could not have been produced without the careful assistance of Colleen Steinhilber of the Natural History Section, Provincial Museum of Alberta, and Lube Strembitsky, Heather Breen, Leasa Juba, and Shirley MacDougall of the Canadian Wildlife Service. Susan Popowich and Mark Steinhilber drafted the final figures. Terry Thormin provided the illustration for the front cover. We thank Hugh Smith, Jim Burns, Julie Hrapko, and Andy Radvanyi for their editorial assistance.

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Ellis Bird Farm
Environment Canada, Canadian Wildlife Service
Environment Canada, Parks
Environmental Law Centre, Edmonton
Federation of Alberta Naturalists
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Saskatchewan Renewable Resources, Wildlife Branch
Saskatchewan Wildlife Federation
Simon Fraser University, Natural Resource Management Program
Trout Unlimited
University of Alberta, Department of Forest Science
University of Alberta, Museum of Zoology
University of Calgary, Faculty of Environmental Design
University of Manitoba, Natural Resource Institute
University of North Dakota, Department of Biology
University of Regina, Department of Biology
University of Saskatchewan, Department of Biology
University of Saskatchewan, Department of Veterinary Anatomy
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OPENING WELCOME FROM THE HOST CLUB

Geoffrey L. Holroyd

It is my pleasure as President of the Edmonton Natural History Club to welcome you to the opening of this workshop on Endangered Species in the Prairie Provinces. As you can see by the number of people in attendance, there has been a terrific response to this program. I find this very rewarding, but not necessarily a surprise, because we all know that wildlife, and especially rare, threatened, and endangered species are important to Canadians.

The 1981 survey of the attitude of Canadians to wildlife states there are about fifteen million Canadians over the age of 15 who are concerned about the welfare of wildlife in Canada, whether it is endangered or not, and those fifteen million people spent 4.2 billion dollars in 1981 on activities directly related to wildlife. That figure should be closer to ten billion dollars when you add in all the wildlife related activities that are not involved in directly experiencing wildlife, such as art, movies, and books. This is big business; it is also more of an indication of how important wildlife is to Canadians. We enjoy looking at wildlife, appreciating wildlife, and taking images of wildlife into our houses.

That survey also indicated that 7.9 million Canadians want to get involved in wildlife related activities. That is an incredible number of people, yet the survey found that only 1.1 million were actually members of a wildlife organization. Now not all of those 7.9 said they wanted to join a club, but they do want to get involved and I think our challenge is to find out how to multiply our 1.1 million club members and translate it into an 8 million-person conservation movement in Canada.

The theme for this workshop follows directly from the results of the survey of attitudes. Our theme is that we care and together we can conserve endangered wildlife and habitats in the prairie provinces. Six objectives reflect this theme:

1) To publicize the recovery efforts for species where efforts are well underway and well coordinated. Public lectures, movies, and displays will accomplish this objective.

2) To determine what factors are limiting the recovery of other species in jeopardy and what we can do to assist in the recovery of these species. To accomplish this objective, working sessions will review the status, limiting factors, and efforts underway to conserve each species. The goal of each working session is to identify specific action items that can be undertaken.

3) To generate interest in low-profile groups of potentially endangered species whose status is unknown. Working sessions will be held to discuss the conservation needs of insects, small mammals, plants, fishes, and herptiles to identify what the next step should be towards the recovery of endangered species in these groups.

4. To provide a forum for groups and agencies to publicize their activities and future plans to conserve species in jeopardy in the prairies.

5. To determine the needs of educators so that information on species in jeopardy is readily available to teachers. This will be accomplished by a working session on education.

6. To establish how much native habitat is left in the prairie mixed grass, and aspen parkland in the three provinces and how much should be protected for the benefit of future generations. One day will be devoted to the discussion of the complex issue of habitat management in this age of intensive land use.

This is obviously an ambitious agenda but it is attainable because in western Canada we have many dedicated and talented people committed to the preservation of Canada's wildlife and habitats. Together we can make it happen!!

To conserve the natural components of the prairies we need to determine our goals. To accomplish these goals we require an action plan. Many ideas will be put forward during this workshop, few will be perfect. Our challenge is to build on the ideas that others put forward, and at the end of the session determine which of the best ideas can be implemented. Eight million Canadians want to get involved and we must lead the way, but we have to do it in an educated fashion and know what we are doing. We do not want a shotgun blast and have it all over with in short order. Your action plans should provide the leadership and direction for those Canadians who wish to appreciate our natural environment.

Yorke Edwards, one of Canada's leading naturalists, recently stated, "The only important thing in this world is life, all life, without life this planet would be like the moon." That is obviously why we are here today; we do not want to see a moonscape occur on the prairies, or anywhere else on this planet.

OPENING ADDRESS TO

THE CANADIAN PRAIRIES ENDANGERED SPECIES WORKSHOP

Brent J. Markham

I am very pleased to be here this morning to welcome you on behalf of the Alberta Fish and Wildlife Division to the first Canadian Prairies Endangered Species Workshop. I would like to extend a particularly hearty Alberta welcome to the folks from Montana, North Dakota, Ontario, Manitoba, Saskatchewan, British Columbia, and the Northwest Territories. It is most encouraging to see this overwhelming response to a workshop of this nature. Alberta is honoured to host the event.

In Alberta, a high priority is placed on endangered species management. The Fish and Wildlife Policy for Alberta, announced in October 1982, states, "the primary consideration of the Government is to ensure that wildlife populations are protected from severe decline and that viable populations are maintained." Although formalized relatively recently, our commitment to endangered species management has been exemplified for some time through our efforts with respect to the Peregrine Falcon (*Falco peregrinus anatum*), and more recently, through cooperation with the Canadian Wildlife Service, in programs aimed at reintroducing Wood Bison (*Bison bison athabascae*) and Swift Fox (*Vulpes velox*) to Alberta.

Since the declaration of the Fish and Wildlife Policy for Alberta, the Division has been working toward the development of a variety of policy statements to expand on the various goals and principles established by this general policy framework. One of the initial efforts in this regard has been the development of an endangered species policy. The draft "Policy for the Management of Threatened Wildlife in Alberta" sets out a framework for the designation and management of endangered, threatened, and vulnerable species in Alberta.

In 1985, the Alberta Legislative Assembly passed into law a new Wildlife Act for Alberta. This new legislation provides a much improved legal framework for the management of Alberta's wildlife resource today. Endangered species were not forgotten in this legislative update. When the Act is proclaimed later this year, regulations will designate eleven "endangered animals" in Alberta, based on our draft policy on threatened wildlife. Concurrent with this designation is the recognition of the need to provide the highest level of legal protection to these species. Section 92(4) of the new Act states that "A person who is convicted of (killing or trafficking in an endangered animal) is liable to a fine of ... $100,000 or to imprisonment for a term of ... 6 months, or both." Certainly Alberta's endangered species will have the legal status they deserve.

I would like to reflect for a few moments on the opportunities that lie ahead. Your presence today is a true reflection of the workshop theme; "We care and together we can conserve endangered wildlife and habitats in the prairie provinces." Over the next couple of days, you will meet many concerned and dedicated people associated with the management and conservation of species in jeopardy. All of you will have numerous opportunities to present and openly discuss concepts, ideas, and strategies related to endangered species management. There is a tremendous amount of expertise here to draw on. For the active researcher, there is an opportunity to not only present your specific project, but also to gain new and different perspectives. Often, we become so involved in our work, that we risk becoming too narrow in scope. Take this opportunity to listen and assess the new ideas and approaches that will emanate from this group. To the uninvolved, now is your chance to learn more about what is happening; about the problems that face our wildlife resources and the programs that are currently operative. Here is your opportunity to express your ideas and views about endangered species management. I encourage you to take an active role both individually and through the numerous available agencies and organizations. Through collective participation we can capitalize on the resources of all and lay down a solid foundation from which to build.

In closing, I wish to mention the Alberta Wildlife Conservation Centennial initiative. I would like you to be aware that the Honourable Don Sparrow, Associate Minister of Public Lands and Wildlife for Alberta, has indicated his approval in principle for the idea to honour 100 years of wildlife conservation in Canada since the establishment of the first wildlife sanctuary in 1887 at Last Mountain Lake, Saskatchewan. To this end, the Alberta Fish and Wildlife Division is working closely with a coalition of Alberta sportsmen, naturalists, businessmen, and the Alberta Recreation, Parks, and Wildlife Foundation to highlight numerous events in 1987 that will focus public attention on wildlife conservation in Alberta. On behalf of the Government of Alberta, the Fish and Wildlife Division hopes other jurisdictions across Canada will follow our lead.

Thank-you all for coming and for giving me this opportunity to address you on behalf of the Alberta Fish and Wildlife Division. I wish you every success in this important meeting.

WELCOMING REMARKS: WORKSHOP ON ENDANGERED SPECIES IN THE CANADIAN PRAIRIES

Philip H.R. Stepney

There are data which suggest that the status of the White Pelican in Alberta is good. Data also suggest their status is uncertain. What do you believe, particularly if you happen to be a manager or politician who has to make a decision based upon multiple criteria, criteria that typically stem from conflicting interests. As we all know, decisions mean choices have been made and these choices have consequences and implications that affect future decisions. When a decision has been based on erroneous or narrow data, this reflects negatively upon those supplying the data. In order that decisions are made which directly include wildlife and habitat concerns, biologists must provide unequivocal evidence for decision makers or at least generate sufficient doubt such that their interests have to be considered.

Wildlife Management's track record determines its credibility; its credibility determines its effectiveness as a force in society. It is imperative that wildlife management become an even more effective force because many of our laws, incentive programs and philosophies governing land use are out-dated and often in conflict with current and future needs. We are no longer a pioneering society, there is almost nothing left to colonize. Nothing left so that we can say "we will protect and nourish this remaining wild area and forego an initial period of taming it." All we can do is manage what we have, not only protecting, as a minimum, what is left of our wild areas but even more boldly restoring wilderness to areas where it is possible. We are capable.

Practicing wildlife management is not easy. It faces all the inherent dangers present whenever science needs to operate in the arena dominated by economics and politics. Science, before it speaks, likes to have sufficient answers to make reliable predictions. This takes time and time is often not a luxury the decision making process can afford.

In many cases, serious doubt about the consequences of a wildlife management decision is quite likely all that can ever be established. Whether or not this is a cause or a result of the fact that the practice of Wildlife Management needs luck as well as smarts, I am not sure. Serious doubt, however, engenders an ethic of caution, a more circumspect approach in making decisions with environmental consequences. Such an approach will likely result in a better decision. While we cannot predict the future per se, our decisions influence its course and the more options that remain open after a decision has been made, the more criteria that have been met, the better the decision is.

Serious doubt is perhaps the best tool available in the wildlife manager's tool bag, because the time-line involved in a decision often precludes protracted research. Many ecologically-based problems are so complex that their answers lie in the realm of probabilities rather than absolutes. This reality conflicts with the human propensity for grasping onto simplistic, one factor, cause and effect relationships. We also compound this weakness by frequently equating history with the span of time we have knowledge of a given problem, particularly when that problem is under immediate study.

It is a very serious challenge that faces all of us interested in endangered species. The challenge, as I see it, is to effectively balance society's collective concerns and the state of our wildlife management knowledge with our needs for decisions. This may produce management plans that not only provide long term benefits to our natural heritage, but also increase the acceptance of wildlife management as a serious component to society's decision making process.

Poor science, simplistic or bandaid solutions, and subjectively derived conclusions will not help us conquer the challenge. The fact that we in the prairie provinces have four separate political jurisdictions looking at wildlife populations and habitats, which of course do not recognize political boundaries, increases the problems ahead of us. It produces a conflict between the need to address species that are endangered only within a political boundary and the need to address species that are truly biologically endangered. This situation is further compounded by having to deal with province-specific laws which may often work against a common solution. We run the risk of trivializng the underlying problem - the need for a change in society's value system regarding the land and the organisms dependent upon it.

The enthusiastic response to this workshop indicates the commitment is there to rise to this challenge. First and foremost, the response demonstrates conclusively we are concerned about the future of wildlife and natural habitats in the Canadian prairies. I am confident this enthusiasm will carry over into hard work during this workshop and will produce lasting results.

On behalf of the Provincial Museum of Alberta, I would like to welcome you, singly and collectively, and wish us success over the next two days. The Museum is proud to be a part of this endeavour.

THE INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES (IUCN): ITS ROLE IN SPECIES CONSERVATION

Harold K. Eidsvik

IUCN was founded in 1948 as an independent international non-profit Swiss Foundation. Its objectives are as follows:

i) to encourage and facilitate cooperation between governments, national and international organizations, and persons concerned with the conservation of nature and natural resources;

ii) to promote in all parts of the world, national and international action in respect of the conservation of nature and natural resources;

iii) to encourage scientific research related to the conservation of nature and natural resources and to disseminate information about such research;

iv) to promote education in and disseminate widely information on the conservation of nature and natural resources and in other ways to increase public awareness of the conservation of nature and natural resources;

v) to prepare draft international agreements relating to the conservation of nature and natural resources and to encourage governments to adhere to agreements once concluded;

vi) to assist governments to improve their legislation relating to the conservation of nature and natural resources; and

vii) to take any other action that will promote the conservation of nature and natural resources.

Its membership comprises government and non-governmental organizations in three categories (Table 1). Through this structure, IUCN has members in 114 of the world's 160 countries.

IUCN is governed by a General Assembly held every three years. The General Assembly approves a triannual program and elects 24 councillors on a geographic basis. Regional councillors for North America and the Caribbean are Dr. David Munro, Mr. Russel Peterson, and Mr. Ivor Jackson.

Table 1. IUCN Membership.

Categories Number of Members			
i)	Category A		
	a) States		56
	b) Government agencies		123
ii)	Category B		
	c) National and international non-governmental organizations		316
iii)	Category C		
	e) Affiliates and Honorary members		6
	Total		501

The General Assembly also elects the chairmen of IUCN's six Commissions that form the core of IUCN's network. These Commissions are:

Ecology
Education
Environmental Planning
Environmental Policy, Law, and Administration
Species Survival
National Parks and Protected Areas

Two of the Commissions have a Canadian chairman: Environmental Planning chaired by Peter Jacobs of the University of Montreal and National Parks and Protected Areas chaired by myself.

Commission chairmen are members of IUCN's Council which is presided over by a president elected at the General Assembly, currently Dr. M. Swaminathan of India.

The Council appoints its own vice-presidents and members of its "Bureau" that serves as an Executive Committee. As well, the council appoints the Director General.

Each of the Commissions has its own organization and membership structure; that of the Species Survival Commission is attached as Appendix 1. From this you will note that the Commission is organized in some 77 specialist groups, each dealing with a species or a group of species. The Species Survival Commission is chaired by Gren Lucus of the U.K.

The Commission on National Parks and Protected Areas is organized on a biogeographic basis with a vice chairman for each of the world's nine biogeographic realms. Biannual Commission meetings are organized to review conservation progress and to develop conservation action plans on a realm by realm basis according to its terms of reference (Appendix 2).

Central to the work of IUCN is the Secretariat located in Gland, Switzerland. The staff of approximately 40 shares a building here with the World Wildlife Fund (WWF, International). In addition to the Secretariat and forming a part of the staff are three centers: the Environmental Law Center in Bonn, the Conservation for Development Center in Gland, and the Conservation Monitoring Center in Cambridge (U.K.). In total there is a staff of approximately 100.

Funding comes from four main sources: WWF (27%), grants from governments (25%), membership (20%), and UNEP (14%). In addition, miscellaneous contributions amount to 14%. The operating budget is approximately $4M US, and in addition, projects are carried out to the
extent of another $5M US. There were approximately 400 of these projects last year, mostly in third world countries (Figure 1).

Projects are the mechanism for on-the-ground implementation of programs. They can take a variety of forms, for example the re-establishment of Addax (*Addax nasomaculata*) and Oryx (*Oryx gazella*) in Oman, and the conservation of White Rhinoceros (*Ceratotherium simum*) in Zaire's Garamba National Park and Giant Pandas (*Ailuropoda melanoleuca*) in Wolong Reserve of China.

Other projects include preparing management plans and training programs for protected areas. The Commission on National Parks and Protected Areas for example, has a $5M US AID project developing 3 national parks associated with the Mahahweli hydroelectric project in Sri Lanka. A management plan was prepared for Khao Yai National Park in Thailand and another for the Simien Mountains in Ethiopia.

While projects are often the most visible outcome of IUCN's work, its role as an organizer, catalyst, and publisher is perhaps the most important. In this respect, the World Conservation Strategy is the key conservation document of the decade. Its simultaneous launch in some 30 countries in 1980 has led to a continuing activity in the production of national conservation strategies. In June 1986, IUCN will be sponsoring an international conference in Kingston on the implementation of conservation strategies. This ongoing activity is the focus of the work of the Conservation Development Center.

In the field of international conventions, IUCN provides the secretariat for the Ramsar or Wetlands Convention. It is organizing the 1987 meeting of the parties in Regina. Until recently, IUCN also provided the home for the Convention on International Trade in Endangered Species (CITES). It continues to be the advisor to the World Heritage Convention on the listing of natural areas. Its law center is continually involved in drafting conventions such as the Law of the Sea, CITES, and the Bonn Convention.

Publications are another key activity of the Union. This includes the Red Data Books on endangered species, the UN Directory of Parks, Parks Magazine, the IUCN Bulletin, and a host of specialized publications on specific topics such as

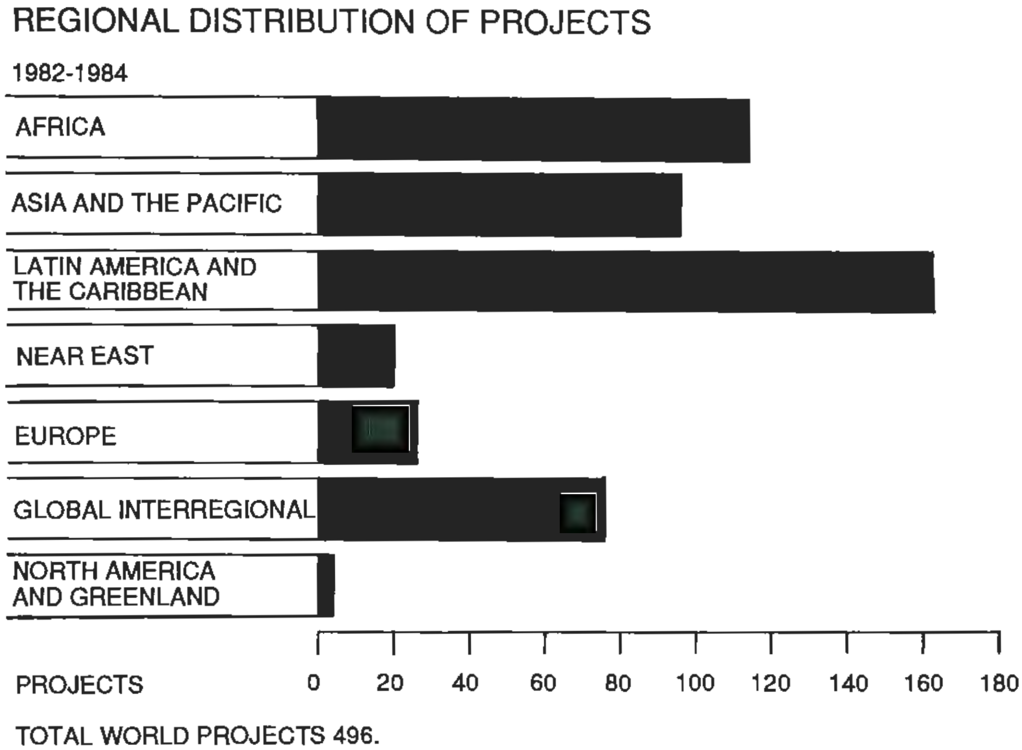

Figure 1. Regional distribution of IUCN projects, 1982-1984 (from IUCN 1984)

Conservation of Islands, Conservation of Tropical Forests, and Antarctica.

The Conservation Monitoring Center at Cambridge and Kew is one of IUCN's newest units. It is in effect the data bank for species and for protected areas and also provides a home for the International Council on Bird Preservation (ICBP) and IUCN's Trade Monitoring Arm, TRAFFIC.

As a coordinating mechanism, IUCN is a participant in the Ecosystem Conservation Group comprising IUCN, FAO, UNESCO, and UNEP. This group meets twice yearly to ensure that their individual efforts are well focused to avoid duplication and overlap. IUCN has not been active in North America. This is perhaps a reflection of the high degree of both government and public conservation commitment. On the downside, this leaves the organization with an extremely low profile that could in due course, affect its budget. To remedy this, the Union is currently in the process of establishing a regional office in Washington, D.C.

In conclusion, IUCN through its members, commissions, and secretariat is very much in the business of both species and habitat conservation. It works through its members in the form of a partnership and looks forward to a continued association with biologists concerned about the Canadian Prairies.

LITERATURE CITED

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Appendix 1. The anatomy of an IUCN Commission network — that of the Species Survival Commission (from IUCN 1984).

IUCN SPECIES SURVIVAL COMMISSION

Conservation awareness

Information & Publishing

Policy Statements | **Interventions**

IUCN Director Generals Office Membership

Commission Officers
Regional Members
Chairmen of Specialist Groups
Associated Institutions
Honorary Consultants

IUCN programme & policy division ⇄ **Executive office IUCN – HQ** ⇄

IUCN operations division ← **Steering committee of 16 members**

Field projects in 60 countries

Conservation achievement

The Species Survival Commission is one of six IUCN Commissions linking a network of volunteer specialists to the IUCN Programme. The others are: Ecology; Education; Environmental Law, Policy and Administration; Environmental Planning; and Parks and Protected Areas.

77 specialist groups

- Amphibia
- Ant
- Antelope
- Bear
- Polar Bear
- Butterfly
- S. American Camelid
- Canidae
- Caprinae
- Captive Breeding
- Cat
- Cave Species
- Freshwater chelonia
- Freshwater Crustacean
- Chiroptera
- Crocodile
- Deer
- Edentata
- African Elephant and Rhino
- Asian Elephant
- African Equid
- Asian Equid
- Fish
- Genome Conservation
- Hippo
- Hyaena
- Insectivore
- Lagomorph
- Marine turtle
- Australasian Marsupial
- Mollusc
- Moth
- Mustelid & Viverrid
- Odonata
- Otter
- Pigs & Peccaries
- Primate
- Asian Rhino
- Rodent
- Seal
- Sirenia
- Snake
- Tapir
- Tortoise
- Veterinary
- Trade
- Whale
- Wild Cattle
- Wolf

ICBP groups

- Birds of Prey
- Bustard
- Cranes
- Galliformes
- Hornbill
- Parrots
- Piciformes
- Storks, Ibises & Spoonbills

IWRB/ICBP groups

- Flamingos
- Herons
- Pelicans
- Seabirds
- IWRB Group on Waterfowl

Plant groups

- European Plants
- Central American Plants
- South American Plants
- Australasian Plants
- Indian Sub-Continent Plants
- Chinese Plants
- Island Plants
- Botanical Inventory of the Tropical Rain Forest Task Force
- Ethnobotany
- Cacti & Succulents
- Cycads
- Ferns
- Orchids
- Palms

Membership

⇄ 1200 volunteer specialists around the world

APPENDIX 2

The Terms of Reference of the Commission on National Parks and Protected Areas are:

1. To participate in the further development, promotion, and implementation of the World Conservation Strategy; to participate in the development of IUCN's Conservation Programme; to support the implementation of the Programme; and to assist in the development and screening of projects for conservation action.

2. To maintain an international network of volunteer experts selected for their capacity to contribute to IUCN's mission in the field of protected areas and to provide a forum for the exchange of views and scientific information on protected areas.

3. To cooperate with the IUCN Conservation Monitoring Centre (CMC) in developing a data base on the global status of all categories of protected areas, to provide policy guidance to CMC, and to assist in the analysis and dissemination of the data.

4. To carry out specific tasks on behalf of the Union, including:

   - to establish international priorities on protected areas.
   - to promote effective management of protected areas through the application of scientific principles and technical expertise.
   - to focus public attention on protected area issues.
   - to promote the development of professionalism in protected areas management through training, production and distribution of publications, meetings, and other means.
   - to provide advisory services to the World Heritage Committee and other international protected area programmes.
   - to promote the implementation of the Bali Action Plan.
   - to monitor the establishment of protected areas and identify trends through the collection and dissemination of information.
   - to promote effective management of protected areas through training, legislation, planning publications, and meetings.
   - to promote international support for the establishment and effective management of protected areas.

The Commission's activities are spelled out in detail in the Bali Action Plan which was developed at the World Congress on National Parks held in Bali, Indonesia, in October 1982.

THE CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES AND ITS APPLICATION TO THE PROTECTION OF ENDANGERED PRAIRIE FAUNA AND FLORA

T. Charles Dauphine

In 1975, Canada joined the Convention on International Trade in Endangered Species (CITES), an international treaty drawn up in 1973 to prevent international trade in wildlife from threatening animals and plants with extinction. The 90 member countries of CITES that together cover about 85 percent of the earth's land area, maintain three lists (called appendices) of species that are or could be threatened by trade. Appendix I contains about 500 species that are currently endangered. CITES rules that these species may be traded only for scientific purposes (e.g., propagation or research); commercial trade is banned. Appendix II contains over 15,000 species that could become endangered by trade. Carefully monitored commercial trade of these species is allowed. Also in Appendix II are some species, like the Canadian Lynx (*Lynx canadensis*) and Bobcat (*Lynx rufus*), included to protect species on Appendix I from being traded under the name of non-threatened species that are similar in appearance. Appendix III contains species put there by individual nations for monitoring by those nations alone. There are 16 Canadian species on Appendix I, over 60 on Appendix II, and 1 on Appendix III (Table 1).

CITES was formed because international commerce in wildlife and wildlife products was - and remains - a flourishing and lucrative business that threatens the survival of many species. Single shipments of wildlife products can be worth millions of dollars. For example the world trade in elephant ivory is valued at $150 million annually; a coat made from Canadian lynx can fetch $100,000; a single macaw or cockatoo can bring over $10,000 (Turner 1985); and rhino horn is worth more than its weight in gold (Inskipp and Wells 1979).

In accordance with the World Conservation Strategy (IUCN 1980), CITES' aim is to regulate rather than abolish international trade so that a regular, sustainable wildlife crop can be taken. In its 10 years of existence, CITES has successfully reduced pressure on the large cats (Williams 1985), crocodiles and alligators, marine turtles, elephants, and several other groups. However, to maintain the fur, leather, and pet industries, wildlife merchants have been quick to shift their attention to formerly unexploited species. Furthermore, illicit trade continues to plague many species where lucrative profits from poaching and smuggling are possible, particularly in Third World nations (Grove 1981). Recent reports of international smuggling of birds of prey for falconry show that Canada has not been immune (Barnes and Hemley 1986). These experiences suggest that no species is exempt from commercial exploitation, and that species in trade need careful monitoring.

Table 1. List of species currently protected under CITES treaty.

Appendix I

Mammals	Birds	Reptiles & Amphibians	Fish	Plants
Black-footed Ferret Blue Whale Bowhead Whale Eastern Cougar Fin Whale Humpback Whale Right Whale Sperm Whale Wood Bison	Aleutian Canada Goose Eskimo Curlew Gyrfalcon Peregrine Falcon Whooping Crane	Leatherback Turtle	Shortnose Sturgeon	-

Appendix II

Mammals	Birds	Reptiles & Amphibians	Fish	Plants
Bobcat Cougar (western) Grizzly Bear Lynx Northern Elephant Seal Polar Bear River Otter Sea Otter Whales[a] Wolf	Diurnal birds of prey[a] Owls[a] Sandhill Crane	Bog Turtle Rubber Boa	Atlantic Sturgeon	Cacti[a] Ginseng Orchids[a]

Appendix III

Mammals	Birds	Reptiles & Amphibians	Fish	Plants
Walrus	-	-	-	-

[a] Includes all family members not listed in Appendix I.

The movement of specimens (or products like furs, ivory, etc.) is controlled by customs agents at ports of entry. Shipments must be accompanied by permits issued by the exporting and importing countries. For Appendix I species, permits are not granted without the approval of the CITES authorities in both countries. In Canada, CITES is administered by designated authorities of the federal, provincial, and territorial governments, since individually they have jurisdiction over portions of the Canadian flora and fauna. It is the responsibility of these authorities to judge whether or not the movement of species conforms with the criteria established for each Appendix. Over the past several years, Canada has exported 3,000-4,000 shipments of specimens annually (e.g., furs, zoo specimens, hunting trophies, ginseng root). Canada has annually received 60 to 70 applications to import Appendix I specimens, about 25% of which have been rejected. The burden of enforcement for CITES lies largely with Customs officials of the importing country, and it is here that the effectiveness of CITES may be reduced by inadequate screening of shipments, misidentification of species, and false documentation.

How does CITES help in protecting the prairie species that are the subject of this workshop? Table 1 reveals that, of the 16 prairie species classified in one of the categories of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), 7 are included in CITES. The most obvious candidates like the Wood Bison (*Bison bison athabascae*), Eskimo Curlew (*Numenius borealis*), Peregrine Falcon (*Falco peregrinus*), and Whooping Crane (*Grus americana*) are on Appendix I because they were once endangered by trade or remain the most coveted by unscrupulous dealers. However, the unlisted species should be examined to see if any would benefit from CITES protection. Are any in trade, or particularly vulnerable to exploitation [e.g., Long-tailed Weasel (*Mustela frenata*), Trumpeter Swan (*Cygnus buccinator*), Swift Fox (*Vulpes velox*)]. Any information or opinion on the actual or potential impact of trade on the unlisted species should be presented to the CITES authorities for consideration. These authorities are responsible for ensuring that all endangered Canadian species that could enter trade are listed, and that all Canadian species that are in trade are monitored so that trade can be curtailed before it becomes excessive.

While preventing international commercial trade through CITES may be a useful or even essential part of the recovery plan for an endangered species, it may become inappropriate at some stage of the species' recovery. Therefore, planning for the eventual downlisting or delisting of CITES candidates should be part of the recovery plans that are being developed or already exist for the species considered at this workshop. For example, the Whooping Crane and Wood Bison offer commercial potential (e.g., zoo exhibit, animal husbandry) that could be used to help finance their rehabilitation. African nations have demonstrated that allowing a carefully controlled export of Appendix I Leopards (*Felis pardalis*) and crocodiles has helped their conservation.

Regardless of whether or not endangered species are included in the CITES appendices, they receive several general benefits from the Convention. The most obvious is the global exposure of the endangered species problem that CITES has provided. By operating at the major ports and other crossroads of the world, a variety of people - tourists, manufacturers, merchants, pet dealers, politicians, etc. - have been made aware of the plight of disappearing species.

Less obvious, but also important, are several benefits of CITES within Canada. A major impediment to wildlife conservation in Canada is the fact that the nation's fauna and flora are divided into segments that fall under the independent jurisdictions of 13 different governments and several agencies within each government. Because CITES deals only at the national level, it has encouraged agencies to work more closely together than would otherwise be the case. This has obvious benefits for species that are found in more than one jurisdiction.

CITES has also raised the standard of wildlife management within Canada. Decisions made by the CITES parties are supposed to be based on scientific information (although there have been exceptions). When Canada wishes to convince the other CITES parties that a species be listed, or not listed, or moved within the Appendices, it must present scientific evidence that will withstand international scrutiny. The resulting need for strong scientific information has encouraged Canadian jurisdictions to document the biological and trade status of species and introduce management practices that they probably would not have done otherwise.

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COMMITTEE ON THE STATUS OF ENDANGERED

WILDLIFE IN CANADA (COSEWIC)

J. Anthony Keith

In the 1960's and early 1970's, papers began to be published in Canada on Canadian endangered wildlife species. A book was produced in 1974 called "Canadian Endangered Species" (Stewart 1974) and a symposium was held in 1976 called "Canada's Threatened Species and Habitats" (Mosquin and Suchal 1977). These activities raised the issue of a common definition for categories of endangerment of wildlife in Canada on the one hand, and on the other hand the question of a uniform national list. It was confusing for everybody to have different authors producing different lists of which species were endangered. Responding to this need, the Federal-Provincial Wildlife Conference of 1976 decided to establish "a standing committee consisting of representatives of the federal and provincial governments and appropriate conservation and scientific organizations for the purpose of establishing the status of endangered and threatened species and habitats in Canada." A strong stimulus for the Conference to take this action was the first national conference on endangered species in Canada, held a few months earlier and organized by the Canadian Nature Federation and World Wildlife Fund Canada.

The standing committee established by the 1976 Federal-Provincial Wildlife Conference is the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). It has been in business since 1977, and reports annually to the Conference. Its members are senior representatives of the provincial and territorial wildlife agencies, the Canadian Wildlife Service, Parks Canada, the National Museum of Natural Sciences, the federal Department of Fisheries and Oceans, and three national non-government organizations: World Wildlife Fund Canada, Canadian Nature Federation, and the Canadian Wildlife Federation.

In starting its business of establishing the status of species and habitats at risk in Canada, COSEWIC established a list of status categories. Five categories have been defined: Rare, Threatened, Endangered, Extirpated, or Extinct. Each of the definitions of these categories is in terms of the species range in Canada as a whole, not within regions of Canada nor throughout the species range if it extends outside Canada. It is important to recognize that there are many geographic levels at which a species may usefully be considered at risk, at the world level, at the level of a particular nation, at the level of a province, and at the regional level. COSEWIC's job is at the national level, considering Canada as a whole.

COSEWIC does its business by commissioning status reports. These are papers, following an established format of topics, by an expert on that particular species. The reports cover basic biological background such as distribution, population size, and general biology; define limiting factors affecting the species; and conclude with an evaluation of the species status corresponding with definitions of categories established by COSEWIC. These status reports are the core of COSEWIC's work and form the basis for full committee decisions on the status of species in question. Popular Summary Sheets on the status of endangered and threatened species can be obtained from the Canadian Wildlife Federation.

The full committee meets once a year and does the rest of its business by correspondence. A subcommittee of COSEWIC has been established for each of the major taxonomic groups of mammals, birds, reptiles and amphibians, fish, and plants. These small working groups are chaired by a specialist in each particular taxa. Each subcommittee's task is to commission or encourage the production of status reports on species that the subcommittee thinks warrant attention, to critically review the text, and then to present the full committee with a text and the subcommittee's recommendation for status. COSEWIC has been very fortunate in having had extremely capable and energetic subcommittee chairpersons who have generated status reports with great success in a short time, and in all cases as an addition to their regular full-time jobs.

Once the status reports have been accepted by the full committee, they are available for public use and distribution. They now represent an interesting compendium of reports on Canadian wildlife and plants, and are inadvertently the best kept secret in biological literature in Canada. Many biologists and others interested in the subject do not know that these reports are available from the Canadian Nature Federation, 75 Albert Street, Ottawa, Ontario, K1P 6G1, which stocks and distributes status reports as part of its contribution to the work of COSEWIC.

During its relatively brief life, COSEWIC has looked at status reports for most of the obvious mammals and birds that should be reviewed. For reptiles and amphibians, the short list of Canadian species has been carefully reviewed and reports on those of concern are either complete or in advanced stages of preparation. For fish, a remarkable number of species have already been reviewed, but a large number still remain to be considered. The same is true for plants. As for extinct species, COSEWIC is reluctant to put too much time into these at the expense of species that may be in trouble now. In addition to identifying individual species at risk, COSEWIC brought to the attention of the 1979 Federal-Provincial Wildlife Conference the clustering of endangered species in the Canadian prairies and the increasingly short supply of prairie habitat:

> "COSEWIC members wish to draw to the attention of the Conference their belief that a major task of conservation in Canada must be to rehabilitate substantial portions of the short-grass prairie, in order to revive its assemblage of plants and animals. Certainly the establishment of a Grasslands National Park would be a major step, which this Conference should strongly support, but Conference member agencies should consider what further actions are necessary to assure a future for this ecological region in Canada" (Keith 1979).

To continue its work, COSEWIC needs knowledgeable people to write status reports, particularly on lesser known plants and fish. Those interested should contact the subcommittee chairpersons. The committee also needs funds to pay for these reports. Reports usually cost a few thousand dollars, and are often done by people largely on their own time who are paid only for their expenses.

In conclusion, it is important to distinguish between COSEWIC's role and the role of management agencies across Canada and the role of non-government organizations. In the endangered species field, COSEWIC has a clear role, establishing which species at the national level in Canada are endangered or in other categories of risk. Its task is to form a definitive national consensus on these points. It is the job of the various government agencies responsible for wildlife and plants across Canada to undertake whatever protective measures they consider necessary for the conservation of species at risk. Non-government organizations do a great job of contributing energy, knowledge, and resources to a wide range of endangered species activities and an equally valuable job of keeping government agencies up to the mark in fulfilling their responsibilities.

This is a typically complex Canadian approach to the conservation of endangered natural resources. There is no over-arching federal endangered species legislation, as there is in the United States. Instead, we have selected to let the various Canadian governments and the private sector work together in a loose association of interests. COSEWIC has been one focal point for cooperation across the country on one aspect, other focal points may become necessary in the future. Whatever the mechanisms, goodwill and open cooperation are the essential ingredients to the national and regional efforts in Canada to conserve species and habitats that are at risk.

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PRAIRIE CONSERVATION

Monte Hummel

I hope you will pardon me for beginning on a home-spun personal note, but I am always glad to get back to the West. Both sides of my family homesteaded in Saskatchewan, and I used to help out at harvest time on my grandfather's farm near Nipawin. Right now, my uncle is the Federal Member of Parliament from that area. My other grandfather farmed near Nokomis where he was reeve for over 40 years, as well as a member of the Provincial Legislature. I learned to drive a tractor out here, how to rogue wild oats out of a grain crop, and that same uncle who is now a Federal member taught me how to catch goldeyes out of the Saskatchewan River with a bit of butcher cord, a willow stick stuck in the bank, and a handful of hooks baited with stewing beef. I remember stories of sturgeon from that river, so big that their tails flopped out over the back of the manure wagon. I remember hoeing turnips on summer evenings - those damned rows seemed to disappear on the horizon - but what I really remember is the deer coming out of the woodlots at dusk, always when I had my back turned. I think they moved in and out of the forest just as I went up and down the rows.

I remember Marsh Hawks (now called Northern Harriers; *Circus cyaneus*) quartering the grain fields so low that I could hide down in the crop and literally see their eyes when they glided a couple of feet over my head.

I remember stories from my grandparents about the abundance of game - bear, deer, moose, even elk - in northern Saskatchewan that tided them over in the first few winters and stories from my father about hunting super-abundant ducks, geese, and Sandhill Cranes (*Grus canadensis*).

More recently, I remember scouting Manitoba's Oak Hammock Marsh in April with Bob Taylor when among the early waterfowl we spotted a migrating Peregrine Falcon (*Falco peregrinus*), Prairie Falcons (*Falco mexicanus*), and a rare pair of Cinnamon Teal (*Anas cyanoptera*). That day there also seemed to be a Rough-legged Hawk (*Buteo lagopus*) on every telephone pole. I remember camping under the winter stars and howling for wolves with Paul Paquet in Riding Mountain National Park, a natural oasis that is now a candidate for an International Biosphere Reserve. And I well remember a spring day trip with Steve Herrero to the foothills west of Calgary, watching migrating Rough-legs and Bald Eagles (*Haliaeetus leucocephalus*) as numerous as if someone had just sprinkled them in the sky.

I think the people who travel across Canada and say they could have done without the prairies are absolutely nuts. These people reflect remarkably little appreciation for what has to be one of the most beautiful parts of this country. Yet what have we done to it? I say we because my ancestors were certainly part of the process. One cold fact: over half the birds and mammals now listed by the Committee on the Status of Endangered Wildlife in Canada are found in the three prairie provinces. In a nutshell, this is the price we have paid for extensive habitat loss in western Canada.

There will inevitably be a clustering of endangered species wherever there are endangered habitats, and the west represents the Canadian hotspot in this regard. I notice that a report to Wildlife Habitat Canada identifies the native grassland prairies as endangered habitats since they are being lost or converted at an extremely rapid rate. For example, the Short-grass Prairie is over 80% gone. There is less than a quarter of the Mixed-grass Prairie left. You'll look hard for the remaining 20% of Fescue Prairie. Well over three quarters of the Aspen Parkland is gone, and there is virtually no Tall-grass Prairie left at all.

As for that super abundance of waterfowl that my father used to hunt, Mallards (*Anas platyrhynchos*) are down from 8.7 million in the 1950's to 5.5 million today, a 38% decline; Pintails (*A. acuta*) from 6.3 to 2.9 million, a 54% decline; and Blue-winged Teal (*A. discors*) are down from 5.3 to 3.8 million, a 28% decrease. Declines in waterfowl have been aggravated by the last three years of drought, but I emphasize that these are long term trends tracked over the last 25 years. The situation is so serious that the Canada-U.S. Waterfowl Management Plan Steering Committee last year concluded, "All other efforts to conserve waterfowl will be in vain if the ongoing trend of habitat loss is not reversed."

Let me broaden that statement for a moment to the global level, because over 70% of the world's wildlife extinctions are caused by habitat loss or degradation. Indeed, the entire planet has become an endangered species hotspot. We are now losing species at the rate of at least one per day. By the late eighties it will be one per hour, and by the turn of the century, up to one million wildlife species could be on the brink of extinction, or lost. This represents an incredible squandering of our genetic heritage. Paul Ehrlich (1981) likened it to rivets popping out of a jet aircraft; you can remove a few rivets and perhaps nothing will happen, but eventually one rivet too many will be removed and the whole plane falls apart and crashes. The question is, how many rivets is too many?

Have you ever stopped to think about the information that is lost when a species becomes extinct? Edward O. Wilson (1985) has shown it is like losing a great work of art. He gave the common house mouse as an example. Each one of its cells contains four strings of DNA. Each DNA strand, if fully stretched out, would be about one metre long, but this molecule is invisible to the naked eye. If we magnified it to the width of a piece of wrapping string, so you could see it, it would be 600 miles long. If the full information on the length of this strand were translated into ordinary-sized letters of printed text, it would fill just about all 15 editions of the Encyclopedia Britannica published since 1768. Do not forget, that is from one strand of DNA in the common house mouse. This kind of genetic information, of course, is repeated billions of times in nature, and mankind has tapped it to solve all kinds of practical problems. For example, 40% of our pharmaceutical chemicals still come from wild plant derivatives. Yet, 25,000 plants are already listed as endangered.

Certainly the World Conservation Strategy (IUCN 1980), that was sponsored and launched worldwide by World Wildlife Fund, gives high priority to saving endangered species and thereby preserving genetic diversity. But, did you also know that the World Conservation Strategy specifically identifies prairie Canada as a priority for conservation efforts because the region is highly sensitive to desertification? Or did you know that the Saskatchewan River is identified as a river basin of international significance on a par with the Colorado River in the U.S., the Danube of Europe, or the Mekong of southeast Asia? Many of the parks and wetlands of western Canada have already been listed on a number of international conventions regarding protected areas. As well, prairie potholes have long been identified as crucial areas for migratory birds that are shared by many nations. The point I am making is that we have on our doorstep in western Canada an urgent conservation challenge that is not only the top priority in national terms, but also extremely important in world terms. What can be done to preserve this resource? Well, I venture many of you knew this before I got up to speak. After all, if you really needed to be persuaded that we have a problem, you probably would not be here. So let us get down to it, stop wringing our hands, and discuss what can be done.

Right away, I would take a second look at the World Conservation Strategy (IUCN 1980) for at least general guidelines because it lays out three global objectives that should have relevance here in western Canada.

First Objective: "Maintain essential ecological processes and life support systems." To me this says if wildlife and people are to stay healthy on the prairies, conservation efforts cannot play around at the cosmetic level. We must ensure that the underlying biological systems, especially soils and habitat, are protected. Save a system - say the Mixed-grass Prairie - and you save the parts of the system - for example, the Burrowing Owl (*Athene cunicularia*).

Second Objective: "Preserve the genetic diversity upon which the functioning of life support systems depends." This principle points out an interesting biological catch-22. On the one hand, you cannot have a complete diversity of species without ensuring the health of the ecological system in which they are found. On the other hand, the healthy system depends on there being a diversity of species. In practical terms, this second objective means identifying species at risk and mounting recovery programs to save them. We must also take preventative measures to make sure more wildlife species do not become endangered.

Third, the World Conservation Strategy urges, "the sustainable utilization of species and ecosystems which support millions of rural communities as well as major industries." To me this says the farmer and rancher must be involved. It goes beyond a strictly protectionist approach and says that conservation must be for people too. It is no sin to farm or graze the land, or to use wildlife for human purposes. But such use must be sustainable. In other words, it must not erode the biological integrity of the system upon which human uses such as farming depend.

Now, if you find these general guidelines more or less acceptable, I want to try a more specific idea on you. My organization, World Wildlife Fund (WWF), would like to lend a hand. Under the guidance and direction of westerners, we propose to open a modest office in the west to coordinate a major regional conservation program focusing on the prairies. We have tentatively called this program Wild West.

Late last year, I circulated a discussion paper on this idea to approximately 100 people in western Canada, including government officials, farmers, naturalist groups, wildlife federations, business, and university experts. I am pleased to report this evening that the Wild West idea, in its preliminary form, has received unanimous approval from all 100 reviewers with many constructive suggestions for improving it. Most important, I think I have found three quarters of the funding required, which we estimate to be about $600,000 over three years. If Wild West is anything like similar programs we have mounted elsewhere in Canada, these funds will be more than matched by contributions of time, services, equipment, and other support from cooperating agencies. So really we should have a million dollar program over three years.

The idea is to bring together representatives from the governments of Manitoba, Saskatchewan, and Alberta; the federal government; agriculture; universities; business; and non-government organizations to form a small western-based Steering Committee that will control and direct the entire program. Their task would be threefold, paralleling the three objectives of the World Conservation Strategy that I outlined earlier.

First, relating to the protection of ecosystems, we could pull together the excellent work already done by provincial jurisdictions on the remaining natural areas in the prairies (especially grasslands) and identify ways of protecting these areas. Incidentally, this does not always mean acquisition or purchase by government. It can include a large number of alternative arrangements with private landowners, some of which WWF has pioneered in southwestern Ontario to protect natural areas in the Carolinian Zone that is already 90% lost to urban and rural pressures. Our work in Ontario has included an active landowner contact program that we hope might be modified to work in the west. This first task, therefore, involves drafting a blueprint or a strategy for protecting the most important remaining prairie habitats that are western Canada's "life support system."

The second task, relating to genetic diversity, will be to mount a series of high profile, hands-on projects to protect and rehabilitate endangered species. This is WWF's specialty, as we have already supported over 50 such projects in western Canada.

Third, relating to sustainable use, we want to support some practical experiments in conservation farming. Times are tough here in the West (even people in the East realize this now!). So it is obviously no time to be asking farmers to provide public benefits in the form of wildlife at the farmer's private expense. We need to work out practical conservation farming techniques that pay, techniques that make both economic and ecological sense. I know this is a tall order, but it is not out of the question, and there are some very promising things going on already. In fact, it was the farmers reviewing my initial discussion paper who suggested we do further work on many new ideas that they wanted to pursue. Obviously, if they are sensibly and sensitively approached, farmers are just as interested as anybody else in helping leave some wild in the West.

I want to emphasize that Wild West will be defined, controlled, and directed by westerners. WWF proposes to provide approximately $200,000 per year as a kind of honest broker, a catalyst to bring people together and help make things happen. For those provincial jurisdictions that are worried about us stirring up a lot of public interest, starting some exciting projects, then pulling out, I say to a certain extent you are right to be concerned. We anticipate fairly extensive television public service messages and special materials in prairie province schools to back up the program. But rather than being cautious or defensive, I hope the provinces will see this program as an opportunity to promote and gain public support for their concerns and initiatives. Provincial government representatives will have every chance to shape the program so that it supports and complements their efforts. WWF has neither the resources, the desire, nor the mandate to be here forever. I am not sure you want that either. But we can certainly commit ourselves to long-term financial support for endangered species projects, and to solid support for the recommendations that come out of Wild West after 1988. All I can say is that our previous programs of this kind have been very helpful to provincial and territorial interests. Consequently, we have a fine set of references for Alberta, Saskatchewan, and Manitoba to check out. Since WWF represents 23 national organizations that have raised over $150 million for 5,000 projects worldwide, I think we would make a strong partner in conservation for the Prairie Provinces.

I am pleased to announce a joint project between WWF and the Canadian Wildlife Service that we hope will assist and support provincial initiatives in Manitoba, Saskatchewan, and Alberta. Together, we are making available a new poster on prairie endangered species free of charge to everyone here. You are the first group to see and receive this poster. The information sheet that goes with the poster promotes the conservation of the points I have made here tonight. We are particularly grateful to Michael Dumas, the artist, who travelled and worked at his own expense to do the preliminary sketches that led up to this magnificent painting, done exclusively for the CWS and WWF. We hope you will take a poster with you. Our only request is that you post it where its message can make a difference.

In conclusion, we all have a big conservation job to do on the prairies, a job of great provincial, national, and international significance. We have the expertise and the public interest and I am confident WWF can find enough dollars to officially launch a Prairie Conservation Program within a couple of months. Let's leave some wild in the West!

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STATUS OF THE ASPEN PARKLAND IN THE PRAIRIE PROVINCES

J. Stan Rowe

The Aspen Parkland is a zone of transition between Boreal Forest and Grassland, narrow along the Alberta Foothills but broadening south of Edmonton and continuing in a band of variable width (50-200 km) across Saskatchewan to the southeastern side of the Lake Agassiz sedimentary basin in Manitoba. Relatively small areas of the type occur in the neighbouring United States at the western and eastern provincial extremities.

Zoltai (1975) gave evidence that the northern edge of the Parkland - where Boreal conifers first appear - has been relatively stable for several thousand years. Proceeding southward from this boundary into a gradually drier climate, the forest declines in height as it opens more and more into a mosaic of groves inter-mixed with patches of Fescue and Mixed Prairie.

Chernozemic soils associated with the Aspen (*Populus tremuloides*) groves or bluffs suggest that the type, and its diffuse southern boundary, have not been stable in the recent past. Rather, the proportion of bluffs to grassland has been labile, fluctuating in response to such environmental variables as drought, fire, browsing by ungulates, and more recently settlement and drainage. For example, a reconstruction of the natural vegetation in Saskatchewan south of 52° latitude as it existed in the 1880's supports the thesis that grovelands increased after settlement, particularly in the parkland belt (Archibold and Wilson 1980). Confirmatory evidence is the documented expansion in range of the tree-nesting Red-tailed Hawk (*Buteo jamaicensis*) (Houston and Bechard 1983).

The Parkland ecotone also harbors some of the major wetlands of the Prairie Provinces. Thus, it provides both lowland and upland habitat for a profusion of plants and animals. Unfortunately for its continued existence, the very richness and productivity of the Parkland's native soils, flora, and fauna indicate that many of its landscape types are suited to exploitation, with the simplification that this inevitably entails. Once ploughed for the monoculture of cereals or oil-seed crops, the breeding-bird population of fields is virtually reduced to one species: the Horned Lark (*Eremophila alpestris*, Harris et al. 1983).

PARKLAND AND ENDANGERED HABITAT

The Aspen Parkland is an endangered habitat; of that there is no doubt. It is under attack by agriculturists, foresters, recreationists, and industry. Most of those "friends-of-the-aspen" who do not share the view that the groves are impediments to grazing and cropping as well as sources of weeds and varmints, nonetheless see them as tracts for hunting and other forms of recreation; as sources of biomass for energy, cattle fodder, and chemical feed-stock; and as providing wood fibre for wood chips, wafer board, and most recently in a Regina factory, chopsticks - one million pairs a day!

No let-up is in sight as Aspen stands are bulldozed, sprayed, cut, and trampled, even as the Fescue and Mixed Prairie associated with them are broken and the ponds and marshes drained.

Past trends give little comfort to those concerned about safeguarding the flora and fauna. Many have noted the efficient aptitude of *Homo sapiens* for completely eliminating the competition. In his book "The Northern Naturalist", Otto Hohn (1983) describes events around Miquelon Lake in the transitional Aspen Parkland on the Cooking Lake moraine just east of Edmonton. Bison (*Bison bison*) in their thousands with Plains Grizzlies (*Ursus arctos*) and Wolves (*Canis lupus*) were exterminated by 1885, just a century ago. By the same date, Passenger Pigeons (*Ectopistes migratorius*) numerous enough to be trapped for food by early settlers were gone. White Pelicans (*Pelecanus erythrorhynchos*) were deliberately destroyed in the early 1900's by a settler who landed his pigs on the nesting islands. Double-crested Cormorants (*Phalacrocorax auritus*) and Great Blue Herons (*Ardea herodias*) were no more by the 1920's. Until recently, all raptors were shot on sight and hung as heroic trophies on roadside fences. As we have cured some of these bad habits, technology has lured us into others even more devastating.

STATUS AND TREND

Perhaps we need a definition of "Parkland". One that helps to distinguish a quality example. How much of the geographic Aspen Parkland ecosystem has been destroyed and what remains? Estimates vary, depending on what areas are assumed to have supported the type originally and on today's remnants judged to be still viable.

One figure puts the pre-settlement area of Aspen Parkland in the three Prairie Provinces at 20.3 million ha, with 80% now converted to agricultural use (Rowe and Coupland 1984). Of the 7.35 million ha originally in Alberta, North (1976) estimated that 90-95% was altered or destroyed, leaving only 5-10% still intact. For the same province, Keddy (1984) quotes the much lower figure of 2% as the proportion of original Parkland vegetation remaining, compared to 30% still "natural" in the adjacent Grassland region.

Most serious in the continuing attack by cattle browsing, patch clearing, road building, and division into acreages, is the further fragmentation that these activities accomplish. The sizes of the Parkland islands are steadily eroded. Loss of habitat around each fragment makes large areas increasingly important as a last refuge for native plants, birds, mammals, reptiles, and amphibians (Fehr 1982, 1984).

Another way to appraise the habitat problem is to examine the success of those groups and agencies interested in locating and securing representative natural areas in the Aspen Parkland type. The following are some impressions gained from study of provincial programs:

1. The search for sizeable Parkland ecosystems has met limited success. Most remaining samples are small: less than 1000 ha in size.

2. Some of the best tracts are in the atypical transition Parkland-to-Boreal zone rather than in the Aspen Parkland proper, and are preserved thanks to the Parks

Canada reserves of Riding Mountain National Park, Prince Albert National Park, Elk Island National Park, and Waterton National Park (Keddy 1984).

3. Parklands preserved in Provincial parks tend to be small - totalling only 4500 ha in 15 parks in Alberta (D. Perraton, personal correspondence) - while in larger reserves such as Turtle Mountain in Manitoba and Moose Mountain in Saskatchewan, the type is subjected to all the impacts of multiple use.

4. In a study to identify sites of national botanical significance in the Aspen Parkland for Parks Canada's National Landmarks Program, Keddy (1984) identified seven pre-eminent areas in the three provinces and remarked that none had yet been officially designated an Ecological Reserve. "Nor are there," she wrote, "any other protected Ecological Reserves in the Aspen Parkland belt." The situation has changed slightly with the designation, in Saskatchewan in 1985, of a 670 ha tract in the Aspen-Oak Section - the province's first Ecological Reserve (Adam 1985).

5. A few larger tracts of parkland exist because they occur on sites that are marginal for agriculture: on dunes or sand with high water tables, on stony or hummocky moraines, on steep-sided coulees and gullies, or in river valleys. This means that the most productive Parkland natural ecosystems - groves and grasslands on the best kinds of soils - are extinct. Despite their marginal soils, all large tracts such as Rumsey and Wainwright in Alberta (which are two of the seven on Keddy's list) are under attack by multiple users.

6. A few of the best remaining areas shelter under the inauspicious wing of the Department of National Defence, a federal agency whose wildlife concerns, so far as I am aware, begin and end with the welfare of Leopard Tanks. I have received this cryptic message from a well-known champion of Natural Areas: "Probably the largest area of remaining Parkland (in Alberta) without any major development is within the Canadian Forces Base Wainwright. I kid you not!"

PARKLAND HABITAT AND AGRICULTURE

The chief threat to natural habitat in the Aspen Parkland continues to be government agricultural policies that by encouraging greater livestock and grain production, keep the squeeze on all native ecosystems south of the Boreal Forest. The short-sighted goal of ever-higher production in the farming sector means intensification of uses on arable lands plus more and more encroachment on marginal lands.

The Canada Grains Council (1982) projected the "improvement" of an additional 120,000 ha of land per year until at least 1990 in western Canada, and agronomists have dutifully set out to find it. "If one assumes," write Bowden and Anderson (1985), "that the wetland areas on the Prairies are approximately equivalent to 10% of the total cropped area in size, and that half of this area could be economically drained, this would add about 5% or 1.2 million ha to the 1981 cropped land base. Increasingly, the agricultural policy thrust across Canada is being directed towards getting these wetlands into production." Many such wetlands are within the Parkland belt.

Subsidies make it happen; as with Saskatchewan's Grazing Improvement Program now operative at David Lake-Wainwright.

As owners of community pastures - another public subsidy to the private livestock industry - governments are embarrassed to find themselves the possessors of sizeable pieces of Parkland habitat. In the USA I understand that those in charge of public lands are required to carefully integrate grazing with protection of native habitat. Not so in Canada, where the aims of management are to incrementally and surreptitiously destroy the native grasslands and the Aspen groves while projecting an image of cooperative custodianship.

A concerned citizen of Saskatchewan writes: "In the winter of 1984-85 the PFRA levelled 1.5 sections of bush in the Ituna-Bon Accord Pasture. There is little bush left, but only because of a breakdown in machinery by the construction company. In this instance a Blue Heron nesting site and that of a Bald Eagle (*Haliaeetus leucocephalus*) were lost." She goes on to describe what an ancillary spraying program is doing to the bush, and she expresses great frustration about finding what the long-term policies of PFRA are with respect to maintaining natural habitat.

PRESERVING THE ASPEN PARKLAND ECOSYSTEM

Does loss of the the Aspen Parkland landscapes really matter? Those who answer "no" are likely to point out that the Parkland is an ecotone, so most if not all of the species that comprise its biota are found either in the neighboring Grassland or Boreal Forest. True, rare species occur, such as Glaucous Grass-of-Parnassus (*Parnassia glauca*) in Saskatchewan, and the lovely Cecropia Moth (*Hyalophora cecropia*) that breeds mainly on Manitoba Maple (*Acer negundo*) in farm shelterbelts, but when political boundaries are crossed, such species cease to be "rare".

The argument is sound, I believe, that both public and government should take responsibility for maintaining the biological diversity entrusted to them within political boundaries, and that species that are rare only because they are at the extremes of their ranges - and hence are represented sparsely in provinces or such political units - may have genetic characteristics that make them important far in excess of their numbers (Maher et al. 1979, Packer and Bradley 1984, White and Johnson 1980). Nevertheless, these arguments are vulnerable and insufficient to counter proposals that species proved to be rare and endangered can with a little planning be preserved in seed banks, botanical gardens, and zoos. Developers in eastern Canada have already made the suggestion that rare orchids be moved to the safety of greenhouses, freeing up the marshes for housing and supermarkets.

The problem is of our own making, a result of narrow perspectives on ecological realities. In the past, we have concentrated too much on endangered species, to the point where we have convinced the public that only species matter. On the contrary, species are no more important (and perhaps less important) than the geographic space where local climate, soil, landform, water, and air together provide the life-support and life-renewing system in which organic communities exist. The ecosystem is the primary unit and focus of concern of ecologists (Rowe 1961).

In contrast to the hopeless term "environment" that ought to be stricken from the ecological vocabulary, the term "ecosystem" projects the concept of a real planet with a surface slice of air super-imposed on a slice of soil or water with organisms at the energized interface. This whole three-dimensional "box" is a living system whose parts - misleadingly labelled "abiotic" and "biotic" - are equally interdependent. The ecosystem is the object of first importance that must be preserved.

Because of an infatuation with things like us, namely organisms, we have been content with an insubstantial "environment", a miscellany of academic factors, rather than the real life-giving volumetric ecosystems that encapsulate organisms. Thus, we have missed the important focus for conservation and preservation while lavishing attention on species in populations and communities. These latter are distractions from the task of educating the public as to what is important in our world.

International concern about saving threatened animals and plants diverts attention and channels energy away from dealing with the ecosystem destruction that put them on the threatened list in the first place.

The price of shallow conceptions of environment, and of the fixation on endangered species, is cynicism among those who detect sentimentality in save-the-creatures campaigns while ecosystems deteriorate and basic causes are ignored. This cynicism reinforces in a vicious circle the inability to perceive deep values in surrounding landscape and waterscape ecosystem: in three-dimensional wildernesses, forests, woodlands, prairies, marshes, lakes, and streams.

The fallacy of wildlife preservation, according to John Livingston (1981) in his book of the same title, is that no rational arguments for saving wildlife exist. You either like wild nature, through some unexplained empathic feeling or experience, or you do not, and no one by force of logic alone can convince the self-centred, utilitarian, care less non-believer that he should care more about saving the Swift Fox (*Vulpes velox*), the Purple Geranium (*Geranium viscosissimum*), and the Cecropia Moth.

I believe that Livingston is right, but only at the species level. We have not yet tried the logical approach at the ecosystem level, educating ourselves and others to feel existence is shared with other organisms inside ecosystems and seeking to demonstrate that survival and evolution of the human species is part and parcel of those natural ecosystems that are being destroyed world-wide.

In this sense, the arguments for preserving the Grasslands and the Aspen Parkland have yet to be made. Perhaps when they are made, the support now lacking for preserving the natural world as much as is possible will materialize. Unfortunately, the year that happens is likely to be the year after the last patch has been ploughed down.

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ENDANGERED PRAIRIE HABITATS: THE MIXED PRAIRIE

Robert T. Coupland

The Mixed Prairie Association was the original vegetation that occupied the semi-arid region east of the Rocky Mountains to about the 100th degree of longitude west of Greenwich, extending from southern Canada to northern Texas. The Canadian portion occupied the brown and dark brown soil zones of southeastern Alberta and southwestern Saskatchewan. The black soil zone to the west and north in Alberta and western Saskatchewan was occupied by the Fescue Prairie Association, while the black soils in eastern Saskatchewan and in Manitoba were vegetated by the True Prairie Association. Before settlement, climate and fire combined to keep the region free of trees, but since then, groves (mostly of Aspen; *Populus tremuloides*) have developed in favoured habitats from roots that had survived repeated burning. As a result, the post-settlement character of the black soil zone was grassland in which groves occurred where the amount of soil moisture exceeded the norm. Therefore, the combined boundaries of the Fescue Prairie and the True Prairie coincide roughly with those of this aspen grove region. Some trees also developed after settlement in the Mixed Prairie region, where the habitat was suitable (north and east facing slopes and in sandy soil).

I use the past tense in describing the natural vegetation because now much of the area has been converted to cropland and the remainder has been modified by livestock grazing. Recollections and records of the extent and condition of particular study sites 40 and more years ago cause me to be distressed with the degenerative effect that agricultural activity has had on these grasslands. However, to obtain a more encompassing view of these changes, I have analyzed data on land use and livestock populations on a historical basis for Census Districts that lie within (or mostly within) the Mixed Prairie region. For comparative purposes I have also studied Census Districts within the Fescue Prairie. In this analysis, I have considered both the declining area that has survived cultivation and the intensity of grazing pressure by livestock on this rangeland.

DECLINING EXTENT OF NATURAL GRASSLAND

The proportion of farmland occupied by rangeland (Census category "other unimproved land") declined from 42% to 31% between 1941 and 1981 in the Mixed Prairie Census Districts studied in Saskatchewan and from 53% to 41% between 1956 and 1981 in the Alberta Districts (Figure 1). Corresponding declines in Fescue Prairie were 41% to 25% and 40% to 31%, respectively. These declines amount to losses, in the latest 25 years studied, of between 19% and 23% of the rangeland that remained in 1956. Losses of such magnitude can be considered to be dramatic, since they have been from the part of the landscape that is ordinary upland. The result is that the proportion of azonal ecosystem types in the surviving rangeland has increased disproportionately.

About one-third of the disappearing rangeland has been converted to seeded pasture in the Mixed Prairie region, while the portion converted in this way in the Fescue Prairie region has been greater, at least in Alberta (Figure 2).

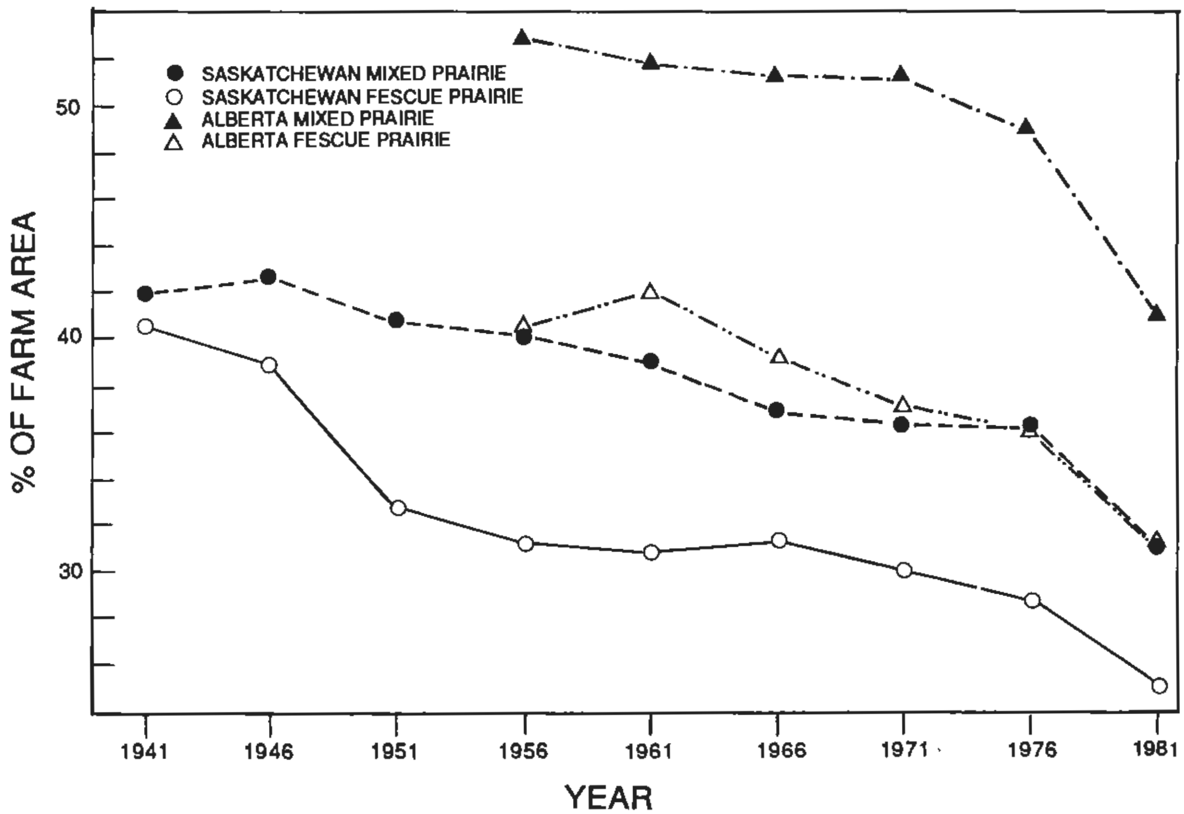

Figure 1. The declining area of rangeland as measured by percentage of the area of farmland that is occupied by the Census category 'other unimproved land', which includes all 'unimproved land' except woodland. Census Districts examined are: for Mixed Prairie in Saskatchewan - 3, 4, 7, and 8; for Fescue Prairie in Saskatchewan - 15, 16, 17; for Mixed Prairie in Alberta - 1, 2, 4, and 5; for Fescue Prairie in Alberta - 3, 6, 7, and 10.

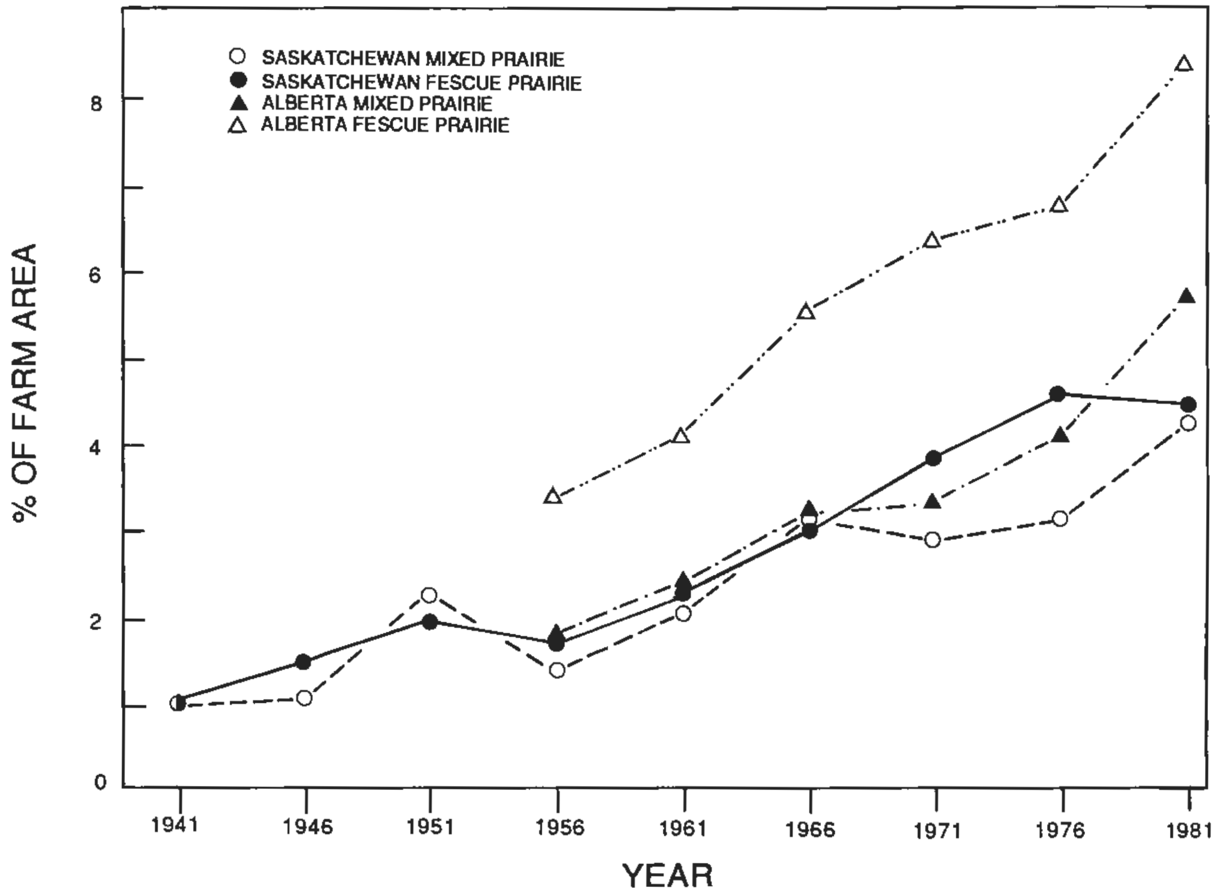

Figure 2. The area of seeded pasture as measured by percentage of the area of farmland occupied by the Census category 'improved pasture'. Census Districts examined are: for Mixed Prairie in Saskatchewan - 3, 4, 7, and 8; for Fescue Prairie in Saskatchewan - 15, 16, 17; for Mixed Prairie in Alberta - 1, 2, 4, and 5; for Fescue Prairie in Alberta - 3, 6, 7, and 10.

The decline of woodland on farms in the Fescue Prairie (aspen grove) region has been greater than that of grassland, with a loss of about two-thirds of the area between 1956 and 1981 (Figure 3).

INCREASING GRAZING PRESSURE ON RANGELAND

In order to evaluate trends in grazing pressure on the remaining rangeland, it is necessary to allow for the increasing portion of the load that is being grazed on seeded pasture. Agronomists attribute the forage yield of seeded grassland to be three times that of rangeland. This factor has been used to calculate equivalent range areas, although this level of production can only be expected for the first few years after seeding. The trend has been for the equivalent range area available to each animal unit to decline, particularly between 1956 and 1976. During these two decades, grazing pressure in the Mixed Prairie region increased by one-third (from 24 to 18 acres/animal unit) in Saskatchewan and by one-half (from 22 to 15 acres) in Alberta. In the Fescue Prairie, grazing pressure increased about 30% (from 13.7 to 10.5 acres/animal unit in Saskatchewan and from 10.1 to 7.8 acres in Alberta) (Figure 4). The grazing load in 1976 was much greater than it was in the 1940's, when overgrazing was considered to be a very serious problem. Increases in grazing load caused by increased populations of beef cattle have more than offset releases caused by reducing the population of horses and by converting rangeland to seeded pasture. Since 1976, livestock populations have declined sharply, but for reasons other than concerns about overgrazing. Grazing by livestock has greatly modified the floristic composition of the rangeland, both in zonal and azonal habitats.

The grazing capacity attributed to seeded pasture in this analysis suggests that it is supporting almost one-third of the grazing load in the Mixed Prairie region and more than one-third in Fescue Prairie region (Figure 5). If, as I suspect, the seeded pasture is not supporting three times as many livestock units per unit area as is rangeland, then the grazing pressure on rangeland has increased even more than the above analysis indicates.

CONCLUSIONS

1. The area of uncultivated grassland in Saskatchewan and Alberta is declining at a rapid rate. The surviving untilled area contains a smaller proportion of typical grassland and a larger proportion of azonal types (saline flats, sloughs, sandhills, badlands) as time goes by, because the typical upland situations are being converted to cropland.

2. The condition of the surviving grassland is deteriorating because of increasing grazing pressure by livestock. Even though the rangelands were considered to be overused a half-century ago, the intensity of grazing has continued to increase. The remedial process of the 1940's of reducing the impact of grazing by removing draft animals from the range was unsuccessful, since horses were replaced by beef cattle.

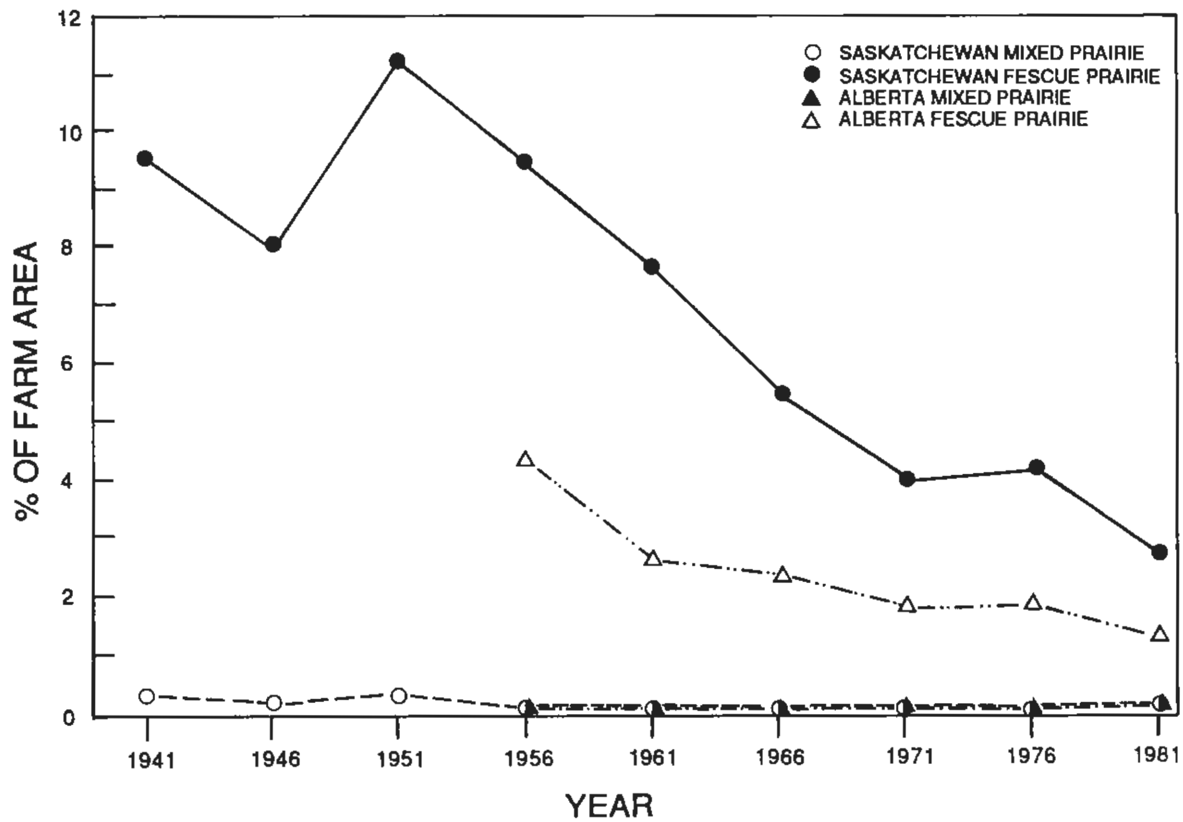

Figure 3. The declining area of woodland as measured by percentage of the area of farmland occupied. Census Districts examined are: for Mixed Prairie in Saskatchewan - 3, 4, 7, and 8; for Fescue Prairie in Saskatchewan - 15, 16, 17; for Mixed Prairie in Alberta - 1, 2, 4, and 5; for Fescue Prairie in Alberta - 3, 6, 7, and 10.

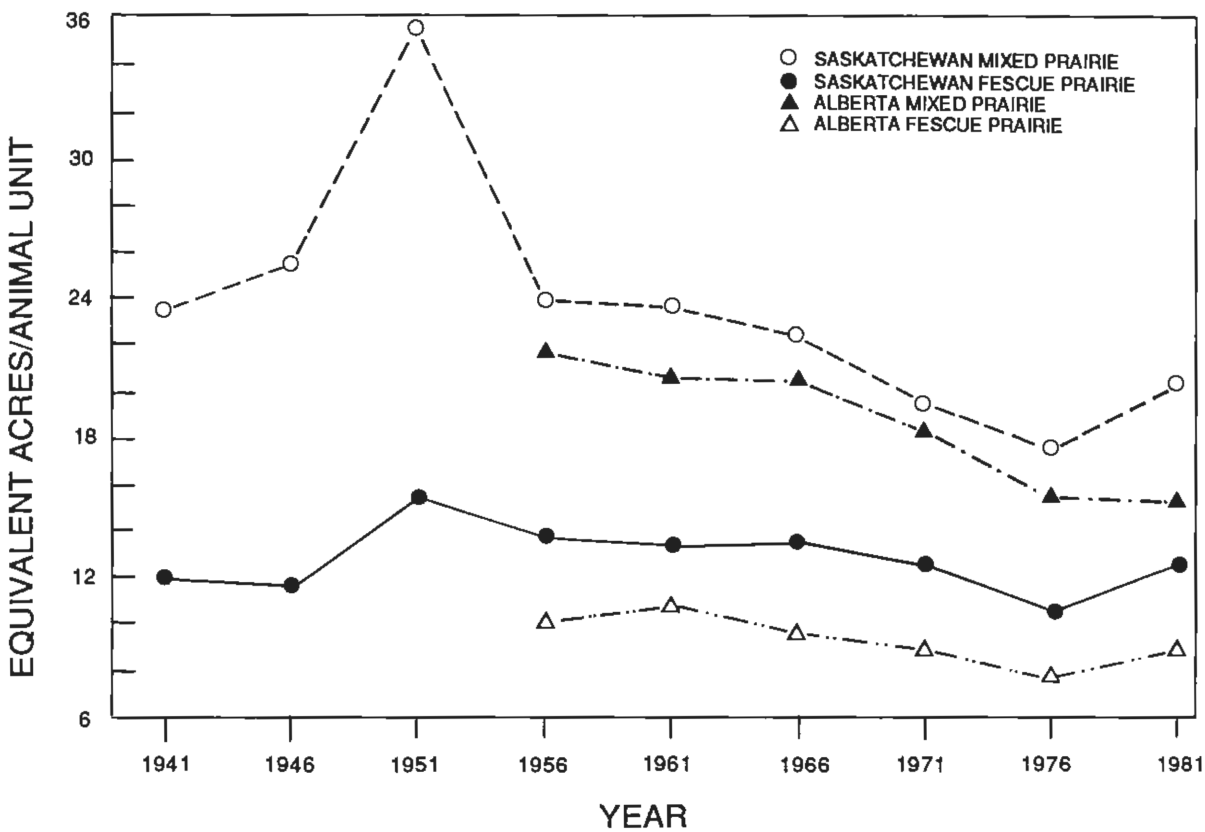

Figure 4. Total grazing load or the declining equivalent area of rangeland available to each animal unit of livestock. Seeded pasture is assumed to have three times the carrying capacity of rangeland. Census Districts examined are: for Mixed Prairie in Saskatchewan - 3, 4, 7, and 8; for Fescue Prairie in Saskatchewan - 15, 16, 17; for Mixed Prairie in Alberta - 1, 2, 4, and 5; for Fescue Prairie in Alberta - 3, 6, 7, and 10.

OBSERVATIONS

1. Government actions that have speeded the destruction of natural habitat include: i) provision of subsidies to convert Class 4, 5, and 6 land to seeded forage crops; and ii) sale of Crown Land that was supervised previously to restrict growth of field crops and/or grazing.

2. Arrangements are urgently needed to protect representative examples of natural grasslands on a perpetual basis. Past failures of determined efforts to preserve grassland research areas suggests the need to develop "fool-proof" arrangements for protected sites. A successful arrangement requires legislation that allocates non-political responsibility on a continuing basis, with strong controls against reallocation of land use.

3. Surviving examples of ecosystems that have been used as cropland will have tremendous value in redesigning agricultural systems, as exploitation of cropland soils reaches the point where the present system must be abandoned.

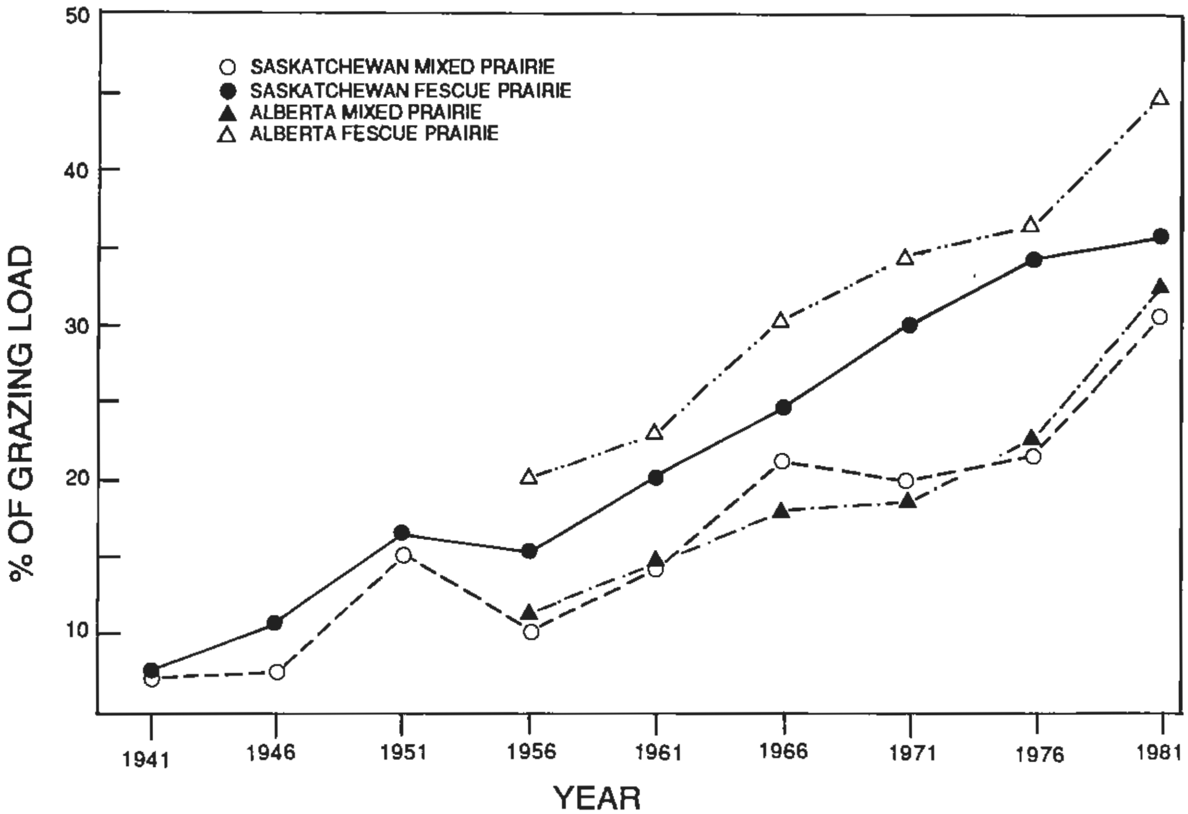

Figure 5. The increasing dependence on arable pasture as measured by the percentage of the total grazing load that is accommodated on improved pasture, assuming that 'improved pasture' has three times the carrying capacity of rangeland. Census Districts examined are: for Mixed Prairie in Saskatchewan - 3, 4, 7, and 8; for Fescue Prairie in Saskatchewan - 15, 16, 17; for Mixed Prairie in Alberta - 1, 2, 4, and 5; for Fescue Prairie in Alberta - 3, 6, 7, and 10.

TALL-GRASS PRAIRIE IN CANADA: AN OVERVIEW AND STATUS REPORT

Karen L. Johnson

ORIGINAL DISTRIBUTION AND CHARACTERISTICS

Tall-grass Prairie is a grassland community originally found along the eastern edge of the extensive North American Great Plains and eastwards on drier soils into forested areas in a "Prairie Peninsula." It occupies the mesic to moist end of the continuum of grassland communities making up the Great Plains grassland biome. Tall-grass Prairie has the life forms and general climatic and soil characteristics of the grassland biome. The region lies at the eastern edge of the rain shadow produced by the Rocky Mountains and, like all grasslands, has a climate characterized by high rates of evaporation and periodic severe droughts during the growing season, a rolling-to-flat terrain, and animal life dominated by grazing and burrowing species (Smith 1974). It has unpredictable, often relatively low, summer and winter precipitation, receiving enough rainfall (40-55 cm annually in our region) to support the taller grasses and some hardy trees such as Bur Oak (*Quercus macrocarpa*) and Trembling Aspen (*Populus tremuloides*), but not enough to support a solid cover of trees (Looman 1983). Its periodic droughts and natural and man-caused fires restrict trees to low wet areas or the banks and floodplains of rivers and streams, allowing the characteristic 1-3 m tall bunch grasses Big Bluestem (*Andropogon gerardi*) and Indian Grass (*Sorghastrum nutans*) to dominate upland mesic and xeric sites (Watts 1969).

Tall-grass Prairie originally covered some 1,000,000 km^2, stretching in an arc from south-central Manitoba to Texas with outliers on moister soil types west through North and South Dakota, Nebraska, and Eastern Kansas and east through Minnesota, Wisconsin, Illinois, and Indiana (Farney 1980). Scattered pockets also occurred on dry sandy or gravelly soils eastward through Indiana, Ohio, southern Michigan, and southern Ontario into western Pennsylvania. These communities are considered relicts of former widespread grasslands present in the region during the hotter and drier Xerothermic or Hypsothermal climatic period several thousand years ago (Maycock and Hills, unpublished data).

Because Tall-grass Prairie occurred on and helped produce deep, rich, productive soils, almost all of this community has been exploited by man for agricultural uses, either the cultivation of cereal or legume crops or for grazing or hay production for domestic herbivores. Less than 1% of the original area occupied by Tall-grass Prairie is still relatively undisturbed and most of this is grazed and has escaped cultivation only because of relatively shallow soil and/or rock outcrops.

In Canada, Tall-grass Prairie originally occupied some 6,000 km^2 of rich chernozemic lake-bottom soils in the Red River Valley of Manitoba (Watts 1969) and an estimated 1,200 km^2 of azonal sandy soils in southern Ontario (Maycock and Hills, unpublished data). The Manitoba Prairie occupied the Red River Valley on the west side of the Red River and extended north to the Assiniboine River and west to the shale and bentonite outcrops of the Pembina Hills (Watts 1969). In Ontario, Tall-grass Prairie occurred as narrow "meadows" up to 10 km long or as the matrix of, or inclusions in, Oak-Hickory Savannahs or open forest. These occurred in the narrow peninsula between lakes Huron, St. Clair, and Erie and extended north to slightly beyond present-day Sarnia (Maycock and Hills, unpublished data).

PRESENT DAY PRAIRIE IN ONTARIO

The only preserved prairie area I am aware of in Ontario is the Ojibway Park and Prairie Provincial Nature Reserve that lies mostly within the city limits of Windsor. It is some 150 ha in size, mostly open Savannah with Red Oak (*Quercus rubra*) and Pin Oak (*Q. palustris*) and patches of dry to mesic prairie. Although on azonal soils and well outside the original range of Tall-grass Prairie, the site has many characteristic plants including Big and Little Bluestem (*Andropogon scoparius*), Indian Grass, blazing stars (*Liatris* spp.), sunflowers (*Helianthus* spp.), and the rare Prairie White-fringed Orchid (*Platanthera leucophaea*). Although azonal and somewhat atypical, eastern sites such as this still provide valuable reservoirs of many prairie plant species (Maycock and Hills, unpublished data).

PRESENT DAY PRAIRIE IN MANITOBA

A survey of Manitoba for prairie sites, both Tall-grass and Mixed-grass, was undertaken by the International Biological Program from 1967 through 1970. Over 60 sites were examined but none larger than 5 or 6 ha were found anywhere in the original range of Tall-grass Prairie in the province. These small sites were found along road allowances, railroad and road right-of-ways, and in corners of pastures and fields difficult to reach or unsuitable for cultivation. However several sizeable remnant prairies were found in the Parkland zone north and east of the original prairie region during or shortly after the I.B.P. survey. The two largest of these have been at least partly preserved by designations as a City Park and part of a provincial Wildlife Management Area while a third was mostly destroyed during the creation of a provincial park. Many small patches of Tall-grass Prairie still occur throughout the northern and eastern parkland transitional zone and many prairie plants also survive along roadsides and in clearings in the pine forest to the east and south of their former main range.

Protected Tall-grass Prairie Sites in Manitoba

1. *St. James Living Prairie Museum.*--About 10 ha of the original 40 ha site located by the I.B.P. survey in St. James (now a part of Greater Winnipeg) was set aside in 1971 as a City Park. Most of it had never been cultivated because of shallow limestone outcrops, only 1.5 m below the surface in some areas. Parts of the site had been disturbed and most had been grazed or hayed at some time, but unbroken prairie sod and most of the characteristic species were still present. There is now an interpretive centre on the site and many thousands of visitors walk through it each year, but there is an active management plan that includes regular burning and the reestablishment of native prairie plants by transplantation and seeding. Big and Little Bluestem are common and it has a

large population of the Prairie Crocus (*Anemone patens* var. *wolfgangiana*). Although there is still a population of weedy annuals like Kentucky Bluegrass (*Poa pratensis*) and thistles, these species are fewer in numbers and smaller in area than when the park was set aside and it seems to be in stable or even improving condition (Hilderman 1971).

2. *Oak Hammock Prairie.*--This 24 ha unbroken prairie is the largest remaining Tall-grass Prairie known in Manitoba. It is part of the Oak Hammock Wildlife Management Area some 24 km north of Winnipeg. It was found in 1973 by a wildlife biologist after a spring burn had released Big Bluestem and other supressed prairie species. The land had been hayed but never broken and was purchased and added to the adjacent W.M.A. in 1974. There are very small, scattered "bluffs" of Trembling Aspen and Bur Oak on the sites, but the dominants are the typical bunch grasses; Big and Little Bluestem on drier sites and Prairie Cord Grass (*Spartina pectinata*) in moister areas. The heavy clay loam soils of the site and presence of the Cord Grass indicate that it is a moister area than optimum for Tall-grass Prairie and these wetter soils are probably the reason it was hayed and not cultivated. The prairie is maintained by regular spring burning (Government of Manitoba a).

3. *Bird's Hill Provincial Park.*--Fairly large patches of prairie, up to 15 ha, originally occurred on the sandy and gravelly deltaic soils found just northeast of Winnipeg in the parkland zone. Most of this area has been destroyed by gravel mining, but a large section of parkland was set aside as Bird's Hill Provincial Park in the late 1960's. Unfortunately, in the process of creating the park, the largest prairie area was paved as a parking lot and most of the other patches have either been planted with exotic domestic grasses, shrubs, and trees to make "lawns" or kept so closely mowed that most prairie plants have little chance of survival. The area is still a useful refuge for those species that can survive the mowing regime and many are present in the meadows and Oak and Aspen Parkland communities present within the park.

Other Tall-grass Prairie Sites in Manitoba

All other known areas of Tall-grass Prairie in Manitoba are less than 6 ha in size and, as mentioned previously, occur in out-of-the-way or unused corners. Many of these small patches occur in southeastern Manitoba and allow the survival of most Tall-grass Prairie plants and many of the attendant mammal, bird, and insect species. Even roadside ditches, regularly disturbed and/or hayed, can support populations of prairie species, including very rare and endangered ones such as the Small White Lady's-slipper (*Cypripedium candidum*), the Prairie White-fringed Orchid, and the Great Plains Ladies'-tresses (*Spiranthes magnicamporum*). Many prairie species are also found in the open pine forests of eastern Manitoba and others are abundant in the Mixed-grass and Sandhill Prairies of southwestern Manitoba (Bourles 1984).

STATUS OF TALL-GRASS PRAIRIE IN CANADA

I do not feel that the grassland biome, as such, can be considered endangered, as man usually has replaced native grass species with domesticated or exotic ones and wild herbivores with domesticated ones. This may simplify and degrade a given local community and the biome as a whole but does not change the overall characteristics of the biome, at least as we presently define biomes. That does not mean that certain communities and some of their component species cannot be considered endangered. I certainly think that the Tall-grass Prairie community can be considered endangered or at least threatened in Canada. Most of the individual prairie species are surviving, many doing very well, in a wide variety of azonal or atypical habitats, but large undisturbed areas with the combination of soils and microclimate necessary to allow full development of the native community are now gone. We know that there are no sizeable areas of unbroken land left in the original range of Tall-grass Prairie in Manitoba. There may still be some slightly atypical or azonal moist or wet prairie, similar to Oak Hammock Prairie, surviving in the Parkland region north and northwest of Winnipeg, but these are on the boundary of the original range of the community. I assume that the same is true of southern Ontario with its even greater population and pressures on the land. Tall-grass Prairie, as a major community, has been destroyed over all of its original range in Canada.

PRESERVATION AND RECREATION POSSIBILITIES

Several slightly azonal but still respectable-sized tracts of Tall-grass Prairie have been preserved in Manitoba and southern Ontario. Most plant species, even rare species, composing the original community still survive in patches and azonal communities in both provinces. A two-fold approach to preserving and regaining Tall-grass Prairie would be to make sure that these species reservoirs are not depleted or destroyed and to attempt to establish sizeable tracts of prairie on cultivated land within its original range.

Strategies of retaining prairie species diversity and gene pools would include persuading municipalities and landowners not to use herbicides or cultivation on roadside ditches, right-of-ways, or other properties with good populations of prairie species.

Reestablishing prairie on cultivated land would be much more difficult, but is at least theoretically possible. A lot of work has been done on reestablishing prairie in the United States, especially in Illinois where universities have several experimental prairies that have been in existence for close to 50 years. Estimates for the time needed to reconstitute a native prairie range from 50 to over 200 years and no one has yet, to my knowledge, been completely successful in doing this. However, enough groups are now trying to reestablish prairies in enough different geographic areas that we are developing better and better techniques of selecting, cultivating, seeding, and transplanting the native species and discouraging exotic or pioneer weeds.

Manitoba's first attempt to reestablish Tall-grass Prairie is just starting in Beaudry Provincial Park, located in the parkland zone about 15 km west of Winnipeg along the Assiniboine River. This area was originally purchased to preserve the excellent stands of deciduous floodplain forest along the river, but included with these stands were several hundred hectares of cultivated uplands and a small stand of Bur Oak with many native prairie species. The Manitoba Parks Branch is going to attempt to reestablish native prairie on some 100 ha of this cultivated upland (Government of Manitoba b). If they are successful, which will probably take many years to determine, this is one way in which Tall-grass Prairie could be preserved. Cultivated private land with the appropriate soil and microclimate could be obtained and native prairie reestablished through seeding, burning, mowing, transplanting, and other agricultural techniques (Old 1969). These areas would probably not be very large because of the competing and increasing demand on productive farmland but it may be possible to regain at least several square kilometres of the original 6,000. This is the only way we are going to increase the amount of Tall-grass Prairie in Canada, as there are no remnant areas left to preserve over the original range. It would be ironic, but appropriate, if the same agricultural techniques that were used to destroy these grasslands were used to regain some sizeable native prairie reserve.

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CRITICAL, THREATENED, AND ENDANGERED HABITATS IN ALBERTA

Cliff Wallis

A great deal of research has ignored the broader questions of habitat. While it is necessary to investigate some rare or endangered species individually, in the long run, a habitat approach to research and management will do far more to prevent species from becoming endangered or threatened in the first place.

This paper was written to stimulate discussion and research on defining and identifying critical, threatened, or endangered habitats. It is presented from an Alberta perspective but many of the concepts apply across the prairies. This paper considers both habitats that are critical for survival of individual species and for habitats that are threatened or endangered by human activities. A method for evaluating and ranking natural habitats is also reviewed.

The original (pre-European) extent of 111 landscape or biophysical types in Alberta has been determined and ranked into broad categories of rare, occasional, and common (Table 1). These categories do not relate to the amount of undisturbed land that remains. While some types may have been common in former times, cultivation may have destroyed almost all of a given type; e.g., upland glacial lacustrine or non/weak solonetz in Northern Fescue Grassland. Each landscape grouping is also categorized as to its prevalence within each Section. Therefore, a rare landscape type (e.g., springs-fresh) in a rare landscape grouping (e.g., valley) would be one of the rarest landscape types in a Section (e.g., Mixed Grassland). A common landscape type (e.g., ground moraine) in a common landscape grouping (e.g., upland) would be one of the most common types in a Section (e.g., Mixed Grassland).

WHAT ARE CRITICAL, THREATENED, OR ENDANGERED HABITATS?

There are no universally accepted definitions for critical, threatened, or endangered habitat. Critical habitat may be defined as any habitat that is crucial for the survival of a species, race, form, or population of a species. However, if that was accepted as a valid definition, then all habitat would be "critical". For practical purposes, critical habitats must be defined more narrowly. Critical habitats because of their restricted distribution or the obligatory seasonal or periodic dependence of species on them, are most crucial to the survival of populations, species, races, or forms. If these critical habitats are disturbed there will be major effects on the plants or animals that depend upon them.

Endangered or threatened habitat can be defined by analyzing the remaining amount of, and land use threats to, specific landform/ vegetation/soils/wildlife (biophysical) types; unique biophysical types; areas of biogeographic interest; areas of high diversity of wildlife/ plant species; areas of unusual concentrations of wildlife or plant species; or areas with populations of rare, threatened, or endangered species. These must be viewed on a sliding scale, from most endangered to least threatened. Over 2/3 of the Mixed Grassland has been lost to cultivation or other development, while over 95% of the upland Central Parkland and Northern Fescue Grassland has been lost. Therefore, it might be fair to say that, because of current land use practices and government policies, a large proportion of habitats in the grasslands and parklands are threatened to some degree.

Table 1.--The relative occurrence of landscape types based on the pre-European extent of each type in Alberta (from Cottonwood Consultants 1983). R = rare, O = occasional, C = common, within each broad landscape grouping (e.g., upland, wetland, valley). Each landscape grouping is also categorized as to its prevalence within each section (e.g., Mixed Grassland, Northern Fescue Grassland).

MIXED GRASSLAND					
Upland (C):					
1.	glaciolacustrine (fine)	C	2.	outwash/sand plain	C
3.	ground moraine	C	4.	hummocky moraine	C
5.	dune field	O	6.	eroded plain	R
7.	solonetz/blow-outs	C	8.	non/weak solonetz	C
Wetland (O):					
9.	wet meadow	C	10.	shallow marsh	O
11.	deep marsh/open water	R	12.	open alkali wetland	O
Valley (R):					
13.	meandering r. terrace	O	14.	sinuous r. terrace	O
15.	eroded bedrock marine	O	16.	er. bedrock non-marine	C
17.	protected slope	C	18.	abandoned channel	O
19.	inactive terrace	C	20.	springs - alkali	O
21.	springs - fresh	R			
Other (R):					
22.	turbid stream	C	23.	+/- clear stream	R
24.	intermittent stream	C	25.	permanent stream	O
NORTHERN FESCUE GRASSLAND					
Upland (C):					
1.	glaciolacustrine (fine)	C	2.	outwash/sand plain	C
3.	ground moraine	C	4.	hummocky moraine	C
5.	dune field	O	6.	eroded plain	R
7.	solonetz	C	8.	non/weak solonetz	C
Wetland (O):					
9.	wet meadow	C	10.	shallow marsh	C
11.	deep marsh/open water	O	12.	open alkali wetland	R
13.	fresh/sl. alkali lake	C	14.	alkali lake	C

Table 1.--Continued.

Valley (R):

15. meandering r. terrace	R	16. sinuous r. terrace	O
17. eroded bedrock	O	18. protected slope	C
19. inactive terrace	C	20. abandoned channel	R
21. springs - fresh	R	22. springs - alkali	O

Other (R):

23. +/- clear stream	R	24. turbid stream	C
25. permanent stream	O	26. intermittent stream	C

FOOTHILLS GRASSLAND

Plains (C):

1. glaciolacustrine (fine)	O	2. outwash/sand plain	C
3. ground moraine	C	4. hummocky moraine	C

Valley/Hill (C):

5. unglaciated	R	6. S or W-facing slope	C
7. N or E-facing slope	C	8. meandering r. terrace	O
9. sinuous r. terrace	O	10. eroded bedrock	R

Wetland (O):

11. wet meadow	C	12. shallow marsh	C
13. deep marsh/open water	O	14. abandoned channel	O
15. seepage/springs	O		

Other (R):

16. +/- clear stream	C	17. turbid stream	O
18. permanent stream	C	19. intermittent stream	C

CENTRAL PARKLAND

Upland (C):

1. glaciolacustrine (fine)	C	2. outwash/sand plain	C
3. ground moraine	C	4. hummocky moraine	C
5. dune field	O	6. kame moraine	R
7. solonetz	C	8. non/weak solonetz	C

Table 1.--Continued.

Wetland (O):			
9. wet meadow	C	10. shallow marsh	C
11. deep marsh/open water	C	12. open alkali wetland	O
13. fresh/sl. alkali lake	C	14. alkali lake	C
Valley (R):			
15. meandering r. terrace	O	16. sinuous r. terrace	O
17. eroded bedrock	O	18. protected slope	C
19. slump	O	20. abandoned channel	O
21. springs - fresh	O	22. springs - alkali	O
Other (R):			
23. +/- clear stream	C	24. permanent stream	C
25. intermittent stream	C		
FOOTHILLS PARKLAND			
Plains (O):			
1. glaciolacustrine (fine)	O	2. outwash/sand plain	O
3. ground moraine	C	4. hummocky moraine	C
Valley/Hill (C):			
5. meandering r. terrace	O	6. sinuous r. terrace	O
7. eroded bedrock	O	8. small stream valley	C
9. protected slopes	C		
Wetland (O):			
10. wet meadow	C	11. shallow marsh	C
12. deep marsh/open water	C	13. abandoned channel	O
14. seepage/springs	C		
Other (R):			
15. +/- clear stream	C	16. turbid stream	O

HOW ARE AREAS THREATENED?

The principal threats to grassland and parkland habitats relate to clearing and draining of the land to make way for agricultural production. Some of the most threatened or endangered habitats in Alberta's prairies and parklands are those, like Northern Fescue Grassland, that have been greatly reduced through cultivation. Moreover, the problem is compounded as many of these and other grassland and parkland habitats are also threatened or endangered through subtle processes, some of which we may not even be aware of at this time. We do know that many of the remnant habitats are being degraded through incompatible grazing strategies or invasion by non-native species. Biotic factors such as grazing and rodent populations are poorly studied yet we know that their influences are significant.

It must be recognized that habitat is not endangered or threatened only by major developments such as cultivation, drainage, or flooding. Habitats are threatened or endangered when the processes of maintaining the system are altered or when one of the key elements of a natural ecosystem is lost. By studying individual species in the absence of the broader aspects of habitat, we often overlook factors that affect a broad range of species. Primarily, these are:

- the influences of biotic factors in habitat maintenance;

- the physical processes that maintain habitats;

- the types of habitat that are critical for many non-game wildlife; and

- the relationships of habitat to groupings of rare, threatened, or endangered species.

A. Biotic Factors

Species like the Mountain Plover (*Charadrius montanus*) are restricted to areas of extremely heavy grazing as well as being restricted to specific landform-soil-vegetation assemblages. The Baird's Sparrow (*Ammodramus bairdii*) and Upland Sandpiper (*Bartramia longicauda*) favour sites that have no or minimal grazing. Cattle grazing can have a major impact on streams and populations of uncommon fish species like the Silvery Minnow (*Hybognathus nuchalis*). One question that needs to be addressed is: what other uncommon species are restricted because of current grazing practices?

It is not just a question of grazing, but a question of maintaining different grazing levels in different biophysical types. There are many heavily grazed areas in Alberta, but there may not be enough heavy grazing in appropriate biophysical types while there may be too much heavy grazing in sensitive sites such as Fescue Grasslands, springs, and streams. Areas like Police Coulee and Kennedy Creek are extremely rare -- clear running streams with bank and spring vegetation that is not damaged by cattle. Little has been published on the benefits or negative effects of different grazing systems on non-game animals and native plants. Certain groups of species or habitats may favour spring, summer, or fall grazing, while others may favour year-round grazing.

By moving to uniform grazing systems and uniform distribution of cattle, we are destroying specific groupings of species and, in some cases, habitat for those species (often rarer ones) that thrive outside the "average" conditions. In some areas we are not losing species but we are losing genetic diversity.

Richardson's Ground Squirrels (*Spermophilus richardsonii*) are not considered wildlife (they are considered an agricultural pest species) yet ground squirrels are an integral part of the habitat of many Mixed Grassland areas and their decline in large areas has not been investigated. The Milk River, where there are no or few ground squirrels today, was considered the centre of ground squirrel abundance when Elliott Coues did his boundary survey in the 1870's. Mountain Plovers were also reasonably common in that area at that time. A host of other species thrive where ground squirrels abound -- Burrowing Owls (*Athene cunicularia*), Long-tailed Weasels (*Mustela frenata*), Badgers (*Taxidea taxus*), and a variety of insects, plants, reptiles, and amphibians. In Saskatchewan, a large number of species are dependent on Black-tailed Prairie Dogs (*Cynomys ludovicianus*).

By ignoring ground squirrels, we are ignoring one of the most critical aspects of habitat for a variety of grassland species, including some that are now considered rare or threatened. In essence, those kinds of habitats are being threatened.

B. The Relationship of Physical Processes

Most habitats are maintained by climatic and geomorphic processes that are not always well-understood. Habitats may be threatened by distant land uses that cause alterations to some of these processes.

About three-quarters of the bird species that breed in the grassland region, nest or forage in river valleys. Valleys are also critical for migrating passerines in spring and fall. Riparian habitats are some of the most threatened ecosystems in arid and semi-arid regions of the world and yet it is only recently that we have begun to understand the processes responsible for maintaining riparian habitats. For example, without major flood events, there may be insufficient regeneration of cottonwood (*Populus* spp.). Consequently, upstream dams that control floods could slowly alter some of the grassland region's most productive bird communities. These effects are compounded by heavy grazing that also restricts the development of native floodplain communities.

C. Types of Critical Habitat for Non-Game Species

Critical habitats are easily defined for plants. However, animal populations are mobile and present special problems in ascertaining what constitutes critical habitat for a given species. While critical habitats for many game species such as deer and waterfowl are fairly well-known, those for most non-game species are not.

There are undoubtedly areas that are extremely important during specific climatic conditions such as the prolonged droughts that characterize the grasslands. We can conceive of a "mother pond" theory that suggests there must be a handful of waterbodies that do not dry up during extreme droughts and are critical to the survival of many amphibians including the rare Great Plains Toad (*Bufo cognatus*). In wet years, these mother ponds act as sources for recolonization. We know of no Alberta studies that have shown this, but the theory sounds reasonable. These are the kinds of questions we must ask and find the answers for. If we do not, then some critical habitats may be lost. If mother ponds do exist, then whole populations of amphibians from a large area could be wiped out if the mother ponds were destroyed because of drainage or contamination of the water.

Similarly, certain alkaline lakes may be critical to certain shorebirds during drought years. Normally, Stilt Sandpipers (*Calidris himantopus*) occur in small groups. In Alberta, groups are considered large if they consist of 50 birds. Flocks of thousands of Stilt Sandpipers and thousands of other shorebirds were observed staging in the Killarney Lake and Sounding Lake areas during recent drought years. Information is insufficient to determine if these concentrations occur in non-drought years. If the high numbers are confined to drought years, then areas like these are undoubtedly critical to the long-term maintenance of certain species.

Over 1/3 of the rare plants in the grassland and parkland regions are found in wetlands. These range from spring/seepage areas along coulees to large lakes and marshes. Rare or endangered birds like the White-faced Ibis (*Plegadis chihi*) and Piping Plover (*Charadrius melodus*) nest or migrate in these areas. Some are major staging areas for waterfowl. Within these regions, wetlands are naturally more restricted than other biophysical units. Continuing threats include drainage, overgrazing, and cultivation in dry years.

About 20% of the rare plants in the grassland and parkland regions are found in sandy soils, principally in sand hill areas. Rare wildlife like the Western Hognose Snake (*Heterodon nasicus*) and Ord's Kangaroo Rat (*Dipodomys ordii*) also occur here. In addition to rare species, the sand hills also support large populations of several game species including Sharp-tailed Grouse (*Tympanuchus phasianellus*) and Mule Deer (*Odocoileus hemionus*). Sand hill areas are locally distributed, and diverse sand hill areas are rare. Principal threats to these habitats relate to cattle grazing and invasion of non-native species as a result of vegetation reclamation along oil and gas access roads and well-sites. Based on the experience in the U.S. with sand hill areas, the potential for cultivation exists but has not been developed to a significant degree in Alberta.

Rock outcrops and badlands are local but very significant to a number of bird species that favor these areas for nesting purposes: the Golden Eagle (*Aquila chrysaetos*), Ferruginous Hawk (*Buteo regalis*), and Prairie Falcon (*Falco mexicanus*). About 10% of the rare plant species in the grasslands and parklands occur in badland and drier coulee habitats. Coulee rims are important to a variety of rare plant and animal species, including the Short-horned Lizard (*Phrynosoma douglassi*). While these are critical habitats, they are generally not facing any major threats.

D. Critical and Endangered Habitats in Alberta

The following are descriptions of some of the known key habitats within each of the biogeographical sections. This is not meant to be an exhaustive listing. Some of the better known and better protected areas are omitted in the hope that attention will be paid to larger blocks or previously ignored or imminently threatened areas.

Foothills Parkland/Foothills Grassland

The southernmost Foothills Parkland and Foothills Grassland have an abundance of plants that are either rare or at the periphery of their range. Some examples include *Melica smithii*, *Trisetum canescens*, *Nemophila breviflora*, *Trisetum cernuum*, *Camassia quamash*, *Montia linearis*, *Potentilla glandulosa*, *Angelica arguta*, *Angelica dawsonii*, *Osmorhiza occidentalis*, *Iris missouriensis*, *Allium geyeri*, *Castilleja cusickii*, *Machaeranthera tanacetifolia*, *Populus angustifolia*, *Oxytropis lagopus*, *Bupleurum americanum*, and *Hydrophyllum capitatum*.

The prime area of significance is the southernmost portion of the Foothills Parkland in the Waterton-Paine Lake area. The prime area of Foothills Grassland identified is the Ross Lake area on the Milk River Ridge. The most extensive Narrow-leaved Cottonwood (*Populus angustifolia*) stands in Canada are found along the Oldman and Belly Rivers. The only sizeable willow parkland site on glaciolacustrine deposits that has been identified is at Sheppard Creek.

An area of Little Bluestem (*Andropogon scoparius*) grassland is located northwest of Fort Macleod and it is in excellent condition. A wet meadow site in Police Outpost Provincial Park contains one of three known sites of *Iris missouriensis* in Alberta and one of a handful of sites for *Haplopappus uniflorus* in Alberta. Several other rare species of the southwest flora also occur in the adjacent grasslands and woodlands. Two special types of springs are found in a small area of mineral springs west of Police Outpost Provincial Park along Boundary Creek; and at Big Hill Springs Provincial Park where there is a major groundwater discharge and well-developed tufa deposits. Both spring sites have rare plant species.

There is very little protection for these areas. The best protection occurs in Waterton National Park. However, the area of Foothills Parkland and Foothills Grassland is quite small in Waterton. Another protected area with significant habitats and species is Police Outpost Provincial Park. Here, recreation development and lack of resource management programs make the future of some species unclear. Valley habitats are largely unprotected and construction of dams may pose a threat to downstream stands of Narrow-leaved Cottonwood. Some habitat destruction by clearing and cultivation continues, but the principal threat to these ecosystems is overgrazing by cattle and competition by non-native forbs and grasses.

Central Parkland

The extensive hummocky moraine near Rumsey is the largest remaining modal site aspen parkland left in the world. Rumsey has good representation of hummocky moraine, non/weak solonetz, wet meadow, and shallow marsh landscapes. Rare plants like *Viola pedatifida* and uncommon animals like the Prairie Vole (*Microtus ochrogaster*) and Baird's Sparrow occur here.

The Sounding Lake and Reflex Lake sand plain areas are important for shorebird migration. There is considerable diversity with kame moraine being well-represented as well as outwash/sand plain, dune field, non/weak solonetz, deep marsh/open water, and fresh to slightly alkali lake. Some lakes support healthy populations of nesting Piping Plovers.

The Wainwright-David Lake-Ribstone Creek area is the largest diverse area of sand dune, outwash, kame moraine, and stream wetland in the Parkland Region of Alberta. The Wainwright-David Lake area has good representation of glaciolacustrine deposits, outwash/sand plain, dune field, non/weak solonetz, deep marsh/open water, and fresh to slightly alkaline lake types. There is also some representation of kame moraine, wet meadow, shallow marsh, springs-fresh, clear stream, and intermittent stream landscapes. There are rare slope fens, shrub fens with rare plant species, and active blow-outs.

Other sizeable areas of Central Parkland on morainal landscapes are in the Neutral Hills-Gooseberry Lake-Bodo area.

Some of the best closed forest in the Cooking Lake moraine area is found around Miquelon Lake Provincial Park. There are many mature trees in the area and there is a diversity of plant and animal life.

Dry Island Buffalo Jump Provincial Park is part of a diverse section of the Red Deer River valley that includes coniferous forest and badlands, as well as slump block features.

More than 95% of the Central Parkland upland has been converted to cropland. Little protection exists for the remaining areas and land clearing continues at a brisk pace, sometimes subsidized by the government Range Improvement Program. It could easily be argued that all remaining native habitat is critical or endangered. The Central Parkland is one of the most threatened biogeographic regions on the Canadian plains.

Mixed Grassland

The Milk River-Lost River area has a wide variety of habitats including some of the last remaining ungrazed vegetation associated with springs and creeks in the Grassland Region. There are numerous plants at the northern edge of their range found in this area of southeastern Alberta. Examples include *Yucca glauca*, *Asclepias viridiflora*, *Chrysothamnus nauseosus*, *Atriplex truncata*, *Castilleja sessiliflora*, *Arenaria congesta*, *Astragalus purshii*, and *Nothocalais cuspidata*. In Canada, several insects such as the Pronuba Moth (*Prodoxus quinquipunctellus*) and Weidmeyer's Admiral Butterfly (*Limenitis weidemeyerii*) are restricted to the lower Milk River area. The Lost River site also contains Mountain Plover breeding habitat, the only known locality in Canada. This species requires extremely heavy grazing on certain soil types.

The Middle Sand Hills is the largest sand dune area in the Grassland Region. It has been identified by Parks Canada as a landscape of Canadian significance. There are active sand dunes and numerous rare or restricted species and a broad array of upland vegetation types. Most are in excellent condition.

Between the Milk River Canyon and Suffield areas, there is good representation of the following landscapes: outwash/sand plain, hummocky moraine, dune field, eroded plain, solonetz/blow-outs, non/weak solonetz, wet meadow, open alkali wetland, meandering river terrace, eroded bedrock (non-marine), protected slope, inactive terrace, alkali-springs, turbid stream, permanent stream, clear stream, and intermittent stream. In addition, there is minor representation of glaciolacustrine deposits, abandoned channels, and eroded bedrock (marine). Both areas have numerous rare or peripheral plant and animal species. The Milk River Canyon has one of seven igneous dikes found in the Grassland Region of Canada. It also has the greatest diversity of valley features, while the Suffield area has the best diversity of upland features. Both are extremely important sites.

The Empress region contain some active sand dunes and populations of Ord's Kangaroo Rat. These are the only active upland dunes in the Grasslands outside the Suffield Military Reserve.

Partly because of their rare associated lichen flora, other igneous intrusions that should be considered are the porphyry at McTaggart Coulee and the large intrusion at Black Butte. The latter site also has a population of Yellow-bellied Marmots (*Marmota flaviventris*).

Writing-on-Stone Provincial Park (Police Coulee) is significant in that it includes extensive areas of massive sandstone outcrops. Associated with these are numerous rare plant and animal species. Diverse shrub communities and numerous beaver ponds attract a variety of bird life. One of the few populations of Yellow-bellied Marmots in Alberta occurs here. There are also Bobcats (*Lynx rufus*), and nesting Golden Eagles and Prairie Falcons.

Dinosaur Provincial Park has been designated a World Heritage Site not only for its paleontological resources, but also for the variety and quality of badlands and riparian vegetation. The park contains one of few examples of ungrazed riparian woodland in the Grassland Region of Alberta.

Terraces found along the lower Red Deer near Bindloss are the largest in the Grassland Region of Canada and have the most extensive and diverse riparian habitats of any area in Alberta. Alkali springs found here have associated Manitoba Maple (*Acer negundo*) woodlands that are rare in Alberta. In addition, the site has active dunes, Western Hognose Snakes, and the most northern population of Ord's Kangaroo Rats.

An area south of Empress along the South Saskatchewan River has the best example of Manitoba Maple woodland with a rich associated understory including several rare plant species. However, the area has recently been heavily grazed and it is unclear what the damage and recovery possibilities are.

Duchess Springs is another special type with extensive spring woodlands on the south-facing slopes of the Red Deer River. These are the most extensive spring woodlands identified in the Grassland Region. There are outstanding specimens of Peach-leaved Willow (*Salix amygdaloides*), some of which are over 20 m in height.

Pakowki Lake-Etzikom Coulee may contain the only breeding colony of American White Pelicans (*Pelecanus erythrorhynchos*) on a natural lake in the grasslands of Alberta. The only regular occurrences of White-faced Ibis are in this area.

Extensive areas of spring seepage vegetation occur in the Douglas Creek area adjacent to the Red Deer River.

More than 2/3 of the Mixed Grassland region has been destroyed by cultivation. Some clearing continues, but it is not as pervasive a problem as in the Parkland. Principal threats to this section include lack of diverse grazing management strategies, overgrazing by cattle in sensitive wetland habitats, and conversion of native range to non-native forage species. Other threats include dam construction with its downstream effects on regeneration of productive riparian habitats.

Little has been formally protected in the Mixed Grassland. The principal areas are at Dinosaur Provincial Park and Writing-on-Stone Provincial Park. There are hopeful signs for some areas along the lower Milk River, but no formal designations have been announced.

Northern Fescue Grassland

The most significant area in the Northern Fescue Grassland is in the Little Fish Lake - Hand Hills - Wintering Hills area. In the Little Fish Lake area are some of the last large remnants of Northern Fescue Grassland and Northern Mixed Grassland. It includes good representation of ground moraine and outwash/sand plain, as well as wet meadow, shallow marsh, fresh to slightly alkali lake, eroded bedrock, and protected slope landscapes. There are also minor areas of hummocky moraine, eroded plain, alkali-springs, turbid stream, and intermittent stream. The area has been the site for past scientific research and it includes rare plants such as *Viola pedatifida* and a breeding population of Piping Plovers. Until recently, the entire area was in excellent condition. However, the lease has changed hands and management has changed with the result that large areas of Fescue Grassland are being degraded and nesting sites for Piping Plovers have been destroyed. The Hand Hills and Wintering Hills are remnant Tertiary plateaus capped with cobbles and gravel. Disjunct Cordilleran plant species have been found in both the grassland and woodland here. Examples include *Perideridia gairdneri* and *Arnica cordifolia*. Lakes in the Hanna area are extremely important for waterfowl migration.

Very little remains of the Northern Fescue Grassland because of extensive cultivation and it should be considered one of the most endangered biogeographic regions on the Canadian plains. Any remaining habitats could be considered endangered. Major threats to the remaining areas, particularly Little Fish Lake, relate to intensification of grazing or mowing and the loss of lightly grazed or ungrazed habitats.

Cypress Hills

The Cypress Hills is unlike any other area in the plains of Canada. The unglaciated plateau is capped by Tertiary gravel conglomerate beds and Quaternary loess deposits. It contains a highly disjunct area of Montane vegetation that has affinities with areas further south in the United States. The distinctive hawthorn shrubbery of the Cypress Hills is not known to occur so extensively in any other area in Canada. The Cypress Hills have been identified by Parks Canada as a landscape of outstanding Canadian significance. The flat plateau with its savanna-like pine and grassland vegetation is unique in Canada. Several species and forms are rare from an Alberta perspective or occur nowhere else in Canada (e.g., the pink-sided form (*Junco hymenalis mearnsi*) of the Dark-eyed Junco and Biscuit-root (*Lomatium cous*). Some invertebrate subspecies are endemic to the Cypress Hills. The relict flora is a remnant of post-glacial forests. Most of the Cypress Hills are contained within provincial parks. However, grazing is placing pressure on some of the more sensitive habitats.

A METHOD OF EVALUATING NATURAL HABITATS

After a review of existing evaluation systems for "protected areas" system planning, a multi-tiered approach was formulated for ecological reserves planning in Alberta (Cottonwood Consultants 1983). The approach may be useful in developing other protected area systems based on habitat.

Priorizing Biogeographic Units

Initially, priorities were established for protection of each of the biogeographic sections represented in Alberta. These were based on the following criteria: human population densities, degree of impact, degree of preservation, number of recent extinctions, rate of habitat destruction, and number and extent of non-native species. The following sections were given a very high priority: Northern Fescue Grassland and Central Parkland. High priority areas include Mixed Grassland, Foothills Grassland, and Foothills Parkland.

Evaluating Representativeness

Within each biogeographic section, criteria for evaluating representativeness were developed for areas that had already been researched and identified as having potential as protected areas. Sites were evaluated principally on the following criteria: size of the site and size of buffer area available, diversity of landscape types, diversity of vegetation communities, diversity of physiognomic types, degree of disturbance, and special features. Other factors such as cultural, geological, and land-use features, were also rated separately.

In previous studies and evaluations, an inordinate amount of emphasis was placed on modal upland sites. Those approaches failed to recognize that many confined features are representative of a biogeographic section, even though they occupy a small percentage of the total landscape. This is especially true of valley and wetland ecosystems. Many critical and threatened habitats have been identified using the evaluation criteria. Some of these areas have major concentrations of rare or threatened species, yet the evaluation criteria were essentially directed to highlight representative biophysical habitat types.

INFORMATION DEFICIENCIES

Alberta has one of the most diverse vegetative and wildlife assemblages in Canada. It is surprising that there are so many areas where research is lacking.

Therefore, only major problem areas and broad classes of deficiencies will be discussed here.

The current reviews and site studies done by Alberta Recreation and Parks and Alberta Energy and Natural Resources provide a good overview of the representative habitats and insights into some of the more critical or threatened habitats. Significant gaps in the information exist, especially on non-game species. In some cases, these information gaps could be narrowed simply by compiling all existing data.

Much is known about mesic upland 'climax' vegetation. By comparison, very little research has been conducted on wetlands, sand dune vegetation, solonetzic soils, and the plant life of fine glaciolacustrine deposits and coarse outwash. Even less research has been undertaken on habitats such as: riparian woodlands and shrublands, badlands, and springs. Information on wetlands generally applies to emergent vegetation and there are virtually no data on submergent vegetation and ephemeral wetland vegetation. The relationships of major hill systems to plant and wildlife distribution are known for only a handful of areas. Comprehensive studies of invertebrates and non-vascular plants have been carried out in very limited areas. The habitat requirements of rare, threatened, and endangered species need to be more clearly defined.

ACTION REQUIRED

There are two major areas where steps must be taken to prevent the loss of additional critical, threatened, or endangered habitats; first, further research and secondly, action on existing information. Rather than waiting for species to become endangered, we have to document extant habitats and species. A complete status report on every species and every major habitat would provide sound direction for conservation action.

Getting Priorities Straight

The major problem in failing to get action on conserving critical, threatened, or endangered habitats, is the failure of the governments and their conservation agencies to commit themselves to action and give priority to these areas. Even where critical, threatened, or endangered habitats are well-known, there have been many problems in achieving a satisfactory degree of protection for them.

Most conservation agencies are principally concerned with recreation development or a limited number of species, especially game animals. There are few agencies actively concerned with plant, invertebrate, and non-game vertebrate habitat. We spend many dollars annually to raise non-native wildlife such as Ring-necked Pheasants (*Phasianus colchicus*) but fail to provide even minimal funding or program emphasis for the habitats of most rare and threatened species.

In some cases, money and manpower are being put into rare species or habitat enhancement but some of it may be misdirected. Building unsightly nesting structures for species like the Ferruginous Hawk seems even more inappropriate when we consider that there is abundant natural nesting habitat throughout the Mixed Grassland region. This is evidenced by the many unused nest sites along coulees. The major problem is that we have not considered the impact of the loss of habitat (habitat that includes ground squirrels) on that species. If ground squirrels were considered wildlife, then more funds could be directed to re-establishing their populations and this would have benefits for a variety of species, including many rare or threatened types.

Institutional Arrangements

Positive conservation action to protect critical, threatened, or endangered habitats in the grassland and parkland regions could include:

1. a moratorium on any further cultivation or drainage of Crown lands in the white zone of Alberta.
2. rescinding of government incentives for programs like the Range Improvement Program and wetland drainage that encourage habitat loss.
3. providing tax incentives not disincentives for private landowners to maintain natural habitat.
4. a more concerted effort for broader conservation education, including regional conservation education centres.
5. long-term grazing contracts on larger holdings to give economic and ecological stability to ranch operations and contracts to specify maintenance of a variety of habitats as one of the obligations of the rancher.
6. agency and private foundation support to independent researchers and matching funding systems.

CONCLUSION

Finally, we need a broader approach to conservation than just protecting a few key sites. It is probably impossible to identify all the critical, threatened, and endangered habitats, but through insightful management, we may be able to protect many of them. Conservation attitudes need to pervade all land management agencies. In this way, habitats could also be protected through less formal mechanisms such as changes to grazing systems and stocking rates.

We must prevent the further fragmentation of extensive habitat blocks -- in essence they are probably the most valuable of our critical, threatened, and endangered habitats. We must also recognize that habitat is seldom lost through catastrophic events. It is a slow, insidious attrition that is sapping the ecological strength of these areas and we must do everything within our power to stop the trend.

As Aldo Leopold remarked, "The first rule of intelligent tinkering is to save all the pieces." The grasslands and parklands have already lost more pieces than they can afford. With every parcel of land that is lost, there is another option closed. What is needed more than anything else is strong political will and agency commitment. Without that, the situation will only get worse. All the research papers, symposia, and human effort will not bring back these habitats once they are gone.

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THE CONSERVATION OF ENDANGERED SPECIES AND THEIR HABITATS - A LONG-TERM ECOSYSTEM PERSPECTIVE

C.L. Caza

In 1985, Wildlife Habitat Canada (WHC) undertook a review of the status of habitat and habitat programs for the conservation of endangered species that have been judged by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to be at greatest risk in this country. Habitat information in the COSEWIC status reports was updated by contacting the authors of the report, knowledgeable individuals identified by the authors, and federal/provincial agencies with jurisdictional responsibilities for the endangered species. Updating information involved a number of activities including the following:

- determining whether any follow-up actions had been taken on the conservation recommendations presented in the original status reports;
- determining whether any new or additional management/conservation information was available for each species;
- updating the assessment of species status or the identification of critical habitat on the basis of new population distribution data;
- determining the present status (protected/unprotected) of critical habitats for each species.

Critical habitat was defined for the purposes of this review as habitat that is essential to the continued existence of a species in Canada either because it is the only (or one of only a few) Canadian localities and/or it supports the only (or one of only a few) known viable populations of the species. The purpose of the review was to make recommendations to WHC regarding its participation in the initiation, development, and implementation of projects for the conservation of habitat for endangered species in Canada. This paper will present some of the findings of this review (Caza 1985) and some of the questions that were raised about the current approach to wildlife conservation, as this information was presented to WHC. The reviewer's perspective is that of an ecologist interested in the long-term conservation of natural systems and such a perspective is maintained in this paper.

A major finding of the review was that there is almost a complete absence of habitat components within active or proposed management plans for endangered species in Canada. In those few cases where critical habitat is currently protected for a species within a park or reserve, there is no ongoing assessment of the status of the habitat (that is, whether significant changes in quality or quantity of critical habitat may be taking place). There appears to be, at the same time, a reluctance to enter into active management of habitats where needed, because of concerns over the long-term nature of these commitments.

There has been relatively little research done on endangered species *habitat* management, in comparison with the information available on species *population* management. Critical habitat, although recognized as an important concept in management, has yet to be defined clearly, in an operational sense, for Canadian species. There is a tendency to want to approach habitat management as something distinct from species management, although the former has absolutely no meaning without reference to a specific organism or group of organisms. Both approaches, at their current stage of development, appear insufficient to ensure long-term conservation of wildlife. Most activities for the conservation of endangered species are presently focused on the individuals of a single species, and frequently on just a single population of a species, rather than on the total environment in which the species must (and is failing to) survive. The activities are frequently scattered and isolated events, and are not integrated into a comprehensive conservation strategy. The results to date of management efforts for endangered species raise the question of whether such an approach can possibly hope to achieve its objective - the long-term preservation of wildlife in Canada. Among the results that suggest there may be deficiencies with this approach are the following:

- the apparent failure of east coast populations of the Right Whale (*Balaena glacialis*) to recover in numbers despite protection from hunting since the late 1930s;

- the recognition of the need for active habitat management to counter natural successional changes to prevent the disappearance of protected populations of the endangered species, Prickly Pear Cactus (*Opuntia humifusa*) in southern Ontario;

- the destruction of critical nesting habitat for the Piping Plover (*Charadrius melodus*) on prairie lakeshores, with a consequent decline in numbers, as a result of activities designed to enhance waterfowl nesting habitat; and

- the potentially significant but undetermined impact of habitat alienation, winter prey availability, and presence of natural and unnatural predators on the success of reintroduction programs for extirpated prairie species such as the Swift Fox (*Vulpes velox*).

When one steps back to examine the problem of the decline of wildlife in Canada, one sees that there are a number of biophysical regions in the country, containing a high concentration of endangered species. Some of these areas include the hot springs of western Canada, the Mixed Prairie, the Carolinian zone of southern Ontario, and the river valleys of the St. Lawrence region and the east coast. Is the problem then, simply one of declining wildlife populations, or are the increasing numbers of endangered species more significant as indicators of threatened biophysical systems? If so, perhaps the solution should focus on the conservation of these systems.

The information collected during the review suggested a need for a change, a broadening of scope, from a single-species approach to a (biophysical) systems approach to the conservation of wildlife habitat. This implies not only the preservation of the components of the ecosystem (such as soil, water, plants, and animals), but also of the system's processes (such as those associated with energy- and materials-flow). A starting point might be the identification of these endangered systems, and the factors threatening them. The kinds of ecosystems that appear to be at greatest risk are those with low resilience to impacts, those that experience intensive use and those that persist under (and are dependent on) unique environmental conditions.

What implications would a system approach have for wildlife management? At the least, a system (or perhaps, ecosystem) approach to wildlife conservation would probably require considerably larger efforts in cooperative management among governments and non-government organizations than are currently practiced. But more appropriate (and radical) would be a reorganization of management responsibilities that would enable managers to respond to the system's requirements, rather than approaching conservation on a resource-by-resource, or species-by-species level.

The long-term preservation of wildlife habitat requires a commitment by government that must be reflected in policy and legislation. Perhaps this is one goal conservationists should be working towards. Habitat loss and degradation due to land-use conflicts, for example, is an increasing problem, a major threat to the conservation of ecosystems. These conflicts must be resolved and wildlife must be recognized as a resource and its conservation as an essential component of resource management planning. Otherwise the best that can be achieved, at the level of a regional conservation strategy, will be a piecemeal collection of areas more representative of lands that conservationists were able to preserve from other conflicting uses, rather than areas capable of sustaining the system.

In summary, the tendency in Canada has been, and continues to be, a focus on the conservation of single species in danger of extirpation or extinction. However, there are indications that such an approach to wildlife conservation will not be adequate in the long-term. Conservation of critical habitat is now recognized as important in the management of endangered species, though to date few activities have been directed towards this objective. However, a single species and its habitat are but components of complex biophysical systems that include both component parts and the physical, chemical, and biological processes that link them. It now seems possible that some of these systems are collapsing under the impact of human activities, and one of the most striking indicators of this disintegration is the decline and loss of wildlife habitat in Canada. These systems need to be identified, along with the factors that threaten their existence, and long-term strategies for conservation need to be developed through resource management and land-use planning.

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PROVINCIAL PERSPECTIVES ON HABITAT - MANITOBA

Bill Koonz

PROVINCIAL PARKS

Manitoba acquired control of its natural resources from the Federal Government in 1930. Manitoba's first four parks and 40 recreational areas were established in 1962, but it was not until 1972 that the Provincial Parks Land Act became law. The act states a government commitment to provide healthful and enriching areas in perpetuity for the enjoyment and use of Manitobans. The Act recognizes responsibility for the conservation of flora and fauna and the preservation of specific areas. The act supercedes Manitoba's Wildlife Act and Forestry Act in Provincial Parks.

The Provincial Parks mandate is to establish, develop, and maintain a system of Provincial Park Lands. These lands are dedicated to the people of Manitoba and shall be developed and maintained for the conservation and management of the flora and fauna therein and for the enjoyment of outdoor recreation therein.

Twelve types of parks are specified in the Provincial Parks Land Policy legislation passed in 1979. This legislation states that park lands will respond first to provincial interests for rare, scarce, or special forms of flora and fauna. Today, there are 165 Provincial Parks in six categories. These include: 12 Natural Parks, 44 Recreational Parks, 102 Highway Rest Stops, 2 Heritage Parks, 4 special use parks, and one Provincial Park Reserve. While a number of rare and endangered species live in Provincial Parks, over 10 parks have been designed to protect certain species and habitats. These include: forest communities, prairie, lowland, escarpment, rare orchids, bat hibernaculum, a number of mammal species, colonial waterbirds, and some special landform features.

Resource inventory and analysis are ongoing requirements for the planning and development of all Provincial Park Lands. Park management plans must be re-evaluated and revised every five years. Large scale park developments are subject to an outside environmental impact assessment and review.

WILDLIFE MANAGEMENT AREAS

Manitoba Wildlife Management Areas (WMA's) are tracts of Crown Land set aside to provide Manitobans with a diversity of habitats to enjoy now and in the future. They are established in consultation with local government and other resource users and can be managed independently regarding hunting and trapping regulations. Therefore, they may also be managed to enhance wildlife use and productivity.

Manitoba's 59 WMA's encompass 3 million ha (30,000 km^2). Size and location may vary considerably with the largest being in the north and the smallest being in the southwest.

The establishment of WMA's is vital to maintain viable wildlife habitats. Agricultural expansion has seriously impacted and continues to erode the province's wildlife habitat base, particularly in southwestern Manitoba. Manitoba's wildlife habitat needs cannot be met in non-agricultural regions. WMA's as small as 1/4 section act as reservoirs for endangered species and habitats, including native grasslands. These islands represent only a token of the diversity and natural abundance once thriving there. In some areas, habitats are being reclaimed. However, reclamation is not always feasible and is usually expensive. Oak Hammock Marsh just north of Winnipeg, for example, has taken 15 years and over 3 million dollars to develop.

Wildlife features in WMA's include, the Hognose Snake (*Heterodon nasicus*), snake hibernacula, Prairie Skink (*Eumeces septentrionalis*), Plains Spadefoot (*Scaphiopus bombifrons*), Arctic Fox (*Aloplex lagopus*), Ross' Gull (*Rhodostethia rosea*), Coastal Caribou (*Rangifer tarandus caribou*), and Polar Bear (*Ursus maritimus*) denning areas. The establishment of WMA's is not a short term concept. WMA's become more significant annually as public demands on undeveloped areas increase.

ECOLOGICAL RESERVES PROGRAM

The Ecological Reserves Program was established in 1973 to protect ecologically significant areas identified during the United Nations International Biophysical Program of the late 1960s and early 1970s. Guidance comes from the Ecological Reserves Advisory Committee composed of respected Manitoba ecologists. The overall mandate for the program in Manitoba was established with passage of the Ecological Reserves Act in 1981.

The goal of the program is to protect examples of all major natural plant communities in all major vegetative zones. To date, six Ecological Reserves have been established with two more expected to receive final approval in 1986. The advisory committee is anxious to locate and establish reserves in prairie sites and other representative communities in southern Manitoba.

WILDLIFE HABITAT CANADA APPROVED PROJECTS FOR MANITOBA

Habitat Enhancement Land Use Program (H.E.L.P.)

This program was developed in response to a drastic decline in duck populations, an increase in concern about soil degradation, and a significant decrease in prairie wetland habitat. The Prairie pothole district of Manitoba has lost 70% of its wetland to agriculture since 1928.

Objectives include:

1. To HELP stem the annual loss of 130 km^2 of Manitoba wetlands.

2. To HELP foster cooperation between wildlife and agriculture by promoting sound land-use practises for soil, water, and wildlife conservation. Landowners attitude surveys in the area showed that financial incentives for habitat

conservation and innovative new farming techniques would be the most effective way of accomplishing these objectives.

The program involved a wide range of voluntary landowner options including leasing blocks of wetlands and uplands, rotational grazing, zero tillage, and winter wheat incentives plus soil erosion and soil salinity prevention measures. The aim is to set aside 1365 ha per year plus influence land-use decisions on an additional 1365 ha per year. A five year pilot project beginning June 1986 is located in the Rural Municipality of Shoal Lake, 80 km northwest of Brandon, in the heart of Manitoba's pothole district. Funding comes from Wildlife Habitat Canada, Ducks Unlimited, and the Province of Manitoba.

The Kissick Project

The Kissick Project is 73 ha of prairie marshland and Mixed-grass Prairie in southwestern Manitoba. It was purchased from the landowner to ensure its permanent protection. The site is a refuge for many native plant and animal species. Funding comes from Wildlife Habitat Canada, the Province of Manitoba, Ducks Unlimited, Manitoba Wildlife Federation, and Manitoba Naturalists Society.

Akudik Marsh

Akudik Marsh is a Ross' Gull nesting area at Churchill. It is a tundra marsh with unstable water levels that is in danger of townsite development. It is the only known nesting area of Ross' Gull on mainland North America. The project has cooperative funding from Wildlife Habitat Canada, Ducks Unlimited, and the Province of Manitoba.

Pinkerton Lakes

Pinkerton Lakes is a wetland complex in southwestern Manitoba. It is an important waterfowl area with landowner problems. The land was purchased from landowners with funds from Wildlife Habitat Canada, Ducks Unlimited, and the Manitoba Wildlife Federation.

MANITOBA HERITAGE MARSH PROGRAM

The Manitoba government entered into the 10 year Heritage Marsh agreement in April of 1985 in conjunction with Ducks Unlimited Canada, the Manitoba Naturalists' Society, and the Manitoba Wildlife Federation. The intent of the agreement is to protect and manage unique wetlands in the province. Five provincial marshes were declared Heritage Marshes: the Summerberry Marsh Complex, Oak Hammock Marsh, Grants Lake, Proven Lake, and the Saskram Wildlife Management Area west of The Pas. This initial designation of Heritage Marshes encompassed approximately 132,000 ha of prime marshland habitat. The agreement also specifies ten "candidate" marshes that will be considered for future heritage marsh status.

The Heritage Marsh Agreement will add stability to the long term protection of critical marshland habitats that are under ongoing pressures from competing land uses, principally agriculture. Manitoba's main contribution is the dedication of Crown land adjacent to any marsh designated as a Heritage marsh. The agreement recognizes that these prime marshland habitats serve a multitude of functions and are an asset to habitat maintenance.

MANITOBA HABITAT HERITAGE PROGRAM

There are numerous initiatives under the auspices of the Department of Natural Resources, Wildlife Branch that allow control of land use and protection of critical, unique, or endangered wildlife habitat within the province. The Manitoba Habitat Heritage Program, introduced during the 1984/85 fiscal year, is aimed at helping to reduce the loss and deterioration of fish and wildlife habitat in southern Manitoba. This program is the first tool available to wildlife managers in Manitoba to affect land use on private land. Projects that can be undertaken include acquisition, habitat protection agreements, and habitat enhancement or restoration.

It is anticipated that the Manitoba Habitat Heritage Act will be proclaimed by February 1986. The Act establishes the Manitoba Habitat Heritage Corporation which will have the capability to acquire land or to enter into agreements with private land owners to protect vulnerable, unique, or threatened fish and wildlife habitat. The Manitoba Habitat Heritage Corporation will be a non-profit entity capable of receiving income tax deductible donations from private organizations or individuals. The Province of Manitoba has contributed $250,000 for the 1985/86 program and a like amount of funding will be allocated for the 1986/87 fiscal year. It is anticipated that this provincial core fund will provide a nucleus for protecting key parcels of habitat in various geographical sectors of the province.

PRIVATE VERSUS PUBLIC FUNDING

Private money for research and habitat purchase has increased greatly in Manitoba recently. Up until about 1980 most private money came from university grants. These were generally short term project by project payments. Recently, however, studies outside the university have been funded to obtain information on a variety of species including: the Hognose Snake, Prairie Skink, Burrowing Owl (*Athene cunicularia*), Ferruginous Hawk (*Buteo regalis*), Red-necked Grebe (*Podiceps grisegena*), Western Grebe (*Aechmophorus occidentalis*), Baird's Sparrow (*Ammodramus bairdii*), Great Gray Owl (*Strix nebulosa*), Ross's Gull, Piping Plover (*Charadrius melodus*), American White Pelican (*Pelecanus erythrorhynchos*), Bald Eagle (*Haliaeetus leucocephalus*), Swift Fox (*Vulpes velox*), Wood Bison (*Bison bison athabascae*), Polar Bear, Beluga Whale (*Delphinapterus leucas*), and others. Habitat has been purchased to protect marshes and orchids.

Private monies have allowed considerable information to be gathered regarding various species most of which were threatened, endangered, or unclassified. Much needed information has been gathered that would not have been otherwise possible. These species are now better understood and can be managed with more confidence.

On the negative side, private monies often are short-term and do not permit long-term monitoring or management. The combined efforts of several private groups to secure and study an area and then turn over management to a province can overcome that problem. To secure and restore endangered habitats will require inputs from as many sources as possible. The problem is to insure that the resource is the most important consideration in any project.

PROBLEMS AND DEFICIENCIES

The major problem regarding the protection of Manitoba's rare and endangered habitats is that there has been little effort to inventory, evaluate, or monitor those habitats. The value, concern, or need for endangered habitats has yet to be recognized by politicans, the general public, or even within the natural resource community (we have met the enemy and it is us). Habitat remnants are recognized for historical or academic value but their preservation has not been considered vital or necessary to human society. Where habitat management or designation has been established, groups or individuals responsible for those areas often lack the skills or the mandate to properly develop a management strategy. Improvement will come when an effort is made to secure endangered habitats, and then hire qualified specialists responsible for the management of those areas.

THE FUTURE

More cooperation is expected between private and public organizations in order to purchase, inventory, reclaim, and manage our dwindling habitats, especially those in agricultural areas. A change in the grain quota system and in land taxing should assist in getting local landowner support.

In future, appreciation on the part of the public will likely increase. The identification of specific habitats, a realization of their values, and more intense management will be the trend. The public will not likely get the hands-on knowledge we currently enjoy as human access to specific areas will be carefully controlled.

On the negative side, habitats will be lost, degraded, and/or lose their integrity before enough interest is generated to protect, restore, and manage them.

HABITAT MANAGEMENT PROGRAMS IN SASKATCHEWAN

Adam P. Schmidt

Many land use changes have occurred on the prairies since settlement. In southern Saskatchewan more than 70% of the native habitat has been destroyed or modified in less than 100 years. The loss ranges from 50 to 70% in the grassland areas of southwestern Saskatchewan to 75% in the aspen parkland areas.

All indigenous wildlife species are dependent on native habitat. Continued loss of native grassland, wetlands, and aspen parkland will result in declines in wildlife populations to the point where some species may be extirpated or game species will no longer support a harvest at current levels.

UPLAND HABITAT PROGRAMS

Concerns about habitat loss and the lack of detailed information on the amount of habitat remaining resulted in the initiation in 1975 of the Terrestrial Wildlife Habitat Inventory. Objectives of the inventory were to determine how much natural habitat remained in the agricultural portion of Saskatchewan, distribution of the habitat, who owned or controlled the land, and which habitat was critical for survival of existing wildlife populations. The information was mapped on National Topographic System 1:250,000 map sheets and a report was prepared summarizing the information for each map area. Primary emphasis was on game species but critical habitat was also mapped for non-game species including Sage Grouse (*Centrocercus urophasianus*), Black-tailed Prairie Dog (*Cynomys ludovicianus*), Prairie Falcon (*Falco mexicanus*), Turkey Vulture (*Cathartes aura*), Golden Eagle (*Aquila chrysaetos*), Ferruginous Hawk (*Buteo regalis*), Trumpeter Swan (*Cygnus buccinator*), White Pelican (*Pelecanus erythrorhynchos*), Double-crested Cormorant (*Phalacrocorax auritus*), Great Blue Heron (*Ardea herodias*), Snapping Turtle (*Chelydra serpentina*), and Painted Turtle (*Chrysemys picta*).

A major deficiency of the Terrestrial Wildlife Habitat Inventory is that the reconnaissance nature of the inventory and limited time for field work resulted in primary emphasis being placed on existing information. As a result, the inventory cannot be considered to be complete for non-game species.

One finding of the inventory was that approximately half of the critical wildlife habitat was on crown lands. Thirty-three percent was on lands administered by the Saskatchewan Department of Agriculture, 10 percent was controlled by the Prairie Farm Rehabilitation Administration, and the remainder by other government departments.

In 1975, the Saskatchewan Department of Agriculture began the Grazing Lease Improvement Program (G.L.I.P.) which fostered subsidized clearing and breaking. Although the Wildlife Branch reviewed development applications and made recommendations to reduce the impact of development on wildlife habitat, these recommendations were not always followed. As a result, the habitat base for wildlife continued to be eroded. The next major threat to wildlife habitat was a decision in 1981 to allow the sale of grazing and haying leases. Protests by wildlife and natural history groups led to a policy whereby lands that contained critical wildlife habitat were not eligible for sale. However, concerns were expressed that because the policy could be changed in the future, the only way to preserve the habitat was to give it legal protection. As a result, the Critical Wildlife Habitat Protection Act was passed by the Saskatchewan Legislature in June 1984. The lands are still administered by the Department of Agriculture but the legislation prohibits the sale or alteration of these lands. The lessees may continue to use the lease as in the past. Minor alterations such as clearing for fencelines and development of watering areas are permitted. Other alterations require the review and approval of the Wildlife Branch. The maximum penality for violation of the Act is $2,000.00.

Eighty-seven thousand acres were initially protected by the Act. Since that time, additional lands have been added. The total now stands at 1.2 million acres and additional areas are being considered for protection. Approximately 150,000 acres were included because they were considered to be critical habitat for rare and endangered species.

It would have been impossible to designate lands in the Critical Wildlife Habitat Protection Act without the use of the information supplied by the Terrestrial Wildlife Habitat Inventory. Nevertheless, short-comings of the inventory regarding rare and endangered species also apply to the Critical Wildlife Habitat Protection Act; not all habitat critical for rare and endangered species has been identified. It is important to note that habitat which has been identified as critical for a game species supports many non-game species and may also be critical for rare or endangered species. When work has been completed on the Critical Wildlife Habitat Protection Act and habitat on crown land is secure, the next challenge will be to develop programs for preserving habitat on privately owned lands.

The only habitat program presently directed at preserving habitat on privately owned land is the Wildlife Development Fund. The primary strategy to date has been to purchase habitat, but in the past some lands have been leased. The program is funded by revenue from hunting licence sales. Initially the funding was $366,000 per year, but in the last year this has been increased to $650,000 per year. Since 1972, over 73,000 acres of wildlife habitat have been purchased. Most of these lands are important habitat for game species and are primarily distributed throughout the aspen parkland and forest fringe.

WETLAND HABITAT PROGRAMS

Wetlands are an important component of prairie habitat. The Canadian prairies are recognized as the major production area for waterfowl in North America. In the past, preservation or improvement of major wetlands was often unsuccessful because of problems related to land control, retention of adequate water levels, or fears of waterfowl depredation. Often one government department would be promoting drainage while another would be promoting preservation. In 1981, the Heritage Marsh Agreement was signed by the Saskatchewan Government, Ducks Unlimited, Saskatchewan Wildlife Federation, Saskatchewan Natural History Society, and The Nature Conservancy of Canada. The signatory parties agreed to cooperate on the preservation and enhancement of five major wetlands. Since that time, agreements have been signed for three more areas and negotiations are underway to include another seven. To date, three Heritage Marshes that include over 16,000 acres have been completed.

Although the Heritage Marsh Program is preserving habitat on large marshes, the major waterfowl production areas are the small prairie potholes. In 1984, funds were obtained from Habitat Canada for a pilot project to determine what incentives would be required by landowners to preserve small wetlands. The first phase of the project involves interviewing all of the landowners in one Rural Municipality in order to identify which incentives are preferred. This phase of the project has just been completed. Once analysis of the interviews is complete the second phase of the project will be to apply for additional funding to implement a project to preserve small wetlands and associated upland habitat.

In summary, the majority of the habitat management programs in Saskatchewan have been directed toward game species. Although the Terrestrial Wildlife Habitat Inventory took nearly 10 years to complete, it provided a solid basis on which to preserve habitat on crown lands as opportunities arose. A significant amount of habitat for rare and endangered species was identified by the habitat inventory and has been preserved by the Critical Wildlife Habitat Protection Act. The habitat inventory will also be a major reference for upland habitat preservation programs on privately-owned lands.

Although this workshop is centered on endangered species, we should not lose sight of the need for large-scale habitat protection programs. Species that are not in danger now could be threatened in the future if the loss of native habitat continues.

HABITAT PROTECTION INITIATIVES IN SASKATCHEWAN:

SASKATCHEWAN WILDLIFE FEDERATION PERSPECTIVES

Lorne Scott

Historically, the rich grasslands, abundant wetlands, and diverse aspen parklands made southern Saskatchewan one of the most productive ecosystems in North America. Today, southern Saskatchewan contains one of the most modified landscapes on the continent. Approximately 75% of the natural vegetation cover has been destroyed. In some areas, such as the Regina Plains, over 99% of the native habitat has disappeared. Nearly half of our original prairie wetlands have been lost.

The loss of natural habitat in southern Saskatchewan is largely responsible for drastic declines in many of our native flora and fauna species. For example, our spring duck population has dropped from 20 million birds in the mid 1950's to 5 million in 1985. In 1960, White-tailed Deer (*Odocoileus virginianus*) numbered 500,000; today we have 250,000 in the province. Local botanists list 18% of our native plants as rare, and disappearing rapidly from much of their former range. In the five year period from 1976 to 1981, Saskatchewan lost 1,947,000 acres of native habitat. This works out to a loss of 1,066 acres per day or 44 acres per hour, day and night.

In light of the above information, many of us view most of the remaining natural habitat in southern Saskatchewan as critical for the well-being of our native flora and fauna. The dramatic loss of wildlife habitat in southern Saskatchewan spurred conservation organizations to initiate various programs to preserve remnants of a once great natural heritage.

ORGANIZATION ACTIVITIES AND PROGRAMS CURRENTLY IN EXISTENCE

Ducks Unlimited was one of the first non-government organizations to recognize the plight of wildlife habitat on the prairies. In 1938, Ducks Unlimited initiated its first wetland preservation programs in Saskatchewan. Today, Ducks Unlimited Canada has secured 650 wetland projects in the province consisting of some 645,000 acres of wetland and associated upland habitats. Ducks Unlimited Canada has budgeted eight million dollars in 1986 to develop another 60 projects containing some 15,000 acres of prime waterfowl habitat in Saskatchewan.

The Saskatchewan Wildlife Federation with a membership of 34,000 in 125 branches is probably the largest sportsman - conservation organization per capita in North America. The loss of native habitat became a concern of the Federation in the late 1960's. As a result of continuous lobbying by the Saskatchewan Wildlife Federation, the Saskatchewan Government established the Wildlife Development Fund in 1972. An impost on big game licenses resulted in a portion of the sportsmen's license fee going into the fund each year. In 1985, $650,000 was allotted to the Wildlife Development Fund. Since its inception in 1972, 75,000 acres of prime wildlife habitat have been secured throughout the province.

With 85% of the land in southern Saskatchewan privately owned, it was evident that we needed to encourage the retention of natural habitat on private land. In

1974, the Saskatchewan Wildlife Federation launched the "Acres for Wildlife" program. Under the Acres for Wildlife program, if a landowner agrees not to clear, break, drain, burn, graze, or otherwise destroy an acre or more of habitat on his land, the Federation will acknowledge his commitment to the wildlife resource by providing a durable and attractive gate sign complete with the owner's name. Corner markers for identifying the landowner's property and a certificate suitable for framing are also provided free of charge. The landowner has the right to opt out of the program at any time and he has full control of public access including hunting privileges. During the past 12 years, 105,000 acres have been signed up under this voluntary program. Once in the program, very few landowners have returned the signs and cancelled their agreement.

In 1978, the Saskatchewan Wildlife Federation established the Habitat Trust Fund for the acquisition of critical wildlife habitat. Habitat Trust is funded by donations from individuals, Federation Branches, and organizations. Over the years, nine parcels of land containing 1,100 acres of excellent wildlife habitat have been donated by dedicated and concerned individuals in the Province. Habitat Trust now holds title to 16,400 acres of prime natural habitat.

In 1982, in response to landowners who grazed livestock on their land and wanted to participate in the Acres for Wildlife program, the Saskatchewan Wildlife Federation designed the "Dual Habitat" program. The Dual Habitat program operates on the same basis as the Acres for Wildlife but does permit grazing by domestic livestock. To date some 27,000 acres have been committed to the Dual Habitat Program by landowners in Saskatchewan.

Some of the best remaining habitat for native plants and animals exists along the many thousands of miles of rural road allowances. This is especially true for undeveloped road allowances. Unfortunately, many portions of public road allowances have been cleared and broken and are being farmed. In an effort to encourage the retention of undeveloped road allowances for the benefit of our native flora and fauna, the Federation implemented the Road Allowance Preservation Program in cooperation with the Rural Municipalities. Rural Municipality Councils are approached and asked to identify undeveloped road allowances they do not plan to develop. With the cooperation of Councils, the Federation will erect a sign at each end of the road. The sign reads, "This Road Allowance Preserved For Wildlife." The local Rural Municipality is identified on the sign, showing their endorsement of the program. This program has received good support in some municipalities and has been totally rejected in others.

In southwest Saskatchewan, some of the best wildlife cover is found around unoccupied farmsteads. The Federation launched a program to encourage landowners to retain the habitat around the empty farmsteads. Our first attempts were too elaborate and never got off the ground. However, a scaled down version titled "Heritage Farmsteads" was initiated in 1985 in conjunction with the Wildlife Branch of Saskatchewan Parks and Renewable Resources. The Heritage Farmstead signs identify the current landowner and the pioneer who settled the land and planted the trees and shrubs around the location. Like the Acres for Wildlife Program, this is a voluntary program with no financial commitments to the landowners.

The Saskatchewan Natural History Society has been a strong voice for conservation in Saskatchewan since 1942, when naturalists first organized in the

Province. Despite a relatively small membership of 2,000 and limited funds, the Society was able to obtain a quarter section lease to protect a portion of a Black-tailed Prairie Dog (*Cynomys ludovicianus*) colony in southwest Saskatchewan. The Saskatchewan Natural History Society has also been instrumental in creating two additional small wildlife sanctuaries.

The Saskatchewan Natural History Society is currently engaged in a program to identify habitat utilized by rare and endangered species including Whooping Crane (*Grus americana*), Burrowing Owl (*Athene cunicularia*), Piping Plover (*Charadrius melodus*), Black-tailed Prairie Dog, Prairie Rattlesnake (*Crotalus viridis*), and some plants. Following the study, the objective is to acquire protection of some of the most important and vulnerable habitat for these species.

Until a few years ago, Saskatchewan's three prominent conservation organizations (Saskatchewan Wildlife Federation, Ducks Unlimited Canada, and the Saskatchewan Natural History Society) worked rather independently of one another. There was always enough game to hunt, wetlands to manage and develop, and wildlife to enjoy and study. In the late 1970's it became evident that there was not enough game for the sportsmen, more wetlands were being lost than preserved, and naturalists' familiar haunts were disappearing at an ever-increasing rate. The three interest groups found themselves backed into the same corner facing the same problem; the loss of natural habitat. They began seeking one another's support and joining forces on conservation issues. It was no longer important whether a duck was shot by a Saskatchewan sportsman, or a hunter in the States, or was left for someone to photograph. It was becoming increasingly clear that without habitat, all our interests would be lost.

In the summer of 1980, the Saskatchewan Government saw fit to impose a freeze on wetland preservation and development programs. The reason for the freeze was over the waterfowl crop depredation program and the inability of the Provincial and Federal Governments to arrive at a satisfactory compensation program for the landowners affected. This highly contentious action solidified the union among the three conservation organizations. A long and bitter battle was launched against the Saskatchewan Government, who had a record of doing little or nothing for wetland preservation in Saskatchewan.

After considerable effort on the part of Ducks Unlimited Canada, a proposal was presented to the Saskatchewan Government whereby Ducks Unlimited, Saskatchewan Wildlife Federation, Saskatchewan Natural History Society, and the Provincial Government would enter into a major wetland preservation program for Saskatchewan. On November 5, 1981, representatives from the four participating parties announced Saskatchewan's Heritage Marsh Program.

Under the Heritage Marsh Program, the Provincial Government contributes all crown land involved and operates waterfowl lure crop and bait stations. Ducks Unlimited Canada provides lure crop land when required, carries out construction and maintenance activities on the projects, and shares in the cost of purchasing private land within the project. The Saskatchewan Wildlife Federation and Saskatchewan Natural History Society also share in the cost of acquiring private land, with the Wildlife Federation doing the land purchasing and holding title of the land in trust.

In addition to preserving several thousand acres of important wetlands, the

Heritage Marsh Program has other valuable and far reaching benefits. The Heritage Marsh Program has set a precedent in pulling conservation groups together towards a common goal. The program focuses much needed public attention on our valuable wetlands. These marshes encompass the interests of agriculture, sportsmen, naturalists, educators, conservationists, and others. In the interests of local landowners, the Heritage Marshes contain lure crops and bait stations and stablized water levels. The marshes provide hunting opportunities for local sportsmen and breeding grounds for waterfowl wintering in the United States. Naturalists can visit the marshes to study and enjoy the many marsh creatures. A great challenge lies with our educators, to use the marshes as outdoor classrooms to convey the importance of our wetlands and emphasize the necessity of preserving our natural environment. The conservationists are satisfied to know that another small portion of our natural heritage will be preserved for wildlife and future generations.

Since its inception in 1981, the success of the Heritage Marsh Program has surpassed all expectations. The first Heritage Marsh, Ponass Lake, was dedicated in October 1983. This 7,400 acre wetland complex, threatened with drainage for decades, is now secure. Local landowners are satisfied with the project as their concerns about waterfowl crop depredation and flooded hay lands have been addressed. A second Heritage Marsh, Ranch Lake, consisting of 2,200 acres was secured in 1984. In the fall of 1985 several hundred people from throughout North America convened to celebrate the preservation of Foam Lake, a 6,900 acre project, and one of the most productive yet threatened wetlands in the province. Work is being carried out on several other major wetlands under the Heritage Marsh Program.

On June 1, 1984, the Saskatchewan Government proclaimed the Critical Wildlife Habitat Protection Act, without a doubt the most significant wildlife habitat conservation program in the history of the province. The Act is designed to protect 3.5 million acres of crown land from sale or harmful alterations. The 3.5 million acres are considered by the Provincial Wildlife Branch to be some of the best and most essential remaining habitat throughout the Province. Saskatchewan's Critical Wildlife Habitat Protection Act is a direct result of a long and difficult three-year lobby by the Saskatchewan Wildlife Federation and the Saskatchewan Natural History Society. To date only 1.3 million acres have actually been placed in the Act. Lobby efforts will not cease until all 3.5 million acres identified by the staff of the Wildlife Branch are secured.

PROBLEMS AND DEFICIENCIES OF CURRENT ACTIVITIES AND PROGRAMS

The biggest problem facing Saskatchewan conservationists regarding wildlife habitat is that 85% of the land south of the forest fringe is privately owned. The fate of much of our wildlife habitat rests largely in the hands of private individuals.

The various voluntary programs with no financial benefits such as Acres for Wildlife may sound impressive but the achievements can soon disappear in time when land changes hands and if the demand and value of land and agricultural products move upwards. In many cases, the voluntary habitat retention programs only temporarily protect habitat until a more permanent and beneficial program is in place for the private landowner.

Although outright purchase is the most secure method of protecting critical wildlife habitat, it is also the most costly. It is unrealistic to think that we will ever purchase all the habitat required to preserve our native flora and fauna. The best we can hope to accomplish is the purchase of prime representative samples of our natural heritage and hope that through education and appreciation of our wildlife resource, private landowners will be encouraged to preserve some habitat on their land.

We cannot totally blame the private landowner for the destruction of wildlife habitat. Unfortunately, since the first settlers arrived some 100 years ago, government incentive programs have promoted and encouraged the destruction of native habitat. The grain quota marketing system is based on cultivated acres, not total farm size. Thus in order to sell more grain, landowners are encouraged to clear, break, and drain more land in order to secure more acres. Often these additional acres include potholes and land prone to erosion. For the health of the land and wildlife resource, these acres might better be left in native habitat.

Government promoted and subsidized drainage and land clearing programs have resulted in substantial losses of wildlife habitat on both private and crown land. Unfortunately, government incentives that encourage habitat destruction are still in place.

WHAT NEEDS TO BE DONE AND WHO SHOULD DO IT

First and foremost, wildlife conservation organizations must maintain and expand their habitat preservation programs. This will not only protect valuable habitat but help make the public and government aware of the importance of habitat. We must continue to devise new habitat retention programs. In Saskatchewan we must ensure that the Critical Wildlife Habitat Protection Act secures all critical habitat identified on crown land.

Immediate efforts should be made to identify and secure rare and endangered species habitat, including remnant Burrowing Owl colonies, Piping Plover nesting habitat, Prairie Rattle Snake hibernacula, and unique areas containing threatened plant species. If these critical areas are lost it will have a profound impact on the species.

Saskatchewan is in dire need of a government department responsible for our native flora. No government jurisdiction has the authority to protect rare and endangered native plants in the province.

A number of years ago, Saskatchewan was in the process of developing a Land Use Policy for the Province. The task was never completed. At one time I thought a comprehensive Land Use Policy would be great, as we could get our important wildlife areas protected once and for all. Since then I have considered that the powerful agriculture lobby may claim virtually all of the land for agriculture development. Let's face it, in the vast majority of cases in a one on one encounter, wildlife interests will lose to agriculture proponents. Indeed a Land Use Policy in southern Saskatchewan could have a devastating effect on our natural heritage.

Stronger and enforced legislation is required regarding some laws designed to protect habitat such as Saskatchewan's Drainage Control Act. For the most part, the Act is nothing more than a piece of paper to be ignored.

The recently announced North American Waterfowl Management Plan proposes paying landowners for preserving wetlands on their land. This program could do much to protect wetland habitat in the prairie provinces.

The most urgent need on the part of both Provincial and Federal Governments is the removal of incentive programs that promote and encourage the destruction of natural habitat on private land. This would include such things as a revision of the grain quota marketing system and the removal of all government sponsored and supported drainage and land clearing programs on both private and crown land.

Furthermore, governments, with the support of conservation organizations and agriculture groups, should seek legislation similar to the 1985 United States Farm Bill. Included in this legislation are three conservation provisions: "sodbuster", "swampbuster", and conservation reserve. Under the sodbuster provision, farmers who plow and cultivate highly erodible soils that have not been plowed in the last five years will be denied all Federal benefits including crop insurance, subsidies, and loans. The similar swampbuster provision also denies Federal benefits to farmers who plow, fill, drain, or otherwise convert valuable wetlands to any type of cropland. Under the conservation reserve provision, farmers will contract with the U.S. Department of Agriculture to take 40 million acres of erodible land out from production over the next five years. These acres would be planted with grasses, trees, and other cover crops.

If legislation similar to the three conservation provisions in the U.S. Farm Bill could be implemented in Canada, it would be a tremendous incentive to preserving natural habitat on private land. Many farmers would not be able to operate without benefits such as crop insurance, subsidies, and loans. Such legislation would be the simplest and most effective means of encouraging private landowners to retain and protect native habitat on their land.

THE ROLE OF THE PRIVATE LANDOWNER AND THE CROWN LAND HOLDER

Few things are more concrete and prestigious than owning land in the prairie provinces. If you own land, you are your own boss and nobody can tell you what you can and cannot do within reason. The feeling that once you have purchased a piece of land "it is yours," is deeply embedded in the roots of western Canadians. Some landowners appreciate the privilege to have title to a piece of land and in so doing they respect the property whether it is the fragile topsoil or some remaining natural habitat. Unfortunately, many landowners mine the land to its fullest. In other words, they take everything they can get from the land and put little back. Such attitudes result in degradation of the soil and any remaining natural habitat.

It is very unlikely that anyone will change the attitude of private landowners to the fact that it really is not their land. They have merely purchased the title of the land to use it for a very brief time in history. The land should be respected and managed in such a way that the next owner may have the same chance of making a living off the land. Unlike a rented apartment that can be replaced, nobody is making more land. Once a piece of land has been abused and destroyed it is gone.

It takes nature 1,000 years to create one inch of topsoil. If six inches of valuable topsoil are lost through erosion, it will take nature 6,000 years to restore the land to what it was a mere 100 years ago.

As conservation agencies and organizations concerned about preserving habitat on private land, we will not succeed in the long run by merely appealing to landowners to leave a few acres of habitat on each quarter section of land. Economics is the key. We either have to financially compensate private landowners who preserve habitat, or initiate programs that will cost them money if they destroy habitat.

Too often, crown land holders whether it be the government departments that control the land or the lessee, view the land with a single purpose, and in Saskatchewan that single purpose is usually agricultural production and financial profit for the lessee. Real consideration is not given to other land uses such as wildlife habitat and to society as a whole.

With the exception of such areas as Provincial Parks, the vast majority of Saskatchewan's crown land is administered by the Department of Agriculture. Thus several million acres of public lands are leased out to individuals for agricultural production and personal profit. These same individuals often control public access to public lands.

Depending upon the political climate, millions of acres of these lands can be offered for sale to the private sector with little or no public consultation. It was such a political move in 1981, that three years later resulted in Saskatchewan's Critical Wildlife Habitat Protection Act. The Act does not change current agricultural practices such as grazing and haying on the land. It merely prohibits the sale of these crown lands or harmful alterations such as clearing, breaking, and draining.

The agriculture industry has such a grip on our crown lands that activities such as grazing and haying are allowed to persist in Provincial Parks including Cypress Hills, where a number of rare and endangered plants are known to exist. Many cattle producers choose to graze cattle in Provincial Forest Reserves because the rent is much cheaper than in Prairie Farm Rehabilitation Administration Community Pastures. Besides, no one monitors how many cattle are in the forest.

A blatant example of both Federal and Provincial Government reluctance to acknowledge that crown lands belong to the public and not the lessee and that there are other uses for land besides agricultural production can be found in southwest Saskatchewan. In 1957, a Grasslands National Park was proposed in the southwest corner of the Province, with the objective of preserving a natural heritage found nowhere else in Canada. Despite numerous meetings, briefs, and conferences; and despite the fact the Premier of the Province in the early 1970's received more mail in favour of the Park than on any other issue while in power; and despite the fact that public hearings held in 1975 overwhelmingly favored the creation of the Park; and despite the fact that a memorandum of agreement was signed in 1982 between the Provincial and Federal Governments; and despite the fact that some 90% of the land proposed for the Park is public land, we still do not have a Grasslands National Park.

Unfortunately, society is prepared to see virtually every acre on the prairies used for agricultural production and very few differentiate between private and crown lands. As agencies and conservation organizations concerned and responsible for preserving wildlife habitat, we must do everything in our power to secure and protect habitat on our crown lands. These lands belong to you and me as much as they belong to the politician and lessee. Unlike private lands, the preservation of habitat on public lands should cost nothing more than successful lobbying and adequate protective legislation. It is imperative that we retain and preserve habitat on crown land.

A quotation from the introduction of the North American Waterfowl Management Plan pretty well sums it up, "All other efforts will be in vain if the ongoing trend of habitat loss and degradation is not reversed."

SUMMARY

In summary, conservation organizations in the Prairie Provinces have been leaders in preserving wildlife habitat through a variety of programs. Current programs must be continued and new ones devised to meet the challenges of the future.

We must continue to lobby governments to remove incentive programs that reward landowners for destroying natural habitat.

Every effort should be made to identify and secure the last remnants of habitat vital to the survival of rare and endangered species.

Support for and involvement in the recently announced North American Waterfowl Management Plan is essential.

Although probably several years away, we must commence a strong lobby to have Canada adopt legislation similar to the three conservation provisions found in the 1985 Farm Bill in the United States.

The only way we can effectively influence the preservation of habitat on private land is to either financially compensate landowners or initiate programs that will cost them money if they destroy habitat.

Governments have been allowed to mismanage and exploit public lands for the sake of the powerful agriculture industry and for the financial benefit of a few privileged individuals in society. It is up to conservation organizations to ensure that public lands are managed for the benefit of our wildlife resource and society as a whole.

Last but not least, we have the tremendous challenge of educating the public about the importance of our great natural heritage. Public interest is there. In the 1981 report titled "The Importance of Wildlife to Canadians," 80% of the people in Canada stated that maintaining abundant wildlife was important to them. Yet in Saskatchewan perhaps 5% of the population are members of wildlife conservation organizations. We must do a better job of educating the public and in turn receive their support for wildlife conservation programs in Canada.

ENDANGERED PRAIRIE HABITAT - PRAIRIE FARM REHABILITATION ADMINISTRATION PERSPECTIVES ON PUBLIC LANDS

Hugh Cook

My objective today is to present the concepts for habitat preservation and management that have evolved within the Prairie Farm Rehabilitation Administration (PFRA). For purposes of this paper I will restrict my comments to include only the public lands federally owned or controlled and referred to as "Community Pastures". However, I would draw to your attention that there are other federally owned and controlled lands including Parks and Wildlife Areas, Indian Reserves, and the Defence and Public Works Areas.

The Prairie Farm Rehabilitation Act was passed by parliament in 1935. The development of PFRA Community Pastures began in 1937. Several years of drought and severe soil erosion by wind generated a requirement for a soil conservation program. On many areas of light submarginal land, soil drifting had progressed to such a degree that the land was unfit for cultivation. In addition to having little agricultural value, these areas constituted focal points of soil drifting and were distributed in such a way that they threatened much larger areas of good crop land. In support of these objectives, the lands removed from cultivation were fenced and regrassed with drought resistant grass species and established as Community Pastures under agreements with the Provinces of Saskatchewan and Manitoba. The grass cover on these pastures has since protected the soil base and at the same time provided valuable grazing for local farm livestock.

Corrective measures had to be taken, and led to the establishment of the PFRA Land Utilization Program that remains today as the Community Pasture Program. The program at that time had three objectives:

1. The permanent withdrawal of submarginal prairie land from cultivation.

2. The establishment of a grass cover on these areas to protect the soil from further erosion and to provide grazing for livestock.

3. The resettlement on suitable land of farmers removed from submarginal areas.

Today PFRA Community Pasture lands total 913,916 ha (2,258,286 acres). The pastures range in size from 2,000 to 45,000 ha, with the average pasture encompassing an area of approximately 10,000 ha. The number of cattle grazing on each pasture varies from approximately 250 cows plus calves to about 3,400 cows plus calves depending on the pasture size and the forage reserves. The number of surrounding farmers who patronize each pasture varies from 12 to more than 100 depending on local conditions. In addition to conserving the soil base, the pastures help farmers to stabilize their livestock operations. These grazing reserves allow farmers to make the best use of their land while also maintaining sizeable cattle herds.

PFRA operates a total of 87 Community Pastures: 62 in Saskatchewan, 24 in

Manitoba, and 1 in Alberta. The forage resource is allocated among approximately 4,000 livestock producers who deliver about 230,000 animals to the pastures each year. The demand for grazing privileges on Community Pastures surpasses the capacity of the land area to provide sufficient forage. Approximately 200 livestock producers and about 25,000 animals are turned away each year.

The Community Pasture Program today has two primary objectives:

1. To make possible the removal of lands from unsuitable or unacceptable land uses and to facilitate improved land use through their rehabilitation, conservation, and management.

2. To utilize the resource primarily for the summer grazing of cattle while assisting in stabilizing small farms and providing breeding bulls to encourage high quality long-term cattle production.

Acting under this mandate, uses other than grazing are secondary to the program objectives of conserving the land resource while providing grazing services to the public. In general, PFRA is in agreement with multiple use concepts for pasture lands. However, any projects or agreements to this end will have to reflect these priorities.

PFRA is currently participating with several wildlife organizations in cooperative projects relating to wildlife management and habitat retention on pasture lands. More specifically, PFRA has cooperated with Ducks Unlimited on such projects as the Fouillard Project on the Ellice-Archie Community Pasture in Manitoba, the Chaplin Marsh Project on the Shamrock Community Pasture in Saskatchewan, and the Meezee Lake Project on the Alonsa Community Pasture in Manitoba. There are several smaller projects initiated by Ducks Unlimited on pasture lands. All these projects are designed to retain or improve nesting habitat and breeding grounds for waterfowl. Adjacent areas frequently support habitat for upland game birds and big game animals. Other noteworthy examples of multiple land use include the section of land on the Masefield Community Pasture set aside for Black-tailed Prairie Dog (*Cynomys ludovicianus*) habitat, the reintroduction of the Swift Fox (*Vulpes velox*) on the Nashlyn and Battle Creek Community Pastures, and the area set aside for the snakepits on the Narcisse Pasture in Manitoba.

Numerous Community Pastures have been designated as Wildlife Management Units by provincial authorities. Within the defined areas, hunting can be controlled, critical habitat retained, and wildlife management improved. With full cooperation of all parties involved and proper management of the resources, there is little or no interference with the PFRA pasture program.

Under the mandate for conservation and proper management of the land resource and the provision of grazing for livestock, PFRA is obligated to make the best possible use of the pasture lands. Because of the continuous demand for grazing and to prevent overgrazing of native range, pasture improvements are frequently being made. All pasture development proposals are screened by several wildlife agencies. A Memorandum of Understanding between the Canadian Wildlife Service (Environment Canada) and PFRA (Agriculture Canada) enables both parties to jointly plan for the integrated land use and maintenance of livestock and wildlife habitat on PFRA pastures. The overall purpose of the agreement is to facilitate the management of migratory birds and wildlife habitat on PFRA pastures and to encourage information exchange, consultation, and cooperation between the agencies.

A similar arrangement of open communication exists with the Wildlife Branch of the Saskatchewan Department of Parks and Renewable Resources. PFRA identifies all planned range enhancement to Saskatchewan Parks and Renewable Resources, well in advance of construction. Where critical habitat can be identified from Saskatchewan Parks and Renewable Resources inventory maps, the Wildlife Branch is consulted prior to final decisions on development plans. The PFRA Pasture Planning Section involves Wildlife Branch staff in the preparation of long term development plans for PFRA pastures in Saskatchewan. Both organizations are thus able to cooperatively ensure their programs are compatible.

The same procedure is followed for development planning on Community Pastures within the Province of Manitoba. Consultation, cooperation, and exchange of information takes place with the Wildlife Branch and, by way of the Wildlife Branch staff, with the Fish and Game Association of Manitoba.

Within Alberta, PFRA operates one Community Pasture on the Canadian Forces Base Suffield. A Suffield Grazing Advisory Committee has been established under a Memorandum of Understanding between PFRA and the Department of National Defence. The purpose of this committee is to ensure that the pasture receives proper range use consistent with the protection of the lands subjected to grazing. The Committee is made up of a representative from each of Canada Agriculture, Environment Canada, Alberta Energy and Natural Resources, PFRA, and Alberta Department of Agriculture. This group closely monitors range conditions and annually, or more frequently if deemed necessary, makes recommendations to the Base Commander relating to pasture management. Of prime concern to this Committee is the range condition, the trend in the range condition, and the habitat for wild ungulates. These and other factors such as water and fence facilities are taken into consideration when making recommendations for grazing capacities.

The Federal Policy on Land Use provides overall guidelines and consistency to PFRA land resource management. To this end, the policy ensures that federal policies and programs and the management of federal lands contribute to the wise use of Canada's land resources. Lands of ecological importance, or containing fragile or critical habitat are to be preserved and protected by way of this policy.

The Range Management component of the PFRA Pasture Planning Section is currently compiling an inventory of the pasture resource within its control. This inventory will consist of a series of transparent overlays on a base map of each pasture. On these overlays will be the most recent information for that area on: soil type, vegetation (both native and tame seeded), pasture improvements (dugouts, wells, fences, corrals, buildings, land clearing, land breaking, etc.), and pasture utilization (rotations of grazing, grazing intensities and duration). All of this information is required to produce an overall long term management and development plan that will be the final overlay.

The identification of wildlife habitat will be included in the vegetation inventory. There is no shortage of information, but there can be discrepancy among sources. Each source considers their information as correct. We are currently accumulating our habitat information for Saskatchewan pastures from an amalgamation of data from the Canadian Land Inventory Classification for Wildlife compiled by ARDA, Terrestrial Wildlife Habitat Inventory Maps from Saskatchewan Parks and Renewable Resources, and Natural Ecological Reserve Information from the International Biological Program. There are other private organizations, such as Ducks Unlimited, employing biologists to accumulate data on what they consider wildlife habitat. All sources are no doubt valid in their interpretation of what constitutes habitat and where these areas are located. However, for our purposes and to satisfy the concerns of the various groups monitoring habitat within the Community Pastures, it would be expedient to have a consensus inventory of wildlife habitat and land use for Canada.

In summary, I have attempted to present a brief overview of the PFRA Community Pasture Program, indicating the role it plays in prairie agriculture. I have mentioned some specific wildlife projects cooperatively being conducted on the pasture land resource, the mechanics involved in these operations, and the agencies taking part in the management of the wildlife resource. Lastly, I indicated that the identification of wildlife habitat and land use for long-term resource management are primary needs for future PFRA pasture planning.

PROVINCIAL PERSPECTIVES ON PUBLIC LANDS - ALBERTA

Diane Griffin

In considering habitat, there are two main elements in relation to the term "endangered". We can think in terms of the habitat of an endangered species that must be protected for the survival of that species. We can also think in terms of the habitat itself that is endangered and must be protected so that it does not disappear.

CURRENT PROGRAMS

In Alberta there are five different pieces of provincial legislation that enable the establishment of protected areas for a number of purposes, all of which have some implication for endangered habitat. These are:

1. Wilderness Areas, Ecological Reserves and Natural Areas Act

2. Wildlife Act

3. Provincial Parks Act

4. Historic Resources Act

5. Willmore Wilderness Park Act

Three wilderness areas have been established to preserve significant areas in their wild and primitive state. They range in size from 151 km^2 to 443 km^2. Activity is restricted to foot travel, research, education, and interpretive programs.

There are no ecological reserves but candidate sites are under consideration and are afforded interim protection. They will protect rare and unique features as well as representative examples of the province's natural diversity. Activities relating to education, scientific research, and interpretation will be allowed, but not hunting unless it is required as a management tool.

Natural areas bridge the gap between strictly protected areas, like ecological reserves, and the areas intensively developed for recreation such as provincial parks. The appropriate activity is decided on a site specific basis but can include hunting, hiking, and camping. There are 96 natural areas established through order-in-council for a total of 16,100 ha. The 61 provincial parks cover 125,250 ha and are zoned for activity ranging from passive recreation to off highway vehicle use. The Willmore Wilderness Park occupies 459,670 ha and is open to activity compatible with primitive, self-reliant recreation.

Additionally, there are 14 bird sanctuaries, 9 wildlife sanctuaries, and 5 historic sites that protect natural features. When totalled with the above, we have 189 areas on 880,300 ha protected by provincial legislation. This translates to 1.33% of Alberta. This figure does not include National Parks; forest recreation areas; forest land-use zones; or the Cold Lake, Wainwright, and Suffield Military Bases that are also designated as wildlife sanctuaries. It also does not include 200,000 ha of prime protection zone in the ecologically sensitive Eastern Slopes that is protected by policy but not by legislation.

While there is adequate legislation, there is not a large number of strictly protected areas in Alberta, just as there are not in the other two prairie provinces. For example, in all three jurisdictions, ecological reserves legislation is a relatively recent mechanism: Alberta (1981), Saskatchewan (1980), and Manitoba (1973). Although there is a lot of public land, there are also competing uses that make it difficult to get agreement and commitment for site protection. It is reasonable to expect that it will take several decades to establish a comprehensive provincial system of ecological reserves after the enabling legislation and supporting budget is in place. Budgetary restraint is a fact of life for any government at this time.

PROBLEMS AND DEFICIENCIES

Members of the public often wonder what we civil servants are doing with our time. For example, it took many years to develop and enact ecological reserves legislation. Even with that in place, Saskatchewan has only one small ecological reserve, Manitoba has six, and Alberta has none. Governments are often accused of a lack of political will and commitment when it comes to habitat protection. The machinery of government does move slowly, but there are some examples where it has moved fast when the political will is strong. For example, British Columbia has over 110 ecological reserves and was the first to have an ecological reserves act (1971). Since then, a total of eight provinces have ecological reserves legislation and the other two use their provincial parks acts, but the progress and commitment has not been nearly as strong as in British Columbia. However, British Columbia has now fallen into a slump and has not established any new reserves in several years even though it has not completed systematic representation of all its natural zones. I was reminded recently to look a little closer to home to also find an example of gains that were made during a moment of strong commitment. Dr. J.D. Ross, Minister of Lands and Forests for Alberta, established natural areas through an order-in-council in 1971, and only one has been added since then.

With pressure for economic development, the habitat conservation people are fairly low in the government pecking order. In some quarters, this is being looked upon as being short-sighted as we are only now becoming aware of the economic value of natural sites. Wildlife and its habitat have a direct impact on millions of Canadians, enhancing tourism and contributing significantly to the economy. Spending on these activities in Canada was estimated at $4.2 billion in 1981, and tourism associated with viewing wildlife accounted for one half of this, according to Statistics Canada. It is a big business. For example, Parks Canada employs 5,000 people and spends $312 million while managing 31 parks.

Domestic species originated from the wild. It is highly desirable to save this gene pool as the genetic resources of both common and rare plants and animals provide a broad base for research and development of agricultural species.

Because concern about endangered habitats and species is a relatively new phenomenon, we probably do not even fully realize what we have to do. It was easy to decide that legislation to enable habitat protection was an important step. It was also relatively easy to decide we needed some man-years to turn the machinery, to do inventories, etc. There are probably a lot of opportunities that we have missed in the field of habitat preservation because we were not quick enough to utilize existing mechanisms, like putting conditions on grazing leases. It is action that counts, not the presence or absence of an ecological reserves act, or any other legislation for that matter.

THE ROLE OF THE PRIVATE SECTOR VERSUS THE CROWN

Most government programs for habitat maintenance and improvement have primarily been for game species, but these have also been beneficial to non-game species. For example, when a pond's water level is raised for waterfowl, it often results in standing "snags" that provide nesting holes for other birds. Alberta's Buck for Wildlife program has also been used for providing such things as nesting platforms for Osprey (*Pandion haliaetus*) or nesting holes for raptors. The reason it is not used more extensively is that few applications have been received for projects related to endangered species or habitats.

The private sector has become increasingly active in habitat and species protection. On the national level, we have the World Wildlife Fund Canada, the Nature Conservancy of Canada, and Wildlife Habitat Canada. At the provincial level in Alberta, we have the Recreation, Parks and Wildlife Foundation, which has put money into the Swift Fox (*Vulpes velox*) project. These organizations are especially important for privately owned habitat since much of the legislation is applicable only to public land. About 30% of the land in Alberta is under private ownership.

Protection of endangered habitat and the habitat of endangered species on public land is a government responsibility. Because of the large public interest in wildlife[1], many citizens take an interest in this and promote programs. They can be actively involved on advisory councils, act as guardians for individual sites, etc. Currently, there is no concentrated effort on patented land. Some individuals manage their land for the benefit of wildlife including endangered species, but these efforts are fragmentary and need coordination and expansion. Non-government organizations as well as governments can play a role in this coordination.

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[1] In 1981, about 84 percent of Canadians participated in some form of wildlife related recreation activity according to The Importance of Wildlife to Canadians, Canadian Wildlife Service Cat. No. CW 66-62/1983E.

RAPPORTEUR'S COMMENTS

ENDANGERED HABITAT SESSION

Norbert Kondla

I am going to recapitulate the highlights of the various papers in the habitat session. Stan Rowe gave us an overview of the situation relating to the Aspen Parkland in Canada and explained that the Aspen Parkland is largely extinct due to agricultural use. Fortunately we still do have some bits and pieces left. A major problem that Stan identified is government agricultural policies. These tend to have short-sighted goals with ever-higher production as objectives. Range improvement programs and subsidies were identified as problems. There tends to be too much focus on species rather than ecosystems and habitats. He also mentioned the lack of integration of wildlife values in land management. As an action item, he pointed out that people need to understand the ecosystem concept as it relates to habitat protection.

Bob Coupland pointed out that the Mixed-grass Prairie is mostly gone. What is left are largely azonal examples. Grasslands are disappearing quite rapidly and those that are not disappearing are certainly deteriorating rapidly. Again the finger was pointed at government actions as the root cause of all this and he also pointed out that simply establishing protected areas is not enough. The retention of that protected status can be quite overwhelming at times.

Karen Johnson provided a summary of the Tall-grass Prairie situation in Manitoba. To me, this was the most depressing situation described. There are only seven protected sites and there is nothing over 10 ha left that is not azonal. However, there was reference to an interesting and innovative attempt to recreate Tall-grass Prairie. From a research point of view, this will be highly interesting and certainly from a conservation point of view, one would hope that it will work.

Cliff Wallis covered critical habitats in general from an Alberta perspective. He gave a lot of Alberta examples and he gave us a definition of critical habitat. Problems that he pointed out were failure to get government to act and level of agency commitment. He pointed out that there is often too much emphasis on modal habitats and not enough on the special or azonal type habitats. He also pointed out that we should be aware of some of the more subtle and insidious threats that are causing habitat destruction rather than focusing exclusively on the big easy-to-see ones. To deal with these problems you have to save the pieces so you can tinker with them later, and there must be political will and agency commitment to get something happening.

Caroline Caza defined critical habitat and reviewed what has been going on at the national level. One of the problems she identified was the single species approach that probably will not do the trick in the long run. She also gave an interesting example of where a well-intentioned habitat enhancement project in Saskatchewan actually did more harm than good, at least as far as the Piping Plovers (*Charadrius melodus*) were concerned. She mentioned the need for cooperative management, the possibility of having to reorganize certain resource management responsibilities in various agencies, and particularly the need to really focus on resource management as a part of land-use planning in Canada. She stressed the need to identify threatened systems and also to develop long range strategies through land-use planning.

The panel discussion for the morning session was valuable. We heard some very familiar phrases that will be repeated in the future. We heard words like land-use planning, holistic, integration, more manpower, educate the agriculturalists, cooperative approaches, and agency commitment. We heard reference to a provincial conservation strategy, a suggestion for a moratorium on major changes to public lands until some planned balanced decisions are developed, talk about tax incentives, suggestions for regional conservation centres, and the idea of long-range grazing contracts. There was a suggestion that we should focus more on economic benefits of conservation if we really want to influence key decision-makers. Planning again was raised in terms of the need to have an appropriate level of planning to make certain decisions. It was pointed out that confrontation sometimes works in dealing with conservation interests but perhaps salesmanship is also needed and may be the most viable route in the long run. It was suggested that government agency employees, aside from having a solid scientific background, should also have a natural history background. It was suggested that conservation groups and people who have interest in conservation should be talking to the non-converted instead of talking to the converted. I suspect I am talking largely to a converted group here so maybe my time would be better spent by talking to a local county council. It was suggested that there should be penalties for negligent land-use practices. That is an interesting concept. Public support was indicated as necessary; private land owners cannot do it all.

Bill Koonz gave us a good description of various programs and problems in Manitoba - problems like an insufficient habitat inventory preventing the identification of important target areas for protection. Problems also exist with society perhaps not placing enough value on these remnant areas, which is strange, because from a value point of view, or even from an economic point of view, one thinks a scarce resource automatically assumes more value. He pointed out that there are really no penalties for the destruction of habitat. There are difficulties with too many decisions being short term. Here is a really interesting one that in all fairness I have observed in some situations in Alberta as well - the case of local interests superceding provincial interests. That simply is a political matter and there is no other way to handle it; you cannot count on a bureaucratic system to deal with those situations in the interest of conservation. Again, the single species focus and the game species focus were identified as problems in dealing with habitat conservation in general. Lack of monitoring, neglect of the less showy species, and managers and planners being out of touch were mentioned. The grain quota and the tax systems were again identified as impediments to conservation land use. Koonz predicted that eventually we are going to have little habitat left and we are going to be doing more and more reclamation at considerable costs to build habitats where we could have simply saved some. He sees an eventual change in both the grain quota and the tax systems because these are causing problems. He sees increased competition with native species by introduced species. He also predicted increased public support for conservation, the creation of habitat manager positions, and the restriction of public access in research areas.

Lorne Scott gave us the non-government organization perspective and it was a really interesting one, because I, for one, was not at all familiar with the Saskatchewan scene. He described a number of really encouraging programs for habitat conservation in Saskatchewan and identified a major role in Saskatchewan for non-government organizations. Two major problems he focused on were government programs that encourage habitat destruction and a really interesting one that is beginning to surface here in Alberta more and more; the major influence of grazing lease holders on public lands. The problem is perceived as an unbalanced management focus on agriculture that perhaps does not maximize the benefits that people could get from public lands. Some of the solutions he recommended were focussing priority on the rare species, more cooperation among non-government organizations (they certainly are cooperating now, but more is necessary), and the addition of lands to the Critical Wildlife Habitat Lands Act now in effect in Saskatchewan. He recommended stronger enforcement of legislation, the removal of destructive incentive programs, and compensation for private land owners. He called for more balanced and better management of public lands. Penalties for destructive land uses and more public support were also called for. He also outlined the U.S. Farm Bill as a model to be followed in Canada.

Next, Hugh Cook gave an interesting insight to the workings of the PFRA and some of the history of that organization. I think the PFRA is living proof there is light at the end of the tunnel and every organization can and does change when properly approached. He pointed out two major problems from the PFRA perspective. First, they are faced with an ever increasing agricultural demand that exceeds the capacity of the land and the organization to deliver their mandate. Second, he expressed some concern with the conflicting wildlife habitat inventory information that is available. This is something we have run into in our department in Alberta as well. We found one way to get around that is to have the various people who will use information for decision-making, collectively sit down and develop the actual inventory program that provides the information. Once people agree on the information, they are much less likely to disagree on land-use decisions.

Diane Griffin described the Alberta situation, focussing primarily on the history of natural areas and ecological reserves. She identified some lost opportunities through existing mechanisms and I think that is really a key point when you look at government and non-government organizations. We have so much in the way of programs, legislation, policies, and regulations that impact on land use, it is difficult to identify and effect corrective action. We have got large bureaucracies with a multitude of programs and yet whenever a function such as this workshop takes place, it does not matter what the topic is, people constantly ask for something new and different or a new piece of legislation. I think Griffin hit the nail right on the head when she said, "use existing mechanisms" because sometimes a small change in what is going on right now will fit the bill. Again, she pointed out a major role for non-government organizations in habitat conservation.

In summary: we need information. In some cases we have got good information and in some cases we do not. We have conflicting information that people cannot agree on. So the first thing we want to have is good information about what is worth conserving. Clearly we need cooperation in decision-making. That is really what it is all about. Clearly we need to balance agriculture and habitat conservation, especially on public lands. There is a very clear imbalance there. More dollars being spent in the private land-use arena are going to be necessary for much progress there. There has got to be more political will and agency commitment; that is where the non-government organizations come in. In my view, the real things that are going to make or break habitat conservation, or any conservation initiative, are land-use decisions and that comes back to the existing mechanisms again. There are existing legislative mechanisms all across the country to make land-use decisions; both on private lands and government lands at all levels. They are there to be used and people will be successful in habitat conservation to the extent that they can influence those decision-making processes.

ENDANGERED PRAIRIE HABITATS SESSION - SYNTHESIS OF PRECEPTS, PROBLEMS, ACTIONS

Garry C. Trottier

The papers in these sessions were largely exploratory since the subject matter has seldom been evaluated in the context of endangered species programs. Precepts fundamental to endangered species management problems, and required actions were presented.

A central theme of the discussions involved the way we traditionally address habitat management needs in an endangered species context. It has become obvious that a large portion of the endangered species problems encountered or anticipated are symptomatic of failure in basic life support systems. The challenge, therefore, is to address the broader question of ecosystem conservation.

The term "endangered species habitat" connotes diverse meanings in the context of endangered species management programs. First, there is the need for fundamental knowledge of species-specific habitat relationships. Secondly, there is a basic question of what is critical habitat and this can relate to both species-specific considerations and species assemblages. Few valid criteria have been developed for identifying critical habitat. Finally, there is the broad question of rating status/threat in a habitat context. Because habitat is a complex of physical and biological parameters, it is a very difficult concept to manage.

PRECEPTS

1. International concern about saving threatened animals and plants diverts attention and channels energy away from ecosystem destruction that puts species on the threatened list.

2. Declining wildlife populations indicate (in many cases) that ecological systems are failing due to land-use practices.

3. Current approaches to endangered species management are deficient because they fail to recognize the inherent worth of ecological systems. Consequently, land-use conflicts continue to destroy these systems.

4. Large scale habitat protection programs currently directed at species in no danger of extirpation will prevent native habitat loss that might otherwise jeopardize species.

5. Habitat conservation can be initiated under existing government mechanisms through which land-use decisions are made. These mechanisms must be used to influence the decision-making process.

6. For half of the species listed by COSEWIC, habitat loss is cited as the main cause for decline and for half the species there is no protection of critical habitat.

7. There is no ongoing evaluation of the status of endangered species habitat.

8. Half of the critical wildlife habitat recorded for Saskatchewan is on Crown lands.

9. Preservation of habitat on public land should cost nothing more than successful lobbying and adequate protective legislation.

10. The fate of much of our wildlife habitat rests largely in the hands of private individuals.

11. Surviving examples of ecosystems that have been used as cropland have tremendous value for redesigning agricultural systems that today are not self-sustaining.

12. We must do a better job of educating the public and in turn receive their support for wildlife conservation programs.

PROBLEMS

1. Extensive terrestrial wildlife habitat inventories on the prairies were based on historical information thus they cannot be considered current for identifying critical habitat for non-game and threatened species.

2. There are many government financial incentives, particularly in the agricultural sector, that encourage native habitat destruction.

3. On public lands there is an unbalanced management focus toward agriculture. Grazing is becoming an overpowering biotic influence on these lands. In many cases, this reflects agricultural demand from producers that exceeds the capacity of the land.

4. There are no evaluation criteria for identifying important (critical, endangered) habitats.

5. Prairie habitats are threatened by subtle factors. Overgrazing is widespread on public lands. However, species assemblages become simplified if there is no diversity in habitat conditions. Research on such species-habitat relationships is fundamental to endangered species management.

ACTIONS

1. Change the scope of endangered species programs to a systems approach.

2. Adopt an empathy for ecosystems that support us, and weaken the policies that result in destruction of these ecosystems.

3. Influence change in land-use policies that threaten biophysical systems. Secure recognition that biophysical systems must be used on the basis of their natural, not converted integrity.

4. The concept of critical habitat must be thoroughly evaluated and defined. These biophysical sites and concomitant species assemblages may be at risk, even though extensive natural areas appear to be complete.

5. Define and identify critical habitats on the prairie. Also include azonal habitats within zonal situations, i.e. valley systems, wetland complexes, dune areas, river communities.

6. Failing ecosystems must be identified along with the factors that threaten their sustainability. Strategies for their conservation must be developed through integrated land-use planning.

7. Identify natural area blocks representative of biophysical systems to serve as target areas for land-use conservation programs.

8. Representative examples of natural grasslands must be protected on a perpetual basis through legislation that prohibits reallocation of land use; for example, the Saskatchewan Critical Wildlife Habitat Act.

9. Lobby for conditions governing grazing leases on Crown lands. This is an example of action that can be realized under the existing infrastructure. It is action that counts, not the presence or absence of ecological reserves.

10. Immediate efforts are needed to identify and secure habitats of rare and endangered species.

11. Reconsideration and removal of government incentive programs that promote and encourage destruction of natural habitat on private land.

12. Lobby for legislation that protects wildlife habitat, e.g., the U.S. Farm Bill conservation measures.

13. Public education must be substantially increased. Attract more attention and more people to the habitat conservation movement.

14. We need a better understanding of the ecological factors which maintain Aspen Parkland, a transition biophysical system. Good examples for this system are virtually extirpated.

RARE PLANTS IN THE PRAIRIE PROVINCES:

A DISCUSSION OF TERMS AND DISTRIBUTION CHARACTERISTICS

Linda Kershaw

DEFINITIONS

Perhaps the best known definition of rare is that used in the IUCN Red Data Book - "not in immediate threat of extinction, but occurring in such small numbers and/or in such a restricted habitat that it could quickly disappear - requires careful watching" (IUCN 1966). In Canada, several National Museums publications list rare species by province using the following definition: "Rare - has a small population within the province ... It may be restricted to a small geographical area or it may occur sparsely over a wide area" (Argus and White 1978). The IUCN definition of rare incorporates the concept of endangerment and therefore demands considerable knowledge of each species before classification can be made (e.g., what factors control species success and distribution? What is the present extent of available habitat and how may this change in the future?). However, in the prairie provinces, insufficient information is available to determine whether most rare species may be threatened, endangered or extinct.

Many attempts are made to quantify "rareness" so that judgement from one species to the next can be comparable, but for many reasons this is not practical and determination of status must remain subjective to some extent. Packer and Bradley (1984) included as rare only those species recorded from five or fewer localities and collections in Alberta. Perhaps five localities per province is a good starting point but the final decision to include or exclude a species must remain subjective. Should a species collected from six sites within a 50 km radius be excluded while another recorded from five sites scattered across the province is included? We have no way of knowing the total population of either. Should a species endemic to Alberta but collected from 10 sites be excluded, while another, common throughout the U.S. prairie but reaching only two sites in southern Alberta is included? The definition of rareness must remain flexible so that such problems can be addressed. It is good to consider quantitative definitions when possible, but arbitrary decisions should not be the final result.

Determination of rareness is necessarily based on collections or reliable reports of occurrences and these may be biased in many ways.

1. Reliability - not all reports are valid nor are all collections correctly identified. All occurrences should be verified by a competent taxonomist.

2. Accessibility - plants are more often acquired along roads, trails and/or rivers, in scenic areas and or sites that are relatively dry.

3. Conspicuousness at the time of collection - early spring bloomers may be overlooked if an area is visited in late summer; some species are always inconspicuous (e.g., Lemnaceae).

4. Unusualness - "rare" or showy plants are always collected whereas common weeds may be left unrecorded (e.g., orchids vs. dandelions).

5. Ease of identification - species of taxonomically difficult groups (e.g., Cyperaceae) may be overlooked either accidentally or purposely.

6. Clear taxonomic definition - a taxon may be considered a variety, subspecies or species, depending on the taxonomist making the judgement (i.e., lumpers vs. splitters). If only species are to be included this would directly affect the content of the list.

The IUCN Red Data Book definition of endangered is: "-in immediate danger of extinction: continued survival unlikely without the implementation of special protective measures" (IUCN 1966). The concepts of rare and endangered are generally thought to be associated, and indeed this is often the case. Plants with localized populations and/or few individuals are more easily threatened. However, some species naturally grow as widely scattered individuals and are rare throughout their ranges. Most of these have highly specialized insect vectors to facilitate cross-pollination. Such species may not be endangered and the wide dispersion of individuals may actually provide a protective buffer against threatening forces. Alternatively, relatively common species may be threatened by extreme selective pressures (e.g., American Elm *Ulmus americana* L. populations were drastically reduced by Dutch Elm Disease in eastern Canada). However, few widespread species threatened by natural predators will become extinct, although their numbers and range may be greatly reduced.

If a species is to be classified as endangered, a great deal must be known about its history and ecology. It becomes necessary to determine which factors have controlled the success or failure of that species and how these are likely to change in the future. Possible exceptions to this would be very localized species whose entire ranges may be threatened. Extinction is a natural phenomenon but the rate of plant extinctions has increased dramatically from man's activities.

Since the autecology of most rare plants is poorly understood, the most effective measure in preserving species is the maintenance of their habitats. The problem (both legal and scientific) comes when we try to define habitat. If a rare plant is found in boreal forest, must all of the boreal forest be protected to save that species? Obviously a more specific definition of habitat must be determined and once this has been done, the areas meeting those criteria must be located.

EXISTING LISTS

Recent lists of rare vascular plants are available for each of the three prairie provinces (Argus and White 1978, Packer and Bradley 1984, Maher et al. 1979, White and Johnson 1980). However, all are subject to continual revision and will undoubtedly show major changes as our knowledge of the flora of each province increases and our definition of 'rarity' becomes more refined.

Distribution Patterns of Rare Species in Prairie Provinces

Three major groups of distribution patterns are recognized:

1. species extending into the provinces from nearby (non-disjunct) widespread populations;

2. species extending into the province as small disjunct populations; and

3. endemic species, limited to a local area and restricted geographically.

For the purpose of this paper, the maximum range of endemic and/or disjunct populations has been set at approximately 200 km. Disjunct populations must be at least 500 km distant from other collection localities.

Over 80% of the "rare" species in the prairie provinces appear to belong to group (1). Such populations add considerably to the species diversity of the provinces, probably accounting for more than 20% of the total floras. Although most of the species in groups (1) and (2) are not rare, the disjunct populations (group 2), might be considered more distinctive as there is little chance of genetic exchange with the main population. Widely disjunct populations are usually thought to have been isolated from the rest of the species gene pool for long periods of time. However, some may be recent disjuncts, the product of long distance dispersal. Small, isolated gene pools are thought to have a much greater chance of diverging to produce new species or varieties. The distance required to ensure complete isolation will vary with the species' dispersal capabilities and reproductive strategy.

Existing reports from the prairies map distributions only in the province being studied (Argus and White 1978, Packer and Bradley 1984, Maher et al. 1979, Johnson and White 1980). It is important that the entire range of each species be considered when determining rareness. Taxa that might then be considered rare would include the following:

1. Widespread species that are rare throughout their range - those found as scattered individuals or small groups throughout their range but widely dispersed in each community where they occur;

2. Species that occur as disjunct populations throughout their range, those found as localized, small groups at a few, widely scattered localities over a large geographic area;

3. Localized endemics, both old and new - species restricted to so few localities that they are considered rare even though they may occur in large numbers.

Vascular plant species listed as rare in one or more of the prairie provinces follow several distribution patterns, which are summarized in the Appendix.

All lists of rare species for the prairie provinces are relatively long. The most recent Alberta list (Packer and Bradley 1984) contains 360 species, representing 24% of the native flora. The Manitoba (White and Johnson 1980) and Saskatchewan (Maher *et al.* 1979) lists contain 300 and 291 taxa respectively. With so many species, it will be necessary to define priorities initially if action is to be taken to protect rare and potentially endangered species. These might include the following:

1. Rank the species in the existing lists (e.g., rare endemics and disjunct populations might be given priority over peripheral populations; species of threatened habitats might be given priority).

2. Identify areas where concentrations of rare species occur and move to protect these. The loss of species reflects the deeper problem of loss of habitat. Hopefully, if these habitats can be preserved, the species diversity of the provinces will also be maintained.

3. Identify areas with restricted habitat types that often support rare species (e.g., sand dunes, dry mudflats on prairies, calcareous cliff, bogs, and fens) and move to protect these.

Generally, when people hear of rare or endangered species, they think only of animals and then only of birds and mammals. This was clearly illustrated in a UNESCO circular on environmental quality (Anonymous n.d.) containing the following information: 297 species of mammals are endangered along with 359 species of birds, 187 species of reptiles and amphibians, 79 species of fish, and (in small print) also 20,000 species of plants.

There are many reasons for preserving plants species, ranging from the need to preserve potentially useful genetic resources to the desire to save aesthetically pleasing species. But living creatures should not have to be beautiful or justfiy themselves in economic terms in order to survive. We need to engender an appreciation of each species as something of value in itself, a unique entity that has evolved over millions of years and that cannot be replaced once it is lost.

A lot of work remains to be done, in clearly defining what is rare or endangered in each province and in determining and implementing the action necessary to preserve these species. Through our discussions, we hope to gain some insight into these problems and take positive steps in this direction.

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APPENDIX

Distribution Patterns of Rare Vascular Plants in the Prairie Provinces[a]

		Alta	Sask	Man
1)	Peripheral Populations			
	- North from widespread populations in the U.S.	45%*	35%	35%
	- South from widespread Arctic and northern boreal populations	10%	5%	15%
	- East from widespread populations to the west	15%	15%	10%
	- West from widespread populations to the east	5%	5%	5%
	Widespread to transcontinental but rare in province	10%	25%	25%
	Relatively widespread but rare throughout range	1%	1%	1%
	Total % of rare species from widespread nondisjunct populations	85%	85%	90%
2)	Rare Disjunct Populations			
	- Disjunct from widespread populations to the north	5%	0%	<1%
	- Disjunct from widespread populations to the south	<1%	<1%	0%
	- Disjunct from widespread populations to the east	1%	1%	<1%
	- Disjunct from widespread populations to the west	<1%	<1%	<1%
	Widespread in the east but disjunct through the west	1%	5%	1%
	Widespread transcontinental but disjunct in province	1%	5%	<1%
	Widespread but disjunct throughout range	1%	<1%	1%
	Total % of rare species occurring as disjunct populations in the province	10%	10%	5%
3)	Endemic Species			
	- Rare Canadian endemics	1%	5%	<1%
	- Rare species endemic to southwestern Canada and northwestern U.S.	5%	0%	0%
	Total % of rare species occurring as localized endemic populations	5%	5%	<1%

[a]Values recorded to the nearest 5% with '1%' representing values of 0.5% to 2.5% and '<1%' representing values of less than 0.5%

RARE VASCULAR PLANTS IN THE ROCKY MOUNTAINS OF ALBERTA

Peter L. Achuff

SUMMARY

This paper deals only with vascular plants (ferns, fern allies, conifers, and flowering plants) since our knowledge of nonvascular species (lichens, bryophytes, algae, and fungi) is currently insufficient to make such an assessment of their status. The definition and listing of rare vascular plants is derived primarily from "A Checklist of the Rare Vascular Plants in Alberta" (Packer and Bradley 1984). Although the title of this workshop is "endangered species", our knowledge of vascular plants in Alberta is too poor at present to make such an assessment and thus, we deal here only with rare species. To further narrow the field, only the Rocky Mountains will be considered as a case example.

There are about 1755 vascular species in Alberta, of which, 360 (20%) are rare (Packer and Bradley 1984, Packer 1983, Achuff et al. 1986). Of these 360 rare species, 224 occur in the mountains, representing 13% of the total provincial flora or 62% of the rare species. By area, Alberta is roughly 10% mountains, 14% grasslands, 11% aspen parkland and 65% boreal forest. Thus, the mountains with 62% of the rare species but only 10% of the area have a disproportionate number of rare species. The taxonomic breakdown, by number of species, for rare mountain plants includes: ferns - 14, fern allies - 3, conifers - 4, monocots - 59 (grasses - 26, sedges - 19, lilies - 5, orchids - 5, other - 4), dicots - 144 (composites - 20, saxifrages - 14, mustards - 9, other - 101).

The mountains are divided into three Ecoregions: Montane, Subalpine and Alpine. The Montane is about 8% of the mountains by area and contains 15% of the rare species in the mountains, the Subalpine covers 51% and has 60% of the rare species, and the Alpine covers 41% and has 25% of the rare species. There is a floristic boundary in the Alberta mountains at about 50^{o}N, and many rare species occur from about Crowsnest Pass south to the U.S. border. Ninety species (40% of rare species) occur only in this area of southwestern Alberta and 108 rare species (48%) occur only in southwestern Alberta and immediately adjacent areas. Further north, more rare species seem to occur in the Front Ranges compared to the Main Ranges. About 91% (204 of 224 species) occur, at least partially, in protected areas - national and provincial parks, wilderness areas, natural areas, or Willmore Wilderness Park. However, not all portions of rare species populations are in protected areas and 20 species are in unprotected areas.

None of the natural resource management agencies, federal or provincial, have a specific rare plant management policy. Plants are covered by broad powers to protect and manage natural resources but are seldom a specific concern in management plans. They have been benignly neglected.

The threats to rare plants are difficult to assess because to do so, one needs to know what species are involved, where they are in detail, and, populations size and trend. Such information is inadequate in virtually all cases. However, potential threats involve large-scale landscape disturbances, such as strip mining, forest harvesting, off-road vehicle use, dams and reservoirs, and continued agricultural intensification, as well as small-scale incremental disturbances, such as roads,

railroads, pipelines, urban expansion, and agricultural intensification. Collecting of rare species for gardens or other purposes does not currently appear to be a threat. Much of the threat could be avoided by adequate consideration of rare species in project planning and assessment.

The major problems in rare plant protection are *information* and *administration*. There are large geographic areas not adequately collected. We lack estimates of population size, specific area occupied and population trend. There is very little information on the life history, population ecology or reproductive rates of rare species. There is no adequate information system - no agency gathers information on rare species nor can the information be easily accessed or updated. Administratively, there appears to be a lack of specific recognition of rare plants in planning, assessing, and administering natural resource management programs.

A basic premise is that rare plants should be conserved in their native habitats. Transplanting to unthreatened sites or propagation in botanical gardens are not acceptable measures for native species conservation. These are only extreme measures when habitat conservation has failed.

Five recommendations would help conserve rare plants:

1. Ensure that an adequate legislative and policy basis for rare plant management exists.

2. Ensure that rare plants are considered adequately in all planning, environmental assessment, and natural resource management activities.

3. Increase information on the location and population biology of rare plants.

4. Establish an information system on rare plants.

5. Designate and properly support a lead agency/group for rare plants.

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SELECTED NORTH AMERICAN PERSPECTIVES RELEVANT TO THE CONSERVATION AND MANAGEMENT OF ENDANGERED PLANT SPECIES IN ALBERTA

James R. Butler

Society's awareness and concern for threatened and endangered plant life has always lagged somewhat behind the concern for endangered wildlife species. In a recent knowledge quiz administered to bird watchers in Pt. Pelee National Park, a location nationally famous for its threatened plant composition, people's knowledge of common wild flowers was lower than their familiarity with all other natural history groups, which included birds, mammals, amphibians, reptiles, and even butterflies (Butler and Fenton, unpublished data). Argus (1977), in his summary of the problems concerned with the conservation of Canadian rare and endangered plants, concluded that support for conservation measures was weak due to an overall low public awareness of the problem of rare and endangered plants.

In spite of society's relatively low awareness of rare plant species, sympathy and general concern for the protection of such species is relatively widespread, and is consistent with an expanding sense of responsible stewardship for the natural environment in general. A powerful support for endangered plant species from Albertans could be easily fostered through expanded public awareness of this resource, through better publications, and the visibility of ecological reserves and rare plant sanctuaries. In many American states "Red Book" lists of sites of threatened plant species have proven highly successful in involving the active participation of private landowners and resource management agencies in cooperative efforts in plant conservation. Private landowners who agree to cooperate in the interest of rare species may receive a formal certificate acknowledging their participation. A current study completed by Braidwood (1987) establishes a potential model for such a program in Alberta in addition to suggesting a nine category classification system intending to inclusively embrace the full range of circumstances for a site's eligibility for Red Book inclusion. The implementation of such a program would be highly beneficial to rare and threatened plant associations.

Within Alberta, virtually all important initiatives in the conservation of plant species have emerged from non-governmental sources. The earliest may include important portions of grasslands deeded by Edgar McHugh for the creation of Nemiskam National Antelope Park, and the positive influences exerted as early as 1902 by the formation of the Territory Natural History Club, later in 1906 to become the Alberta Natural History Society. In recent years, Universities and other research institutions have been largely responsible for contributing to the growing data base concerning threatened plant communities.

The Alberta Fish and Wildlife Division has only recently expanded its perceived mandate to embrace a wider spectrum of the wildlife resource, but has yet to follow the model of more progressive North American wildlife agencies who have included plant species within the spectrum of their non-game management program. Mashburn (1984) found at least 8 American states performed organized surveys of critical plant communities within their non-game programs. These have largely focussed on endangered plant communities in grassland, and wetland habitats.

Missouri's Wildlife Division has been a leader in identifying the most critical plant populations through quantitatively monitoring and field checking historic locations. To increase their effectiveness, area managers are given training sessions on how to identify and protect endangered plants on Department of Conservation land. The public outreach program sponsors open houses with their staff in prairies, forests, or Ozark stream habitats and they have been instrumental in the formation of the Missouri Native Plant Society.

Research on critical plant populations and other non-game species has been sponsored and encouraged in Illinois for 126 years, and has left the legacy of a data base which has facilitated the wise management, and the formation of recovery programs for a wide range of endangered plants and animals.

Such a long-term faunal and floral survey provides valuable information about population changes that might otherwise go unnoticed. Surveys done on prairie bird species in Illinois done in 1908-1909, 1957-58, and 1978-1979, showed that while population densities remained basically the same from 1908 to 1957, they declined by 40 percent from 1958 to 1978-79. For example, the Bobolink (*Dolichonyx oryzivorus*) was reduced by 97 percent and the Grasshopper Sparrow (*Ammodramus savannarum*) by 96 percent, both indicator species to the accelerated decline of grassland environments.

At the Federal government level, the United States Forest Service set up a sensitive species policy in 1979 to protect and manage species that were sensitive but not yet endangered. Their objective was to (1) develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions, and (2) maintain viable populations of all native and desired non-native wildlife, fish, and plant species throughout their geographic range on national forest system lands. Current programs include new efforts in the Northern Plains on classification of plant communities and associated wildlife. Effects of fire on plant succession are also being investigated in Montana.

Monitoring of rare plants in the United States has increased dramatically since legislation in 1973 (Endangered Species Act) encouraging such activity. State and federal agencies, consulting firms, and environmental groups are involved in numerous projects to identify and monitor rare plants. In addition, the Biosphere Reserves Program in 1979 provided monitoring guidelines which are being implemented. Most U.S. Biosphere Reserves are now progressing from inventory and quantitative monitoring to modeling and management.

The challenge of raising public awareness toward rare and threatened plants necessitates expanded public awareness programs in the form of the following:

(a) more effective restriction signage that explains the reason for a restriction when fragile areas are posted;

(b) inclusion of endangered plant content in school environmental education materials and field outings;

(c) the development of presentation-information packages that may be utilized by group leaders and interpretive staff;

(d) innovative touring presentations, incorporating dramatics, puppets, etc., that address topics of threatened plants;

(e) effective touring exhibits which may be displayed at special gatherings, shopping centres, etc.;

(f) a wider range of well-illustrated books or publications directed at the general public;

(g) public advertisements in papers or magazines on the nature of "be alert for this plant, it is one of Alberta's vanishing heritage;"

(h) a commitment on behalf of the Alberta Fish and Wildlife Division to accept flora as a legitimate component of their wildlife mandate.

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ENDANGERED PLANTS IN ALBERTA: ALTERNATIVES FOR LEGAL PROTECTION

Donna Tingley

INTRODUCTION

The purpose of this paper is to briefly review some legal alternatives for protecting endangered plants in Alberta and to suggest a strategy for implementing appropriate protective mechanisms.

As a preliminary matter, it is important to discuss what is meant by "legal protection" of endangered plants. The key issue when speaking of legal protection is enforceability. Unless a requirement that endangered plants be protected is enforceable in a court of law, then compliance is voluntary. For example, a federal-provincial agreement which has not been ratified by legislation, is not legally binding on its signatories. Although a breach of the agreement might lead to political repercussions, there are no legal consequences flowing from the breach. Consequently, this paper will focus on those means of protecting endangered plants which are legally enforceable.

CONSTITUTIONAL BACKGROUND

Before it is possible to review specific legal alternatives, it is necessary to know whether an appropriate enactment would be passed by the federal or the provincal level of government. The question of which level of government has the jurisdiction to legislate in relation to endangered species has led to a great deal of confusion and it is useful to briefly review this question (Versteeg, 1984). Generally speaking, because the province owns all plantlife and wildlife within its boundaries, it is the provincial level of government which has the authority to pass laws in relation to these matters.

There are a few exceptions to the province's jurisdiction to deal with endangered species. Any endangered species found on federal lands, such as national parks, will be under the jurisdiction of the federal government. As well, the federal government has the jurisdiction over seacoast and inland fisheries, even though they are owned by the provincial government. The federal government has jurisdiction over migratory birds by reason of the *Migratory Birds Convention Act*, R.S.C. 1970, c. M-12. Lastly, the federal government has the jurisdiction over wildlife subject to international treaties. In order to be enforceable, however, the treaties must be implemented by legislation passed by the appropriate jurisdiction. To conclude, if one is concerned with obtaining legal protection for endangered plants, one should look to the provincial level of government, unless the plants are located on federal lands.

PROVINCIAL LEGISLATION

There are two types of legal regimes which have been adopted by Canadian provinces to protect endangered plants. The first type of legislation, which has been enacted in Ontario and New Brunswick, lists specific endangered plants and prohibits any destruction of those plants. The second type, allows for the establishment of ecological reserves, wherein various forms of wildlife, including endangered plants, may be preserved. Each type of legislation is reviewed in turn.

The structure and intent of the New Brunswick and Ontario acts is similar. The New Brunswick *Endangered Species Act*, R.S.N.B. 1973, c.E-91, begins by defining "endangered species". The Act says that an endangered species is "species or subspecies of a fauna or flora threatened with extinction by reason of the destruction of its habitat or a drastic modification or severe curtailment thereof, disease, over-exploitation, predation, the use of chemicals or any combination of the foregoing factors, and declared by the regulation to be endangered". Thus, to be designated an endangered plant, the plant species must meet the criteria set out in the Act, plus the Cabinet must have formally declared the plant to be endangered. In New Brunswick, one plant has been declared endangered; the Furbish Lousewort (*Pedicularis furbishiane*). The Act further says that it is an offence to destroy or interfere with any member of an endangered species or its habitat. The penalty for breaching this section is a fine of not less than $25 and not more than $1000 or imprisonment for a period not exceeding 100 days or both.

The Ontario *Endangered Species Act*, R.S.O. 1980, c.138 differs in a few respects from the New Brunswick Act. The Ontario Act contains a preamble. A preamble is a useful part of a statute which helps to explain the overall purpose of the enactment. The preamble in the Ontario Act reads as follows: "Whereas it is considered expedient to provide for the conservation, protection, restoration and propagation of species of fauna and flora of the Provincial of Ontario that are threatened with extinction." As well, the maximum fine in the Ontario Act is higher than in the New Brunswick Act, being $3000 or six months imprisonment. One plant species, the Small White Lady's-slipper Orchid (*Cypripedium caudidum*), has been declared endangered in Ontario.

When receiving legislation, it is important to look at the administrative practise as well as the word of the statute in order to determine its true impact. It is interesting to note that in neither New Brunswick nor Ontario, has there been a prosecution under the provinces' respective endangered species legislation in regard to plants, although there have been prosecutions in both jurisdictions in regard to Bald Eagles (*Haliaeetus leucocephalus*).

In both provinces, different innovative approaches have been adopted for dealing with endangered plants. In New Brunswick, in certain circumstances, ecological reserves have been established to protect their endangered plant, the Furbish Lousewort (David Cartwright, pers. comm.). In Ontario, in certain cases where a Small White Lady's-slipper Orchid has been located on private land, the government has entered into an agreement with the landowner to protect the plant (Doug Hagan, pers. comm.).

Alberta is one province where the second type of legislation which can be used to protect endangered plants, an 'ecological reserves act', has been enacted. Alberta's *Wilderness Areas, Ecological Reserves and Natural Areas Act*, R.S.A. 1980, c.W-8 proves, in section 3.1, that the provincial Cabinet may pass a regulation designating Crown land as an ecological reserve where, among other things, there are "rare or endangered plants or animals that should be preserved". Certain activities are prohibited within an ecological reserve, including hunting, fishing and trapping, the landing of an airplane, and the lighting of an open fire.

The Act provides that before an ecological reserve can be established, disestablished or altered, public notice must be given. In addition, the Cabinet may ask the Environment Council of Alberta to hold public hearings to receive submissions on these matters.

The *Wilderness Areas, Ecological Reserves and Natural Areas Act* contains useful mechanisms for receiving public input into the process of establishing ecological reserves. The Act provides for the establishment of an Advisory Committee on Wilderness Areas and Ecological Reserves which is to receive and consider requests from the public on the establishment of ecological reserves and natural areas. Recommendations then go from the Committee to the Minister of Recreation and Parks who must then pass the recommendations on to Cabinet for consideration.

At the present time, no ecological reserves have been established in Alberta. However, several sites have been reviewed by the Advisory Committee on Wilderness Areas and Ecological Reserves and recommendations have been forwarded to the Minister of Recreation and Parks.

In conclusion, there are two statutory legal mechanisms which could be utilized in Alberta to protect endangered plnts. The government could be asked to establish ecological reserves pursuant to the existing *Wilderness Areas, Ecological Reserves and Natural Areas Act* to protect endangered plants. Alternatively, the Alberta government could be pressed to enact an "endangered species act" similar to that in force in New Brunswick and Ontario. It is suggested that the former approach be adopted by interested groups for the following reasons. First, the *Wilderness Area, Ecological Reserves and Natural Areas Act* is already in force. It is much easier to deal with existing legislation than to have the government pass a new act. Secondly, the existing Act establishes an explicit mechanism for the receiving of public input on ecological reserves. Lastly, based on the New Brunswick experience, the government has relied in part on the establishment of ecological reserves as a practical means of protecting the Furbish Lousewort.

Because there are not yet any ecological reserves in Alberta, their establishment must be closely monitored by conservation groups. If it is concluded that ecological reserves are not an appropriate mechanism for protecting endangered plants, then consideration should be given to lobbying the Alberta government to enact an "endangered species act".

ALTERNATIVE STRATEGY

As a footnote, it may be helpful to raise as an alternative, a non-governmental, legal approach for the protection of endangered plant species. Rather than relying on the provincial government to provide for the protection of edangered plants, individuals or groups can enter into legal agreements or acquire and on their own to protect endangered plants. For example, the Status Report on the Furbish Lousewort notes at p.10, that its author, Dr. George Stirrett, has personally entered into an agreement with the Canadian Pacific Railway to protect various Furbish Lousewort plants from railway activities. Although this approach may involve some expense, it can allow interested conservationists to provide necessary protection for endangered plants through a variety of legal means without reference to government budgets, priorities, and procedures.

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DISAPPEARING COTTONWOODS: THE SOCIAL CHALLENGE

Cheryl E. Bradley

Eckholm's (1978) paper states "By far the biggest single cause of species extinctions over the next few decades will be the destruction of habitats." The most serious example of this given is the clearing of moist tropical forests in Africa, Asia, and Latin America, where animal and plant species, some as yet unidentified and often unique to small localities, are rapidly going extinct. Hundreds of species are expected to disappear. A less dramatic, prairie example is the drainage and cultivation of wetlands in the grassland and aspen parkland natural regions of North America. In Alberta alone, sixteen species specific to these habitats are identified as rare by Packer and Bradley (1984).

These losses of habitats and plant species are largely direct and deliberate, and theoretically can be controlled through legislation, policies, and programs to protect specific areas (e.g., ecological reserves, wilderness areas, parks, and wildlife sanctuaries). There are legal mechanisms in place to accomplish this in Canada's prairie provinces, however, the social challenge is to generate public support, particularly at the local level, for policies and programs to effectively prevent the loss of these threatened habitats.

More difficult to identify and control are inadvertent losses of species and habitats that result from the human activities distant to the specific habitats of plants and animals that are impacted. The effect of acid rain on aquatic and forest ecosystems is a well-known example of this. A less well-known example, which is the central theme of this paper, is the loss of riparian forest habitats in the semi-arid regions of North America (including the prairies) due to negative impacts of water management policies and practices on the life history of cottonwoods.

Since cottonwoods are the dominant species of riparian forests throughout the semi-arid regions of North America, widespread negative impacts on this one group of species can mean the disappearance of very productive habitats critical to several plant and animal species. Cottonwoods included in the group are Fremont's Cottonwood (*Populus fremontii*) in the deserts of the southwestern United States, Narrowleaf Cottonwood (*Populus angustifolia*) in montane regions of southwestern Alberta and northern Montana, and Plains Cottonwood (*Populus deltoides*) in the Great Plains from northern Texas to Canada's prairie provinces. Although occupying less than 1% of the total area of these regions, these riparian woodlands are disproportionately important as habitats providing food and cover for many wildlife species. For example, about 60% of bird species in the Great Plains nest, feed, or rest during migration in riparian cottonwood forests. They are important recreational environments and provide shade and forage for livestock.

Recent studies have noted a loss in riparian cottonwood forests and have attributed it to alterations in flow regimes caused by dams. My research along the Milk River in southern Alberta and northern Montana, (Bradley 1982, Bradley and Smith 1984, 1986), showed positive correlations between years in which cottonwoods had become established and years when high flows (greater than the 2-year return flood) occurred during the period of seed dispersal (late May - early July). These conditions developed on average once every 5 years.

The Fresno Dam, built in 1939 near Havre, Montana, caused erosion of the streambed and channelization downstream, a decrease in channel migration and point bar formation, and reduced flood magnitude and frequency. Since cottonwood seedlings in nature are recruited primarily onto newly formed point bars, when high flows occur during the period of seed dispersal, suitable conditions for recruitment seldom occur downstream. On the Milk River floodplain downstream of the Fresno Dam, there were very few cottonwoods younger than 45 years - significantly less than in populations upstream of the dam and reservoir. The population downstream of the dam is geriatric. In another 40 years, if present conditions continue, I anticipate that most of the trees on the floodplain will have disappeared.

Similar effects on Plains Cottonwood populations have been noted on the Missouri River (Johnson et al. 1976, Behan 1981) and South Platte River (Crouch 1979a and b), and on Fremont's Cottonwood populations in the American southwest (Johnson and Jones 1977, Fenner et al. 1985).

Although Narrowleaf Cottonwood has not been specifically studied in this regard, it is reasonable to postulate that its life history is similar to Plains and Fremont's cottonwoods and that the planned dam on the Oldman River, to be constructed in the next few years, will have major impacts on downstream populations. The best and most extensive example of the Narrowleaf Cottonwood forest ecosystem in Canada occurs only a few kilometres downstream of the dam site.

Since no major tributaries enter the Milk River downstream of the proposed dam site at the forks of the North and South Milk in Alberta, there is also the distinct possibility that Plains Cottonwood forests as far downstream as the Milk River Canyon Natural Area/Ecological Reserve will be detrimentally affected by the altered flow regimes should that dam be buit. The effects will be insidious and left for the next generation to realize when cottonwoods in their natural environment, and the wildlife dependent on them, are rare.

The social challenge is to counteract this trend. There are a number of steps we can take:

- survey river valley floodplains in the prairies to ascertain the extent of Plains Cottonwood forests and their importance as natural environments for plant and animal life and for recreation;

- when undertaking environmental impact assessments for potential effects of dams proposed for southern rivers, include the following: a) potential downstream effects on flood frequency, channel morphology, and lateral channel migration; b) potential downstream effects on cottonwood forests; and c) potential downstream effects on wildlife, recreation and aesthetics;

- consider placing dams upstream of minor but substantial free-flowing tributaries so that some influx of sediment and flooding will still occur downstream;

- when a decision to proceed with an obstruction of a southern river is taken, make allowances in operation plans of the dam for periodic man-induced early summer (June) high water, and monitor rates of channel migration and cottonwood regeneration downstream;

- undertake a study to determine the extent to which the regeneration of Narrowleaf Cottonwood and various cottonwood hybrids along rivers in southwestern Alberta are dependent on river regimes.

In Montana there is consideration of saving floodplain cottonwood forests by planting, watering, and fencing seedlings from cattle, a time-consuming and expensive proposition, but perhaps the only alternative to no floodplain forests at all (Behan 1981).

Although cottonwoods in the prairie provinces are not yet considered rare or endangered species, there is a threat to their survival in natural environments that is not currently being recognized.

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PLANT SESSION: PROBLEMS AND SUMMARY

Peter Lee

PROBLEMS

1. Insufficient information is available to determine whether most "rare" plant species in Alberta are in fact threatened, endangered, or extinct.

2. Present lists of rare plant spcies are tentative as determination of rareness may be biased due to the nature of collections and reporting of information.

3. No central database for maintaining accurate records of plant distribution and abundance.

4. Insufficient recognition of rare plants in planning, assessing, and administering natural resource management programs.

5. Low public awareness.

RECOMMENDATIONS FOR ACTION

1. Refine the definition of rare plant species to include widespread species that are rare throughout their range; species that occur as disjunct populations throughout their range; and localized endemics.

2. Define priorities for rare plants based on ranking of species in the existing "rare" lists; identify areas where concentrations of rare species occur and areas with restricted habitat types that support rare species.

3. Identify major geographic areas where information gaps exist so that the areas can be targeted for collection.

4. Expand general public awareness through such measures as signage, educational materials for schools, brochures, and other publications and advertisements.

5. Publish "Red Book" lists of sites of rare/threatened plants.

6. Involve naturalists and naturalist organizations as well as institutions (e.g., universities, colleges, museums, government agencies) in the collection of information on site locations and characteristics.

7. Establish an information (i.e., data handling) system for rare plants.

8. Designate and properly support a lead agency/group for rare plants.

9. Pursue both a government (i.e., legislative) and non-government approach (e.g., private landowner contacts, private legal agreements) for protecting rare plants.

10. Support research into population biology of rare plants.

11. Ensure that rare plants are considered adequately in all planning, environmental assessment, and natural resource management activities.

12. Develop objectives and implement management practices to ensure that plant species do not become rare, threatened, or endangered.

CONSERVATION OF ENDANGERED PRAIRIE INSECTS

Eric Whiting

STATUS REPORT AND GENERAL RECOMMENDATION

At present there is neither a list of endangered prairie insect species nor any conservation programs designed specifically to protect prairie insects. The absence of an endangered species list is due largely to the lack of knowledge about the prairie insect fauna. Although a few groups are reasonably well known (either because they are large and conspicuous like butterflies, or because they have been studied locally by taxonomic experts), there is a paucity of information about the distribution and abundance of most prairie insects. In addition, there are probably several species present that have not yet been recorded from the prairies, and at least a few that are completely unknown. Furthermore, most of the existing information about prairie insects is fragmentary, scattered, and unpublished.

A preliminary list of endangered prairie insects could probably be prepared by collecting and collating existing distribution records. This would provide some initial targets for conservation efforts, as well as identifying taxonomic groups and geographical areas that require additional study. Subsequent preparation of a more comprehensive endangered species list is also desirable, but will require a great deal of additional research on the taxonomy, distribution, and abundance of prairie insects.

Lack of funding for prairie insect conservation (both for basic research and for the development of specific conservation programs) is also a problem, and is primarly due to lack of public awareness and support. The majority of human-insect encounters involve pest species that are rarely endangered and most people have few opportunities to learn about other insects. Thus, a negative public image of insects develops, and the value of insect conservation is not perceived.

Greater public awareness may be achieved by expansion of insect interpretive displays in parks, teaching more about insects in public schools, encouraging media productions about insects, and increasing the profile of insects within the conservation movement. To maximize public interest and concern, insect awareness programs should emphasize the ecological and economic importance of beneficial insects, the diversity of insects, and the often remarkable adaptations of insects to their environments.

The development of successful insect conservation programs also requires a general strategy that is practical and realistic. Conservation programs for mammals and birds are usually designed to protect individual species. This strategy may also be practical for a few insect species, especially those that are conspicuous, popular, and reasonably well known (such as butterflies). However, species-oriented conservation strategies are not suitable for most insects because:

(a) Lack of knowledge makes it difficult to identify which species are endangered and to design meaningful conservation programs, and

(b) the number of endangered insect species is probably very high (although the actual number of endangered insects is unknown, the fact that more than half of all known animal species are insects suggests that the number of endangered species may be very high). Thus, the cost of protecting endangered insect species individually would be very high, while public support for insect conservation is very low.

It is more practical to preserve specific habitats or areas that contain a number of unique or rare insects (i.e. to preserve entire insect communities and their associated ecosystems as units) because:

(a) Insects are well suited to community-oriented conservation. Their small size and great diversity should allow large populations of several insect species to be maintained in a relatively small area.

(b) A community-oriented approach is more economical. Less manpower and fewer resources are required to protect several insect species within a single conservation program than to protect them individually.

(c) Conservation efforts can be combined with those of other habitat-oriented management programs that are designed for larger, more popular organisms (such as mammals and birds). This could greatly increase the impact of limited resources designated for insect conservation.

(d) Community-oriented conservation programs can be developed in the very near future. Programs designed to conserve individual species would take much longer to develop, because of the additional research required. Many rare species and their habitats may be lost before species-oriented programs could be implemented.

ACTION LIST

At present, no conservation programs have been developed or implemented specifically to protect prairie insects. The major impediments to developing such programs are lack of knowledge about the prairie insect fauna and lack of public awareness and support. To address these problems and facilitate the future development of programs to conserve endangered prairie insects, the following actions are recommended:

1. Preparation of a list of insect species presently known from the prairies and a preliminary list of endangered prairie insects including the known range of each species. Preliminary lists may be prepared by collecting and collating existing published and unpublished collection records (and other relevant data). Unpublished records may be solicited from entomologists at universities and government research stations, and from amateur entomologists. The Biological Survey of Canada (Terrestrial Arthropods, National Museum of Natural Sciences, Ottawa) should be encouraged to take an active role in this project. Faunal lists should be updated regularly and revised as new information becomes available.

2. Selection of habitats or areas that are potentially suitable for the development of insect conservation programs. Criteria for site selection may include:

   a) Presence of several rare or unique insect species. Available information should allow the selection of one or two sites on this basis; e.g., the South Saskatchewan River between the Saskatchewan/Alberta border and Gardner Dam, where at least 25 species of rare or endangered aquatic insects are known to occur. Preparation of a preliminary list of endangered prairie insects should facilitate the recognition of other unique areas.

b) Presence of several rare or unique plant or vertebrate species, or unique geomorphology. These may indicate the existence of rare insects in areas where knowledge of the insect fauna itself is inadequate. The Athabasca Sand Dunes and The Great Sand Hills (in southwestern Saskatchewan) are two such areas where rare insect species might occur.

Special consideration should be given to habitats or areas meeting the above criteria that are also threatened by major environmental disturbances, or that lie within parks or other government-administered lands (government ownership or control should facilitate the development of conservation programs). Native grasslands within the proposed Grasslands National Park merit special attention as a potential insect conservation area for both of these reasons. Once areas of potential importance for insect conservation have been selected, further research on their insect faunas should be encouraged.

3. Increased development of insect interpretive displays in parks, including some mobile displays that can be sent to public schools. This would help to increase public interest and support for insect conservation and simultaneously provide an opportunity for research on the insect fauna of parks. Insect displays could be developed through the combined efforts of park naturalists and provincial entomological societies. Many park naturalists are already interested in developing insect displays, and entomological societies in at least two provinces have active public education programs. Increased communication between these two groups, combined with a modest amount of funding, should lead to an increase in the number of insect interpretive displays in prairie parks. An increase in the number of park naturalists with entomological experience would also be beneficial.

4. Establishment of a central committee to coordinate insect conservation programs in the prairie provinces, encourage the initiation of new conservation programs, and act as a liaison among groups concerned with prairie insect conservation. This committee should include respresentatives from the three prairie provincial entomological societies; university entomology departments; the Biological Survey of Canada (Terrestrial Arthropods); provincial museums; and national, provincial, and local parks. It should meet once or twice a year to evaluate the current status of prairie insect conservation and formulate general policies. Day-to-day business should be handled by a small full-time staff. Ideally, the committee should also provide funds to help initiate and support specific insect conservation programs.

THE BULL TROUT - ENDANGERED IN ALBERTA

Wayne Roberts

The Bull Trout (*Salvelinus confluentus*) has suffered a marked decline in abundance in Alberta (Allan 1980, Nelson and Paetz 1982, Roberts 1982, Paetkau 1984). Bull Trout were not only more abundant in the first half of this century but also occupied the plains portions of east slope streams such as the badlands of the Red Deer River (Cavender 1978) and the vicinity of Edmonton on the North Saskatchewan River.

Through angling, natural history observations, and research during a period of over twenty-five years, I have noted the decline or disappearance of Bull Trout from a number of streams in west central Alberta. Information regarding the distribution and abundance of Bull Trout in the early 1900s was obtained through conversations with long-time residents of this area. Except where noted the information presented here is from the author's field notes, angling log, and species accounts.

Within the Red Deer River drainage the Bull Trout formerly reproduced in tributary streams at least as far downstream as the Raven River. Presently the Bull Trout is absent from the Raven, Stoney Creek, and others where it formerly occurred in great abundance. Only one significant rearing stream (Pinto Creek) has been identified in the upper Red Deer Watershed (Anon. 1985). George McNutt, a resident along the Clearwater River since 1914 noted the presence of Bull Trout in tributaries to the Clearwater downstream to its confluence with the North Saskatchewan River. The abundant "native brook trout" (juvenile Bull Trout) indicated that these streams were used for spawning and rearing. At present Bull Trout are not known to reproduce in tributaries downstream from the Tay River. The Tay River population is nearly extirpated. Populations in a number of tributaries immediately upstream of the Tay River are severely reduced (Allan 1980). It is reasonable to expect that the decline of Bull Trout within the Red Deer and Clearwater rivers is typical for the species in other free flowing streams as well.

Reasons cited for the decline of Bull Trout in Alberta include habitat alteration, excessive angler harvest and competition with exotic trout species. The role of habitat alteration must be regarded as minimal as much of the habitat formerly occupied by the Bull Trout presently supports populations of Brook Trout (*Salvelinus fontinalis*), Brown Trout (*Salmo trutta*) or native *Salmo* species. Allan (1980) notes that much of the upper Clearwater River is underutilized by Bull Trout and that environmental degradation is not an important factor in this area. The role of competition for food and space with exotics appears to be largely speculative. Bull Trout naturally occurred with other trout species along the east slopes of Alberta. Mixed populations of Brook, Brown and Bull Trout were known to occur in the Tay River until recently. Bull Trout were abundant and appeared not to be suffering as a result of the presence of exotics.

Hybridization between Brook Trout and Bull Trout is known from a number of Alberta streams. It appears to occur mainly in situations where Bull Trout are scarce and female Bull Trout are likely to encounter many male Brook Trout. Also, the spawning of these two species overlaps both temporally and spatially. In two situations, single female Bull Trout and hybrids were found in beaver dams populated by Brook Trout and no other Bull Trout. Hybridization appears to be more the result of the decline of Bull Trout than the cause of decline.

Excessive angler harvest is the acknowledged major factor in the decline of Bull Trout (Anon. 1985). Bull trout are easily caught - that is they readily take a wide variety of lures and baits. In a mixed species community of trout and char it is to be expected that disproportionately high numbers of Bull Trout will be harvested by anglers and relatively fewer of the other species will be removed. Selective removal by anglers becomes the agent of change in the population rather than competition with exotics. This is not to deny the existence of any competition but points out the relative unimportance of competition in the decline of the Bull Trout.

Aside from the ease of capture by anglers, Bull Trout populations are poorly able to cope with the angler harvest owing to the late age at which they attain sexual maturity. Bull Trout generally do not become sexually mature until they are five, or more frequently, six or seven years old (Radford 1977, Stirling 1978, Allan 1980). As Bull Trout may be taken by anglers when the trout are in their second or third summers of life, most are probably harvested before they become sexually mature. This results in few adult fish and exceedingly small spawning runs such as those documented by Allan (1980) where zero to ten redds were found in study tributary streams surveyed along the Clearwater River. Much larger populations of spawners were observed there within the last 20 years. It is to be expected that continued harvest from such depleted populations will lead to their extirpation.

Bull Trout decline first in the lower reaches of rivers where relatively few but large fish are found. Accessible tributaries are easily fished out. That Bull Trout exist as residual populations in headwater regions, or sometimes occur there in abundance, is not as a result of differences in the nature of the streams themselves but merely the result of reduced angler access and harvest. Bull Trout populations in headwater regions are rapidly depleted following improved access for anglers provided by logging or oil roads. Maintenance of remote headwater areas is vital to the continued prosperity of such populations.

Native trout and char populations in headwater regions are becoming an increasingly valuable resource and are highly prized by knowledgeable anglers (Smith 1984). From the point of view of aesthetics they provide one of the ultimate freshwater angling experiences. Their value will only increase with time provided they are afforded the necessary protection - maintenance of their remoteness and wise use by those who experience them.

Within Alberta, the stated management objectives for the Bull Trout include protection from extinction, rehabilitation of depleted populations and development of an education program for anglers (Anon. 1985). The first of the management recommendations listed in the report reads as follows: "Develop fishery regulations to protect Bull Trout stocks during spawning and rearing and regulate fishing in line with the production surplus." Most populations have no demonstrated production surplus and any harvest of depleted or declining populations undermines all of the aforementioned objectives. Continued angler harvest constitutes a real threat to the survival of many populations of Bull Trout. Such harvest results in the angling public unwittingly participating in the decline. Anglers are under the impression that the government is acting in response to the best available biological information and that there are indeed surplus harvestable Bull Trout. Surely anglers would retain alternative harvestable species if they knew that there are no "surplus" Bull Trout. Bull Trout can be caught and released numerous times. They are an ideal catch and release salmonid. Anglers need not be denied the opportunity to fish for Bull Trout on a catch and release basis but this species in its present state of decline cannot withstand angler harvest. Any harvest of Bull Trout from declining populations is inconsistent with biological reality, and the provincial management plan and does nothing to bring the average angler onto the side of conservation. Butler and Maw (1985) note the role of ineffective regulations in the decline of Bull Trout stocks.

It is noteworthy that the Federation of Alberta Naturalists, Trout Unlimited, Edmonton Trout Club, and Alberta Fish and Game Association asked the government in a resolution passed at the 1983 Fish and Game convention to cease the harvest of Bull Trout except in populations with a harvestable surplus. However, Bull Trout harvest is still permitted in Alberta and the process of decline continues. Placing the Bull Trout on an action list of threatened species will be an important first step in ensuring its future survival. Cessation of harvesting from depleted stocks and stocking to suitable areas will be required to maintain and restore Bull Trout stocks. In its present state of decline the Bull Trout is an indication of our failure as stewards of renewable resources.

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CONSIDERATIONS IN THE PROTECTION AND CONSERVATION OF AMPHIBIANS AND REPTILES IN ALBERTA

James R. Butler
and
Wayne Roberts

Alberta's herpetofauna consists of eighteen known species of amphibians and reptiles, of which seven species (39%) are uncommon enough to be recognized as potentially threatened. All seven, and some populations of an additional species are deserving of special management consideration or some form of population monitoring. The majority of those species and populations under concern (63%) are associated with prairie environments, often confined to specific habitat requirements within southeast Alberta. These would include the Plains Spadefoot (*Scaphiopus bombifrons*), the Great Plains Toad (*Bufo cognatus*), the Eastern Short-horned Lizard (*Phrynosoma douglassi brevirostre*), the Western Painted Turtle (*Chrysemys picta belli*), and the Western Hognose Snake (*Heterodon nasicus*).

The Long-toed Salamander (*Ambystoma macrodactylum*) may have reached Alberta through mountain passes following post-glacial colonization of intermontane corridors in British Columbia from glacial refugia to the southwest. While widespread along some of Alberta's mountain valleys, populations are scattered due largely to unsuitable habitats. Only sixteen Alberta locations are currently known.

The Northern Leopard Frog (*Rana pipiens*) on published distribution maps appears widespread throughout eastern Alberta. In reality, surveys here indicated that the species is absent throughout most of this range (Roberts 1981, Roberts 1987).

Within populations of the widespread and relatively common Tiger Salamander (*Ambystoma tigrinum*) concern exists for the protection of populations of the distinct sub-species *A. t. diaboli*, the Grey Tiger Salamander, which may occur in Alberta only along a limited area of the central Saskatchewan border. Concern also exists for the protection of specified sloughs, ponds, and lakes where the aquatic larvae of Tiger Salamanders remain through their lives in the juvenile gilled condition (neoteny). The habitats of neotenous Tiger Salamanders must be free of predatory fishes and of adequate depth to escape freezing. Such locations, and their large neotenous inhabitants which can exceed 300 mm in length, are deserving of special recognition.

Populations at the extreme of their distributional range offer interesting opportunities for behavioural or physiological studies. Eight species of amphibians and reptiles reach their northernmost limits in Alberta, and others mark their western and eastern limits here. These populations may give us insights into active evolutionary processes, and are deserving of special attention. The discovery of widespread occurrences of neoteny in Tiger Salamander populations in permanent water in central Alberta is but one illustration.

What on range maps appear as continuous distributions are often in reality high fragmented. With expanded agricultural cultivation and associated drainage of wetlands, amphibian populations in Alberta may have actually been in a state of decline over the past 50 years, with the prospects of expansion highly unlikely. Isolated populations of the Great Plains Toad and Plains Spadefoot should receive important provisions towards protection. Populations of the Short-horned Lizard probably are relicts of a formerly widespread species and are restricted presently to favourable habitats as a result of climatic change (Powell 1983) and likewise require protection.

Over-wintering hibernation sites, which are termed hibernacula are important locations for snake populations, especially the Red-sided Garter Snake (*Thamnophis sirtalis parietalis*), the Plains Garter Snake (*T. radix*), the Wandering Garter Snake (*T. elegans vagrans*), the Bullsnake (*Pituophis melanoleucus*), and Prairie Rattlesnake (*Crotalus viridis*). Such locations must be recognized as critical wildlife habitats and be granted the full capacity of protection.

North Americans have demonstrated in recent years an expanded sense of stewardship for a wide spectrum of the wildlife resource. This is manifested through expanded attention to wildlife appreciative recreation patterns which have given rise to multi-million dollar wildlife viewing industries (Butler 1984) and record contributions and memberships in environmental concerns and related organizations. While amphibians and reptiles have never held a high profile in the wildlife conservation movement in Alberta, society's concern in general for the welfare of wildlife does indeed embrace this group.

This was made evident in 1985 when adjacent to Alberta's Bow Valley Provincial Park, Canada Cement Lafarge Ltd. requested a zoning change to expand its shale-quarrying operations. The expansion site would have destroyed a unique breeding population of the Long-toed Salamander here at an abrupt mountain-grassland ecotone in its only sympatric location with the Tiger Salamander. The media rallied on behalf of a salamander. The Alberta report (March 25, 1985) with color photographs featured an article *The Salamander's Awful Fate: Canada Cement wants to turn them into concrete.* The Edmonton Journal (March 11, 1985) carried the heading, *Rare Salamanders Threatened by Plan to Expand Quarry*; and later on another day with a heading *Salamanders Win Reprieve From Crushers*, and yet again, *Rare Salamanders Win Reprieve From Demolition.*

The national magazine *Equinox* also joined in the eventual celebration of the salamander's protection (September - October, 1985) in an article titled *Salamander's Reprieve: Environmentalists Win the Battle to Preserve a Unique Alberta Habitat.* Several radio stations carried interviews concerning the fate of this salamander population and pin-on buttons proclaiming *Save the Long-toed Salamander* were prominently protrayed along city streets in Edmonton and Calgary. The entire episode constituted an unparalleled Canadian response for the protection and conservation of an amphibian. Whether such a response would have occurred even twenty years ago is perhaps questionable, but such a response today is consistent with society's expanding sense of stewardship for a wider spectrum of the wildlife resource.

As field guides both nationally and provincially have increasingly addressed herpetofauna, public awareness of this group has substantially increased. Butler and Fenton (1986) discovered during resource familiarity field quizzes with bird watchers (N = 168) at Pt. Pelee National Park that people recognized a greater percentage of amphibians and reptiles (54%) than they did common wild flowers (46%).

Consistent with the phases Butler (1984) has identified that Canadian Fish and Wildlife agencies have undergone and are undergoing in the stewardship and management of wildlife resources, Alberta Fish and Wildlife have only recently made in-roads into the Ecological Phase of Phase IV which is partially defined by expanded attention to a full range of wildlife species, which includes amphibians and reptiles. An important first step in the conservation of amphibians and reptiles in Alberta, was the formal recognition and listing of five species of amphibians and reptiles as either rare (Long-toed Salamander), threatened (Eastern Short-horned Lizard), endangered (Western Painted Turtle and Western Hognose Snake) and declining (Northern Leopard Frog) with a defined long-term goal of monitoring population status and ensuring viable populations (Alberta Fish and Wildlife 1984).

Increased attention to non-game species within the Alberta Fish and Wildlife Division is necessary to ensure the adequate management and conservation of amphibian and reptile populations in Alberta. An expanded framework for the identification, and protection of sites of special natural interest, such as recently developed by Braidwood (1986) is needed. This proposed classification system allows for the recognition and protection of site types which recognizes locations of low or unknown population levels, peripheral populations, disjunct/outliers, unusual concentrations or associations, and areas of special genetic interest. Increased ties with private landowners, including incentives for protection of critical habitats must be implemented. Funding is needed to conduct field surveys concerned with species distribution and population numbers.

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THE NORTHERN LEDPARD FROG - ENDANGERED IN ALBERTA

Wayne Roberts

The Northern Leopard Frog (*Rana pipiens*) has suffered a marked decline in abundance in Alberta since 1978 and is presently absent from much of its former range. Roberts (1981) reported the absence of Northern Leopard Frogs from a number of known spawning sites within central Alberta during 1979 and 1980. Subsequent visits to many such sites during each of the past five years have resulted in no sightings of this species. Enquiries made of naturalists, scientists, fishermen, and farmers have yielded no recent records of Northern Leopard Frogs in central Alberta although many of these people recalled seeing them in abundance "years ago." This species still occurs in extreme southern Alberta, for example along the Milk River, however, it is much less abundant than before (C.B. Smart, personal communication). There are Northern Leopard Frogs in a disjunct northern population at Wylie Lake (C. Wallis, personal communication) but information on the number of such populations and their historical abundance is lacking. Harper (1931) found this species in the Northwest Territories but not in northeastern Alberta.

The distribution of the Northern Leopard Frog is shown by Schueler (1982) and Cook (1984) as including roughly the eastern half of Alberta in the south and a narrower eastern band in the north. Specimen records for Alberta, north and east of Edmonton, are lacking and sight records are few. South of Edmonton, Northern Leopard Frogs were previously widespread and abundant especially along larger streams, tributaries and associated ponds and lakes. Northern Leopard Frogs are now apparently absent from much of this area except in the extreme south.

Leopard frogs have declined elsewhere since the 1960's (Gibbs *et al.* 1971, Modern Medicine 1973, Hine *et al.* 1981). Redleg disease, overwintering mortalities, and toxic substances have been implicated in the decline. Cook (1984) attributes sudden crashes in Canadian populations of Northern Leopard Frogs to "rigours of the environment." Why the decline in Alberta was so abrupt and over such a large area is unclear. It was not possible to study the decline of many populations as their disappearance was so sudden and complete.

This species has been successfully introduced outside of its natural range (Green 1978) and should be reintroduced within its former range in Alberta. Reintroduction to selected favourable habitats within Alberta may provide an opportunity to understand the reason(s) for the decline of this species if the success or failure of the introduced populations is monitored closely. If these introductions were successful they would act as centers of dispersal and aid in the reestablishment of this species within its former range.

It is discomforting to know that a species so abundant and widespread can disappear so fast - unnoticed by most. Hine *et al.* (1981) aptly sum up the decline as follows: "The drama of the leopard frog decline that has been unfolding over the past decade may provide a vital insight into ecosystem health - it must not go on unnoticed or unattended."

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STATUS REPORT ON THE REPTILES AND AMPHIBIANS OF SASKATCHEWAN

D.M. Secoy

The following discussion on the population status of the Saskatchewan herptiles is very tentative, due to, in the case of most forms, a severe lack of information. There has rarely been systematic collection in any area or of few forms. Any information which indicates that any of the following assignment of a particular species to a status is inappropriate is welcome.

SECURE

I would assign the following species to the status of 'secure', with the recognition that there may be fluctuations in population levels due to short-term climate change or local disturbance. They are typically generalists in their habitat requirements. The recent near decade of drought in the southern part of the province has brought some species to low levels. Another important factor for many of these species, since they breed, forage, or overwinter in or near water, is the continuing tendency in the southern part of the province to drain sloughs and other shallow-water habitats and to channel streams and rivers in order to increase drainage of spring meltwaters. For these reasons, it could be argued that many of these species are threatened, particularly in the long term. The snakes, in particular are more vulnerable, because of human attitudes.

Tiger Salamander (*Ambystoma tigrinum*).--Fairly common in the prairie and aspen parkland habitats where their breeding conditions are met.

Canadian Toad (*Bufo hemiophrys*).--Found in all of Saskatchewan, except for the far north-east. Can be locally abundant near sloughs, marshes and other water bodies, particularly in the aspen parklands.

Boreal Chorus Frog (*Pseudacris triseriata maculata*).--Found in all of Saskatchewan, except for the far north-east. Apparently less abundant than formerly in the grasslands, with slough drainage.

Wood Frog (*Rana sylvatica*).--Found in all of Saskatchewan, except the short-grass prairie region of the southwest. Populations apparently healthy.

Leopard Frog (*Rana pipiens*).--Found in all of Saskatchewan, except the northeast corner. Populations known to fluctuate widely.

(?) Snapping Turtle (*Chelydra serpentina*).--Found in the Qu'Appelle, Souris and Frenchman Rivers. Less common than the Painted Turtle and more likely to be hunted.

Western Painted Turtle (*Chrysemys picta belli*).--Found in the Qu'Appelle, Souris and Frenchman Rivers, and the ponds in their floodplains (see MacCulloch 1981).

Red-sided Garter Snake (*Thamnophis sirtalis parietalis*).--Spotty in its distribution through the province (records from Weyburn, Amisk Lake, the Cypress

Hills, Cluff Lake), but apparently locally abundant.

Western Plains Garter Snake (*Thamnophis radix haydeni*).--The most abundant snake in the province - so abundant as to be considered a pest in the southern third of the province. Populations fluctuate greatly with the drought cycle (see Dukart 1984).

Wandering Garter Snake (*Thamnophis elegans vagrans*).--Apparently fairly common in the grasslands of the western margin of the province, south of the North Saskatchewan River.

RARE

I would assign the following species to the status of 'rare'. These animals are either at the very margins of the distribution for their species or they have narrow habitat requirements. They are all vulnerable and could easily disappear from the province with a climate shock or habitat destruction.

Plains Spadefoot (*Scaphiopus bombifrons*).--This toad is found in the sandhills of southwestern Saskatchewan and valley areas of the grasslands.

Great Plains Toad (*Bufo cognatus*).--Found in the dry grasslands of the very southwestern corner of the province. Less vulnerable to the draining of the sloughs than the amphibians of the eastern grasslands, since it is in cattle, rather than wheat, country.

Eastern Short-horned Lizard (*Phrynosma douglasi brevirostre*).--Found very locally in rocky outcrops in the Frenchman River valley and the Cypress Hills.

Red-belly Snake (*Storeia occipitomaculata*).--This eastern woods form is known only from the lower Qu'Appelle Valley.

Smooth Green Snake (*Opheodrys vernalis*).--Another woodland snake reported from the Qu'Appelle, Souris and Big Muddy valleys.

Western Hognose Snake (*Heterodon nasicus*).--Uncommon, in the short grass prairie.

Bullsnake (*Pituophis melanoleucas sayi*).--Uncommon; perhaps should be considered 'threatened' since it is often killed because of confusion with the Prairie Rattlesnake.

Eastern Yellow-bellied Racer (*Coluber constrictor flaviventris*).--Only a few specimens have been reported from the Frenchman and Big Muddy river valleys.

THREATENED

Prairie Rattlesnake (*Crotalus viridis viridis*).--While there are fairly large populations of this species associated with hiberncula in the rocky outcrops of the Frenchman and South Saskatchewan River valleys, the species is systematically persecuted by humans and must be considered threatened (see Gannon 1980).

CONCLUSIONS

These assignments of the Saskatchewan herpetofauna to the various status levels is extremely problematic. There has been little systematic collection within the province (but see Secoy 1976) and attempts to raise funds for collecting baseline data on population sizes and distribution have not been very successful. Until this basic information is available, the status designation is difficult to document and any attempts at protection difficult to justify. Funding should be sought for examination of the basic data of these and other ectotherm groups so that our ability to assign status is as well founded as it is for birds and mammals.

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AMPHIBIANS AND REPTILES IN MANITOBA

William B. Preston

None of the 22 species of amphibians and reptiles known to occur in Manitoba are endangered at present. Three, however, are listed as protected species under the Manitoba Wildlife Act: the Plains Spadefoot (*Scaphiopus bombifrons*); the Northern Prairie Skink (*Eumeces septentrionalis septentrionalis*); and the Plains Hognose Snake (*Heterodon nasicus*). The Plains Spadefoot is officially regarded as rare in Manitoba but is probably much more abundant than formerly believed (Preston and Hatch 1986). Probably of greatest concern in the welfare of this species is habitat since it requires low areas that will form seasonal pools of water of sufficient duration for tadpole development. Also of concern are pesticide residues in agricultural areas. Spadefoots readily breed in flooded areas of planted fields and the effects of pesticide residues on the developing tadpoles are unknown.

The Northern Prairie Skink is also officially regarded as rare in Manitoba. Although this species is highly restricted in distribution in Manitoba, it has recently been found in several new localities (E.J. Bredin, pers. comm.). Much of the skink's habitat is contained within a provincial park and a military reserve, but may still be subject to disturbances within these protected areas (i.e., development in the parks, fires in the military reserve, etc.). The Plains Hognose Snake is officially regarded as threatened in Manitoba. This species has been collected or observed in several new localities in recent years and therefore may be more widespread in Manitoba than was suspected, but is still quite restricted in distribution. As for the previous species, habitat preservation is of primary concern and the Hognose Snake should retain its protected status. A Master's thesis, through the University of Manitoba, on the biology of this species is nearing completion.

For seven species, including the three mentioned above, a permit is required in order to collect specimens for scientific or educational purposes. The four additional species are: the Green Frog (*Rana clamitans*); the Mink Frog (*Rana septentrionalis*); the Common Snapping Turtle (*Chelydra serpentina*); and the Western Painted Turtle (*Chrysemys picta belli*). The Green Frog and the Mink Frog are at the western periphery of their range, barely entering Manitoba from Ontario. The Green Frog is known in Manitoba from two specimens but is fairly common in some localities in northwestern Ontario. The Mink Frog, although restricted in its Manitoba distribution, seems fairly common in its habitat, much of which lies within the boundaries of provincial parks. In regard to the two turtle species, populations do not appear to be high enough to sustain any large scale collecting.

Four additional species, the Gray Tiger Salamander (*Ambystoma tigrinum diaboli*), the Northern Leopard Frog (*Rana pipiens*), the Western Plains Garter Snake (*Thamnophis radix haydeni*), and the Red-sided Garter Snake (*Thamnophis sirtalis parietalis*), require permits for commercial collecting. The Red-sided Garter Snake is officially regarded as threatened, not as a species but in respect to hibernaculum populations that appear to be declining due to overharvesting. A research project is currently underway through the Natural Resources Institute, University of Manitoba, to assess the effect of harvesting on a den population. There is some concern regarding the use of Tiger Salamanders as bait in angling. This could lead to extirpation of some larval populations and possible mixing of populations through release of unused bait animals. I do not see a necessity to use these animals for bait on a commercial basis.

The Great Plains Toad (*Bufo cognatus*) is a recent addition to the herpetofauna of Manitoba, known only by two specimens, one taken in 1983 (Preston, 1986), and one taken in 1986.

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THE WHITE PELICAN

Steven H. Brechtel

"A wonderful bird is the pelican,
His bill will hold more than his belican
He can take in his beek
Food enough for a week
But I'm dammed if I see how the helican."

D.L. Meritt

BACKGROUND

Although few individuals have had personal contact with the American White Pelican (*Pelecanus erythrorhynchos*), almost everyone can recognize its distinctive appearance. Unlike the diminutive Piping Plover (*Charadrius melodus*) or the relatively nondescript Baird's Sparrow (*Ammodramus bairdii*), White Pelicans present a striking public image. This high profile has been, at best, a mixed blessing.

Early in this century, public awareness of the fish-eating habits of this species lead to its exclusion from international protection under the Migratory Birds Convention Treaty between Canada and the United States. This error has yet to be rectified. In addition, the pelican's habit of nesting in large colonies on easily accessible islands has led them into continual contact with man; often to their detriment. Few people realize that even a brief visit to an active colony may cause the death of eggs and/or young from temperature stress or predation, or result in adult birds abandoning their newly established nests.

On a more positive note, the visibility of pelicans has also contributed to the public and professional concern which lead to the preparation of the 1978 Status Report for the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This report detailed the decline in pelican numbers and identified human disturbance at the nesting colonies as the main management problem. In response to these factors, and the general lack of management protection, COSEWIC designated the White Pelican as threatened in Canada (Markham 1978).

Since that time, considerable effort has been directed at documenting the status of the White Pelican in each of the provinces in which it breeds (Roney 1979, Brechtel 1981, Dunbar 1984, Koonz and Rakowski 1985). The papers presented in this working group provide a unique compilation of present regional data and perspectives. Although not included in the working session, a brief report on the single colony in British Columbia is included at the end of this summary.

Since 1978, provincial wildlife agencies have initiated a variety of protective and management programs for White Pelicans:

- British Columbia, Alberta, and Ontario have declared this species to be endangered under provincial legislation.

- British Columbia, Alberta, and Saskatchwan have enacted protective regulations prohibiting access on some (Alta.) or all (B.C., Sask.) nesting colonies during the breeding season, and have carried out limited habitat protection and/or development activities for this species.

We have come a long way since the 1978 COSEWIC Report, and have a much better understanding of both the species and what actions are necessary to ensure its future success in Canada.

ACTION LIST

The following Action List defines and explains the most essential management programs required to maintain the Canadian White Pelican population. In order of importance:

1. DISTURBANCE AT OR NEAR THE COLONY SITE DURING THE NESTING SEASON MUST BE PREVENTED.

If no other action is taken, this one restriction would probably ensure the continued survival of all White Pelican populations in Canada. This will require:

(a) legislation precluding access on colonies or within a 100 to 500 m buffer zone around each nesting island from at least 15 April to 15 September annually; and

(b) a commitment by provincial authorities to actively enforce protective regulations, and an increase in the awareness of enforcement personnel of the sensitivity of this species and the reasons for its protection; and

(c) a coordination of management, research, and enforcement programs to minimize disturbances. (e.g., census, banding, sign placement, monitoring etc.)

2. A COORDINATED MONITORING PROGRAM FOR INDIVIDUAL COLONIES AND REGIONAL POPULATIONS SHOULD BE ESTABLISHED.

The colonial nesting habit of this species leaves it vulnerable to major population fluctuations. A monitoring program will provide early warning of any problems as well as rapid identification of new or relocated colonies requiring protection. Surveys should also identify major foraging areas and traditional loafing sites.

3. A COMPREHENSIVE PUBLIC COMMUNICATIONS PROGRAM SHOULD BE INITIATED WHICH WILL INCREASE PUBLIC AWARENESS OF THE UNIQUE REQUIREMENTS OF ALL COLONIAL BIRDS, INCLUDING WHITE PELICANS.

To be effective, management, regulations and protection must be supported by an active public communications/education program. Specific target groups and messages include:

(a) Fishermen, both commercial and recreational, should be informed that pelicans do not generally compete with them for fish.

(b) Regulatory and Land Management agencies should be made aware of the presence, and requirements of colonial nesting sites to prevent unnecessary conflicts.

(c) Users of lakes with nesting islands should be informed of the reasons for and extent of protective regulations.

(d) A general public awareness of colonial management programs and species requirements should be fostered. This will minimize the unintentional disturbance of colonies by visitors. It will also encourage positive political feedback and support for continuing management programs.

4. ECONOMIC SUPPORT SHOULD BE PROVIDED FOR MANAGEMENT-ORIENTED WHITE PELICAN RESEARCH.

Topics requiring attention include:

(a) what factors have lead to the present expanding population,

(b) what behavioral or habitat elements contribute to the initiation or abandonment of individual colony sites,

(c) regional definitions of food habits and the importance of foraging areas and traditional loafing sites,

(d) interspecific interactions on mixed-species colonies and the impact of pelican management programs on other species, and

(e) pelican response and sensitivity to various disturbances.

5. APPROPRIATE ACTIVE HABITAT MANAGEMENT PROGRAMS SHOULD BE INITIATED.

Although each colony has specific requirements, the following general objectives should be met:

(a) In British Columbia, Alberta, and Ontario: create, enhance, or protect alternate nest sites to allow or encourage relocation in response to disturbance or loss of existing habitat. This will "spread the risk" and help to secure the long-term survival of these relatively small provincial populations.

(b) In all areas: ensure the physical integrity of colony sites and incorporate colonial waterbird habitat requirements into future land and water management programs.

In addition to the above-noted action items, the following general concepts should be incorporated into all long-term management programs:

(a) Virtually all White Pelican nesting sites are actually mixed-species colonies including a variety of other colonial birds (cormorants, gulls, terns, etc.). Each of these species has unique habitat and life-history requirements. It is important that management for one species be balanced against the various and sometimes conflicting requirements of other species.

(b) It appears that regional populations and possibly individual colonies have developed specific requirements and adaptations which must be considered when management is planned (e.g., the opportunistic feeding on "garbage" in Manitoba, or variations in the tolerance and response to aircraft). For management to be effective, it must include both overall protective legislation and colony-specific operational management programs.

CONCLUSION

After consultation, it is the unanimous opinion of the working group that the status of the White Pelican, as defined by COSEWIC, be changed from "Threatened" to "Rare". This recommendation is made with some trepidation. Biologically, this species fits easily into the "Rare" category. Politically, however, a 'de-listing' may be perceived as ending the need for active management and concern. This is not the case.

Although we do not have a complete understanding of why the Canadian White Pelican population has stabilized and increased, one significant factor has been the legislative and management protection given to nesting colonies in British Columbia, Alberta, Saskatchewan, and Ontario. To a large extent, these programs were initiated in response to the original COSEWIC threatened listing. It will be important to communicate to both the public and regulatory bodies, that the management required by a "Threatened" White Pelican is very similar to that required by one which is "Rare".

In designing future programs, the Saskatchewan legislation provides a good example of appropriate management. Although this species has no unique designation under Saskatchewan legislation, all colony sites are protected from disturbances during the breeding season. In addition, a continuing monitoring program has been implemented and newly-found or formed colonies are rapidly granted protection. If all White Pelican colonies were afforded similar protection, the future of this species in the Canadian prairies would be assured.

In this era of high extinction rates, it is most satisfying that the recovery of the White Pelican can be considered a success story. In Canada, concern for this species lead to its designation as "Threatened" in 1978. Since then, management, research, protective legislation and other less clearly understood factors have combined to reverse an apparently declining population trend. Although it may always be "Rare" in portions of its range, and future threats may arise, this species is no longer threatened in Canada.

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STATUS AND MANAGEMENT OF THE WHITE PELICAN IN BRITISH COLUMBIA

Dave Dunbar

(NOTE: The following is the text of a January 22, 1986 letter by Dave Dunbar, Wildlife Biologist in charge of Bird and Non-game Management, Lower Mainland Region, B.C. Ministry of the Environment to Steve Brechtel.)

"... In our absence, I will briefly outline the current status of the colony in B.C. and indicate our present management concerns. I also have attached a copy of my thesis, 'The Breeding Ecology and Management of White Pelicans at Stum Lake, B.C.' A Ministry of Environment published copy of my thesis will be available at the end of this week. If workshop participants desire a copy, I would be glad to supply them with one.

A. Current Status of the Colony

Table 2 of my thesis (page 73) lists the number of adults, nests, clutch sizes, productivity and survivorship of White Pelicans at Stum Lake from 1953 to 1980. Details for these years are described in Chapter 3. The following table is data collected at Stum Lake since 1980:

Year	Minimum No. Adult Observed	Total No. Nests	Fledged Young	Productivity (Young/Nest)	No. Young Banded
1981	-	96	58	0.60	-
1982	-	123	76	0.62	3
1983	-	-(a)	100	?	95
1984	200	120	73	0.61	66
1985	-	-(b)	91	?	89

(a) No survey conducted due to logistic problems with remote-control aircraft.

(b) No survey conducted due to internal disorganization.

Overall, the Stum Lake colony appears to be doing fairly well. The number of nests are generally high (at least when we count them) and seem to be relatively consistent during the last few years. Likewise production at the colony also has been fairly good. The colony is still quite vulnerable, however, and there are no plans to remove it from its present designation of "endangered" in British Columbia.

B. Limiting Factors

The limiting factors at Stum Lake continue to be human disturbance and coyote harassment. Evidence of coyote harassment was observed as recently as 1984 while I was at the colony counting nests. Several dead adults were observed (freshly killed) and quite a few courting birds (80) with no nest sites were present. A more detailed discussion of predation and disturbance effects are provided in Chapters 6 and 8 in my thesis.

C. Problems in Management

The two factors listed above are very difficult to control, particularly in light of the remoteness of the lake and the distances involved (from Ministry of Environment Regional Headquarters and District offices to the lake) in maintaining adequate enforcement. Other obvious problems are limited available funds (especially for non-game animals) and staff time.

One other problem that we believe we have now corrected was a disorganized monitoring program (the colony occurs within a Provincial Park which is regulated by the Ministry of Lands, Parks and Housing; is protected by the Wildlife Act of the Ministry of Environment; and, has recently been surveyed by Environment).

D. Current Management Practices

Current management at the colony involves two broad areas; (i) a monitoring and banding program; and, (ii) habitat enforcement and land acquisition projects.

(i) *Monitoring and Banding Program.*--The colony will be monitored on a yearly basis for both the number of nests and the number of young that are produced. This is the very minimal amount of data that is necessary to determine the colony's productivity and overall health of the population. The monitoring program will hopefully be undertaken by volunteers from the Williams Lake Field Naturalists with some funding from the Ministry of Environment (Regional Headquarters).

A banding program (young of the year only) was initiated in 1982 and has continued ever since. The first attempt was unsuccessful (only three young banded); however, we did learn a great deal from our mistakes. The objectives of our banding program (colour-coded bands) are to provide age-specific breeding and mortality data and to elucidate migratory patterns, wintering areas and inter-colony movements of both adults and subadults.

(ii) *Habitat Enhancement and Land Acquisition Projects.*--Several projects have been proposed to either acquire valuable habitat or to create additional nesting habitat. One such project involved the purchase (by the Nature Trust of B.C.) of a lake about 20km to the north of the breeding colony. The lake is utilized by pelicans as a foraging lake and contains a heavily treed island. Manipulation to this island could create additional nesting habitat. Although the logistics of establishing a second colony may be very difficult, I personally do not believe them to be impossible. The use of decoys to attract pelicans to other nesting sites may have some merit.

Another study currently on the drawing board involves creating an additional island at the breeding lake, to determine the likelihood of the pelicans adaptability to new nesting sites.

Although projects to create new nesting sites in British Columbia may be doomed to failure (there have not been any successful attempts in North America to my knowledge[1]), they still may be the only way to reduce the pelicans "vulnerability" in B.C. (i.e. - "having all the eggs in one basket").

Anyway Steve, I hope these comments are of some use to you and I hope your workshop on White Pelicans is successful. Sorry we could not make the workshop."

1 In 1978 the Alberta Fish and Wildlife Division expanded a small rock island at Beaverhill Lake to provide an alternative to the previously used colony island which had become connected to the mainland. Pelicans, cormorants and gulls accepted this island and have nested there successfully (Steve Brechtel pers. obs.).

MANAGEMENT CONSIDERATIONS FOR THE AMERICAN WHITE PELICAN IN ALBERTA

Philip H.R. Stepney

The American White Pelican (*Pelecanus erythrorhynchos*) was first recorded in Alberta in 1789 when Sir Alexander MacKenzie discovered a breeding colony on the Slave River rapids (MacKenzie 1801). Subsequent records (Thompson 1933, Salt and Wilk 1958) indicate that the species occurred at suitable locations throughout the eastern half of the province. In Alberta the pelican has always been a subject of debate. The species has been a regular target of criticisms from commercial and sport fishermen, colonies have been ruined by vandals, and natural and man-induced changes in lake levels have changed the occurrence and suitability of nesting islands. Nesting sites of pelicans have been abandoned for seemingly no apparent reason and changes in human recreational activities have put competitive demands on the habitat and nesting areas used by pelicans. The need to successfully manage this species and the habitat in which it lives probably has never been greater.

WHAT DO WE KNOW

Past Distribution Synopsis

It is difficult to determine the changes in number of pelican colonies in Alberta since the turn of the century. Data are simply lacking for many areas, particularly the remote lakes in the northern half of the province. Even the more accessible sites have not been reported on regularly. This situation is compounded by a natural pattern of irregular occupation of many colony sites from one year to the next, a pattern very recognizable in those lakes in the prairie portion of the province. The water levels in these lakes fluctuate widely, a factor shown to strongly affect pelican occurrence and productivity (Evans 1972).

There appears to have been 12 pelican colonies abandoned in the province since the late 1800's (Fig. 1). However, not only are data on abandonment difficult to assess, but the data are somewhat misleading. The colony at Lac Ste. Anne had only a few pairs and was only reported once (Macoun and Macoun 1909). Lower Therian Lake involved only two nests, presumably first breeding attempts because the nests were started in June (when eggs typically hatch) but never finished (Vermeer 1969). The purported colony at Frog Lake was based on circumstantial evidence only (Lies and Behle 1966). Pelicans have been on Frog Lake every year since 1978 but have never attempted to nest, although one half buried egg was discovered among the rocks (personal observation). There are other cases I do not regard as abandonment. In 1983 the birds nesting on the south island on Pelican Lake abandoned that seemingly traditional location for the wooded island in the northern portion of the lake. They returned the following year to the south island. A similar situation seemingly existed on the big wooded island in eastern Utikuma Lake, where birds nested in 1978, 1980, and 1981 but in the other years since 1978, the birds seemingly preferring to use the two bare rock islands located to the northwest and southwest of the wooded island. This seems likely to also be the case of the 1975 nesting on

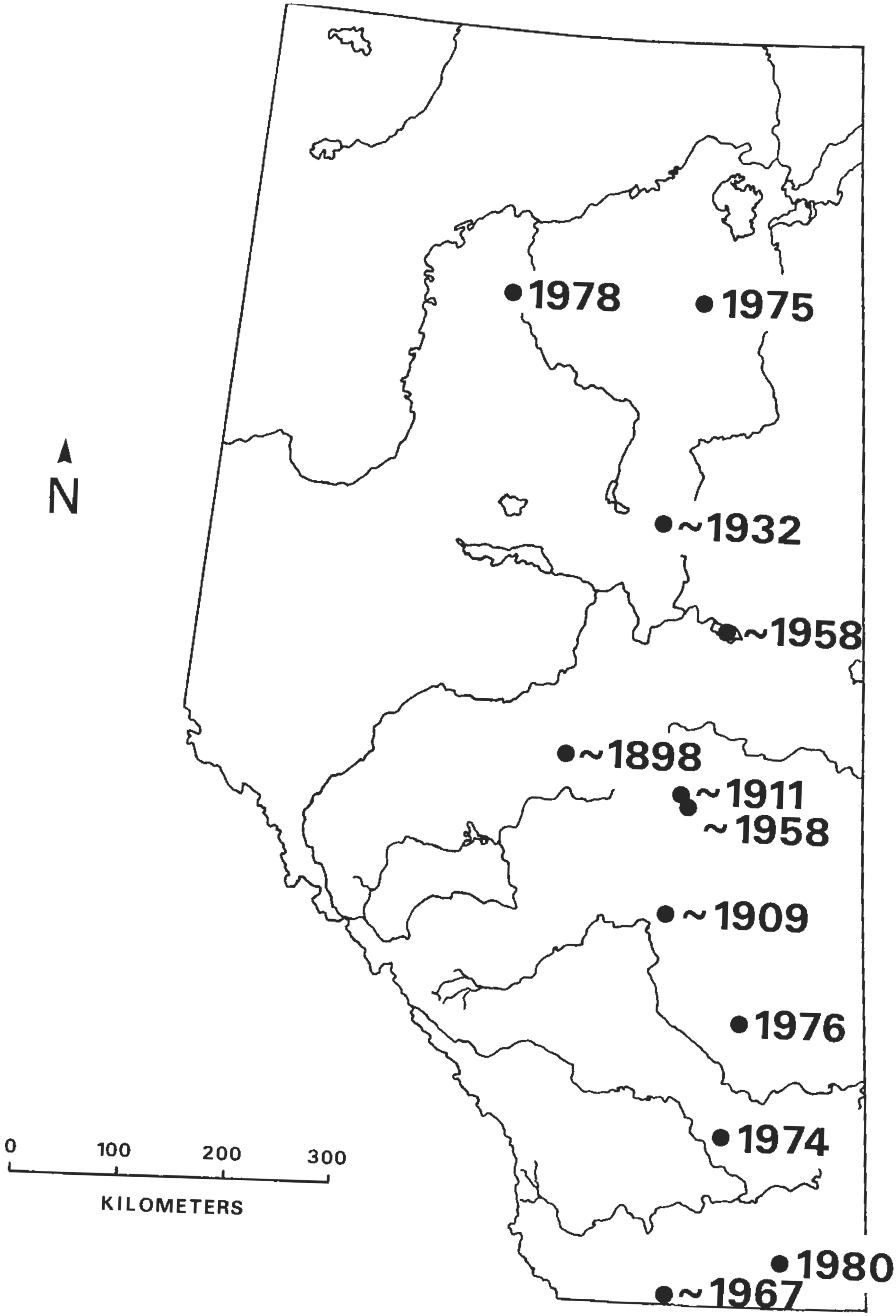


Figure 1. Last breeding dates for American White Pelican colonies active prior to 1980.

what is referred to as Big Island Lake, (Bishoff and Fyfe 1975), a lake to the north of Namur Lake, where the pelicans typically nest (Beaver and Ballantyne 1978). Equally ambiguous is the apparent one-time nestings on Coleman, Shanks, and Pakowki lakes. If these lakes present only infrequent opportunities to nest, then application of the term abandonment when a colony does not return is inappropriate. The status of individual colonies can be as much a function of which year it was censused, as much as the actual behavior of the birds.

Data on the nesting at Pelican Rapids and Buffalo Lake are too scant to base any conclusion on, even if the birds actually bred at those locations.

Data, however, do support abandonment of nesting sites at North Miquelon Lake (Farley 1919), Oliver Lake (Salt and Wilk 1958), Lac La Biche (Farley 1922), and Lake Newell (Bretchel 1981). While the water levels in Miquelon and Oliver lakes have decreased, the water levels in the latter two lakes has remained much more stable, suggesting there may be several factors influencing the known cases of abandonment.

In summary, the pelican has abandoned some sites within the Province since the turn of the century, but the cases of definite abandonment are seemingly not as frequent as has been suggested (Bretchel 1980). Much of the abandonment appears to be a natural pattern of irregular occupation and a significant amount is an artifact of the fact the baseline data required for comparison is too incomplete to base meaningful conclusions upon.

Current Distribution Synopsis

Within the last 15 years in Alberta, both the number of recorded nesting colonies and the average number of nesting pairs per colony has increased (Table 1). Data in this table include nests with eggs or young too small to band plus whatever identifiable empty nests remained. Because most of the young pelicans were of banding age, about one month old, the remains of many nests were destroyed and hence not included in this count. Studies indicate the average number of young raised from a nest is less than one even though two eggs is the normal clutch (Hosford, 1965). Hence, the actual number of nests in a colony would be greater than the number of young banded but less than the sum of young banded and nests counted.

Both lines on the graph in Figure 2 show a definite increase in the number of colonies in the last 10 years. The most obvious cause for this is the increased effort expended in looking for colonies, suggesting that the earlier declines suggested by the solid line graph may be an artifact rather than an indication of a declining number of pelican colonies.

There were seven known breeding colonies in north central Alberta in 1985 (Fig. 3). Provincial Museum of Alberta staff banded 661 young pelicans at six of these colonies plus counted an additional 286 nests, the majority of which contained eggs or young too small to band. We did not visit the Slave River rapids colony in extreme northern Alberta. An eighth colony, the North Rock Pile Colony on

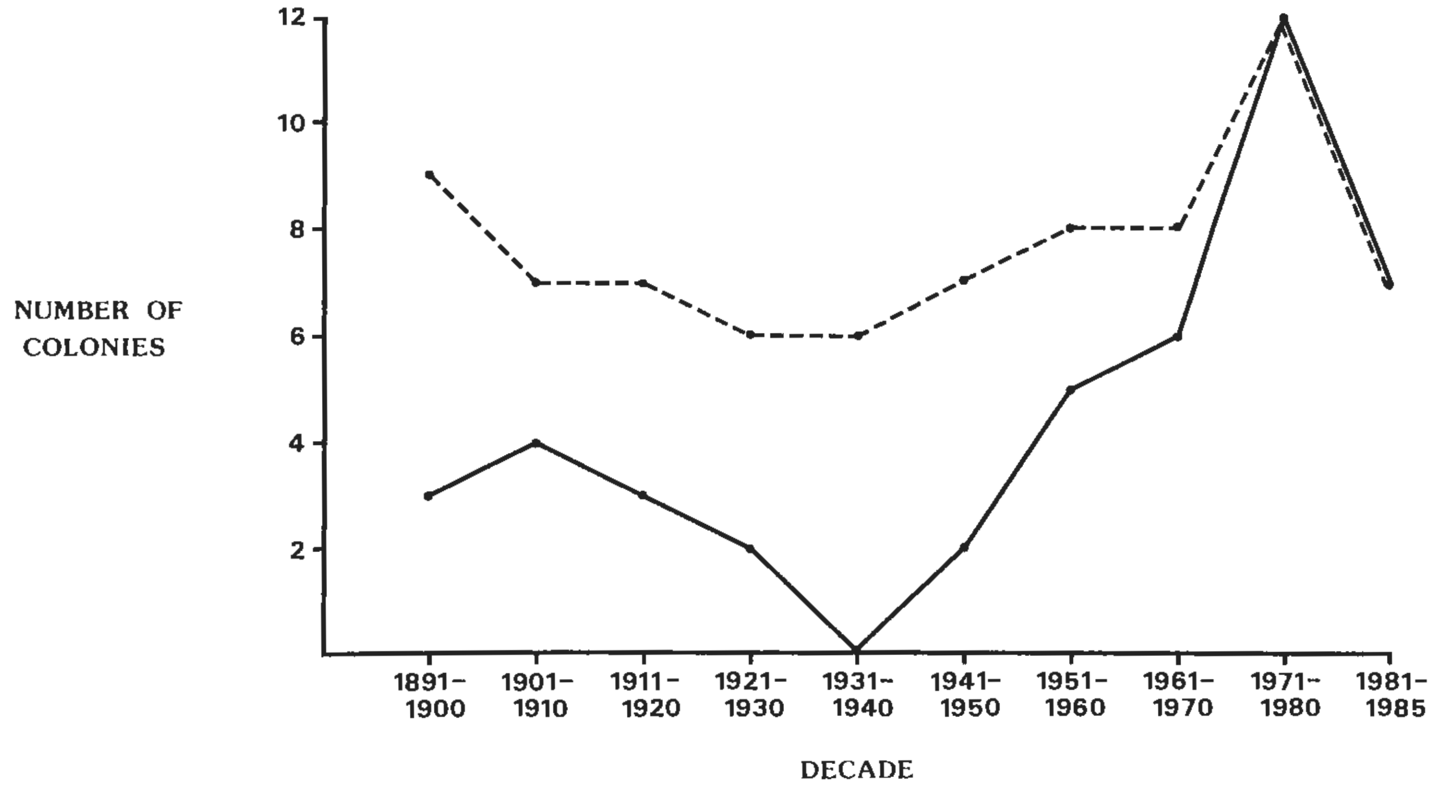
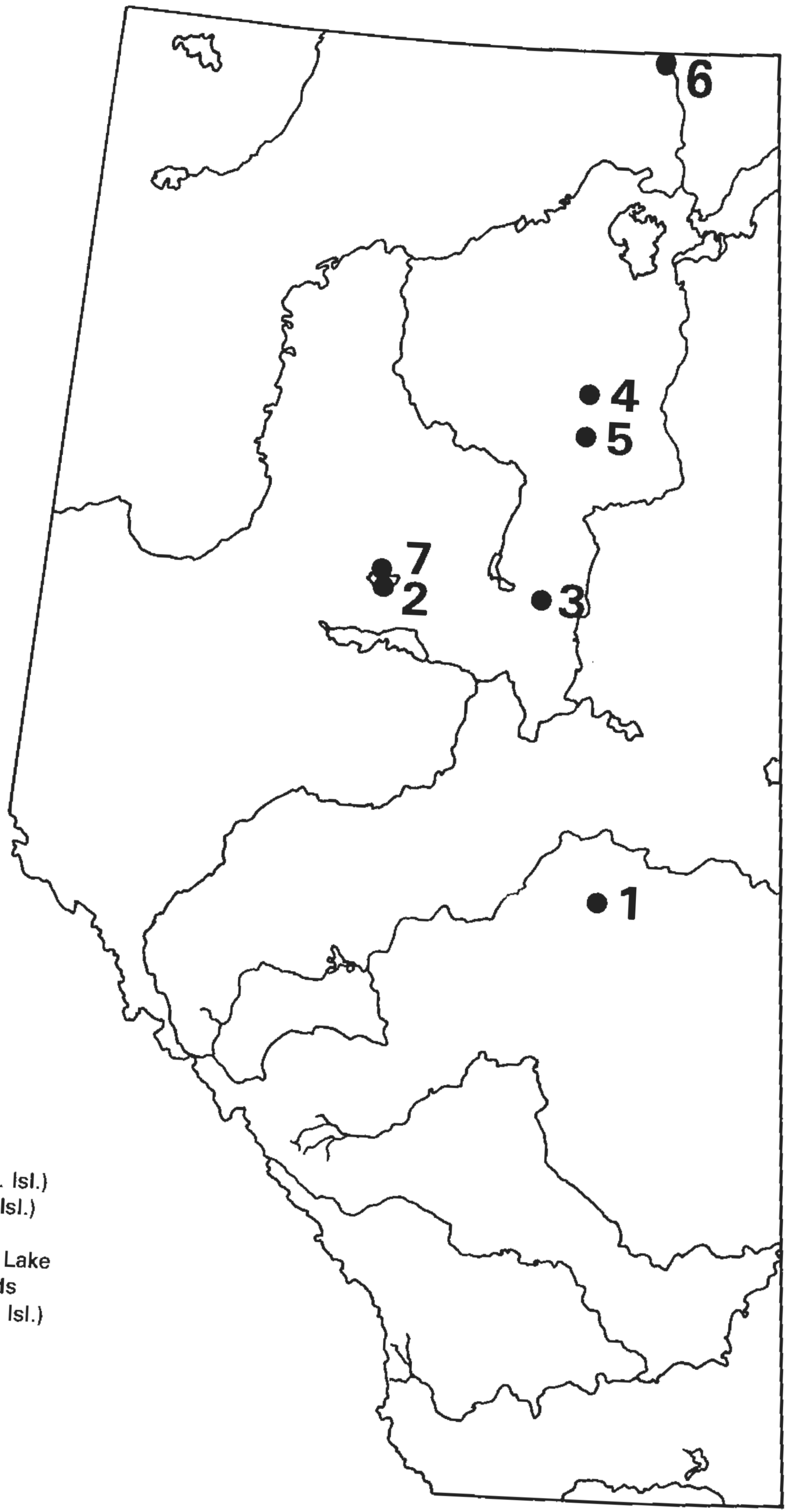


Figure 2. Known (—) and presumed (---) American White Pelican breeding colonies in Alberta over the past 10 decades.



1. Beaverhill Lake
2. Utikuma Lake (S. Isl.)
3. Pelican Lake (S. Isl.)
4. Namur Lake
5. unnamed (Birch) Lake
6. Slave River Rapids
7. Utikuma Lake (N. Isl.)

Figure 3. Known American White Pelican breeding colonies - 1985.

Table 1.--Numbers of identifiable pelican nests plus the total number of young banded each year.

Colony	1978	1979	1980	1981	1982	1983	1984	1985
Beaverhill	---	---	38	10	---	0	84	33
Pelican Lake								
South	100est.	---	---	---	232	0	246	150
North	---	---	---	---	0	287	0	0
Utikuma Lake								
South	20	---	present	14	76	14	7	17
North	97	---	40est.	2	28	12	1	2
Big	29	---	129	destroyed	0	---	---	---
Namur Lake	---	---	---	---	---	---	---	25
Birch Lake	---	---	---	---	---	---	---	59
Total no. of nests	246	---	207	26	336	313	338	286
No. of young banded	---	---	63	196	300	250	363	661

The 1978 COSEWIC Report indicates a total of 220 nests in 4 colonies in 1967-69 and 234 nests in 9 colonies in 1975-77.

Utikuma Lake, commenced breeding but abandoned, seemingly because of vandalism (personal observation).

Also important to the American White Pelican in Alberta are 12 known loafing sites which are feeding and resting areas used in the summer, presumably in several cases by non-breeding birds. These 12 loafing sites are used regularly and are lakes with islands, some of which are previous nesting sites (Fig. 4). These loafing sites occur primarily in the east central portion of the province but there are still two in the southern portion, in spite of the recent drought in that area.

Recent Increases, Banding, and Mortality

Since 1980, my staff and I have banded 1,833 young pelicans from a total of seven different colonies in north central Alberta. Four of these colonies, Beaverhill Lake, North and South Rock Pile Colonies on Utikuma Lake, and Pelican Lake, supported breeding pelicans in each of the six years and one other, Namur Lake, is suspected to have been continuously used. The Big Island colony on Utikuma Lake was occupied in 1978 and 1980 but was destroyed in 1981 by canids. In 1983, the colony on Pelican Lake left its usual nesting island and nested on the north island under trees occupied by nesting Great Blue Herons (*Ardea herodias*) and Double-crested Cormorants (*Phalacrocorax auritus*).

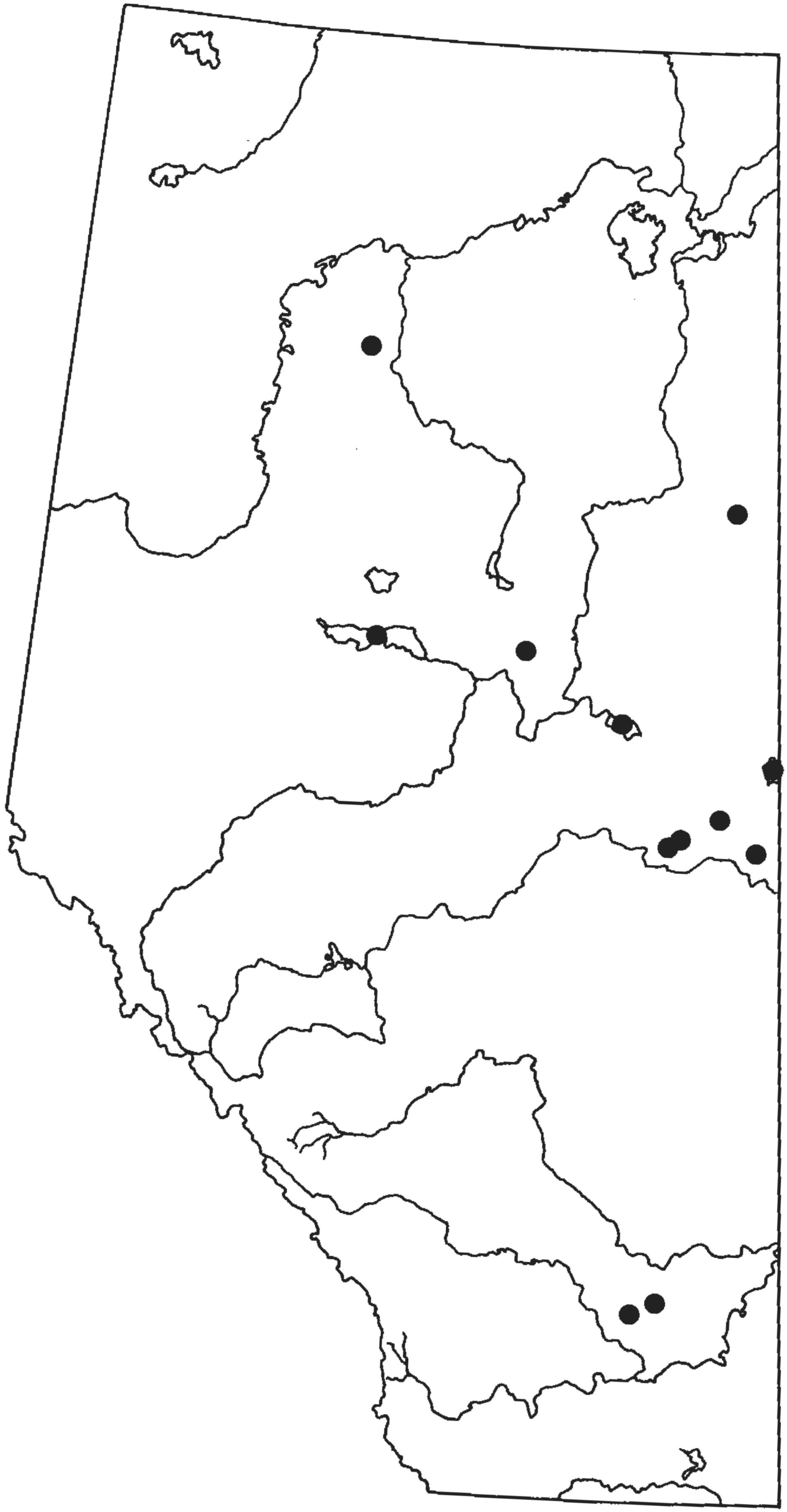


Figure 4. Known lakes consistently used for loafing; all contain apparently suitable nesting islands.

Over the past six years the average number of young we have banded each year has increased (Fig. 5), although the number of colonies visited each year has only varied from two to four. The fourth colony is represented by the 12 young banded on Namur Lake for the first time in 1985.

Band recoveries total 17 to date and indicate that pelicans from Alberta migrate southeastward across the province proceeding south across the Dakotas, through eastern Kansas and Oklahoma then south to Texas and Mexico. The wintering recoveries come primarily from the Gulf Coast of Mexico (Fig. 6).

Not unexpectedly, mortality in pelicans is highest in young birds (Fig. 7). Houston (1972) reports a lifespan of 12 years and perhaps 14 in American White Pelicans, ages not unexpected in large birds with low levels of annual recruitment.

The most frequent cause of mortality for the sample producing the band return data is gunshot (Fig. 8). This suggests either a prejudice among North Americans against the pelican as a fish eating bird or as objects for senseless target practice.

Problems With Censusing a Colony

The number of pelican nests in a colony is difficult to determine if the colony is not censused before early July. Late nesting birds remove material from unoccupied nests and the large young frequently obliterate evidence of poorly constructed nests, particularly those that initially were only shallow scrapes in the sand. Hence, the count of the nests is almost always less than the true number of nests, in some cases almost 100% less.

For similar reasons, counts from aerial photographs are an unreliable means of determining nesting pairs. Non-nesting birds are invariably associated with nesting ones and the former maintain inter-individual dispersion patterns identical or nearly so to that of nesting birds (personal observation). Aerial photographs of Gordon Lake taken by the author in 1985 showed a well established colony, first identified in 1984, that apparently contained over 200 pairs. However, a foot search of the colony revealed it to be only a loafing site. Similar aerial photographs have revealed the same error in identifying other nesting locations. A foot search in early June is the best means of obtaining a nest count.

Characteristics of Nesting Habitat

Of the six nesting colonies visited in 1985, the lakes that contain five of them, Beaverhill, Utikuma, Pelican and "Birch", are characterized by: (1) overall shallow water depths of 6-20 feet and rather extensive near shore shallows; (2) cloudy or turbid water; (3) an essentially non-vegetated island with a sand or soil surface over at least part of it; (4) an island that is above wave reach, and (5) remoteness from areas of human activity. In addition, Utikuma and Pelican, the two lakes with the highest number of nesting pelicans and the most success in fledging young, have abundant Yellow Perch (*Perca flavescens*) and Lake Whitefish (*Coregonus clupeaformis*) populations, as evidenced by regurgitated food items.

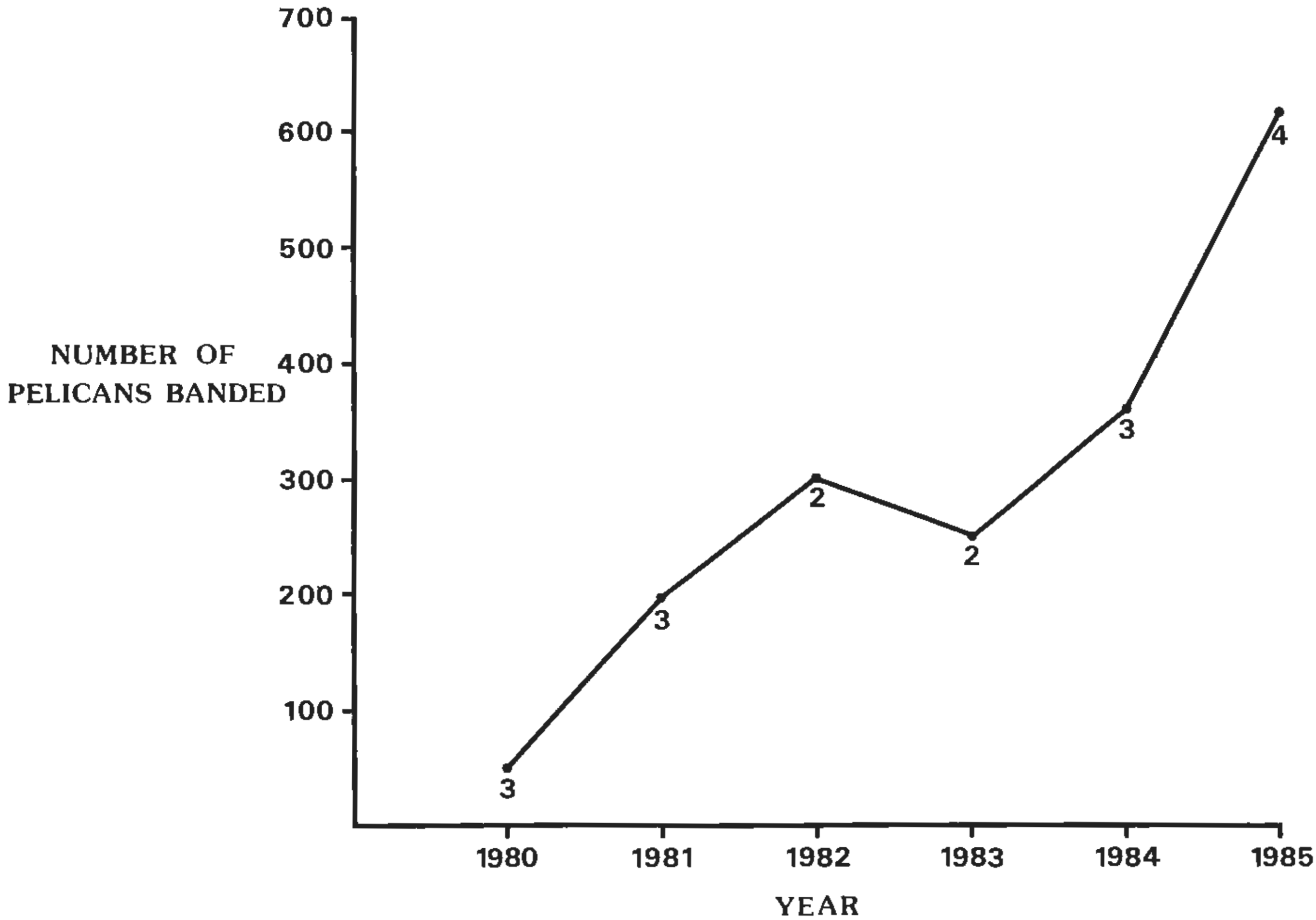


Figure 5. Number of American White Pelicans banded and the number of colonies visited each year.

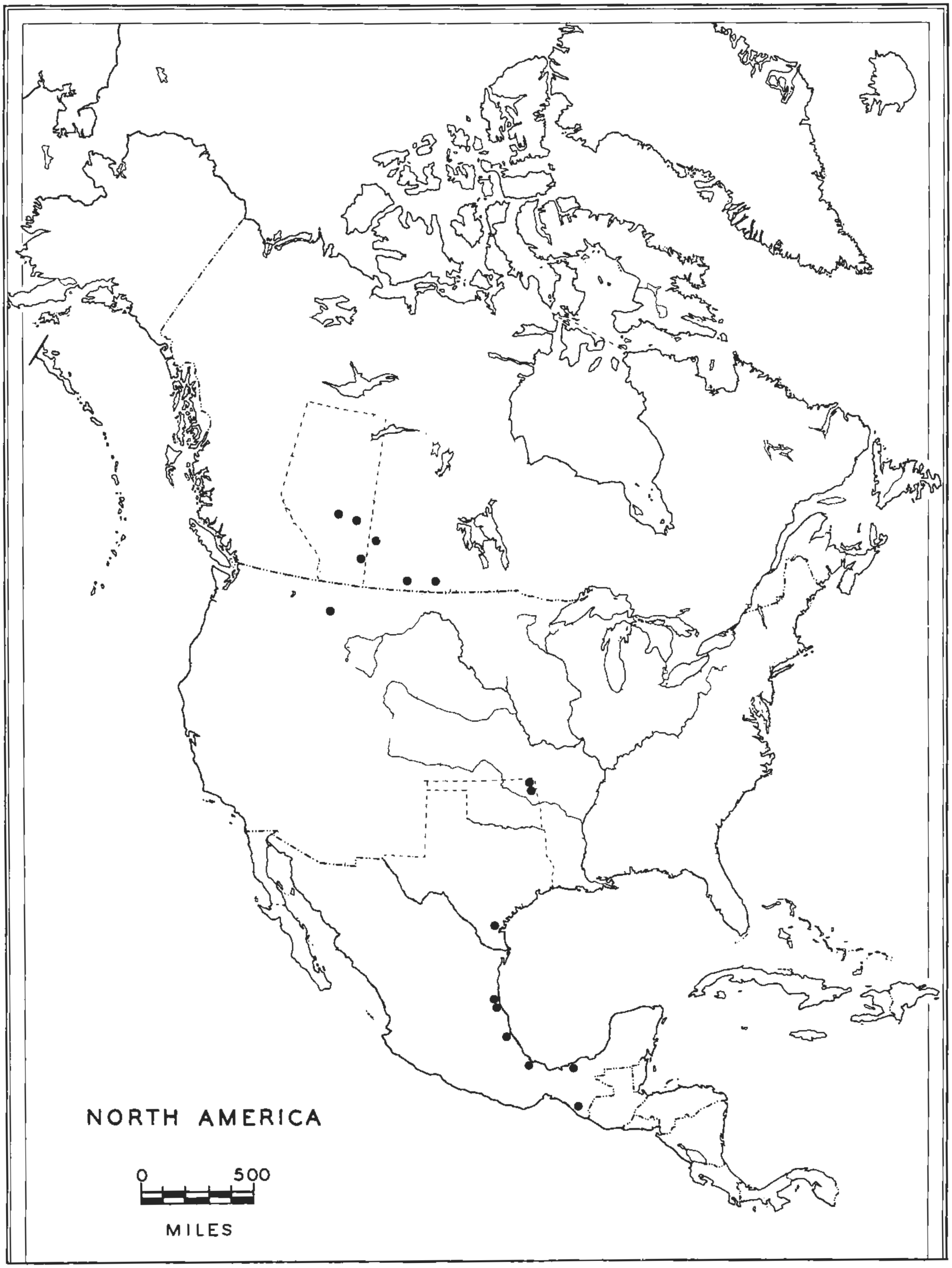


Figure 6. Locations of American White Pelican recoveries 1980-1984.

I do not know if there are perch in "Birch" Lake. Perch, however, are absent in Beaverhill Lake, where the young pelicans, are primarily fed aquatic invertebrates and only occasionally fish, typically stickleback. Young pelicans raised on Beaverhill weighed less than young in other colonies and mortality in the nesting stage was appreciably higher; often as high as 80%. Further, all of these five pelican colonies share their islands with nesting Double-crested Cormorants.

Namur lake, the sixth colony, was also the smallest, containing approximately 25 nests and only 12 young. The lake is characterized by deep, clear water, the island is treed, cormorants are absent and the lake is known for Lake Trout (*Salvelinus namaycush*), Walleye (*Stizostedion vitreum*), and Northern Pike (*Esox lucius*); I do not know if it contains perch. Fly-in fishermen also have been known to frequent the nesting island at times during the nesting cycle. Ravens (Corvus corax) had also removed eggs from the pelican nests as evidenced by the broken, discarded shells beneath trees at various locations on the island.

Pelicans are surface feeding birds that benefit most from foraging on schooling fish such as perch and whitefish that inhabit the middle to upper portions of the water column. Double-crested Cormorants, which typically forage with pelicans, may contribute to pelican feeding success by causing the fish to school and move towards the surface to escape. Turbid or algae-filled water may assist pelicans in capturing fish by making the birds less obvious. At other times, the shallows are used to herd fish towards shore where they are more easily captured. Non-vegetated islands allow the pelicans essentially 360^0 access to their nests, reducing intra-specific strife between incubating birds and those attempting to approach their nests. Unobstructed winds on the open islands may facilitate take-offs and landings by the heavy birds, and the absence of vegetation would also permit them to land more easily within the area occupied by their nest. By contrast in 1984 when the colony in Pelican Lake moved to a wooded island, over 40 of the 159 nests contained eggs that had been broken by the pelicans and the number of dead young pelicans was high. These two conditions were most evident in those portions of the colony nesting beside the pathways the adults used to walk from the open area where they landed back into the trees where the nests were located.

The lakes used by the six colonies are not generally used by people and three of them can be reached only by aircraft, suggesting that pelicans avoid human activity during breeding. This is supported inferentially by the former occurrence of the pelican on Lac Ste. Anne, Miquelon Lake, Lac La Biche, Buffalo Lake, and Lake Newell, all of which are located close to population centres and are used for recreational purposes. However, as discussed earlier, the case for abandonment of any colony in Alberta as a result of disturbance is equivocal; founded almost wholly on inferential evidence, starting with Farley (1919).

WHAT DO WE NEED TO KNOW?

Research Needs

1. Determine more precisely the factors that stimulate birds to colonize an island - if a prime component is behavioural interaction among the birds and only secondarily interaction with the habitat, then it is apparent luck plays a big role in the management of this species. Further, until we know more about why the pelican occupies an island for breeding purposes, we cannot really say

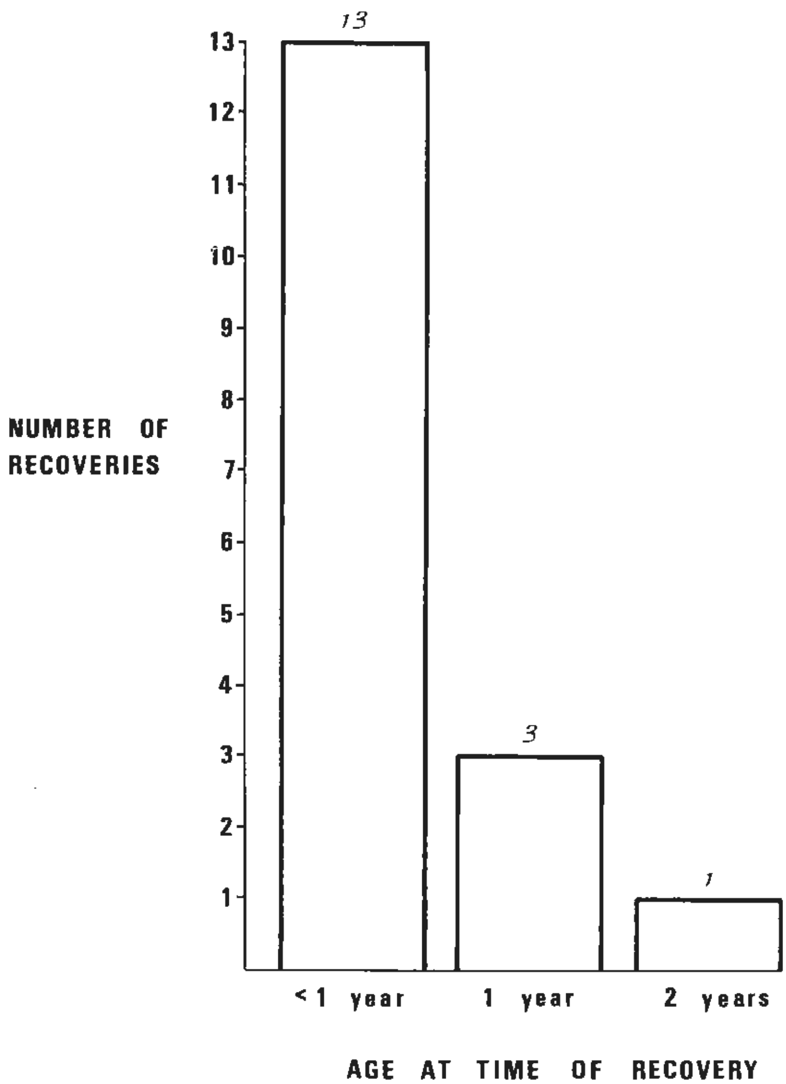


Figure 7. Frequency of age classes of American White Pelican recoveries.

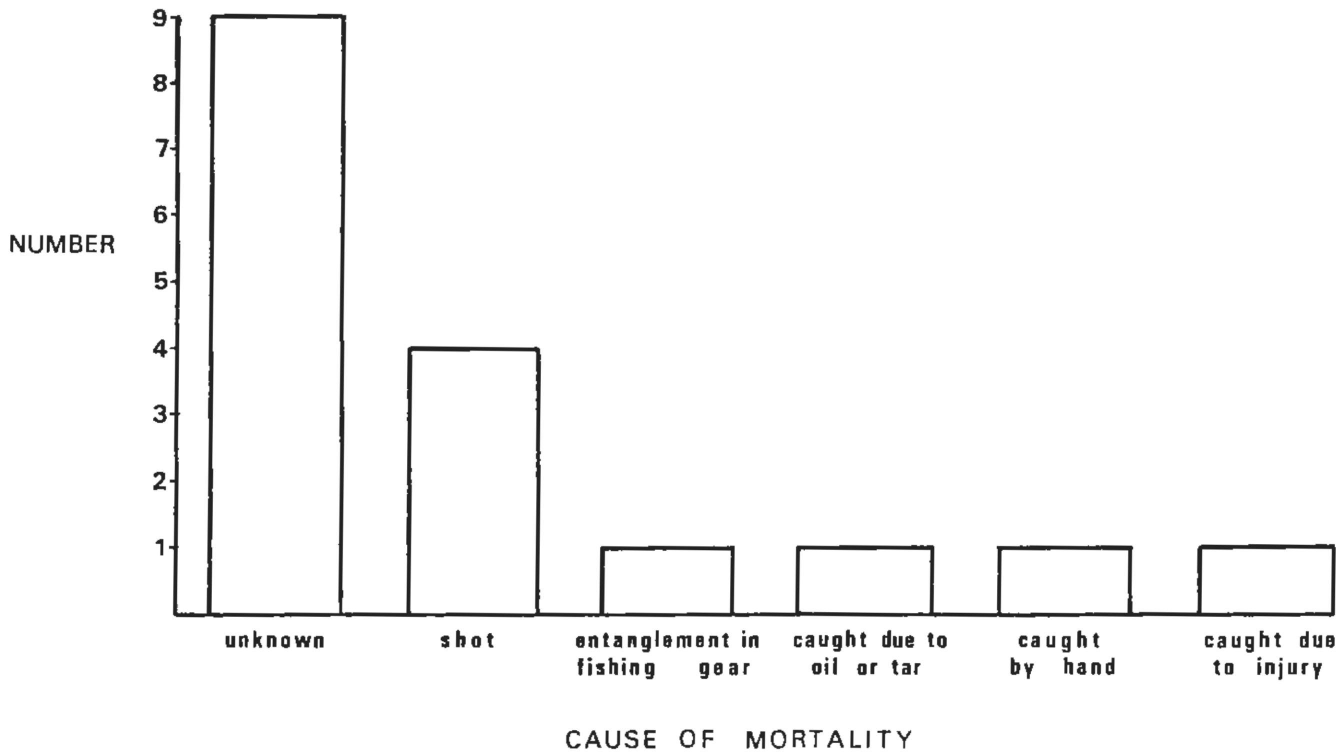


Figure 8. Most frequent causes of mortality in banded American White Pelicans.

conclusively why they abandon islands. For example, minimal attention has been paid to changing water levels population density and fish stock conditions. Data of this type would enable us to make more reliable statements about presumed disturbance.

2. Determine what effect the exploding Double-crested Cormorant population has on competition for nest-sites and the effect it may have on food fish stocks for the pelican;

3. Assess all remote lakes for nesting colonies and consistent loafing areas;

4. Assess the effects that habitat management for pelicans may have on species associated with them - habitat enhancement for the pelican may prove detrimental to other species, particularly in situations involving water stabilization programs.

WHAT HAS BEEN DONE

In 1978 the Province gave protected status under the Fish and Wildlife Act to nesting islands in the following six lakes; Beaverhill, Namur, Newell, Lower Therian, Wadlin, and "Birch". Pelicans currently nest on only Beaverhill, Namur, and "Birch", and it is doubtful they ever nested on Lower Therian Lake. The island in Wadlin Lake is currently only a crescent-shaped ridge of large boulders; the last definite count of nests was in 1974 and there was an aerial estimate of 19 in 1978 (Brechtel 1981). There is no exposed sandy area suitable for nesting purposes, seemingly as a result of a rise in the water level; there is, however, a submerged sandy shelf along the island's west side. Signs, either on the shore or anchored off the islands, were posted on Namur and Lower Therian Lake informing the public that access was prohibited.

When the level of Lake Newell, an irrigation reservoir, was being increased, the shoreline of the nesting island was augmented with rock fill and rip-rapped with automobile tires to reduce the eroding effects of waves. The Pelicans have not nested on this island since 1974, but the cormorant populations has continued to increase.

When the water levels in Beaverhill Lake dropped to the point the island became connected to the mainland, a new island was created offshore which was successfully adopted by both pelicans and cormorants.

Approximately three years ago the Fish and Wildlife Division began issuing provincial banding permits for pelicans (and cormorants) as a requirement in conjunction with a federal permit, indicating an increased appreciation for the need to manage these two species. By extension, this produced greater coordination between legitimate research efforts that may be visiting the nesting islands for different purposes.

Since 1980, staff at the Provincial Museum of Alberta have been banding young pelicans at most known colonies in north central Alberta and monitoring population changes. An ad hoc aerial survey of other island-containing lakes near nesting areas were surveyed as time and funds permitted.

WHAT CAN BE DONE

A broad spectrum program to enhance the opportunities for maintenance or increase in White Pelican populations would need to address the following areas.

Habitat Management

1. Create new islands in suitable lakes.

2. Augment existing islands so that they remain above wave reach and always contain sand or soil nesting areas.

3. Maintain water levels in lakes where appropriate.

4. Reduce all forms of fishing, particularly commercial, in lakes used for foraging purposes.

5. Check food fish stocks in lakes with seemingly suitable nesting habitat and alter habitat for fish production if it is low.

Political Management

1. Put the White Pelican on the Migratory Bird Act in an attempt to reduce the number being shot on their wintering grounds in Mexico.

2. Erect No Access signs on a 1/2 mile perimeter around colonies from the time of ice melt to September, in short enforce the existing legislation pertaining to the six designated colonies.

3. Expand the number of designated sites to include other nesting areas, particularly Utikuma Lake.

4. Be more aggressive regarding the administration of the crown lands in question for the specific benefit of the pelican colony, not multiple use.

5. Coordinate management of wintering habitat with U.S. and Mexican State and Federal agencies.

6. Use legislation covering Natural, Ecological or Wilderness areas to afford protection to at least the large colonies.

7. Regulate activities of upstream water users to ensure their activities do not alter the water quality or secondarily the fish stocks of the nesting lake.

Public Management

1. Put notices regarding avoiding (all) islands with colonial nesting species in Provincial Fishing and Boating Regulations.

2. Distribute information kits to RCMP units that patrol waterways.

3. Distribute information kits to fishing lodges and jumping off points on lakes with nesting colonies.

4. Have direct contact with people living on shores or close by lakes containing nesting colonies. Contact natives most likely to use remote lakes and air charter operations that fly in fishermen.

Site Specific actions that can be done in Alberta

1. Amend the existing legislation to make it illegal to enter islands used by all colonially nesting species of birds. Definitely include the remaining islands known to be used by pelicans or cormorants either in mixed or single colonies.

2. Augment the island in Wadlin Lake so that it contains a flat sandy area. It currently consists only of large boulders.

3. Contact the natives on the shore of Utikuma Lake living in cabins opposite the north rock pile nesting island and request their cooperation in not going on the island.

4. Remove any wintering canids from the large wooded island in the east end of Utikuma in hopes the birds will recolonize it.

5. Create an island on Muriel Lake out of the isolated rocks that form a breakwater in the northeast arm of the lake. Do the same for Upper Therian Lake; initiate a perch stocking program in Therian Lake if it is feasible.

6. Regulate the water levels in Beaverhill Lake and add more material to the island.

PROGNOSIS

My prognosis for the White Pelican in Alberta is that it is maintaining its numbers likely at the level typical for the province and perhaps recently increasing in numbers as well, primarily by increasing the number of breeding pairs in a colony but also by increasing the number of colonies. This situation would be enhanced by selected island augmentation and creation, by more rigorous application of a restricted zone around all islands containing all colonially nesting birds, as this may induce re-occupation of old sites, and by developing specific management plans for the known nesting lakes, particularly with regards to fish stocks.

The number of non-breeding pelicans in the Province exceeds the number of breeders by several orders of magnitude (personal observation). The pelican also demonstrates a capacity to use many lakes in the southern portions of the province when water conditions are appropriate. Mortality does not seem to be high in Canada or the United States and it seems to decrease rapidly in birds older than one year. In short, we have the birds required to start new colonies when conditions permit.

If a status quo is maintained in the factors currently affecting pelican populations in Alberta, it appears highly likely the pelican will successfully persist in the province. If more aggressive action is applied to their management, it is also likely they could be induced to consistently occupy portions of their range no longer used, regardless of the causes for their present absence.

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STATUS AND MANAGEMENT OF THE WHITE PELICAN IN SASKATCHEWAN

Keith Roney

Saskatchewan has traditionally been an important nesting area for the American White Pelican (*Pelecanus erythrorhynchos*). Macoun (1900) noted that pelicans were "found on all the large lakes throughout northern Manitoba and Assiniboia and Saskatchewan." He states that "they were breeding in numbers at Long Lake (Last Mountain Lake), to the northwest of Indian Head, in 1879." He also notes that the pelicans were breeding on Old Wives Lake, the Quill Lakes, and Crane Lake. Raine (1892) recorded about 50 pairs of pelicans nesting on the east end of Rush Lake in 1892. Thompson (1932) stated that "Saskatchewan contains more breeding colonies of the white pelican than any other province in Canada...And, for the white pelican, it still presents the most favorable conditions of any region within its breeding range."

Since the early reports of Macoun, at least eleven known nesting sites have been established and subsequently abandoned. Of the eleven colonies that were abandoned, seven were caused by low water conditions and four by human disturbances. Two additional colonies located at Quill Lakes and Cypress Lake were abandoned but have since been recolonized - Quill Lake in 1971 (R. Long, pers. comm.) and Cypress Lake in 1985.

Saskatchewan still maintains a significant percentage of the total pelican breeding population in Canada. Since Vermeer (1970) censused the colonies in 1968, and counted a total of 6,558 nests, the number of nests in Saskatchewan has steadily increased. In 1985, there were 13 colonies containing a total of 17,931 nests (Roney and Hlady 1986). This represents about 34% of the 53,345 pelican nests in Canada (B. Koonz in prep.). The 13 colonies were located within 11 different water bodies (Table 1).

Table 1.--Census of White Pelican Colonies in Saskatchewan - 1985

LOCATION	CENSUS DATE	NO. OF NESTS
Basin Lake	June 3	227
Cypress Lake	June 4	90
Kazan Lake	June 7	1145
Lavallee Lake	June 6	4897
Lenore Lake	June 3	162
Mud Lake	June 3	462
Old Wives Lake	June 4	2184
Preston Lake	June 5	157
Primrose Lake	June 8	6652 (2)[a]
Redberry Lake	June 4	347
Suggi Lake	June 5	1608 (2)

[a] Indicates number of nesting islands, if more than one.

Management strategies and protection for each of these existing colonies is essential. Maintaining as many viable nesting sites as possible will assist in reducing the risk of a major catastrophe destroying a significant number of birds in any single colony. Some of the major management concerns that need to be addressed are:

1. reduction in the amount of human disturbance - this entails conflicts between the birds and commercial and recreational fishermen, as well as well-meaning bird-watchers, naturalists, photographers, curiosity-seekers, researchers, and bird-banders;

2. regular monitoring of colonies - to identify any problem areas, to recognize significant changes in colony size and determine causal factor(s);

3. identification of major feeding areas and monitoring of their toxin levels - protection of important foraging areas from contamination can assist in preventing loss of productivity due to egg-shell thinning, loss of feeding areas due to drainage and development, and loss of productive areas due to toxic chemicals;

4. increase in public awareness of the pelican's needs - help promote an understanding of the pelican's lifestyle, of ecological requirements, help to eliminate negative attitudes towards fish-eating birds and help to reduce human disturbance.

The White Pelican, being a fish-eater, was not included in the list of birds protected under the Federal Migratory Birds Convention Act of 1916. Protection is afforded only under separate provincial or state laws. Until 1970, only three colonies in Saskatchewan received any special treatment. In 1887, the first Federal Bird Sanctuary in North America was established at Last Mountain Lake to provide protection for waterfowl, shorebirds, and colonial nesting species such as the White Pelican. The colonies at Old Wives Lake and Redberry Lake received protection when these areas became Federal Bird Sanctuaries in 1925. In 1970, three pelican nesting islands and in 1971, four pelican nesting islands, were designated as Wildlife Refuges (Table 2). Wildlife Refuges, however, did not restrict public access onto these nesting islands, especially during critical periods when these visits could seriously disrupt nesting activities.

A set of management proposals and recommendations was presented to the Wildlife Branch of Saskatchewan Parks and Renewable Resources in 1980 (Roney 1980). The major proposals were legislated and passed in 1982. At that time, five nesting islands were identified and access onto them was prohibited from 15 April to 15 September. In addition, a 100 m buffer zone was placed around the refuge. Four other islands were listed with access prohibited from 15 April to 15 September. The colonies were reviewed, and in 1983, changes were made whereby all pelican nesting sites were designated as Wildlife Refuges, and access was prohibited from 15 April to 15 September, plus, a 100 m buffer zone was provided for all refuges. The refuges identified were: Gatehouse Island (Kazan Lake), Heglund Island (Cypress Lake), Isle of Bays (Old Wives Lake), Lenore Lake, Mud Lake, Backes Island (Primrose Lake), Preston Lake, Redberry Lake, Rock Island (Dore Lake), and Scheelhaase Island (Suggi Lake).

Table 2.--Federal Bird Sanctuaries and Wildlife Refuges in Saskatchewan established to protect White Pelican colonies.

FEDERAL BIRD SANCTUARY	YEAR ESTABLISHED	SIZE (ha)
Last Mountain Lake	1887	4,792
Old Wives Lake	1925	26,063
Redberry Lake	1925	6,394
WILDLIFE REFUGES		
Heglund Island (Cypress Lake)	1970	78
Isle of Bays (Old Wives Lake)	1970	194
Redberry Lake	1970	34
Backes Island (Primrose Lake)	1971	6
Gatehouse Island (Kazan Lake)	1971	4
Rock Island (Dore Lake)	1971	5
Scheelhaase Island (Suggi Lake)	1971	13
Lenore Lake	1982	?
Mud Lake	1982	?
Preston Lake	1982	?
Bazill Wildlife Refuge (Dore Lake)	1984	?
Basin Lake	1985	?

In 1984, Bazill Wildlife Refuge (Dore Lake) and in 1985, Basin Lake Wildlife Refuge, were added to the list. The colony at Lavallee Lake has not been classified as a Wildlife Refuge. It is located within Prince Albert National Park and is situated in an area classified as a wilderness zone. There is no public access into this area without permission. Whenever a new pelican colony is located, only a couple of months is required for an Order-in-Council to establish that location as a Wildlife Refuge. With this new legislation, it is hoped that human disturbance of the colonies can be reduced and/or eliminated.

In order to monitor the colonies on a continuous basis, surveys will be conducted at least every three years. The results will be analyzed and any problem areas can be identified and corrected. The surveys are conducted from the air and timed to correspond to the peak incubation period around the first week of June. Aerial photos are taken and later examined to count the incubating adults. Aerial surveys disturb the birds less than ground-based surveys.

Public education is essential to inform the people of the plight of the pelican. A film is presently being prepared with funding provided by the Canada Life Assurance Company. This film is educational and aims to promote an understanding and instill a concern for the pelican's specialized nesting requirements. The film addresses negative attitudes the public has towards the fish-eating habits of the birds, and problems associated with disrupting breeding activities. The public cannot be too well-informed.

What does the future hold for the White Pelican in Saskatchewan? The outlook is optimistic, with all colonies receiving protection; and legislation to provide protection for future colonies. Conflicts between fishermen and the pelican still exist, but through education, these conflicts can be drastically reduced. Important foraging areas still need to be identified and managed and more enforcement of the regulations is required. With the combined efforts and concerns of organizations such as Saskatchewan Parks and Renewable Resources, Canadian Wildlife Service, Ducks Unlimited, World Wildlife Fund and Saskatchewan Museum of Natural History, we will all be able to enjoy the beauty of this magnificent bird for years to come.

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THE AMERICAN WHITE PELICAN IN MANITOBA

Bill Koonz

Currently, there are at least 15 White Pelican (*Pelecanus erythrorhynchos*) colonies in Manitoba. Using aerial photos, more than 20,000 nests were counted during 1984 and 1985. Populations appear to be at or near an historic peak. Colonies are generally associated with large, shallow lakes occurring from Lake Winnipeg westward. Island colonies occur on eight lakes with colony sizes ranging from a dozen to more than 4,000 pairs. Islands range in size from a few hundred square meters to over 10 ha. Sites vary from bare sand to dense forests and granite outcrops.

Newspaper articles from southwestern Manitoba during the 1880's and 1890's indicate at that time pelicans were trophies worth mounting. Reports by Bent (1922) and others, however, at the turn of the century indicate that several colonies were well known in various provincial locations. Bent's visit to a Lake Winnipegosis colony, shortly after 1900, showed that pelicans had already learned to feed on the remains of fish left on islands by commercial fishermen. More recently, pelicans have learned to fly directly into nuisance grounds where they forage on a variety of items. These grounds are often some distance from water.

Traditionally, pelicans have been associated with islands devoid of woody vegetation. Some islands have been used for at least 100 years. Recently, however, colonies have been established on treed islands. Over time, trampling and nitrogenous wastes will eliminate the woody vegetation from these sites. Colonies, once established, appear to increase in size with the pelicans often occupying other barren and/or treed islands nearby. Fluctuating water levels or the presence of predators sometimes force birds to shift colony locations within a given area.

Several environmental factors affect the establishment of colonies. Food sources throughout the season are essential, but the nature and extent of vegetation is important. Studies between 1945-1953 when Double-crested Cormorants (*Phalacrocorax auritus*) and pelicans were destroyed because of their feared negative impact upon commercial fishing, revealed that pelicans under two weeks of age die within 20 minutes if left unshaded in bright sunshine. It was simple to frighten away the adults and dramatically reduce colony productivity. Leaves provide protection from direct sunlight but can be a hindrance when adults are taking off, landing or looking for mobile chicks. Pelicans may seek out treed islands to inititate colonies and in established colonies they congregate under woody vegetation when it is present. Colonies established under such cover have a greater risk of predation from species which live year round or nest on the occupied island. Studies are underway to determine if the clearing of woody vegetation will enhance productivity within an established colony.

Lakes colonized by pelicans have historically been subject to large water level fluctuations both in the short and long term. This condition has been greatly altered in recent years by the control of water levels for hydro-electric purposes and for cottage developments. The stabilization of water levels has generally been a mixed blessing for colonial nesting waterbirds. It has enhanced habitats for such species as: Double-crested Cormorant, Ring-billed Gull (*Larus delawarensis*), Herring Gull (*Larus argentatus*), and American White Pelican, but it has been detrimental to the Common Tern (*Sterna hirundo*), Forster's Tern (*Sterna forsteri*), Caspian Tern (*Sterna caspia*), and several grebe species. Shorelines have stabilized and nutrient turnovers are much reduced in lake-associated marshes. Woody vegetation has invaded many islands and encroached on shorelines and marshes have become less productive. The invasion of islands by woody vegetation means greater possibility of predation and less suitable conditions for several tern and shorebird species. Reduced marsh productivity is detrimental to several grebe and heron species.

Hydro-electric generation has generally benefitted pelicans. It has helped to produce stable water levels, thus ensuring that nesting islands are present in the long term. It also provides open water for loafing and feeding, for many fish species move upstream to spawn in spring. In some cases, hydro impoundments are the only large areas of open water for hundreds of miles, for the birds arrive and initiate nesting a month or more before the ice clears from major lakes. In a few situations, however, water regimes controlled for hydro-electric power production result in large drawdowns or reservoir filling during summer months. In these areas, colonial water bird nesting colonies have been eliminated.

Man's developments and his waste disposal have upset nature's colonial waterbird balance. For the pelicans this has been largely an advantage; unfortunately, various shorebirds, gulls, terns, grebes, and heron species have not been as lucky. A Manitoba island may contain as many as eight species of colonial nesting waterbirds. Species within these mixed colonies compete for nesting sites and food and often prey on each other. Management initiatives are necessary to ensure that species adversely affected by man do not disappear from much of their historic prairie range as a result of increases in other species better able to cope with human developments. We are currently working on a film illustrating some of the relationships within a mixed colonial waterbird nesting island. Certainly pesticides, disturbance, pollution, drainage, and human developments continue to be valid concerns but colonial waterbird species interact with each other. Those enhanced by man can compound problems for those adversely affected by humans. Protecting a species and its nesting and feeding areas may not be enough.

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A REVIEW OF HABITAT REQUIREMENTS AND MANAGEMENT PRIORITIES FOR THE CANADIAN BREEDING POPULATION OF TRUMPETER SWANS

Len Shandruk

INTRODUCTION

This paper is a summary of panel member participation and discussions held during the workshop working session on Trumpeter Swans (*Cygnus buccinator*). Background information on historic and current population status and habitat needs in Canada is presented along with current management efforts. Following a review of habitat problems and trends associated with the Canadian breeding population, a series of recommendations regarding the need for species and habitat protection and management is presented.

HISTORIC RANGE AND POPULATIONS

The historic range of the Trumpeter Swan covered much of pristine North America, with summering areas throughout much of north-central North America and wintering sites along the Mississippi River and the Atlantic, Gulf, and Pacific coasts (Rogers and Hammer unpublished data). In Canada, the Trumpeter Swan formerly nested from Ontario to British Columbia, north as far as southern portions of the Northwest Territories and the Yukon. During the early 1880s, trumpeters that nested in Canada and the lower United States were nearly exterminated by the commercial trade in swan skins, subsistence hunting, recreational hunting, and the destruction of habitat. By the last half of the 19th century, the Trumpeter Swan was no longer breeding in the eastern half of the continent.

By 1933, the known population of Trumpeter Swans in the western half of the continent had dwindled to 66 non-migratory birds in the Yellowstone-Tristate area of Wyoming, Montana, and Idaho. A few migratory trumpeters were presumed to be breeding near Grande Prairie, Alberta and wintering in the Tristate area of northwestern United States. The Alaskan breeding Trumpeter Swans were not discovered until 1954 (Hansen et al. 1971).

CURRENT POPULATIONS AND THEIR STATUS

The Trumpeter Swan received official status as a rare and endangered species in the United States in 1946. During 1968, following the verification in 1954 of the Alaskan breeding population, the status was downgraded although still protected. It was not until 1978 that the Trumpeter Swan was officially designated as rare by COSEWIC.

For management purposes, biologists currently recognize three distinct geographic populations of Trumpeter Swans in North America: the Pacific Coast Population, Rocky Mountain Population, and the Interior Population (Figure 1). In addition, other trumpeters are found worldwide in zoos, aviaries, and scientific institutions for a total world population estimate of 11,000 to 12,000.

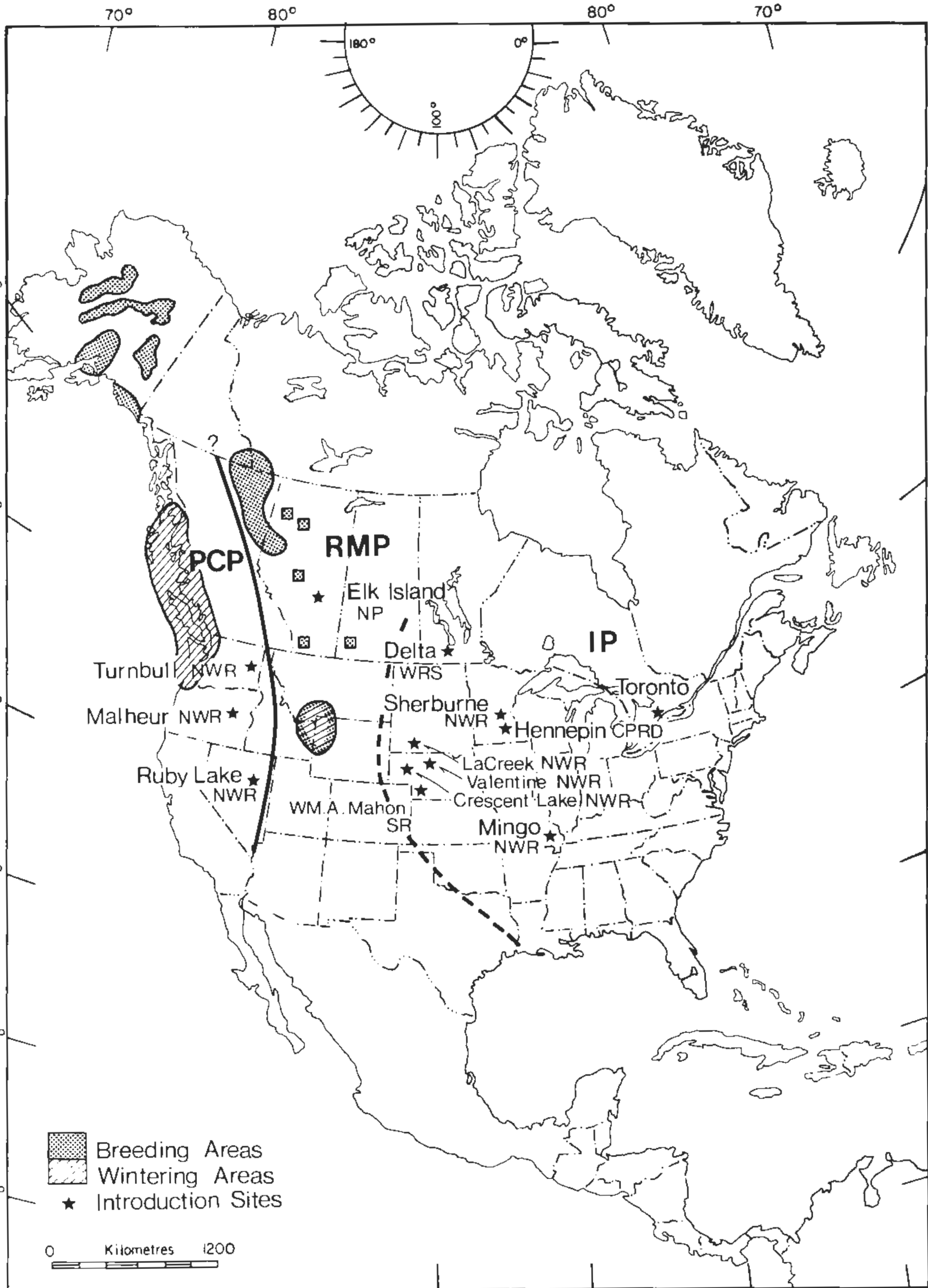

Figure 1. Geographic distribution of the three populations of Trumpeter Swans.

The Pacific coast population breeds mainly in Alaska and winters along coastal British Columbia and portions of Washington and Oregon. Pacific coast flocks have been restored at Turnbull NWR (Washington), Malhuer NWR (Oregon), and Ruby Lake NWR (Nevada). The Rocky Mountain population is comprised of the non-migratory tristate subpopulation and the migratory interior Canada subpopulation that breeds in the Grande Prairie/Yukon-NWT region and overwinters in the Tristate area. Finally, the Interior population is comprised of non-migratory restoration flocks located east of the Rocky Mountain population, mainly in mid and western USA. The largest flocks are located at LaCreek NWR, South Dakota; Valentine and Crescent Lake NWR; William Mahon State Refuge in Nebraska; and Hennepin County Park Reserve in Minnesota.

BREEDING TRUMPETER SWAN DISTRIBUTION AND HABITAT USE IN CANADA

The Canadian breeding population of Trumpeter Swans is considered a subpopulation of the Rocky Mountain population. During 1985, CWS conducted Trumpeter Swan population surveys throughout the total known breeding range in Canada. This was part of a cooperative effort with the USFWS, conducted every five years to determine a total North American Trumpeter Swan population. The 1985 surveys accounted for the following flocks that breed in Canada:

1. Mackenzie District, NWT	75 birds
2. Toobally Lakes, Yukon	141 birds
3. Fort Nelson, B.C.	20 birds
4. Fort St. John, B.C.	72 birds
5. Grande Prairie, Alta.	285 birds
6. Edson, Alta.	23 birds
7. Pioneer Flocks, Alta.	22 birds
8. Cypress Hills, Sask.	5 birds
Total	643 birds

The largest breeding component of this subpopulation nests in the Peace River block of northwestern Alberta, west of the city of Grande Prairie. Total population of the Grande Prairie flock in 1985 was about 285 swans or 44% of the Trumpeter Swans that breed in Canada.

Trumpeter Swans arrive on their Canadian breeding grounds two to three weeks before most lakes become ice-free. In the Peace River district this occurs during the month of April and is progressively later in more northern areas. Swans arriving prior to ice breakup utilize small sloughs and backwaters of rivers that become ice-free earlier than lakes. Swans have been observed feeding in stubble fields of barley, especially when ice breakup on lakes was delayed.

The Peace River district is a northern extension of the aspen parkland ecoregion surrounded by boreal mixedwood forest. Large shallow lakes and marshes occur within both ecoregions. Lakes utilized by breeding Trumpeter Swans average about 100 ha in the Peace River district and are almost universally occupied by only one breeding pair.

Historically, it was believed that Trumpeter Swans nested primarily on the more productive marshes and lakes within the aspen parkland. Today, however, the Peace River aspen parkland is almost totally in agricultural production and there has been extensive industrial activity associated with the petroleum and forest products industries. Recreational use of lakes in the parkland has had - and will continue to have - an impact on Trumpeter Swan habitat use. As a result, Trumpeter Swans now use wetland breeding and staging habitats in both the aspen parkland and boreal mixedwood forests of the Peace River district in Alberta and British Columbia.

The second largest component of breeding Trumpeter Swans in Canada occurs in northwestern British Columbia, southeastern Yukon, and southwestern Northwest Territories. The exact size of these flocks and their total occupation of breeding habitat is not well known, although work has been initiated to assess flock sizes and to verify their wintering area. The 1985 population surveys estimate current population numbers at 308 swans.

This northern extension of Trumpeter Swan breeding territory in Canada is primarily foothills to mountainous boreal mixedwood forests, interspersed with wetland complexes. The climax vegetation on most areas below the subalpine consists of White (*Picea glauca*) and Black (*P. mariana*) Spruce with a moss or moss-shrub understory. Various stands of Lodgepole Pine (*Pinus contorta*), Trembling Aspens (*Populus tremuloides*), and Tamarack (*Larix laricina*) also occur throughout the region, especially in response to fire and variations in topography. It has been observed that swans utilize habitats that McKelvey et al. (1983) and McCormick (1985) broadly classified into four types:

1. long and narrow deep lakes such as Toobally Lakes (Yukon) that are used for summering and staging habitat by swans;

2. perched basins associated with glacial moraines and terraces;

3. outflow streams in valley bottoms with connections to beaver impoundments or to perched basins;

4. oxbow wetlands associated with major river channels such as the Liard and Nahanni rivers. The latter three types of wetlands provide the major nesting habitat for Trumpeter Swans in this subpopulation.

Human impact on swan habitat in these northern breeding areas has generally been minimal. However, this may change: exploration for oil, gas, and minerals continues throughout the region; float trips on river systems in the national parks and fly-in fishing lodges are becoming very popular; and hydroelectric development on the Liard River seems imminent. Currently there are no specific measures in place to protect key habitats, except within national parks. Most of the habitat is on Crown lands. All developments within the region require land-use permits and are therefore subjected to an environmental screening process.

Since 1948, a small group of trumpeters have nested in the Cypress Hills of southwestern Saskatchewan and southeastern Alberta (Nieman and Isbister 1974). This flock was estimated to contain five birds in 1985.

In addition, Trumpeter Swans have pioneered the Edson, Otter Lakes, Chinchaga River, and Pincher Creek areas of Alberta. The fall 1985 population total is 45 birds in Alberta pioneer flocks. Habitat within these areas is extremely variable, but the majority of wetlands used by swans are similar to those found in the mixedwood forest areas of the Peace River district.

WINTERING HABITAT REQUIREMENTS

Trumpeter Swans leave their Canadian breeding and/or summering areas as their fall staging habitats freeze in approximately early to mid-November. Migration along the eastern flank of the Rocky Mountains is rapid and direct to the Tristate region. Canadian breeding trumpeters join the sedentary Tristate breeding subpopulation by mid-November in the Yellowstone Lake area and remain there well into December or until wetlands freeze over and limit their food supply. They then move west to major wintering areas on a 25 km (16 mi) stretch of open water along Henry's Fork of the Snake River (including key concentrations at Harriman State Park, Idaho); the Teton River, Idaho; and Hebgen Lake, Montana.

Trumpeter Swan wintering habitat in the Tristate is characterized by shallow lakes, streams, rivers, and ponds with adequate macrophytes for feeding. Warm springs or turbulent waters are responsible for keeping areas from icing over during periods of extremely cold weather. Because the majority of the Canadian breeders traditionally utilize a very restricted area of the Snake River, they are very vulnerable to catastrophic losses. Irreversible declines in the population could result from diseases, disturbance, habitat destruction, or changes in habitat availability associated with extremely cold weather and/or reduced winter water flows from Island Park Dam on the Snake River.

Another problem that may result from the crowded wintering habitat is the very low productivity of the Tristate sedentary subpopulation. It is believed that competition for food resources and the lower nutritional quality of these foods may result in a negative energy budget for young birds and sedentary breeders, thus reducing their ability to produce healthy clutches and survive the following winter. It is felt that Canadian swans that only overwinter in the Tristate have better nesting success and brood survival because the breeding adults are able to find nutritious foods in Canada prior to nesting in spring. Therefore, management and preservation of severely limited natural wintering habitat in the Tristate appears to be the most critical factor for the maintenance and/or expansion of the Rocky Mountain population.

CURRENT MANAGEMENT ACTIVITIES

Tristate Area

The Tristate area has an extremely high potential for increased recreational use. In addition, activities associated with forestry, agriculture, hydrocarbon, and geothermal resource exploration are being conducted. Since the area now provides wintering habitat to more than 1500 Trumpeter Swans, it has become necessary to restrict general public activities around critical swan wintering and nesting habitats, especially at Yellowstone National Park, Red Rocks Lakes NWR, and Harriman State Park.

Yellowstone National Park has sponsored studies of the ecology of breeding and migrant trumpeters (Hampton 1981, Shea 1979). The major goal of these studies was to provide recommendations on management practices that would reduce swan/people conflicts in the park. Recommendations include closure of park roads and trails during the critical nesting period. The U.S. Forest Service has included Trumpeter Swans in many of their forest land-use plans for this area. The states of Idaho and Wyoming have also closed white goose seasons in certain counties to protect trumpeters from being mistakenly shot for either the Snow (*Chen caerulescens*) or Ross' (*C. rossii*) Goose.

Rate of water flow in the Snake River is probably one of the most important factors maintaining ice-free conditions on areas utilized by trumpeters. Flow rates and water quality of the Snake River are continually monitored to ensure that wintering habitat quality and quantity are developed to protect trumpeters in the event that extremely cold temperatures or other catastrophies might cause a freeze on the Snake River.

Prior to 1970, Red Rock Lakes NWR provided excellent Trumpeter Swan nesting and brood rearing habitats. Supplemental winter feeding has allowed for the maintenance of a larger number of wintering birds than natural conditions would permit, resulting in a reduced quality of breeding and brooding habitat. Efforts are being made to reduce the amount of artificial feeding in order to decrease wintering swan use on the area. In addition, a cooperative program has been initiated to evaluate potential alternate swan wintering sites in central and western Wyoming. Another cooperative effort will determine movements, seasonal distribution, population recruitment, and dispersal of swans summering in Wyoming outside of Yellowstone National Park.

Since 1946, the respective State Fish and Game departments, the U.S. Fish and Wildlife Service, and Red Rock Lakes NWR staff have conducted region-wide annual aerial surveys of Trumpeter Swan production in September to provide a management data base for the Rocky Mountain population of trumpeters. Since 1964, an annual region-wide aerial population survey has also been conducted each February. Various weekly surveys of wintering habitat use by swans are conducted in key areas such as Red Rock Lakes NWR, Harriman State Park, and Yellowstone Lake. In 1982, a three-year Tristate cooperative project was initiated to investigate possible disease vectors and parasites that may be having an impact on winter survival of Trumpeter Swan cygnets.

Red Rock Lakes NWR has been a primary source of trumpeters for restoration and avicultural flocks. Most restoration flocks in the Pacific Coast and Rocky Mountain Populations have been established from this flock. Birds and eggs are currently being sought for restoration programs in Ontario, Minnesota, Kentucky, and Tennessee. In 1981, the Trumpeter Swan Society proposed to establish 10 populations of approximately 100 birds each, breeding in northern areas and migrating to southern wintering areas. Releases in northern breeding areas would be through cooperative efforts with various state and provincial agencies. The society also proposes the establishment of a captive breeding flock of 45 birds at the Wildlife Restoration Center in western Kentucky. In response to these proposals, the Pacific Flyway Technical Committee has developed guidelines for transplants and removals from the Pacific Coast and Rocky Mountain Populations.

Another major management activity recently undertaken is the preparation of the North American Management Plan for Trumpeter Swans by members of Trumpeter Swan subcommittees of all the major flyway technical committees. The goal of the plan is "to manage Trumpeter Swans for numbers and distribution that will provide maximum direct benefits to the public and for the intrinsic values of the birds themselves" (North American Flyways Councils 1984). Input is being provided by the U.S. Fish and Wildlife Service, the Trumpeter Swan Society, the Canadian Wildlife Service, and states and provinces.

Currently, Ruth Gale has been contracted by the USFWS to analyze and summarize 1935-1986 data on the Rocky Mountain population with particular emphasis on the reasons for the recent decline in cygnet productivity at Red Rocks Lake. A final report will be published later this year on habitat relationships, population dynamics, and management recommendations for this population.

Canadian Breeding Areas

In 1978, the Canadian Wildlife Service and Alberta Fish and Wildlife jointly sponsored a thesis on Trumpeter Swan ecology and habitat use in the Peace River parkland (Holton 1982). Increased access demands by the petroleum and pulp and paper industries, recreationalists, and agriculturalists to use areas that are important swan habitat, prompted the Alberta Government in 1979 to develop land-use guidelines for swan habitat protection. A repository of land-use information is used to provide recommendations to local land-use and planning authorities and to apply restrictions to land use on Crown lands surrounding swan lakes. The main purposes of these restrictions are to create a 500 m no activity buffer zone around lakes during the breeding season and to protect lakes from habitat destruction and degradation. Land-use restrictions may limit habitat destruction and disturbance on Crown lands, but will have minimal impact on private lands adjacent to wetlands that are important to Trumpeter Swans.

The Alberta Trumpeter Swan management proposal states the following objective: "sufficient protection and management should be provided to maintain a minimum Trumpeter Swan population of 25 breeding pairs and to encourage population growth to 50 breeding pairs" in the Grande Prairie area and 80 pairs in the province (Brechtel 1982). The plan addressed additional management and habitat protection needs required to ensure continued maintenance of swan breeding habitat in Alberta. Brechtel (1982) also proposed a transplant program that resulted in the Elk Island National Park Trumpeter Swan transplant project in 1983.

From 1978 to 1981 the Canadian Wildlife Service conducted aerial surveys to determine the status and distribution of Trumpeter Swans in the southern Yukon. During 1984 and 1985, CWS conducted surveys to determine habitat use and population status of Trumpeter Swans in the Mackenzie District, N.W.T. McKelvey *et al.* (1983) recommended that further surveys be conducted to monitor population dynamics of Yukon trumpeters in relation to climate and disturbance factors that may influence the productivity of the flock. Due to the increased potential for habitat destruction and disturbance from industrial activities and recreational use of swan breeding lakes, they recommended that the Toobally Lakes area be given special status as a National Wildlife Area. Aerial surveys should also be continued in the southern Yukon, northern British Columbia, and southwest Northwest Territories to accurately document Trumpeter Swan habitat use in this area.

The CWS, Alberta Fish and Wildlife Division, and Saskatchewan Parks and Renewable Resources have continued to monitor habitat use and productivity of Trumpeter Swans in various outlying locations in British Columbia, Alberta, and the Cypress Hills of Saskatchewan. In Saskatchewan, these efforts are required -- along with an increased level of management and protection -- to ensure that the present flock of five birds in the province expands to the proposed Saskatchewan population goal of 10 breeding pairs. If these goals are to be met, other wintering areas for Canadian-breeding Rocky Mountain population birds must be located.

To assist provinces in successfully establishing new flocks and increasing the size of existing ones, CWS has developed draft guidelines for transplanting Trumpeter Swans in Canada (Turner and McKelvey 1983). CWS will encourage the preservation and management of Trumpeter Swan habitats under provincial and private control and ensure that habitats under federal jurisdiction are protected and maintained. Population restoration by artificial means, including propagation by aviculturists, will be encouraged as the natural growth and expansion of existing populations seems limited. It was recommended that not more than 25 eggs be taken during any one nesting season from trumpeter nests in the Peace River district for restoration purposes.

FUTURE MANAGEMENT NEEDS

To maintain or expand the current Canadian breeding population of Trumpeter Swans this workshop recommended the following management needs:

1. All key Trumpeter Swan breeding, staging, and migration habitats in Canada should be determined and documented. This will involve extensive surveys, banding, and collaring of Trumpeter Swans within the northern Canadian breeding grounds and pioneer flocks.

2. The management and diversification of the wintering habitat appears to be the most critical factor in the maintenance and/or expansion of the Rocky Mountain Population. To this end, there is a need for liaison with state and federal agencies in the U.S. and for support initiatives intended to maintain and/or improve winter habitat quantity and quality and to encourage swans wintering in the Tristate to pioneer new wintering areas.

3. Establishment of alternate wintering and breeding sites by transplanting Trumpeter Swans will provide population security and long-term habitat stability and will help to buffer Canadian-breeding swans from major habitat degradation or disease-related impacts on the Tristate wintering habitat. Several agencies in Canada are responding to increasing public demands for viewing of Trumpeter Swans and re-establishment of breeding concentrations in Ontario, Saskatchewan, and Alberta should be supported.

4. In cooperation with the provinces and territories, legislation should be enacted to designate key swan breeding and staging lakes in Canada as critical wildlife

areas. This will further enable the regulation of surface activities such that habitat destruction and disturbance is reduced or eliminated.

5. An information program should be developed to inform the general public, private landowners, and government land-use management agencies of the status and biology of Trumpeter Swans breeding in Canada. Provincial and federal parks with resident swans should be encouraged to incorporate information on swan management in their interpretive programs. This will acquaint water-based users with the direct threat posed to nesting swans during critical periods.

6. There is a need for a coordinated approach to North American Trumpeter Swan population and habitat management. As a first step, Canada should endorse the North American Plan and participate in the various flyway technical committees dealing with swan management. In addition, a long-term Canadian strategy for Trumpeter Swans should be developed.

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FACTORS LIMITING THE SIZE OF THE BREEDING POPULATION OF FERRUGINOUS HAWKS

Josef K. Schmutz

A major decline in the breeding range of Ferruginous Hawks (*Buteo regalis*) in Canada has been well documented (Houston and Bechard 1984, Schmutz 1984). Based on this decline, the Committee on the Status of Endangered Wildlife in Canada has classified this species as "threatened". This decline does not appear to be a local phenomenon but has also occurred in the United States (USFWS 1985).

In the northern part of Ferruginous Hawk breeding range, the decline in abundance is correlated with an invasion of aspen into prairie habitat following a reduction in naturally occurring prairie fires (Schmutz and Schmutz 1980; see also, Houston and Bechard 1983). Within prairie habitat, Ferruginous Hawk abundance decreases as more of the land is cultivated (Schmutz 1984). This negative relationship has been reported many times and is widely accepted as a causal factor in Ferruginous Hawk abundance (Olendorff 1973, Howard and Wolfe 1976, Lokemoen and Duebbert 1976, Gilmer and Stewart 1983).

The purpose of this report is to review the previously suggested reasons for a decline in Ferruginous Hawks. The aim is to focus attention on other, equally possible factors. It is imperative that the factors limiting the population be well understood before conservation efforts can be effective.

LOSS OF GRASSLAND

The conversion of grassland to cultivated fields has been so often implicated in the decline of Ferruginous Hawks that it is rarely questioned. While evidence for this factor, although based on correlation only, is strong, there is also evidence to the contrary:

1. In some areas of 80% or more cultivation, Ferruginous Hawks nest at high densities (A.R. Smith, personal communication).

2. In areas formerly occupied by Ferruginous Hawks, Swainson's Hawks (*Buteo swainsoni*), which have highly similar ecological requirements, nest at exceptionally high densities (Schmutz 1984).

3. On their wintering grounds in Texas, Ferruginous Hawks are abundant in areas of greater than 95% cultivation. In this area, farm dwellings are abundant and human traffic is high in contrast to the sparsely settled regions frequented by Ferruginous Hawks in Alberta. It is clear that Ferruginous Hawks prefer areas with grassland but whether this factor in itself limits the size of their breeding population is much less clear.

AVAILABILITY OF NESTS

Since Ferruginous Hawks nest on outcrops or steep slopes and in some cases even on level ground, nest sites themselves can hardly be limiting. However, when available, the hawks prefer to nest on elevated substrates such as trees and shrubs, rock piles, haystacks, power transmission towers, windmills, and nests provided for them (Olendorff et al. 1980, Schmutz et al. 1984). Pairs nesting on ground are accessible to mammalian predators and produce fewer fledglings than those nesting on elevated substrates (Lokemoen and Duebbert 1976, Schmutz et al. 1984). Since Ferruginous Hawks build large and bulky nests, these are often poorly supported and fall out of trees during storms (Gilmer and Stewart 1983). Thus the provisioning of artificial nest structures or wire baskets in trees affords the hawks a secure nest substrate and protection from predation and disturbance.

On a study area near Hanna, Alberta, Ferruginous Hawk density increased significantly after artificial nests were erected (Schmutz ***et al.*** 1984). While it is clear that at a local level nest availability limits Ferruginous Hawk density and that nest quality affects their reproductive success, the effect of these factors at the total population level is not known.

OVERWINTER SURVIVAL

It is possible that high mortality of Ferruginous Hawks occurs overwinter limiting the size of the breeding population. This suggestion could be rejected by demonstrating that by erecting artificial nests, the number of breeding pairs increases without causing declines in other less suitable areas. This would suggest the existence of a segment of the population that was previously unable to breed because of a lack of available habitat.

The survival of Ferruginous Hawks is currently under study (Schmutz, in progress). Based on returns from one nesting season to the next, survival in the adult age class was 75%. There is as yet no evidence of surplus of individuals who are unable to breed due to a lack of habitat.

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THE FERRUGINOUS HAWK IN ALBERTA

David A. Moore

Historically, the Ferruginous Hawk (*Buteo regalis*) was found in the grassland habitats of Alberta as far north as Edmonton (Macoun and Macoun 1909, Salt and Salt 1976). Due to two main factors, the expansion of the Aspen Parkland Ecoregion into the northern portion of their range and the increasing cultivation of the prairie habitats, they now occupy approximately 60 percent of their former range in Alberta.

Within the last ten years, Ferruginous Hawk nests have been located within three of the twelve ecoregions in Alberta (Fig. 1), the Short Grass Prairie Ecoregion (47,000 km^2), the Mixed Grass Ecoregion (30,500 km^2) and the Fescue Grass Ecoregion of (13,000 km^2). The southern 10,000 km^2 of the Aspen-Parkland Ecoregion may also be suitable for a scattered population. Thus less than 16% of the province is considered suitable habitat for the Ferruginous Hawk. Further limitations within this area occur due to urban development, agriculture, vegetative cover types, and the prey base.

Schmutz (1982), in estimating a provincial population of 1,082 $\pm$ 429 pairs, found that the Ferruginous Hawk population increased from west to east in Alberta. Natural grasslands and grazing predominate in the eastern Short Grass Ecoregion. Studies in the Hanna/Sheerness area have found extremely few Ferruginous Hawk nests closer than 0.5 km from an occupied dwelling, emphasizing the need for undisturbed habitat. Thus the maintenance of grasslands appears essential for the survival of this species in Alberta.

Ferruginous Hawks have been extensively monitored in a 500 km^2 area of the Short Grass Prairie Ecoregion south of Hanna, Alberta. A study conducted in 1975, and 1976 by J. Schmutz was originally designed to investigate the degree of ecological segregation between three species of prairie buteos (Schmutz 1977). The study area consisted of community pasture, farmland and a complex of three lakes. Approximately 8% of the land area was used for grain production in 1975 and 1976, while approximately 15% is under grain production today.

As part of the study, 38 pairs of Ferruginous Hawks were found in 1975 and 48 pairs in 1976 (Table 1). The area was examined superficially for Ferruginous Hawks in subsequent years and since 1981 intensive surveys for Ferruginous Hawks have continued to determine population levels and the effect of artificial nesting structures on the population (Table 2). The study area has varied in size from 335 km^2 in 1975 to 480 km^2 in 1976, 1984 and 1985 with the original 335 km^2 a core area that has remained constant.

In 1975, 98 nest site poles were erected on a 100 km^2 community pasture in an attempt to artificially increase the density of nesting hawks on a part of the study area. Two poles were used by Ferruginous Hawks (Table 2) in the first year (Schmutz et al. 1984). By 1985, Ferruginous Hawks nested on twelve of the 78 poles available and 22 were utilized

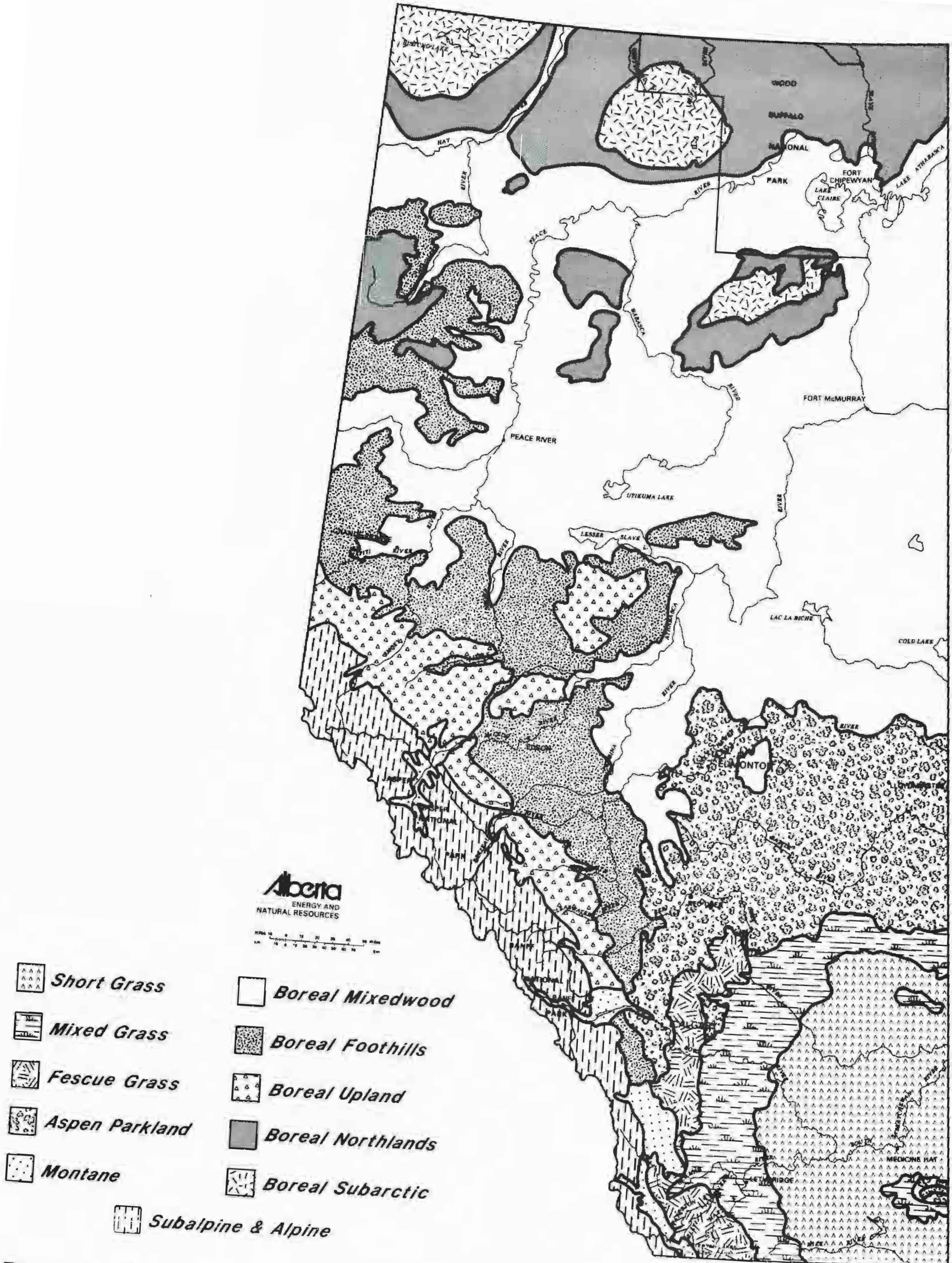

Figure 1. Ecoregions of Alberta

Table 1.--Ferruginous Hawks Abundance in the Sheerness Study Area[a]

	1975	1976	1977	1981	1982	1983	1984	1985
Study Area Size(km^2)	335	480	480	326	326	326	480	480
Ferruginous Hawk Nests	38	48	49	31	31	37	48	52
Density of Nests per km^2	0.113	0.100	0.102	0.095	0.095	0.113	0.100	0.108
% Deviation From Mean Density of 0.103 nests per km^2	+10%	-3%	-1%	-7%	-7%	+10%	-3%	+5%

[a] Data from Alta. F. & W. Div. (1985), Schmutz et al. (1984), Schmutz pers. comm.

by other species. The use of 34 poles in one year is the largest recorded since the poles were erected. Since 1976, a total of 57 poles have been used at various times as nesting structures by Ferruginous Hawks, Swainson's Hawks (*Buteo swainsoni*), Canada Geese (*Branta canadensis*), American Crows (*Corvus brachyrhynchos*), and unidentified duck species. Ferruginous Hawk annual usage of the nest structures has ranged from 2% to 15% of the available poles while pole usage by all species has ranged from 4 to 44%. Within the 100 km^2 area where the poles were erected, the density of Ferruginous Hawks rose from nine pairs in 1975, all located on natural nests, to 16 pairs, a 178% increase. Twelve nests were on poles and four in trees (one in an artificial basket) in 1985. Despite the presence of the poles, the overall Ferruginous Hawk population in the 500 km^2 study remained stable although 23 percent now nest on artificial structures.

During the winter of 1982 J. Schmutz erected a further 105 poles in five distinct areas of southeastern Alberta from the Sheerness area to the U.S. border. Because of logistical considerations only two of these groups have been examined since 1982. Of 16 poles located within 50 km of the Sheerness study, eight have been occupied, five by Ferruginous Hawks. In 1985 near Manyberries, Alberta, 15 nesting poles were checked, five pole-nesting Ferruginous Hawks were located and three poles showed evidence of previous use.

STATUS OF THE FERRUGINOUS HAWK IN ALBERTA

The draft of "A Policy for the Management of Threatened Wildlife in Alberta" proposes that the Ferruginous Hawk be designated as Threatened in Alberta. Schmutz (1984) estimated that the Alberta population was 1,082 ± 429 pairs of

Table 2.--Use of Artificial Nest Poles in Sheerness Study Area[a]

Year	Area km^2	No. of Poles Available	No. of Poles Used by Ferruginous Hawks	No. Used by Other Species[b]
1975	335	0		
1976	480	98	2	+2
1977	480	98	4	2
1981	326	82	11	9
1982	326	80	12	9
1983	326	78	11	19
1984	480	78	12	17
1985	480	78	12	22

[a] Data from Alta. F. & W. Div. (1985), Schmutz et al. (1984), Schmutz (Pers. Comm.)

[b] Canada Goose, Swainson's Hawk, and American Crow

Ferruginous Hawks. It is the goal of the Fish and Wildlife Division that these numbers be maintained, as estimates indicate that Alberta's population could be 40% of the North American total and its range in Alberta one-third of the Canadian total (Schmutz and Schmutz 1980).

Inventory, habitat requirements, behavior and productivity are all inadequately known for the Alberta population and must be studied in greater detail to form a base for indepth management plans.

It is proposed that land-use guidelines respecting public lands should reflect the following: (1) the Ferruginous Hawk may be sensitive to disturbance during the breeding cycle and occupied nest sites in areas of heavy use should have a restricted access status invoked to control recreational use and oil and gas exploration adjacent to the nests; and (2) if public land is to be opened to agriculture (within the range of the Ferruginous Hawk), a percent of the area affected should be left in its native state in blocks to be assessed in the future.

The maintenance of existing provincial grazing reserves or the establishment of new grazing reserves in the south will probably benefit the Ferruginous Hawk population by maintaining short grass prairie habitat both for nesting and foraging provided these rangelands are left in their native state.

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STATUS OF THE FERRUGINOUS HAWK IN SASKATCHEWAN

Alan R. Smith

DISTRIBUTION

The former breeding range of the Ferruginous Hawk (*Buteo regalis*) in Saskatchewan included some 220,000 km^2 in the southern third of the province (Figure 1). It extended north to the southern edge of the aspen parkland. Within the last 70 years the range has contracted concomitant with expansion of the aspen parkland. In the western part of the province, the range has withdrawn only 50 km, but in the east it has withdrawn 150 km; in addition, the species no longer breeds on the Regina Plains (Smith and Adam umpublished data). The present range is approximately 150,000 km^2 (about 70% of the former range).

ABUNDANCE

In the core of the range in Saskatchewan, which is an L-shaped area along the Alberta and Montana borders, Ferruginous Hawks occur in numbers comparable to former populations (Smith and Adam unpublished data). The core is 80,000 km^2 in area or about half the present range.

In the peripheral zone which lies between the core area and present northern limits, populations are disjunct and the species is absent from vast areas. This zone is about 70,000 km^2 in area or about half the present range.

FACTORS INVOLVED IN POPULATION CHANGES

All of the following factors can be implicated in population declines, paradoxically they may also be involved in increases.

1. *Invasion of Aspen Groves.*--The Ferruginous Hawk is an open-country dweller whose gross range has been reduced by the southward expansion of the aspen grove region. This expansion was brought about with the control of fires as the Prairies were brought under cultivation. On the periphery of the aspen grove region, however, populations of Ferruginous Hawks have increased due to increased availability of tree nest sites (see below).

2. *Intensive Cultivation of Grassland.*--This has had the effect of reducing prey populations. The tall grain crops that have replaced grasslands have also made foraging more difficult. In addition, nest site disturbance due to farming activities may be involved. The net result has been a fragmentation such that the present gross range is discontinuously occupied. However, Schmutz (1984) suggests that the effect of grassland cultivation has been overestimated. In Alberta, up to 30% of the foraging range can be cultivated before Ferruginous Hawk populations are adversely affected; in a 100 km^2 area of southern Saskatchewan, I found 6 successful nests in an area that was over 80% cultivated. The conclusion that may be drawn from these data is that at least in some areas, the classical concept that the size of breeding populations is inversely proportional to the area under cultivation does not apply. A certain amount of cultivation probably benefits the Ferruginous Hawk by

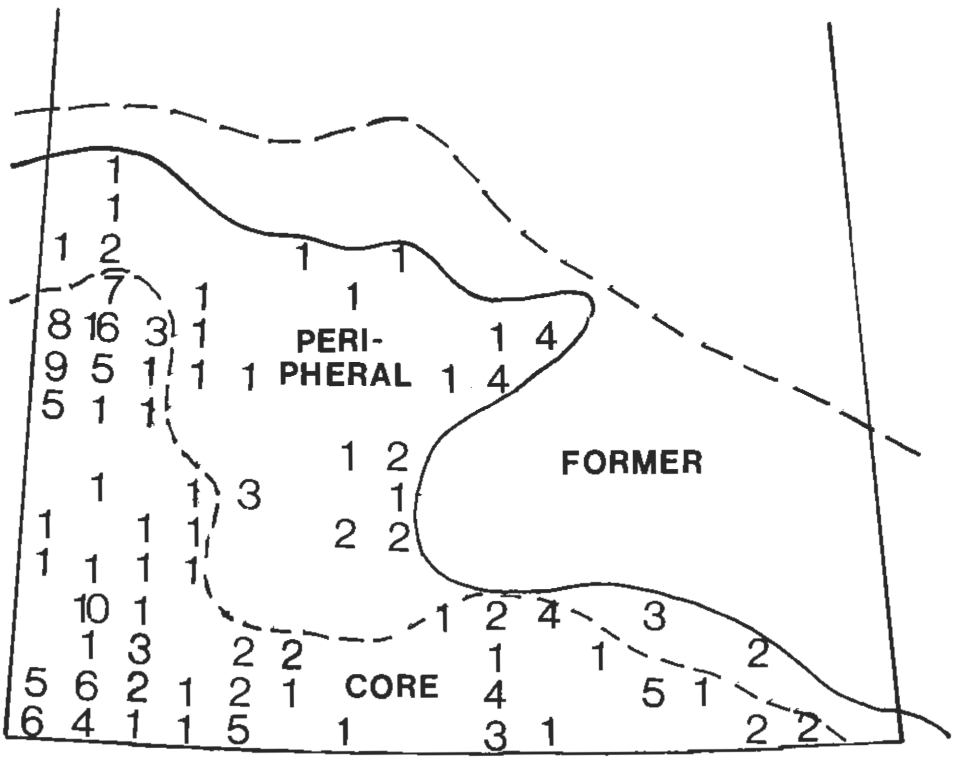

Figure 1. Distribution of Ferruginous Hawks in Saskatchewan showing area formerly occupied by this species, a peripheral area, and a core area where the hawks are more common. Numbers refer to number of nests plotted on a 1:50,000 map sheet. Data were taken from Smith and Adam, in prep.

increasing habitat diversity and the amount of edge, which in turn, increases prey populations. Further studies of habitat-predator-prey relationships are certainly warranted.

3. *Availability of Nest Sites.*--In Saskatchewan as elsewhere, this species has nested in a variety of situations: on the ground, on cliffs, in trees, and on man-made structures such as power poles, rock piles, and hay stacks. Human disturbance, however, has reduced nesting on the ground and probably on cliffs such that the species is now more dependent on alternate tree or "tree-like sites". Where these are not available the species has declined. In most areas, however, the number of tree nest sites has increased due to the invasion of aspen groves, the planting of shelterbelts around subsequently abandoned farmsteads, and more recently the erection of artificial nest sites for this species and the Swainson's Hawk (*Buteo swainsoni*).

POPULATION ESTIMATE

Without a systematic survey the number of Ferruginous Hawks in Saskatchewan is difficult to estimate. Fyfe estimated that there were 150-200 breeding pairs in 1979. Information gathered for the Saskatchewan Bird Atlas suggests a minimum of 170 pairs. This figure does not, however, take into account huge gaps in geographic coverage. The Saskatchewan Natural History Society is funding a survey of the core of the species provincial breeding range. This survey will begin in May of 1986.

PRODUCTIVITY

While, for various reasons, the number of young fledged per successful nest is not the best parameter to measure productivity, it is the only one available to us. An on-going banding program by Dr. C.S. Houston has yielded valuable data on this productivity parameter. An analysis of these data (Table 1, Fig. 2) suggests that, while the fledging rate fluctuates, the overall trend is downward. While of concern, this decline does not necessarily translate into an overall population decline as the fledging rate is only one component of productivity. The cause of this decline is unknown.

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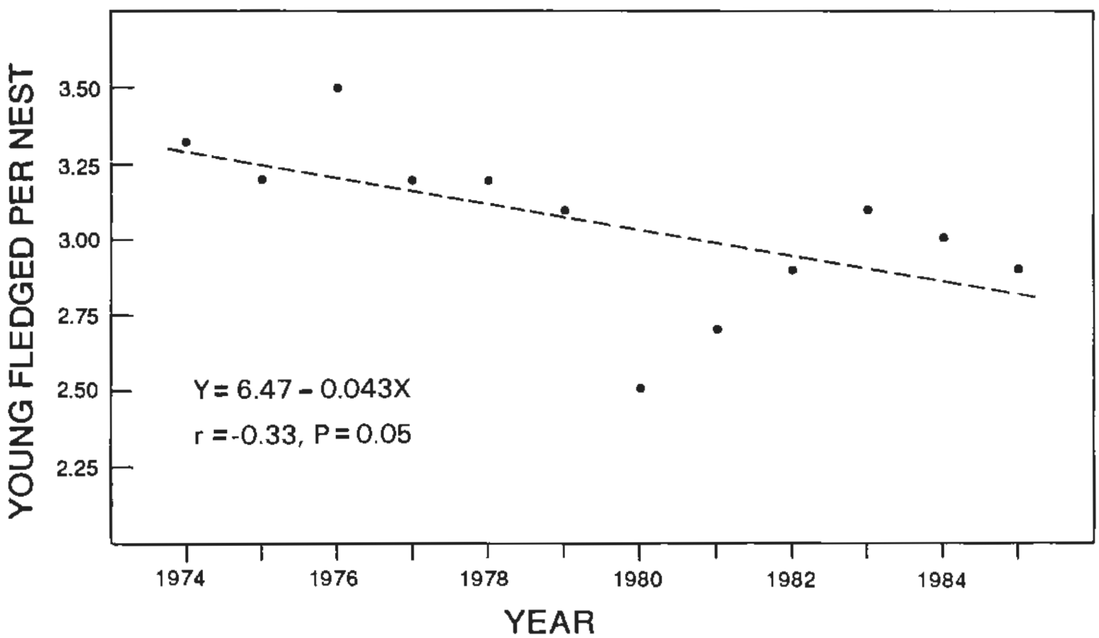

Figure 2. Changes in the average number of young fledged from Ferruginous Hawk nests from 1974-1985 in Saskatchewan. The decline is significant at the .05 level.

TABLE 1.--NUMBER OF FERRUGINOUS HAWK YOUNG FLEDGED PER SUCCESSFUL NEST IN SASKATCHEWAN.

Brood Size	Number of Nests																			
	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
1	0	0	0	0	2	1	0	0	1	0	0	2	1	1	2	3	3	1	1	[a]
2	0	0	0	0	1	1	3	1	1	2	0	2	1	4	8	5	2	6	10	[a]
3	0	1	0	0	1	5	2	4	4	5	6	4	9	4	5	3	10	13	14	[a]
4	0	0	0	2	5	1	7	0	5	2	6	7	6	5	3	4	6	9	9	[a]
5	0	0	0	2	1	0	0	1	1	1	0	1	0	1	0	1	0	1	2	[a]
Total Nests	0	1	0	4	10	8	12	6	12	10	12	16	17	15	18	16	21	30	36	38
Total Young	0	3	0	18	32	22	40	19	40	32	42	51	54	46	45	43	61	93	109	111
Yg/nest	0.0	3.0	0.0	4.5	3.2	2.7	3.3	3.2	3.3	3.2	3.5	3.2	3.2	3.1	2.5	2.7	2.9	3.1	3.0	2.9

[a] data unavailable

FERRUGINOUS HAWK REPORT FOR MANITOBA

Brian Ratcliff

In 1984, confirmation of Ferruginous Hawks nesting in Manitoba was made by Ratcliff and Murray (1984). Hales (1927) was the last to document this species nesting in Manitoba. Other records were reported by Bechard (1981), based on egg collections at the American Museum of Natural History and the Western Foundation of Vertebrate Zoology.

With the discovery of the nesting hawks, the Manitoba Dept. of Natural Resources, Wildlife Branch, initiated a project to put up artificial nest sites and search for other nesting pairs. Efforts by Houston (1982) in Saskatchewan and Schmutz et al. (1984) in Alberta to attract Ferruginous Hawks to artificial nest sites proved successful. In Manitoba, there are potential nesting sites in trees but they lack a nest structure. During October, 1984, in the Lyleton area, close to where the hawks were nesting, three artificial sites were constructed in single trees located in full section pastures. These sites were checked in May, 1985; two were empty and one had a nesting Great Horned Owl (*Bubo virginianus*). Plans are being made to put up more structures near Lyleton and also along the Souris River near the North Dakota border.

In 1985, three Ferruginous Hawk nests were located and another seven individual observations were made in Manitoba. Two of the nests were in the Lyleton area and the other was near Broomhill. The 1984 nest site was not used in 1985. During the first week of June, young were observed in both the Lyleton nests but the Broomhill nest was unchecked. On 8 June, a severe wind and dust storm hit Manitoba with gusts to 130 km/hr. Three weeks after the storm, the Broomhill nest was climbed and the nest was empty but both adults were present. A new nest was being built in a large aspen tree 30 m away. The Lyleton nests both had two young in them and they were banded on 9 and 10 July. These represent the first Ferruginous Hawk young banded in Manitoba.

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FERRUGINOUS HAWK

Josef K. Schmutz

DISCUSSION AND ACTION LIST

The workshop on Ferruginous Hawks was well attended and following the presentations a spirited discussion extended beyond the allotted time period. Below is a list of factors which have been implicated in the decline of this species and recommended for action.

1. *Availability of Grassland*.--As is evident from the distribution of Ferruginous Hawks, grassland habitat is crucial for their reproduction and survival. Land use in the greatly diminished grasslands should be restricted to grazing at an intensity that will maintain this prairie community near its natural state. If properly maintained, a diverse plant community provides food and cover for a variety of prey animals which in turn support healthy populations of Ferruginous Hawks.

2. *Monitoring*.--Since it is not clear whether Ferruginous Hawks are declining in population size or whether they have stabilized, their populations should be monitored. This should be done in a statistically valid manner to allow reliable comparisons over time.

3. *Nest Management*.--The provision of artificial nests is beneficial for Ferruginous Hawks. Despite reservations toward artificial nest structures by some individuals on esthetic grounds, these efforts by landowners and others should be encouraged. Wire baskets in trees are virtually indistinguishable from natural nests. Larger nest structures should be as esthetically pleasing as possible, not exceed 4 m in height, and be placed into land depressions.

4. *Over-winter Survival*.--Ferruginous Hawks spend 4-6 months outside of Canada during the winter. If high mortality occurs overwinter, reducing it may represent the greatest challenge in this species conservation effort.

5. *Prey Species*.--Ground squirrels and hares are the principle source of food for Ferruginous Hawks. Since ground squirrels are poisoned as an agricultural pest, efforts should be made to prevent these from being eliminated totally from large areas of their range. They should be given status as a wildlife species or otherwise monitored.

6. *Secondary Poisoning*.--The incidence of mortality of Ferruginous Hawks caused by secondary poisoning should be investigated. Landowners and the general public should be made aware of this potential source of mortality.

7. *Protection from Disturbance*.--Artificial nests, if placed, should be at least 300 m from dwellings, regularly used gates or other frequently visited sites. If pairs suffer from repeated disturbance, their nests can be removed after the nesting season and replaced within 500 m. During the courtship, laying, incubation, and early nestling periods (April - early June) the hawks are severely affected by disturbance.

THE PEREGRINE FALCON

Richard W. Fyfe

INTRODUCTION

The Peregrine Falcon (*Falco peregrinus*) is one of the most cosmopolitan of all bird species, breeding on all continents except Antarctica. In some parts of the world it was formerly very abundant and maintained its population, despite persecution and extensive harvests over many years. The best documented populations were those in Europe, and some of these were surprisingly high. The estimates for Scandinavia alone were as high as 2,500 breeding pair, for France about 500 pair, and for the British Isles about 1,050 pair with roughly 800 in England and 250 in Ireland (Ratcliffe 1980). By comparison, the total known recorded population for the *anatum* subspecies (*F. p. anatum*) in the United States and Canada (Fyfe et al. 1976) is less than that documented for England, a country roughly one-fifth the size of Alberta.

Although globally the species was probably never endangered, several populations declined severely in the 1950's and 1960's to the point that some subspecies approached extinction in Europe and North America. In England, during the last world war, the peregrine had declined to about 85% of its pre-war population because of extensive persecution, then it rebounded after the war to former levels, only to decline again in the 1950's and 1960's, to a low of 44% of its former level in 1964 (Ratcliffe 1980). Similar declines had been noted and documented in Germany and Switzerland, and to a lesser extent in France and Scandinavia (Hickey 1969).

In North America, local declines in peregrine populations had been noted in the late 1940s in the eastern United States. However, it was not until the late 1950s and early 1960s that observers began to realize a more general decline was taking place, at least in the eastern United States.

Dr. Joseph Hickey felt that the timing of the declines was not coincidental and organized the first ever Peregrine Falcon Population Conference in Madison, Wisconsin in 1966. Specialists from both continents were invited to report on peregrine populations and to discuss the factors that may be contributing to their decline. Papers presented at the conference indicated that declines had occurred in widely separated areas during the same chronological period but failed to indicate any reasonable cause for the declines. Pesticides were implicated by data from England (Ratcliffe 1969). Unfortunately, little additional information on pesticide residues in raptors was available from the rest of Europe or North America.

Aside from the lack of pesticide data, the conference also pointed out the paucity of data available on raptor populations or more specifically on peregrine populations from Canada. As a consequence, population and pesticide monitoring were initiated in this country.

In the following three years, raptor surveys were carried out in Canada; in the maritimes, Ontario, and the prairie provinces; in an attempt to determine whether the peregrine numbers were declining and whether other raptor populations might also be affected. These initial surveys suggested that in some areas, the *anatum* peregrine population had declined severely. In some areas other species also appeared to have declined locally, although not as severely. In particular, the Prairie Falcon (*Falco mexicanus*) appeared to have declined in Alberta and Saskatchewan (Fyfe et al. 1969), and the Merlin (*Falco columbarius richardsonii*) appeared to be gone from some areas where it was formerly known (Fyfe unpublished data).

Pesticide monitoring of raptor eggs and prey species was also increased following the Madison conference. Specifically, a large cross-section of prey was monitored as part of a general pesticide monitoring program. In the prairie region, monitoring was carried out on Prairie Falcons, Merlins, and buteos. In general, residues of organoclorines in raptors and their prey were not alarming; however, individuals were found with high levels (Fyfe et al. 1969, Fyfe 1976, Fimreite et al. 1970).

At a second conference of North American raptor specialists held at Cornell University in 1969, it was recommended that pesticide monitoring should be continued and regular five-year surveys throughout the range of the Peregrine Falcon in North America should be initiated.

During the first survey in 1970, an attempt was made to check all known historical eyries of *F. p. anatum*, *F. p. tundrius*, and *F. p. pealei* for occupancy. Before the survey's completion, it was obvious that *F. p. anatum* had all but disappeared from its former range south of the boreal forest and east of the Rocky Mountains. In Canada, only one eyrie was located south of 60°N and a few additional eyries of this race were located in the Yukon and NWT. As for the other two races (*F. p. tundrius* and *F. p. pealei*) they appeared to have declined in some localities but no evidence of an overall decline was noted in either of these races. This situation was reported to the 1971 Federal/Provincial Wildlife Directors Annual Meeting where it was decided that the Canadian Wildlife Service should take a small number of the remaining *anatum* young into captivity.

RESEARCH AND MANAGEMENT

Surveys

The results of the 1970 survey clearly indicated the extent of the decline in the *anatum* race and paved the way for the initial steps taken toward the recovery of these birds. It was agreed that North American Peregrine Surveys were to be continued at five-year intervals in cooperation with American researchers. Initially, the Canadian Wildlife Service coordinated, and in a large part funded, and carried out the 1970 survey together with many Canadian and American volunteers. This format has changed with more funding from World Wildlife Fund Canada and the provinces and territories and with more provincial and territorial involvement in the actual surveys. Whereas the initial survey had indicated the severity of the decline for the *anatum* peregrines, it also provided a baseline for assessing *F. p. tundrius* and *F. p. pealei* populations (Cade and Fyfe 1970). The 1975 survey further documented the decline of *anatum* and suggested that the *tundrius* population appeared to be declining to the extent that this race was subsequently considered threatened, while *pealei* appeared to be remaining relatively stable (Fyfe *et al.* 1969). The 1980 survey showed the first indication of localized recoveries in *anatum* populations in Alaska and along the Yukon River in the

Yukon (Fyfe unpublished data). There was also some suggestion of a *pealei* population increase and it appeared *tundrius* had generally remained stable with a suggestion of an initial recovery in a couple of areas.

For several reasons it was not possible to carry out a 1985 North American Peregrine Survey. Nevertheless, several provincial and territorial agencies carried out surveys in 1985 and the remainder have indicated they will do so in 1986. The completion of this survey is particularly important since it is possible captive-raised birds may have been added successfully to the wild populations.

Captive Breeding

Following the directive of the Wildlife Directors, 12 young *anatum* peregrines were taken into captivity specifically to: a) maintain the gene pool, b) attempt to find methods of breeding them in captivity, and c) determine methods for reestablishment should breeding be successful.

The Wainwright Peregrine Falcon Breeding Facility, established in 1972, attempted to increase the gene pool of Canadian *anatum* birds by contacting falconers and zoos where these birds were being held. At the same time we obtained several pairs of Prairie Falcons, Gyrfalcons (*Falco rusticolus*), and Merlins for use in initial pairing, breeding, and release experiments and, if successful, to serve as foster incubators and parents for the *anatum* eggs and young.

The initial breeding success in the Canadian Wildlife Service project came in 1972 with captive Prairie Falcons and was followed in 1974 by the production of *anatum* peregrines at Wainwright. Several years of experimental releases followed, utilizing such methods as the fostering of young to wild parents in northern Alberta (Fyfe et al. 1977), cross-fostering, hacking, and multiple-hack releases, in both rural and urban areas. In general, all of these methods have proven feasible and the releases in urban centres have provided unique opportunities for excellent public relations. The experimental releases were considered successful following breeding of released captive-bred birds in the wild, first in Canada in 1977 (Fyfe *et al.* 1977) and in subsequent years in the U.S. and Germany. In Canada, the program has been well received and we have been fortunate in that several provinces and some private agencies have been cooperating in the releases of these birds.

Despite the fact that we have recorded several successful breeding attempts, many birds have been observed following the releases but there are few reports of successful breeding. This is explained in part by the lack of observers and the huge area for potential nesting. Unfortunately, for the most part, the necessary follow-up has simply not been done. In my opinion this is absolutely essential if we are to evaluate the success of the program.

Pesticide Monitoring

Pesticide monitoring of peregrines has been carried out since 1966 and was expanded in the early 1970s in conjunction with the population surveys. However, because of the endangered status of the species, initial samples consisted almost entirely of dead young or addled eggs.

In addition, a long-term ecosystem monitoring project was initiated utilizing Prairie Falcons and Merlins as indicator species. They were monitored each year on a random basis to provide an index against which to measure changes in the residue levels in the prairie region. This project was of particular importance to the peregrine recovery program since it would provide the background for making decisions relative to the potential success of releases.

Elevated DDE residue levels were the norm in egg samples of peregrines and Richardson's Merlins (Fyfe unpublished data). Considerably lower levels were found in the eggs of Prairie Falcons and most other species monitored had relatively insignificant residue levels (Fyfe et al. 1969; Fyfe unpublished data).

In general, prey species were only monitored coincidentally where they were included in other programs such as the specific and extensive monitoring of the effects of seed treatments on wildlife. However, with the initiation of the experimental releases, specific monitoring of prey was carried out in several potential release areas. This was an attempt to determine the relative pesticide levels that the newly introduced peregrines would have to contend with.

In addition, following the successful release and reestablishment of captive-raised peregrines in the wild, specific monitoring was carried out to determine what levels had accumulated in the released birds. The results from egg analysis were not encouraging as it was clear that these birds continued to be exposed to high residue levels of organochlorines in the wild (Fyfe unpublished data) which were sufficient to affect reproduction (Peakall et al. 1975). Since the use of organochlorines had been severely restricted in Canada and the United States in the early 1970's, it appeared that either the peregrines or their prey had to be picking up these residues on the wintering grounds.

In 1979 the Canadian Wildlife Service initiated a cooperative project with the objective of locating the primary souces of contamination in the prey of peregrines on the wintering grounds. CWS researchers would work with colleagues in each of the nine countries to be monitored. Ten samples of each of 10 species of northern migrants were to be collected on their arrival on the wintering areas and again just prior to their return migration. In addition, provision was made to collect and analyze a limited number of samples of resident species of concern to our co-workers in each country. It was a relatively simple matter deciding which areas should be monitored since many of the wintering areas were known through band recoveries of wintering peregrines. Samples from Surinam, Peru, Ecuador, Panama, and Costa Rica are currently being analyzed and Mexico and Venezuela still have to be visited.

Banding

A major raptor banding project, coordinated by Canadian Wildlife Service, was carried out by interested volunteers in conjunction with the pesticide monitoring and population surveys throughout the prairies and in northern Canada. This program was of particular significance because it concentrated on the banding of 1000+ nestlings annually just prior to fledging (Fyfe and Banasch 1981). Since every recovery was of a known-age bird, each recovery provided data in relation to the age at recovery, distance moved, and direction from the original nest site.

In the 1970's, the banding of birds of prey was well received at all levels; i.e., both by the public and government agencies. Unfortunately this program had to be stopped due to changes in the permit system and regulations relative to banding. For the most part, these volunteers are no longer involved in banding and the raptor banding that is carried on now is done primarily by government or university researchers. In my opinion this is very unfortunate since there are many interested and capable amateurs. We are losing a tremendous resource by not finding ways of involving these people.

Enforcement

With the knowledge of the severity of the *anatum* decline, one of the principal concerns was the potential loss of birds through illegal activities. Unfortunately the widespread attitude that birds of prey were pest species had resulted in a general indifference with little or no concern for these birds by enforcement agencies. Consequently one of the first tasks of raptor biologists was that of education of the public and even more importantly of wildlife agencies and enforcement personnel.

At the same time, CWS biologists encouraged cooperation between enforcement personnel and raptor enthusiasts in an effort to achieve an information network to assist in protecting the birds. This approach was well received and for several years there was excellent cooperation and involvement between the public, enforcement officers, and the biologists. Consequently the only serious poaching problems in the prairie region came from illegal activities of people from other regions.

Unfortunately for the resource, a few species of birds of prey have become very valuable in today's international market place. This value in turn has attracted entrepreneurs who have been unscrupulous in their attempts at obtaining these birds from the wild. Such activities have resulted in a series of investigations by enforcement agencies in an attempt to stop illegal activities and enforce the regulations. This was widely publicized in what was referred to as "Operation Falcon". A few smugglers were caught and were given the opportunity for plea bargaining. In so doing, these people listed the names of most people or agencies working with birds of prey at the present time. Understandably virtually everyone working with raptors, and many only remotely connected, suddenly found they were named and even listed as suspects on official lists circulated in North America and Europe. We were not exempt and innuendos resulting from hearsay precipitated an investigation and internal audit of the Wainwright facility in which we had to account for every egg, chick, and bird ever held at that facility. (I am pleased to report that for 17 years of records at Wainwright only three discrepancies were found, all of which we were able to explain satisfactorily.) I do not question that this had to be done. However, it was most unfortunate because of the personal trauma resulting from the shadow cast on those investigated.

I am particularly concerned that the resource stands to suffer immeasureably since even more damaging is the fact that everyone's credibility is now under question and the entire framework of raptor research and conservation is shaken. This was very evident at the recent International Raptor Conference in Sacramento. I am concerned that it will take years to repair the damage that has been done and still more years to once again establish trust and cooperation between raptor workers at all levels and enforcement personnel. Yet this must be done for the sake of the resource, as we need the enforcement arm to enforce the laws that protect these birds and, although they do not appear to realize it, they need us to provide the necessary and valuable information link to protect the resource.

Public Education and Publicity

Perhaps the most difficult problems to overcome were in educating not only the public but also government officials in relation to: 1) the fact that there could be problems associated with pesticides, and 2) why it was important to save a bird of prey. Few people were aware of the possibility of environmental problems from the use of pesticides and fewer still were prepared to question it. Pesticides were well established as essential to modern agriculture and agriculture officials were not about to accept such ridiculous suggestions as pesticides being potential environmental concerns. This attitude was exemplified at my first pesticide meeting in western Canada when one of the agriculture officials first asked "Why are you working on pesticides here?"; then stated "We have no problems." In addition, it was well recognized that both official and public sentiment towards birds of prey in the late 1960's and early 1970's was that all of these birds were vermin and that the only good hawk was a dead one.

Consequently, improving public relations and education became a priority, that in the beginning proved to be a difficult uphill battle. We were fortunate in having farsighted managers and in having a couple of major successes initially in our research relative to wildlife species as indicators of environmental problems. The identification of serious problems related to mercury and other seed treatments resulted in a broad public awareness of the potential of environmental contamination and in turn in a good cooperative interagency approach relative to pesticide research in this country. As for attitudes, the peregrine received a great deal of publicity with the result that public and official sentiment shifted dramatically, not only relative to the peregrine but to all birds of prey. At the same time, the peregrine declines became a major international concern on both sides of the Atlantic and the species soon became a symbol of environmental concerns.

I will now summarize a series of recommendations that I believe are necessary to facilitate the recovery of the peregrine and safeguard other birds of prey.

1. Complete the National Peregrine Falcon Recovery Plan that incorporates input from federal, provincial, and territorial wildlife agencies; non-government organizations; and the public. I personally believe we are wasting the best resource available as long as we fail to find ways of actively involving all those who are interested.

2. Establish a nationwide ecosystem monitoring program that will provide a basis for determining changes and trends in chemical residues in the environment.

3. Develop a coordinated national raptor banding program that will utilize the energies of serious birders.

4. Maintain a minimum of three geographically separated *anatum* breeding projects to provide stock for release and to maintain genetic diversity.

5. Establish and maintain a nuclei of breeding peregrines in the wild in each of those regions of Canada where they formerly bred, utilizing both government and non-government organizations in the release and subsequent population monitoring.

6. Conduct national peregrine surveys every five years to determine population trends and provide the data necessary for protecting the species. Again I emphasize that a coordinated approach utilizing serious birders is needed.

7. Eliminate the prevailing attitude of guilty until proven innocent that appears to exist between enforcement personnel and the raptor community. If we are to safeguard the resource, we must work together.

8. Maintain the high profile and excellent public relations program for the peregrine but share the credit. This has been, and continues to be, a cooperative program and all involved need the support such a program generates.

As reported in Sacramento in the international context, the species has made dramatic recoveries in some areas. The most spectacular of these have occurred in Europe, specifically in Great Britain, Switzerland, and parts of France and Germany. There have also been dramatic recoveries in North America, in southern Alaska and along the Yukon and Porcupine Rivers in the Yukon. *F. p. tundrius*, in the Northwest Territories and northern Quebec, appears to be making a somewhat less dramatic recovery and there have been some peregrine pairs reestablished in the eastern United States and in northern Alberta. *Anatum* birds appear to be holding their own in the Mackenzie District and in a few areas of the southern United States.

Unfortunately, populations remain depressed in most other areas including much of Scandinavia and North America. For most of the range of the *anatum* in Canada and the United States, there has been no improvement and the species is still considered endangered. This is particularly true for the Canadian population and most of the midwestern United States. In both of these areas, limited data show poor natural reproduction and medium to high residue levels.

The peregrine program has come a long way toward achieving its goals. Nevertheless, it has been difficult maintaining the necessary level of support and clearly we still have a long way to go. One major obstacle in Canada continues to be the absence of a National Recovery Plan for this species. Such a plan has been in preparation for the past several years but has not been totally acceptable to all agencies and is currently to be revised once again. This plan is urgently needed to provide goals and guidelines that can be applied across Canada.

I have no doubt that we will see the recovery of the *anatum* peregrine but, I also believe that the recovery can be achieved and accelerated if everyone will conscientiously direct their efforts toward the welfare of the resource.

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THE GREATER PRAIRIE CHICKEN IN ALBERTA

Dave Moyles

The Greater Prairie Chicken (*Tympanuchus cupido pinnatus*) is classified as extirpated in Alberta and thus any attempt to reestablish the species would have a lower priority than conservation efforts directed at species considered as endangered or threatened.

The Greater Prairie Chicken extended its range into Alberta during the mid to late 1880s and early 1890s, flourished for approximately one and one-half decades and then declined, becoming expatriated by 1940. Rowan (1926) reported that early settlers recalled seeing prairie chickens in the 1890s and that the species was plentiful in the early 1900s. Prairie chickens were seen as far north as Lac La Biche, 220 km northweast of Edmonton and throughout central and southern Alberta (Rowan 1926). In 1900, the hunting season extended from September 16 to December 14 and hunters were limited to 50 chickens per day, with a seasonal limit of 200 (Johnston and Smoliak 1976).

The decline in numbers must have started slightly after 1910 in some areas. The hunting season for prairie chickens was closed for one year in 1917. Although hunting was allowed after October 1, 1918, the season was reduced to a two week season by 1920. In Dr. Rowan's field notes, comments on the sightings and collecting of "pinnated grouse" (Rowan's terminology) are common until 1925 (Rowan field notes). The great majority of these sightings were near Beaverhill Lake, 48 km east of Edmonton, but Rowan also saw prairie chickens in the Stettler-Big Valley area. In fact, Rowan records male prairie chickens displaying on three, perhaps four, booming grounds near Beaverhill Lake in 1925. However, no further references can be found until the notes of 1932, when Rowan and R. Lister flushed one prairie chicken near Beaverhill Lake in May, 1932. Rowan mentioned in his field notes that this was the first prairie chicken seen during his many visits to this area since 1927. This was to be the last sighting of the Greater Prairie Chicken recorded by Dr. Rowan.

Several prairie chickens were sighted in the Beaverhill Lake area in 1934 (Salt and Wilk 1966) and one was shot during the fall in 1938 near Youngstown (Wm. Wishart, pers. comm.) Godfrey (1966) reported that one was seen near Medicine Hat in 1940.

Dr. F. Hamerstrom reported that prairie chickens had been reported in the Sullivan Lake area in the early 1950s and again in 1961 or 1962 (letter to J.G. Pelchat, 1963). In 1965, a small flock was seen in the Coutts area in southern Alberta (Salt and Salt 1983). A single prairie chicken was seen near Mountain View, a village in southwestern Alberta, on March 5, 1972 (Salt and Salt 1983).

Sightings are occasionally reported, but seldom verified. Part of the problem in verification of these accounts is nomenclature; many Albertans refer to the Sharp-tailed Grouse (*Tympanuchus phasianellus*) as "prairie chicken" or "chicken". As well, people may be seeing sharp-tails, hen pheasants, or even Sage Grouse (*Centrocercus urophasianus*), depending on the locale, and confusing these birds with the Greater Prairie Chicken.

Essentially, the Greater Prairie Chicken has had about a 50-year life span in Alberta. Any considerations of possible reestablishment must include an examination of historical factors that modified the distribution and abundance of the species.

The Greater Prairie Chicken followed the "plow" through the Canadian prairies, appearing in Manitoba in 1881 and becoming common in southern Manitoba by 1883 (Thompson 1891). Westward movement continued as the advent of the plow created a mosiac of cereal croplands, primarily wheat and barley, interspersed with large tracts of unbroken native prairie. The range conditions in Alberta at the turn of the century were the best in recorded history (Johnston and Smoliak, 1976). Grazing pressure was light as the Plains Bison (*Bison bison bison*) was all but extinct and other ungulates, such as Elk (*Cervus canadensis*) and Pronghorn Antelope (*Antilocapra americana*), were severely reduced in numbers. Domestic livestock were present but the prairie rangeland was not completely stocked until the early 1920s. As well, the grasslands benefited from a series of years of above-average precipitation in the late 1870s and early 1880s (Johnston and Smoliak 1976). Thus the prairie chicken population increased rapidly, using abundant tall grass for nesting, brood-rearing, and winter cover; and croplands for food, particularly in winter.

Changing agricultural practices sounded the death knell for prairie chicken in Alberta. In the early 1920s a series of severe droughts and harsh winters, coupled with overgrazing, had serious impacts on the quality and quantity of available forage (Nuttall, 1984). Rowan (1926) felt that the breeding distribution of prairie chickens was confined to the vicinity of large lakes. He recorded a booming ground on a sand bar point which jutted into Beaverhill Lake and several nest sites located within a few yards of the water (Rowan field notes). Given the selection by prairie chicken for grassy areas close to large lakes (Rowan 1926), these birds would have been displaced as grazing and trampling damaged the habitat. The use of lakes for cattle watering sites and overgrazing coupled with drier conditions, caused the deterioration of prairie chicken habitat and led to their decline in Alberta.

Another possible factor contributing to the decline may have been hybridization with the Sharp-tailed Grouse. Two Greater Prairie Chicken x Sharp-tailed Grouse hybrids were described by Rowan (1926). One bird was taken in 1918 near Gough Lake while the other was shot near Edmonton in 1925. Johnsgard and Wood (1968) felt that hybridization was more likely to occur in areas where both species were relatively common. However, hybridization can occur even if one of the two species is rare. Hybridization at this time would severely reduce potential growth of one species as one year's production would be lost.

Competition from Ring-necked Pheasants (*Phasianus colchicus*) may have also occurred, as is currently happening in Illinois (Vance and Westemeier 1979, Westemeier 1985). Male pheasants harass male prairie chicken on arenas, often driving them off. As well, egg-dumping by hen pheasants in prairie chieken nests has reduced production, as the incubation period for pheasant eggs is one to two days less than that of prairie chicken eggs. Female greater prairie chicken often leave the nest with the early hatching pheasant chicks, and the abandoned prairie chickens die in the shell (Westemeier 1985). Rowan indicated that the numbers of pheasants seen in the Beaverhill Lake area seemed to be increasing during the 1920s and 1930s (Rowan field notes).

REQUIREMENTS FOR REESTABLISHMENT

The main requirement for reestablishment would be an area of suitable grassland habitat. The COSEWIC status report (1979) recommended that a minimum of 2,000 to 4,000 ha of grasslands be established for Greater Prairie Chickens in order to maintain a viable population. Failing the provision of a large block, several smaller parcels of grassland in close proximity to one another should be secured.

Currently, there are no pieces of publicly-owned land under Fish and Wildlife Division control that would be suitable for prairie chicken. As well, individuals holding grazing leases on public lands are now entitled to purchase these leases, pending final approval by government. With transfer of these lands to private ownership, the trend to conversion of native grassland to tame pasture or cropland may accelerate.

Two other options may be possible. First, the feasibility of entering into a long-term agreement with the Federal Government for use of a portion of Canadian Forces Base Suffield should be explored. Negotiations may be hampered by the increasing use of this base by N.A.T.O. forces as a training ground. A second approach would be to enter into a long-term agreement with one of the larger privately-owned ranches in southern Alberta. With either of these options, legal contracts would have to protect the agreement and ensure continuation of the program should priorities shift or ownership of the land change.

Several management practices will have to be implemented. Habitat development practices such as seeding with both native and tame grasses, soil fertilization, prescribed burning, rotational haying and/or light grazing schemes would be employed when applicable. Once suitable tall grass cover has been established, possible interference through competition and/or hybridization should be controlled. This may require removal of pheasants and Sharp-tailed Grouse. A program of selective predator control should also be instituted. This control program would be aimed at specific "problem" animals and not be a widescale removal program.

Release techniques would have to be given consideration as well. Biologists in Kansas have created an artificial display ground in their attempts to establish Sharp-tailed Grouse (Rodgers 1985). This artificial dancing ground has served as a focal point for the released birds. Similar techniques would have to be employed for the Greater Prairie Chicken in Alberta.

Such a reestablishment program would be manpower-intensive, given the current situation. Once suitable arrangements have been made to secure the land base, habitat improvement measures and any control procedures deemed necessary would have to be instituted. The final goal would be a small but viable population of the Greater Prairie Chicken in the province.

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THE GREATER PRAIRIE CHICKEN IN SASKATCHEWAN

Adam Schmidt

CURRENT STATUS

The Greater Prairie Chicken (*Tympanuchus cupido pinnatus*) is considered to be extirpated in Saskatchewan. According to Johnston and Smoliak (1976) the prairie chicken moved into the Canadian prairies between 1881 and 1900 apparently in response to improved habitat conditions from a series of wetter than normal years and elimination of the Plains Bison (*Bison bison bison*). Initially, Greater Prairie Chickens benefited from agricultural development because of the food they obtained from cultivated fields. However, as more of the prairie was plowed or grazed, the quality of the habitat deteriorated and led to the elimination of this species from Saskatchewan by the late 1930s or early 1940s.

Several sightings were reported between 1971 and 1977 (Anweiler pers. obs.; Brazier 1972a, 1972b; Hatch 1973; Wapple 1977). Most of these reports were of single birds and only one was viewed in the hand (Hatch 1973). None of the observations were during the breeding season. If present land use trends continue, it is unlikely that habitat changes will favour the natural reestablishment of the prairie chicken in Saskatchewan.

THE FUTURE

Saskatchewan does not have any plans to reestablish the Greater Prairie Chicken to the province. Reestablishment plans would probably require major land use changes or habitat improvements.

ACKNOWLEDGMENTS

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THE GREATER PRAIRIE CHICKEN IN MANITOBA

Barbara R. Minish

HISTORY

The Greater Prairie Chicken (*Tympanuchus cupido pinnatus*) originally occurred in the moist, tall, climax grasslands of the eastern Great Plains from approximately the 100th meridian eastward to Kentucky, Ohio, and Tennessee and northward to Michigan, Wisconsin, Minnesota, and South Dakota (Sharpe 1968). The Greater Prairie Chicken followed the expansion of cultivated land northward, colonizing North Dakota in the 1870's and reaching Manitoba, Saskatchewan and Alberta by 1900 (Johnsgard and Wood 1968). Thompson (1891) stated that by 1885, the Greater Prairie Chicken was considered a permanent resident in the Red River Valley.

Although early expansion of agriculture into the Prairie provinces led to the establishment of the Greater Prairie Chicken, further development of cereal farming and cattle ranching eliminated the tall grass vegetation on which the species depends (Johnston and Smoliak 1976).

CURRENT STATUS IN MANITOBA

The five-year report to the legislature on wildlife (Manitoba Dept. Nat. Res. 1983) states:

> ...Since the disappearance in the early 1950's, of a group of Greater Prairie Chicken which was located near the edge of Delta Marsh, there have been no confirmed sightings in the province.

A possible sighting was made in the Spruce Woods area south east of Brandon in 1983 by K. Leavesly (pers. comm.).

FUTURE MANAGEMENT

Researchers point to the availability of suitable grassland for nesting and brood rearing as the universal limiting factor for prairie chickens throughout their range (Kirsch 1974, Westerneier 1980). There is no consensus on the minimum amount of grassland habitat required to maintain a viable population. Toepfer (1983) suggests a minimum of 405 ha of undisturbed grassland in blocks of not less than 61 ha as a requirement of any reestablishment site. The state of Missouri is attempting to acquire smaller scattered tracts (32-97 ha) of native prairie and/or other tracts which can be planted to native grasses (Missouri Dept. of Cons. 1984). However, these smaller tracts of land are part of an overall strategy to increase the total amount of prairie chicken habitat in Missouri and are not targeted as individual reestablishment sites. Although this minimum amount of habitat (ie. 404 ha) could be found in Manitoba, as Hamerstrom et al. (1957) state: "A single, small isolated flock is in a highly vulnerable position."

A survey of restoration efforts in the United States indicates that most attempts to reestablish prairie chickens have been considered unsuccessful (Kruse 1973). In Manitoba in the 1970s, pen-reared chicks from Jamestown, North Dakota were used in a reestablishment attempt. Most of the birds did not survive to be released and those released did not form a viable population. Results of a more rigorous reestablishment attempt in Wisconsin show that pen-reared birds are extremely vulnerable to both avian and mammalian predators and that the survival of transplanted wild birds is far superior to released pen-reared birds (Toepfer 1975, 1976).

A reestablishment project in Manitoba would require wild birds for transplant. The states of Nebraska and Oklahoma may be able to provide birds through a species transfer (D. Geary, K. Johnson pers. comm.). The state of Kansas might provide birds through either a species transfer or a direct cash agreement (D. Montie pers. comm.). Acquisition and transplant of birds would be costly and labour intensive.

A further hindrance to the reestablishment of Greater Prairie Chickens into Manitoba is the presence of Sharp-tailed Grouse (*Tympanuchus phasianellus*) in areas of suitable prairie chicken habitat. There may be competition between Greater Prairie Chicken and Sharp-tailed Grouse hens in the spring leading to exclusion of prairie chickens by sharp-tails from suitable habitat (Toepfer pers. comm.). As well, Sparling (1980) reports that the hybridization between sharp-tails and prairie chickens in areas of sympatry may lead to the loss of pure strains of Greater Prairie Chickens.

The presence or absence of sharp-tails in suitable prairie chicken leaves the wildlife manager with a dilemma: If sharp-tails are present it would be unwise to consider the area as a reestablishment site for prairie chickens. However, habitat suitable for Greater Prairie Chickens will likely attract Sharp-tailed Grouse reducing the prospects of long-term prairie chicken residency.

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GREATER PRAIRIE CHICKEN DISCUSSION

Barbara R. Minish

Based on speaker reports, COSEWIC should update the status report for the Greater Prairie Chicken as the species is considered extirpated from the prairie provinces. If the bird is not present in Ontario, COSEWIC should consider changing the status of the species in Canada from endangered to extirpated.

Discussion of status led to the question of confirmation of possible sightings. It is difficult for agencies to keep accurate, up-to-date records for a species if sightings cannot be verified. Individuals of an endangered species should not be killed to confirm identification. A photograph of the animal in question would be ideal, however camera equipment is not always available. As well, weather and other situational problems do not always allow for photography.

Reestablishment of prairie chickens would require use of wild birds. The release of pen-reared birds is not a viable option at this time as the survival rate of these birds after release is low. Reestablishment projects would be costly and labour intensive. Projects would require predator control and the suppression or removal of Sharp-tailed Grouse from the areas.

Although concerns about Sharp-tailed Grouse populations are peripheral to the question of the future of the Greater Prairie Chicken in the prairie provinces, management efforts to enhance Sharp-tailed Grouse populations would likely be favoured over efforts to reintroduce greater prairie chickens.

WHOOPING CRANE

Ernie Kuyt

Whooping Cranes (*Grus americana*) are no longer full-time prairie residents and you might think they fall outside the purview of this workshop. For a month in fall, and for brief periods in spring, Whooping Cranes continue to use portions of Saskatchewan and the birds probably could not exist without these important stopover areas.

I will start with a brief historical overview of Whooping Crane numbers and significant events. Then I will present the plans made to increase population numbers and how the work was envisaged, the migration studies carried out by CWS and other agencies, recently planned administrative and regulatory proceedings, new field work in the planning stage, and finally the current population figures and outlook.

HISTORICAL OVERVIEW AND FOUR SIGNIFICANT EVENTS

The best information we have about historical numbers of Whooping Cranes was summarized by Robert Porter Allen (1952). He estimated that about 1300 Whooping Cranes existed in North America during the mid-1800s. At that time, our prairies still contained an abundance of lakes, marshes, potholes, and other wetlands where whoopers could safely nest and feed. Agricultural practices changed all that. Prairie wetlands were drained, grazed, burned, and converted to arable land in a process that continues today. Whoopers were forced to abandon prime nesting habitat and moved to suboptimal or marginal wetlands where productivity declined. Illegal or irresponsible shooting and egg collecting contributed to the rapid decline of these marsh dwellers.

Four events occurred that were destined to have important influences on the future of Whooping Cranes although it was not apparent at the time. In 1916, the Migratory Birds Convention Act was signed jointly by the USA and Great Britain (on behalf of Canada). Whooping Cranes were listed as Migratory Birds, and as such, qualified to receive protection under the Act.

Wood Buffalo National Park, straddling the Northwest-Territories- Alberta border, was established in 1922; coincidentally, the last year whoopers nested in the Canadian prairies. Although the park was established to protect the remaining herds of indigenous Wood Bison (*Bison bison athabascae*), its genesis was of the greatest importance to Whooping Cranes because of their discovery there in 1954. The following year Dr. W.A. Fuller, then with CWS in Fort Smith but subsequently for many years a Professor of Zoology at the University of Alberta, observed several nests in Wood Buffalo National Park, the first whoopers nests seen in 33 years!

It had been known for a long time that most Whooping Cranes winter along the Gulf of Mexico, northeast of Corpus Christi on the Texas coast. In 1937, about 200 km^2 of coastal wetlands, including brackish and freshwater areas and upland meadows, were set aside near Rockport, Texas. The area, known as the Aransas National Wildlife Refuge, was reserved to provide a safe winter refuge for Whooping Cranes. At that time, the total migratory population was only 16 birds and many people believed conservation efforts had come too late. The establishment of the Aransas refuge appears to have been the first conservation practice specifically designed to assist the Whooping Crane.

The fourth significant event was the publication of Allen's (1952) monograph "The Whooping Crane." This magnificent comprehensive work combined virtually all information on Whooping Crane life history, food habits, and migration known up to that time. However, after all these events had occurred, the Whooping Crane population in 1957 still numbered only 26 birds.

Nineteen forty-one is usually considered the nadir of the Whooping Crane population. At that time, the flock wintering at Aransas National Wildlife Refuge numbered only 15 birds. There were six other wild birds extant in a separate non-migratory population in Louisiana. These six birds had disappeared by 1949; the last one, an injured bird, was taken into captivity.

Accurate population figures were first obtained in 1938, and winter population size has been recorded each year since 1938 on the basis of aerial census flights over the Aransas winter range. Between 1957 and 1966 the population climbed from 26 to 43 birds, no doubt aided by the increased level of protection and greater publicity.

STRATEGY FOR POPULATION INCREASE

In 1964, concerned about the slow increase of the Whooping Crane population, the USFWS and CWS agreed on a plan to obtain surplus eggs from the wild and use these eggs to establish a captive population. This flock would produce young birds that would eventually be returned to the wild. Whoopers normally lay two eggs annually and since only one of the chicks generally survives, it was reasoned that one of the two eggs could be collected without decreasing the production of young in the wild. At the present time the captive flock, located at the Patuxent Research Centre near Laurel, Maryland, consists of about 40 birds.

Since 1977, most of the surplus eggs collected by CWS in Wood Buffalo National Park have been shipped to Idaho where the eggs are placed in nests of foster parent Sandhill Cranes (*Grus canadensis*). We hope this population will eventually become self-sustaining. There are now about 40 birds in this population, scattered throughout Idaho and the adjoining states. To our disappointment, breeding has not yet occurred, partly because of higher than expected mortality of female birds and perhaps due to behavioural difficulties. A meeting of key personnel in Reno, Nevada this winter will analyse the Idaho experiment and will hopefully arrive at a consensus on future plans for that project. The remainder of the eggs, usually two per year, are shipped to the Patuxent Research Centre.

CURRENT FIELD STUDIES

Northward migration of Whooping Cranes from the winter range begins during the last week in March or first week of April and lasts from 2-4 weeks. Our aerial surveys over the breeding range between late April and the third week of May are designed to locate breeding pairs, nests, and single or grouped nonbreeders. With 20 years experience and a little luck we almost never miss finding the nests. Surplus eggs are collected in late May. During June and July, aerial surveys are carried out to determine chick survival. In early August, surviving chicks are caught, measured, and colour-banded and a small blood sample is collected for sex determination. Several aerial surveys in August and September help to determine survival of banded birds and augment early season data on distribution of nonbreeding birds.

From 1981-1984, major migration studies were undertaken by the USFWS and CWS. By means of light aircraft, we followed radio- transmitter-equipped Whooping Cranes on fall and spring migration between Wood Buffalo National Park and Aransas National Wildlife Refuge. Much information was obtained about the migration corridor, chronology of migration, flight behaviour, staging in Saskatchewan, mortality, habitat use, and other factors. These fascinating studies were the first ones where birds were followed all the way from breeding range to winter range as well as during the return in spring.

NEW OR RECENT DEVELOPMENTS

Recovery Plan

A Canadian Whooping Crane Recovery Plan is now in a fourth draft and is nearing completion. It will be a mixture of international, national, and regional work plans. Its stated purpose is to outline a course of cooperative action to be carried out in Canada, designed to protect and increase the Whooping Crane population in Canada and elsewhere, resulting in an eventual removal of the species from its present endangered status. For downlisting to the threatened category of COSEWIC, the criterion is the attainment of a breeding population of 40 pairs in Wood Buffalo National Park and 25 nesting pairs in each of two other wild populations in North America.

Contingency Plan

The objectives of this plan, which will be a part of the recovery plan, are the designation of appropriate response options and reporting procedures when Whooping Cranes are reported as sick, injured, or dead, or if they are healthy and perceived to be at risk, (e.g., in areas where they face hazards such as contaminants, disease, power lines, hunting, etc.). Various reporting centers in Alberta, NWT, and Saskatchewan will be used to channel information and response.

Identification of Staging Habitat

By good fortune, Whooping Cranes are protected federally at Aransas National Wildlife Refuge and at Wood Buffalo National Park and these key areas are secure. There is much habitat in between that is not secure and not well known. A region of concern is the staging area in Saskatchewan. The results of the radio-tracking project, augmented by earlier records, indicate the great importance to "staging" Whooping Cranes of the area between Meadow Lake, Prince Albert, Quill Lake, Weyburn, Swift Current, and Lloydminster. Particularly in autumn, Whooping Cranes may rest and feed on stubble fields and wetlands for periods of up to a month before continuing their migration.

A new project, to be carried out from Saskatoon and assisted by results of aerial surveys and a reporting network, will identify and describe critical staging habitat. Crane use of these areas will be assessed as well as the security of the habitat. The work will depend greatly on the CWS colour-banding program for the identification of areas used repeatedly by the same cranes.

Study of water levels - Wood Buffalo National Park

The objectives of this study are to determine seasonal and year-to-year changes in surface water levels on lakes and ponds in the crane nesting area and to assess the relative contribution of ground water to maintenance of pond water levels. The study is a cooperative one with Parks Canada, National Hydrology Research Institute, CWS, and Water Surveys of Canada participating. The study began in 1985 when a series of water gauges (piezometers) were installed in Wood Buffalo National Park to monitor ground water variations and two bedrock wells were drilled to study regional water contributions.

CURRENT POPULATION FIGURES AND OUTLOOK

The Wood Buffalo National Park population has shown continued but relatively slow growth from 44 birds in 1965. We have been greatly encouraged by the birds' fine performance during the period from 1975-1977 when 30 young were raised and the Wood Buffalo National Park flock jumped from 49 to 71 birds. Aided by excellent habitat conditions during the last two years, the cranes produced 15 chicks in 1984 and set an all-time record of 16 chicks in 1985. The total population in 1985 was 95 or 96 birds, also a record dating back to at least 1938.

The results of our colour-banding show that 34% of the Wood Buffalo National Park population consists of sexually immature birds of less than four years, while 16% are young breeders, a situation that augurs well for the future.

The maturation of young birds (at $\pm$4 years of age) into the breeding segment of the population has brought with it a few southward breeding range extensions, such as those occurring in 1977, 1982, 1983, and 1984. Even though breeding range extensions are relatively minor ones, we believe they are important in "diversifying" the breeding range and ensuring that at least some chicks will be produced in case of sudden environmental changes such as drought or fire in Wood Buffalo National Park.

Our estimate of the age composition of this population (based on a colour-banding program) enables us to predict that the breeding population will not increase much, if at all, during the next two years. In 1990, we expect the breeding population will reach 40 pairs and the total population will be over 150 birds. We will never have many Whooping Cranes but due to the cooperation of many individuals and agencies, these spectacular birds are edging away from extinction.

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A NATIONAL PERSPECTIVE AND MANAGEMENT STRATEGY ON THE PIPING PLOVER

Gerald McKeating

In the autumn of 1985, CWS initiated the development of a National Recovery Plan for the Piping Plover (*Charadrius melodus*). From the outset, it became abundantly clear that no consensus existed on the status of the bird in Canada. Although Piping Plovers have a wide breeding distribution from the east coast to Alberta, estimates of the total world population vary from only 3,500-4,600 birds.

Saskatchewan forms the core area of the North American breeding population. At some sites, the Piping Plover is a common breeding bird. As much habitat in Saskatchewan remains to be adequately surveyed, the total number of Piping Plovers in the province cannot be estimated accurately.

The current status of the species in the Atlantic Provinces, where it is less abundant than in the prairies, was determined at a workshop in November 1985 in Sackville, New Brunswick. About 220-238 pairs exist in the Atlantic region, including that portion of Quebec in or adjacent to the Gulf of St. Lawrence. Of those pairs, about 25% are located within National Parks. Workers within the region believe that the majority of pairs have been located. The key to census accuracy is the use of uniform census techniques, however other factors such as timing, weather, and degree of effort are less easily controlled.

A key factor influencing the presence or absence of plovers in Atlantic Canada is the dynamic nature of the habitat. Plovers there prefer wide pebbly beaches. Since those portions of the beach are frequently overwashed by storms and are under constant change, nest loss through storms and high tides occurs regularly. What is excellent plover habitat in one year may be poor for the species in the next. A reduction in the number of plovers in the same area a couple of years apart does not necessarily mean a real decline in the population. The birds may have merely moved elsewhere, sometimes into small, lesser known beach areas. Piping Plover populations may shift location, but the population <u>may</u> remain relatively stable.

From the data available in 1985, the approximate distribution of birds in the Atlantic region was as follows:

Newfoundland.--5-10 pair (not much habitat available).

Prince Edward Island.--51-59 pair (1984), Prince Edward Island National Park had 21 pair in 1985.

Nova Scotia.--64-69 pair (Bruce Johnston, pers. comm.) Kejimikujik National Park-Cadden Beach Unit had 19-26 pair in 1985.

New Brunswick.--85+ pair, Kouchibouguach National Park had 12 pair and 12 individuals in 1985, but monitoring efforts were not as extensive as those in 1983.

Quebec (north shore - unknown).--Iles de la Madeleines: 15 pair plus 5 individuals (Pierre Laporte, pers. comm.). While habitat on the islands was completely surveyed, available time only permitted one visit.

If more effort goes into surveying for plovers, more birds are found. It is apparent that more than one visit to a site is required to obtain a reliable population figure. It is important, therefore, when comparing data to also compare the census techniques that were used.

As a result of widespread concern especially expressed through the Canadian Nature Federation, the Canadian Wildlife Service appointed a national coordinator to formulate a recovery plan strategy for the species. The plan is being developed through cooperative action by bringing together non-governmental organizations, provincial agencies, CWS, and specialists on plover biology. Provincial representatives from Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Manitoba, Saskatchewan, and Alberta were named, but Ontario was reluctant to participate as they believed that the bird had been extirpated in that province. Consultations have been held with representatives of the World Wildlife Fund, Wildlife Habitat Canada, ICBP Canada, Canadian Nature Federation, COSEWIC, Prince Edward Island Nature Trust, Saskatchewan Natural History Society, Federation of Alberta Naturalists, Parks, Canada, United States Fish and Wildlife Service, and the Nova Scotia Bird Society.

In Manitoba and the Atlantic region, workshops were held in November 1985. Much fruitful and, at times, controversial discussion occurred. This Endangered Species Workshop in Edmonton brings together additional views regarding the bird's status on the Great Plains.

We are now in the process of summarizing the ideas brought out during these meetings and reviewing the literature. We are identifying the conflicts, and issues, and most of all, the data that need to be collected in the future. A draft recovery plan should be ready for comment within a year. At the same time, we are encouraging research proposals compatible with the needs already identified in the planning process. It is important to understand that the plan will be national in approach with specific details to be developed at the regional level. A regional recovery team will be formed in the Atlantic Region and in the Prairie Region. Those teams should consist of provincial and federal government, non-government organizations, and specialist representatives who will recommend priorities and determine what specific studies are required.

When comments are received on the draft plan, it will be revised and then made available for wider comment and program implementation. It is anticipated that a revised COSEWIC status report will be developed as a result of the planning process.

From my perspective there is much disagreement regarding the change of status from threatened to endangered given the Piping Plover in 1986 by COSEWIC. However, if that change in status has done nothing but stimulate discussion and debate and most importantly, spurred individuals to undertake field work to broaden the data base, then it was worthwhile.

THE PIPING PLOVER IN ALBERTA

Cleve R. Wershler

RANGE

The Piping Plover (*Charadrius melodus*) ranges very locally through the Central Parkland and Northern Fescue natural regions of Alberta, and is rarely recorded in the Mixed Grassland (Alberta Recreation and Parks n.d.). Major breeding areas are a concentration of lakes in the Hanna district, and saline ponds and lakes in the Sounding Lake Sand Plain. Since 1930, when the first nesting of the species was recorded for Alberta, it has been regarded as a rare and local summer resident (Farley 1932).

HABITAT

Typical habitat is sandy beach mixed with gravelly materials -- pebbles, cobbles and small rubble -- sometimes covered with a deposit of salt. Size and extent of the gravel varies from one location to another, but at least some patches of gravel are required for suitable nesting habitat. The nest site itself is usually located in a patch of gravel in older unvegetated or, rarely, lightly vegetated beach, back from the more active shore. There is some evidence to suggest that the minimum beach width is a limiting factor, with birds nesting in areas of greatest beach width (Weseloh and Weseloh 1983).

The waterbodies that contain suitable habitat along their shores range from slightly alkaline, for example Little Fish Lake, to saline, for example waterbodies in the Sounding Lake Sand Plain.

POPULATION

In 1976, the provincial population of Piping Plovers was estimated at 100-110 pairs (Weseloh and Weseloh 1983). Since then, an additional 80 or more birds, nesting or suspected of nesting, have been recorded in new localities. A large portion of these were from the eastern part of the province, an area not censused in 1976. Considering that there are records of approximately 180 birds from different areas within the last 15 or so years, without any systematic inventory, an Alberta plover population of 300 or more is quite possible. However, this is a cumulative figure and may be an over-estimate since the species appears to be ephmeral in its use of nesting habitat (Haig pers. comm.). Clearly, more effort in censusing available habitat is needed.

Local populations are fairly low. Ten to 15 breeding pairs have been recorded at Dowling Lake and Reflex Lake, with a significantly higher density occurring at Reflex Lake.

Declines in populations of Piping Plovers in Alberta appear to have been relatively small and slow. For at least 6 locations where Piping Plovers have previously nested, there have been no recent records. These areas are mostly along the northern or western edge of the provincial range. The disappearance from some of these areas can be partly accounted for by recreational development and perhaps a drop in the water table, but a lack of field work in other areas may be responsible for a lack of observations.

ADAPTABILITY

Despite the fact that the Piping Plover has very specific habitat requirements, it exhibits an ability to rapidly colonize newly created habitats such as exposed beach formed by drops in water levels. There is one record of the colonization of a man-made habitat -- an artificial pond created by a sulphur plant operation.

The ability of the Piping Plover to shift its nest location with respect to changes in the environment does lessen its vulnerability to the effects of high and low water fluctuations. However, it is still likely that the provincial population is prone to fluctuations related to climatic extremes in the Central Parkland and Northern Fescue Grassland, since habitat outside of this primary range is marginal and local. In this regard, major breeding areas like Dowling and Reflex lakes, that appear to have fairly stable populations, are very important.

LIMITING FACTORS

As noted elsewhere in Canada and the United States, the Piping Plover is very vulnerable to human disturbance (McNicholl 1985, Recce 1984) and there are a number of factors that have had negative effects on nesting birds in Alberta. Damage due to the overstocking and confinement of cattle along a nesting beach can destroy eggs through trampling, as well as ruining the habitat for years. This has occurred at Little Fish Lake. Recreational developments that destroy natural beach and the concentration of recreational activities at beaches, have affected several areas, including Buffalo Lake and Reflex Lake. Off-road vehicle traffic has not been monitored. A sulphate plant operates on a small lake in the Sounding Lake Sand Plain, but it is not known if Piping Plovers ever frequented this site.

With the publicity that the major breeding populations of Piping Plover in Alberta have received in recent years, there has been a predictable increase in visiting bird-watchers. This could potentially have negative impacts on nesting success in these areas.

MANAGEMENT RECOMMENDATIONS

Major Piping Plover habitat is mostly on crown land leased for grazing and therefore, the adjacent habitat is primarily natural grassland or parkland. The majority of private land in the grassland and parkland is cultivated. Crown ownership of plover habitat should aid in the future protection and management of the species.

Management programs should focus on protecting nesting habitat from recreational developments, off-road vehicular travel, and human disturbance during critical times in the nesting season. Agreements between ranchers and the Lands Division and Special Areas Branch of the provincial government should provide for stocking rates and access to water that are compatible with the protection of the quality of Piping Plover breeding habitat. Adjacent natural plant communities should also receive protection from cultivation and clearing, since the destruction of the immediate backshore vegetation could potentially have direct and indirect impacts on the nesting habitat.

RECOMMENDATIONS FOR FURTHER RESEARCH

A status report on the Piping Plover in Alberta should be a top priority. Populations and habitats need to be inventoried and mapped, and a monitoring program should be initiated. We now have a fairly good idea of the locations of significant and potentially significant habitats, and a general picture of potential areas of more isolated marginal habitat.

An area of high potential for major nesting habitat is the Sounding Lake Sand Plain. The saline ponds and lakes, combined with the sandy soil of the region, make up some of the most productive Piping Plover habitat in Alberta as well as a major staging area for several species of migrating shorebirds.

STATUS

If COSEWIC criteria were applied to the Alberta population of Piping Plovers, the author would suggest a status of "Threatened Species". This takes into consideration the known and estimated population in the province, the relative stability of the Alberta population, and all of the potential threats, as well as population trends in other parts of North America.

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SASKATCHEWAN PIPING PLOVERS

Wayne C. Harris

RANGE IN SASKATCHEWAN

The known breeding range of Piping Plovers (*Charadrius melodus*) in Saskatchewan is primarily in the aspen parkland and the mixed-grass vegetation zones (Harris et al. 1983, 1985). This is the primary range but it is known that at least a few plovers utilize the boreal forest area at least as far north as Lake Athabasca and the dry short-grass prairie area in the southwest (Harris et al. 1985). Within the primary range, a survey completed in 1984 showed that the major breeding lakes are Big Quill and Chaplin lakes and Lake Diefenbaker. Manitou, Last Mountain, Old Wives, and Redberry lakes also had significant populations.

HABITAT

In Saskatchewan, Piping Plovers are utilizing open, unvegetated beaches on a variety of water bodies. Although virtually all water in this area is to some extent saline, there is a definite range in salinity from very saline (Big Quill, Chaplin, and Little Manitou lakes) to relatively fresh (Lake Diefenbaker). In the cases of the very saline basins, the salinity is a major factor in maintaining the unvegetated status of the shorelines while in fresher basins, fluctuation in water levels is the major factor.

PROVINCIAL POPULATION

In 1984, the adult population on 16 lakes that were known to have had Piping Plovers in the past was only partially surveyed because of financial and time constraints. The total number of Piping Plovers actually seen was 802 and the estimated population on these 16 lakes was 1430. As the 16 lakes represent only a portion of the known breeding habitat, it was estimated that the provincial population was probably 2000-2500 individuals (Harris et al. 1985). The additional 500-1000 birds are likely using smaller saline basins particularly in the area between the North and South Saskatchewan Rivers and on the South Saskatchewan itself. With the exception of the Lake Athabasca record, the boreal forest area is totally unknown and has been excluded from the above population estimate.

The Big Quill Lake Population

The Big Quill Lake population is the only one that has been looked at in detail over an extended period of time. In 1909, Ferry spent time on Big Quill Lake recording bird observations (Ferry 1910). One of the species he recorded was the Piping Plover. According to his data there were over 300 Piping Plovers on the lake. In 1978, Renaud et al. (1979) censused the population on Big Quill Lake and concluded that there had been no significant change in the population over the 69 year span. Since 1978, Big Quill Lake has been subject to fairly intensive work. In 1980-81, Whyte studied the breeding ecology of the Piping Plover along the east shore of Big Quill Lake (Whyte 1985). In 1984-85, Harris censused and evaluated breeding success of the species on the entire lake.

Whyte (1985) found that reproductive success was quite low during his work. In 1980, only 18 of 63 eggs hatched and only 12 young fledged and in 1981, only 7 of 81 eggs hatched and 6 young fledged. This reproductive success rate is alarmingly low. In 1984, a census of the lake found 138 individuals on coverage of 76% of the shoreline. As the remainder of the shore appeared to be suitable habitat as well, the population of Big Quill was estimated to be 263 individuals (Harris et al. 1985).

In 1985, an attempt was made to evaluate the reproductive success. The start of work was delayed until June 14 by extremely bad weather. Consequently, information on clutches was extremely limited and hatching was under way. In total, 47 broods and/or nests were located with 38 successful nests fledging at least 125 young.

These breeding results had some interesting features. In the past, the east shore of the lake was one of the best nesting areas but in 1985, 75% of all production was on the west shore. Because of the late start of our work, we cannot be sure that nesting was attempted on the east shore. However, it is believed that a storm on June 10 with winds in excess of 160 km/hr may have wiped out, by wave wash, any nests on that shore. By June 21, a flock of adult Piping Plovers had begun to form along the west shore and by July 6, had reached 120+ individuals. These presumed failed breeders are thought to have come from the east shore. I believe that in 1985, there were at least 300 adults on Big Quill Lake, a number comparable to previous work and representing a relatively stable population since 1910 (Harris and Lamont 1985).

Redberry Lake

A census of Redberry Lake in 1984 yielded an adult population of 40 (Harris et al. 1985). Survey work undertaken by CWS in 1985, indicated 44 individuals and good reproduction (P. Taylor, pers. comm.).

PROBLEMS AND CONCERNS

During the past several years, there have been reports on Saskatchewan's Piping Plover population that leave an erroneous impression (McSweeny 1985, Recce 1984). They have presented inaccurate information presumably due to misinterpretation of the data. For example, there is no concrete evidence to support a dramatic decrease in the Lake Diefenbaker population as claimed by McSweeny (1985). The decline was used as evidence of overall population decline, but this population is suspected to fluctuate widely due to water level fluctuations in this man-made reservoir. In 1984, water levels were low due to drought, but in 1985, they were normal. Thus, the plover fluctuated at that site in accordance with habitat availability. Recce (1984) indicated that the Big Quill Lake population had decreased to only 30% of its 1978 levels, yet the quoted source does not support this figure (Whyte 1985).

In the past two years, there have been development proposals for some of our large saline lakes that may jeopardize the Piping Plover. A Ducks Unlimited project, involving Middle Quill Lake, resulted in virtual elimination of the small Piping Plover population that Renaud had found there in 1978 (Renaud et al. 1979). This development resulted in a freshening of the water quality and a vegetating of both shore and shallow submerged areas, thus eliminating plover habitat. In 1978, Renaud found 28 adults; the 1984 survey yielded 4. There are development proposals in process for Chaplin, Old Wives, and Big Quill lakes that may affect Piping Plover populations on these important breeding areas. In other words, Saskatchewan's largest and most productive areas for Piping Plovers may be threatened. Because of the foregoing, we must have good data for the sites where development is proposed and better overall census data to evaluate the Saskatchewan population.

FUTURE NEEDS

Although we have a better idea of Saskatchewan's current Piping Plover population, we still need a further look at the stability of the populations. Do they fluctuate from year to year, or are they relatively stable? What is the long-term trend? What about the reproductive success? Are the other areas having success equal to that apparent at Big Quill Lake? What type of production are we getting from the smaller areas?

Although all of these factors are important, probably the most critical is the protection of the nesting habitat. Due to the nature of these areas, they have up until now received very little disturbance. The highly saline waters held little potential for recreation, industrial use, or wildlife development and no self-respecting cow was willing to wade through alkali muck to drink alkali water. However, recent industrial proposals and wildlife development projects have drawn attention to these areas and the advent of all-terrain vehicles has opened up recreation activities on these areas. It may be that habitat protection is the most critical current need for Piping Plovers in Saskatchewan. Where developments do occur, we need to monitor the impact on plover populations.

ACKNOWLEDGMENTS

Appreciation is expressed to the people who have devoted their time to assist in censusing the populations and to those who have funded the work, Saskatchewan Parks and Renewable Resources through the Saskatchewan Natural History Society. Also, thank-you to Bob Hart of the Potash Corporation of Saskatchewan for permission to use the data collected for PCS on Big Quill Lake in 1985 on the reproductive success of that population. Dale Hjertaas has provided valuable direction and assistance during the past three years.

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PIPING PLOVERS IN MANITOBA -

A STATUS REPORT ON THE SPECIES

AND INITIAL RECOVERY PLAN FOR THE PROVINCE

Susan M. Haig

DISTRIBUTION

Manitoba is on the eastern fringe of Piping Plover (*Charadrius melodus*) prairie habitat. Whether there are distinct prairie and Great Lakes populations may become evident from electrophoretic analyses that are now underway. For now, it is not known whether any of the populations are distinct from one another.

During the past 125 years, Piping Plovers have been recorded at 29 sites throughout southern Manitoba (Figure 1). Since 1981, my assistants and I have carried out air and ground searches for birds and habitat in most potential sites south of Norway House (there are no records further north) and found: seven current breeding areas, 44 pairs, and 30-40 nonbreeding birds for a provincial total of approximately 120 birds. Of the seven sites, West Shoal Lake with 25-35 breeding pairs is the focal point of Piping Plover activity in the province. Two areas on Lake Winnipeg (Grand Marais beach/island and Hecla Island) are used by 10-13 pairs. Piping Plovers breed at two sites on Lake Manitoba (Clandeboye Bay and Hollywood Beach) for a total of 3-5 pairs. There are 1-4 pairs on Salt Point on Lake Winnipegosis and 1-3 pairs on Whitewater Lake.

Most of my research was concentrated on birds at West Shoal Lake, Lake Manitoba, and Lake Winnipeg. West Shoal Lake is a small, shallow lake that has variable water levels. On Lake Manitoba, birds breed along the narrow beach that separates the lake from the Delta Marsh. Here birds feed on 10 m wide sand/gravel beaches and lay eggs at the edge of the high beach. Finally, we watched birds on the southeast corner of Lake Winnipeg at Grand Marais. Here birds use a sandspit separating Grand Marais marsh from Lake Winnipeg and a 10 m x 1 km island just offshore.

CURRENT RESEARCH

Birds are individually marked with colour bands and international flags at all three sites and monitored between sites and years. Over a single breeding season, the average adult invests in 1.6 nests (range 1-3), 6.2 eggs (range 0-12); a pair hatches 1.7 chicks (range 0-4), and fledges 0.9 chicks (range 0-4, Table 1). In addition, they may have 1 to 3 mates during the breeding season. This increase in the number of nests, eggs, and mates is due to the tremendous amount of nest destruction that occurs each year. Overall, 72% (n = 50) of first nests and 43.3% (n = 30) of renests are lost for a total of 61.3% nest destruction (Table 2). Despite this low rate of success, breeding birds are fairly philopatric to former nest sites (Table 3). Males return significantly more often than not regardless of previous nest success. Female returns are more varied but previous nest success does not seem to play a role in their return patterns.

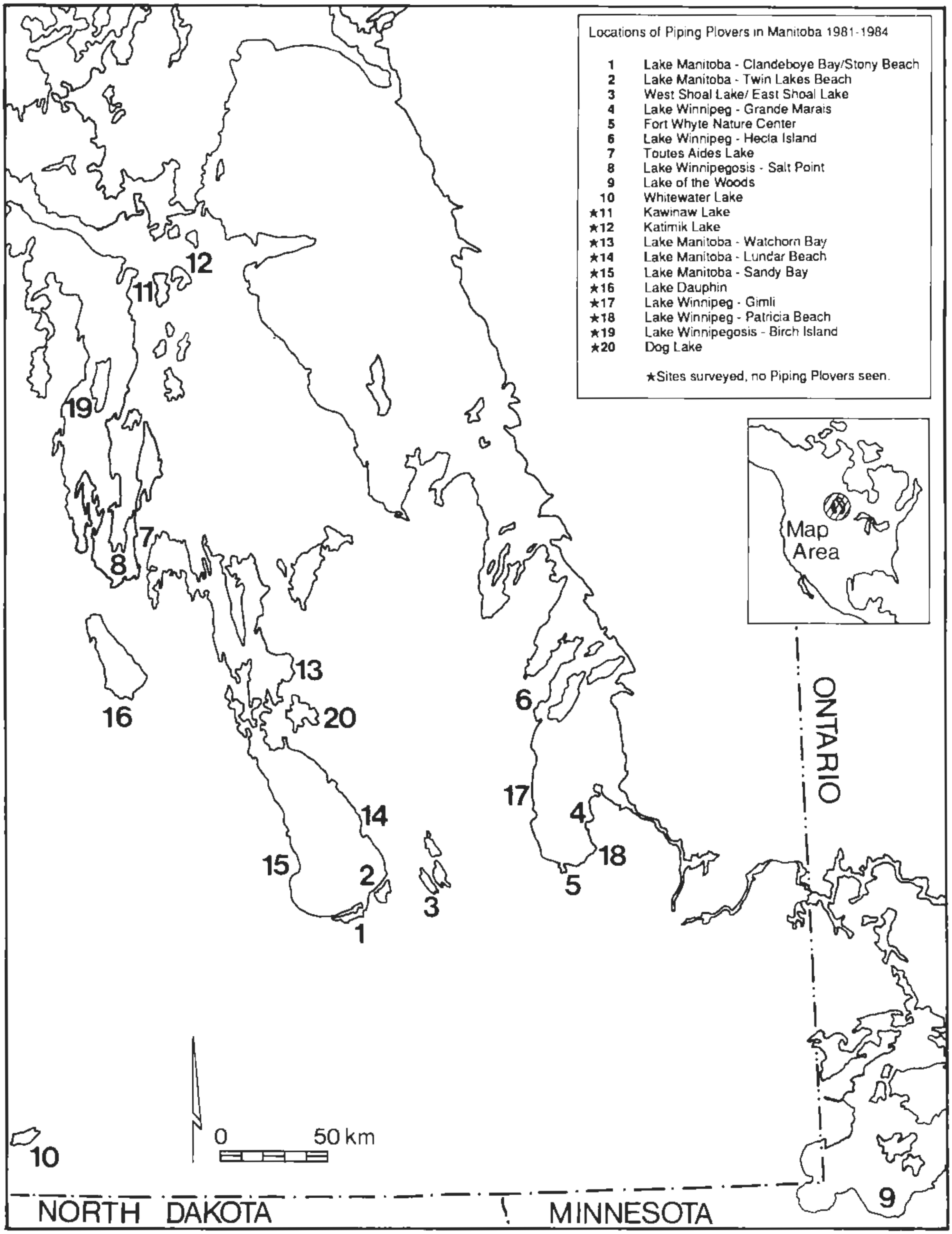

Figure 1. Locations of Piping Plovers in Manitoba, 1981-1984.

Table 1.--Annual reproductive effort among individual Piping Plovers in southern Manitoba (from Haig 1987).

	Mean	Mode	Range	SD	N
Number of nests	1.6	1	0-3	0.6	80
Eggs laid per female	6.2	4	0-12	2.3	78
Chicks hatched	1.7	0	0-4	1.7	92
Chicks fledged	0.9	0	0-4	1.4	94
Number of mates	1.3	1	0-2	0.5	71

METHOD OF NEST DESTRUCTION

A number of factors act separately or jointly to cause nest failure at each of the sites monitored. First, Lake Manitoba and Lake Winnipeg have water regulatory structures that maintain constant water levels on the lakes. These high and stable water levels cause frequent nest destruction. Overall, 24% (n = 80) of nests monitored were washed out by storms. An additional 40% of all nests were destroyed by natural predators such as skunks and gulls, or humans. Human disturbance ranges from cattle stepping on nests at West Shoal Lake to vehicles running over nests at Clandeboye, or heavy recreational use of beaches on Lake Winnipeg.

STATUS OF PIPING PLOVERS IN MANITOBA

The status of Piping Plovers in Manitoba is precarious. In at least two of the three major areas (Lake Winnipeg and Lake Manitoba) in which they occur, they face immediate threats, while the status of peripheral areas is uncertain. The distribution and success of Piping Plovers on Lake Manitoba has dramatically declined in recent years. Each year between 1964 and 1981, 10-17 pairs of Piping Plovers bred on the south shore of the lake, and were seen regularly eight miles north at Twin Lakes Beach. During the past four years, birds have stopped breeding at Twin Lakes Beach, 81.5% of the nests have been destroyed by storms, skunks, or people, and only four chicks have fledged. I cannot quantify the status of birds on Lake Winnipeg. However, the recreational use of beaches has severely damaged the habitat and reproductive success of the birds there. Without some immediate protective measures, birds on Lake Manitoba and Lake Winnipeg may discontinue breeding completely and abandon the sites.

PROTECTIVE MEASURES

Several protective measures have been initiated. In 1982, Clandeboye was declared a Special Conservation Area by the Minister of Natural Resources. The signs prohibited traffic of any sort on the beach. Unfortunately, without

Table 2.--Piping Plover nest destruction in Manitoba (from Haig 1987).

Year	First Nests	Second Nests	Total
1981	-	50 (2)	50 (2)
1982	100 (7)[a]	75 (4)	90.9 (11)
1983	67 (9)	0 (2)	54.5 (11)
1984	61 (18)	30 (10)	50 (28)
1985	69 (16)	58.3 (12)	64.3 (28)
TOTAL	72 (50)	43.3 (30)	61.3 (80)

[a] Values represent percent destroyed with sample size in parentheses.

enforcement, people disregarded the signs. In addition, an artificial habitat was created in 1983 and 1984 on Delta Research Station's Lake Manitoba property. We removed sapling willow and cottonwoods from the front 25 m of ridge. We then plowed up a 25 m x 2 km strip of sand, and deposited gravel every 20 m. A pair did initiate a nest on the improved habitat, but the nest and new beach were completely washed out in a storm.

MANAGEMENT RECOMMENDATIONS

A five-step plan that would start Piping Plovers on the road to recovery in Manitoba has been proposed. The most important, immediate objective is to protect and strictly enforce protection of Clandeboye, West Shoal Lake, and Grand Marais. Secondly, the water level regulation policy should be investigated for Lake Winnipeg, Lake Manitoba, West Shoal Lake, and Lake Winnipegosis to determine if steps can be taken to insure natural fluctuation of water levels. Third, there are at least eight locations that may harbour additional pairs and are worth censusing. Fourth, annual censuses need to be continued so that habitat use and reproductive success can be monitored. Finally, these measures will not be successful without public support. The plight of the Piping Plover and the birds' role as an indicator species needs to be promoted to the public on a small scale in local towns and on a province-wide basis. The experience with the Special Conservation Area signs points to the fact that most efforts will fail without strong public support.

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Table 3.--Percentage of birds (sample size in parentheses) returning to nest sites used in the previous breeding season. Data are from southern Manitoba 1982-85 (Haig 1987).

Return	Males	Females	Overall
Overall pattern	77.1 (35)**	56.7 (30)	67.7 (65)**
Following nest failure	76.5 (17)**	57.1 (14)	67.7 (31)**
Following nest success	73.3 (15)**	54.5 (11)	65.4 (26)

** Percentage significantly greater than null hypothesis (50%), $P < .05$, X^2, 1 df.

PIPING PLOVER ON THE AMERICAN GREAT PLAINS

John Sidle

On December 11, 1985, the Piping Plover (*Charadrius melodus*) was finally designated in the U.S. Federal Register under the Endangered Species Act of 1973. The Register review contains supplementary information on the bird's biology, population status on the coast and interior plains and a summary of public comments and U.S. Fish and Wildlife Service recommendations (Recce 1984).

I looked at the species throughout its range and, in my view, threatened status was warranted throughout its range with the exception of the Great Lakes population where so few birds remain that an endangered designation was necessary.

The Lewis and Clark expedition, during their voyage up the Missouri River, found the Piping Plover a common bird on sandbars in the river as was the Least Tern (*Sterna antillarum*), a breeding associate of the Piping Plover. Most of that sandbar habitat has disappeared, especially over the past 25-30 years with the construction of reservoirs. Other riverine developments in Nebraska and in South Dakota also eliminated a lot of riverine sandbar habitat. We estimate about 570 pairs are in the Great Plains of the United States, of which 350 are in Nebraska. Piping Plovers are essentially extirpated from Iowa as there are no remaining sandbars along the Missouri River between Iowa and Nebraska. There are several pairs, however, that nest at an ash disposal site of a power plant. There are fifty pairs in South Dakota in addition to those birds located on South Dakota's common boundary with Nebraska and about 130-170 in North Dakota. The 20 or so pairs in Minnesota at Lake of the Woods are considered as part of the Great Plains population.

In conclusion, I want to emphasize the need for Canadians and Americans to work closely together to ensure the conservation of the Piping Plover.

LITERATURE CITED

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WINTER DISTRIBUTION AND STATUS OF PIPING PLOVERS ON THE GULF OF MEXICO

Susan M. Haig

In 1981, a study was begun in Manitoba to investigate the population biology and life history strategies of the Piping Plover (*Charadrius melodus*). At that time, little was known about the birds' breeding biology (Wilcox 1959, Cairns 1977) and post-breeding activities had never been studied. The breeding study in prairie Canada provided critical data on mating systems, dispersal patterns, and genetic diversity, but by 1982, it became obvious that the picture would not be complete without knowledge of post-breeding distribution and status. A preliminary search for winter data revealed that: (1) current winter censuses accounted for only 5-20% of the total species population (data later published in Haig and Oring 1985); and (2) Piping Plovers seemed to disappear from U.S. coastal beaches during much of the winter.

To resolve the winter issue, and further clarify factors that may be limiting the species, an international effort was launched to determine the distribution of post-breeding Piping Plovers. Goals for the project included: determination of the winter distribution of Piping Plovers, definition of critical areas that may limit the species, and initiation of cooperation among biologists and conservationists throughout North America and the Caribbean.

METHODS

Preliminary distribution information was gathered in several ways: response to a poster distributed to biologists, conservationists, and bird watchers throughout North America and the Caribbean; a literature search for Piping Plover distribution information; compilation of most North American museum skin records; and a 1982 pilot study in Texas. Cooperation between Ducks Unlimited - Mexico (DUMAC), Universidad Autonoma Metropolitana, Fauna Silvestris (Mexico), U.S. Fish and Wildlife Service, U.S. National Park Service, and Pan American Shorebird Program was set up prior to initiation of field work.

From January through April 1984, all suitable beaches and mudflats between Campeche, Yucatan and Jacksonville, Florida (Figure 1) were surveyed and/or censused for Piping Plovers and other shorebirds. Censuses were carried out by 2 observers either walking or riding a 3-wheeled all-terrain vehicle. Most beaches from Tampico, Tamaulipas to Matamoros, Tamaulipas proved to be inaccessable so an aerial survey of habitat was conducted. Beaches along this stretch were censused when access was possible. For each linear mile of census, observers recorded: number of individuals per species, flock size, microhabitat-use by species, human disturbance, beach width, weather, and tide information. Since observers usually doubled back to the starting point, areas were checked twice for the presence of Piping Plovers. In November 1983, beaches and tidal flats were censused from Rio Lagartos to Campeche (Yucatan), and from Corpus Christi to Brownsville (Texas).

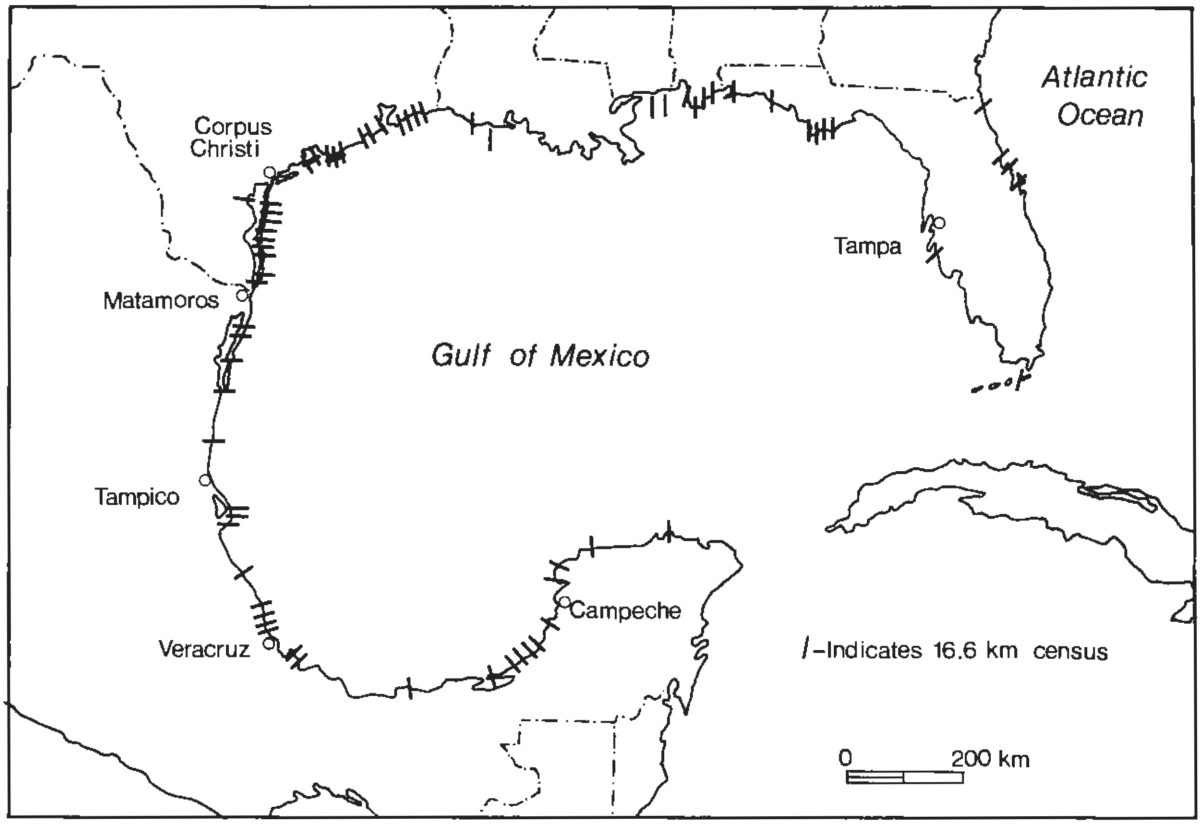

Figure 1. Location of winter censuses 1984 (from Haig and Oring 1985).

RESULTS AND DISCUSSION

Shorebird Censuses

Over 700 miles of Gulf of Mexico habitat was ground-surveyed for presence of Piping Plovers. This resulted in collection of 464 miles of shorebird census data (Figure 1). Six hundred miles of beach were air-surveyed from Tampico to Matamoros.

Piping Plover Distribution

The 579 Gulf Coast Piping Plovers (Table 1) recorded in early 1984 account for more birds than have been recorded on past Christmas Bird Counts over the entire species' range (Haig unpubl. data). Results pointed out the overall importance of the Texas coast to Piping Plovers and the low number of birds seen further along the Gulf.

Perhaps the most significant result of the census was discovery of a specific habitat preference by Piping Plovers during migration and on winter sites. Past records indicated that pre- and post-breeding Piping Plovers use Gulf and Atlantic beaches from August to October and March to April. Examination of Piping Plover habitat use in mid-winter indicates that some birds are still on beaches, but a significant number were on sandflats adjacent to beaches. South Padre Island, Texas; Bolivar, Texas; and Port St. Joe, Florida best illustrate this point. Sandflats are quite ephemeral and appear or disappear depending on wind and tide conditions. The soup-like nature of extensive sandflats make it nearly impossible to get close to Piping Plovers, indicating censuses may be low estimates of the density in any one area. It is important to note the birds were using sandflats, not mudflats. Many other shorebirds were seen on typical tidal mudflats, but few Piping Plovers were among them.

Discovery of a specific habitat preference was a turning point in unraveling the mystery of Piping Plover distribution. It points out that both beach and sandflat habitat are necessary for post-breeding birds, helps explain why so few birds are seen on Christmas Bird Counts, and leads me to believe that Piping Plovers may not be moving as far south as was once thought. Amos (pers. comm.) gave further support for this contention with 1984 data showing that while birds had been absent from Padre Island beaches for weeks, an overnight freezing of Laguna Madre brought numerous Piping Plovers back to the beach the following morning.

Furthermore, my November 1984 survey of south Texas revealed no Piping Plovers on South Padre Island beaches and several hundred on adjacent Laguna Madre sandflats. It was impossible to get very close to birds because of the soft substrate so a comprehensive census was not completed. It is interesting to note that the highest recent Christmas Bird Count for the area was 13 Piping Plovers. The vast expanses of sandflats to the north would be difficult to census, but are necessary to inspect before significance of the area can be assessed.

Table 1.--Locations of Piping Plovers on the Gulf of Mexico, winter 1984.

State	County	General Location	Number of Piping Plovers
Veracruz	-	Anton Lizardo	11
Veracruz	-	Veracruz-north	2
Veracruz	-	Tuxpan barrier islands	4
Texas	Neuces	Padre Island	4
Texas	Neuces	Corpus Christi State U.	31
Texas	Neuces	Packery Channel	92
Texas	Neuces	1850 Pass	28
Texas	Neuces	Corpus Christi-North	17
Texas	Aransas	Port Aransas Airport	16
Texas	Aransas	Rockport	3
Texas	Brazoria	Freeport	4
Texas	Galveston	San Luis Pass	11
Texas	Galveston	Galveston Jetty	13
Texas	Chambers	Bolivar Flats	125
Texas	Jefferson	Gilchrist	10
Texas	Jefferson	Sea Rim State Park	23
Louisiana	Jefferson	Grand Terre	33
Mississippi	Hancock	Waveland to Biloxi	37
Mississippi	Harrison	Deer Island	11
Mississippi	Jackson	Ship Island	4
Alabama	Mobile	Dauphin Island	49
Florida	Bay	Tyndall AFB	7
Florida	Gulf	Port St. Joe	4
Florida	Gulf	Port St. Joe Beach	14
Florida	Franklin	St. George Island	10
Florida	Lee	Fort DeSoto	9
Florida	Keys	Bahia Hondo State Park	7

Examination of the total U.S. winter distribution (Table 2) indicates that approximately 834 Piping Plovers can be accounted for. Numbers from Texas do not include an estimate for South Laguna Madre sandflats (as they were censused 9 months after other areas). Distribution and determination of critical areas is becoming better defined but winter sites for 2,000 to 3,000 birds remain unknown.

Table 2.--Winter distribution and population estimate of Piping Plovers in the United States.

State	Estimate	Year
Alabama	80	1984
Florida	135	1984
Georgia	15	1983
Louisiana	33	1984
Mississippi	51	1984
North Carolina	100	1983[a]
South Carolina	20	1984
Texas	400+	1984
Total	834+	1984

[a] J. Fussell, pers. comm.

Missing birds may be accounted for in the following ways: First, on the surface it is curious that more birds were not seen in Mexico. If current habitat-use hypotheses hold, Piping Plovers may not be using many Mexican areas because water stabilization structures have been built between Laguna Madre and barrier islands. High water levels eliminate sandflats and carve rough slopes into shorelines. Not only were Piping Plovers absent, but censuses indicate that few birds were in the area. What may have temporarily improved Mexican Gulf coast fishing, might be responsible for a major loss of avian winter habitat. Access to this area is quite difficult, but repeated censusing would be worthwhile.

The occurrence of Piping Plovers in South America or other continents has not been documented. Distribution of Piping Plovers throughout the Caribbean is sketchy at best (Table 3). Since little information exists, letters were sent to knowledgeable people throughout the Caribbean to determine if unpublished data could be found. Responses revealed little new information except that the northern shoreline of Cuba may contain sandflats (Garrido, pers. comm.). Obviously, it is difficult to speculate about numbers of birds in these areas without further ground and air surveys.

Critical Areas

Identification of critical winter habitat for Piping Plovers and other shorebirds is a complex issue (Myers 1983). Both beach and sandflat areas on the Gulf and Atlantic coasts are seriously threatened by continued human development. It is important to realize that development of a beach not only destroys beach habitat, but usually necessitates stabilization of sand movement, hence, destruction of adjacent sandflat habitat. Results of this study point to areas that require immediate attention.

Table 3.--Occurrence of Piping Plovers throughout their winter range (from Haig and Oring 1985).

Location	Estimate	Year	Source
Bahamas	Rare	1981	Norton[a]
Barbados	Rare	1984	Academy of Natural Sciences[a]
Bermuda	6-8	1983	Wingate[a]
Dominican Rep.	Rare	1931	Wetmore and Swales (1931)
Cuba	10+	1984	Garrido[a]
Ecuador	1 seen	1956	Marchant 1956
Haiti	2 seen	1929	U.S. National Museum[b]
Jamaica	0-2	1983	Goodbody, Hurst, Sutton[a]
Mexico	20+	1984	This study
Netherlands-Ant.	1	1983	Voous 1983
Puerto Rico	Rare	1983	Raeffaele 1983
United States	834+	1984	This study
Virgin Islands	0-5	1983	Ynetema[a]
West Indies	Rare	1982	Norton[a]

[a] Personal communication
[b] Museum skin

1. Bolivar Flats, Texas. While immediate threats to the area were not obvious, it is essential to identify this area as a critical migratory and winter area for Piping Plovers and other shorebirds.

2. Padre Island/Laguna Madre, Texas. Clearly, the beaches and sandflats in south Texas were the most productive found. They were also the most threatened. Beaches resemble highways and filling in the back-beach lagoons was quite prevalent from Port Aransas to Mustang Island. On South Padre Island, development was not quite as extensive, but rapid growth was apparent. Expansion of South Padre Island development may be the most devastating because of the tremendous amount of prime habitat that would be destroyed.

3. Laguna Madre, Tamaulipas. It appears that the damage may already be completed for the Matamoros to Tampico stretch of beach. Stabilization of water levels benefits few avian species over a long period of time. If nothing else, it may serve as a lesson not to repeat.

CONCLUSION

In 1984, a shorebird census of 454 miles of Gulf of Mexico beaches and sandflats was conducted. It was the first time a major Gulf census had been carried out for Piping Plovers, and the first time many Mexican beaches had been censused for any shorebird species. The winter distribution of Piping Plovers was described and important habitat requirements were discovered. Serious coastal habitat destruction, endangering many species including Piping Plovers, was further documented. Future censusing will be necessary before the winter distribution of Piping Plovers is fully understood. This collaborative effort between Canada, Mexico, and the United States has already produced positive steps in protecting Piping Plovers.

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THE MOUNTAIN PLOVER IN CANADA

Cleve R. Wershler

The Mountain Plover (*Charadrius montanus*) is confined to the extreme southeast corner of Alberta and, potentially, the southwest corner of Saskatchewan, along the Canada-United States border. From historic records it is apparent that it once bred in considerable numbers in this general region (Coues 1878). Since the turn of the century, large tracts of land have been cultivated in the United States and Saskatchewan, effectively reducing the habitat for northern populations of the Mountain Plover to a few fragmented areas. Until 1979 there were few reports of Mountain Plovers in Canada, with only 4 records suggesting possible breeding. Since 1979, when it was first documented nesting in Canada, the Lost River area in Alberta has constituted the only known Canadian breeding population (Wallis and Wershler 1981). In 1985 a study was conducted by the author and Cliff Wallis, funded jointly by Alberta Fish and Wildlife and the World Wildlife Fund, to determine the status of the Mountain Plover in Canada.

HABITAT

In Alberta, the Mountain Plover inhabits a sandy phase of the Mixed Grassland. Breeding habitat is heavily grazed or recently burned and grazed grassland in relatively flat upland situations. Preference has been shown for areas which have been used as winter feeding pastures for cattle. In total, the potential nesting habitat in Alberta is approximately 20 square miles (5,180 ha). Two or three square miles of potential habitat have been planted to exotic forage crops.

There are no documented nesting records from Saskatchewan. However, a probable family group was recorded in a prairie dog town near Val Marie (Peart and Woods 1980), and since Mountain Plovers nest in good numbers in upland prairie dog towns in north-central Montana, it is possible that they use similar areas in Saskatchewan.

POPULATION

From 4 breeding adults and 4 nests in 1979, the known Lost River population reached a high of 11 adults and at least 6 nests in 1981 when a larger area was surveyed. The site was only casually visited in the following years, until 1985, when a thorough search of suitable habitat in Alberta and in Saskatchewan was conducted. Despite an apparent abundance of suitable habitat, only one pair of Mountain Plovers nested in 1985 in the Lost River area. This nesting attempt failed due to undetermined causes, but this may have been related to drought conditions in 1985, with grassland bird populations being generally low. In a Colorado study a significantly higher proportion of nests were abandoned during a drought year, when the food supply was low, compared to a year of higher precipitation (Graul 1973).

LIMITING FACTORS

The Mountain Plover is one of a small group of endemic grassland birds in the Great Plains that can be characterized by restricted ranges, specialized habitats, and narrow environmental tolerances (Mengel 1968). The Mountain Plover is particularly intolerant of cultivation, ungrazed to moderately grazed grassland, and grassland on strongly solonetzic soils.

Under favourable conditions, double clutches are often laid. These are incubated simultaneously by male and female birds. During drought conditions the trend is to lay only one clutch (Graul 1973). As mentioned previously, there also appears to be a greater chance of nest failure during drought years.

With the known Canadian population of Mountain Plovers being so low, it is particularly vulnerable to mortality during migration and to disturbance on the wintering grounds. It is not known where the Alberta population winters or whether there is any movement between that population and the much larger population in north-central Montana. However, a fair amount of banding was conducted in 1981 and 1982 in Montana, which could provide insight into these issues.

The number of naturalists visiting the Lost River area for the rare flora and fauna is increasing every year. Along with this increased visitation comes a greater chance of birds being disturbed during critical times of the breeding season.

Range managers have also had impacts on the nesting habitat. In recent years there has been more vehicle trail development through the area, perhaps due to a trend to range riding in a pickup rather than on horseback. The dumping of winter feed has, in a number of sites, caused an increase in the spread of exotic grasses and an accumulation of exotic plant materials in the soil litter.

MANAGEMENT RECOMMENDATIONS

Large continuous areas of natural grasslands are threatened habitats and should be protected from the plough and the seeding of exotic forage plants. In order to protect the diversity of plants and animal species, management strategies incorporating a variety of grazing pressures and timing should be adopted. This should include heavily grazed areas for Mountain Plover nesting habitat. Details of management would have to be worked out as more is learned about the species' breeding biology in Canada. In Alberta, breeding habitat is entirely on leased crown land, which should theoretically expedite a grazing plan for the Lost River area.

RECOMMENDATIONS FOR FUTURE STUDY

1. A monitoring program for the Lost River population to measure and account for fluctuations in population and nesting success.

2. Reconnaissance to find new populations in Alberta and Saskatchewan.

3. A banding program, if it is determined to be safe and practical in view of the low population, to determine wintering grounds.

4. Controlled burn experiments.

5. Further studies into breeding biology.

STATUS

In the United States, the Mountain Plover was placed on the "Status Undetermined" list of the Department of the Interior in 1973. This was in response to significant declines in the breeding populations in several states, including Montana, and declines in the wintering populations of California.

In view of the historical accounts of the Mountain Plover along the 49th parallel and the regular breeding records since 1979, it is recommended that the Mountain Plover be given "Endangered" status in Canada.

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MOUNTAIN PLOVER

Cliff Wallis

SUMMARY OF GENERAL DISCUSSION

There appears to be sufficient *potential* habitat to support viable populations of Mountain Plover (*Charadrius montanus*) in Alberta and Saskatchewan. However, there may not be enough heavily grazed areas of suitable size.

Another problem that needs to be addressed is how to maintain areas of heavy grazing without damaging the vegetation of an area and, potentially, Mountain Plover habitat. Are there times of the year when it may be preferable not to have cattle on a site? Are there times of the year when Mountain Plovers are sensitive to the presence of cattle (e.g., during courting and early nest-building stages)?

The possibility was raised of having portions of three PFRA pastures in the Antelope Coulee area of southwestern Saskatchewan declared as a National Wildlife Area. This area is only 50 km east of the only known Mountain Plover breeding area in Canada and contains potential breeding habitat.

Good land use and wise resource management over extensive areas of native habitat in the grassland region will be more effective for maintaining rare species and habitats than the artificial manipulation of habitat for a single species.

The status of other grassland shorebird species was raised. The Long-billed Curlew (*Numenius americanus*) and Upland Sandpiper (*Bartramia longicauda*) were both considered worthy of special attention by both Alberta and Saskatchewan researchers. The Long-billed Curlew has shown population declines in both the United States and Canada, despite its ability to utilize cultivated lands. The Upland Sandpiper is very locally distributed, mainly in lush grassland habitat which is becoming very rare.

In Saskatchewan, population declines of Marbled Godwits (*Limosa fedoa*) and Willets (*Catatrophorus semipalmatus*) have also been noted in recent years. This may be partially related to the recent drought.

RECOMMENDATIONS

1. Greater emphasis needs to be placed on managing native grasslands for more than just livestock production. This would recognize the need to maintain the variety of grazing patterns which would benefit the range of wildlife inhabiting the grasslands. In particular, more attention must be given to providing sufficiently large areas of ungrazed and heavily grazed lands to complement the existing widespread moderately grazed lands.

2. In certain cases, it may be necessary to manipulate habitat for a single rare or endangered species. This should be considered a last resort and should not take the place of good management of natural habitats. Non-native or partially disturbed native habitats would benefit most from such manipulation.

3. The relationship of Mountain Plovers and numerous other rare grassland species to the widespread decline of Richardson's Ground Squirrels (*Spermophilus richardsoni*) needs to be studied.

4. There needs to be a prairie bird group formed which would pool resources for the study of prairie species, their habitats, and interrelationships with other species. Cooperative research and exchange of ideas would be encouraged to reduce duplication of effort and expedite necessary conservation programs.

5. Recommendations from the paper by Wershler should be followed (this symposium).

6. Management of sites will be improved if the local ranchers are involved in formulating management plans and if they are kept informed of research findings.

7. If there is a strong possibility of the Antelope Coulee area becoming a National Wildlife Area, then a study should be undertaken to estimate the habitat potential for Mountain Plovers.

STATUS OF BURROWING OWLS IN ALBERTA

Gary Erickson

The range of the Burrowing Owl (*Athene cunicularia*) in Alberta includes all of the short grass and mixed grass regions of southeastern Alberta and extends west and north into much of the fescue grass and portions of the aspen parkland (Fig. 1). A subjective assessment based on habitat and population information is that the distribution and abundance of Burrowing Owls is from moderately fragmented and locally abundant in the short grass region, highly fragmented and uncommon in the mixed grass region, and isolated and rare in the fescue grass and aspen parkland regions. Wedgewood (1978) arrived at a population estimate of 610 pairs in Alberta. This estimate was based on information gathered from a follow-up to the Lang et al. (1978) Alberta inquiry on Burrowing Owls.

The Alberta Fish and Wildlife Division (1985) estimated the population at approximately 720 pairs. This estimate was extrapolated from density figures obtained from Wedgewood (1978) and the current availability of suitable habitat.

Lang et al. (1978) reported that the presence of owls decreased after cultivation of the pasturelands. Other causes of declines included harassment by dogs, collapse of burrows, and collision with vehicles. Zarn (1974) indicated that the primary or chief limiting factor affecting populations was burrow availability. He also indicated other limiting factors including brush control and bank stabilization activities, effects of pesticides, secondary poisoning through rodent control programs, shooting, and lack of food as probable causes of population decline.

Wedgewood's follow-up report to Lang et al. (1978) indicated that only 8 of 18 sites occupied in 1972 and/or 1973 were used in 1977. The habitat in 8 of the 10 vacant sites was reported to be unchanged. Recent investigations by the Alberta Fish and Wildlife Division suggest that the conversion of native grasslands to agricultural use will affect an estimated 25 percent of the available Burrowing Owl habitat within the next 10 years.

In September of 1985 a draft Policy For The Management Of Threatened Wildlife In Alberta was developed by the Fish and Wildlife Division. This document now serves as interim policy until such time as it is reviewed and recommended by the Fish and Wildlife Advisory Council and approved by the Minister. The purposes of this policy were to: adopt a system to identify threatened wildlife; to rank species into categories that reflect the degree of threat; and to recommend management actions for threatened wildlife. Four levels of threat were subjectively selected to rank the status of wildlife species; endangered, threatened, vulnerable, and viable. The Burrowing Owl is identified as a threatened species in this policy.

Presently the Provincial Wildlife Act does not formally recognize the Burrowing Owl as a species in jeopardy. The Division is currently in the process of finalizing a new Wildlife Act. The new Wildlife Act will list all species identified as endangered, threatened, and vulnerable in the Policy For The Management Of Threatened Wildlife In Alberta, as Endangered Wildlife. This new Act allows for fines of up to $100,000 or imprisonment for up to 6 months, or both, to individuals

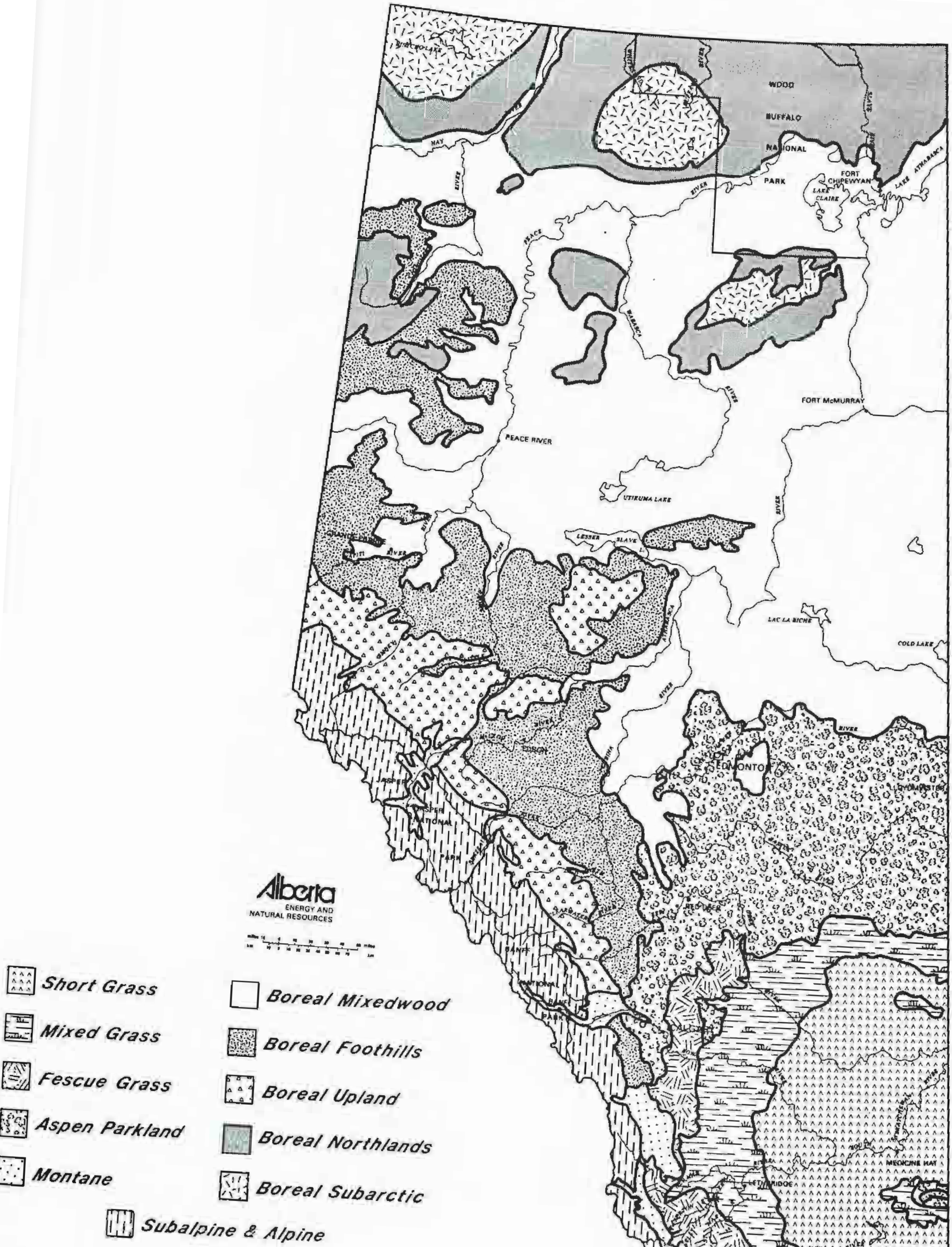

Figure 1. Ecoregions of Alberta

convicted of shooting, trapping, or trafficking Endangered Wildlife. In addition, the new Act has provisions for the Minister or Lieutenant Governor in Council to establish sanctuaries for prescribed kinds of wildlife and to control use of those lands.

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BREEDING BIOLOGY OF BURROWING OWLS IN SASKATCHEWAN

Elizabeth A. Haug and Lynn W. Oliphant

Since approximately 1950, there has been a substantial decline in the Burrowing Owl (*Athene cunicularia*) population in Canada. Opinions vary on the duration of the decline with some believing it began during the 1930s (Wedgwood 1978). Owls are not found in many districts they once inhabited and the population size has also dropped in adjacent states to the south (Wedgwood 1978, Zarn 1974). From all recent reports, the numbers of Burrowing Owls are decreasing at a rate greater than the loss of nesting habitat (Wedgwood 1976, 1978). The great majority of Burrowing Owl research has been conducted in the United States. Very little work has been done in Saskatchewan, which is the major breeding range of this species in Canada, and thus many aspects of Burrowing Owl life history and habitat requirements in Canada are poorly understood. The apparent decrease in population numbers and the overall lack of understanding of the species were the main incentives for a recent study (Haug 1985) summarized below.

The major objectives of this study were: (1) with the aid of radio-telemetry, to determine the size and shape of home ranges of adult owls, to document movements and activity patterns within these home ranges and to determine which habitat types were most preferred for foraging, nesting, and loafing; (2) to document breeding biology, reproductive performance, causes of mortality, and limiting factors of Burrowing Owls in Saskatchewan; (3) to develop and test a census technique.

This information is required for proper preservation of existing breeding habitat or acquisition of lands for potential restocking programs. It was also hoped that factors limiting recruitment to the population could be defined. The major area searched for Burrowing Owl nest sites was approximately 3500 km^2 located in southcentral Saskatchewan near Saskatoon. The radio-telemetry studies were conducted on two smaller areas where three or more pairs were known to nest.

METHODS

Field work was conducted from June to August 1981, and from May to October in both 1982 and 1983. Active nestsites were located by visiting historical nestsites as recorded by Wedgwood (1978). Other nestsites were located by visually checking and/or broadcasting tape-recorded primary calls (Martin 1973) over areas that appeared to be adequate nesting habitat (Zarn 1974, Wedgwood 1978).

A vehicle driving route was set up to test the use of primary call playback as a census technique (Haug, unpublished data). Tape recordings of the primary call were broadcast twice weekly from 1 May to 15 June 1982 and 1983 over areas where Burrowing Owls were known to be nesting. The number of owls and types of responses were recorded.

Three of the 47 nest sites active between 1981 and 1983 were chosen as major study areas for telemetry studies and a hacking program (Haug, unpublished data). These three colonies involving 16 nesting pairs, were checked daily and provided the majority of nesting biology information. The other nestsites were checked biweekly to determine the progress of nesting pairs. Diurnal observations were made from a vehicle and radio-telemetry was utilized to investigate nocturnal activity. Attempts were made to trap, band, and colourmark all adults and young owls for individual recognition. Nine adult male owls were trapped and radio-tagged for determination of home range size, activity patterns, and foraging habitat utilization. Food habits were determined by collection and analysis of regurgitated pellets. Owl carcasses found on the study area were analysed for organochloride and organophosphate pesticide residues.

RESULTS AND DISCUSSION

Burrowing Owls were first observed on the study area in late April, with the greatest influx of owls occurring during the first week of May. Except for a few unpaired males, owls arrived on the nesting sites already paired. Egglaying and incubation began during the third and fourth week of May and only females were observed to develop a broodpatch and incubate. Downy young were observed at burrow entrances in the third and fourth week of June, with fledging occurring during mid to late July. Family units began to disperse in August and most owls were gone by the end of September.

Nest success and production were obtained from 102 breeding pairs. The overall percentage of nests which fledge at least one young was 59%. There were 4.5 young fledged per successful nest but only 2.6 young fledged per nest attempt. In both 1982 and 1983, badgers (*Taxidea taxus*) and weasels (*Mustela* sp.) were believed to be the major predators on eggs and young owls causing at least 50% of the nest failures.

Thirty-seven percent (10/27) of the owl remains found were attributed to vehicle collisions. This was a significant mortality factor for fledgling owls. Loss of breeding habitat may be limiting population numbers in Saskatchewan. By 1981, 23% of the historic nest sites listed by J.A. Wedgwood (1978) had been converted to cropland. During 1982 and 1983, 11% of the breeding habitat recorded in this study had been converted to cropland. Organochloride residues detected in both juvenile and adult owl and small mammal tissue samples included DDT, DDD, DDE, heptachlor epoxide, and lindane.

Significantly greater numbers of both male and female owls were detected using the primary call playback census technique as compared to visual searching. During both years of the study, there was a 39% increase in detection of males and a 97% increase in detection of female owls on nestsites where numbers of nesting pairs were known.

In 1983, a total of 14 eggs were removed from two nest burrows prior to cultivation of the nestsite. Seven young owls were successfully raised and released back to the wild.

Mean home range size as determined by radio-telemetry was 2.41 km^2 (range 0.14 to 4.81 km^2). There was evidence, although not statistically significant, to suggest the variation in home range size was inversely correlated with an index of the numerical density of grasshoppers, the owls' main prey item. There was a positive correlation (r = .94) between home range size and the number of young fledged per pair. Peak foraging hours, characterized by long distance flights, occurred between 2000 and 0630 hours. During daylight hours, owls were predominantly observed loafing or roosting within 50 m of their nest burrows. Grass/forb habitat types, which included road rights-of-way, hayland, ungrazed pasture, and uncultivated areas, were preferred for foraging by adult male burrowing owls. Crop and grazed pasture were generally underutilized in relation to their occurrence within the home ranges.

MANAGEMENT RECOMMENDATIONS

From this study, management recommendations were designed and include: (1) a complete census of historic sites listed by Wedgwood (1978) is needed, as well as a search of possible new sites visually and with the primary call playback census technique; (2) preserve breeding habitat through purchase or easement of land involved; (3) maintain a mix of hayland, uncultivated areas and cereal crops within 1 km of the breeding habitat to ensure adequate prey species; (4) reduce or eliminate pesticide spraying within a 3 km radius of nest sites.

FUTURE NEEDS

Future investigations should document winter biology and include: (1) banding and telemetry studies to determine migration routes and wintering areas; (2) winter habitat and prey requirements, movements, and limiting factors. During the breeding season, more information is needed regarding: (1) nesting habitat and burrow requirements and (2) limiting factors to population recruitment and how it varies in different areas. Research should also address potential toxicological problems such as secondary poisonings that could lead to reproductive failures and increased mortality.

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BURROWING OWL NEEDS IN SASKATCHEWAN

Dale Hjertaas

A review of Burrowing Owl (*Athene cunicularia*) status in Saskatchewan currently nearing completion will probably class this species as threatened in the province. However data are not adequate to estimate the size of the provincial population. In 1984 the Saskatchewan Natural History Society with funding from Saskatchewan Parks and Renewable Resources hired Prairie Environmental Consultants to identify all known breeding sites (Harris and Lamont 1985). Of the 800 sites found, 655 could be plotted accurately. A request for sightings published in Western Canada Outdoors in 1985 produced 141 sites. These have not yet been plotted to see how many overlap.

Sightings of Burrowing Owls range from single birds, sometimes on small plots of grass such as road ditches or cemeteries, to colonies of 3 to 20 pairs on pastures. Attendance at the single pair sites is erratic, they are often left vacant after one or two years.

The Burrowing Owl in Saskatchewan now occupies a very fragmented range. This indicates a real need for habitat protection. One mechanism that could be used to protect Burrowing Owl habitat lying on provincial crown lands is the Critical Wildlife Habitat Act. The Saskatchewan Natural Hisory Society is currently reviewing all known nest areas to identify sites that should be protected by this legislation. Unfortunately, there will be many sites we do not yet know of.

I believe an important need for the Burrowing Owl is a Recovery Plan. While plans require regular change they serve to set out what is known about problems, perceptions as to what limiting factors are, what management will be undertaken and who will do it. However we really don't know enough to write a recovery plan for the Burrowing Owl in Saskatchewan. Hence one urgent need is information.

I suggest the following as a priorized list of projects which would address information needs in the province:

1. The first is a stratified random survey to estimate the Burrowing Owl's population and determine the portion of the population in colonies as opposed to lone pairs. This survey would also provide an estimate of habitat occupancy rates and assess habitat features, such as nest hole availability, which may limit the Burrowing Owl population. Harris and Lamont (1985) showed that Burrowing Owls prefer not only grassland, but certain land systems. This indicates that the 226,000 km^2 range can be surveyed fairly economically by stratifying according to land system and land use.

2. A second project would be location of nest areas by advertising for Burrowing Owl sightings in the rural weekly newspapers. These papers are read by the vast majority of the farm community who probably know if there are owls on their farms. The chances of getting a response would probably be improved if a local person, possibly a member of the Saskatchewan Natural History Society, could act as a contact person. People reporting owls should be questioned about

how long the site has been occupied. I believe this would identify many additional breeding areas and help determine if colonies are fairly stable.

3. The third project I wish to see initiated is an extensive banding or color marking program to provide information on pioneering, movement between sites, survival, and perhaps eventually on wintering areas. A continuing banding project using nest boxes would also serve to monitor productivity.

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BURROWING OWLS IN MANITOBA

Brian D. Ratcliff
(Abstract Only)

In 1979, the Burrowing Owl (*Athene cunicularia*) was classified as a threatened species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), but still we have limited information about the Canadian population.

Between 1982-1984, I conducted a survey to determine the current status and distribution of Burrowing Owls in Manitoba. A total of 263 owls were banded with U.S. Fish and Wildlife bands plus a colour band. One juvenile owl banded in July 1982, was found dead at San Antonio, Texas in October 1982. This is the first indication of where the Burrowing Owl population in Manitoba is wintering.

A major snow storm in May 1983, caused severe problems with the owls. The owls had already started incubation and many clutches failed to hatch. The recruitment of young owls into the already low population declined and the total number of pairs dropped from 76 in 1982 to 35 in 1984.

A lot of time was spent during the survey talking to landowners about this owl and how they could help the species. I feel that the best management plan for this threatened species is continued public education.

THE BAIRD'S SPARROW IN ALBERTA

Wayne W. Smith

INTRODUCTION

The Baird's Sparrow (*Ammodramus bairdii*) is a short-tailed, grayish sparrow; similar to the Savannah Sparrow (*Passerculus sandwichensis*). However, it differs by being quite buffy on the head and breast without any yellow. During the breeding season, Baird's Sparrows are easily distinguished by their song; which can be simply described as that of a musical Savannah Sparrow.

DISTRIBUTION

The Baird's Sparrow has a relatively restricted breeding range. It is bounded on the west by Calgary, on the north by Edmonton and Saskatoon, on the east by Winnipeg, and on the south by northern South Dakota and central Montana. The winter range is southeastern Arizona to central Texas, and south into northern Mexico. The population center of this breeding range is mainly restricted to southern Alberta, southern Saskatchewan and North Dakota.

PROTECTIVE STATUS

This species is listed as "Rare" by COSEWIC, but in Alberta, Baird's Sparrow would have to be somewhere between threatened and endangered. This status is based primarily on the habitat used by Baird's Sparrows which is both rare and patchily distributed.

HABITAT

In Alberta, Baird's Sparrow is a Northern Fescue Grassland species that also occurs to a limited extent in the Mixed Grassland region. The typical breeding situation is lush grassland. These areas have to be ungrazed or lightly grazed if extensive areas of thick, tussocky grasses exist. Preference is shown for flat or gently rolling habitat.

In the Mixed Grasslands, ungrazed damp depressions on uplands also provide nesting habitat. Unfortunately, such areas in Alberta tend to be tremendously overgrazed. Areas of grassland on strongly solonetzic soils (hardpan areas) are avoided.

Baird's Sparrows often co-exist with Sprague's Pipits (*Anthus spragueii*), which have a similar range. However, Pipits exhibit a wider range in choice of habitats, such as moderately grazed areas.

The critical habitat for Baird's Sparrow is continuous tracts of lush grassland. This poses a problem because fescue grasslands are very rare; in fact they are one of the most endangered ecosystems in North America. In Alberta, over two-thirds of the grassland area is cultivated, with the remaining third in jeopardy. Baird's Sparrows have a problem even in the remaining grassland because much of it is overgrazed.

PRIMARY RANGE IN ALBERTA

In Alberta there appears to be five main population centers, with a few additional marginal areas.

i. Little Fish Lake area. This is probably the largest remaining single block of fescue grassland in North America. In the last decade not only has more of the area been grazed or mowed but grazing is more intensified and mowing occurs more frequently.

ii. Milk River area. This is a Mixed Grassland. One part of this area, the Kennedy Creek drainage, used to have an extensive area of ungrazed *Stipa* grassland. The Milk River area has become more intensively managed. Every year there is more crossfencing, watering holes, and salt licks.

iii. (lower slopes of) the Cypress Hills. This is a mosaic of fescue and mixed grasslands. As in other areas, management is becoming more intensive.

iv. Suffield area. Mainly west of the South Saskatchewan River. The problem here is not so much cattle grazing or cultivation, but use for military activities.

v. Neutral Hills. This is a fescue grassland, with management becoming more intensive.

All of these remaining areas of grassland are primarily crown owned. Of these grassland areas, less than 100 km^2 are "proposed" for protection under Natural Areas or Ecological Reserve programs, however, only a portion of this is potential Baird's Sparrow habitat.

MANAGEMENT RECOMMENDATIONS

The present level of protection is totally inadequate. Remaining Baird's Sparrow habitat would have more potential if grazing management was different. This would involve a change of stocking rates for cattle in key areas and the total exclusion of grazing in some areas for some years. Key areas must be protected from cultivation.

Crown land sales are currently ongoing within the range of the Baird's Sparrow. This invariably results in more cultivation. Unfortunately, it is a sad fact of the Baird's Sparrow's life that modern range techniques are just not compatible with this species' requirements. Effective management would require Fish and Wildlife working together with the Lands Division and Special Areas Branch of the Alberta government.

RESEARCH REQUIREMENTS

What is urgently needed right now is a status report and population estimate for Alberta. The range that is left could be easily pinpointed and inventoried. Primary habitats would have to be inventoried. Dry slough and lake bottoms, and exotic fields within the range would have to be checked for use.

CONCLUSION

Baird's Sparrow is in trouble. Their habitat is rapidly disappearing and it is not unforeseeable that this species could disappear from Alberta in 50 years.

ACKNOWLEDGMENTS

Thanks go to C.R. Wershler and C.A. Wallis for their constructive comments on the manuscript.

BAIRD'S SPARROW SURVEY IN MANITOBA

Brian Ratcliff

During the past century, a dramatic transformation has taken place on the prairies. Expansion of the agricultural industry has virtually eliminated short grass, mixed grass and long grass prairie habitat. There has been a concomitant decline in most wildlife species numbers that are dependent on this native grass habitat.

A survey was conducted during the summer of 1985 to locate Baird's Sparrows (*Ammodramus bairdii*) in southern Manitoba. The Baird's Sparrow has been officially classified as an endangered species in Manitoba. Fifteen volunteers from the Manitoba Naturalists and the Brandon Naturalists clubs helped to survey for this sparrow using tape recordings of Baird's Sparrow vocalization. Birds were first recorded on 18 May, and were noted singing until 23 July. Monthly counts of individuals were: May-66, June-60, July-56, for a total of 182 singing males. Four females were also located which were identified by observing copulation. Some areas where no males were located in May produced birds holding territories in June and July. These birds may have been late arrivals to the breeding area or they did not respond to the initial playing of the tape. Also it should be noted that the strong winds that persisted in late May and early June made surveying difficult.

Most of my efforts were concentrated in the southwest part of the province as I have observed Baird's Sparrows in this area for the past three years. In 1985, a total of 67 males were recorded near Lyleton. William J. Walley from Dauphin found three males southwest of Birtle on 20 May but on a return visit 2 July, he noted 21 singing males. On both dates he was conducting a breeding bird survey and travelled the same route. Calvin Cuthbert with Ducks Unlimited, Brandon, encountered approximately 50 males between 25 May and 23 July thoughout southwestern Manitoba. Six observers from Winnipeg checked the area north and west of the city but only 2 birds were located at Shoal Lakes.

The habitat these sparrows were utilizing was mainly overgrown pastures or grazed pastures with low-lying areas. Pastures that had a grass growth of 10 cm or more plus a low-lying area that had dead grass from previous years growth seemed to be preferred. These low areas were once sloughs but are now semi-dry because of the low precipitation in recent years. Birds were also noted singing from wheat fields and alfalfa fields.

This was a one-year survey but plans are being made for some follow-up work. Dr. Spencer Sealy at the University of Manitoba, has shown interest in this project and was impressed with the number of birds located. He is now looking for a graduate student to continue this work. The Manitoba Dept. of Natural Resouces Wildlife Branch and the World Wildlife Fund have indicated that they would both seriously consider funding a project.

It appears that a remnant population is still holding on in the western part of the province. A major study looking at the habitat requirements of this sparrow is needed now. Once this has been conducted, recommendations can be made to the Habitat Heritage Program and the Ecological Reserves Program regarding the habitat that needs to be protected.

I would like to thank the fifteen volunteers who made time to look for this sparrow and thanks also to the World Wildlife Fund, the Manitoba Department of Natural Resources Wildlife Branch and the James L. Baillie Memorial Fund for their financial assistance.

BAIRD'S SPARROW

Cleve Wershler

SUMMARY OF GENERAL DISCUSSION

The Baird's Sparrow (*Ammodramus bairdii*) has always been a little known species. Following its discovery in 1844 there was a period of thirty years of no observations. In the 1880s it was already becoming rare in North Dakota because of widespread agricultural development. In 1962 its restriction to natural grassland vegetation was noted in North Dakota.

There were different perceptions in different provinces as to the status of the Baird's Sparrow and its habitat preferences. In Alberta the major habitat is ungrazed or lightly grazed native grassland, especially fescue grassland. The status in Alberta was recommended as "threatened". In Saskatchewan, cultivated fields are mostly used, especially winter wheat with continuous cropping practices and no tilling. The status recommended for Saskatchewan was "rare". In Manitoba, disturbed natural vegetation and overgrown non-native vegetation are used. Because of the widespread habitat destruction, the few remaining breeding areas are in ravines or slough bottoms with denser, tussocky vegetation, and in fields that have been allowed to grow up. The Manitoba status for this species is "endangered".

Lush grasslands are very rare in the grassland region of the prairie provinces. The Baird's Sparrow seems to be one of the species most affected by current management practices in the remaining areas of native grassland. The importance of maintaining lush grassland habitats cannot be overemphasized. It was cautioned that care should be taken in assessing the Saskatchewan situation. Even though the Baird's Sparrow appears to be doing better there in cultivated fields, it should be noted that these habitats are more exposed to pesticides and herbicides and are very vulnerable to changes in management practices.

The Baird's Sparrow is an endemic species of grasslands on the Great Plains with a narrow range of habitat specificity. As such, it should be given research priority to determine its status.

RECOMMENDATIONS

1. An assessment of Baird's Sparrow use of non-native habitats needs to be made. This should include a comparison of nesting success and density between native and non-native sites. It must be determined if this use of non-native habitat is a long-term trend or a short-term adaptation to factors such as drought conditions.

2. An assessment in all regions of the effects of grazing on Baird's Sparrow populations is needed and comparisons made to previous research.

3. Sufficiently large areas of ungrazed or lightly grazed native grasslands need to be protected in all regions (see recommendations under Mountain Plover (*Charadrius montanus*) regarding grazing strategies).

4. Preparation of status reports on this species has been recommended for all provinces.

SMALL MAMMALS

Jack Dubois

Small mammals are defined as species weighing on average less than five kilograms. World-wide these small species make up 90% of the 3,900+ or so named species of mammals (Bouliere 1975). In the prairie provinces 77% of the 100 or so mammal species fit in this category. They include 46 rodents, 7 shrews, 1 mole, 9 bats, 1 pika, 5 rabbits, and 8 smaller members of the weasel family. Weights range from 3 g for the Pygmy Shrew (*Sorex hoyi*) to 5 kg for the Arctic Hare (*Lepus arcticus*) and Fisher (*Martes pennanti*). As a group, small mammals represent the most numerous and widespread mammals in the world.

The small mammals found in Alberta, Saskatchewan, and Manitoba (Table 1), can be roughly assigned to seven groups by habitat preferences. These are tundra, boreal, montane, grassland, cold (Great Basin) desert, eastern deciduous, and widespread (i.e., those found in two or more biomes). It is apparent that species of concern fall into two categories: furbearers [Muskrat (*Ondatra zibethicus*), Marten (*Martes americana*), Fisher], whose populations are affected by trapping; and grassland species [Plains Pocket Gopher (*Geomys bursarius*), Black-tailed Prairie Dog (*Cynomys ludovicianus*), Black-footed Ferret (*Mustela nigripes*), Long-tailed Weasel (*Mustela frenata*)], whose populations are affected by direct human action such as shooting, poisoning, or trapping, and indirectly through habitat loss. Those species that live in any biome other than grasslands or across several, or whose pelt is not valuable, are not in danger.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has identified as threatened the following small mammals: Black-tailed Prairie Dog; Fox Squirrel (*Sciurus niger*); Plains Pocket Gopher; Black-footed Ferret; and the Long-tailed Weasel (Cook and Muir 1984).

As with many species designated as rare, the Black-tailed Prairie Dog occurs in low numbers on a restricted range in Canada (Kerwin 1972, Millson 1976), but is common in the United States on the main part of its range. This species now receives some protection by the Saskatchewan Natural History Society and the Federal Government on lands set aside for a proposed Grasslands National Park. However, that park will not be proclaimed for quite some time and in the meanwhile the status of the Black-tailed Prairie Dog is uncertain.

The Fox Squirrel is listed by COSEWIC as "not in any category", i.e., there was not enough information to include it in a formal category. In 1972, the first naturally-occurring specimen in Canada was reported from Manitoba (Wrigley et al. 1973) and within one decade the species has spread throughout much of the southern part of the province. The species first appeared in Saskatchewan in 1978 or 1979 (Adam 1984). An increasing number of specimens are being brought in and sightings are being reported to the museums in both provinces. I would recommend that COSEWIC remove the Fox Squirrel from consideration.

The Plains Pocket Gopher is of similar status to the prairie dog. It is widely distributed in the United States. Its restricted range in Canada has remained virtually static since 1973 (Wrigley and Dubois 1973). Although unprotected by law or physical sanctuary on its Canadian range, the Plains Pocket Gopher seems to be holding its own. It is extremely vulnerable however, and could be wiped out in short order by concerted persecution. It should remain on the list as rare.

The Long-tailed Weasel is threatened, that is, in the Committee's definition, "likely to become endangered in Canada if the factors affecting its vulnerability do not become reversed" (Cook and Muir 1984). The concern for this species is related directly to the rapid disappearance of wetlands, bluffs, and hedges, as more land is put into agricultural production on the prairies. This carnivore is running out of habitat.

At present, the Manitoba Wildlife Branch is actively collecting Long-tailed Weasel carcasses from trappers. When they have a large sample, the harvest situation will be clearer. Long-tailed Weasels are regulated under provincial trapping seasons but are difficult to monitor as their pelts are not differentiated in fur royalties reports from those of the Ermine (*Mustela erminea*).

The status of most species of bats in Canada is unknown. Their impact on the standing crop of insects is largely unquantified. The effect of human disturbance of roosts and hibernacula, and of pesticide residues in their prey have not been examined in Canada. More work is required on their life histories and population levels on the prairies.

Of the other small mammals of the prairie provinces, there are none that are potentially endangered. Some, like the Pygmy Shrew, Northern Bog Lemming (*Synaptomys cooperi*), and Prairie Vole (*Microtus ochrogaster*), though widely distributed, have always been uncommon. In general the rapid loss and degradation of grassland habitat would seem to point to continuing decreases in population and species diversity of the small mammals that live there. Unfortunately, baseline data is lacking on pristine faunas. Some monitoring of small mammals at a few locales has gone on in Manitoba since the early 1970's, which if continued may be of great value in predicting future trends.

For the small mammals of Alberta, Saskatchewan, and Manitoba I recommend the following:

1. that they be given sanctuary both in law (specified in wildlife acts), and "on the ground" in whatever form of habitat preservation is politically possible (parks, ecological reserves, wildlife management areas, etc.).

2. that farmers in agro-Canada be given economic incentives to leave marginal lands unbroken, undrained, and ungrazed. The biggest current disincentive to this in western Canada is the Canadian Wheat Board quota system. Differential taxes on "unused" land would be another incentive, possibly based on ecological land-classification schemes (Standing Comm. on Agric., Fisheries and Forestry 1984 p. 22).

3. increased funding from both private and public sectors for research into certain effective methods for population monitoring of (at least) critically endangered species.

4. greater research effort into and publicity of alternatives to the present practice of herbicide use on right-of-ways, hydro lines, road allowances, etc. Programs such as "Ribbons of Habitat" in Manitoba (brochure, Dept. Nat. Res. 1985) and its Saskatchewan equivalent, the "Road Allowance Preservation Program" (Lorne Scott, Sask. Nat. Hist. Soc. pers. comm.) deserve stronger provincial support where they exist and emulation where they do not. These marginal tracts of land add up to millions of hectares across the prairies and we can restore a rich species diversity of plants and animals to them by better ecological management, similar to the "Integrated Pest Management" approach being advocated for pesticide use (Anon 1985).

Table 1.--Small Mammals of the Canadian Prairie Provinces

SPECIES	DISTRIBUTION[a]	BIOME[b]
Masked Shrew	ASM	W
Prairie Shrew	ASM	W
Dusky Shrew	ASM	W
Water Shrew	ASM	W
Arctic Shrew	ASM	W
Pygmy Shrew	ASM	W
Northern Short-tailed Shrew	SM	E
Star-nosed Mole	M	E
Little Brown Myotis	ASM	W
Long-eared Myotis	AS	M
Long-legged Myotis	A	M
Northern Long-eared Bat	ASM	W
Western Small-footed Myotis	AS	C
Silver-haired Bat	ASM	W
Big Brown Bat	ASM	W
Red Bat	SM	W
Hoary Bat	ASM	W
Pika	A	M
Eastern Cottontail	SM	E
Nyttall's Cottontail	AS	C
Snowshoe Hare	ASM	B
Arctic Hare	M	T
White-tailed Jackrabbit	ASM	G
Eastern Chipmunk	M	E
Least Chipmunk	ASM	W
Yellow Pine Chipmunk	A	M
Red-tailed Chipmunk	A	M
Woodchuck	ASM	W
Yellow-bellied Marmot	A	M
Hoary Marmot	A	M
Richardson's Ground Squirrel	ASM	G
Columbian Ground Squirrel	A	M
Arctic Ground Squirrel	M	T
Thirteen-lined Ground Squirrel	ASM	G
Franklin's Ground Squirrel	ASM	G
Golden-mantled Ground Squirrel	A	M

Table 1.--cont'd

Black-tailed Prairie Dog	S	G
Gray Squirrel	SM	E
Fox Squirrel	SM	E
Red Squirrel	ASM	W
Northern Flying Squirrel	ASM	W
Northern Pocket Gopher	ASM	G
Plains Pocket Gopher	M	G
Olive-backed Pocket Mouse	ASM	C
Ord's Kangaroo Rat	AS	C
Western Harvest Mouse	AS	G
Deer Mouse	ASM	W
White-footed Mouse	S	W
Northern Grasshopper Mouse	ASM	C
Bushy-tailed Woodrat	AS	C/M
Northern Red-backed Vole	M	T
Southern Red-backed Vole	ASM	B
Heather Vole	ASM	B
Meadow Vole	ASM	W
Long-tailed Vole	AS	M
Yellow-cheeked Vole	ASM	T
Prairie Vole	ASM	G
Water Vole	A	M
Sagebrush Vole	AS	C
Muskrat	ASM	W
Brown Lemming	A	T
Southern Bog Lemming	M	E
Northern Bog Lemming	ASM	B
Collared Lemming	M	T
Norway Rat	ASM	W
House Mouse	ASM	W
Meadow Jumping Mouse	ASM	W
Western Jumping Mouse	ASM	G
Woodland Jumping Mouse	M	E
Marten	ASM	W

Table 1.--cont'd

Fisher	ASM	B
Ermine	ASM	W
Least Weasel	ASM	W
Long-tailed Weasel	ASM	G
Black-footed Ferret	AS	G
Mink	ASM	W
Striped Skunk	ASM	W

[a]DISTRIBUTION:	A	Alberta	[b]BIOME:	G	Grasslands
	S	Saskatchewan		C	Cold Desert
	M	Manitoba		W	Widespread
				E	Eastern Deciduous
				M	Montane
				B	Boreal
				T	Tundra

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SWIFT FOX REINTRODUCTION PROJECT

Jo-Anne Reynolds

The mammalian fauna of the Canadian prairie has changed dramatically over the last one hundred years. Large herds of Bison (*Bison bison*) once roamed the expanses of grassland, along with the Plains Grizzly (*Ursus arctos*), Prairie Wolf (*Canis lupus*), Black-footed Ferret (*Mustela nigripes*), and Swift Fox (*Vulpes velox*). The large mammals of the prairie, particularly the predators, were perceived as a threat by settlers across the prairie, and were relentlessly persecuted. Swift Foxes, because of their small size, were not a threat, and were seldom directly eliminated by settlers. However, they were killed by poisons and traps set for larger animals, and were susceptible to the ecological changes brought about by cultivation and the disappearance of endemic prairie wildlife. Swift Fox numbers declined through the late 1800s and early 1900s, and by the late 1930s, they had disappeared from much of their original range, including Canada and the northern United States. COSEWIC has designated the Swift Fox as an extirpated species in Canada. This means it is no longer found in Canada, but still occurs in other parts of its range. In parts of the central and southern United States it appears to be doing quite well, and is expanding back into parts of its former range.

In 1973, an experiment began at the Wildlife Reserve of Western Canada, near Cochrane, Alberta. Miles Smeeton and his late wife, Beryl, who were enthusiastic conservationists, imported two pairs of Swift Fox from Colorado. They built pens for them and began breeding them, in the hope of some day having enough to be able to release to the wild. Their idea was a good one, and soon aroused interest. In 1977, the University of Calgary became involved through Dr. Stephen Herrero, and in 1978, the Canadian Wildlife Service joined the program. Since then, the project has expanded to include several agencies, organizations, and individuals, including: the provincial governments of Alberta and Saskatchewan; the University of Manitoba; the World Wildlife Fund (Canada); the Alberta Recreation, Parks, and Wildlife Foundation; the Calgary Zoo; and the Moose Jaw Wild Animal Park.

To date, two experimental releases of Swift Fox have been undertaken. The first was in southeastern Alberta in 1983, and the second was in southwestern Saskatchewan in 1984. A supplemental release has since taken place at the Alberta site, and another is scheduled for Saskatchewan in 1986.

The releases are performed in a "soft" manner. Foxes are taken to the release site early in the winter and placed in pairs in holding pens. They are maintained in the pens throughout the winter, and with luck, produce a litter of pups in the spring. The family groups are released in mid to late summer, through tunnels under the fence. Feeding of the foxes continues for a time after the release. This helps to ease the transition of the foxes into the wild, and encourages them to remain in the release area.

The foxes are radio-collared prior to release and monitored after release with aerial and ground-based radio-telemetry to observe their progress in the wild. The results of these studies, which are carried out by the University of Calgary, are being used to evaluate the success of the releases and to help plan future activities.

What has been learned so far?

1. The soft release method is an effective release strategy. Three of the six pairs of foxes released in Alberta in 1983 remained in the release area to breed and raise pups the following year (Scott-Brown and Herrero 1985). This number may have been higher, but one member of each of two other pairs was killed by predators before the next breeding season. One original pair of foxes has remained together in the release area, and continues to use the den in their release pen. Not all the foxes remained in the release area, some disappeared immediately after release.

2. The released foxes, most of which were born in captivity, have shown themselves to be quite capable of learning to hunt and to dig or remodel dens for themselves.

3. Public interest in the support of the project has been tremendous. In particular, the people who live in the two release areas have been very enthusiastic, understanding, and supportive of the project. The success achieved in the project so far would not have been possible without their support. Other than one accidental road-kill, there have been no human-related problems with either release.

4. The most serious problem encountered so far is that of predation, primarily by Coyotes (*Canis latrans*). The known mortality of the original foxes released in Alberta is 56% (Scott-Brown and Herrero 1985). However, some of these foxes have established systems of dens and have managed very well. More information is needed on how Swift Foxes and Coyotes interact and co-exist.

5. Another area of difficulty has been in radio-telemetry. The small size of the Swift Fox limits the type and size of transmitter and battery pack that can be put on. As well, Swift Foxes spend much of their time underground, which causes severe attenuation of the transmitted radio signal. This makes ground-based radio-telemetry very difficult if the whereabouts of the foxes are unknown. Future work on the project will concentrate on overcoming the predation problem and studying other factors that influence the establishment of Swift Foxes in an area. A study of the food habits of the released foxes is currently underway. New methods of monitoring the foxes may be tested, as well as other release strategies (Scott-Brown and Herrero 1985). The future of the Swift Fox in the wild in Canada is not yet assured, but those involved in the project are still optimistic about the chances for success.

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THE REESTABLISHMENT OF THE BLACK-FOOTED FERRET

TO THE CANADIAN PRAIRIE

Richard Laing

HISTORIC RANGE

Historically, Black-footed Ferrets (*Mustela nigripes*) ranged from Saskatchewan to Texas (Fig. 1). In the United States, the area occupied by ferrets closely corresponded with the range of prairie dogs (*Cynomys* spp.), whose numbers were estimated in the billions during the late 1800s. The decline of the Black-footed Ferret in the United States was probably a result of prairie dog eradication programs. Between 1924 and 1935, 15 Black-footed Ferrets were collected in southern Saskatchewan (Fig. 2). The last Black-footed Ferret collected in Canada was acquired in 1937 near Climax, Saskatchewan. Only one Black-footed Ferret has been collected in Canada outside of southern Saskatchewan, this specimen was taken in 1901 near Gleichen, Alberta.

CURRENT STATUS

At present, only one wild population of Black-footed Ferrets is known to exist. This population inhabits several White-tailed Prairie Dog (*Cynomys leucurus*) colonies in northwest Wyoming, near the town of Meeteetse. The Meeteetse population, censused since 1984, rises sharply each May, coincident with the appearance of young of the year. In 1984, 130 ferrets were recorded in a fall count (Forrest et al. 1985). However, winter mortality or emigration reduced the population to previous spring levels of 40-60 individuals.

In June of 1985, a sylvatic plague outbreak occurred, reducing prairie dog populations in some colonies (D. Belitsky pers. comm.) Since prairie dogs are the primary prey of Black-footed Ferrets, some effect on population sizes is expected. During the fall of 1985, six Black-footed Ferrets were trapped and moved to Laramie, Wyoming, for captive breeding purposes (D. Belitsky pers. comm.). These animals soon became ill and died. The cause of death was diagnosed as canine distemper. Another six ferrets have been trapped and moved to Laramie, Wyoming. While all six of the first group of ferrets died, the second group is healthy, and will form the basis of the captive breeding program. As a consequence, the Meeteetse Black-footed Ferret population is now believed to be significantly smaller than it has been in the past three years. Additional ferrets will be trapped and added to the captive population, as the wild population allows (D. Belitsky pers. comm.).

LIMITING FACTORS

There are two important factors limiting the recovery of the Black-footed Ferret. First, large continuous areas or complexes of prairie dog colonies are required to support large populations of ferrets. Black-footed Ferrets depend upon prairie dogs for food and utilize prairie dog burrows for shelter and escape from

Figure 1. Historical distribution of the Black-footed Ferret (from Henderson et al. 1969).

predators. Secondly, at present, there are not enough animals in the wild to allow direct translocations to other suitable sites. Until other wild populations are found, the recovery of the species will depend upon the success of captive breeding programs.

Field studies indicate that solitary Black-footed Ferrets require 12-15 ha of prairie dog colonies; females with litters require 40-60 ha (Forrest et al. 1985). While biologists debate what population size is necessary to be self-sustaining, the present Wyoming ferret population provides a rough estimate. In Meeteetse, 40-60 ferrets have been supported on 2500-3000 ha of prairie dog colonies, probably for at least 50 years (Clark and Groves unpublished data). Either large continuous colonies or small, closely associated colonies are acceptable, if intercolony movement by ferrets is possible.

CONSERVATION EFFORTS

Since the rediscovery of Black-footed Ferrets in Wyoming, conservation efforts have been extensive. Research at the Meeteetse site has greatly increased our understanding of the species biology and ecology. Plans have been developed to construct a breeding facility specific for Black-footed Ferrets. Several states have begun search programs for Black-footed Ferrets, and have also started assessing areas for their potential as reestablishment sites. An area in Saskatchewan has also been evaluated for a possible Black-footed Ferret reestablishment.

SEARCH FOR BLACK-FOOTED FERRETS

The importance of finding another Black-footed Ferret population cannot be overstated. Intensive field searches are required to determine if the species still exists in Canada. Millson (1976) conducted field searches for Black-footed Ferrets in prairie dog colonies in southern Saskatchewan. The writer researched these sites in 1985. No evidence of the species was found by either researcher; however, search efforts were inadequate to conclude that Black-footed Ferrets no longer inhabit the site. Searches should continue and concentrate on and near prairie dog colonies in Saskatchewan. Possible Black-footed Ferret sightings continue to occur and should be investigated. A winter and summer field survey is recommended. Public assistance in the search for the species is desirable, and a lead role by a government or private agency is necessary to coordinate sightings.

REESTABLISHMENT IN CANADA

Millson in 1976 and the author in 1985, evaluated an area in Saskatchewan for potential Black-footed Ferret reestablishment. This is the only area in Canada occupied by Black-tailed Prairie Dogs (*Cynomys ludovicianus*). A large portion of the Black-tailed Prairie Dog occupied area has been proposed as Grasslands National Park. However, before this site can be considered for a Black-footed Ferret introduction, the total area of prairie dog towns will have to increase approximately four fold. To achieve this increase, habitat enhancement programs are recommended including; range improvement by seeding, burning, and

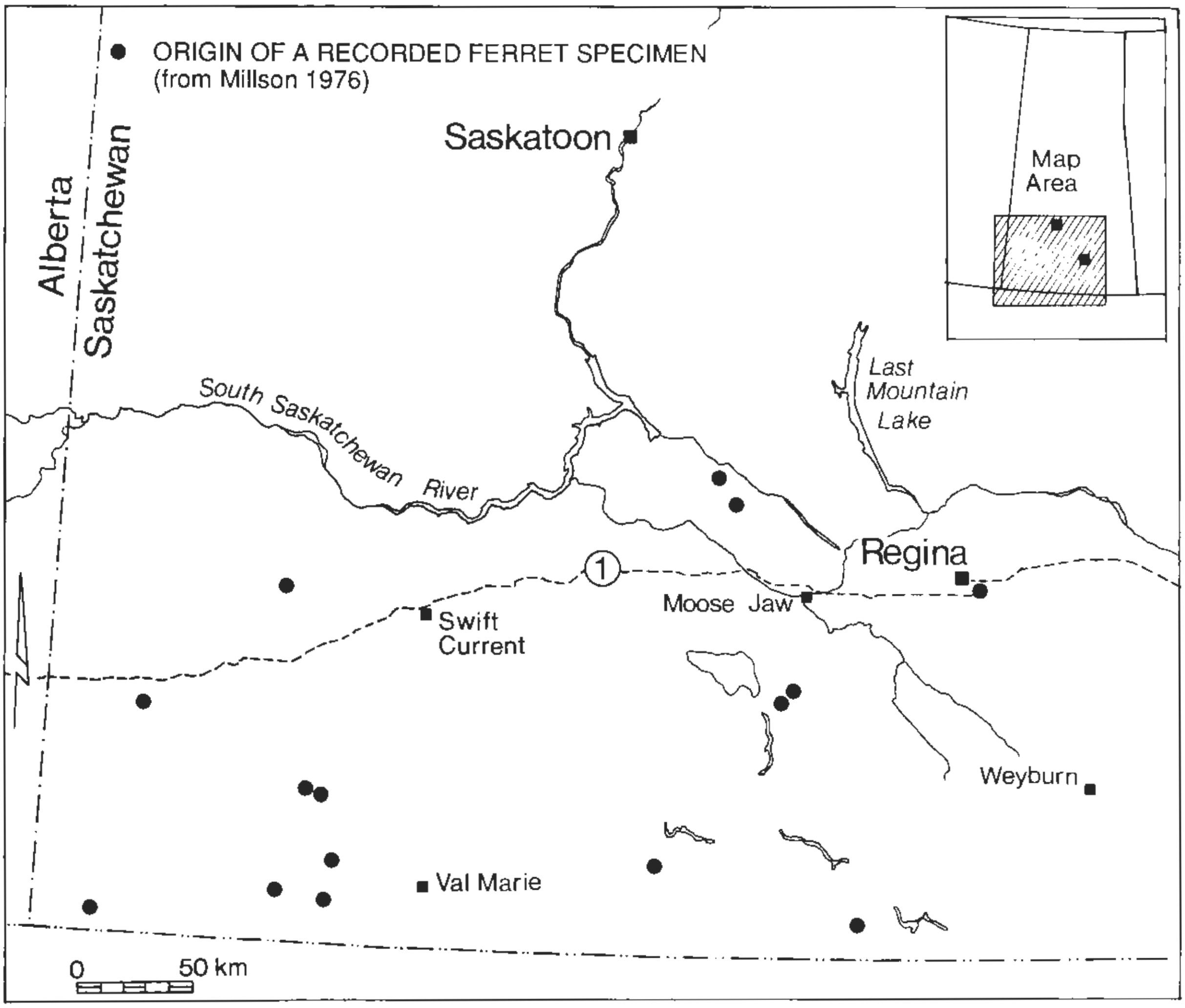

Figure 2. Distribution of collecting sites of Black-footed Ferrets in Saskatchwan from 1924-1935.

grazing or mowing of tall vegetation. Experimentation with moving prairie dogs from nearby Prairie Farm Rehabilitation Act pastures to the park is also recommended.

FUNDING

The recovery of the Black-footed Ferret will be an expensive project. The financial support of Canadians will be an important part of the recovery of the Black-footed Ferret. Funding is initially required to conduct an eight month field survey in the prairie provinces. Support should also be considered for the construction, maintenance, and operation of the proposed Black-footed Ferret captive breeding facility near Laramie, Wyoming. This facility would not only be designed to encourage breeding, but would include prairie dogs which would be used to train ferrets to capture their own prey, prior to release into the wild. Canadian financial support for the captive breeding centre would help ensure the construction of this facility, and would demonstrate a strong interest in the recovery of the Black-footed Ferret. Funding is also required to prepare the Saskatchewan site for future reestablishment of the species.

RECOVERY TEAM

During the 1970s, a team prepared a set of guidelines for the recovery of the Black-footed Ferret. Their stated objective was to reestablish populations of Black-footed Ferrets in every U.S. state historically occupied by ferrets. The recovery team will likely be reformed, and a new set of guidelines established. It would be desirable to have a Canadian representative on the team. Such a representative could convey a Canadian interest in the recovery of the ferret, and provide the team with ideas and information gathered from experience with reestablishment programs in Canada, such as used for the Swift Fox (*Vulpes velox*).

SUMMARY

The reestablishment of the Black-footed Ferret to the Canadian prairie will only occur if an active long-term commitment to this end is realized. Canadians can assist by providing financial assistance for captive breeding, and for the preparation of the proposed Grasslands National Park as a reestablishment site. Since long-term habitat protection can be assured in a National Park, this site may someday become an integral part of the recovery of the Black-footed Ferret.

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CURRENT STATUS AND PROPOSED MANAGEMENT PLANS FOR WOODLAND CARIBOU IN ALBERTA

E. Jan Edmonds

CURRENT STATUS AND CONFLICTS

Woodland Caribou (*Rangifer tarandus caribou*) numbers and distribution in Alberta have severely declined since the early decades of this century. Prior to the 1930s, caribou were distributed throughout the mixed coniferous and boreal forest zones and in mountainous regions north of Banff National Park (Fig. 1). As recently as the mid-1960's, there were an estimated 6000 to 8000 caribou (Stelfox 1966) in the northwest and north central portions of the province but today less than 2000 remain throughout the province, and their distribution is patchy and discontinous (Fig. 1).

There are four major management problems that require special consideration and resolution. They are: the alteration and destruction of caribou habitat, the increased access to caribou ranges resulting from industrial roads, the continued loss of caribou to hunting despite closed seasons, and the high levels of wolf predation causing continued decline of caribou herds in west central Alberta.

The use of caribou habitat for alternative purposes can result in destruction or alteration of important habitat such as winter range or calving areas. Along the southern distribution of caribou range, extensive timber harvest programs have already removed and continue to remove large areas of mature coniferous forest, the primary habitat of Woodland Caribou. Expansion of coal extraction north of Grande Cache would remove important winter range and possibly disrupt seasonal movements of montane caribou populations. Oil and gas exploration has less effect on habitat but the increased access associated with this and other industrial activity can cause disturbance on important ranges, disrupt seasonal movements and increase mortality from poaching.

Recreational hunting of caribou was closed in 1981, however losses to illegal hunting or mistaken identity (caribou confused for elk, deer, or moose) continue. For some herds, like the caribou that winter around Grande Cache, these losses are a significant adjunct to already high natural mortality. There is no indication that harvest of caribou by Natives is high, but levels are unknown.

Two detailed studies of Woodland Caribou (Fuller and Keith 1981, Edmonds and Bloomfield 1984) that have been conducted since 1976, show that predation, mainly by wolves, is the major factor limiting the growth of populations at both Grande Cache and Ft. McMurray.

PROPOSED MANAGEMENT PLANS (currently under review)

Public Awareness and Education

Pamphlets, posters, road signs, and slide shows will be produced to provide the public, industry, and other government agencies with

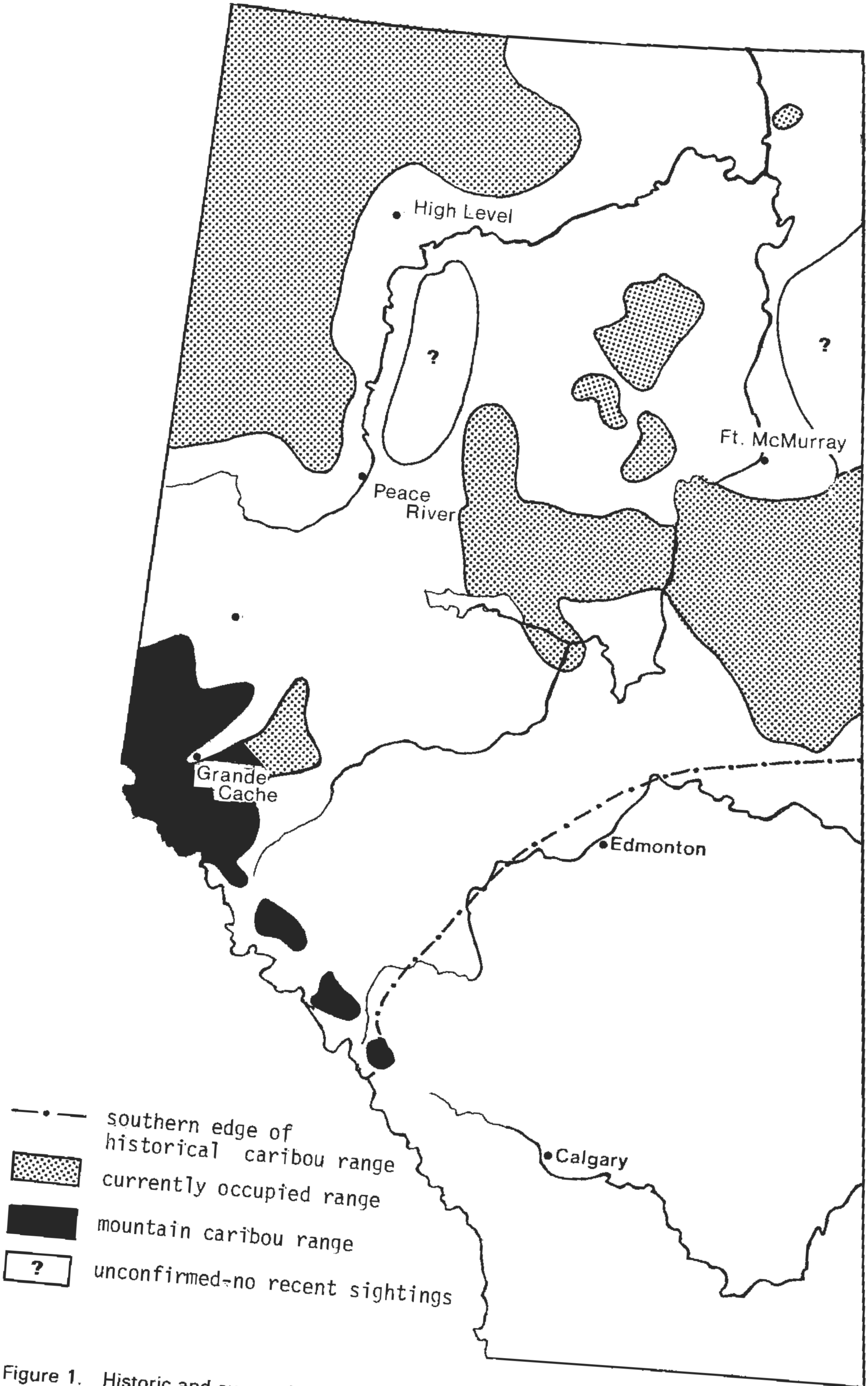

Figure 1. Historic and current Woodland Caribou range in Alberta.

information on the threatened status of the caribou. Particular emphasis will be directed at hunters to increase their awareness of continued losses of caribou during the hunting season.

Inventory

Determining the distribution and numbers of Woodland Caribou is a costly and often inaccurate process but is a high priority. Capture/radio-collaring programs have been used successfully to date and are the only means of collecting reliable data. The caribou postcard sighting program has been initiated in some areas of the province in order to obtain preliminary data on distribution. Following this program, capture/radio-collaring program can be implemented.

Guidelines for Industrial and Recreational Development

Timing, location, and duration of activity in caribou habitat will be developed in consultation with industry, other government departments, and public interest groups. Protection and maintenance of caribou habitat and restriction of access are the main concerns of these guidelines. Guidelines for timber harvest on caribou range have been developed.

Mortality Factors

The problem of human-caused mortality of caribou will be addressed through the public information program. Forthcoming legislation will provide stiffer fines for infractions against threatened and endangered wildlife.

A wolf reduction program has been proposed to aid in the recovery of the Woodland Caribou herds that reside in the Grande Cache area. These herds have severely declined since the mid-1960s and reducing the intensity of predation is an essential component of managing these herds.

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STATUS OF WOODLAND CARIBOU IN SASKATCHEWAN, 1985

A PRELIMINARY ASSESSMENT

Tim W.P. Trottier

Some biologists, hunters, and wildlife appreciators are concerned that the Woodland Caribou (*Rangifer tarandus caribou*) population in Saskatchewan is declining to the point of extinction.

The northern half of Saskatchewan has traditionally been given over to resource exploration. A number of mining, logging, and wild rice operations now exist, with more proposed. These operations may be impacting Woodland Caribou populations through loss of habitat, increased road access, hunting, and disturbance.

Last winter I drafted a proposal to document caribou distribution across the province in order to examine the relationship between caribou and hunting and logging as well as to develop an aerial survey technique that will provide a reliable estimate of density. We are still in the early stages of this study, but I can report here on historical information from nearly two hundred interviews with resource users across the province.

FORMER DISTRIBUTION AND STATUS

Interview data, a study by Ruttan (1960), and a report by Kelsall (1984) contributed to the following preliminary assessment of past caribou distribution. Woodland Caribou occupied roughly 60% of Saskatchewan avoiding only the aspen parkland and grasslands in the south, and the open lichen woodland farther north (Fig. 1). Informants suggest that caribou were most numerous in Rowe's (1972) southern boreal ecoregion (Fig. 2). Large areas of poor drainage, dominated by Tamarack (*Larix laricina*) and Black Spruce (*Picea mariana*) muskeg, are common in this region. The Precambrian Shield farther north might have harbored more caribou than reported as that region was largely unexplored until recent times. Groups of 15 to 25 caribou were said to be common in the 1920s and 1930s. Reports of from 250 to 500 Woodland Caribou along the Churchill River suggest possible confusion with Barren-ground Caribou (*Rangifer tarandus groenlandicus*) (Fig. 1). Bob Ruttan (1960) completed a preliminary study of the species in the winter of 1960 (Fig. 1). His contribution included an accurate ground count, an estimate of density, and information on winter movements and feeding behavior. Ruttan distinguished 17 groups of caribou with an average group size of 5.4 in a study area that was mostly treed muskeg. He observed 92 caribou over 676 km^2 for a density of .14 caribou/km^2 (.35/mi^2). He also believed that caribou were more numerous south of the Churchill River. With respect to mortality, Ruttan deduced that as they were easily hunted and their meat was preferred over Moose (*Alces alces*), caribou suffered heavy losses where there was good access to the herds (i.e., Indian Reserves). Ruttan further attributed an apparently increasing Woodland Caribou population to low predation and a hunting prohibition.

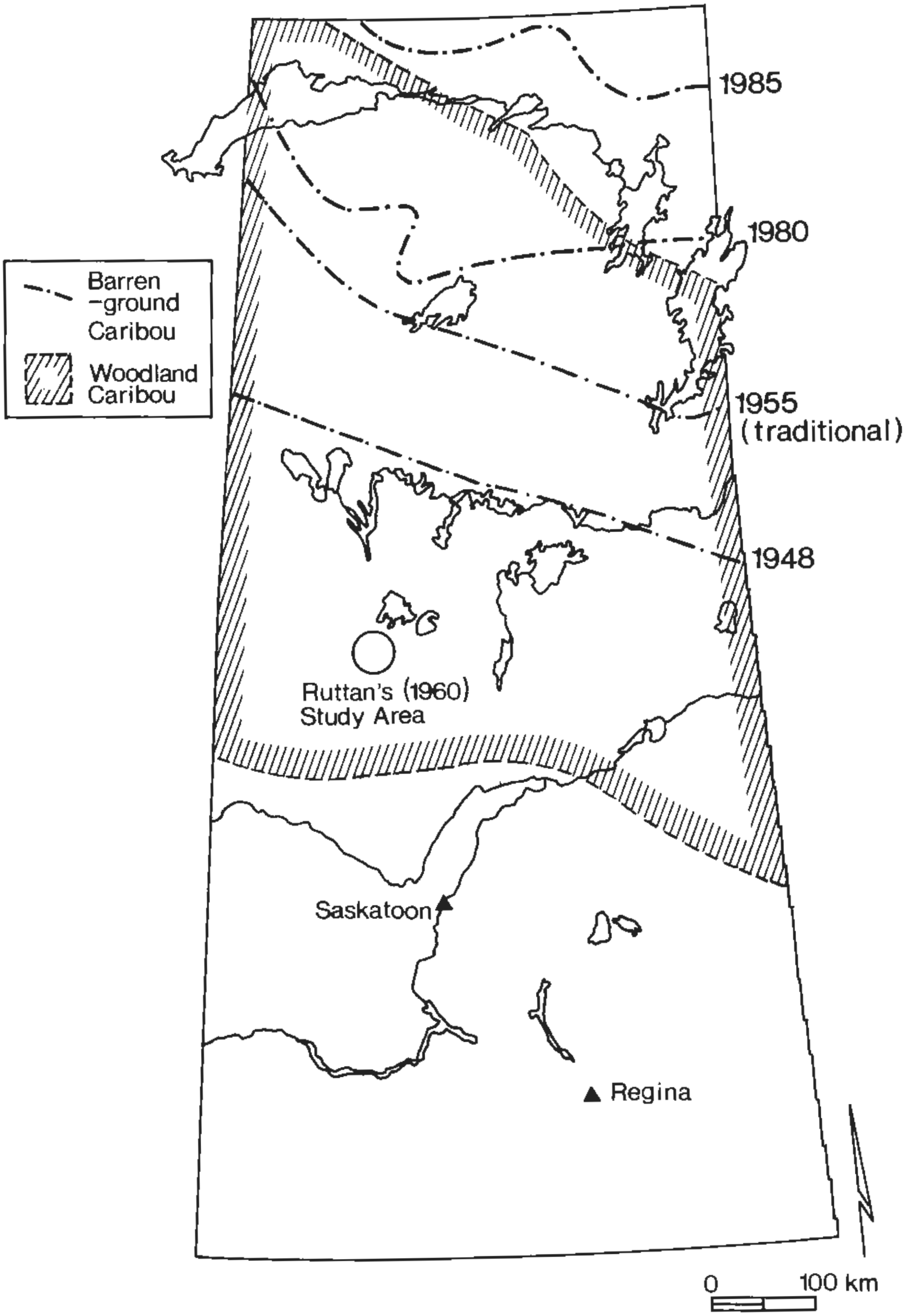

Figure 1. Historical distribution of the Barren-ground and Woodland Caribou in Saskatchewan.

Concern over the species' status resulted in closed seasons during the 1950s, but a season was reopened in 1964. An open season was made province-wide in 1968, with the exception of the far northern zone, where confusion between Woodland and Barren-ground Caribou could result. Barren-ground Caribou could be hunted only by residents of that zone.

CURRENT DISTRIBUTION AND STATUS

Current distribution of Woodland Caribou is based on incidental observations during aerial surveys, interviews, and reports from hunters and trappers (Fig. 3). The northern range limit appears to have receded to a line south of Lake Athabasca and west of Wollaston Lake. Both areas have been extensively burned-over in recent years. The southern range limits have also receded, coincident with the northward expansion of agriculture and logging. Informants commonly reported that entire bands of caribou had been hunted out of some areas along the forest fringe. Observers indicate that caribou are also much less common in the adjacent boreal forest. Biologists report fewer sightings during aerial surveys and sport-hunters are less successful each year (Table 1).

Table 1.--Woodland Caribou Sport Harvest and Hunter Success 1980 to 1984

	1980	1981	1982	1983	1984	Total	Average
Harvest	60	54	35	27	23	199	40
Hunter Success	28%	42%	28%	13%	15%		

Hunting seasons have changed little since 1968. There is a two week season (November) in the southern half of the range and two seasons in the northern half. Caribou of either sex may be hunted. The annual sport harvest is not only low, it has declined by 50% over the past five years.

Unregulated hunting has been reportedly low (19 caribou over the past two years). There are, however, many gaps in the reporting system. Reports of entire bands being hunted out of an area lead me to speculate that unregulated hunting has an appreciable impact on local herds. Caribou are seldom seen at traditional road crossings and have disappeared from some favoured hunting areas.

Runge (pers. comm.) listed six possible causes for caribou decline over the past 20 years'.

1. Use of the snowmobile has accelerated hunter access to remote caribou habitat and created hunting trails for predators.

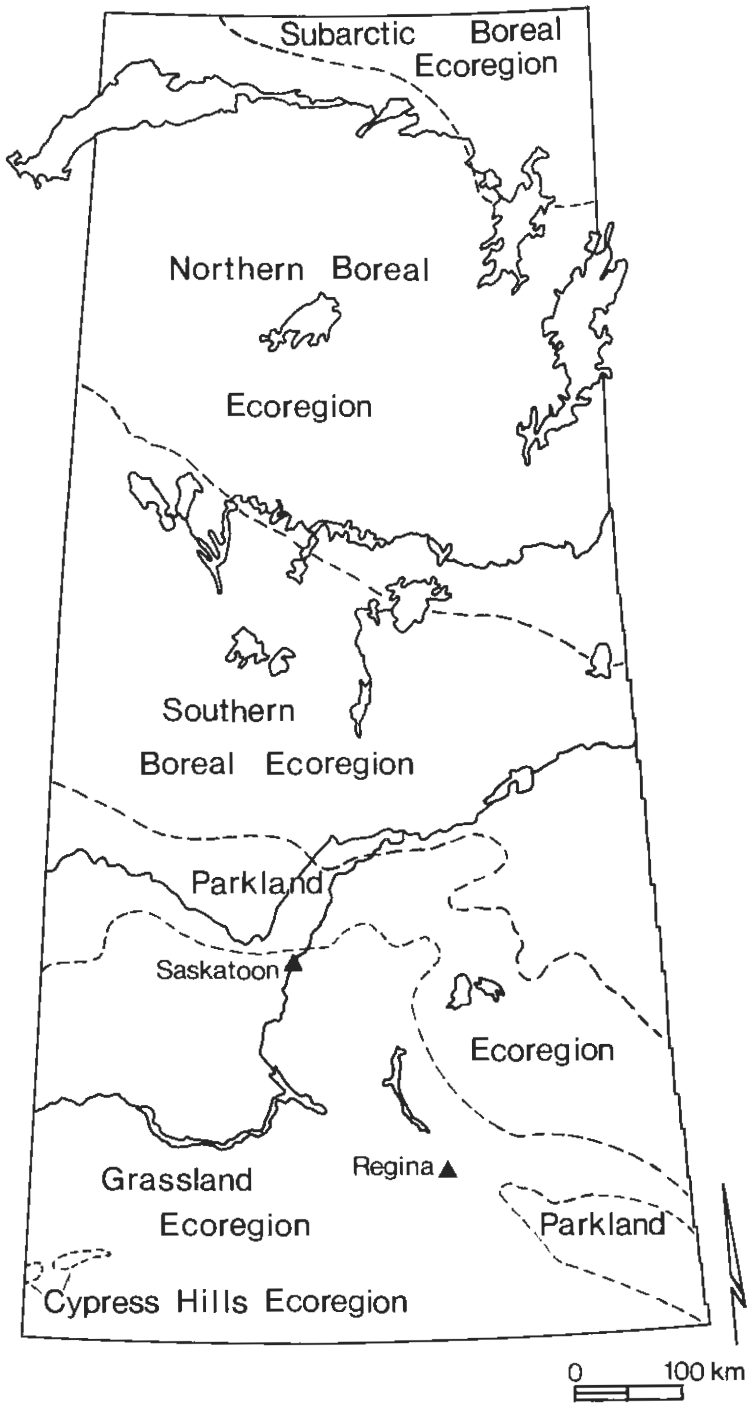

Figure 2. Ecoregions of Saskatchewan, adapted from Rowe (1972).

2. Decline in the moose population may have resulted in native hunters switching to caribou.

3. Wolf predation may have increased due to a scarcity of other ungulates in some areas.

4. Altered habitat and rutting grounds may have resulted from logging practices.

5. Northward expansion of White-tailed Deer (*Odocoileus virginianus*) to logged over areas has introduced meningeal worm which could severely impact Woodland Caribou.

6. Successional changes may be occurring in large muskegs as a result of decreasing annual precipitation and lower water levels. Caribou habitat may be on the decline.

The Saskatchewan Wildlife Branch has undertaken a short-term study of Woodland Caribou. We chose a 2400 km^2 study area in north-central Saskatchewan (Fig. 3) based on: traditional caribou occupancy, year-round hunting, extensive logging and access trails, and mixed habitat and landform types dominated by treed muskeg. Ground reconnaissance and intensive aerial surveys will be conducted in late February-early March 1986. Forest inventory maps and ground and aerial reconnaissance are being used to determine primary habitat which will then be intensively surveyed by helicopter. Survey design is in the experimental stage. If a reliable estimate of density can be obtained, it may be applicable to other areas of the province where: (a) we know there are caribou and (b) their primary habitat has been identified. This would give us a better population estimate than the educated guess we are working with now. Until such time, Kelsall's (1984) figure of 2500 caribou in Saskatchewan is our best guess.

FUTURE MANAGEMENT

Saskatchewan is not currently in a position to declare Woodland Caribou an endangered species. We hope to improve the data base through our present study by answering some important questions:

1. How can we arrive at a more accurate population estimate?

2. Is the population declining and is the decline significant?

3. If significant what can be done to reverse the decline?

Sport-hunting restrictions would be most effective in formalizing concern for the future of the species, but this would not affect total numbers. To determine if unregulated hunting is significant we must improve on the reporting system. One suggestion is to employ trapline officers from various Native communities to collect wildlife harvest data. Information exchange with Native people would be an important part of such a program. If unregulated hunting is found to be impacting the caribou population, then the department should reduce hunting pressure with agreement from Native band councils. In areas where local herds are threatened,

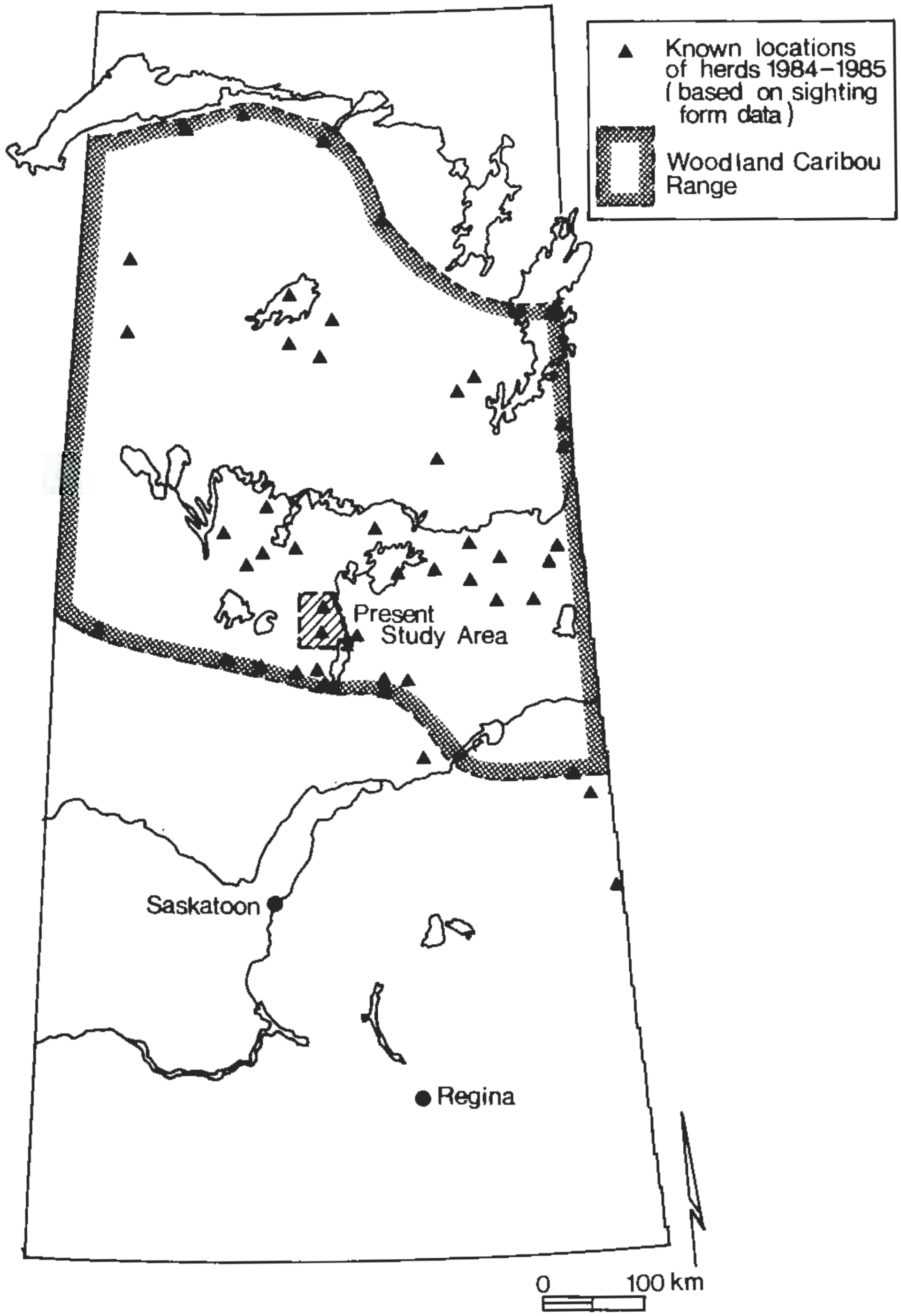

Figure 3. Current distribution of Woodland Caribou in Saskatchewan.

game preserves may be the only way to stop all hunting until numbers increase.

The present study could also be expanded to include radio-collaring, intensive ground reconnaissance, and behavioral observations to examine the potential impact of logging on caribou movements, habitat, and overall numbers. This should be an important first step to future management in light of the increased demand for resource use throughout the southern range of the caribou. In the meantime, regional biologists should review forestry operating plans and recommend measures to lessen disruption of caribou habitat (i.e., leave blocks in caribou habitat, fewer roads and trails, and the timing of operations to avoid or circumvent the caribou rut). A major program of forestry road closures is underway across Saskatchewan to reduce hunter pressure on Moose. This program may also benefit Woodland Caribou and should be monitored by annual surveys.

A detailed study of the species might also shed some light on wolf predation. In the absence of a wolf-caribou interaction study, we may have to consider wolf control in some areas based on the reported incidence of wolf predation on caribou and the frequency of wolf sightings on caribou range.

Finally, we must look to studies and management plans of other jurisdictions for direction. If adjacent provinces, or all of Canada, give the species threatened or endangered status, Saskatchewan will no doubt reassess the status of caribou at home.

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WOODLAND CARIBOU IN MANITOBA

Merlin Shoesmith

PRESENT DISTRIBUTION AND STATUS

The Woodland Caribou (*Rangifer tarandus*) occurs throughout the Precambrian Shield, Hudson Bay Lowlands, and limestone bedrock areas of eastern, northern, and west central Manitoba (Fig. 1). The highest densities occur in the northeast along Hudson Bay.

The provincial population estimate is 4,500 based on indirect and direct observations of individual herds and subjective analysis of available data. There is no reason to believe that the population is decreasing in most areas except along the southeastern fringe where forest cutting and recreational activity have apparently caused a significant decrease in the size of individual herds and continuity of large areas of suitable habitat. Isolated herds, such as those found at Aikens Lake (35 to 40 individuals) and Flintstone Lake (60 in Nopiming Provincial Park), persist in this area but it is not known how long this will continue with the current level of human activity. Nopiming Provincial Park is located along the Ontario border 160 km northeast of Winnipeg.

As human use of these fringe areas increases in western (Swan-Pelican Lakes near Swan River) and central Manitoba (Long Point, south of Grand Rapids), fewer and fewer caribou are seen in areas where they were common 15 to 20 years ago. Large herds of 100+ individuals are still found in the remote Pukatawagan, Molson Lake, and Shamattawa areas of the west and north.

The Cape Churchill herd has been increasing over the past 7 to 8 years. A fairly accurate estimate of this herd was made through a combination of aerial and ground counts in June and July 1985. A minimum herd estimate of 1337 caribou was obtained with 272 (about 20%) being calves. An earlier count (June 11) revealed 340 calves in this herd. Nearly 200 mature bulls were in this herd, again a minimum estimate.

TRENDS IN USE AND FORECAST OF DEMANDS

The Woodland Caribou is classed as a big game species in Manitoba and continues as such even with the "rare" designation by COSEWIC in 1984. Recreational and subsistence hunting occurs in the more remote areas of the caribou range with a harvest level that is probably well below the annual productivity of these herds. Hunting is not allowed in any of the southern fringe areas where the small, isolated herds are in jeopardy. Public demand for the 250 available licences has been low over the years. In 1975, only 59 of the available licences were sold with about 20 caribou harvested. In 1981, 215 licenced hunters harvested 60 Woodland Caribou.

Our regional field staff estimated that 125 additional caribou were harvested by Treaty Indians. In the Cape Churchill area, about 40 caribou were taken by illegal

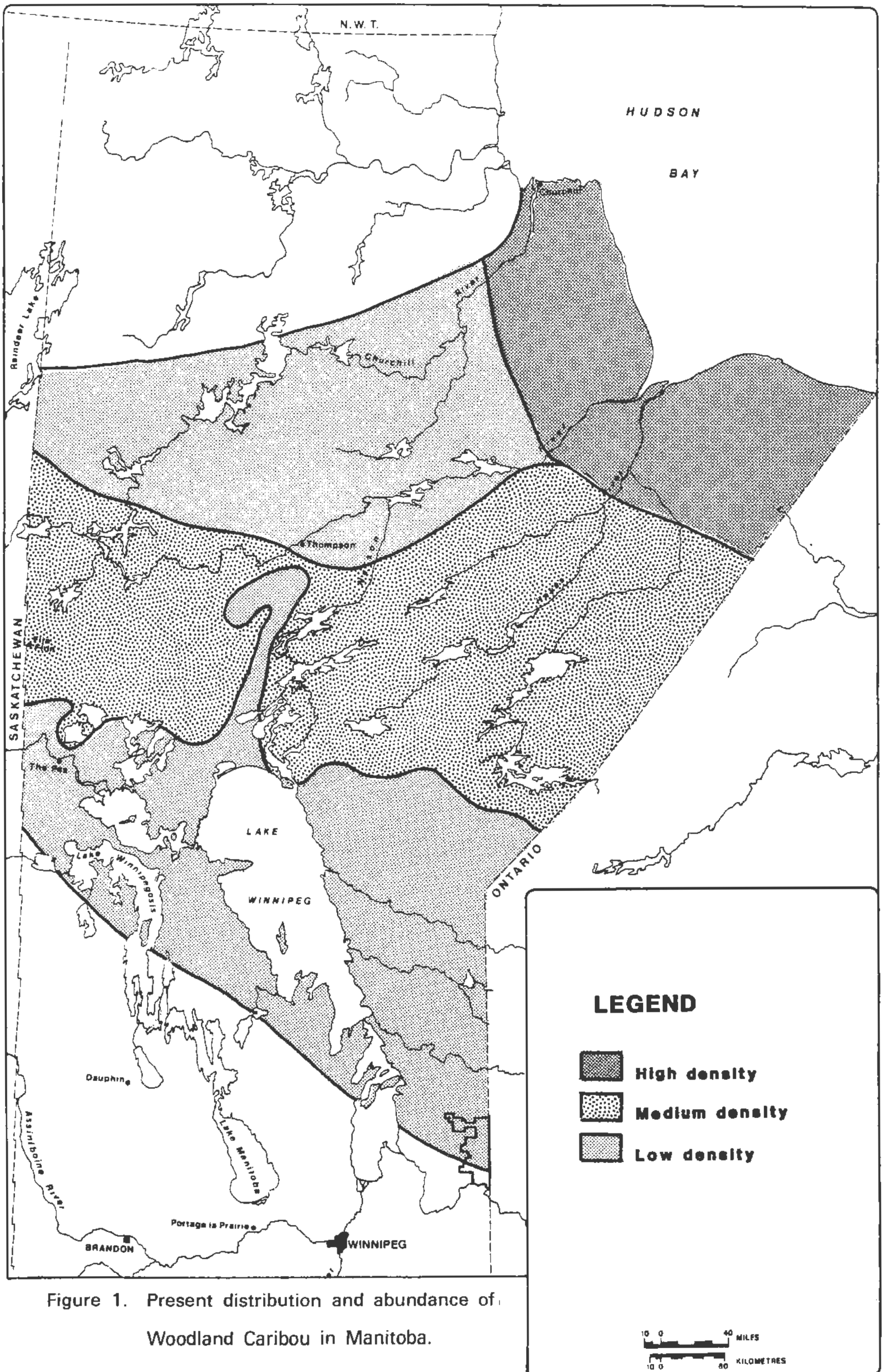

Figure 1. Present distribution and abundance of Woodland Caribou in Manitoba.

hunting and a small number of caribou are annually taken by trappers for subsistence. Recreational hunting use of Woodland Caribou has not increased due to the remoteness of caribou habitat. However, once caribou are found, they are easily hunted and killed. Consequently, as access to remote caribou range increases, the kill is likely to increase.

CAPABILITY TO MEET DEMAND

Woodland Caribou herds in the Cape and Hayes-Nelson River areas will easily meet human demand in the foreseeable future. However, reproduction and habitat are two limiting factors that must be examined and well understood if supply is to meet demand elsewhere. Harvest must be kept in line with the low, natural recruitment rates into the population. Critical areas of caribou range, especially in the southeast, will require protection from disturbance by fire or development to ensure that local populations do not become extirpated.

INFORMATION NEEDS - RESEARCH

Two study proposals to examine the effect of forest cutting on Woodland Caribou distribution and use are under review at present for the Aikens Lake and Sasgaginnak Lake herds. A tagging program will continue in the Grass River Provincial Park.

SPECIAL CONCERNS

1. A technique to census and locate the major herds on a regular basis is needed.
2. Wildlife managers must develop consistent policies related to consumptive use of RARE species.

HISTORY AND MANAGEMENT OF THE PRONGHORN IN ALBERTA

Morley W. Barrett

INTRODUCTION

The pronghorn (*Antilocapra americana*), while common in much of the western plains today, is a unique North American species that has had to struggle with civilization for its survival. The pronghorn is the sole member of its genus and falls in the Artiodactyla Order and Ruminantia Sub-order. Early European explorers estimated their numbers at 30-40 million and indicated that pronghorns were at one time as numerous on the plains of western North America as were bison (*Bison bison*). However, the arrival of white settlers on the western plains had catastrophic effects on pronghorn. This paper briefly describes the early decline of the pronghorn and their subsequent recovery under a progressively evolving wildlife management system. Although pronghorn population trends in North America have reflected a high degree of synchrony, this paper emphasizes the history and management of the species in Alberta.

HISTORICAL DECLINE AND RECOVERY

Historically, Pronghorns occupied the grassland and steppe areas of the great basin region and scattered pockets in the western part of the continent. Settlement during the 19th century brought extensive cultivation, fencing, and unregulated grazing by domestic stock. In addition, market hunting and widespread, year-round subsistence hunting were commonplace. These factors combined to produce a devastating decline in pronghorn numbers and threatened the survival of the species throughout much of its range in both Canada and the United States. Settlement pressure in western Canada intensified with the completion of the Canadian Pacific Railway in 1880. Anthropogenic factors in conjunction with the historical natural stresses such as drought and severe winters, combined to depress pronghorn numbers early in the 20th century. The winter of 1906-07 was reputably the most severe on record in the Canadian prairies and lowered pronghorn numbers to a level where spontaneous, unaided recovery was in doubt.

Public concern for the survival of pronghorns increased and the Alberta Legislature indefinitely closed pronghorn hunting in the province in 1914 (Mitchell 1980). Prior to 1920, reserve areas to aid pronghorn survival were set up in southern Alberta at Nemiscam and Wawaskesy. Private individuals were authorized to maintain an "antelope farm" for the purposes of supplying animals for restocking programs. Progress came slowly and in 1924, pronghorn numbers in Alberta were estimated at under 1100 animals. Numbers gradually increased during the next 20 years but fluctuated widely depending on environmental conditions. Hunting seasons were allowed in years when favourable population estimates prevailed (Mitchell 1980).

In the past 30 years, intensive research programs have revealed much about the population ecology of the species and have provided the basis for the current system of management. Annual aerial surveys began in Alberta in 1955 and supplied more quantitative data. The population estimates for pronghorns in North America (Figure 1) and Canada (Figure 2) show remarkably similar and dramatic recoveries of

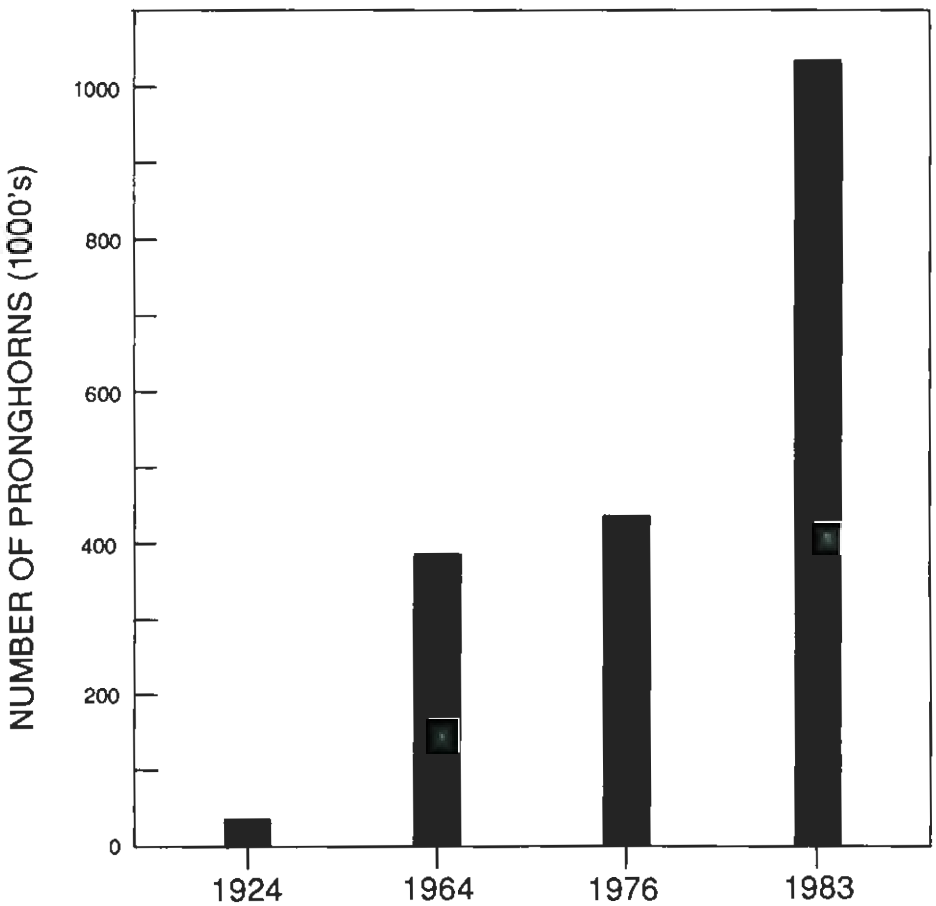

Figure 1. Estimated pronghorn population in North America (from Nelson 1925; Yoakum 1968; Pronghorn Antelope Workshop 1984).

the species in the last 60 years. Although pronghorns occur in both Alberta and Saskatchewan and are generally in phase with respect to major population fluctuations, Alberta accounts for about 60% of the Canadian animals.

RANGE RELATIONSHIPS AND MORTALITY FACTORS

Pronghorns are highly selective feeders and during the spring to fall period predominantly consume broad-leaved plants or forbs. In northern ranges during the late fall and winter period, browse, principally Silver Sagebrush (*Artemisia cana*), becomes the overwhelmingly important food item. Consequently, wintering areas for pronghorns tend to be gently rolling bottom or river basin sites amply covered with sagebrush (Figure 3). When snow conditions are not severe, pronghorns will feed on green winter wheat or alfalfa fields. Generally, areas with a high preponderance (>25%) of cultivation have a lower value to pronghorns, especially during winter.

Wintering areas allow a special management focus as they provide the nucleus for population manipulation through harvest legislation. Furthermore, special efforts have been made in land-use planning to retain these important wintering areas and a system of fencing in the travel corridors that allows easy access by pronghorns. Pronghorns in Alberta are at their northern range limit and major losses during periodic severe winters will continue to decimate populations every few years (Barrett 1982a). Adverse weather is perhaps the most significant factor reducing population stability in Alberta.

On an annual basis, many pronghorns are lost to predation, vehicle collisions, disease, and legal or illegal harvest but these factors have significance only in the short-term, site-specific context. One study in Alberta indicated that more than 50% of the fawns born in a year were killed during the first two months of life, primarily by Coyote (*Canis latrans*) or Bobcat (*Lynx rufus*) predation (Barrett 1984). Despite such high losses, the population was able to increase significantly in years when other environmental factors were positive. Of greatest importance to pronghorn survival in Alberta, in a long-term perspective, is the ability of resource and land-use managers to retain a suitable distribution of quality habitat for the species.

THE ROLE OF HUNTING

The legal harvest of pronghorns is an important aspect of the management of this species. Pronghorns are both highly visible and vulnerable, and as a consequence, hunting regulations have evolved that allow for greater population intervention than is the case for most species. Through years of research, biologists have mapped out both the distribution of key subpopulations of animals and the distribution of quality habitat. The current pronghorn hunting areas are set up to reflect these factors (Barrett 1982b). Biologists have further shown that vast differences can occur in the stability and carrying capacity of ranges between different subpopulations in the same year. In areas where numbers are depressed

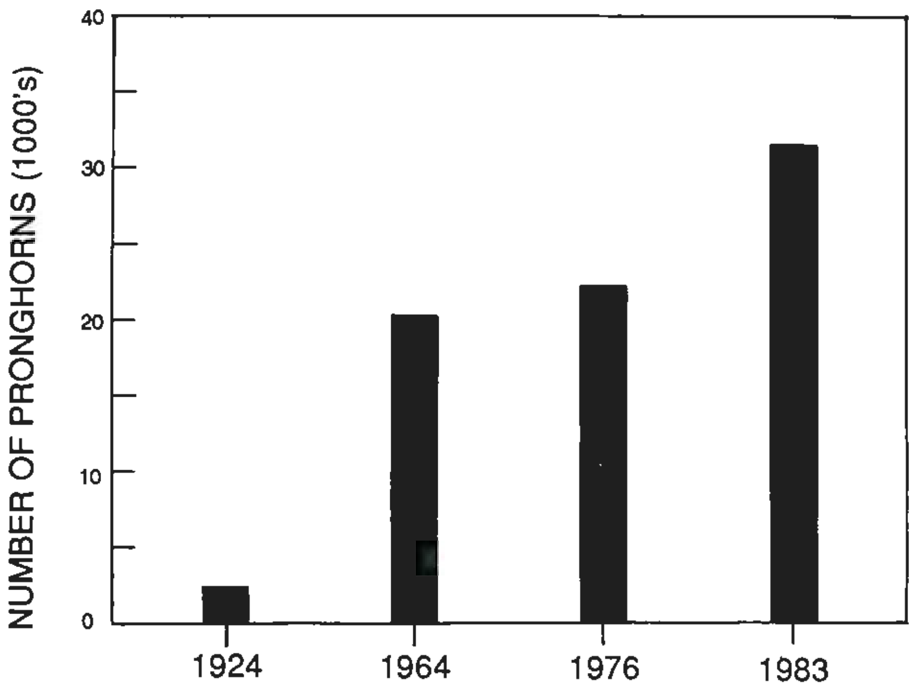

Figure 2. Estimated pronghorn population in Canada (from Nelson 1925; Yoakum 1968, 1978; Pronghorn Antelope Workshop 1984).

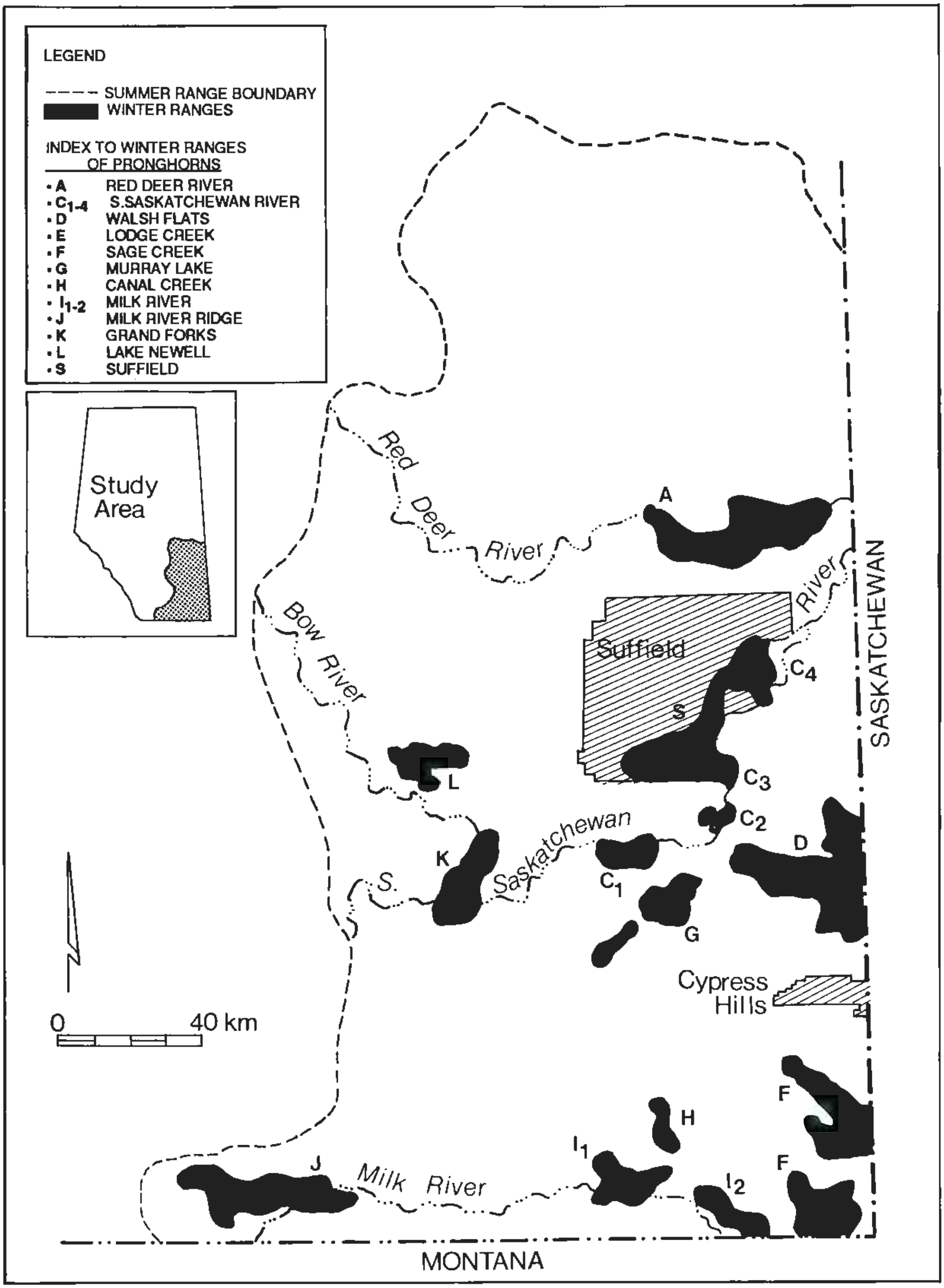

Figure 3. Delineation of the summer distribution and wintering areas of pronghorns in Alberta.

and range conditions good, reduced permit numbers are part of a strategy to increase local pronghorn numbers. Where high numbers or concern for range conditions exist, an increase in hunting permits, including the authorization of permits to harvest females, is provided as part of the management approach.

Pronghorn hunters in Alberta have been highly successful (55.5%; Table 1) and harvested in excess of 20,000 pronghorns while the population has increased from below 10,000 to over 30,000 animals (Figure 4). There is no biological reason why the legal harvest of pronghorns should not be part of the management program for this species for generations yet to come.

Table 1.--The estimated mean summer population and harvest summary for pronghorns in Alberta from 1970-1985.

	Mean	Minimum	Maximum
Summer Population	16,171	9,424	32,071
Hunting Permits[a]	2,528	798	8,995
Harvest Estimates	1,404	481	3,878

[a] Permits to harvest females issued in 7 years.

EVOLUTION OF MANAGEMENT PROGRAM - A REVIEW

The current management program in Alberta has evolved over several decades and continues to be refined as new information is learned about the species. Some of the key elements responsible for bringing the pronghorn from the brink of extirpation to its relatively abundant levels of recent years are summarized below.

Legislation.--Early in the 20th century, political leaders recognized the plight of the species and brought in protective legislation. This ended the legal year-round harvest of the species and helped focus public attention on this once endangered species.

Protected Areas.--Two special pronghorn reserves were established before 1920 in southern Alberta.

Trapping and Restocking.--Although only a limited amount of trapping and redistribution was carried out in Alberta, this procedure has been of enormous value in reestablishing pronghorns throughout their traditional range in much of North America.

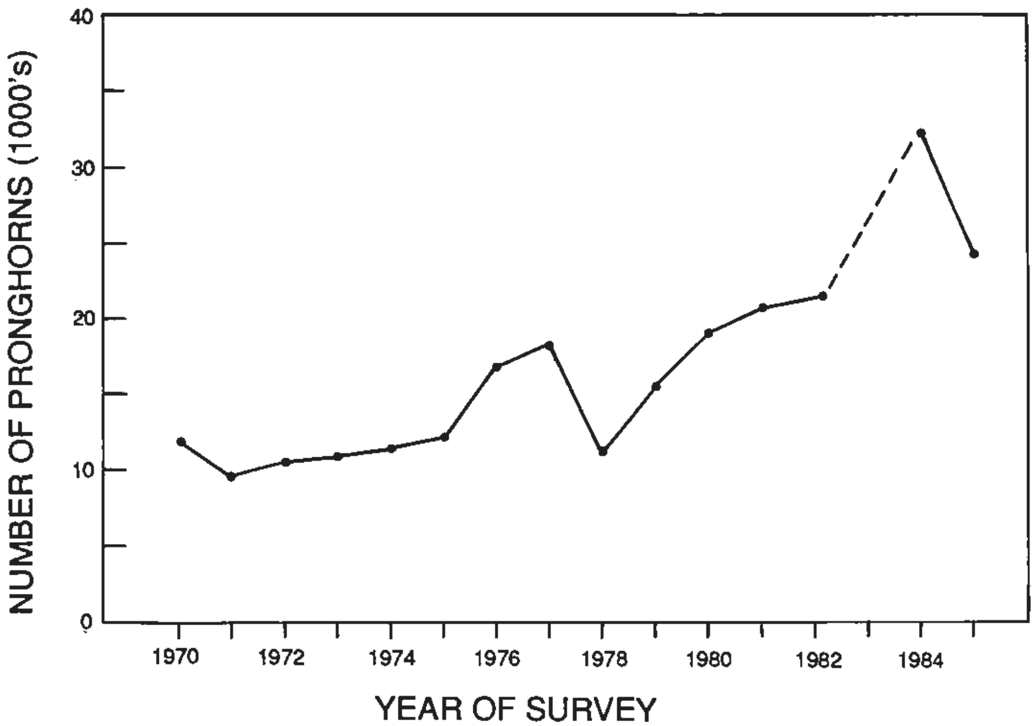

Figure 4. Estimates of summer population of pronghorns in Alberta.

Enforcement Programs.--Wildlife enforcement officers have effectively deterred illegal harvest and augmented public respect for wildlife legislation.

Key Seasonal Ranges.--The identification of key winter ranges in particular has made it meaningful to incorporate habitat and population factors into the annual management program for pronghorns.

Pronghorn Mobility - Fencing.--The range fence requirements of pronghorns have been recognized with increasing frequency by grazing reserves, community pastures, Department of Transportation, and private ranches.

Research Programs.--More research data exist for pronghorns than perhaps any other species of big game in Alberta. These data, including subpopulation distribution and size, have been the foundation for biologically sound and successful management programs.

Hunting.--The ability to distribute the harvest on a geographic basis in proportion to annual goals established by surveying local subpopulations has established hunting as an important tool in management of the species.

Public Attitude.--Once shot indiscriminately year-round, the pronghorn is now an important trophy and viewing animal. The high compliance rate exhibited by hunters and efforts of land owners and government departments to take into account the needs of this species underscore the strength of public commitment and confidence towards the current management program for pronghorns.

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THE CANADIAN WILDLIFE SERVICE PROGRAM

TO RESTORE WOOD BISON

Hal W. Reynolds

INTRODUCTION

Urban and agricultural development over the past 50 years have resulted in the loss of a major portion of prairie rangelands. Because of the incompatibility of free-roaming herds of bison with this development and the potential for serious conflicts, wild populations of bison on the prairies can never become a reality. Therefore, the more isolated and undeveloped rangelands in northern Canada are the only remaining areas where establishment of free-roaming herds of bison is possible. It is in those areas that we are presently directing efforts for the rehabilitation of the Wood Bison.

Another interesting and pleasing aspect of the Wood Bison project is that it is showing some obvious signs of success, similar to those for the Whooping Crane (*Grus americana*) and the Peregrine Falcon (*Falco peregrinus*) as shown by Ernie Kuyt and Richard Fyfe (this symposia).

HISTORICAL BACKGROUND

The Wood Bison is currently classified as an endangered subspecies of the North American bison (Novakowski 1979, Cook and Muir 1984). Current research has confirmed the validity of subspecific status for Wood Bison (van Zyll de Jong 1986). Wood Bison once numbered in the thousands and ranged over most of the boreal forest regions of northeastern British Columbia, northern Alberta, northwestern Saskatchewan, and the southwestern Northwest Territories (Figure 1).

Wood Bison declined drastically throughout the late 1800's and, by 1891, their numbers were reduced to an all-time low of about 300 (Ogilvie 1893). Numbers of Wood Bison remained dangerously low throughout the first half of the twentieth century, even though federal law had offered legislative actions to control harvest. The mistake of transferring more than 6,000 Plains Bison (*Bison bison bison*) to Wood Buffalo National Park from central Alberta between 1925 and 1928 nearly caused extinction of the Wood Bison. It was not until 1957 that Dr. N.S. Novakowski of the Canadian Wildlife Service discovered an isolated population of bison in the Nyarling River area in the northwestern corner of the park. Subsequent investigations and collection of five specimens in 1959 confirmed that these animals were the purest Wood Bison left in the world (Banfield and Novakowski 1960). It was then decided to protect this herd from hybridizing with the introduced Plains Bison in the south part of the park. During the 1960's, Wood Bison were further threatened by a severe outbreak of anthrax. This led to the first transplant of 18 Wood Bison to what is now the Mackenzie Bison Sanctuary in the Northwest Territories in 1963. Continued concern regarding anthrax outbreaks resulted in a second transfer of 23 Wood Bison to Elk Island National Park in 1965 in a further effort to save the subspecies from extinction. These animals became a source

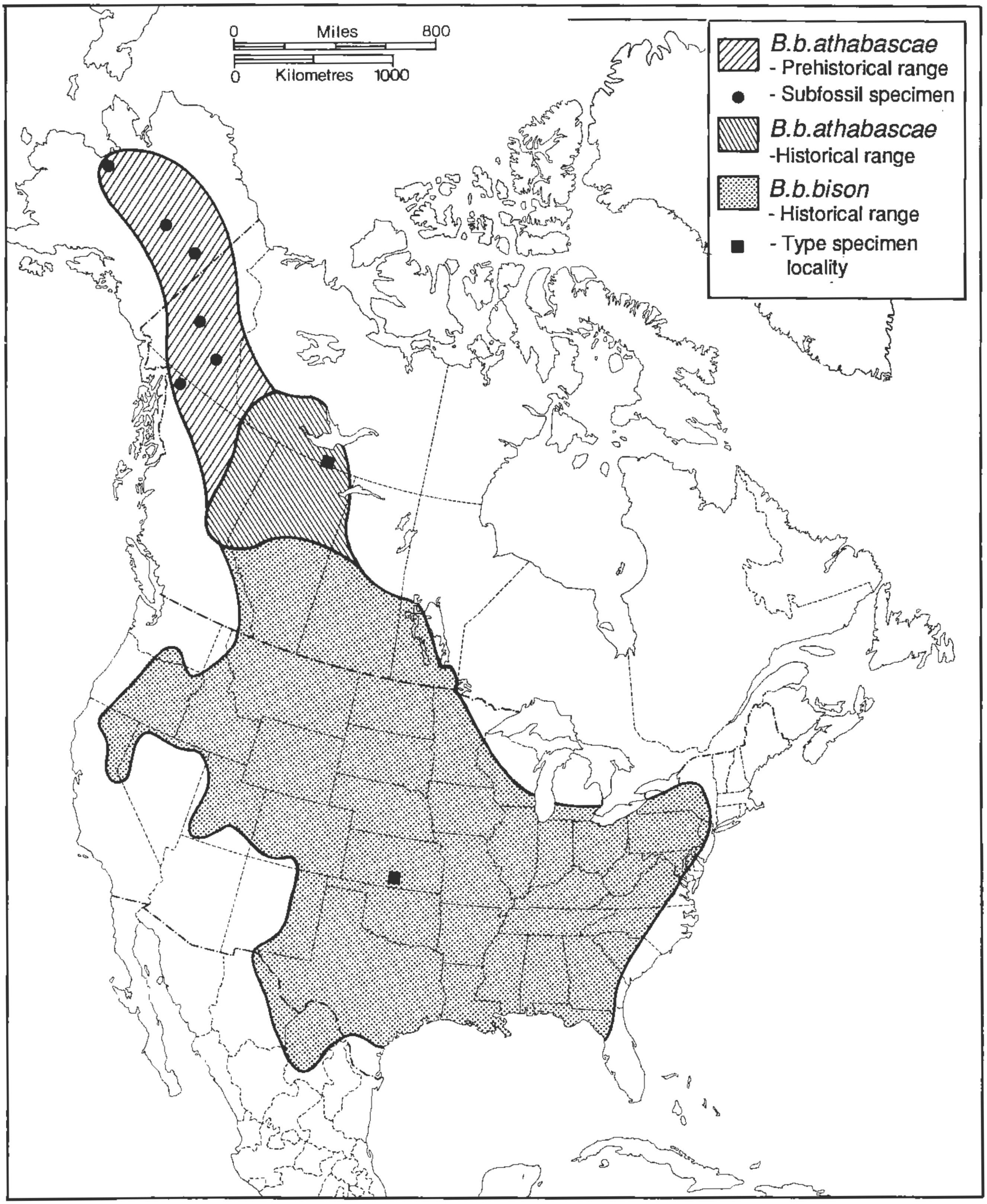

Figure 1. Historic and prehistoric distribution of wood bison (Bison bison athabascae) and historic range of plains bison (Bison bison bison) (after van Zyll de Jong 1986).

breeding herd for future transplants to the wild.

STATUS OF WOOD BISON

Wood Bison are listed in the Red Data Book by the International Union for the Conservation of Nature and Natural Resources (IUCN), and are thereby recognized world-wide as endangered. Wood Bison are also classified as Appendix I animals in the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), which provides regulated protection from international trade. Wood Bison are also listed as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), a federal-provincial group established in 1977 to assess the status of wildlife species considered to be in jeopardy in Canada and to assign them to specific categories of concern (Novakowski 1979, Cook and Muir 1984).

REHABILITATION PROGRAM OBJECTIVES

In 1975, the official Wood Bison Rehabilitation Program was established through the cooperative efforts of the Canadian Wildlife Service; Environment Canada, Parks; and provincial and territorial wildlife agencies in western Canada. The Canadian Wildlife Service is coordinating this cooperative national program to establish free-roaming populations of Wood Bison in areas of historic range (Reynolds et al. 1982). Program objectives are to establish a minimum of three (preferably five) free-ranging, viable populations of Wood Bison in areas of former range and to protect and preserve the gene pool by dispersing small breeding herds to zoological gardens and parks. Ultimately, the goal is to reestablish sufficient numbers of Wood Bison in the wild to justify removal from the endangered species list.

EARLY REHABILITATION MEASURES

As a result of the captive breeding program, successful transfers of Wood Bison have been made to eight institutions for preservation of the gene pool. Unfortunately, the first attempt to reestablish a free-roaming herd of Wood Bison using the Elk Island National Park source stock in 1978 was not successful. This transfer experiment failed when Wood Bison released in the wild in Jasper National Park, moved out of the park onto provincial land and had to be removed from an area of agricultural development.

The second transfer of Wood Bison into the wild from Elk Island National Park occurred in cooperation with the Northwest Territories Wildlife Service. In June 1980, 28 animals were released near Nahanni Butte, Northwest Territories (Reynolds 1982). This release group fragmented into several small herds and moved randomly throughout the region. One group moved south into the province of British Columbia. After 5 years, two groups of animals (15 and 6) established home ranges within 50 km of the release site. Production and survival of some calves indicates marginal reestablishment, even though losses of adults and juveniles have occurred.

If this herd remains relatively sedentary, it should increase and become a viable population.

PRESENT REHABILITATION PROJECTS

Transfers to the wild for establishment of free-roaming herds of Wood Bison are negotiated as cooperative agreements with provincial and territorial wildlife agencies under the terms of the Canada Wildlife Act (1973). Experience gained from the transplant attempt to Jasper National Park in 1978 and from the transfer to Nahanni in 1980 resulted in the development of other projects in northern Canada using large, on-site holding corrals. Transfer animals can be maintained in these enclosures for several years prior to release to the wild in anticipation that they will locate nearby when released. Cooperative projects for establishment of free-roaming herds of Wood Bison were initiated in the Yukon Territory (1980), Manitoba (1981), and Alberta (1981). This was followed by range assessments and site selection. Cooperative agreements were signed in the Yukon Territory (1984), Manitoba (1986), and Alberta (1983).

Manitoba Project

A 23 km^2 enclosure was constructed at a site in the northern Interlake District of Manitoba near Waterhen. The first shipment of 34 Wood Bison was delivered in February 1984. Subsequent shipments and on-site births have increased the total population to 73 as of January 1986. Transfers to this project have used surplus animals from other cooperators in the captive breeding program. In Manitoba, only progeny of the original transfer animals are to be released to the wild, employing the theory that animals born and raised within the enclosure will exhibit a strong tendency to establish a home range in the general area once released. The first release to the wild is tentatively scheduled for the spring of 1988 using between 20 and 30 animals, depending upon the availability of animals born on site. A unique aspect of the Manitoba project is that, once a wild herd has been established, the original stock will be used as a breeding nucleus to develop a commercial Wood Bison ranch. Cooperators in the project are: the Manitoba Department of Natural Resources (Wildlife Branch), Environment Canada (Canadian Wildlife Service and Parks), the Waterhen Indian Band, Indian and Northern Affairs Canada, Special ARDA (DREE/Northlands Development Agreement), Canada Employment and Immigration Commission, and the Canadian Wildlife Federation.

Alberta Project

An area in the vicinity of Hay-Zama Lakes in northwestern Alberta was selected and a 3 km^2 holding corral has been constructed. The first shipment of 29 Wood Bison was delivered in February 1984. Poor survival of calves during the winters of 1984/85 and 1985/86 and poor reproduction on site has caused a postponement of the first release to the wild, at least until the spring of 1987. Flooding conditions and severe winter weather have resulted in the need for supplementary feeding within the compound. When health and nutritional problems are corrected and calf production improves, a release to the wild can be made. Original transfer stock will eventually have to be released to the wild or be removed from the compound. Major cooperators in this project are: Alberta Forestry, Lands and Wildlife (Fish and Wildlife Division), Environment Canada (Canadian Wildlife Service and Parks), the Dene Tha Indian Band, Canada Employment and Immigration Commission (N.E.E.D. and Winter Works projects), and Indian and Northern Affairs Canada.

Yukon Project

An area in the Nisling River Valley in the southwestern Yukon was selected and a 5 km^2 holding corral was constructed. The first shipment of 34 Wood Bison is to be completed in March 1986. Once animals that were born on site are available, a release to the wild can be made. If the first release is successful, more releases during the following three years will be made until all Wood Bison within the enclosure have left. Cooperators in this project are: Yukon Renewable Resources (Fish and Wildlife Branch and the Parks Branch), Environment Canada (Canadian Wildlife Service, Parks, and Environment 2000), Canada Employment and Immigration Commission (N.E.E.D. and Katimavik), Yukon Fish and Game Association, and Yukon Outfitters Association.

CONSERVATION NEEDS

Five of the basic needs to ensure continued conservation for Wood Bison are:

1. Protection of habitat and prevention of further loss to conflicting interests such as energy development and agricultural encroachment are required. This is especially true in areas of marginal agricultural potential. Such protection of habitat is absolutely necessary if rehabilitation programs are to be successful.

2. There is a specific need for protection of reintroduced populations of Wood Bison to prevent genetic mixing and disease contamination through interbreeding with free-roaming herds of hybrid and/or Plains Bison. The onus is on each recipient jurisdiction to ensure this protection by establishing Wood Bison management areas, sanctuaries, and/or wildlife refuges. We must all help by supporting government agencies with such endeavours.

3. Additional funding is required to complete needed biological studies and to monitor reestablishment of introduced populations to assess whether or not they have been successful. If so, why? If not, why not? What are the biological principles that contribute to success or failure?

4. Protection of Wood Bison as an endangered wildlife species is necessary. This will require enactment of special legislation for endangered species, both at the provincial and federal levels, in a two-tiered approach as suggested yesterday by Dale Hjertaas (this symposium). However, this may never be possible under existing constitutional rights.

5. And lastly, time, patience, and lots of luck are required for natural reproduction and growth to occur in reintroduced populations. In the case of Wood Bison, we are looking at time frames of 15-25 years. For example, in the Mackenzie Bison Sanctuary, it took 23 years for the herd to increase from 18 to 1500 animals in a situation where exponential growth occurred and annual population increments reached 20-25%.

CONCLUSION

As a rehabilitation program, the Wood Bison project has been relatively successful and, hopefully, will continue that way. It began with less than 100 Wood Bison, essentially the two groups of 18 and 23 animals that were transferred to the Mackenzie Bison Sanctuary and Elk Island National Park, respectively, and has grown to in excess of 2,000 animals in approximately 26 years -- one-quarter of a century to become marginally successful as a rehabilitation program. Time is of the essence! With good reproduction during 1986, it may be possible to consider downlisting from endangered to threatened by 1987 or 1988. If present projects are successful in establishing other viable herds of Wood Bison in the wild, delisting will soon be a reality. The Wood Bison is truly on the road to recovery.

In closing, I would like to stress that the key to success remains with the preservation of habitat and with the early detection of declining populations long before the point where intensive and extensive rehabilitation programs are required to save the species from extinction. Rehabilitation programs can and do work, but they are long-term, extremely expensive, and unnecessary if conservation needs are appropriately identified and met prior to development of a crisis situation.

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SUGGESTIONS FOR A BREEDING BIRD ATLAS OF THE PRAIRIE PROVINCES

Mike Cadman

The Endangered Species in the Prairie Provinces Workshop made the need for Breeding Bird Atlas work on the Prairies abundantly clear. A breeding bird atlas project:

1. mobilizes large numbers of experienced naturalists,

2. ensures comprehensive data gathering at a level that could not be accomplished by a small number of professionals,

3. maximizes coverage in a short time period,

4. helps the participants learn about the biology of the species they find and become more knowledgeable about their area, and

5. has the potential to be a catalyst for other atlas projects.

The primary value of an atlas in the prairie provinces would be the data gathered on the distribution and abundance of endangered, threatened and rare species.

Workshop participants expressed the need for comprehensive inventories for species such as Burrowing Owl (*Athene cunicularia*), Piping Plover (*Charadrius melodus*), Ferruginous Hawk (*Buteo regalis*), Greater Prairie Chicken (*Tympanuchus cupido pinnatus*), Mountain Plover (*Charadrius montanus*), Trumpeter Swan (*Cygnus buccinator*), Peregrine Falcon (*Falco peregrinus*), Baird's Sparrow (*Ammodramus bairdi*) and White Pelican (*Pelecanus erythrorhynchos*). In most cases recent attention to these species has led to the discovery of new breeding locations. Given the continuing reduction of prairie and aspen parkland habitats, it is apparent that all breeding locations of these species should be located as quickly as possible. Furthermore, it is likely that there are other species whose status is questionable. An atlas project would be directly beneficial in providing volunteers to seek out new breeding locations for these birds. Similarly, professional directed census work on these species would provide useful data for the atlas project.

The "atlas" project already underway in Saskatchewan, though not typical of Breeding Bird Atlases in that large numbers of volunteers have not been mobilized to collect data, would provide a useful baseline against which more comprehensive coverage could be compared.

METHODOLOGY

The threat to the prairies and aspen parkland ecosystems supercedes political boundaries. Therefore it is suggested that a single atlas project should be organized to ensure coverage of all three prairie provinces. A similar system is already in place in the Maritimes, even without the immediate threat to a unique ecosystem.

The threat to the prairie and aspen parkland ecosystems is severe enough that the atlas project should ensure that these areas are covered thoroughly before attention is diverted to the more remote areas to the north. Advantages to this approach to consider:

- the human population, including the naturalists of the prairie provinces, is primarily found in these two ecosystems,

- volunteers prefer to work close to home,

- most areas within these ecosystems are readily accessed by road, and

- success in coverage of these areas, and the results obtained, would encourage people to work towards the coverage of the whole of each of the provinces.

DATA COLLECTION

Data should be gathered on the basis of the Universal Transverse Mercator Grid System. All other Canadian atlases (here I refer to standard Breeding Bird Atlases) are using this system. Therefore, results would be comparable, data sets would be compatible, and methodological and technical advances made in one project could be used in others. The development of computer software is expensive and time consuming. Just as important, is the need for these programs at the beginning of the project so that results can be communicated to volunteers to help encourage further work. This work has already been completed in Ontario, and the programs and approaches developed here are available for use in other atlas projects.

The size of grid squares, degree of coverage and grid sampling system are best devised once needs are clearly identified and the full potential of the atlas project is considered. If a sampling system is devised, however, it is suggested that, as in the Vermont Atlas (Laughlin and Kibbe 1985), suspected areas of ornithological importance which may fall outside the sampled squares should receive special attention. Nevertheless, comprehensive coverage, rather than sampling, is recommended to ensure that significant breeding locations are not left undiscovered.

ORGANIZATIONAL STRUCTURE

Most atlas projects have been steered by a management and a technical advisory committee. This is the suggested method for the proposed atlas. The committees should consist of members of the Canadian Wildlife Service (from each province), provincial wildlife and parks staff, museum people, university ornithlogists, naturalists, birders (preferably regional coordinators), and members of other potential funding agencies such as foundations, businesses and industry, and World Wildlife Fund Canada. There are no doubt other agencies, both governmental and private, with which project organizers will be familiar, that should also be invited to join these steering committees. The hiring of two full time staff is recommended: a project coordinator and an assistant coordinator who would possess strong technical (computer) skills.

Activities in each of the provinces could be overseen by separate provincial (sub?) committees familiar with the people, birds, ecosystems, and logistical problems in each jurisdiction. Each of the provinces should be divided into at least 20 regions with the majority of these regions concentrated in the prairie and aspen parkland areas. A volunteer coordinator should organize activities in each.

TIMETABLE

Explanatory material should be produced and distributed immediately. Interested people and potential steering committee members should meet as soon as possible. Here, decisions as to methodological and organizational approaches can be made and responsibilities for funding applications assigned. The goal should be to start the project as of January 1st, 1987. To succeed in this regard, at least one staff member should be hired as of September 1st, 1986. This is less lead time than would be preferred, but the need for the project is acute.

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METHODOLOGY AND PRELIMINARY RESULTS OF THE ONTARIO BREEDING BIRD ATLAS

Mike Cadman

Data collection for the Ontario Breeding Bird Atlas is now complete and the final steps in the processing of 1985 data are underway. Maps showing the summarized data for the project will soon be distributed to 87 authors who will write accounts for the 295 species recorded during the five years of data collection (1981-1985). By the fall of 1986, we hope to have the book published. The book, like the methodology for the project, will be modelled on the *Atlas of Breeding Birds in Britian and Ireland* (Sharrock 1976). It will be an important contribution to our understanding of breeding bird distribution and abundance in Ontario, and a useful baseline against which future populations can be compared.

The project has helped to develop cooperative relationships between groups interested in conservation, a large volunteer network that we hope to build on to develop future projects, and a sophisticated computer data base. The computer data base will facilitate analysis of the information collected by volunteers so that factors such as species associations and the relationships of distributions to biogeographical features can be quantified.

Atlas projects around the world have proved to have similar benefits. The flexibility of the methodology means that with careful planning, atlas projects can be successful wherever there is sufficient support from the naturalist community.

METHODS

Space does not permit a full account of atlassing techniques here. The reader is encouraged to refer to Sharrock (1976) and Eagles and Cadman (1983) for a full explanation.

The Ontario atlas is a joint project of the Federation of Ontario Naturalists and the Long Point Bird Observatory. Activities are directed by a Management and a Technical Advisory Committee composed of professionals and prominent amateur naturalists. The project has had two full-time staff since 1981 and a full-time data base manager since early 1983. Other temporary staff have been hired on government employment programs, both for clerical and field work, as needed. In 1985, three naturalist clubs hired summer employees for field data collection.

The Atlas' base budget was in the range of $55,000-$70,000 each year. Funding was provided by 10 different organizations, but the bulk of funding was provided by the Canadian Wildlife Service, the Ontario Ministry of Natural Resources, Supply and Services Canada, the Richard M. Ivey Foundation, the Ontario Heritage Foundation, and World Wildlife Fund Canada. Some data were sold to consulting companies to assist in environmental impact assessments.

Data collection is based upon the Universal Transverse Mercator Grid system shown on 1:50,000 and 1:250,000 scale topographic maps. Our goal was to obtain at least 16 hours of coverage in each of the 1900 10x10 km squares in sector 1 (southern Ontario north to Sault Ste Marie) and 50 hours in each of the 110 100x100 km blocks in northern Ontario. Data were also collected on a 10 km basis near the city of Thunder Bay. After two years, preliminary data allowed us to set new goals for coverage in southern Ontario based on the number of species that should be recorded before the square could be considered adequately sampled. Adequate coverage in sector 1 required that at least 75% of the species expected to breed in a square were recorded. Though most squares in the south were road-accessible, 60 northern blocks had no road or rail access. Atlassers were encouraged to record information on a 10 km square basis in northern Ontario, so that we had precise details as to where the work had been done, but our goal was to obtain a representative sample of the birds that bred in the whole 100 km block.

The province was divided into 46 regions, each of which had a volunteer regional coordinator. It was their responsibility to help find and assist volunteers, and to ensure that all squares and blocks were covered. Volunteer involvement grew from 500 people in 1981 to over 1500 in 1985. Atlassers were mainly concentrated around urban centres in southern Ontario, so travelling to under-populated areas was encouraged from the beginning. Nevertheless, coverage around cities was obtained first with gaps elsewhere gradually filling in over the years. Only since 1983 has considerable effort been made to sample remote blocks of northern Ontario.

Full instructional materials were provided, and a quarterly newsletter kept participants up to date on results and techniques. Volunteers bought their own maps and paid their own travel. Free camping in Ontario provincial parks was arranged for atlas volunteers through the courtesy of the Ontario Ministry of Natural Resources. The Ministry was also helpful in providing flights and other logistical assistance for atlassers. One private company provided a large number of flights free of charge, or at 25% of the commercial rate. Without this assistance, many northern blocks would not have been covered. Besides coastal blocks, most remote northern blocks were covered by teams of volunteers in canoes. A team of four would spend one week in a 100 km block. Advertising in Ornithological newsletters, journals and birding magazines encouraged about 50 Americans and 3 Englishmen to assist us with work in the north. All foreign volunteers were expert birders or skilled in wilderness survival. The James L. Baillie Memorial Fund provided grants to help cover the expenses of atlassers working in distant or remote areas.

RESULTS

Atlas volunteers worked for 100,000 hours and contributed more than 400,000 records. Although the 1985 data are not yet fully processed, it appears that all squares and blocks were covered, though a small number may not have attained adequate coverage. This result was obtained in large part due to an extraordinary effort in the final field season. One-third of the projects data were collected in the last year, and special emphasis was put on 'under-atlassed' species such as nocturnal, inconspicuous, or retiring birds. Though coverage of this latter group is uneven, being concentrated near cities, our knowledge of their distribution and abundance has been greatly augmented by the atlas project.

In sector 1, we are confident that we now have an accurate and comprehensive picture of the distribution of most species. The level of coverage obtained allows us to say that if a species was not recorded in a square we can be fairly sure that it was not there or that it was not common. Therefore, we can use the number of squares in which the species was recorded to gauge its abundance, and produce ranked lists showing which are Ontario's rarest breeding birds. Many volunteers categorized the abundance of each species by estimating numbers such as one pair, 2-10 pairs, 11-100 pairs, or 101-1000 pairs. These results have not been summarized and their usefulness is as yet unknown, though they have the potential to be a useful tool in estimating provincial abundance, locating significant regional trends and determining important population centres.

Eleven species have been confirmed as breeding in Ontario for the first time during the atlas period, and several others are presently under review. The majority of these are from northern Ontario, particularly on or near the Hudson Bay coast. Most of these northern birds have probably been breeding in Ontario for many years but have not been discovered because of lack of field work in these remote areas. Most of the new records from southern Ontario, [Cinnamon Teal (*Anas cyanoptera*), California Gull (*Larus californicus*), Mountain Bluebird (*Sialia currucoides*)] are most likely accidentals, though they may represent the start of future trends in eastern colonization. The Canvasback (*Aythya valisnaria*) was confirmed as a nester for the first time, though it had been suspected of breeding for some time. Other species which had bred previously were not located or confirmed as breeders. These include Lark Sparrow (*Chondestes grammacus*), Bewick's Wren (*Thyromanes bewicki*), Dickcissel (*Spiza americana*) and Greater Prairie Chicken (*Tympanuchus cupido pinnatus*).

New breeding locations were found for many rare species, including Hooded Warbler (*Wilsonia citrina*), Bald Eagle (*Haliaeetus leucocephalus*), Acadian Flycatcher (*Empidonax virescens*) and Henslow's Sparrow (*Ammodramus henslowi*).
Some species were found to be more common than expected eg. Sandhill Crane (*Grus canadensis*), Blue-grey Gnatcatcher (*Polioptila caerulea*), Red-bellied Woodpecker (*Melanerpes carolinus*), Common Raven (*Corvus corax*), Screech Owl (*Otus asio*) and Saw Whet Owl (*Aegolius acadius*). Unsuspected patterns of distribution were found for many species, including Yellow-throated Vireo (*Vireo flavifrons*) which appears to have two distinct centres of population; Black Tern (*Chilidonias niger*), which is absent away from the Great Lakes shorelines in most of south-western Ontario; Upland Sandpiper (*Bartramia longicauda*), which is found in heavy concentrations in extreme eastern Ontario; and Loggerhead Shrike (*Lanius ludovicianus*) which is concentrated along the northern edge of heavily cultivated land in southern Ontario. The Atlas provides a useful baseline against which changes in population and distribution can be compared. The distribution of rapidly expanding species such as House Finch (*Carpodacus mexicanus*) will be well documented by the Atlas data when separated into yearly files.

Summarizing and mapping species totals for squares and blocks provides useful data on species diversity in different parts of the province. Somewhat surprisingly, the area of lowest diversity is in Essex and Kent counties in extreme south-western Ontario and the area of highest diversity is along the southern edge of the Canadian Shield between Ottawa, Kingston and Gravenhurst. A number of species that are rare elsewhere in the province are found in this latter location. These findings have important implications in potential recommendations for land use in all of southern Ontario, and particularly in the extreme southwest where woodlot removal and drainage would appear to be responsible for low species diversity.

SUMMARY

Breeding bird atlas projects have a variety of benefits:

1. They provide a greater understanding of the distribution and abundance of all species. This is, of course, of most immediate importance in our knowledge of rare, threatened, and endangered species.

2. They provide useful baselines against which future changes in distribution, abundance and status can be compared.

3. They help develop cooperation between conservation groups; an atlas is most successful when all interested groups work together.

4. They help create a network of volunteer naturalists who are motivated, knowledgeable and who can serve as a basis for future atlases, and other similar projects.

5. They create large, detailed data sets that can be analysed to help understand factors affecting the distribution and abundance of species.

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THE SASKATCHEWAN BIRD ATLAS PROJECT

A.R. Smith

The Saskatchewan Bird Atlas Project is different from standard bird atlases in several ways. These differences are the result of certain constraints and different objectives. The constraints are imposed by Saskatchewan's relatively low population density. This has resulted in the use of the larger 1:50,000 mapsheet as the grid (instead of the standard 10km UTM grid) and the use of a 20 year atlas period instead of the standard five year period. Although these changes mean a loss in precision, it was felt that the grid size and time period were appropriate for, and make the best use of, the data that would be available. This judgment was proven correct as the project progressed.

Differences due to different objectives include the use of data from the recent past. Saskatchewan has had a reputation perhaps unparalleled in Canada for the publication of regional annotated lists of birds and participation in other census projects such as the Breeding Bird Survey, Prairie Nest Records Scheme, and the Christmas Bird Count. It seemed important to us that these valuable sources of information, which included winter and migration data, be used. Emphasis was placed on the documentation of the exact location of the occurrence of rare and endangered species and habitats, species peripheral to the province, and important waterfowl and shorebird staging areas.

The results of this project have been analyzed two ways. Firstly, species maps were prepared showing the status and distribution of each species on the provincial grid. Many of these maps are illustrative of various biogeographic phenomena such as range contraction (Ferruginous Hawk *Buteo regalis*), range expansion (Great Crested Flycatcher *Myiarchus crinitus*, Orchard Oriole *Icterus spurius*), migration routes (Whooping Crane *Grus americana*, Blackburnian Warbler *Dendroica fusca*), reverse migration (Prairie Falcon *Falco mexicanus*), ecological isolation between species (Hairy (*Picoides villosus*) and Downy Woodpeckers (*Picoides pubescens*), Say's (*Sayornis saya*) and Eastern Phoebes (*Sayornis phoebe*).

Secondly, key area maps were produced. These show the areas of importance to migratory birds: waterbird colonies, raptor breeding areas, Sage Grouse (*Centrocercus urophasianus*) leks, waterfowl and shorebird staging areas, and sites used by rare and endangered species. The delineation of areas of importance to the passerines and other poorly surveyed taxa was problematic and was inferred from occurrences of habitats suitable to these groups. If these habitats were scarce they were indicated on the maps. Examples of such areas include riparian woodlands (owls and passerines), and extensive sedge marshes (rails and other marsh birds). Since many areas were important to more than one species or group, data could be combined to form key zones. Final steps were the calculation of the size of each area, and the amount of land under various jurisdictions. The latter step can have enormous management implications.

The process of delineation of key areas is difficult since there is no a priori method. If criteria are applied a priori, too few or too many areas may be defined. This process, then, is as much an art as it is a science for if too few areas are delineated the species, group or habitat may receive inadequate protection; on the other hand if too many areas are chosen the results may lack credibility.

THE ALBERTA BREEDING BIRD ATLAS PILOT PROJECT:

THE CALGARY EXPERIENCE

Allan Wiseley

In 1982 and 1983, the Bird Study Group of the Calgary Field Naturalists Society conducted a pilot breeding bird atlas project. The area chosen for the Calgary Atlas was a circle of 80 km radius centred on the heart of the city. The circle contains approximately 200 of the Universal Transverse Mercator (U.T.M.) grid system of 10 km x 10 km squares. Each square represented an independent sampling unit.

A total of 30 observers signed up to participate in 1982, however 8 of these dropped out or failed to turn in data. Eight observers atlassed independently in single squares; three paired observers surveyed individual squares; and one "blitzing" group of 6 (which eventually decreased to 3) tried to survey single squares each weekend during the months of June and July. The following year interest dropped and only a handful of observers actively sampled squares. Surveying was done on a total of 22 squares in the Calgary Atlas, predominantly in the first year. Birdwatching records from non-atlassers were also integrated into the Atlas data, giving usable information on an additional 34 squares.

Despite the urging to complete 16 hours of observation time in the squares, only 7 squares had 15 or more hours spent in them. Several of the squares with low hours had been done by the blitzing group or by keen people taking an opportunity to contribute further. The quality of the breeding evidence gathered was judged relatively low, based on the high proportions of records in the "observed" and "possible" breeding categories and the low proportions of "probable" and "confirmed" records.

The Calgary Breeding Bird Atlas failed to meet its objectives, but the experience has been informative and rewarding to participants. Reasons offered for its failure are the following:

1. Time spent by observers in squares was low, reflecting flagging levels of personal commitment over the duration of the project.

2. Some observers suffered from a lack of training, although help was offered on several occasions.

3. There was a low level of contact between leader and participants during the project.

4. Data compilation was slow, preventing the flow of desirable feedback to participants.

The future of an Alberta Breeding Bird Atlas project is tenuous for several reasons, including the above problems encountered in Calgary. The success of an Alberta Atlas must rely heavily upon knowledgeable participants. Alberta may not have the number of capable volunteer birdwatchers and professional ornithologists needed to adequately atlas the province. The marshalling of the numbers of volunteers needed is no small task. We must also seek to further develop skills in the birdwatchers that would be participating.

The view of the Alberta Ornithological Records Committee is that the Calgary Atlas project was valuable in spite of low levels of coverage and relatively low quality breeding evidence gathered. A well planned and supported project would considerably reduce the faults encountered in the Calgary experience. The project will only work with the committed efforts of several professional ornithologists and a "bandwagon" atmosphere generated by supporting agencies and organizations.

LEGAL STATUS OF ENDANGERED SPECIES IN ALBERTA

Doug Culbert

INTRODUCTION

The Alberta Fish and Wildlife Division is presently in the process of finalizing a new Wildlife Act. Regulations under this Act are currently under review and must be approved by government before the new Act is proclaimed. This presentation will deal with the legal status of endangered species under the present Wildlife Act as well as the proposed new Wildlife Act.

PRESENT LEGISLATION

The Wildlife Act, including its regulations, is the primary legislation protecting the fish and wildlife resource in Alberta. The Designation and Protection of Endangered Wildlife Regulations is the only legislation under the Act that specifically deals with endangered species. This regulation: a) designates the Double-crested Cormorant (*Phalacrocorax auritus*) and the White Pelican (*Pelecanus erythrorhynchos*) as endangered species; b) establishes several of the nesting colonies of these birds as prohibited access wildlife areas; and c) prohibits entry upon and/or approach within one-half mile of these prohibited access wildlife areas. No specific reference is made in the Act with respect to the hunting, trapping, and possession of endangered wildlife. However the Act prohibits these activities with respect to all wildlife species unless a person is the holder of a licence or permit authorizing him to do so, or the Act or regulations authorize the activity without a licence or permit. In essence, there is no distinction made between offences concerning endangered or non-endangered species. A person who contravenes provisions of the Act in respect to the above activities is liable to a fine from $10.00 to $1,500.00.

PROPOSED WILDLIFE ACT

The proposed Wildlife Act and regulations once they are proclaimed, make provisions for the protection of endangered species habitat and allow for higher fines and/or imprisonment to persons guilty of illegally hunting, trapping, or possessing endangered species. Regulations under the Act will designate 11 species as Endangered Animals and make provisions for the protection of habitat.

Specifically, the Lieutenant Governor in Council may make regulations: a) establishing wildlife sanctuaries and habitat areas; and b) classifying wildlife sanctuaries into those for the benefit of all wildlife or those for prescribed kinds of wildlife. In addition, the Minister may make regulations: a) providing that areas are to be wildlife sanctuaries, habitat development areas, migratory bird lure sites, or wildlife control areas only for prescribed parts of the year; b) respecting the use, control, and management of the aforementioned areas; c) respecting the access or exclusion of any person to or from the aforementioned areas; and d) respecting the protection of wildlife habitat and the restoration of habitat that has been altered.

The proposed Act will make a distinction between offences concerning endangered species and other wildlife species. A person who is convicted of an offence (i.e. hunting or trafficking) in respect to an endangered species will be liable to a fine of not more than $100,000 or to imprisonment for a term not more than six months, or both. In addition, all of the licences of that person that are of a type prescribed as recreational will automatically be cancelled and his right to obtain or hold any such licence will be suspended for a period of three years.

MANAGEMENT POLICY

In September of 1985 a draft "Policy for the Management of Threatened Wildlife in Alberta" was developed by the Fish and Wildlife Division. The information in this document now serves as interim policy until such time as it is revised and recommended by the Fish and Wildlife Advisory Council and approved by the Minister.

The purposes of the policy were to: a) adopt a system to identify threatened wildlife; b) to rank species into categories that reflect the degree of threat; and c) to recommend management actions for threatened wildlife. Four levels of threat were subjectively selected to rank the status of wildlife species in Alberta; Endangered, Threatened, Vulnerable, and Viable. Eleven species were identified as endangered, threatened, or vulnerable. They were:

Endangered	Peregrine Falcon	(*Falco peregrinus*)
	Whooping Crane	(*Grus americana*)
	Wood Bison	(*Bison bison athabascae*)
	Swift Fox	(*Vulpes velox*)
Threatened	Burrowing Owl	(*Athene cunicularia*)
	Ferruginous Hawk	(*Buteo regalis*)
	Woodland Caribou	(*Rangifer tarandus caribou*)
Vulnerable	Piping Plover	(*Charadrius melodus*)
	Mountain Plover	(*Charadrius montanus*)
	Trumpeter Swan	(*Cygnus buccinator*)
	White Pelican	(*Pelecanus erythrorhynchos*)

LEGAL STATUS OF ENDANGERED SPECIES IN SASKATCHEWAN

Adam P. Schmidt

Saskatchewan does not have any legislation that identifies or gives special protection to endangered species. General regulations under the Wildlife Act prohibit hunting, pursuing, or disturbing any wildlife except game species during hunting seasons or species that are not protected at any time. Thus, endangered species already receive legal protection. The only additional protection that might be considered would be to increase the penalty for violations against certain species.

In recognition of the sensitivity of colonial birds to disturbance, some colonial nest sites have been designated as Wildlife Refuges. Most of the White Pelican (*Pelecanus erythrorhynchos*) colonies have been assigned this status. Except with a special permit, no one may enter or approach within 100 m of a Wildlife Refuge. Destruction or alteration of habitat within a refuge is also prohibited.

In order to protect their property or livestock, landowners may destroy any carnivore except raptors, Swift Foxes (*Vulpes velox*), and Black-footed Ferrets (*Mustela nigripes*). This regulation recognizes that some species should not be destroyed even if they become a problem. However, the regulation does not give them additional protection above other protected species.

The Critical Wildlife Habitat Protection Act prohibits sale or alteration of wildlife habitat on designated crown-owned lands. This Act was aimed primarily at protecting habitat for game species but it was also used to protect habitat for White Pelicans, Great Blue Herons (*Ardea herodias*), Ferruginous Hawks (*Buteo regalis*), Sage Grouse (*Centrocercus urophasianus*), and Prairie Falcons (*Falco mexicanus*). The maximum penalty for a violation under this Act is $2,000.

The maximum penalty for a violation under the Wildlife Act is $1,000 except for hunting wildlife with the use of a spotlight where the minimum penalty is $500 and the maximum is $2,000. Conservation officers have the option of taking a case to court or allowing the accused to make a voluntary fine payment. If the case goes to court and results in a conviction, the judge usually imposes the same fine as the voluntary payment unless there are special circumstances that warrant a larger penalty.

Most charges related to endangered species would be laid under the section of the Act that prohibits killing, disturbing, or molesting protected wildlife. The voluntary payment for such an offence is $100. If the offence occurs in a wildlife refuge or game preserve, the voluntary fine payment is $100 plus $150 for each big game animal and $25 for each other animal or bird unlawfully taken. Charges related to trading or trafficking in wildlife could result in a fine of $100 plus $150 for each big game animal, raptor, White Pelican, Swift Fox, or Black-tailed Prairie Dog (*Cynomys ludovicianus*) and $25 for each other animal or bird. In addition to a fine, anyone convicted under the Wildlife Act loses their hunting privileges for a period of one year. This penalty probably is more of a deterrent than any of the fines that might be levied.

In Saskatchewan, we do not have any plans to implement legislation to give special protection for endangered species. Some animal groups such as amphibians and reptiles currently are unprotected. If public interest dictates, some species may require protection in the future. The maximum penalty for convictions under the Wildlife Act, particularly for trafficking in wildlife, are presently being reviewed.

THE ROLE OF MUSEUMS IN ENDANGERED SPECIES CONSERVATION

W. Bruce McGillivray

Natural history museums are often viewed as one of the bad guys in the fight to preserve endangered species and in the effort to preserve wildlife in general. The tangible evidence used against museums is the drawers and cases containing thousands of animal and plant specimens. There is also a public attitude against scientific collecting built in part by portrayals of museums collectors on television and in the movies as indiscriminate in their collecting activities.

Bias against scientific collecting has developed from suggestions that museums collectors were responsible for the ultimate extinction of some endangered species. Two birds that come to mind are the Great Auk (*Alca impennis*) and the Huia (*Heteralocha acutirostris*). For both species, the last recorded specimens are found in museums (Greenway 1967). There is a tendency to presume that those who acquired the last documented record of existence in fact "caused the extinction." This tendency persits despite an awareness of intensive harvesting of Great Auks for food in the 18th and early 19th centuries and loss of Huia habitat in New Zealand. The problem is one of semantics, since a documented record means the collection of a specimen - the last documented record would be associated with a specimen and would most likely be found in a museum.

Why then do museums have large collections of organisms and why are they useful in the conservation effort? One of the primary uses for museum collections is the preservation of an historical record extending decades even millenia into the past (if we consider fossils). This record is critical in determining change and the impact of man on habitats and species. Historical information provided by specimens provides insight into past ranges and relative abundances of currently endangered species. The presence of environmental contaminants can be well documented by examining specimens collected over the span of many decades. Evolutionary modifications in clutch size, egg dimensions, organism size, shape and coloration can be detected and related to environmental factors. These types of data are used when baseline information is needed on currently endangered species. For instance, historical collecting localities could tell us where to search for current populations. Historical associations between occurrence and land use can be assessed and reasons for range expansion or contraction analyzed. To be of continuing value, this historical record must be maintained and updated.

Probably the primary value of museum collections to conservation is through their use in specimen identification and for research into species and subspecies relationships. The definitions we use to measure degrees of rarity refer only to species but it is clear that preservation of distinctive subspecies or genetically unique populations may also be important. In the past, identificaton of taxa was based on external characters (ie., color, plumage, dentition etc.). It is only recently with the advances in biochemical systematic techniques (such as eletrophoresis, DNA x DNA hybridization, and radio immunoassay, cf. Barrowclough 1983, Buth 1984) that we can assess the genetic uniqueness of populations and subspecies. Taxonomic questions are now being answered in the biochemistry laboratory as well as in the scientist's office. These techniques utilize fresh or frozen tissues -

therefore in addition to having skins and skeletons, museums are becoming storehouses of frozen tissues.

In Alberta, a number of bird species are separable into 2 or more distinctive forms. Work is ongoing with several of these species to assess the genetic relatedness of the forms and determine whether new species should be named. For some species, distinctive populations may be at risk even though the species as a whole is not threatened. Without knowledge of the population structure of a species, no meaningful conservation effort can be attempted.

In Canada, museums are usually supported by tax dollars, yet museum research is guided more by biological than by political boundaries. Hence, museums can study the distribution and abundance of an endangered species thoughout its range rather than examining rarity in a political context (ie., rare in Alberta, or rare in Saskatchewan). The question can arise whether or not to preserve an endangered population of a species in one jurisdiction if the same species is common in another jurisdiction. A museum might supply information on the genetic uniqueness of the local population and on the differences between populations of the species in the two jurisdictions. However, without continued acquisition and study of specimens, these answers would not be available.

A final area I want to consider is the preservation of frozen tissues. Because of the importance of biochemical methods to modern systematics, many museums possess special freezers for ultra-cold tissue storage. Technology in cryopreservation has increased so that it is now possible to freeze embryos of several mammalian species, thaw and implant them into host wombs (Gee 1984). Many of these embryos have matured successfully. The implications are obvious - sperm, eggs, seeds, plant meristems, even whole organisms could be preserved frozen to be thawed to enhance gene pools or to restock new habitat. It sounds improbable but the technology will soon be reliable enough to consider frozen gene pools a practical alternative. Captive propagation programs would be preferable but the physical capacity of zoos to propogate species is limited (Conway 1980). Cryopreservation may be the only way of preserving the genetic information of non-glamorous endangered species.

I close with a request to those working on endangered species to remember that specimens (either complete or partial) are of great value if preserved properly and stored in a museum. If specimens are found in the field or mortality occurs in captive situations, all material that is not in use should be turned over to a museum. Comprehensive collections could be built with specimens acquired this way. These collections provide insurance, the value of which will be judged in the future.

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HISTORY OF THE LAST MOUNTAIN LAKE BIRD SANCTUARY

SASKATCHEWAN (1887-1987)[1]

P.S. Taylor and C. Jorgenson

On June 8, 1887, the federal government under Sir John A. MacDonald reserved the first area for wildfowl in Canada at the north end of Last Mountain Lake in what is now central Saskatchewan, then part of the Northwest Territories. This reserve contained approximately 1,026 ha. Sanctuaries in other provinces were not established until 1920, giving Saskatchewan the distinction of having the first bird sanctuary in Canada, indeed, in North America. After the Migratory Birds Convention Act was passed in 1917, the reserve was known as the Last Mountain Lake Bird Sanctuary.

The sanctuary was expanded in 1921 to include all the waters of Last Mountain Lake along with the islands and uplands originally set aside on the northern portions of the lake. Administration of the sanctuaries at this time was carried out by Canadian National Parks in Ottawa. In 1951, the boundaries of the sanctuary and the administration again changed to include the present day boundaries containing almost 4,900 ha administered by the Canadian Wildlife Service.

In 1966, the Canadian Wildlife Service began the purchase of marginal lands around the northern portions of Last Mountain Lake. Almost 3,240 ha of provincial crown land was added forming the land basis for the first cooperative wildlife area in Canada. Today, the Last Mountain Lake Wildlife Area contains approximately 14,126 ha of lake, wetlands, and uplands within its boundaries, including the 4,795 ha bird sanctuary. The area received International Biological Program status in 1970 and was designated as a Ramsar site for Wetlands of International Importance in 1982.

Negotiations for an agreement between Canada and Saskatchewan have been underway for a number of years to have the area protected and managed under one authority, the Canada Wildlife Act and its regulations. This agreement to form the Last Mountain Lake National Wildlife Area will give primary responsibility for all lands to Canada, and recognize the cooperation between the federal and provincial governments in protecting the area during its first 100 years.

On June 8, 1987, Canada will have a unique opportunity to celebrate the 100th anniversary of wildlife conservation in our country.

[1] Abstracted from Taylor, P.S. and C. Jorgenson. 1985. Sanctuaries in Canada. The Blue Jay 43:102-106.

PUBLIC EDUCATION SESSION - PROJECT WILD

Jennifer Clark

Education of both children and adults has a large part to play in stemming the tide of extinction for both plants and animals.

Project WILD is an important tool for those who work with children. Designed and written by teachers and wildlife managers, project WILD contains 81 activities that teach about wildlife and its needs.

Project WILD is inter-disciplinary and supplements a wide variety of curriculum subjects, but it tackles more than just wildlife information. In the face of the many pressures affecting the quality and sustainability of life on earth, WILD addresses the need for human beings to develop as responsible members of the ecosystem.

The goal of WILD is to assist learners of any age in developing awareness, knowledge, skills, and commitment to result in informed decisions, responsible behaviour, and constructive actions concerning wildlife and the environment upon which all life depends.

Two WILD activities deal directly with issues of endangerment: Deadly Links and Here Today, Gone Tomorrow.

C.W.F. sponsors WILD at the national level. Project WILD is delivered in Alberta by Alberta Fish and Wildlife Division. A network of facilitators presents free six hour workshops around the province where and when requested. Attending a workshop is the only way to obtain a WILD activity manual. Many other provinces have adopted WILD or are considering doing so.

PUBLIC EDUCATION: COMMITMENT TO THE CLASSROOM

Joy Finlay

My premise is that every one of us is an educator in some way, recognized or not, whether in the formal, informal, or nonformal "classrooms" of our time. I believe the ABC's of a curriculum for public education are within the realm of practical application for each and every one of us. They are based on learning about the ABC's of environmental education; based on some aspect of the science of life and/or the art of living. But I want to emphasize that PEOPLE are what make any program, or place, or publication work! It is by example of lifestyle and initiatives taken (or neglected) by individuals that public education in the broad sense is (or is not) effected. Program and facility resources, like legislation, may be used to facilitate the process, but they do not cause it to happen.

Has this workshop been public education? Yes? Was there a program of study to follow? No? Was there a place, a facility whose mandate provided this workshop? Were the materials already prepared for us? What was the key that brought about this public education event? True, this workshop represents a web of interrelated factors - programs, facilities, and materials. But the key to these resources being brought together? PEOPLE!

Someone had the idea and took the leadership. Many others became involved to help plan, present, and participate. PEOPLE have been the key to this workshop's success. The programs, paper resources, and the facility are important, but are not in themselves the key.

Now you are still wondering what I meant by the ABC's for education, the basics for a curriculum. ABC stands for the stuff this world system is made of - the ABIOTIC, BIOTIC, and CULTURAL components.

What do we need to teach this curriculum? We could take awhile to list excuses for why we cannot progress with public education. (We do this in and for the schools!)

We need people such as you and me:

- Who are aware of our own lifestyle - so we can teach by example (or practice what we preach);

- Who use their energy to pursue further knowledge of the ABC's that make this world tick;

- Who take a persistent initiative to promote a greater awareness, understanding, and responsibility for ensuring an environment fit for living;

- Who are opportunistic about sharing appreciation, knowledge, and concern about the living and non-living things of the natural and the built environment; and

- Who believe that education is an ongoing process and the classroom is everywhere.

In closing, I share the following poem with you:

"Tell me, tell me everything!
What makes it Winter
And then Spring?
Which are the children
Butterflies?
Why do people keep
Winking their eyes?
Where do birds sleep?
Do bees like to sting?
Tell me, tell me please, everything?

Tell me, tell me, I want to know!
What makes leaves grow
In the shapes they grow?
Why do goldfish
Keep chewing? and rabbits
Warble their noses?
Just from habits?
Where does the wind
When it goes away go?
Tell me! or don't even grown-ups know?

(from Curiosity, by Harry Behn)

CONCLUDING REMARKS TO THE ENDANGERED SPECIES CONFERENCE

Stephen Herrero

I have been asked by the conference organizer to summarize some of the major events in the conference. I have tried to do that faithfully, given that I could not be at all the sessions.

Geoff Holroyd began by telling us that there are 7.9 million Canadians that want to become involved in wildlife related activities. This is a figure that bears repeating. It is about a third of our population. We are a country that has a significant and enduring interest in wildlife. The opportunity exists to tap that interest in terms of concrete programs that will protect habitat, protect species, and make all of our lives richer.

It became obvious to me early in the conference that we owe a lot to COSEWIC. Tony Keith hit on some of the highlights. The species status reports that have been generated by COSEWIC over the years are the bible of information on species throughout Canada as well as on the prairie. These are detailed reports done for very little remuneration, by dedicated people who have accurately informed us of the status of wildlife throughout Canada. This information has been fundamental to the kind of action we are trying to take here today. Someday soon we will hopefully be able to go from status reports to species recovery plans.

Tony Keith mentioned that in 1979, the Federal-Provincial Wildlife conference brought out, through the work of COSEWIC, that there was a clustering of endangered species on the prairie. Perhaps as many as half of the species in trouble in Canada: endangered, threatened, rare, or extirpated occur in the prairie provinces. When you look at the prairie, this should not be surprising. You have land that was developed quickly because of its economic value. We developed it before we protected wildlife habitat. Reserves and other forms of protection have been a rear guard action trying to salvage what is possible. We have not done that badly in some ways; in others we have done very badly. The fact that there is not any significant Tall-grass Prairie left partly reflects the value of that land for agriculture purposes and partly our shortsightedness. We would all give out of our own pockets today if we could go back and recreate a major Tall-grass Prairie reserve, but we cannot. There are only certain things that are possible.

There are a number of federal, provincial, and private sector initiatives happening, however, that suggest a very interesting future. Monte Hummel told us about the Wild West Programme soon to be launched by World Wildlife Fund Canada. Here, about $600,000 raised by WWF will be used to aid endangered prairie species and other natural components of the prairie.

In another session I was able to attend, I learned about the legislative basis and legal aspects of the protection of endangered species. I learned that at least five pieces of federal legislation are important in the protection of rare, threatened, endangered, or extirpated wildlife in Canada. One of these is the Canada Wildlife Act. Using it, joint agreements have been drawn between the Canadian Wildlife Service and the provinces for the reintroduction of Wood Bison (*Bison bison athabascae*) and Swift Fox (*Vulpes velox*), and perhaps some day will be made for the reintroduction of Black-footed Ferrets (*Mustela nigripes*). This is an important piece of legislation for helping to restore species in trouble. The Game Export Act is another important piece of legislation that helps to control the flow of potentially endangered species between provinces. It is administered by the Department of Indian and Northern Affairs. There is an Export and Import Act administered by External Affairs, or Customs, that helps to control the flow of endangered species in and out of Canada, especially those protected under the CITES Convention. There is the very well known Migratory Birds Convention Act. If a bird is fortunate enough to be migratorial along international borders, it is well protected by this Act, which again is administered by the Canadian Wildlife Service.

Finally, we were reminded in the session by Harold Eidsvik, that the Parks Act is very important for the protection of wildlife. This is because the National Parks Act gives strict protection to wildlife unless they endanger people. Parks Canada administers many diverse pieces of land.

Taking all legislation together there is a broad federal legislative basis for species protection, but there is not as we heard, a single endangered species act, and it does not sound like we should expect one. The Endangered Species Act in the United States has been hailed by some as a very progressive piece of legislation; by others as a prohibitive and not terribly successful Act. Be what it may in the United States, we are not apt to see the same kind of legislation here. It tends to be strictly prohibitive, something unusual in Canada. Here we will probably continue with a negotiative type of arrangement whereby endangered species and their needs are identified, and then they are managed by debate and discussion between the federal-provincial jurisdictions and interested citizens. In other words, I suspect we will continue to have a negotiative protection of endangered species as opposed to a very strictly legislated protection - such is our way of progress.

It was interesting to find out that the three prairie provinces all have some form of change, expansion, or improvement of their legislative bases related to endangered species. Perhaps the most impressive is Alberta's "Policy for the Management of Threatened Wildlife in Alberta." It sets forth the logical and conceptual basis for defining endangerment. It identifies the status of different species in the province. It also proposes legislation that will strengthen our ability to manage, protect, and encourage the future of endangered wildlife in Alberta. But typical perhaps of provincial approaches, it identifies habitat and impact on habitat of endangered species as being important, but it does not prohibit development on lands used by endangered species. It just suggests identifying impacts. So it is a piece of legislation that will help to increase the focus of impacts on endangered species, but it will depend upon the concern and vigour of the people involved in order to get habitat protected.

There was a major theme in the conference of identifying what we should protect by legislation, where, when, and how. Should we be protecting species, populations, or subpopulations? These issues have been debated in biology for years. Aldo Leopold perhaps answered this debate as well as possible. People kept on telling him there were a lot of Grizzly Bears (*Ursus arctos*) left further up north, and so why was he worried about them in the lower 48? He said, having Grizzly Bears only in Alaska is good enough for some, but it is not good enough for me. Having Grizzly Bears only in Alaska is like only having happiness in heaven; Leopold was afraid he might never get there.

We will continue this debate. I think there should be different answers in different places. If there are enough people who are concerned about a local population of anything, then that should, if possible, be saved. But the other side of the coin is a very hard one. And that is, how many do we have to save? We are beginning to get more sophisticated in arguing about the genetic reasons for preserving species and populations. We know many plant species are important in medicine, as Monte Hummel pointed out, and we know genes from wild species are important in bringing characteristics such as disease resistance back into agricultural crops like wheat and corn. We know wild genes have saved domestic varieties many times. But how many wild genes do we save? Should we save all of the wild strains of corn? Who should pay to save them?

How many Whooping Cranes (*Grus americana*) do we want? Fortunately people have been working on this type of question. The concept of a minimum viable population has proved to be a tool that many of us are using. We have heard quite a bit about this at the conference and it is important. I do not know how many of you picked out this theme running across a number of presentations. For example, Ernie Kuyt said that with regard to Whooping Cranes, their long term aim was to establish at least three populations of whoopers. Then he could go away happy. One population, the one that migrates between Wood Buffalo Park and Aransas Wildlife Refuge in Texas, should have at least 40 breeding pairs, and there should be two other populations independent of this with at least 25 breeding pairs. These are semi-soft numbers, but they have come out of the evolving field of conservation biology. Geneticists and biologists have become seriously interested in the conservation of small populations, perhaps because small populations are becoming more common. Species or populations reduced to this level often have the support of many people who are concerned that say Whooping Cranes survive.

Note the controversy regarding the Grizzly Bear in Yellowstone National Park. How many are enough? It is important that determination be accurate, because once gone we probably could not restore them.

We have also faced this question in the Swift Fox reintroduction work. Our overall goal is to establish three to five independent, free-ranging populations so that severe winters, disease outbreaks, or other vagaries of one season will not completely decimate the entire population. Right now we do not have one population established, so we are going to be around for a while in trying to successfully achieve these ends. Hal Reynolds mentioned the same thing with regard to Wood Bison. Again aiming for three populations, maybe five. So we have a long way to go before we are able to establish minimum viable populations for these endangered species that are being rehabilitated. The Whooping Crane work and the Peregrine Falcon (*Falco peregrinus*) work have been going on for a long time. Funding agencies are hard to convince that success will take longer than a few years. Thank God the federal government exists to give continuity, although seldom many dollars, to the funding for many endangered species restoration projects. Also, Alberta Recreation, Parks, and Wildlife Foundation has been very understanding, as has the World Wildlife Fund. Even the World Wildlife Fund has its three year horizon at which time they feel results should be concrete. But with most of these endangered species restoration projects, the time frame will be 5-20 years. There is patience and time needed in order to restore the endangered species that we are all concerned about.

Amidst the big issues of what and how many to protect, we tend to forget the little issues that make threatened and endangered species real to us. I want to give a special thanks here to the Calgary Zoo and Ralph and his colleagues who brought down Tika and Audi our little, live Swift Fox. I think these are probably the two most valuable Swift Fox that we have in the world today. They were hand reared from birth by the Calgary Zoo who, in their experience and foresight, had the idea that these foxes would be tremendous public relations agents. I know any of you that went to visit them will agree. Sure they are cute and cuddly and might give the "wrong" image of being a tamed "wild" animal. Ideally, people could go out in the Swift Fox's natural environment and see wild foxes and learn about them. But I think Tika and Audi are a good beginning. Interesting and informing people about the animals in captivity can be a start for appreciating them in nature.

Finally, schools are starting to teach about real animals in their natural environment. Project Wild is something that was developed in the United States to do this and we heard about it in the education section. It has been recently translated into the Canadian context, and I think will be very successful here as it has been in the United States. Operation Lifeline, the World Wildlife Fund initiated educational programme that aims at informing people about endangered species, hopefully will be another success. As long as people know about a species' status, and if some concern exists, then there is hope that we can conserve them.

At this conference, we have focussed on the importance of habitat for all wildlife. We know that habitat changes have been at the core of many of our species losses. Monte Hummel reminded us of the significant decreases in the numbers of Mallard (*Anas platyrhynchos*), Pintail (*A. acuta*), and Blue-winged Teal (*A. discors*) brought about as a result of loss of marshes and other habitats on the prairie. The session on Woodland Caribou and Mountain Caribou (*Rangifer tarandus caribou*) made it all too clear how major habitat alterations have recently decimated these caribou. In Alberta, there have been decreases of up to 30% over the last ten years or so, and up to 50% in the last 17 years. Here you have a species that oftentime abandons range when its migratory range is interrupted. This makes long-term survival a particular challenge.

How do we save habitat? There have been endless good ideas presented at this conference and clearly I think a new conviction from all of us that it can be done, should be done, and will be done. Some private groups such as Ducks Unlimited have done wonderful things for habitat protection, as has the Nature Conservancy and Trout Unlimited. The Wild West Programme, mentioned by Monte Hummel of World Wildlife Fund, Canada is another thrust in this direction.

Monte's speech last night, which introduced the Wild West Programme, was of course an event of significance in itself at this conference. It was right, insightful, well-delivered, and I think it made clear what a leader Monte Hummel and WWF are in this field. Monte and WWF have gotten many Canadians concerned about endangered species and habitat. Monte has involved broad segments of the Canadian public: business, industry, academia, agriculture, and school groups and has tied them all together to support conservation. Monte has a rare and wonderful ability to coordinate and involve.

Regarding the Wild West Programme, he identified three aims. I think they are worth re-stating. One is to establish natural areas for endangered species protection in partnership with land owners. The second one is to encourage conservation farming. Both of these are focussed at the level of the local landowner. We have known for years that if you cannot involve the local landowner, show him some benefits from conservation, then wildlife conservation programmes are doomed on the prairie. So here is a chance. The third aim of the Wild West Programme is to protect endangered species. This is the traditional interest of World Wildlife Fund and its many Canadian supporters. With the Wild West Programme, WWF will try to extend concern for endangered species into a broader concern for life on the prairie.

Above all at this conference, there was encouragement. This came from concerned people and the series of success stories about species that either have made it or are on their way to making it. The great success stories were certainly species like the pronghorn (*Antilocapra americana*), the Wood Bison, Peregrine Falcons, Whooping Cranes, and perhaps Swift Fox, although for all except pronghorn it is too early to be sure. There are other species that could be mentioned, but this is enough to suggest a significant degree of hope for the future for those concerned about rare and endangered species.

Another success was this conference itself, the fact that it was conceptualized, organized, and delivered in such a timely and humane way. The workshops balanced the major sessions. Each of you who are involved with or concerned about a particular species had the chance to get together with others having similar concerns. This is what made the conference special for me; this is what suggests a future for threatened and endangered wildlife in Canada. We have had one really grand conference focussing on this topic. I am sure it will be a seed that will grow into much more activity, more conferences, more action in the future. I hope to see you all again. Thank-you.

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