
WWF

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A

Title:

AN OVERVIEW OF REPTILES AND AMPHIBIANS IN ALBERTA'S GRASSLAND AND PARKLAND NATURAL REGIONS

Prepared by:

Cottonwood Consultants Ltd.
Calgary, Alberta

Date:

DECEMBER 1986

Contains:

From literature, museum collections, unpublished field notes, and a volunteer field research program in 1986, the status is documented for all reptiles and amphibians known to occur in the Grassland and Parkland regions of Alberta. Of a total of 16 species, five are considered to be "species of concern" -- species which are either rare or which have undergone recent and widespread declines. These include: the Western Painted Turtle, Plains Hognose Snake, Eastern Short-horned Lizard, Great Plains Toad, and Northern Leopard Frog.

The following information is provided for all species: Alberta distribution, habitat, threats, population size and trend, protective status, and recommendations for protection and management. For most species of concern, all known collection and observation localities are documented and mapped.

Title:

SWIFT FOX REINTRODUCTION PROJECT

PROGRESS REPORT 1987

WORLD WILDLIFE FUND

Prepared by:

Stephen Herrero
Professor of Environmental Science
The University of Calgary
Faculty of Environmental Design
Calgary, Alberta T2N 1N4

and

Charles Mamo
Box 314
Cremona, Alberta T0M 0R0

Contains:

During the fall of 1987, 95 swift fox were released in Alberta and Saskatchewan. Included in the report are: historical notes on swift fox, preliminary results for Fall 1987 releases, discussion of "soft" versus "hard" release techniques, and release site selection in relation to habitat requirements (especially in terms of predator-avoidance). Also outlined, is a research schedule and budget for 1988.

Title:

PILOT RARE PLANT MONITORING PROGRAM IN THE OLDMAN REGIONAL PLAN AREA OF SOUTHWESTERN ALBERTA

Prepared by:

Clifford Wallis, C. Bradley, M. Fairbarns,
J. Packer and C. Wershler

Cottonwood Consultants Ltd.
Calgary, Alberta

Date:

1986

Contains:

In 1986 a pilot project was initiated to assess and monitor known populations of numerous southern Alberta plant species identified as having "high priority". Included in the report: an evaluation of rare plant monitoring techniques, recommendations for initiating monitoring plans, identification of threats to endangered, rare and threatened species, identification of four plant species (*Iris missouriensis*, *Castilleja cusickii*, *Cypripedium montanum*, *Allium geyeri*) as endangered, and four further species (*Astragalus lotiflorus*, *Polanisia dodecandra*, *Chenopodium subglabrum*, Carex *nebraskensis*) as threatened. Other species considered rare but not threatened include, *Oxytropis lagopus*, *Suaeda moquinii*, *Erigeron flagellaris*, *Haplopappus uniflorus* and *Stephanomeria runcinata*. Recommendations are also made for the removal of several species from priority or rare plant lists.

Title:

PIPING PLOVER STUDIES

ALBERTA 1987

Subtitles:

I. Piping Plover Breeding Habitat
Census and Monitoring Program
Alberta 1987

II. Monitoring of Piping Plovers, Habitat, and Land Use
at Little Fish Lake, Alberta

III. Monitoring of Piping Plovers, Habitat, and Land Use
at Reflex Lake, Alberta

Prepared By:

C. R. Wershler
Sweetgrass Consultants Ltd.
Calgary, Alberta

Date:

February 1988

Contains:

This project was based on recommendations contained in the 1987 report, "STATUS OF THE PIPING PLOVER IN ALBERTA - 1986" by Wershler and Wallis. The 1987 Piping Plover work in Alberta included three components: field surveys, monitoring of selected key habitats, and management planning. The last component is covered in separate reports for the Little Fish Lake and Reflex Lake areas. Included in the reports are maps identifying Piping Plover habitat at: unnamed lake south of Sunken lake, Chappice Lake, Chain Lakes, and unnamed lake north of Metiskow. Detailed maps are provided for Little Fish Lake identifying: current and proposed fence, Piping Plover habitat, Piping Plover nest sites, recommended cattle access points, ecological reserve boundaries, and high/low water levels. A map is also provided for Reflex Lake describing: Piping Plover habitat, fences, and access point to be closed.

Title:

A STRATIFIED RANDOM SURVEY FOR BURROWING OWLS ON THE WEYBURN (62E) AND REGINA (72I) MAP AREAS

Prepared by:

Dale G. Hjertaas
Wildlife Branch
Saskatchewan Parks, Recreation and Culture

and

Wendy Lyon
Saskatchewan Natural History Society

Date:

June 1987
Wildlife Technical Report 87-2

Contains:

This survey was confined to the Weyburn (62E) and Regina (72I) 1:250 000 map areas of the National Topographic Survey. A stratified random survey technique was used to establish the relative abundance of the Burrowing Owl in southeastern Saskatchewan. Also studied were: rates of occupancy of suitable habitat, habitat preferences of Burrowing Owls, and the use of a stratified random sample technique on a rare species. Management recommendations, a Burrowing Owl questionnaire, and instructions for Burrowing Owl Surveys are included.

Title:

THE TALL-GRASS PRAIRIE COMMUNITY

IN MANITOBA

Prepared by:

Sheila M. Anderson

Date:

September 1986

Contains:

A survey of the known sites of Tall-grass Prairie in Manitoba, and a search for unrecorded sites in both the original Tall-grass Prairie and Aspen Parkland zones. Included are site descriptions, location maps, and species lists. Sites are discussed with respect to suitability for restoration and protection.

Title:

MANAGEMENT OF BURROWING OWLS IN MANITOBA

POPULATION DISTRIBUTION

AND

PLAN FOR RECOVERY

Prepared by:

Kenneth A. Thomson

Date:

July 1986

Contains:

Included is a literature review, with emphasis on historical and recent Burrowing Owl distribution in North America (Manitoba in particular) and recovery techniques. A "Plan For Recovery" section includes a discussion of habitat considerations, protection and education. Several historical distribution maps are included.

Title:

MONITORING OF THE PLAINS SPADEFOOT

(*Scaphiopus bombifrons*)

IN SOUTHWEST MANITOBA

1987 - 1988

Prepared by:

William B. Preston
Curator of Reptiles, Amphibians and Fishes
Manitoba Museum of Man and Nature
Winnipeg, Manitoba

Date:

May 1989

Contains:

Discussion of reconnaissance studies of spadefoot toads in the Melita - Lyleton area of southwestern Manitoba. Mentioned are: possible limiting factors, distribution, and further studies. "Have You Seen This Toad" poster included.

Title:

DISTRIBUTION AND STATUS OF PIPING PLOVERS IN MANITOBA

1986

Prepared by:

Susan Haig
Dept. of Biology, University of North Dakota
Grand Forks ND 5802
and
Delta Waterfowl and Wetlands Research Station
Portage la Prairie, Manitoba
R1N 3A1

Date:

1986

Contains:

Potential Piping Plover habitat (as seen from aerial surveys) on the shores of Lake Winnipeg, Lake Manitoba, East Shoal Lake, Lake Winnipegosis, Lawrence Lake, and Lonely Lake are identified and referenced on a map (included). Site specific comments are provided in an Appendix to the map. An extensive summary table is provided for areas surveyed for Piping Plover use in 1986. Contained in the summary table are Piping Plover locations, Piping Plover numbers (breeding adults and chicks), date of observation, observer and map reference number, and comments. The locations of Piping Plover nesting areas and migration sites in 1986, are provided on a map. A discussion includes: status of Piping Plovers in Manitoba, threats to Piping Plovers in Manitoba, conservation measures, and future studies.

Title:

DISTRIBUTION AND STATUS OF PROVINCIALLY RARE PLANTS

IN THE SOURIS RIVER VALLEY

SOUTHEASTERN SASKATCHEWAN

Prepared by:

Vernon L. Harms
The W.P. Fraser Herbarium
and Department of Biology
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0

Date:

April 1989
(Fraser Herbarium Technical Report 89-1)

Contains:

Provides an in-depth historical review of the Souris River valley (literature, floral composition, relevant events, etc.). Included in this thorough report are: an annotated list of the provincially rare plants in the Souris valley, an identification of the threats to these provincially rare plants, and an identification and description of potential "natural areas" in the Souris valley. A number of maps are included.

Title:

AN EVALUATION OF THE CONSERVATION VALUES OF THE MIDDLE SAND HILLS STUDY AREA

Prepared by:

Brian R.Braidwood
Edmonton, Alberta

Date:

May 1989

Contains:

Included is: a general discussion on "evaluating conservation value", a systematic procedure to evaluate site conservation value, an assessment of the conservation value of the Middle Sand Hills Area (located on the Suffield Military Reserve in southeastern Alberta), and recommendations for protection mechanisms for the area. The focus of the study is the measurement of threat levels and site significance in an absolute sense and not in relation to other sites.

Title:

PHASE I OF A STUDY ON THE RESTORATION OF THE TRUMPETER SWAN POPULATIONS IN SASKATCHEWAN

Subtitle:

HISTORICAL RANGE, EXPLOITATION AND POPULATION TRENDS 1743-1987

Prepared by:

H. Greenwood
and
A. Young

Oikos Ecological Research Associates Ltd.
211 20th. Street East
Prince Albert, Saskatchewan
S6V 1K7

Date:

July 1987

Contains:

A comprehensive review of the literature relevant to the historical range, exploitation, and population trends of the Trumpeter Swan in Saskatchewan. Extensive bibliography included.

Title:

WE NEED YOUR HELP TO FIND

THE BLACK-FOOTED FERRET

Prepared by:

Richard Laing

Date:

1986

Contains:

Prepared to recruit public assistance in determining if black-footed ferrets still exist in the prairie region of Canada, this document includes: a colour photograph of a black-footed ferret, status information, detailed description of the species, a detailed line drawing, a description of black-footed ferret signs, and local contact persons for reporting sightings.

Title:

POTENTIAL TRUMPETER SWAN RESTORATION IN SASKATCHEWAN

Prepared by:

Harold H. Burgess
Chairman Restoration Committee and Past President
The Trumpeter Swan Society

Date:

September 1986

Contains:

Nine Saskatchewan areas are surveyed in terms of their suitability for Trumpeter Swan reintroduction. These cursory surveys are considered supplements to the work of R.Kent Brace (1977) and the Saskatchewan Waterfowl Technical Committee (1975). Areas are prioritized in terms of their reintroduction suitability. Recommendations are made for further studies, and monitoring of other experimental Trumpeter Swan restoration work in North America.

Title:

PROJECT SUMMARY

BURROWING OWL 1987

(MANITOBA)

Prepared by:

Anonymous

Date:

1987

Contains:

Included is a description of the project's two phases: the reintroduction program at Oak Hammock Wildlife Management Area, and the continued monitoring of Manitoba's resident population of Burrowing Owls (located in the southwest portion of the province). Holding pens, artificial burrows, and traps are described.

Title:

LONG-TAILED WEASELS (*Mustela frenata*) IN MANITOBA A STATUS REPORT

Prepared by:

Kay Harvey
Graduate Student
Natural Resources Institute
the University of Manitoba
Winnipeg, Manitoba

Date:

April 1988

Contains:

Results of this study show that long-tailed weasel numbers in Manitoba are much lower than 30 years ago. Included in the report are: results from trapper questionnaires, data gathered using carcass analyses (age, sex, size, toxicological), and probable causes of reduction. Management strategies and further studies are also discussed.

Title:

ELK ISLAND NATIONAL PARK

TRUMPETER SWAN RE-INTRODUCTION

1987 PROGRESS REPORT

Prepared by:

Len Shandruk
Canadian Wildlife Service
Edmonton, Alberta

and

Terry Winkler
Elk Island National Park
Fort Saskatchewan, Alberta

Date:

February 1988

Contains:

A three year "Wildlife 87" re-introduction project was developed to restore the Trumpeter Swan (Cygnus buccinator) as a free flying migratory breeding bird in Elk Island National Park (EINP). Aerial survey techniques, capture and transplant methods, summer and migration monitoring, and winter and spring habitat monitoring are described and results from these are discussed. A number of recommendations are cited.

Title:

ALBERTA SNAKE HIBERNACULA SURVEY

-1987-

Prepared by:

Cottonwood Consultants Ltd.
615 Deer Croft Way SE
Calgary, Alberta T2J 5V4

Date:

1987

Contains:

Overwintering sites or "hibernacula" are one of the most critical limiting factors for many snake species, yet there has been very little documentation of snake hibernacula in Alberta. This study identifies locations of snake hibernacula, particulary for Prairie Rattlesnake, Bull Snake and Plains Hognose Snake, in the drier Mixed Grassland Region of Alberta. A program involving broad-scale solicitation, telephone and on-site interviews was employed both to raise the public profile of the importance of snake hibernacula and to determine additional hibernacula locations. Fifty dens were located and described as a result of this project. Included in the report are: hibernacula site descriptions (legal land description, habitat description, landowner/contact, species/numbers, land status, etc.), a discussion of public attitudes towards snakes/hibernacula, identification and discussion of threats to Alberta snake populations, and management considerations (protection of snake dens/habitats, etc.) "Wanted - Snake Dens" poster included.

Title:

MANITOBA'S ECOLOGICALLY SIGNIFICANT

AREAS PROGRAM

Prepared by:

Ecologically Significant Areas Program
Resource Allocation and Economics Branch
Department of Natural Resources
Winnipeg, Manitoba

Date:

October 1987

Contains:

The Ecologically Significant Areas program is an expansion of the earlier Ecological Reserves program. The expansion permits recognition of private land and administrator protected allocated Crown land through its voluntary protection activity. Included in this document: discussion of the development of this program (especially in relation to the World Conservation Strategy), program goal, program goal statement, program objectives, and program components.

Title:

SMALL WHITE LADY'S SLIPPER

PROTECTION PLAN

(MANITOBA)

Prepared by:

John P. Morgan
The Manitoba Naturalists' Society

Date:

October 1986

Contains:

The small white lady's slipper is an endangered orchid of the tall grass prairie. Manitoba has most of the remaining sites where this plant is known to occur. The largest and most endangered population of small white lady's slipper is near Lake Francis, 55 km northwest of Winnipeg. Site characteristics, site maps, future management needs, and project costs are included in the report. Background information regarding the Manitoba Naturalists' Society is also included.

Title:

"OPERATION GROUND OWL"

ALBERTA BURROWING OWL SURVEY

1986 TO 1988

Prepared by:

Anonymous

Contains:

1988 was the final year of a three year project to study the Burrowing Owl in the province of Alberta. Objectives of the study were: to identify key areas used by existing breeding populations, to reach a conclusion as to the status of the Burrowing Owl in Alberta, and to make recommendations regarding future land use/habitat protection and species management policies to insure the protection of existing and future populations. Included in the report: a description of specific components of the work plan, observations on nesting characteristics, limiting factors (discussion of pesticides, road kills, eradication of burrowing mammals and habitat destruction), documented nesting activity, and a specific list and discussion of recommendations.

Title:

CURRENT STATUS OF THE PLAINS POCKET GOPHER (*Geomys bursarius*) IN CANADA

Prepared by:

J. E. Dubois
and
M. Oberpichler

Manitoba Museum of Man and Nature
Winnipeg, Manitoba

Date:

September 1987

Contains:

The objectives of this study were: to delineate the species' range; to study habitat requirements, concentrating on soil and vegetation; to collect and identify ectoparasites; and to determine reproductive seasons and rates. The plains pocket gopher is a major concern to farmers and thus a survey was suggested to determine present control methods and attitudes of the farm community. Municipal and provincial gopher-control programs are reviewed, and management recommendations are formulated in support of the continued existence of the plains pocket gopher in Canada.

Included in this scientific report are: a map of plains pocket gopher distribution in Canada, discussion of past and present distribution, discussion of various habitat factors (soil, vegetation, etc.), and discussion of plains pocket gopher biology (reproduction, ectoparasites, etc.). Gopher control methods (past and present) are discussed in detail. A questionnaire (included), given to individual farmers asking them to assess the pocket gopher population and damage to their land, is also discussed. Manitoba "Pest Facts" document also included.

Title:

PIPING PLOVER CENSUS AND EVALUATION OF THE EFFECTS OF EXPERIMENTAL HABITAT ENHANCEMENT AT CHAPLIN LAKE, SASKATCHEWAN

Prepared by:

Wayne C. Harris
Prairie Environmental Services
Box 414
Raymore, Saskatchewan S0A 3J0

Date:

November 1988

Contains:

During the summer of 1988, Chaplin Lake was surveyed to assess the current Piping Plover population and to evaluate the effects of artificial nesting beach placement on this population. Included is a description of: Chaplin Lake habitat, habitat enhancement technique utilized, and censusing conducted to evaluate the success of habitat enhancement. A thorough discussion and a concise executive summary included.

Title:

OPERATION BURROWING OWL

1987 PROGRESS REPORT

(SASKATCHEWAN)

Prepared by:

Anonymous

Date:

1987

Contains:

Project Burrowing Owl was initiated in Saskatchewan in 1987. Included in this progress report: the objectives of Operation Burrowing Owl, a description of the project area, methods, program results, habitat use, and a discussion. Several tables illustrate: land system (ie. moraine, fluvial) selection by nesting Burrowing Owls, soil type selection, vegetation type selection, and the condition and use of vegetation at Burrowing Owl nesting areas. Also included is "An Introduction to Wildlife Planning in Saskatchewan", an Operation Burrowing Owl questionnaire, and an Operation Burrowing Owl voluntary habitat protection agreement.

Title:

WESTERN BLUE FLAG (*Iris missouriensis*)

MONITORING PROGRAM IN SOUTHWESTERN ALBERTA

Prepared by:

Clifford Wallis
Cottonwood Consultants Ltd.
Calgary, Alberta

Date:

February 1988

Contains:

In 1987, six permanent sample plots were established in southwestern Alberta to monitor populations of the endangered western blue flag, *Iris missouriensis*. Populations were censused and habitat characteristics were noted. Population estimates, limiting factors, threats, and recommendations are included. Detailed site data sheets contain specific information regarding the associated vegetation, detailed location notes, percent iris cover, and note of adjacent western blue flag locations.

Title:

REDISCOVERY OF GREATER PRAIRIE CHICKENS IN SOUTHERN SASKATCHEWAN

Prepared by:

Wayne C. Harris, Donald A. Weidl and Susan M. McAdam
Prairie Environmental Services
Box 414
Raymore, Saskatchewan S0A 3J0

Date:

December 1987

Contains:

During the spring of 1987, a small population of Greater Prairie Chickens were discovered in the Val Marie - Killdeer area of southwestern Saskatchewan. These birds represent the last known individuals of this species in Canada. General locations of the Greater Prairie Chicken observations (maps) and numerous notes on these observations are included.

Title:

WESTERN PAINTED TURTLE SURVEY

OF SOUTHEASTERN ALBERTA

1987

Prepared by:

Ray Wershler
8254 Edgebrook Dr. NW
Calgary, Alberta T3A 4K6

Date:

January 1988

Contains:

The main purpose of this survey was to determine the present status of the Western Painted Turtle (Chrysemys picta belli) in southeastern Alberta, and to locate oxbow lakes and other potential habitats for turtle populations. Management options with respect to maintaining or enhancing populations and protecting turtle habitat are considered, and potential effects of a proposed dam on the Milk River are reviewed. Individual sites are described, and western painted turtle status is discussed - with specific reference to Milk River, Cypress Hills, and Crowsnest Pass locations. Further studies are discussed.

Title:

RARE WILDLIFE AND PLANT CONSERVATION STUDIES IN SANDHILL AND SAND PLAIN HABITATS OF SOUTHERN ALBERTA

Prepared by:

Clifford Wallis and Cleve Wershler
Cottonwood Consultants
Calgary, Alberta

Date:

March 1988

Sandhill habitats contain a major concentration of significant features, including numerous rare, threatened and endangered species of plants and animals. Research in 1987 was undertaken on rare, threatened and endangered wildlife and plants. Rare, threatened and endangered plants were studied to map distributions and assess the degree to which dune stabilization was occurring and how this was affecting native plants. Recommendations were developed for the management of key habitats and significant species. Principal threats to native plants and animals, and "key" sand plain and sandhill habitats (worthy of formal protection, those that should be retained in their natural condition, and those which can be dropped from further consideration) are identified. This is a comprehensive report, containing species status information too numerous to mention in this brief summary.

Title:

Limenitis weidemeyeri

OR

WEIDEMEYER'S ADMIRAL IN CANADA

Prepared by:

Edward M. Pike
Drumheller, Alberta

Date:

Undated

Contains:

Having been rediscovered in Alberta (1974), Limenitis weidemeyeri has since been found in small numbers in widely separated localities along the Milk River valley. Discussed in the report are: the extent of Weidemweyer's Admiral along the Milk River valley and adjoining coulees; the larval food plant and life history; habitat preferences; harmful effects of ranching on habitat and host plants; extent of hybridization with related species; and identification of critical areas for this species' survival, with recommendations for its management. Included is a map of the Milk River drainage, indicating the known range of L. weidemeyeri in Canada, and the locations it is likely to be found. A photo depicts a typical habitat of the species.

Title:

LETHBRIDGE FISH AND GAME ASSOCIATION

BURROWING OWL PROJECT REPORT

Prepared by:

Lethbridge Fish and Game

Date:

May 1989

Contains:

During the summer of 1988, the Lethbridge Fish and Game Association began a major conservation effort in aid of the Burrowing Owl. The project involved two phases: captive breeding of Burrowing Owls for future release in specific study areas; installation of experimental artificial nest burrows in different parts of Southern Alberta. Habitat manipulation and captive breeding of threatened or endangered species, aviary construction, and artificial nest burrow installation are discussed. A map illustrates artificial nest site locations, and diagrams are included for artificial nest burrows and captive breeding aviary. Three newspaper clippings describe the project.

Title:

THE TALL GRASS PRAIRIE CONSERVATION PROJECT

PROGRESS REPORT - 1988

Prepared by:

Marilyn Latta
Manitoba Naturalists Society

Date:

April 1988

Contains:

the Tall Grass Prairie Conservation Project is designed to identify and preserve remnant tall grass prairies in Manitoba. This project is a continuation and expansion of the Tall Grass Prairie Inventory which started in May 1987. Included is the discussion of: inventory methods, promotion and publicity, preservation and management, and funding. A revised budget is attached.

Title:

THE STATUS OF THE LOGGERHEAD SHRIKE

(*Lanius ludovicianus excubitorides*)

IN SASKATCHEWAN:

THE 1987 SURVEYS

Prepared by:

Christopher I. G. Adam
Wildlife Ecologist
2636 Argyle St.
Regina, Saskatchewan

Date:

September 1987

Contains:

This report outlines the Saskatchewan portion of a Prairie Provinces wide survey of Loggerhead Shrikes conducted in June and July, 1987. It also provides comments upon survey guidelines with a view to tightening up the survey for future runs, and gives an indication of the current distribution of shrikes in Saskatchewan. Population Size and Trends (with special reference to Saskatchewan), discussion of Loggerhead Shrike habitat, and habitat trends are included. The Loggerhead Shrike survey, and guidelines, are discussed in detail. A results and discussion section includes comprehensive information regarding: Loggerhead Shrike distribution in Saskatchewan, total Loggerhead Shrikes per Saskatchewan survey route, etc.

Title:

STATUS OF THE LOGGERHEAD SHRIKE

(*Lanius ludovicianus*)

IN MANITOBA DURING 1987

Prepared by:

Ken De Smet and Michael Conrad

Date:

November 1987

Contains:

This report addresses surveys and research on the Loggerhead Shrike in Manitoba as part of a prairie-wide effort to assess the status of the species. The current distribution and abundance of Loggerhead Shrikes in Manitoba is discussed, along with some indication of their productivity and a discussion of methodology used on shrike transects. Maps included.

Title:

AN ESTIMATE OF POPULATION SIZE AND PROBABLE CAUSES OF POPULATION STABILITY IN FERRUGINOUS HAWKS IN SOUTHEASTERN ALBERTA

FINAL REPORT

Prepared by:

Josef K. Schmutz, Ph.D.
Department of Biology
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0

Date:

October 1987

Contains:

The purpose of this project was to evaluate current population trends of Ferruginous Hawks in Alberta to determine whether a decline evident in the past was still occurring. Included in the report is: an introduction to the species, its biology, historical and current distribution; a discussion of the Ferruginous Hawk decline in the Canadian prairies; study area descriptions and methodology employed; and a comprehensive results and discussion section. Recommendations are included.

Title:

CENSUS AND HABITAT EVALUATION FOR MIGRATING SHOREBIRDS IN EAST-CENTRAL ALBERTA

Prepared by:

Cleve Wershler
Sweetgrass Consultants Ltd.
Calgary, Alberta

Date:

December 1987

Contains:

This project involved on-the-ground surveys of migrating shorebirds at wetlands in east-central Alberta during the fall of 1987. Fourteen sites were surveyed along the eastern edge of Alberta's Central Parkland region, between 52 degrees and 53 degrees N. latitude and from Ranges 1 to 6, west of the Fourth Meridian. Data was recorded on numbers, species, habitat and prevailing weather conditions using "Prairie Shorebird Survey" forms provided by the Canadian Wildlife Service. When possible, actual counts were made of species numbers; for large numbers, estimates were made. Results include totals of numbers of species and individuals observed at each water body, migration peaks, descriptions of each water body (hydrology, surficial geology, land use, habitats, significance of habitats, and other important ecological phenomena), and the status of each species.

Title:

NATIONAL RECOVERY PLAN

FOR THE BURROWING OWL

(SECOND DRAFT)

Prepared by:

Elizabeth Haug
6 Livingston Place
Winnipeg, Manitoba R3T 3T5

Date:

May 1989

Contains:

This plan incorporates the results of past and current research and management techniques to priorize problems on a national basis and management tasks necessary to address them. It is believed that by implementing the management techniques described herein, the national population goal of 3490 nesting pairs can be achieved.

Included in the report are: former and present population status of the Burrowing Owl (its' range, distribution and population size in Manitoba, Saskatchewan, Alberta, and British Columbia); a national plan for recovery (priorized strategies, and national recovery goals); Burrowing owl natural history (habitat requirements, behaviour and breeding biology, and causes of decline); and a synopsis of conservation efforts to date. A comprehensive implementation schedule is included in the Appendix section.

Title:

MANAGEMENT PLAN

FOR THE FERRUGINOUS HAWK

IN CANADA

Prepared by:

Josef K. Schmutz
Department of Biology
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0

Date:

February 1989

Contains:

The purpose of this plan is to identify actions which, when implemented, will halt the ferruginous hawk's long-term decline in breeding range, and will ensure the continued existence of ferruginous hawks within their present range in Canada. The recommended actions flow directly from the results of past research carried out by many individuals and agencies in western Canada. This plan also contains a summary of pertinent ferruginous hawk biology and measures of historic and current population performances as a reference point for future changes.

Title:

SASKATCHEWAN'S 1988 SEARCH

FOR THE GREATER PRAIRIE CHICKEN

Prepared by:

Dale Hjertaas

Date:

November 1988

Contains:

This survey was conducted in the spring of 1988 to determine the size of the Greater Prairie Chicken population in the region where the three birds and suspected hybrid were observed (1987). Included is a description of the study area, the study methods employed, results and discussion sections, and some recommendations.

Title:

INTERIM PROGRESS REPORT FOR THE STUDY OF:

CONTROL OF *Bromus inermis* AND REESTABLISHMENT OF *Festuca altaica* var. *hallii* IN NATIVE GRASSLAND

Prepared by:

James T. Romo
and
Perry Grilz
Department of Crop Science and Plant Ecology
University of Saskatchewan
Saskatoon, Saskatchewan

Date:

October 1988

Contains:

A project, designed to ascertain the effects of prescribed burning on native grassland, was initiated in 1986 at Kernan Prairie (approximately 10 km northeast of Saskatoon). The ultimate objective of the research is to develop burning prescriptions for maintaining the integrity of grasslands dominated by *Festuca*. Study of the ecology of *Bromus* and *Festuca* is the emphasis of this report. Discussed in the report are: effects of burning and glyphosate on *Bromus* and native flora; ecology of *Festuca*; use of containerized seedlings for establishing *Festuca*; germination of *Bromus* and *Festuca*; and experimental design and data analysis.

Title:

1988 MANITOBA BURROWING OWL CONSERVATION PROGRAM FINAL REPORT

Prepared by:

Elizabeth Haug
and
Carol Churchward

Date:

January 1989

Contains:

This final report contains a summary of the Burrowing Owl Conservation Program in Manitoba. Components of the program (educational program, population surveys, and owl transplant program) are described and the results of each discussed. General recommendations for the 1989 season, and recommendations for habitat protection program are included. A 1988 Burrowing Owl site distribution map, an "Information Wanted" poster, a banding schedule, and bird band recovery reports included.

Title:

STATUS

HABITAT PREFERENCE AND MANAGEMENT

OF THE BAIRD'S SPARROW IN MANITOBA

1987 - 1988

Prepared by:

Ken D. De Smet
and
Michael P. Conrad

Department of Natural Resources
Winnipeg, Manitoba

Date:

January 1989

Contains:

This report documents the species status and habitat needs of the Baird's Sparrow, as identified during rare and endangered species work in southern Manitoba during 1987 and a cooperative study with World Wildlife Fund Canada during 1988. Included is a discussion of: methods, distribution and abundance, habitat preferences, general biology, productivity and limiting factors. Management implications are presented. Maps and nest data included.

Title:

STATUS, HABITAT NEEDS AND MANAGEMENT OF FERRUGINOUS HAWKS IN MANITOBA (1987 - 1988)

Prepared by:

Ken D. De Smet
and
Michael P. Conrad

Department of Natural Resources
Winnipeg, Manitoba

Date:

January 1989

Contains:

This report discusses the status, habitat requirements and nesting success of Ferruginous Hawks in Manitoba during 1987 and 1988. Ongoing and proposed management initiatives to sustain nesting populations in the province are outlined.

Title:

CONSERVATION AS A STIMULUS FOR

RURAL ECONOMIC DEVELOPMENT

Prepared by:

Robert D. Sopuck

Date:

June 1988

Contains:

As the executive summary notes:

> The prairie and aspen parkland regions of western Canada have been greatly modified by human settlement and agriculture. Soil erosion and the loss of wildlife habitat and species are becoming serious problems that must be addressed. The only conservation programs that will be effective are those that also deal with the economic problems that exist in western Canada.

Topics discussed include: factors affecting conservation programs; land degradation and economics; the public interest; the land base; stages in conservation; sustainable economic development for the prairies; a conservation development scenario; and concluding remarks. Executive summaries are included for each topic.

Title:

THE BEAUDRY PRAIRIE RESTORATION

SEED COLLECTING PROJECT

1988 FINAL REPORT

Prepared by:

Douglas R. Collicutt
Project Manager, BPR-SCP
960 Garfield Street
Winnipeg, Manitoba R3E 2N6

Date:

November 1988

Contains:

The Beaudry Prairie Restoration - Seed Collecting Project is an independently operated project sponsored by, and acting in cooperation with, the Parks Branch of the Manitoba Department of Natural Resources. The project is intended to supplement and expand upon the seed collecting efforts already begun by Parks Branch for their tall-grass prairie restoration project in Beaudry Provincial Heritage Park, near Winnipeg. The Manitoba Naturalists Society's Tall-grass Prairie Conservation Project estimates that only 0.0005% of the tall-grass prairie remains within the primary range of this habitat type in southern Manitoba. In recognition of this situation Parks Branch has embarked on a project to re-establish a tall-grass prairie community in Beaudry Provincial Heritage Park. Included in the report: description of supporting agencies; project goals and objectives; results of the 1988 operating season (summary of seed collection, types and quantities of seeds collected); collecting sites; equipment descriptions and discussion; involvement of volunteers; discussion of a new species record for Manitoba; a financial statement; and objectives for 1989. A project summary is included.

Title:

CONSERVATION OF BURROWING OWLS:

SURVIVAL AND MOVEMENT IN A LOCAL POPULATION

(INTERIM REPORT)

Prepared by:
Josef K. Schmutz, Daniel Wood and Gwendolyn Wood

Date:
December 1988

Contains:

The purpose of this study was to record the rate of survival of breeding burrowing owls and to compare this with rates from other populations of burrowing owls and birds of prey of comparable size. Ultimately, the authors hope to evaluate whether annual survival is a possible factor limiting the size of the Canadian breeding population of burrowing owls. Included in the report: background information, methods, results (burrowing owl populations, adult return rate/survival, burrowing owl distribution), and interim conclusions. Nest locations of burrowing owls (found in 1988) are presented on a map.

Title:

A) ADDITIONS TO THE LIFE HISTORY OF

THE NORTHERN PRAIRIE SKINK

B) INTERIM STATUS OF THE MIXEDGRASS PRAIRIE

UPPER ASSINIBOINE DELTA

MANITOBA

Prepared by:

Errol J. Bredin
Carberry, Manitoba

Date:

November 1988

Contains:

A) A portion of this report is a supplement that updates a COSEWIC report on the Northern Prairie Skink. This small lizard is limited in its Canadian distribution to a small area of ancient, deltaic sands in southwestern Manitoba, the Upper Assiniboine Delta or Carberry Sand Hills, and the Lauder Sand Hills. Extensive field studies from 1987 to 1988 on factors threatening the skink in Manitoba led to some new life history data, most notably the effect on the species by drought conditions. Included in the report: factors currently threatening the species; habitat; study methods; study area (maps); life history of the skink (population size, seasonal occurrence, specimen measurements, numbers of eggs per clutch); discussion of possible protective mechanisms for the skink and its habitat.

B) Included as a continuation of the previous report, this report discusses: succession of mixed grassland to aspen parkland; leafy spurge infestations, and effects on the skink; and concluding specific remarks on habitat protection.

Title:

1988 CENSUS AND HABITAT EVALUATION FOR MIGRATING SHOREBIRDS IN ALBERTA

Prepared by:

Cleve Wershler
Sweetgrass Consultants
Calgary, Alberta

Date:

February 1989

Contains:

As a continuation of 1987 shorebird surveys, spring and fall field surveys were conducted on transient shorebirds during northward and southward migrations in 1988. On-the-ground surveys were conducted on a total of 21 water bodies in the Central Parkland and Mixed Grassland of Alberta. Shorebird numbers, habitat descriptions, weather conditions, water levels, extent of shore, and grazing intensity were recorded for each site, using Prairie Shorebird Survey forms provided by the Canadian Wildlife Service. For sites surveyed for the first time, habitats were mapped and described in more detail, and additional information was collected on hydrology, surficial geology, land use, and noteworthy ecological phenomena. 1988 field data was complemented with published and unpublished information on shorebird species in Alberta and on the various sites surveyed.

From a summary and analysis of the data, the following information was highlighted: single day totals for all species, maximum single day counts, unusually high numbers of various species, and the occurrence of rare and uncommon species. In addition, the following topics were discussed: general patterns of moisture and habitat conditions in 1988; comparison of 1988 data with 1987 data; key habitats; land use threats to habitats; and recommendations for the conservation of habitats.

Title:

PIPING PLOVER SURVEY:

SOUTH SASKATCHEWAN RIVER-

RED DEER CONFLUENCE TO MIRY BAY
AND
GARDINER DAM TO SASKATOON

Prepared by:

Margaret A. Purdy
and
Bertram J. Weichel

Date:

November 1988

Contains:

The purpose of this study was to conduct a survey for Piping Plovers (Charadrius melodus) and suitable plover breeding habitat along two reaches of the South Saskatchewan River; from the Alberta border to Miry Bay and from Gardiner Dam to Saskatoon. Included in the report: an abstract; discussion of abundance, distribution and breeding status of Piping Plovers along the South Saskatchewan River; description of the riparian habitat used by the plovers; description of the existing and potential threats to plovers and their habitat on the South Saskatchewan River; study methods; and a thorough discussion. Several habitat photos and a map included.

Title:

THE LOGGERHEAD SHRIKE IN MANITOBA

ITS STATUS AND HABITAT NEEDS

Prepared by:

Ken D. De Smet
and
Michael P. Conrad

Department of Natural Resources
Winnipeg, Manitoba

Date:

January 1989

Contains:

Surveys during 1987 revealed that the range of the Loggerhead Shrike (*Lanius ludovicianus*) was restricted compared to its historic distribution in Manitoba (De Smet and Conrad 1987). Remaining populations were found primarily in the extreme southwest where 95% of the 1987 sightings occurred. Populations in this area and throughout the remainder of the province have declined from former numbers. Included in the report: discussion of habitat preference; use of non-typical habitats, and management implications of this phenomenon; nest-site preferences and productivity in non-typical versus typical habitat; introduction to study methods; and habitat needs and management recommendations. An endangered species handout and shrike observation made by the authors during 1988 (including nesting and banding data) are included in the Appendix.

Title:

SUFFIELD MILITARY RESERVE

INVESTIGATION OF LAND USE AND PRESERVATION OPTIONS

(ALBERTA)

Prepared by:

Judy Archer

Date:

April 1988

Contains:

Suffield Military Reserve is a 1000 square mile area owned by the federal government and operated by the Department of National Defence. Suffield is significant because it is a large representative area of mixed grass prairie. The area provides habitat for both representative and rare, declining or endangered species. Included in the report: specific study objectives; a historical overview of the reserve; a description and discussion of major interest groups involved (Dept. of Nat'l Defence, Alberta Energy Company, Prairie Farm Rehabilitation Administration, Canadian Wildlife Service, Alberta Wilderness Association, etc.); discussion of DND's environmental measures (zoning, advisory committees,etc.); an outline of military concerns; a situation evaluation; and a number of recommendations. Several maps are included.

B

AN OVERVIEW OF

REPTILES AND AMPHIBIANS IN ALBERTA'S

GRASSLAND AND PARKLAND NATURAL REGIONS

Prepared by: Cottonwood Consultants Ltd.
Calgary, Alberta

A Project Funded by:

WORLD WILDLIFE FUND CANADA
WILD WEST PROGRAM

DECEMBER 1986

TABLE OF CONTENTS

EXECUTIVE SUMMARY

From literature, museum collections, unpublished field notes, and a volunteer field research program in 1986, the status is documented for all reptiles and amphibians known to occur in the Grassland and Parkland regions of Alberta. Of a total of 16 species, five are considered to be "species of concern" -- species which are either rare or which have undergone recent and widespread declines. These include: the Western Painted Turtle, Plains Hognose Snake, Eastern Short-horned Lizard, Great Plains Toad, and Northern Leopard Frog.

The following information is provided for all species: Alberta distribution, habitat, threats, population size and trend, protective status, and recommendations for protection and management. For most species of concern, all known collection and observation localities are documented and mapped.

The major threat to all species is the loss of natural habitat, including the elimination of natural vegetation and the drainage of wetlands. The most critical habitats include: wetlands and upland vegetation in sandplains and sandhills in the warm, dry parts of the Mixed Grassland; oxbow lakes along the Milk River; and extensive bedrock outcrops and badlands along major stream valleys in the Mixed Grassland.

It is recommended that the significant remaining areas of natural grassland and parkland be preserved. This includes proposed ecological reserves and natural areas, as well as portions of the Middle Sand Hills. Protection of these areas would ensure the security of most species of amphibians and reptiles. In addition, the following critical habitats should be afforded strict protection: snake hibernacula, major breeding ponds for Great Plains Toads and Northern Leopard Frogs, oxbow lakes frequented by Western Painted Turtles along the Milk River, and the small isolated habitats of the Eastern Short-horned Lizard.

Several rare species and critical habitats are still poorly known. The most pressing research needs include: studies of critical habitat in the Middle Sand Hills and Milk River oxbow lakes, documentation of snake hibernacula, and a feasibility study for a recovery plan for Northern Leopard Frogs.

The five species of concern should be listed on the provincial list of threatened species prepared by the Alberta Fish and Wildlife Division. "Endangered" status is recommended for the Western Painted Turtle, Plains Hognose Snake, and Great Plains Toad. "Threatened" status is recommended for the Eastern Short-horned Lizard and the Northern Leopard Frog.

ACKNOWLEDGEMENTS

We would like to acknowledge the cooperation of those organizations and persons who have freely contributed time and information to this project:

Alva Bair, Milk River
Bob Bullock, University of Lethbridge
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Bob Murphy, Royal Ontario Museum
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Leonard Piotrowski, Lost River Ranch
June Picotte, Remount Community Pasture
Larry Powell, University of Nebraska
Diana Reesor, Reesor Ranch
Hugh Smith, Provincial Museum of Alberta
Wayne Smith, Calgary
Wayne Roberts, University of Alberta Zoology Museum
Allan Ross, Onefour Research Station
Tony Russell, University of Calgary Zoology Museum
Malcolm Stark, Lethbridge Community College
Ray Wershler, Calgary
Tom Willock, Medicine Hat
John Wolper, Dinosaur Provincial Park

This project was made possible through the generous support of World Wildlife Fund Canada's "Wild West" Program.

1.0 INTRODUCTION

In the spring of 1986, World Wildlife Fund Canada announced the start of "Wild West", a major conservation initiative in the Grasslands and Parklands of the prairie provinces. As part of this program, research on Alberta's amphibians and reptiles began in the spring of 1986. The information gathered is providing direction for further research programs and for conservation of rare and endangered species and critical habitats.

This report is intended to provide brief overviews on the status of all reptiles and amphibians occurring in the Grassland and Parkland natural regions of Alberta. The ecosystems of these natural regions are considered "endangered" or "threatened" in Canada (Wallis 1986).

To date there has been little published on the habitat and distribution of reptiles and amphibians in Alberta. At the Workshops on Rare and Endangered Species in the Prairie Provinces held in January 1986, it was noted that six of the fourteen species found in these regions are of special concern because of rarity or recent declines.

Major impacts on reptile and amphibian habitat include cultivation of native grasslands, draining of wetlands, disturbance of wetlands by livestock, and the killing of snakes at hibernacula. There are no amphibians or reptiles currently protected under Alberta wildlife legislation and, with the exception of Writing-on-Stone and Dinosaur Provincial Parks, little of their critical habitat is "protected". Though reduced somewhat from previous decades, cultivation of uplands and drainage of wetlands continues and new ways are being researched to convert natural habitats to cropland.

In Alberta's draft policy document on threatened wildlife, the Alberta government makes provision for legal protection for rare species of reptiles and amphibians. This would allow the restriction of disturbances and land use activities as well as the formulation of guidelines to reduce impacts and active management programs. Two reptile species, Eastern Short-horned Lizard and Western Painted Turtle, are only considered "peripheral" in this draft policy. The Plains Hognose Snake, Tiger Salamander and Northern Leopard Frog are placed in a "status undetermined" category.

The following were goals for the 1986 studies which were funded under the Wild West program:

1. To describe the known range of all reptile and amphibian species occurring in Alberta's Grassland and Parkland natural regions.

2. To document and map all observations or collections of all rare reptiles and amphibians in Alberta's Grassland and Parkland.

3. To describe the known habitat of all species, and to highlight any critical habitats.

4. To document major declines in species such as the Leopard Frog.

5. To assess the existing and potential threats to each species.

6. To recommend research, management, or conservation action for the protection of reptiles and amphibians and any critical habitats.

7. To conduct field investigations on at least three of the rarest or most poorly known species in Alberta: Plains Hognose Snake, Western Painted Turtle, and Great Plains Toad.

Rare species or species of concern which were assessed in this project included:

Western Painted Turtle
Plains Hognose Snake
Eastern Short-horned Lizard
Great Plains Toad
Northern Leopard Frog

More common species which were also researched included:

Red-sided Garter Snake
Plains Garter Snake
Wandering Garter Snake
Prairie Rattlesnake
Bull Snake
Blotched Tiger Salamander
Boreal Toad
Dakota Toad
Wood Frog
Boreal Chorus Frog
Plains Spadefoot (considered a species of concern by Butler & Roberts 1986)

The species accounts were prepared from a review of the literature, from the authors' unpublished field notes, from interviews with people from a variety of backgrounds who had unpublished information on the various species, and from collection information in the National Museum of Canada, Royal Ontario Museum, University of Alberta Museum of Zoology, University of Calgary Museum of Zoology, and Provincial Museum and Archives of Alberta. In addition, a volunteer field program was carried out by the authors in order to gain more information on species most at risk: the Western Painted Turtle, Plains Hognose Snake, and Great Plains Toad.

Personnel involved in the field work and the preparation of species'

accounts included: Wayne Roberts, Cliff Wallis, Cleve Wershler, George Pendlebury, and Ray Wershler. Larry Powell assisted by providing us with a copy of his unpublished status report on Short-horned Lizards in Canada (see copy attached) and in reviewing the final manuscript.

2.0 FIELD PROGRAM

Field work undertaken included the following:

1. surveys of sandhill vegetation in the Milk River-Lost River and Middle Sand Hills-lower Red Deer River areas for Western Hognose Snakes;

2. surveys of sandy areas in the Milk River-Lost River and Middle Sandhills-lower Red Deer River areas for Great Plains Toads; and

3. a survey of oxbow lakes along the Milk River for Western Painted Turtles.

Following two summers of drought conditions in southeastern Alberta, the summer of 1986 was quite wet in the Milk River-Lost River area. Many ponds, some of which had been dry for years, filled up with water. However, amphibian populations, including those of the normally common Chorus Frog, remained quite low. Moisture levels in the Empress-Bindloss area continued to be down, with little rain falling until late summer. All of the ponds known to be previous breeding sites of the Great Plains Toad were dry.

The following is a more detailed itinerary of the field program undertaken in 1986:

May 29 (evening)
- listened for Great Plains Toads from Lost River area north to east of Medicine Hat; none were heard (C.Wallis, C. Wershler)

May 30 (morning)
- drove roads in Hilda-Empress-Bindloss area, looking for Western Hognose Snakes; none were found (C. Wallis, C. Wershler)

May 30 (afternoon)
- searched Remount Pasture area for Plains Hognose Snakes; none were found
- inspected ponds south of Bindloss where Great Plains Toads had bred in the past; they were dry (C. Wallis, C. Wershler)

June 28
- roads driven in Empress-Remount Pasture-Bindloss-Jenner area in search of Plains Hognose Snakes; none were found (C.Wallis)

June 30 (evening)
- listened for Great Plains Toads in Bindloss-Remount Pasture area; none were heard (C. Wershler, R. Wershler)

July 1 (morning and afternoon)
- searched for Plains Hognose Snakes and Great Plains Toads in Remount Pasture area; none were found (C.Wershler, R. Wershler)

July 6 to 9
- searched for Great Plains Toads and Plains Hognose Snakes in Lost River-Milk River area; none were found (C. Wershler, R. Wershler)

July 7
- checked Milk River oxbow lake east of town of Milk River (C. Wallis)

July 28
- drove roads in Empress-Remount Pasture-Bindloss-Jenner area in search of Plains Hognose Snakes; none were found (C. Wallis, C. Wershler)

August 1 to 2
- searched Remount Pasture area for Hognose Snakes; also drove roads in Empress-Middle Sand Hills-Bindloss-Jenner area; none were found (G. Pendlebury, C. Wallis)

August 28
- oxbows checked along Milk River for Western Painted Turtles; no turtles were found but oxbow lake at Pinhorn Grazing Reserve headquarters looked like suitable habitat (C. Wershler)

September 23
- oxbow checked along Milk River (east of Milk River townsite); unsuitable alkaline habitat (C. Wallis)

3.0 SIGNIFICANT HABITATS

The most important habitats for the majority of reptiles and amphibians in the parkland and grassland are natural environments. Many species are eliminated with cultivation of native vegetation and drainage of wetlands. Of these natural habitats, three are considered to be the most critical for the rarest species:

1. sand plain and sand hill vegetation and associated wetlands, especially in the warmer, drier parts of the Mixed Grassland.

2. extensive bedrock outcrop and badland areas found along the major stream valleys and coulees in the Mixed Grassland.

3. oxbow lakes along the Milk River.

Extensive, relatively undisturbed sand hill and sand plain areas occur in the Milk River-Lost River, Pakowki Lake, and Middle Sand Hills districts. These areas are important or potentially important for Great Plains Toads and Plains Hognose Snakes. Wetlands in many sand plain districts have been cultivated.

Many grassland amphibians are adapted to withstand periods of drought and may not breed during dry years. However, prolonged drought combined with mortality from disease and predators may result in the temporary elimination of amphibian populations. There exists the possibility for "centres of dispersal" -- wetlands which provide critical habitat for amphibians during these extended periods of drought. When ample precipitation returns these could serve as centres from which survivors repopulate habitats which suffered through the drought. This concept has not been studied but amphibians are known to move locally following and during periods of rainfall. It may take several years following a severe drought for a species to repopulate parts of its range. However, if the centres of dispersal were destroyed, then entire districts could lose their populations of these amphibians. There is a need to identify those wetlands which perennially support amphibian populations, particularly the rarer species like the Great Plains Toad.

The most extensive rock outcrops and badlands are found along the South Saskatchewan River, the Red Deer River at Dinosaur Provincial Park, and along the Milk River at Writing-on-Stone Provincial Park and the Milk River Canyon. Some of these areas are important for Short-horned Lizards and all provide critical overwintering hibernacula for several species of snakes. The continued availability of "safe" hibernacula is probably the most critical limiting factor for snakes in Alberta. Some species, notably the garter snakes, are able to overwinter in mammal burrows while others, like the Bull Snake and Prairie Rattlesnake, seem to be dependent on major rock outcrops or extensive badland formations. No overwintering hibernacula of Plains Hognose Snakes have been

described for Alberta.

Oxbow lakes along the Milk River are critical habitats for Western Painted Turtles. These habitats are very limited in extent and many dry up when there are insufficient floodwaters or when the main river channel becomes too separated from the oxbow lake . Regular flooding and creation of new oxbow lakes are crucial to Western Painted Turtle habitat maintenance.

4.0 RECOMMENDATIONS

Research

Our knowledge of amphibians and reptiles in Alberta is still sketchy. There should be greater encouragement and support for naturalists, university researchers, and other interested parties who wish to study Alberta species and habitats.

The most pressing research needs include:

1. an assessment of Great Plains Toad and Plains Hognose Snake populations and habitat in the Middle Sand Hills area of the Suffield Military Reserve and adjacent lands. For the same cost, populations of Ord's Kangaroo Rats could also be identified as they occur in the same general area. Information would be used to gain status for the most significant sites so they can be protected or actively managed. Estimated cost: $5000.

2. identification of hibernacula locations in the drier Mixed Grassland region based on local residents' information. This could be a combined mail-out questionnaire and follow-up interview program such as that conducted by Pendlebury in the mid-1970's for Prairie Rattlesnakes. The goal would be to raise the public profile of snake hibernacula and information gained would be used to establish protected sites. Estimated cost: $3000.

3. population assessment of Western Painted Turtles -- this would include a survey of newly formed oxbow lakes as well as a resurvey of previously used sites, and interviews with Cypress Hills residents. Information collected would be useful for potential reintroduction programs. Estimated cost: $750.

4. an assessment of Great Plains Toad numbers in natural and irrigated lands in the Hays-Vauxhall-Lake Newell district. Information gathered here could be useful in management of Great Plains Toad habitat. Estimated cost: $1500.

5. feasibility study for reintroduction of Northern Leopard Frogs, including identification of suitable pilot project areas for supply and release, and sites and procedures for initiating a long-term monitoring program. Estimated cost: $1500.

6. television spots on native amphibians and reptiles, using donations of existing slides and footage. Estimated production cost: $1200/spot.

Longer-term research needs are identified in the species' accounts.

Habitat Protection

Efforts should be made in planning programs to ensure the long-term protection of the most critical habitats: sand hill/sand plain areas and associated wetlands; extensive bedrock outcrops and badlands; and oxbow lakes.

In general, conservation of the few remaining significant tracts of native grassland and parkland as well as major wetlands will ensure the maintenance of many of the native amphibians and reptiles. To support this goal, some demonstration projects could be:

1. the establishment and wise management of the Kennedy Creek/Milk River Canyon natural area/ecological reserve.

2. the protection of the natural habitats of the Middle Sand Hills (Suffield Military Reserve) under a National Wildlife Area designation.

3. the establishment and wise management of the proposed Wainwright (David Lake) ecological reserve.

Legislation

Greater legislative protection should be provided for known critical habitats such as hibernacula and endangered or threatened status should be provided for the rarest species:

1. Western Painted Turtle - Endangered
2. Eastern Short-horned Lizard - Threatened
3. Plains Hognose Snake - Endangered (each of the colour phases)
4. Great Plains Toad - Endangered
5. Northern Leopard Frog - Threatened

Other Conservation Mechanisms

Suitable habitat for many reptiles and amphibians is maintained in many Provincial and National Parks as well as in natural areas and proposed ecological reserves. However, many of the most significant habitats have not been identified and there is often no formal review of developments which could affect these areas. The Natural Areas Program in Alberta has initiated studies and active management of environmentally significant sites. It is proposed that Alberta Recreation and Parks and Parks Canada also embark on programs for the identification and management of environmentally significant areas, including reptile and amphibian habitats. This will ensure long-term protection of the valuable areas managed by these agencies.

Program Coordination

Alberta Fish and Wildlife has the mandate to coordinate conservation action programs for Alberta's reptiles and amphibians. It is important that they expand the protection of reptiles and amphibians through policy and legislation and that they provide the necessary manpower and funding to facilitate research and habitat conservation. They can also play a significant role in public awareness and education programs.

5.0 SPECIES' ACCOUNTS

The following headings are listed in every species' account:

1. Latin name
2. common name
3. brief summary of status
4. habitat
5. threats
6. population size and trend
7. protective status
8. recommendations/management action

For the common species, general range maps and a note on their general distributions have also been prepared. For rare species, all known collections and observations are documented and mapped.

The approximate limit of the main range is denoted by a solid line. Dots indicate actual collection or observation localities -- these are used for rare species and have also been used for more common species to denote isolated occurrences outside the main range, more restricted patterns of distribution within a general range, or to place exact locations for range limits. Open circles refer to unconfirmed reports.

Noteworthy references for Alberta records are listed.

LATIN NAME: Ambystoma tigrinum melanostictum

COMMON NAME: Blotched Tiger Salamander or Tiger Salamander

BRIEF SUMMARY OF STATUS:

Widespread and relatively common throughout the Grassland and Parkland regions of southern and central Alberta.

GENERAL ALBERTA DISTRIBUTION:

Occurs throughout the Mixed, Northern Fescue and Foothills Grasslands and the Foothills and Central Parkland, from the United States boundary north to Barrhead region at the southern edge of the Mixed Wood Boreal Forest, and from the Saskatchewan boundary west to the edge of the Foothills and Rocky Mountains.

HABITAT:

Semipermanent and permanent ponds, lakes and streams. Outside the breeding season, Blotched Tiger Salamanders spend considerable time underground in burrows of mammals such as the Richardson's Ground Squirrel.

THREATS:

Drainage and cultivation of wetlands; the impact of disposal of various chemicals from oil and gas exploration and of cattle activity on breeding ponds has not been researched. There is a significant mortality on highways associated with their mass migrations following or during rain. The impact of ground squirrel declines in parts of the Grassland region is unknown.

POPULATION SIZE AND TREND:

Blotched Tiger Salamanders appear to be common in Alberta and populations appear to remain at healthy levels despite some local losses due to wetland destruction.

PROTECTIVE STATUS:

Blotched Tiger Salamanders occur in numerous Provincial Parks in which wetland areas receive a measure of protection. This species is listed as "status undetermined" in "A Draft Policy for the Management of Threatened Wildlife in Alberta".

RECOMMENDATIONS/MANAGEMENT ACTION:

Protection of wetlands for other wildlife will benefit this species.

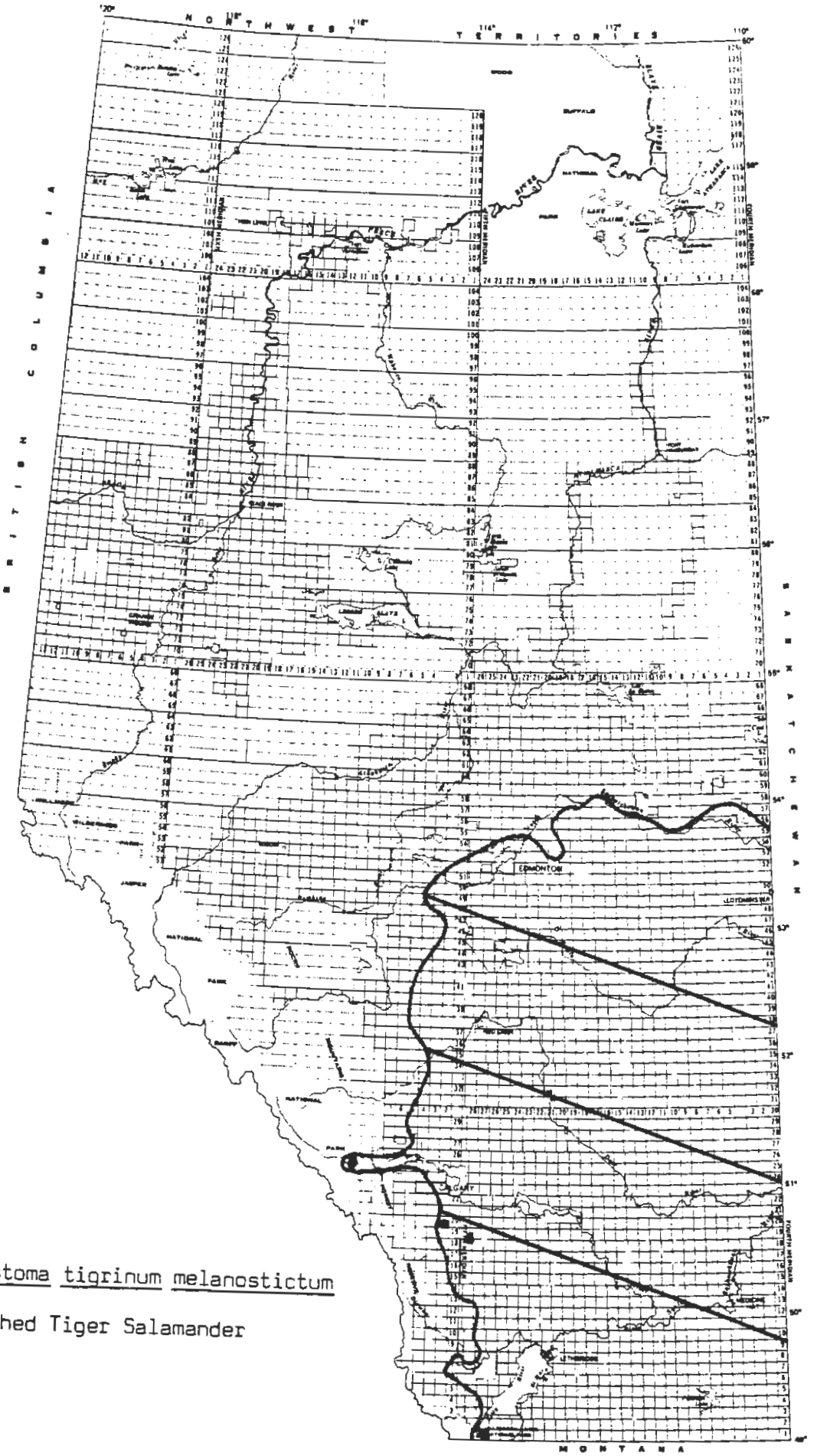
A distinct subspecies Ambystoma tigrinum diaboli, the Grey Tiger

Salamander, may occur in east-central Alberta along the Saskatchewan border. Researchers in this area should be on the lookout for this form.

Concern has also been expressed for the protection of wetlands which support neotenous Blotched Tiger Salamanders. These are salamanders which remain in a juvenile gilled condition throughout their entire lives and can grow to lengths which exceed 300 mm. They require an absence of predatory fishes and the water to be sufficiently deep to escape freezing.

REFERENCES:

Butler and Roberts (1986)



Ambystoma tigrinum melanostictum

Blotched Tiger Salamander

LATIN NAME: Scaphiopus bombifrons

COMMON NAME: Plains Spadefoot

BRIEF SUMMARY OF STATUS:

Very local but sometimes common in suitable habitats in the Mixed Grassland; rare in the Central Parkland. Butler and Roberts (1986) considered it a species deserving "special consideration".

GENERAL ALBERTA DISTRIBUTION:

Occurs through the eastern half of the Mixed Grassland from the United States boundary north to the Red Deer River and west to Writing-on-Stone Provincial Park and Dinosaur Provincial Park; also collected at Barons, Claresholm and Gleichen; known in the Central Parkland only from the Sounding Lake and Dilberry Lake-Reflex Lakes areas.

HABITAT:

Breeds in shallow water of vernal pools on uplands and along streams, semi-permanent ponds, oxbow lakes and stream meander channels. All the known records come from natural habitats in areas of sandy glacial outwash, sand dunes or sandy stream channels. Its distribution in cultivated areas is unknown. Stream valley habitats may be important during extended periods of drought and may serve as reservoirs for repopulation of upland areas.

Breeding generally occurs during May but immatures have been noted in the Reflex Lakes and Orion districts up to August 22.

THREATS:

Major threats are cultivation of wetlands and flood control along major streams. The impact of disposal of various chemicals from oil and gas exploration and development and of cattle activity on breeding ponds has not been researched.

POPULATION SIZE AND TREND:

Locally common in the Mixed Grassland where they occur in breeding groups of up to several hundred individuals; rare in the Central Parkland where only two breeding localities are known. It is adapted to the vagaries of the grassland climate and may not breed during dry years. However, the Alberta population of Plains Spadefoots appears to decline dramatically after extended periods of drought. Within this natural fluctuation, the Alberta population appears to be "stable". No long-term declines have been documented.

PROTECTIVE STATUS:

Populations occur on protected sites in Dinosaur Provincial Park and Writing-on-Stone Provincial Park. There may be populations at Dilberry Lake Provincial Park where protected status to its habitat could be given. Populations may also receive protection in the proposed Milk River Canyon/Kennedy Creek natural area/ecological reserve.

RECOMMENDATIONS/MANAGEMENT ACTION:

Because its habitat is localized, protection of known breeding habitat from cultivation and other developments should be a priority. Further research should be directed to the location of "centres of dispersal", areas which may support populations of Plains Spadefoots (and other grassland amphibians) through extended dry periods. The effects of cattle activity on breeding ponds of this and other grassland amphibians should also be studied.

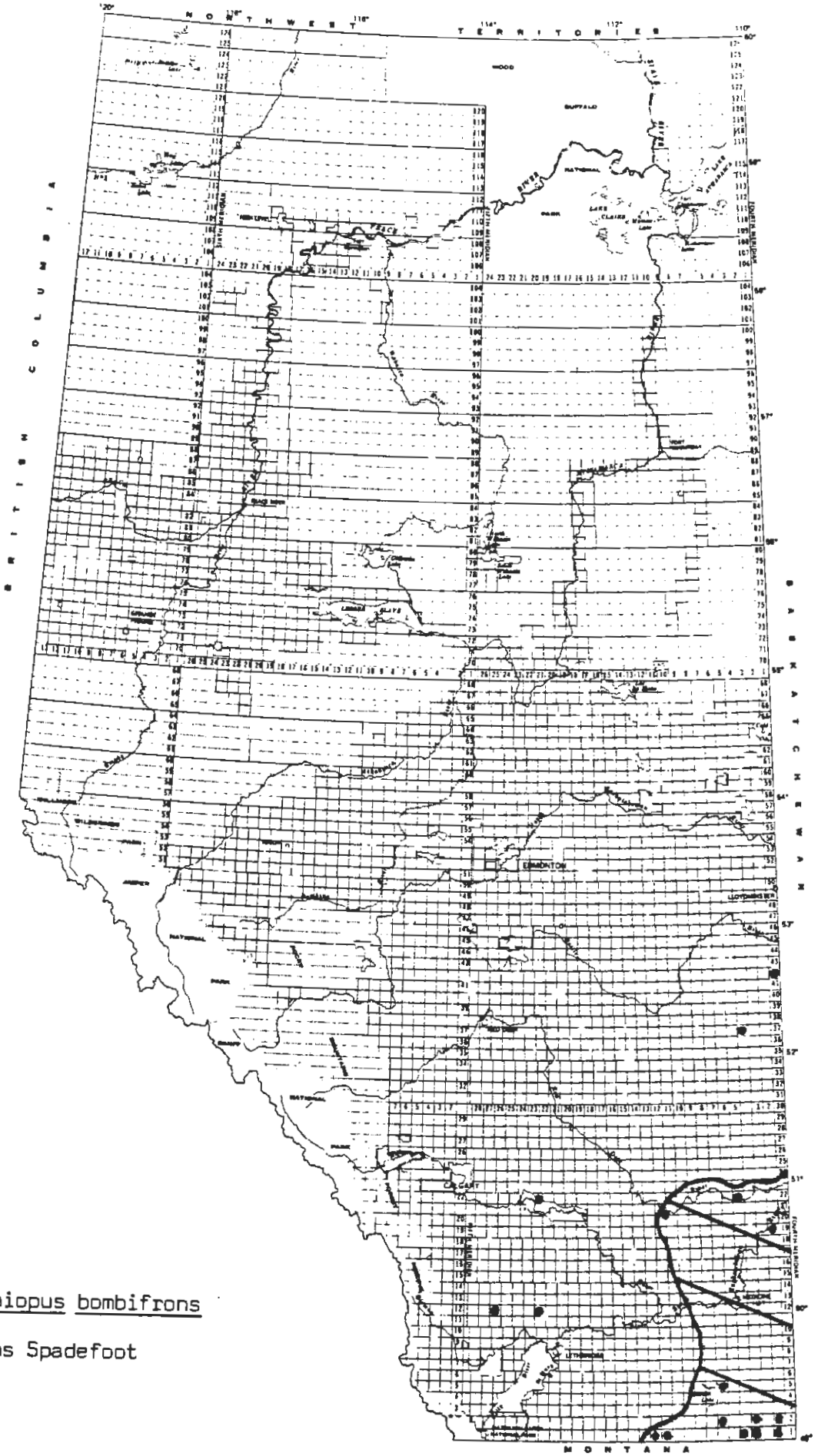
Alberta Parks should be made aware of the significance of populations in their jurisdiction and the need to identify breeding habitat and protect them from developments.

The Middle Sand Hills of the Suffield Military Reserve may be important for this and a number of other grassland reptiles and amphibians. At the present time, this area is out-of-bounds for military activity but is open to oil and gas development. Cooperative conservation approaches with the Suffield Environmental Advisory Committee and the Alberta Energy Company to identify and protect critical habitats could be explored. A suggestion was made several years ago to have this area designated a National Wildlife Area. This proposal was made again last year to Tom McMillan, federal minister of the Environment. Numerous species of wildlife, including several rare types, would benefit from any additional protection which could be afforded this nationally significant area.

The establishment of the Kennedy Creek/Milk River Canyon natural area/ecological reserve would protect populations of Plains Spadefoots.

REFERENCES:

Butler and Roberts (1986)
Lewin (1963a)
Moore (1952)
Wallis (1976)
Wallis (1977)



Scaphiopus bombifrons

Plains Spadefoot

LATIN NAME: Rana pipiens

COMMON NAME: Northern Leopard Frog

BRIEF SUMMARY OF STATUS:

Formerly widespread when it was at least locally abundant; now absent from much of its former range within the Central Parkland even though its habitat remains widespread; reduced populations persist in the Mixed Grassland of extreme southern Alberta. Protection of Leopard Frogs and their reintroduction into suitable habitat is required. This species should be regarded as threatened.

GENERAL ALBERTA DISTRIBUTION:

The main distribution of Northern Leopard Frogs is in the Central Parkland, Northern Fescue Grassland, Foothills Grassland, and Mixed Grassland natural regions. Isolated occurrences are known from the eastern fringes of the Foothills and from the Mixed Wood Boreal Forest north at least to Lesser Slave Lake and, possibly, Fort McMurray. They also occur in low populations on the Kazan Upland Canadian Shield north of Lake Athabasca.

HABITAT:

Adults and transformed subadults occupy open areas along the margins of a variety of waterbodies. This includes shorelines with little or no vegetation such as in the badlands along grassland and parkland rivers, as well as shorelines with well-developed plant communities of grasses, sedges and willows. Northern Leopard Frogs also occur some distance from shorelines in a variety of vegetation which is usually open or only sparsely wooded. Permanent water is a constant feature of the home range occupied by this species as it overwinters under rocks in springs and streams or in shallow depressions on the bottoms of lakes. Leopard Frogs are often associated with water which is clear and not too alkaline.

Spawning occurs in temporary ponds, sloughs, dugouts, borrow pits, the shallow vegetated areas of lakes, backwaters and oxbow lakes of rivers, and beaver ponds where warm standing water provides an environment for the rapid development of eggs and tadpoles. While summer habitat for transformed individuals is widespread, suitable habitat for spawning and overwintering are localized and probably restrict the distribution of Northern Leopard Frogs.

THREATS:

Draining of wetlands is perhaps the major threat to this species due to the loss of spawning and rearing habitat and the dessication of surrounding habitat. Natural fluctuations in the water table similarly affect this species. Leopard Frogs have been collected elsewhere for

biological supply houses and as fish bait. Such harvest in Alberta is not warranted with the present restricted range and small populations of Northern Leopard Frogs. Toxic substances, including a variety of agricultural chemicals such as Atrazine, have been identified as a possible cause of declines in Wisconsin populations of this species (Hine et al 1981) while low pH from acid rain is known to adversely reproduction of Northern Leopard Frogs (Schlicter 1981).

POPULATION SIZE AND TREND:

Populations of Northern Leopard Frogs in central Alberta declined or crashed during the late 1970's (Roberts 1981). A decline was also noted in Saskatchewan (D. Secoy, personal communication). Much of the former range in central Alberta, including the middle reaches of the Red Deer River drainage appears to be devoid of this species. Populations in the south range from few or none along the St. Mary's River to locally abundant along the Milk River and at least one site on the lower Red Deer River (C. Wallis and C. Wershler, personal communication). Most southern populations appear to be reduced.

No single explanation has been found for the dramatic decline of this species in Alberta. While a decline in the water table and low winter water flows in rivers would have reduced or eliminated spawning and overwintering habitats in certain areas, this does not account for disappearances of populations from spring rich areas such as the Clearwater River/North Saskatchewan River near Rocky Mountain House and Kilini Creek northwest of Edmonton.

It is possible that epidemics of "Red Leg" may have caused high mortality of overwintering Northern Leopard Frogs. This disease is caused by Aeromonas hydrophila, a bacterium widespread in North America and Europe which affects fish and amphibians (Emerson and Norris 1905). At least half of the infected Leopard Frogs die (Reichenbach-Klinke and Elkan 1965) and in laboratory populations it may be 100% fatal (Hunsaker and Potter 1960). It is evident from the observations of Hine et al (1981) that "Red Leg" is a factor in the decline of the Northern Leopard Frog in Wisconsin where large numbers perished during the fall and winter.

While Roberts (1981) did not discuss the role of this disease in the decline of Northern Leopard Frogs in Alberta, massive mortality of individuals displaying symptoms of this disease occurred in populations overwintering in springs along the Clearwater River during 1976. During low water years numerous frogs may have overwintered in a small number of favorable sites where they became infected with "Red Leg".

Healthy populations in certain oxbows of the Milk River and at a spring in the Bindloss area may be indicative of population increases and are perhaps a sign of hope for this species in southern Alberta.

PROTECTIVE STATUS:

This species is listed as "status undetermined" in "A Draft Policy for the Management of Threatened Wildlife in Alberta".

Suitable Leopard Frog habitat occurs in many provincial and national parks throughout southern Alberta. While these receive no active management, formal protection could be given in many areas.

The establishment of the Kennedy Creek/Milk River Canyon natural area/ecological reserve would protect known healthy populations of Northern Leopard Frogs.

RECOMMENDATIONS/MANAGEMENT ACTION:

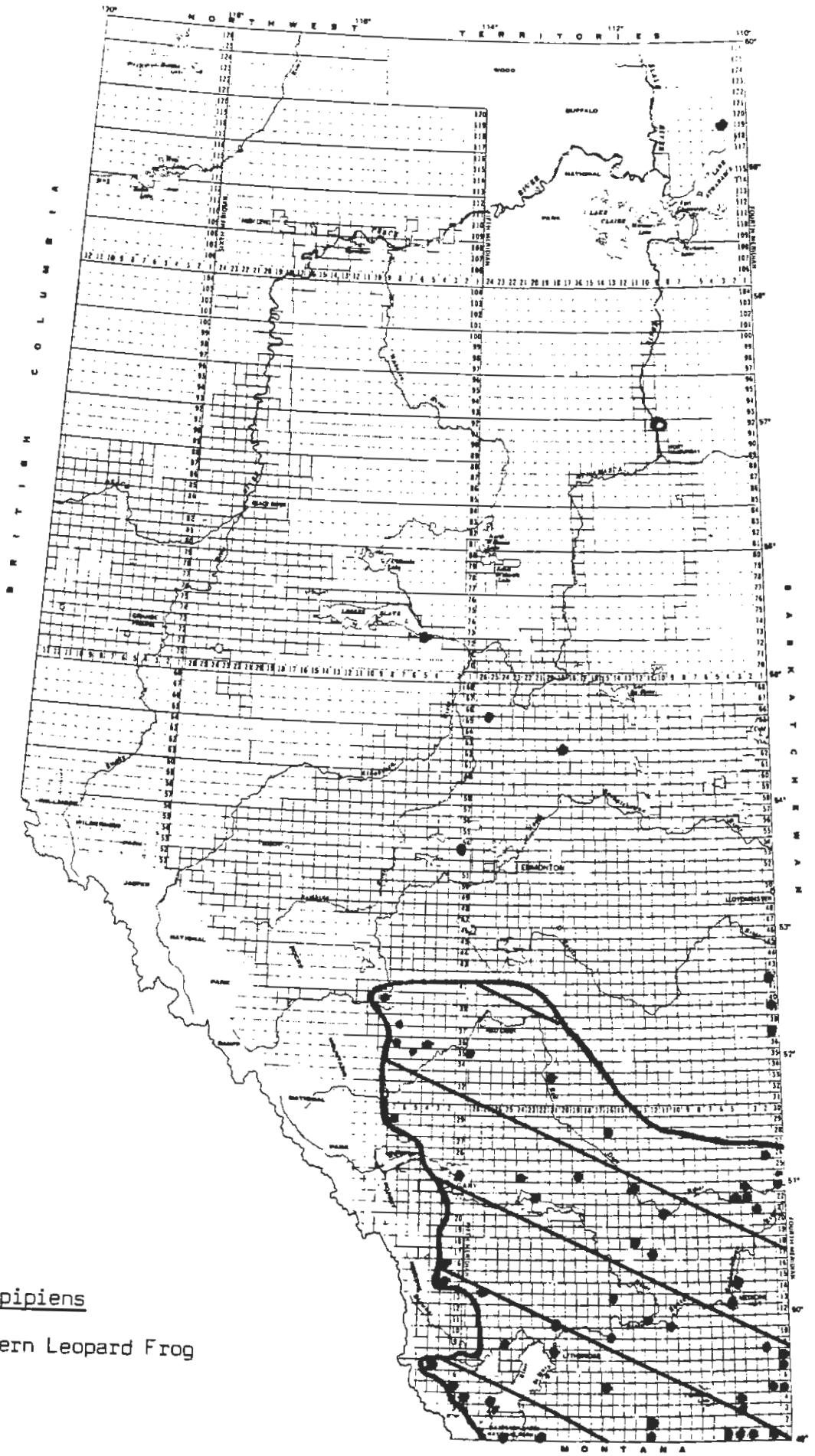
Populations where abundant Northern Leopard Frogs occur should be monitored to see whether numbers are stable or increasing. Adjacent areas should be surveyed to determine whether or not they are being repopulated. Where populations are small, reproductive success should be studied in selected sites to determine if poor recruitment is responsible for low numbers and poor recovery of these populations.

Roberts (1986) recommended reintroduction of Northern Leopard Frogs to a small number of sites within the known range of this species. This is required as colonization of Alberta probably was facilitated initially by an abundance of water (post-glacial lakes) and natural repopulation of the former range may be a slow process. Reintroduction sites should be characterized by being previously occupied by this species; and have permanent water for overwintering, suitable spawning and rearing habitat, and access to permit regular monitoring; and be relatively free of disturbance from human activity. These populations may serve as centres of dispersal for surrounding areas.

This is regarded as a "status undetermined" species in Alberta (non-license species) but should be regarded as "threatened". Legal protection should be accompanied by an education program pointing out the decline in numbers and requesting assistance in maintaining habitat and minimizing disturbance.

REFERENCES:

Butler and Roberts (1986)
Roberts (1981)
Roberts (1986)



Rana pipiens

Northern Leopard Frog

LATIN NAME: Rana sylvatica

COMMON NAME: Wood Frog

BRIEF SUMMARY OF STATUS:

Common in the northern parts of the Foothills Parkland and Central Parkland, becoming rare further south; absent from the Grassland region.

GENERAL ALBERTA DISTRIBUTION:

Widespread throughout the wooded regions of northern and central Alberta, from the Northwest Territories boundary south to the southern edge of the Central Parkland and the Porcupine Hills area in the Foothills Parkland, and into the Rocky Mountains along the major stream valleys.

HABITAT:

Semi-permanent and permanent ponds and lakes in wooded regions.

THREATS:

Drainage and cultivation of wetlands.

POPULATION SIZE AND TREND:

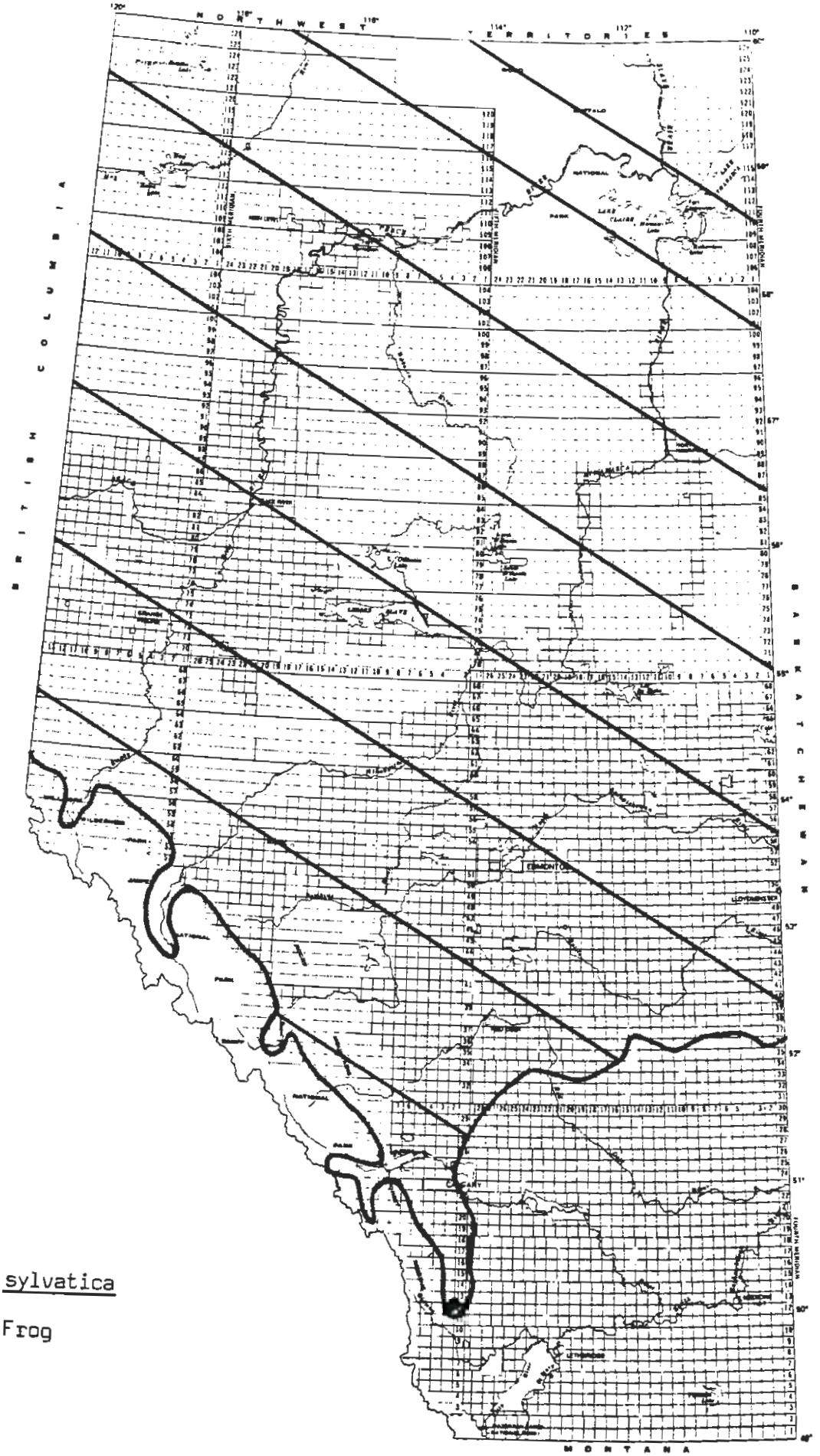
Common in much of the more heavily wooded Parkland and there have been no long-term declines noted. There have been some local losses due to wetland destruction, principally at the southern edge of the Parkland.

PROTECTIVE STATUS:

Occurs in numerous Provincial Parks and National Parks.

RECOMMENDATIONS/MANAGEMENT ACTION:

Protection of wetlands for other wildlife will benefit this species.



Rana sylvatica

Wood Frog

LATIN NAME: Bufo cognatus

COMMON NAME: Great Plains Toad

BRIEF SUMMARY OF STATUS:

Should be considered endangered; very rare and very local in the Mixed Grassland region of Alberta.

GENERAL ALBERTA DISTRIBUTION:

Sand hills and sand plains in the Red Deer River-Suffield Military Reserve-South Saskatchewan River, Taber-Lake Newell, and Lost River-Milk River areas.

SPECIFIC LOCALITIES:

- collection at the Royal Ontario Museum:

Medicine Hat, June 8, 1928, T. Kurata

- collections at the National Museum of Canada:

Medicine Hat, south golf course, slough by green, emerging from cracks in ground, also in grass and bare ground everywhere around the slough edge, 124 immatures, June 28, 1957; 20 individuals, July 7, 1957, S. S. Bleakney and F.Cook

- collections at the University of Alberta Museum of Zoology:

Lost River, Aug 19, 1950, R. Lister
Medicine Hat, July 16, 1951, R. Lister & J. Moore
Empress, exact location unclear, July 12, 1951, J. Longmuir
Suffield, exact location unclear, July 16, 1951, J. Moore
Taber, exact location unclear, August 1951, W. Saskow
Vauxhall, exact location unclear, August 1951, W. Saskow
25 mi S of Empress, June 21, 1970, N. Panter
9 mi W and 20 mi S of Empress, June 24, 1971, N. Panter & V. Lewin
S end of L Newell, June 3, 1979, V. Lewin
3 mi S of Hays, June 9, 1982, V. Lewin, collected in spawning congress

- collections at the Provincial Museum of Alberta:

Hilda, S14-Tp 19-Rge 2-W4, June 16 and 17, 1970 and June 23, 1969, seven collections; calling in pond with several hundred spadefoots on June 16; sandy area with sage; also caught on road (probably at night), M. Hampson

- other observations:

5 miles south of Bindloss, SE30-Tp 21-Rge 2-W4, several calling in shallow water of pond dominated by Polygonum, in sandy kame moraine, May 27, 1976, recordings made, C. Wallis
7 miles south of Bindloss, NW8-Tp 21-Rge 2-W4, two calling in shallow water of small pond, sandy kame moraine, May 2, 1978, photographs taken, C. Wallis, C. Wershler, R. Wershler
Bindloss bridge, Tp 22-Rge 3-W4, 1 very small Great Plains Toad, July 18, 1974, W. Smith
White Rock Coulee area, South Saskatchewan River, Tp 17-Rge 3-W4, small slough on upland, several calling with Chorus Frogs, May 29, 1974, W. Smith
Lost River, SE3-Tp 1-Rge 4-W4, May 19, 1981, C. Wallis, C. Wershler
Empress, possibly in Saskatchewan, along the Red Deer River, several calling with numerous Plains Spadefoots, May 24, 1974, W. Smith
10 miles SW of Empress, N20-Tp 21-Rge 1-W4; 1 calling on May 3, 1976, C. Wallis, W. Smith; again on June 15, 1979, several calling in small shallow pond at edge of sand hill area, C. Wallis
Lost River Ranch, Tp 1-Rge 5, 1 calling, May 14, 1975, C. Wallis, W. Smith
Lost River Ranch, NE10-Tp 1-Rge 5-W4, calling in small shallow pond in sandy outwash plain, May 21, 1978, C. Wallis, C. Wershler
South Saskatchewan, Tp 18, Rge 3, W. Smith, dugout
Lost River, Tp 1, Rge 4, W. Smith

- observations by June Picotte, Remount Community Pasture, Tp 21-Rge 3-W4:

Great Plains Toads have been heard calling from a dugout to the SW of the headquarter buildings and have also been seen in the vicinity of the buildings and in the garden. One was photographed being swallowed by a Plains Hognose Snake. The Remount headquarters are located in a large tract of unbroken native grassland on sand hill terrain.

HABITAT:

Vernal pools and semipermanent ponds, rarely in lakes; in sand hills and sand plains. It is unclear whether the Vauxhall and Taber records were from natural or irrigated areas -- few natural wetlands persist in these areas today.

In Oklahoma, Bragg (1940) noted that Great Plains Toads bred only after rain in spring or summer when the temperature exceeded 12°C. He also stated that they did not breed in excessively muddy water, even though the young tadpoles may have been later subjected to disturbance by buffalo wallowing in the pools. While clear water was a requirement for breeding, it did not seem to be necessary for successful development of the young. All breeding records by Wallis, Smith, and Wershler for Alberta are in relatively clear water in areas which were not being grazed at the time of breeding.

In Alberta, Great Plains Toads breed in May and early June.

THREATS:

The major threats are drainage and cultivation of wetlands. The impact of disposal of various chemicals from oil and gas exploration and of cattle activity on breeding ponds has not been researched.

POPULATION SIZE AND TREND:

The population in Alberta is very low. An extended period of drought over the last few years has dessicated most of the Great Plains Toad's known breeding ponds. In 1986, no breeding was noted in the Bindloss-Middle Sand Hills or Lost River areas. Drought persisted beyond the breeding season in the former area but it is possible that breeding occurred in early summer at Lost River following an unusually wet late spring. Above normal precipitation fell over most of southern Alberta in late summer and fall and it is possible that breeding ponds may have adequate water next spring. At least two former breeding ponds have now been cultivated.

PROTECTIVE STATUS:

No protected areas containing populations of Great Plains Toads are known in Alberta. This species is not listed in Alberta Fish and Wildlife's "A Draft Policy for the Management of Threatened Wildlife in Alberta".

RECOMMENDATIONS/MANAGEMENT ACTION:

During wetter years, there needs to be further research to determine the locations of breeding ponds. Research should also be directed to the location of "centres of dispersal", areas which support populations of Great Plains Toads (and other grassland amphibians) through extended dry periods. Research should be done in cooperation with any Saskatchewan surveys in the Great Sand Hills. The most extensive potential Alberta habitat lies adjacent the Great Sand Hills and repopulation of some Alberta ponds may rely on Saskatchewan wetlands or vice versa.

Because its habitat is highly localized, protection of known breeding habitat from cultivation and other developments should be a priority. Grazing should be eliminated from known Great Plains Toad ponds during the breeding season.

The Middle Sand Hills of the Suffield Military Reserve may be important for this and a number of other grassland reptiles and amphibians. At the present time, this area is out-of-bounds for military activity but is open to oil and gas development. Suggestions have been made to have this area designated a National Wildlife Area (see note under Plains Spadefoot). Numerous species of wildlife, including several rare types, would benefit from any additional protection which could be

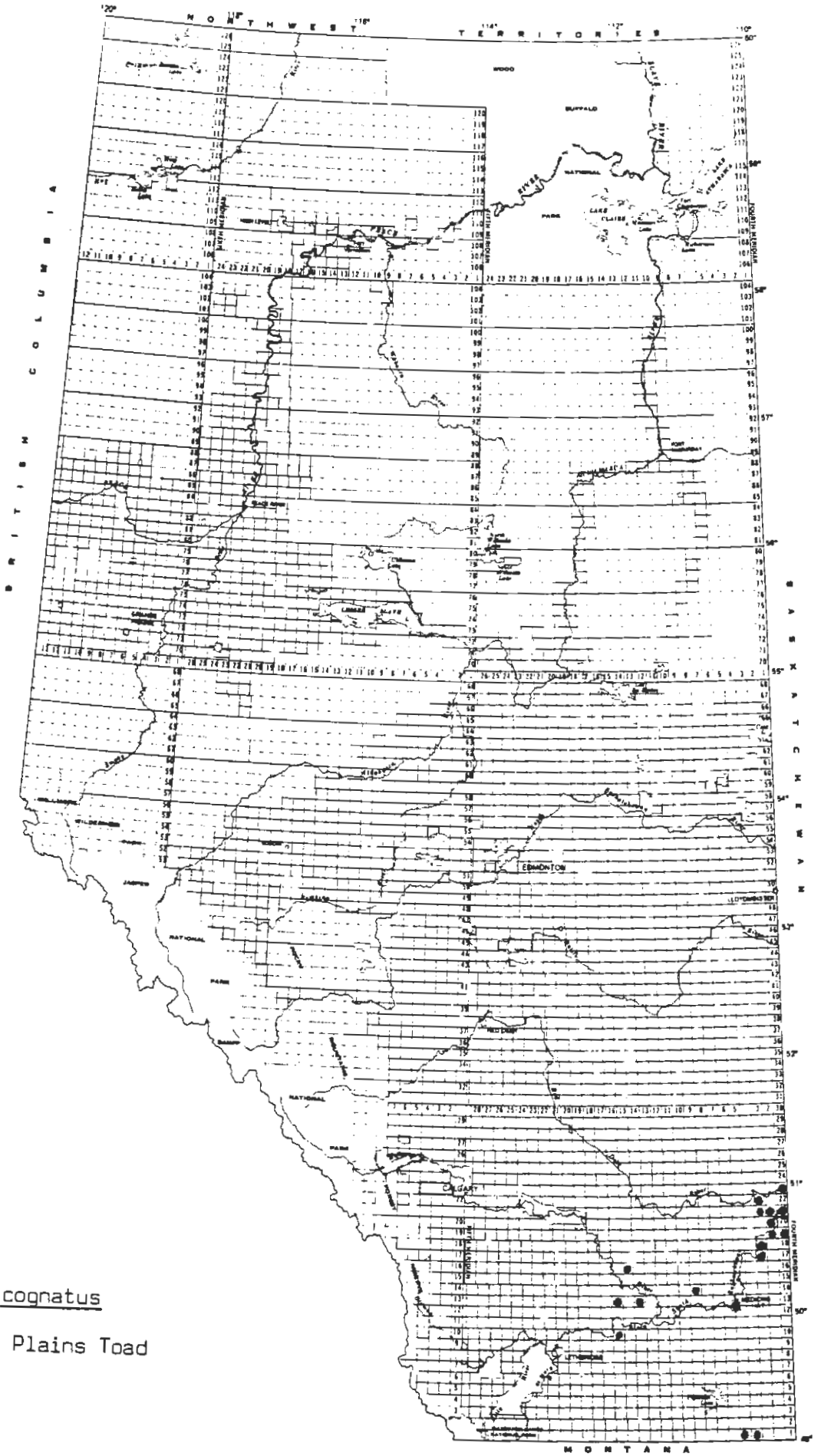
afforded this nationally significant area.

The Vauxhall-Lake Newell-Hays population should be studied to determine the impact of irrigation and agriculture on populations of Great Plains Toads.

In January 1986 it was recommended by participants at the Edmonton workshops on Rare and Endangered Species that the Great Plains Toad be listed as "threatened" and possibly "endangered" in Alberta. It is the authors' view that this species should be classified as "endangered" under appropriate provincial wildlife legislation.

REFERENCES:

Butler and Roberts (1986)
Logier (1931)
Moore (1953a)
Lewin (1963a)
Wallis (1976)
Wallis (1977)



Bufo cognatus

Great Plains Toad

LATIN NAME: Bufo americanus hemiophrys

COMMON NAME: Dakota Toad or Canadian Toad

BRIEF SUMMARY OF STATUS:

Common throughout the Central Parkland, becoming more localized further south in the Northern Fescue Grassland; rare in the northern part of the Mixed Grassland.

GENERAL ALBERTA DISTRIBUTION:

Widespread through the eastern wooded portions of Alberta from the northern part of the Mixed Grassland along the Red Deer River north at least to the Peace-Athabasca delta and Lesser Slave Lake areas.

HABITAT:

Permanent ponds, lakes, oxbow lakes, old meander channels, and slow-moving streams; generally in relatively clear water.

THREATS:

Drainage and cultivation of wetlands; flood control along major streams.

POPULATION SIZE AND TREND:

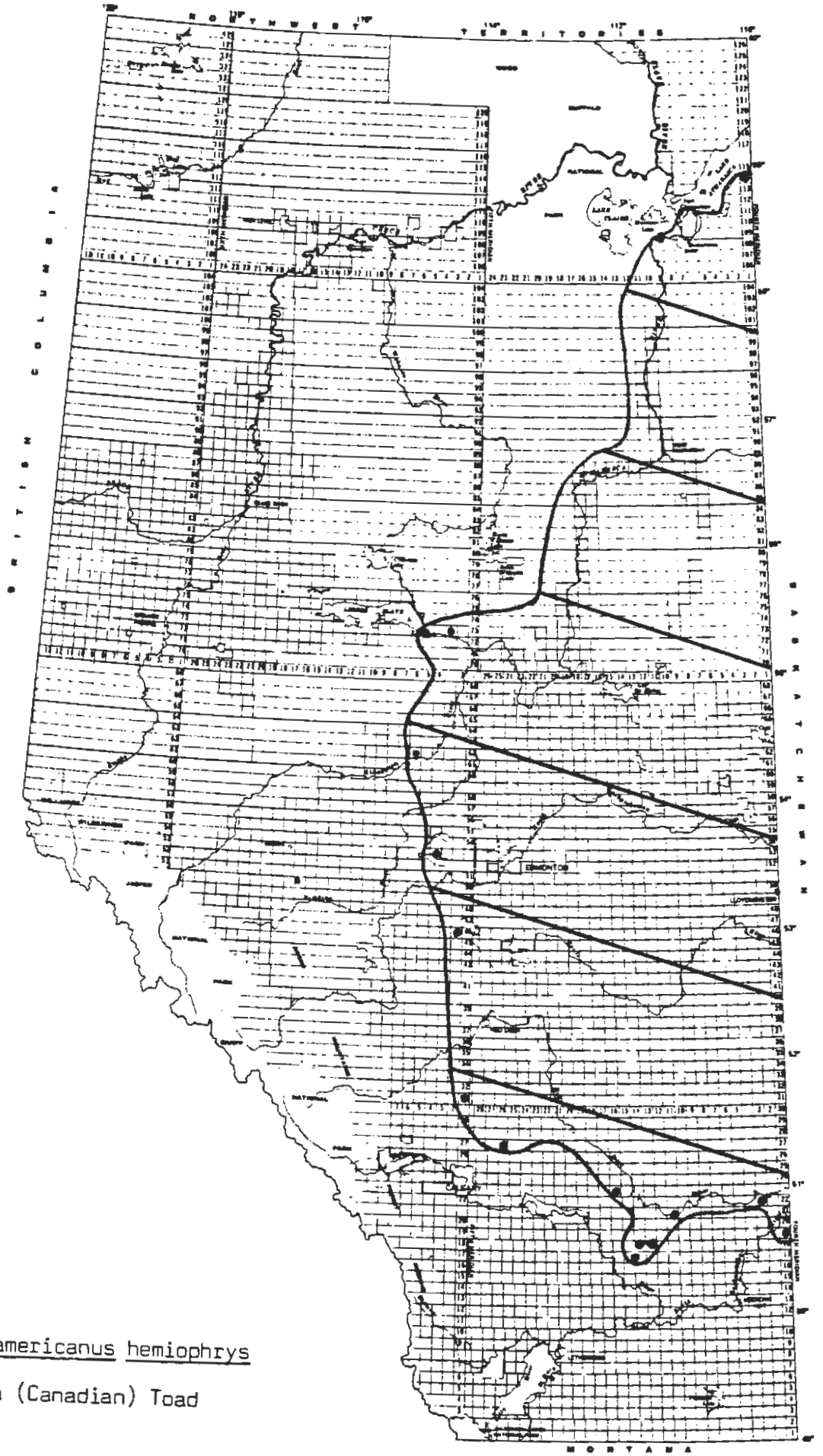
Common throughout much of the Central Parkland and Northern Fescue Grassland, especially the eastern portions; confined to irrigation districts and the Red Deer River in the Mixed Grassland. Dakota Toads appear to be maintaining themselves at healthy levels despite some local losses due to wetland destruction.

PRDTECTIVE STATUS:

Dakota Toads occur in numerous Provincial Parks and Elk Island National Park.

RECOMMENDATIONS/MANAGEMENT ACTION:

Protection of wetlands for other wildlife will also benefit this species.



Bufo americanus hemiophrys

Dakota (Canadian) Toad

LATIN NAME: Bufo boreas boreas

COMMON NAME: Boreal Toad or Western Toad

BRIEF SUMMARY OF STATUS:

Rare in the Foothills Grassland region; but common in the Foothills and Rocky Mountain Regions.

GENERAL ALBERTA DISTRIBUTION:

Foothills and Rocky Mountains from the United States border north into the Peace River district. There are also records from Calgary and widely disjunct occurrences at Del Bonita and Hays in the Foothills Grassland and Mixed Grassland.

HABITAT:

Beaver ponds and other permanent wetlands in wooded areas. They apparently also occur along major rivers well into the grasslands. It is not known if these are viable breeding populations or individuals which have been transported downstream in floodwaters.

THREATS:

There is insufficient knowledge of grassland populations to assess the threats.

POPULATION SIZE AND TREND:

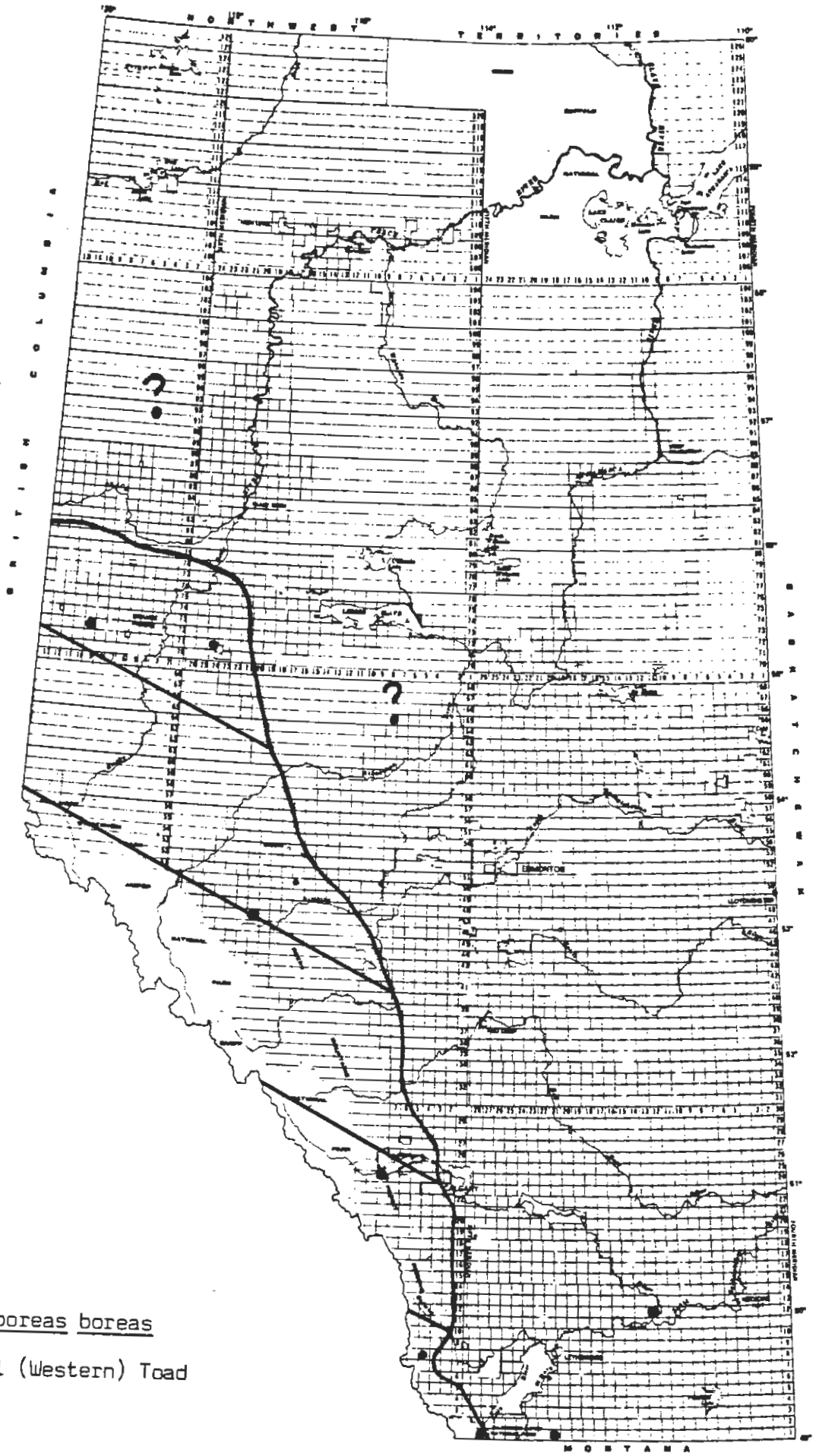
Undetermined in grassland environments.

PROTECTIVE STATUS:

Protected in several national and provincial parks; no protection for grassland populations.

RECOMMENDATIONS/MANAGEMENT ACTION:

More research is needed to determine the extent and significance of this species' occurrence in the grassland region.



Bufo boreas boreas

Boreal (Western) Toad

LATIN NAME: Pseudacris triseriata maculata

COMMON NAME: Boreal Chorus Frog

BRIEF SUMMARY OF STATUS:

Abundant.

GENERAL ALBERTA DISTRIBUTION:

Found in most areas of Alberta, except in the Main Ranges and higher elevations of the Rocky Mountains.

HABITAT:

A variety of vernal pools, and semi-permanent and permanent wetlands; along stream valleys and in uplands.

THREATS:

None.

POPULATION SIZE AND TREND:

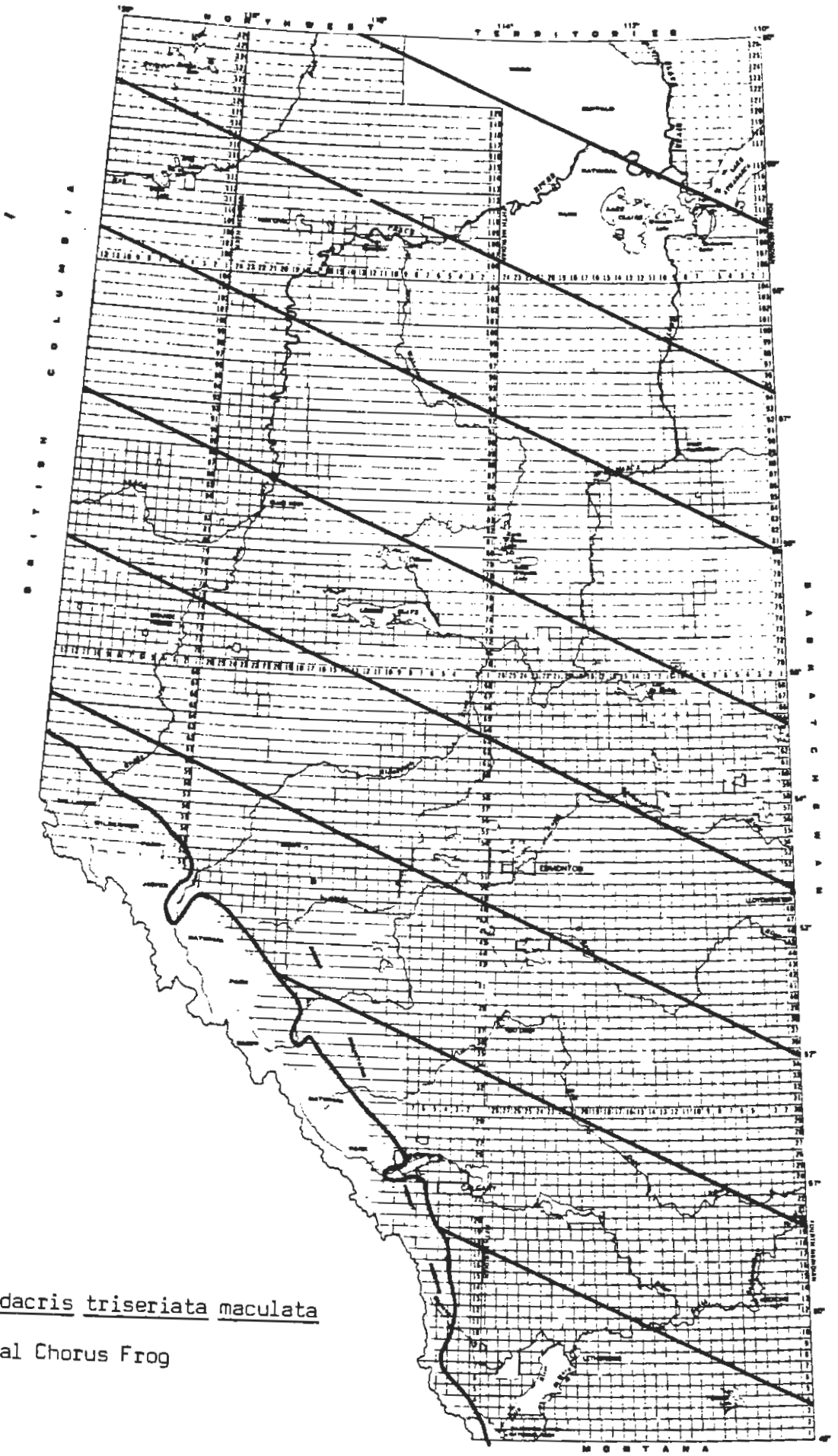
Chorus Frogs are abundant throughout the Parkland and Grassland regions. It is maintaining healthy populations in all but the most extensively and intensively cultivated areas of Alberta. Populations appear to build up rapidly following periods of drought.

PROTECTIVE STATUS:

Boreal Chorus Frogs occur in numerous Provincial Parks and National Parks.

RECOMMENDATIONS/MANAGEMENT ACTION:

None required. Protection of wetlands will benefit this and other wildlife species.



Pseudacris triseriata maculata

Boreal Chorus Frog

LATIN NAME: Chrysemys picta belli

COMMON NAME: Western Painted Turtle

BRIEF SUMMARY OF STATUS:

Should be considered endangered; very local and very rare in Alberta, occurring here at the northern limit of its range.

GENERAL ALBERTA DISTRIBUTION:

Naturally occurring only along the lower Milk River and, possibly, Battle Creek in the Cypress HIlls. This species occurs along the Battle Creek drainage in Saskatchewan and along the Missouri River drainage in Montana.

SPECIFIC LOCALITIES:

Cypress Hills, photographed at Battle Creek at Reesor's Ranch, summer 1979, J. Martin; also one recorded several years previous

- collection at the National Museum of Canada:

Milk River at mouth of Verdigris Coulee, summer 1967, T. Willock

- collections at the University of Alberta Museum of Zoology:

Milk River 17 mi west of Wildhorse, oxbow lake with much emergent vegetation, primarily cattails, bulrushes, and sedges, with several large partly submerged tree trunks which were used for basking, old claw marks from past years indicated several years of use, June 6, J. Ryder and V. Lewin and June 7 and 19, 1962, V. Lewin

Milk River Canyon oxbow lake (about 2 miles west of previous site), 55-1-5-W4, July 1975, 3 sight records, W. Smith and C. Wallis; again July 1976, 2 sight records, C. Wallis, C. Bradley, L. Bradley, G. Langford

There are numerous records of introductions including a Coleman/Blairmore population which may persist in several ponds, as well as some at Calgary, Grimshaw, Hines Creek, and Edmonton.

HABITAT:

Oxbow lakes and, possibly, ponds or slow-moving streams in the Cypress Hills.

THREATS:

Flood control from upstream dams.

POPULATION SIZE AND TREND:

Very small, possibly extirpated. None seen since the mid-1970's. Oxbow lakes have been dry along the Milk River for several years. Reflooding and creation of new oxbow lakes this year may allow the species to re-establish itself along the lower Milk River. Apparently suitable habitat along Police Coulee does not appear to be utilized by Western Painted Turtles.

PROTECTIVE STATUS:

This species is listed as "peripheral" in Alberta Fish and Wildlife's "A Draft Policy for the Management of Threatened Wildlife in Alberta".

Suitable habitat may receive protection in the proposed Milk River Canyon/Kennedy Creek natural area/ecological reserve. The species has been recorded in Cypress Hills Provincial Park, however, no active research or management has been carried out there.

RECOMMENDATIONS/MANAGEMENT ACTION:

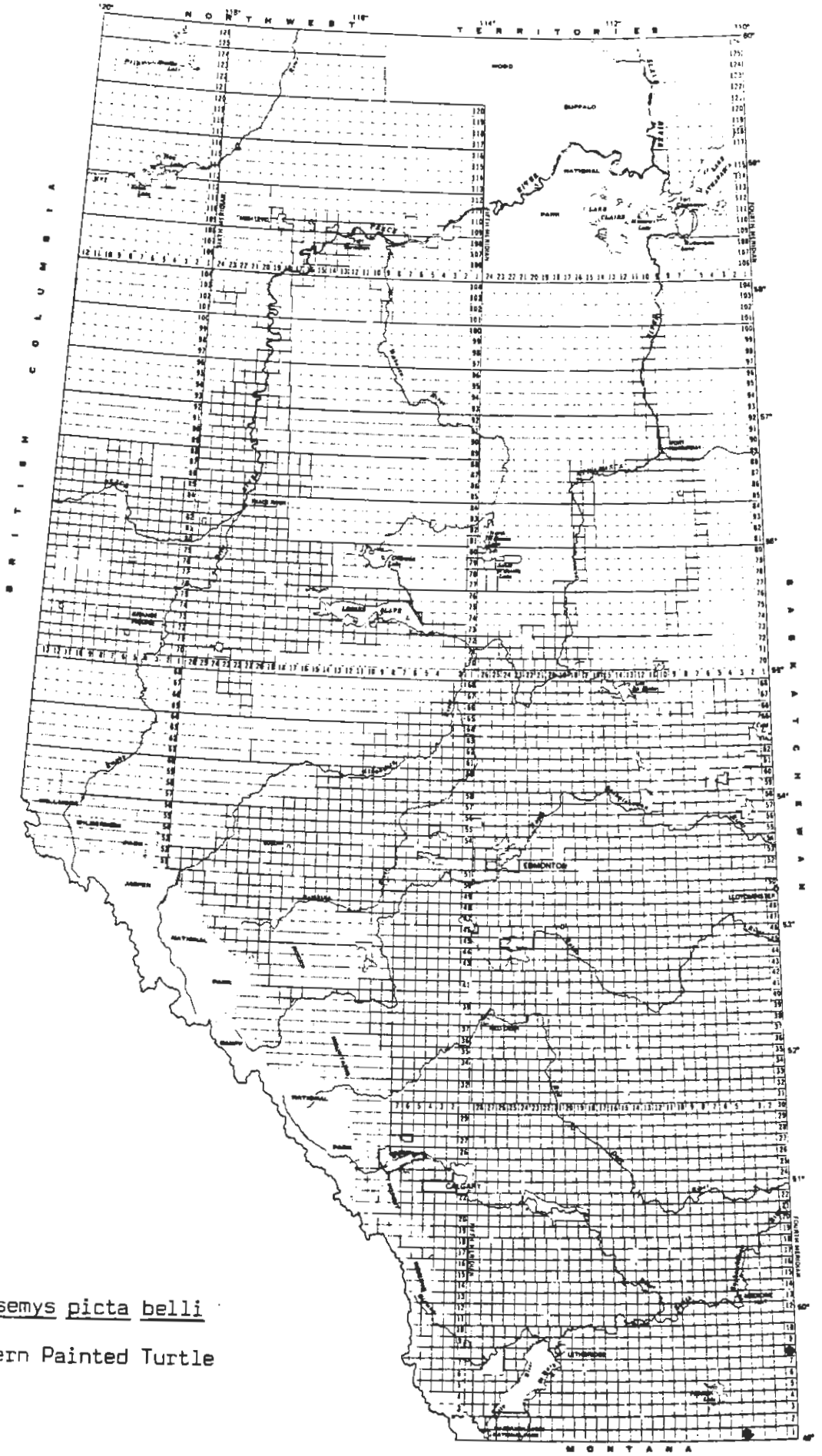
Western Painted Turtles should be listed as endangered in Alberta. Design of the proposed Milk River dam upstream should allow floodwaters to pass through at sufficient levels to permit reflooding of oxbow lakes on a regular basis. An assessment of populations and newly formed oxbows along the lower Milk River and Battle Creek should be made. Reintroductions along the lower Milk River should be considered in suitable habitat.

The establishment of the Kennedy Creek/Milk River Canyon natural area/ecological reserve may help in the protection of populations along the lower Milk River Canyon.

This species should be classified as "endangered" under appropriate provincial wildlife legislation.

REFERENCES:

Butler and Roberts (1986)
Lewin (1963a and 1963b)
Wallis (1976)



Chrysemys picta belli

Western Painted Turtle

LATIN NAME: Phrynosoma douglassi brevirostre

COMMON NAME: Eastern Short-horned Lizard

BRIEF SUMMARY OF STATUS:

Should be considered threatened; small and scattered populations are found in isolated areas of suitable habitat; has apparently declined in some sites.

GENERAL ALBERTA DISTRIBUTION:

Occurs along the major river valleys and large glacial spillways and coulees of the Mixed Grassland from the Milk River north to Bow Island and the Suffield Military Reserve.

SPECIFIC LOCALITIES:

Tp 14 Rge 5 just north of Medicine Hat, Larry Powell
Tp 11 Rge 11 west of Bow Island, Larry Powell
Chin Coulee north of Foremost, M. Williams
Bear Gulch east of Aden, M. Williams
Lost River Canyon, M. Williams
Manyberries, M. Williams
lower Milk River Canyon, M. Williams
Chin Coulee north of Nemiskam, J. Soper
SE of Manyberries, Larry Powell
vicinity of Wildhorse, V. Lewin
north bank of South Saskatchewan River 9 km NW of Bow Island, 24-11-11-W4, four individuals, lightly vegetated areas over the top one-half of south-facing banks August 18, 1976, D. Schowalter; three more seen here in 1977 and one collected by R. Burns of the Provincial Museum in 1977
south bank of Milk River just east of Writing-on-Stone Provincial Park, SE33-1-12-W4, one on west-facing outcrop, D. Schowalter; the Gilchrist family 2 miles east of here are familiar with the species and indicate that it likely occurs throughout the local area of badlands
north bank of the South Saskatchewan River 20 km south of Suffield, April 27, 1980, Laird and Leech (1980)
north side of the Milk River (presumably the Lost River) 8 km south of Onefour, May 1, 1980, Laird and Leech (1980)
north side of the Milk River, sections SE3 and SW2-Tp 1-Rge 4-W4, south-facing valley rim, 2 individuals, C. Wallis, C. Wershler
north side of the Milk River, NE 36-Tp 1-Rge 6-W4, observations beginning in 1974, ending in June 21, 1980; C. Wallis, C. Wershler, R. Wershler; studied later by L. Powell
east side of Lost River, SW11-Tp 1-Rge 4-W4, 2 individuals on west facing rim of Lost River valley, sandy soil, May 25, 1979, C. Wallis; last records, each of one individual, April 30, 1982, C. Wershler; and May 22 and 23, 1982, R. Wershler

east side of Lost River, NW2-Tp 1-Rge 4-W4, on southwest-facing slope with yucca plants, gravelly, sandy soil, May 25, 1979, C. Wallis

- collections at the National Museum of Canada:

north bank of the South Saskatchewan River 11 km west of Redcliff
Lost River Ranch, 9 km NW of Onefour
Grassy Lake (probably north of the town along the South Saskatchewan River)
Writing-on-Stone Provincial Park
east bank of South Saskatchewan River 16 km NE of Medicine Hat, south-facing slope in badlands about 1/4 mile east of South Saskatchewan River, SE24-14-S-W4, May 16, 1972, D. Schowalter, H. Armbruster, L. Armbruster

- collections at the University of Calgary Museum of Zoology:

Nemiskam Community Pasture, 110° 31' W, 49° 17' N, July 15, 1979, L. Powell
Comrey, August 29 to September 3, 1979, L. Powell
Bow Island, September 8 and 9, 1979, Larry Powell

- collections at the University of Alberta Museum of Zoology:

Medicine Hat, June 4, 1936, E. Logier
Foremost, May 28, 1950, M. Maddough
Manyberries, Aug 1, 1950, S. Dann
Onefour, July 20, 1950, E. Strickland
Lost River, Aug. 19, 1950, J. Moore
Lost River, May 20, 1951, S. Smoliak
Lost River, Aug 7, 1951, R. Lister
Manyberries, June 10, 1951, S. Dann
Lost River, May 27, 1950, S. Smoliak
Lost River, Aug 20, 1950, S. Smoliak
Manyberries, Aug 3, 1953, S. Dann
Comrey, June 26, 1953, G. Monkman
Redcliff, June 7, 1953, Howe & Whitbread
Medicine Hat, August 11, 1953, J. Anderson - 13 young
13 mi S of Ralston, July 2, 1961, Mrs. O. Johnson; also June 27, 1961 same locality
Milk River 20 mi W and 1 north of Wildhorse, May 30, 1962, J. Ryder
4.5 mi N of Onefour, July 1959, S. Smoliak
Lost River, 11 mi West of Wildhorse, June 17, 1962, V. Lewin
6 mi E, 2 mi S of Manyberries, August 23, 1972, found on clay mudflats by W. Calvert, also on clay slide by M. Robinson
4 mi N and 5 mi W of Bow Island, August 13, 1980, V. Lewin

- collections at the Provincial Museum of Alberta:

3 sites near Manyberries; 49° 15' N, 110° 28' W, Aug. 8, 1966; 49° 23' N, 110° 41' W June 25, 1967; and S14-5-5-W4 June 12, 1971, Mike

Hampson, R. Carson, and D. Taylor

HABITAT:

The Eastern Short-horned Lizard prefers south-facing slopes and the upper reaches of coulee or canyon slopes and Bearpaw shale slopes. Many of the sites occur in the ecotone between the upland grassland and the eroding badland slopes. Here, there is a mosaic of grassland on sandy soil and sparsely vegetated areas on eroded clay and exposed sandstone.

The Bearpaw shale areas are a mosaic of silt/sand dunes and alluvial fans on which grows a patchwork of creeping juniper. Patches of grassland are found on higher ground between the eroding Bearpaw shale ravines. Short-horned Lizards are found in both ravine and grassland situations.

There seems to be a requirement for sandy soil to facilitate burrowing.

THREATS:

Collectors pose one of the few threats to this species but the extent of the problem has never been documented. Short-horned Lizards occur both in grazed and ungrazed areas but it is not known whether they show any preference for lightly or ungrazed patches which occur within grazed pastures.

POPULATION SIZE AND TREND:

Eastern Short-horned Lizards are considered rare in Canada (Powell and Russell 1985). Overall, the Short-horned Lizard population in Alberta is low. They occur in strongly localized and isolated sites. Of five sites where populations were studied, the maximum population was 125 and the minimum was 8. About 25 sites are known for Alberta.

No long-term data exists on any of the populations in Alberta. At one site along the Lost River, the species has apparently declined over the last decade. The major researcher of Short-horned Lizards, Larry Powell, was unable to locate any in this area where previously they were easy to find. The reasons for the apparent decline are unknown. The site is more frequently visited by naturalists now and there has been a prolonged drought over the last few years.

The last reported sighting in Writing-on-Stone Provincial Park was in 1934 and the current park staff have no records of this species in the park. Dave Schowalter has recently seen Eastern Short-horned Lizards immediately east of the park.

PROTECTIVE STATUS:

This species is listed as "peripheral" in Alberta Fish and Wildlife's "A Draft Policy for the Management of Threatened Wildlife in Alberta".

The proposed Kennedy Creek/Milk River Canyon natural area/ecological reserve includes one of the largest and best-studied populations of Short-horned Lizards in Canada. The potential for protection exists at Writing-on-Stone Provincial Park if populations still exist there.

RECOMMENDATIONS/MANAGEMENT ACTION:

Several major populations should be monitored to establish population trends. Since most of the sites occur in areas which are grazed by cattle, it would be useful to study the relationships between Short-horned Lizard distribution and cattle grazing on a micro-habitat basis.

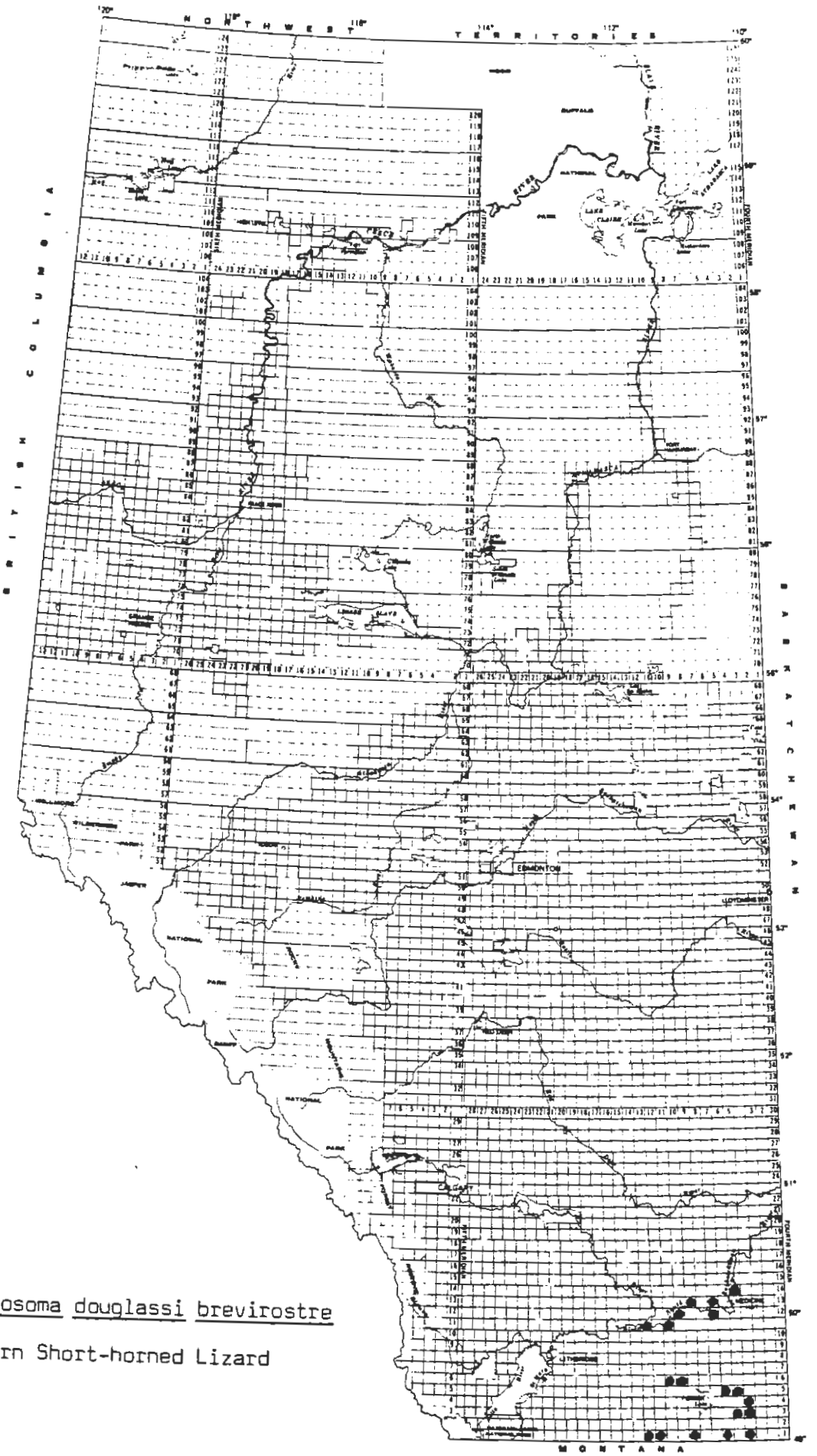
The establishment and wise management of the Kennedy Creek/Milk River Canyon natural area/ecological reserve would protect one of the most significant populations of Eastern Short-horned Lizards.

Powell and Russell (1985) suggest that Eastern Short-horned Lizards should be classed as "threatened" in Alberta. Population densities are low and recruitment also appears to be low. Such populations cannot withstand any more than mild manipulation or loss of individuals.

Habitats of known populations should be protected from damaging developments, and lands containing major populations should be considered for legal designation as wildlife sanctuaries, natural areas or ecological reserves. The small size and localized nature of the habitat should simplify the task of reserving conservation lands for Short-horned Lizards.

REFERENCES:

Powell (1982)
Powell and Russell (1985)
Williams (1946)
Schowalter (1979)
Milner (1979)
Laird and Leech (1980)
Lewin (1963a)
Soper (1949)
Wallis (1976)



Phrynosoma douglassi brevirostre

Eastern Short-horned Lizard

LATIN NAME: Heterodon nasicus nasicus

COMMON NAME: Plains Hognose Snake or Western Hognose Snake

BRIEF SUMMARY OF STATUS:

Should be considered as endangered; populations appear to be very low and very isolated; two colour variants are known.

GENERAL ALBERTA DISTRIBUTION:

There are two areas of distribution in Alberta, both in the Mixed Grassland -- the lower Red Deer River - Middle Sand Hills - South Saskatchewan River and the Milk River Canyon - Pakowki Lake area.

SPECIFIC LOCALITIES:

- collection at the National Museum of Canada:

Dunmore, 49° 59' 00" N, 110° 34' 45" W, September 20, 1927, H. Seamans

- collections at the University of Alberta, Museum of Zoology:

Comrey, 49° 07' 00" N, 110° 44' 20" W, July 2, 1938, E. Logier and J. Brown
Empress, 50° 57' 00" N, 110° 00' 40" W, July 13, 1951, by a roadside pool, 2 specimens, R. Lister, and J. Moore
20 mi W and 2.5 mi N of Wildhorse, 49° 02' 00" N, 110° 39' 30" W, June 15, 1962, J. Ryder
13 mi W and 5.5 mi N of Wildhorse, 49° 04' 49" N, 110° 30' 15" W, July 1961, E. Stribney
23 mi S and 4 mi west of Empress, 50° 37' 07" N, 110° 05' 40" W, where Highway 41 passes through some small sand hills, July 24, 1971, N. Panter, dead on road
14 mi S, 1 mi west of Orion, August 12, 1980, J. Acorn, dead on road

- collections at the Provincial Museum of Alberta:

2 records for S14 - Tp 19 - Rge 2 - W4, live, coyote site; May 30, 1969 and August/July? 24, 1971, adult dead on road, both on prairie trail
1 record 1.5 miles west of Many Island Lake on prairie trail, Tp 13, Rge 1 - W4, dead on road, run over for about a week, June 26, 1969, adults, Mike Hampson

- collection at the University of Saskatchewan Museum of Zoology:

Manyberries, 49° 23' 47" N, 110° 41' 40" W, no date

- collection by B. Shantz:

Hilda, probably in Tp 19-Rge 2-W4, close to the top of a knoll on a south-facing exposure, sandy soil, sparse vegetation comprised of spear grass, wild rose, and sand dock, June 22, 1972

- collection by G. Pendlebury:

2 km W and 14.5 km N of Medicine Hat, 50° 11' 00" N, 110° 42' 38" W, on west side of gravel road separating cultivated land from overgrazed rangeland, sandy soil, sagebrush, prickly pear cactus, and cushion cactus were common flora, May 19, 1973

- collection by V. Lewin:

Lost River Ranch, 20 miles W and 2.5 miles N of Wildhorse, SW19-Tp 1-Rge 5-W4, short grass surrounded by large sandstone rocks and creeping juniper on south-facing slope at first step from the top of the Milk River Canyon rim, June 15, 1962

- observations by June Picotte, Remount-Bindloss area:

Five Plains Hognose Snakes have been observed in this area since 1975 between May and August. Two were on roads near Bindloss, two were on Remount Community Pasture, Tp 21-Rge 3-W4, near the headquarter buildings and one was on the road on the way into Remount Community Pasture. One of these sightings was on a sandy fireguard on a knoll to the SW of the headquarters at Remount, and a photograph was taken of it swallowing a Great Plains Toad.

- other observations:

Lost River near Onefour, probably in section 29, 30, 31 or 32, Tp 1-Rge 4, 1980 or 1981, sandy terrain, L. Powell

Milk River Canyon, NE36-Tp 1-Rge 6-W4, edge of badlands in sandy soil with sandstone outcrops and grassland, L. Powell

Atlee, 10 miles west of Buffalo, S4-Tp 22-Rge 7-W4, on road in sandy kame moraine area, small wet meadow nearby, C. Wallis, C. Wershler, R. Wershler

Bindloss, N22-Tp 22-Rge 3-W4, sand plain above the Red Deer River, 2 found dead on gas well servicing trail, June 16, 1980, C. Wallis, C. Wershler

A collection for Manyberries listed by Logier and Toner (1961) may be from the Milk River or Pakowki Lake area. A collection from Craigmyle at Royal Ontario Museum was received from J. Moore of the University of Alberta. The collection date is given as July 9, 1949 but the exact location of the collection is not clear. Craigmyle is considerably north of this species range in Alberta and suitable habitat is not known in this area.

Of additional interest is the presence of two colour morphs with apparently separate geographic distribution within the Alberta range. The pattern of darkness on the ventral surface is continuous in the Milk River - Pakowki Lake population and is somewhat checkered in the Middle Sand Hills - lower Red Deer River population.

HABITAT:

Plains Hognose Snakes prefer areas of sandy soil in sand hills, glacial outwash, and around exposed sandstone outcrops. The requirement for sandy habitats stems from its burrowing habits. There is one documented record of a Hognose Snake feeding on a Great Plains Toad in Alberta. Other prey items noted in the Alberta specimens include small mammals, insects, and Plains Spadefoots. Elsewhere it is known to feed on toads, as well as frogs, salamanders and lizards.

Pendlebury (1976) suggested that there may be a correlation between activity of Plains Hognose Snakes and recent rainfall as well as periods of rising temperature. In Alberta, they have been found as early as May 10 and as late as September 20.

THREATS:

Killing of snakes, particularly at hibernacula, is the most significant threat. It is not known what the extent of the past killing has been, however, a pipeline construction company in the Bindloss area was reported to have hired a full-time snake control person.

Several of the records are of road kills, including some on little-used gas well service trails. It is not known how severe an impact this mortality has on their populations. The apparently small and isolated populations may be much more vulnerable to this kind of impact compared to other species of snakes.

Cultivation is a longer-term threat. Although some sand plain and sand hill areas have been cultivated, much of this habitat remains intact, particularly in the Middle Sand Hills and Milk River-Lost River areas. Agricultural researchers are looking at new methods for utilizing these kinds of habitats and this could create future problems.

POPULATION SIZE AND TREND:

The scarcity of records suggests a very low population but the secretive nature of this species makes any estimation difficult. With one exception, and despite repeated research efforts, it has never been found twice in the same site in Alberta.

The last known records for Alberta were in 1981. Extensive and intensive studies by several researchers over the last five years have failed to turn up any new records.

PROTECTIVE STATUS:

Plains Hognose Snakes are not listed in Alberta Fish and Wildlife's "A Draft Policy for the Management of Threatened Wildlife in Alberta". There is one record of a Plains Hognose Snake from the proposed Kennedy Creek/Milk River Canyon natural area/ecological reserve.

RECOMMENDATIONS/MANAGEMENT ACTION:

The establishment and wise management of the Kennedy Creek/Milk River Canyon natural area/ecological reserve would protect some of this species' known habitat.

The Middle Sand Hills of the Suffield Military Reserve may be important for this and a number of other grassland reptiles and amphibians. We have anecdotal evidence of the occurrence of Plains Hognose Snakes there and it lies at the edge of an area where there is a concentration of records. At the present time, this area is out-of-bounds for military activity but is open to oil and gas development. Suggestions have been made to have this area designated a National Wildlife Area (see note under Plains Spadefoot). Numerous species of wildlife, including several rare types, would benefit from any additional protection which could be afforded this nationally significant area.

The effects of proposed roads should be carefully evaluated before proceeding with new road construction in critical habitats for Plains Hognose Snakes.

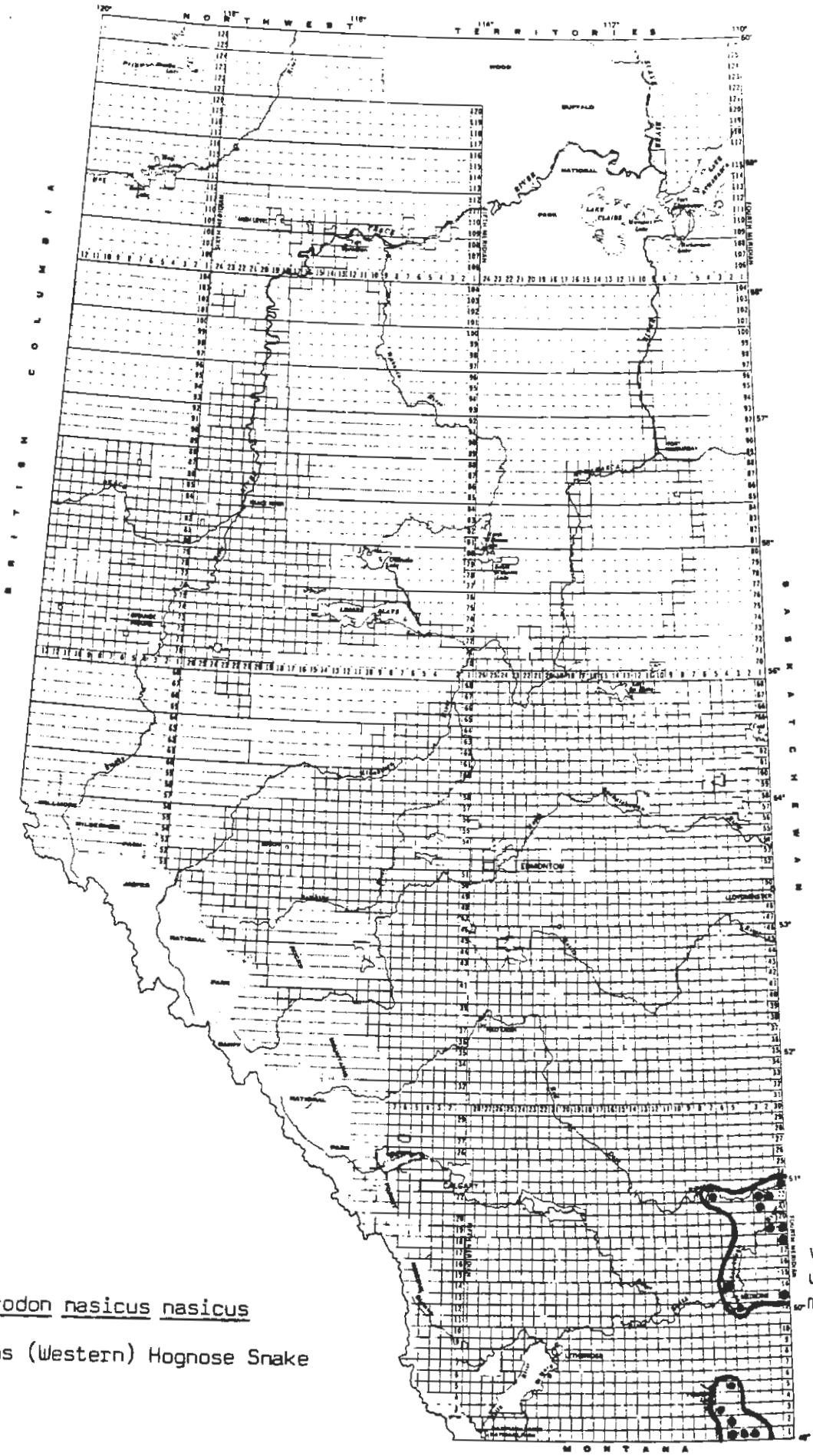
There should be an education program on the value of snakes and requests for additional information from residents in known and potential habitat should be made. In particular, there is a need to determine the locations of overwintering hibernacula. A field research program and interviews with well-servicing personnel (such as those for the Alberta Energy Company) should be conducted in the Middle Sand Hills to identify populations of Plains Hognose Snakes.

Ongoing research should be conducted in known habitats in sand hill and sand plain areas in the drier parts of the Mixed Grassland to determine the extent of the populations, habitat use, and behavior. A more detailed analysis of weather data than that conducted by Pendlebury (1976) may help to determine the most appropriate sampling times.

This species should be classified as "endangered" under appropriate provincial wildlife legislation.

REFERENCES:

Pendlebury (1976)
Wallis (1977)
Lewin (1963a)
Moore (1953b)



Heterodon nasicus nasicus

Plains (Western) Hognose Snake

LATIN NAME: Pituophis melanoleucus sayi

COMMON NAME: Bull Snake or Gopher Snake

BRIEF SUMMARY OF STATUS:

Generally uncommon, apparently largely confined to several localities in the vicinity of the valleys of the Milk, South Saskatchewan, and lower Red Deer Rivers. May have declined or disappeared in many areas of its former range.

GENERAL ALBERTA DISTRIBUTION:

Mixed Grassland region, associated with the Milk, South Saskatchewan, and lower Red Deer River valleys. There are several collections or observations from the Calgary area. These records and ones from the Waterton, Trochu and Hanna areas appear to be disjunct from the species' main range in southeastern Alberta. The main range extends west along the Milk River to Writing-on-Stone Provincial Park, and along the South Saskatchewan River and Red Deer River from the Saskatchewan border upstream to Medicine Hat and Dinosaur Provincial Park.

HABITAT:

Bull Snakes have been noted in a variety of valley and upland habitats: native grassland, sand hill vegetation, eroding badland slopes, sandy areas around sandstone rock outcrops, and riparian woodlands. They are most often seen in areas near extensive badlands. It is known that these areas contain suitable cavities which serve as hibernacula.

THREATS:

Cultivation of native grasslands has probably been a major factor in the decline or disappearance of Bull Snakes. A species with similar habitat requirements, the Prairie Rattlesnake, has reportedly declined in parts of Nebraska and Kansas because of increased agricultural activities. Killing of snakes, particularly at hibernacula, is also a major threat. Highway mortality is a factor which has not been well-documented.

POPULATION SIZE AND TREND:

Bull Snakes are widely distributed but, with a few exceptions, rather local and uncommon. Relatively high populations at Dinosaur Provincial Park are noteworthy. No long-term data exists, however, our records indicate that there may have been a decline in populations along the Milk River over the last five years. It is unclear whether this is related to the prolonged drought or other factors.

Large areas of its former range are now cultivated. We know of no recent records in many areas of its historic range.

PROTECTIVE STATUS:

Good populations exist in Dinosaur Provincial Park and there are records from Writing-on-Stone Provincial Park. Some of the Milk River Canyon population would be included in the proposed Kennedy Creek/Milk River Canyon natural area/ecological reserve.

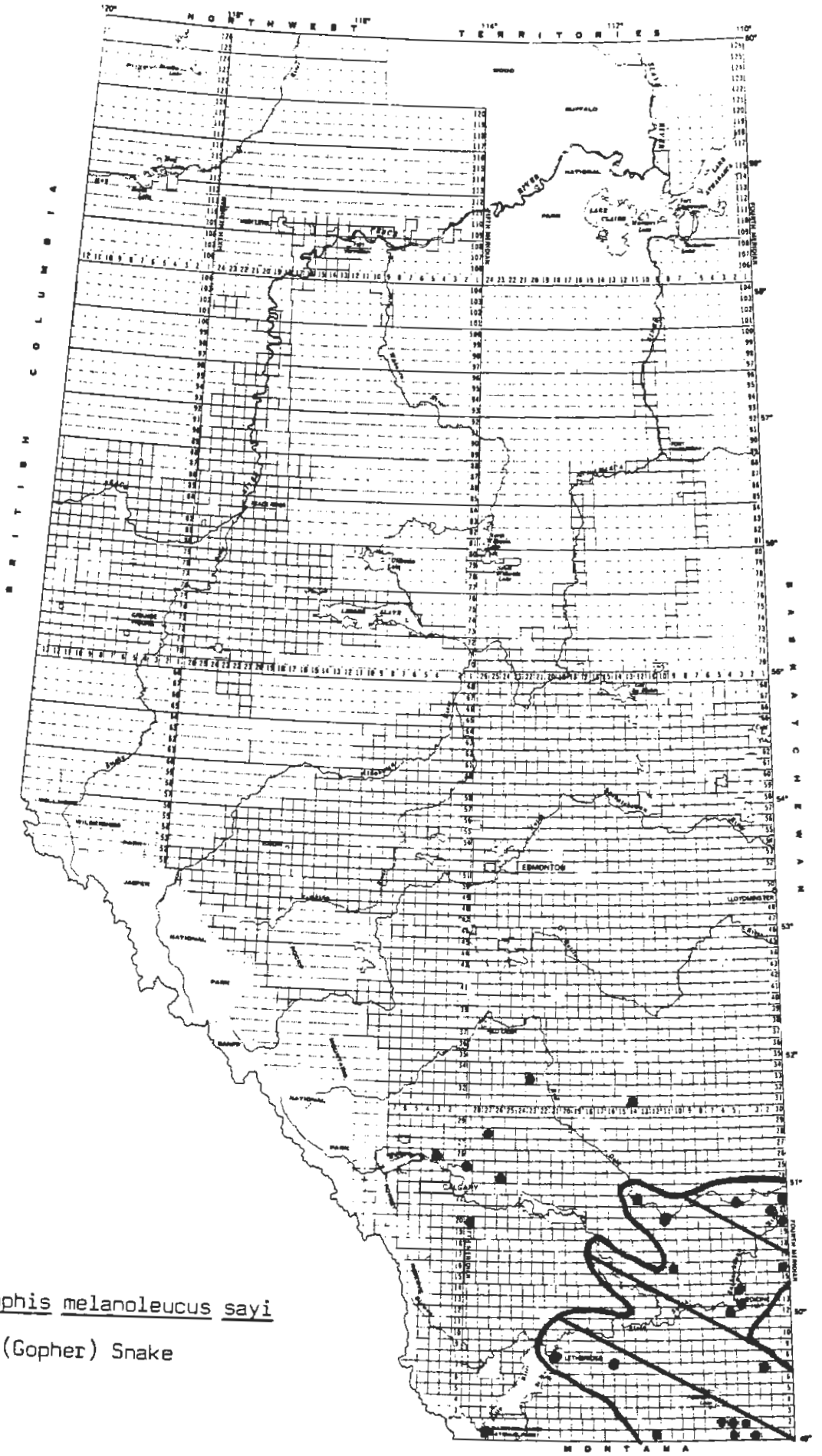
RECOMMENDATIONS/MANAGEMENT ACTION:

Identification and protection of hibernacula will benefit this species. Protection of large blocks of native grassland adjacent suitable denning sites is also important. To this end, the establishment of "protected areas" at Kennedy Creek/Milk River Canyon and the Suffield Military Reserve (see notes under Plains Hognose Snake) would protect several key habitats.

There should be an education program on the value of snakes and requests for additional information, particularly on hibernacula, from residents in known habitat should be made.

REFERENCES:

Pendlebury (1969)
Laird and Leech (1980)
Wallis (1976)
Wallis (1977)



Pituophis melanoleucus sayi

Bull (Gopher) Snake

LATIN NAME: Crotalus viridis viridis

COMMON NAME: Prairie Rattlesnake or Western Rattlesnake

BRIEF SUMMARY OF STATUS:

Fairly common in its localized habitat. Its range has shrunk considerably with extensive cultivation of native grasslands.

GENERAL ALBERTA DISTRIBUTION:

Mixed Grassland from the lower Red Deer River south to the United States boundary, west to Dinosaur Provincial Park. Historically, there are records north of here, mostly along the Red Deer River, to the Ghostpine Creek area. We have only two recent records north of the Red Deer River, 10 miles north of Bindloss, June 24, 1976, by C. Wallis; and 4 kilometres north of the Jenner Ferry, July 25, 1980 by Laird and Leech (1980).

HABITAT:

Prairie Rattlesnakes have been noted in a variety of valley and upland habitats: include native grassland, sand hill vegetation, eroding badland slopes, sandy areas around sandstone rock outcrops, and riparian woodlands. They are most often seen in areas near extensive badlands and sandstone outcrops. The principal geological formations in these areas are Oldman and Foremost formation shales and sandstones. Milk River formation sandstones are the major geological feature in the Writing-on-Stone area. It is known that these rock formations contain suitable cavities which serve as hibernacula. After climate, the availability of hibernacula appears to be the most important natural limiting factor. Pendlebury (1977) stated that Prairie Rattlesnakes usually move no more than 4.3 km from their denning sites in Alberta. Some residents in Prairie Rattlesnake districts believe that this species may move up to 25 km from overwintering sites.

THREATS:

Cultivation of native grasslands and killing of snakes, particularly at hibernacula, are major threats. Pendlebury (1977) noted that Prairie Rattlesnakes tend to disappear from the upland and become confined to the coulee systems when an area is cultivated. Klauber (1956) cites increased agricultural activities as the cause of Prairie Rattlesnake declines in parts of Kansas and Nebraska. Highway mortality is a factor which has not been well-documented but they are one of the most commonly found road-killed snakes.

The effect of declines in Richardson's Ground Squirrels is not clear but ground squirrels are an important food item in some areas. These declines have occurred across large tracts of native Mixed Grassland in the southeastern part of Alberta and have not been well-documented.

There is good evidence that declines of once common wildlife, including some threatened species like the Ferruginous Hawk, Burrowing Owl, and Long-tailed Weasel, may also be linked, in part, to Richardson's Ground Squirrel declines (Wallis 1986).

POPULATION SIZE AND TREND:

In spite of recent drought, the Prairie Rattlesnake appears to be maintaining its population in some parts of its range. In some areas it is said to be increasing while along the lower Milk River it is thought to have decreased over the last ten years (L. Piotrowski, personal communication). No reason has been cited for this decline.

Cultivation of native grasslands and irrigation has been cited as a major cause for their disappearance from some areas. There are numerous historic, but no recent, records for the area northwest of Dinosaur Provincial Park to the Trochu area. This area includes some Northern Fescue Grassland and Central Parkland and is largely cultivated today.

Starting in 1977, Prairie Rattlesnakes have made a comeback at Dinosaur Provincial Park (J. Wolper, personal communication). Considered abundant in 1912 (Pendlebury 1977), they were apparently absent from the area during the early 1970's. Since 1981, an average of six sightings have been made each year within one mile of the campground.

PROTECTIVE STATUS:

There are good populations and large hibernacula at Writing-on-Stone Provincial Park. There is a small population at Dinosaur Provincial Park. Populations along the Milk River Canyon would be included in the proposed Kennedy Creek/Milk River Canyon natural area/ecological reserve.

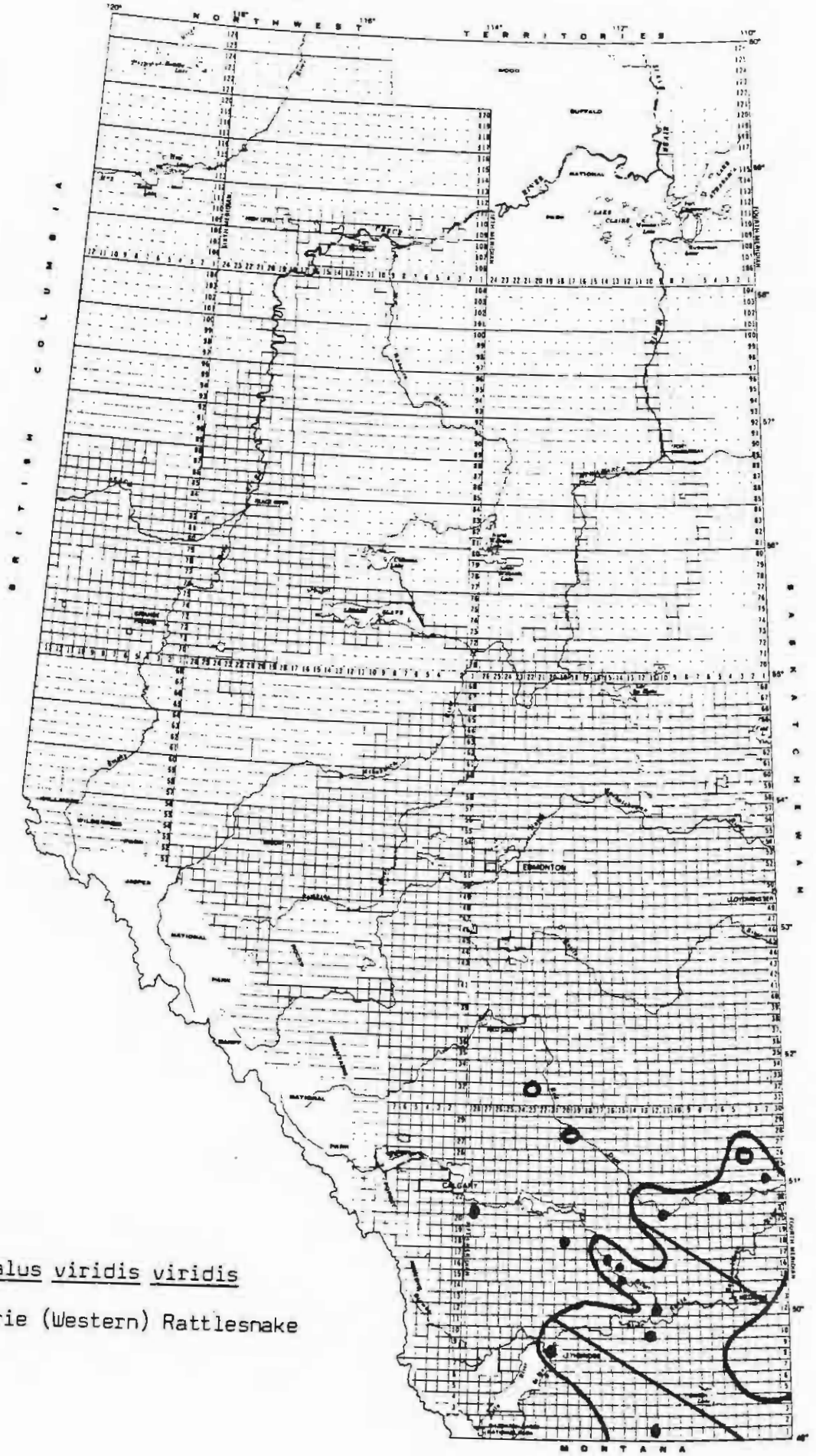
RECOMMENDATIONS/MANAGEMENT ACTION:

Identification and protection of hibernacula will benefit this species. Protection of large blocks of native grassland adjacent suitable denning sites is also important. To this end, the establishment of "protected areas" at Kennedy Creek/Milk River Canyon and the Suffield Military Reserve (see notes under Plains Hognose Snake) would protect several key habitats.

There should be an education program on the value of snakes and requests for additional information, particularly on hibernacula, from residents in known habitat should be made.

REFERENCES:

Pendlebury (1977)
Wallis (1976)
Wallis (1977)



Crotalus viridis viridis

Prairie (Western) Rattlesnake

LATIN NAME: Thamnophis sirtalis parietalis

COMMON NAME: Red-sided Garter Snake or Common Garter Snake

BRIEF SUMMARY OF STATUS:

Locally abundant along water courses in central Alberta; becoming more localized and less common further north and south.

GENERAL ALBERTA DISTRIBUTION:

Red-sided Garter Snakes are found mainly along streams in the western part of the Central Parkland. They are local along the eastern fringes of the Foothills and Montane regions and along the Peace and Slave Rivers in northern Alberta. There is an isolated population in the Cypress Hills.

HABITAT:

A variety of vegetation is found in areas occupied by this species. Heavily wooded areas are generally avoided. Water margins and areas close to water appear to be preferred. Open areas and rock outcrops are used for "sunning" especially just after emergence from or just prior to entering into overwintering hibernacula. Hibernacula generally are found in fractured bedrock (sandstone and limestone) and coarse gravels. The presence of suitable hibernacula may be a major limiting factor.

THREATS:

Destruction of hibernacula or harassment of snakes at hibernacula are the greatest threats to this species. Hibernacula in gravel pit areas have been destroyed. Drainage of wetland habitat is an ongoing problem which affects this and other wildlife.

POPULATION SIZE AND TREND:

Populations appear to be stable but destruction of hibernacula results in the extirpation or reduction of local populations. Drainage and cultivation of upland wetlands may be confining this species to major stream courses.

PROTECTIVE STATUS:

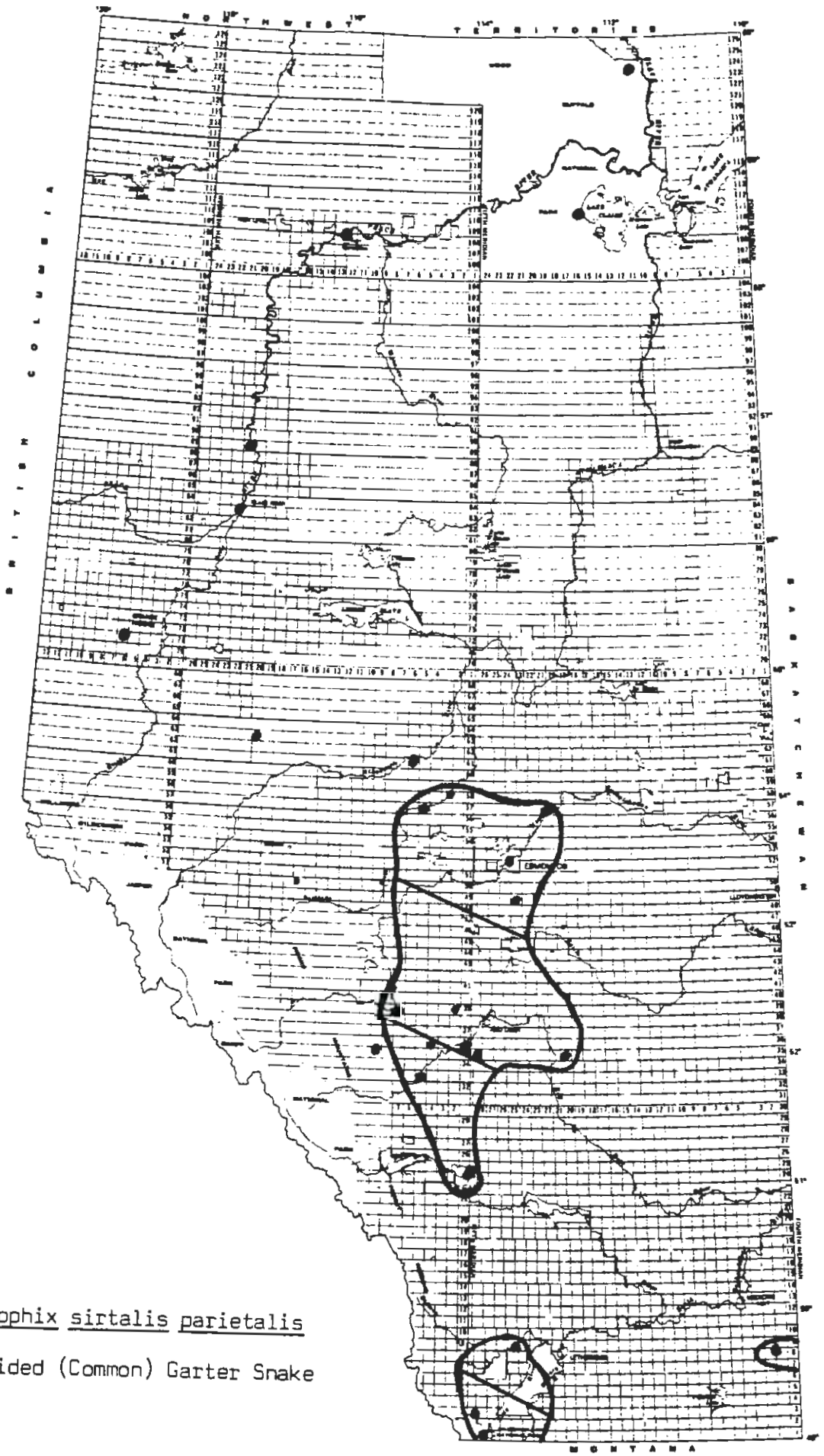
Populations occur in Cypress Hills and Notikewin Provincial Parks and in Waterton Lakes and Wood Buffalo National Parks.

RECOMMENDATIONS/MANAGEMENT ACTION:

Public education about the ecological role of garter snakes is desirable. The significance and vulnerability of hibernacula and aggregated snakes should be stressed.

Certain hibernacula should be "developed" as sanctuaries and educational/interpretive sites.

Major hibernacula should be identified and protective status provided.



Thamnophix sirtalis parietalis

Red-sided (Common) Garter Snake

LATIN NAME: Thamnophis radix haydeni

COMMON NAME: Western Plains Garter Snake or Plains Garter Snake

BRIEF SUMMARY OF STATUS:

Locally abundant over a wide area of east-central and southern Alberta. Populations are expanding northward.

GENERAL ALBERTA DISTRIBUTION:

Western Plains Garter Snakes are found throughout much of the Grassland and Parkland regions. They also occur on the southern fringe of the Boreal Forest where recent clearing has taken place.

HABITAT:

Habitats used range from grassland to meadows and clearings in lightly wooded areas. It may be found at some distance from water and in dry areas, however, it often forages along the margins of waterbodies or enters the water to feed. Habitat for this species is widespread.

THREATS:

This is one species which has benfited from clearing of wooded areas and often takes advantage of excavations (basements, root cellars, mine shafts) for hibernacula. While this species uses a wide range of sites for hibernacula, the aggregated snakes are vulnerable to destruction. Intensive cultivation of large areas may reduce the density of local populations. This is one of the most commonly encountered road-killed snake but highway mortality has not been cited in any population declines.

POPULATION SIZE AND TREND:

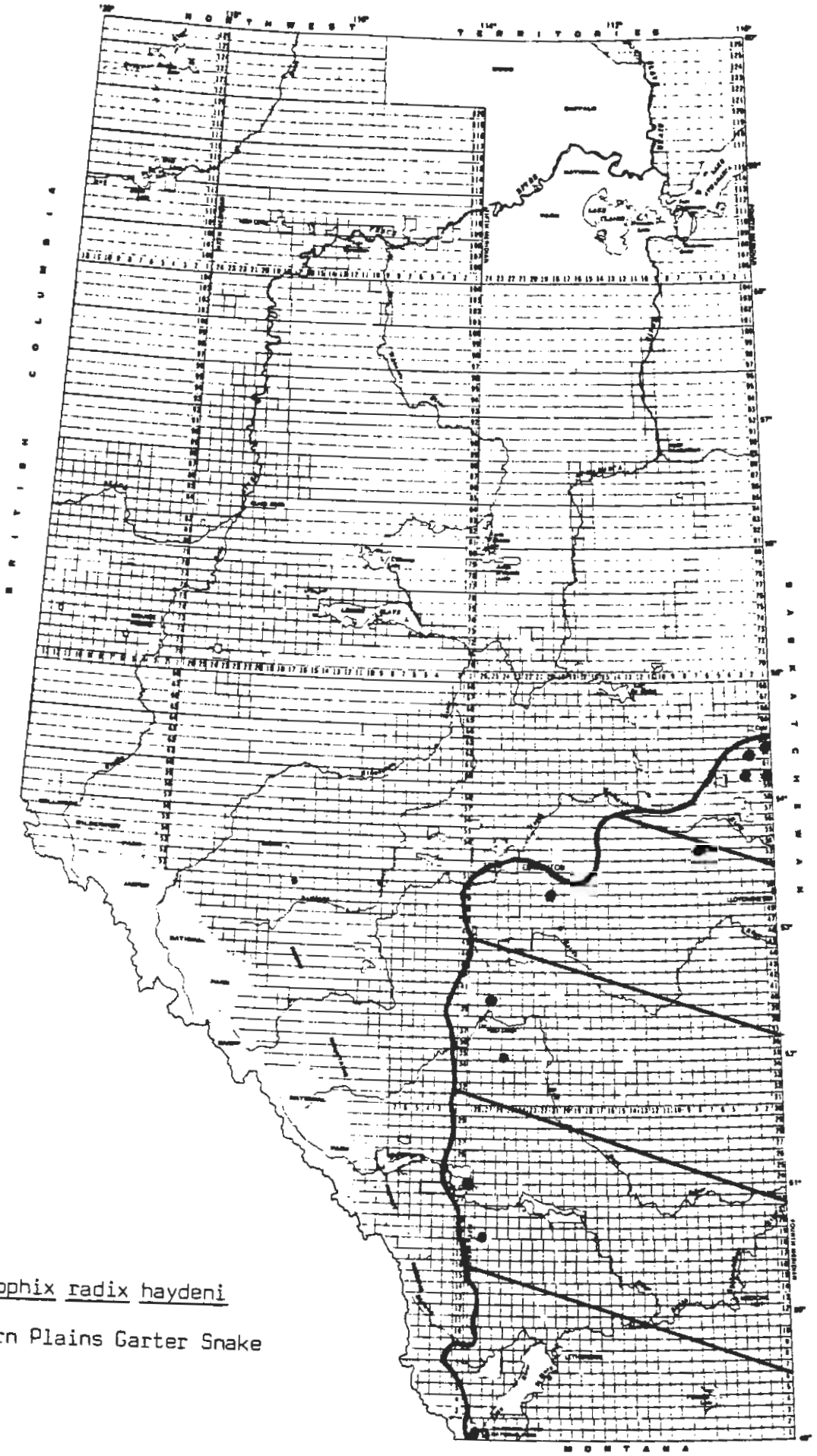
This species is common to abundant over its range within Alberta. Populations may be expanding northward as forested areas are cleared. The population appears stable as expansion offsets other losses. Much of the habitat currently occupied is relatively stable as it is difficult to cultivate (ravines, ridges, hummocky moraine) or it is native grassland or parkland allocated for grazing.

PROTECTIVE STATUS:

Western Plains Garter Snakes occur in many Provincial Parks.

RECOMMENDATIONS/MANAGEMENT ACTION:

Public education combined with protection of natural habitats and hibernacula will benefit this and other species.



Thamnophix radix haydeni

Western Plains Garter Snake

LATIN NAME: Thamnophis elegans vagrans

COMMON NAME: Wandering Garter Snake or Western Terrestrial Garter Snake

BRIEF SUMMARY OF STATUS:

Local along water courses in south-central and southern Alberta.

GENERAL ALBERTA DISTRIBUTION:

The species is wide-ranging along streams in the Milk River and South Saskatchewan River drainages in southern Alberta from Grassland and Parkland regions up to 1700 metres in the Rocky Mountains. A disjunct population is found in the Jasper area.

HABITAT:

The habitat occupied includes grasslands, springs, oxbow lakes, riparian habitats and, less frequently, lightly wooded areas. Its habitat seems widespread but this species is much more localized than other garter snakes in Alberta.

THREATS:

As with other garter snakes, this species is most vulnerable while aggregated at hibernacula. This is the most vulnerable garter snake found in Alberta due to its low reproductive output, small population size, and its more restricted and localized distribution.

POPULATION SIZE AND TREND:

This is the least abundant garter snake in Alberta. Populations are small, localized and probably stable. Much of the occupied habitat along water courses remains relatively undisturbed by man.

PROTECTIVE STATUS:

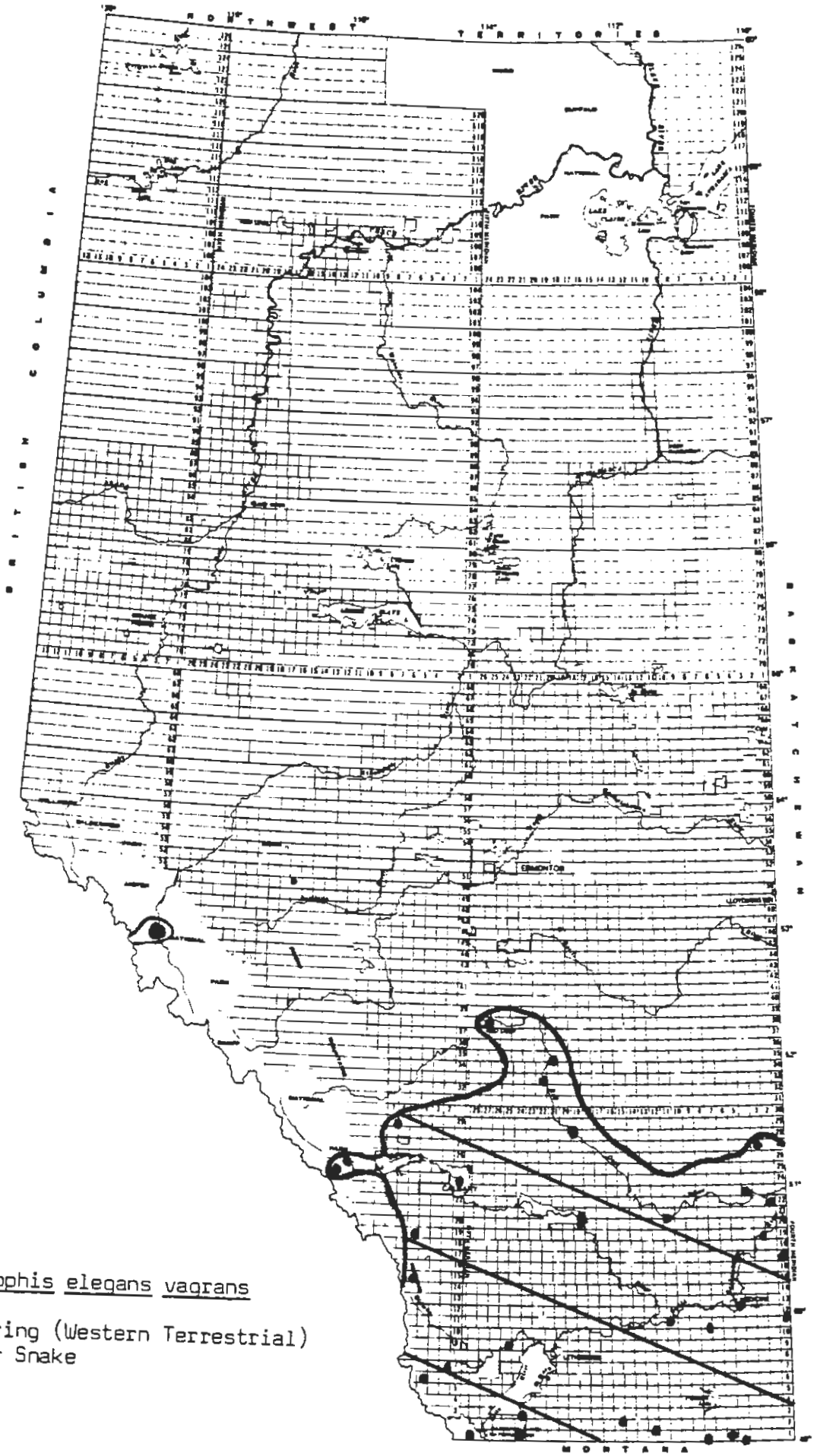
Wandering Garter Snakes occur in many Provincial and National Parks.

RECOMMENDATIONS/MANAGEMENT ACTION:

Within Alberta, less is known of this species than the other garter snakes. Research is required to determine why this species is so localized.

Public education combined with protection of natural habitats and hibernacula will benefit this and other species.

The locations of major hibernacula need to be determined and their characteristics described.



Thamnophis elegans vagrans

Wandering (Western Terrestrial)
Garter Snake

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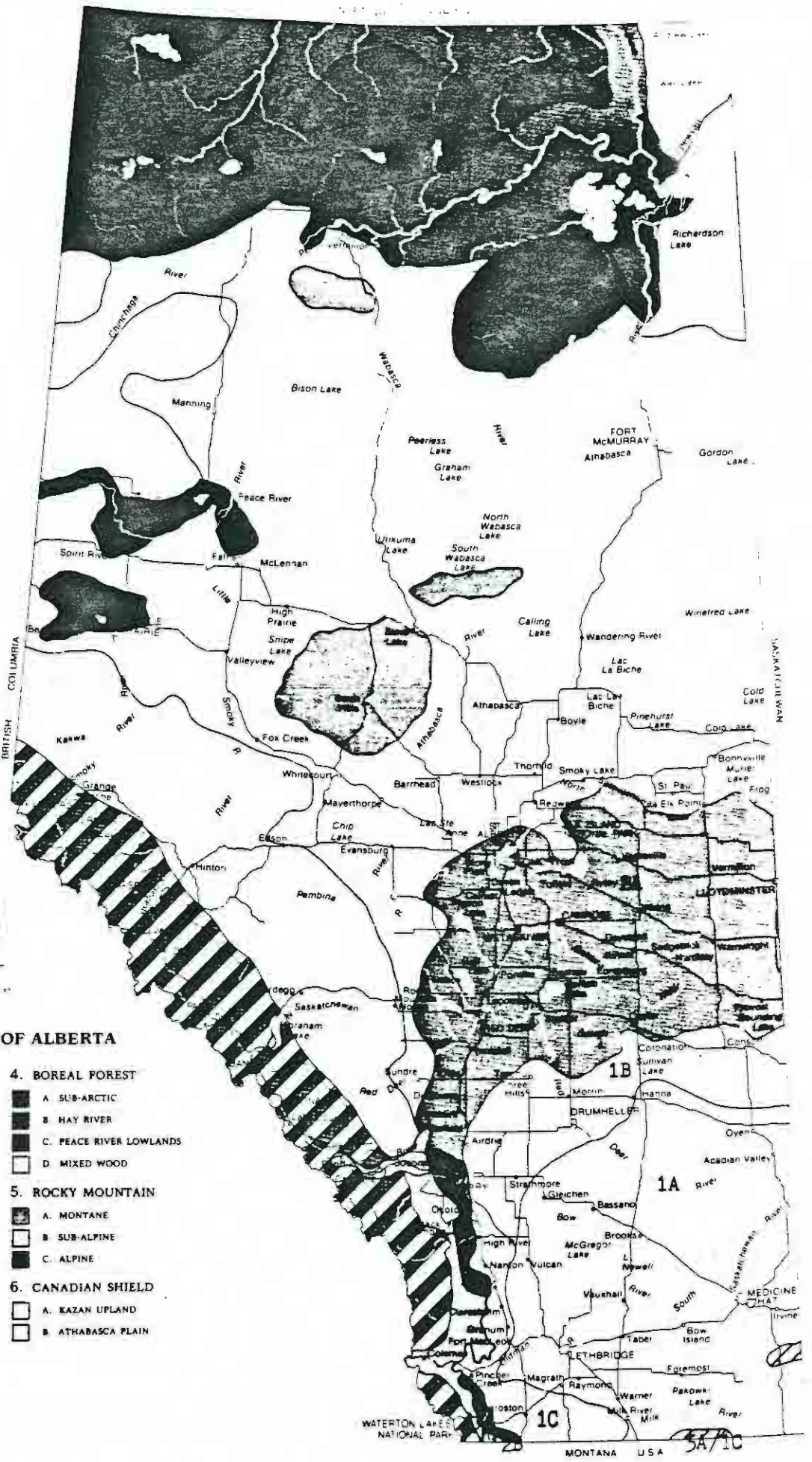
APPENDICES



Alberta

RECREATION AND PARKS

NATURAL REGIONS OF ALBERTA

1. GRASSLAND
   - A. MIXED
   - B. NORTHERN FESCUE
   - C. FOOTHILLS
2. PARKLAND
   - A. CENTRAL
   - B. FOOTHILLS
   - C. PEACE RIVER
3. FOOTHILLS
   - A. MAIN
   - B. NORTHERN OUTLIERS
4. BOREAL FOREST
   - A. SUB-ARCTIC
   - B. HAY RIVER
   - C. PEACE RIVER LOWLANDS
   - D. MIXED WOOD
5. ROCKY MOUNTAIN
   - A. MONTANE
   - B. SUB-ALPINE
   - C. ALPINE
6. CANADIAN SHIELD
   - A. KAZAN UPLAND
   - B. ATHABASCA PLAIN

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Prepared by Graphics, Design Branch

The Status of the Short-Horned Lizard, *Phrynosoma douglassi*, in Canada

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1985

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Abstract

The short-horned lizard, Phrynosoma douglassi, reaches the northern limits of its distribution in British Columbia, Alberta, and Saskatchewan. The pygmy short-horned lizard (P. d. douglassi) has been reported from the area of Osoyoos, B.C., but not for several decades, and it may be extirpated in this country. The eastern short-horned lizard (P. d. brevirostre) has a scattered distribution in southeastern Alberta and southwestern Saskatchewan. The vegetation of the range in these provinces is mixed grass prairie. The range lies mostly within the dry steppe climatic region. Populations in these provinces are confined to south-facing slopes, grassland-badland ecotones, and Bearpaw shale outcrops. The distribution seems to be relictual in nature. This subspecies should be classified as rare in Alberta and Saskatchewan.

Introduction

The short-horned lizard, Phrynosoma douglassi (Fig. 1), is distributed over much of western North America (Reeve 1952), and has the most extensive range within the genus Phrynosoma (Sherbrooke 1981). The six recognized subspecies range from west-central Mexico in the south to southern British Columbia, Alberta and Saskatchewan in the north (Reeve 1952; Logier and Toner 1961). The taxonomic status and range in the United States and Mexico are described by Reeve (1952), and habits, reproduction and diet for various areas over the entire range are described by Smith (1946), Pianka and Parker (1975), Guyer (1978), Montanucci (1981), Sherbrooke (1981), and Powell and Russell (1984, in press a).

Distribution

P. douglassi is classed as a non-desert species of phrynosome by Heath (1965), and is found in a variety of habitats over its latitudinal range. In northern Mexico it is confined to high-altitude open grassland (Montanucci 1981); in Arizona, New Mexico, Utah and Nevada it inhabits sagebrush steppe, pine forest, and juniper-pinon woodlands (Smith 1946; Reeve 1952; Montanucci 1981), while in the north of its range it is found in sagebrush communities and semi-arid short-grass prairie (Smith 1946; Sherbrooke 1981; Powell and Russell 1984). The short-horned lizard is always found at high altitudes, but its upper altitudinal limit is closer to sea level in the northern part of its range (Montanucci 1981).

Two subspecies of P. douglassi are found in Canada; the pygmy short-horned lizard (P. d. douglassi) in southern B.C., and the eastern short-horned lizard (P. d. brevirostre) in southeastern Alberta and

southwestern Saskatchewan (Smith 1946; Schmidt 1953; Logier and Toner 1961; Cook 1984). Reeve (1952) did not list any Canadian localities for either of these subspecies, although he did note one specimen of the eastern short-horned lizard taken on the Milk River at 49°N, and did extend the range of the subspecies marginally into Alberta on his range map. Conant (1975), Stebbins (1966) and Behler and King (1979) noted that the range of the pygmy short-horned lizard extends into southern B.C., and that of the eastern short-horned lizard extends into southern Alberta and Saskatchewan, but the recorded limits are not totally congruent.

Cowan (1936) recorded two specimens of the pygmy short-horned lizard from Osoyoos, in the Okanagan Valley just north of the Washington border. These were apparently collected in 1910. Logier and Toner (1961), Carl (1968), Gregory and Campbell (1984) and Orchard (1980) reiterated this report. Schmidt (1953) lists the pygmy short-horned lizard as being found in south-central B.C., Carl (1968) raised the possibility that it is found in the Keremeos region, and Orchard (1980) noted that subsequent sightings have been reported in the Osoyoos region. No other information on the distribution of the subspecies in B.C. is available, and at present there are doubts as to whether or not it persists in the region.

Osoyoos lies in the Okanagan Valley. The altitude of the valley bottom ranges between 300 m and 365 m, while surrounding mountains range from 1200 m to 1800 m. The soil of the area is classified as $A2_{52}$ in the Soils of Canada Inventory (Clayton et al. 1977). The climate is warm and dry; the mean daily temperature is greater than 22°C in July, and the average frost-free period is 100-140 days, while precipitation is less than 30 cm per year (Farley 1979). Osoyoos lies within the ponderosa pine - bunchgrass

biogeoclimatic zone (Farley 1979).

Logier and Toner (1961) stated that the eastern short-horned lizard in Alberta ranges through "...southwestern [sic] Alberta northward to about 50° latitude", and record specimens from Manyberries, Onefour, and Medicine Hat. Williams (1946) recorded specimens from Chin Coulee at Foremost, Bear Gulch east of Aden, the Lost River canyon, Manyberries, and the lower Milk River Canyon. Soper (1949) recorded the lizard from Chin Coulee north of Nemiskam, and stated that it was found in widely-scattered coulees and along the Milk River valley and associated tributary drainage areas. Lewin (1963) recorded it from Foremost, Comrey, Manyberries, the vicinity of Onefour, and the vicinity of Wildhorse. Schowalter (1979) listed three range-marginal localities for this province: on the east bank of the South Saskatchewan River 16 km northeast of Medicine Hat; on the north bank of the South Saskatchewan River 9 km northwest of the town of Bow Island; and on the south bank of the Milk River just east of Writing-on-Stone Provincial Park. Milner (1979) recorded the subspecies along the Milk River canyon and along southeastern parts of the Red Deer River, but this last locality was disputed by Laird and Leech (1980), who noted that there were no other records of this lizard so far north. Laird and Leech (1980) recorded it from the north bank of the South Saskatchewan River, 20 km south of Suffield, and from the north side of the Milk River 8 km south of Onefour.

Additional localities in Alberta are documented from museum specimens. The collection of the University of Alberta Museum of Zoology contains two specimens from the vicinity of Redcliff (UAMZ 129, 130). The Herpetology Collection of the National Museum of Canada contains one specimen from the north bank of the South Saskatchewan River 11 km west of Redcliff [NMC 3479

(1)], one from the Lost River Ranch 9 km northwest of Onefour [NMC 7333(2)], one from Grassy Lake [NMC 1020(1)], and one from Writing-on-Stone Provincial Park [NMC 1829(1)]. A specimen from Nemiskam Community Pasture, 19 km southeast of Manyberries, is deposited in the collection of the University of Calgary [UCMZ(R) 1980.19].

The range of the eastern short-horned lizard extends north to 50°10' in Alberta (Fig. 3). The distribution appears to be disjunct, with one group of populations along the South Saskatchewan River, another group in the Milk River and Pakowki Lake drainages, but only two populations in between, in Chin Coulee. The South Saskatchewan River forms the northern boundary of the recorded range in this province. There are no records east of Wildhorse in this province, and the Cypress Hills mark the eastern border of the range to the north. Similarly, to the southwest the Sweetgrass Hills seems to confine populations to the Milk River valley. The maximum elevation at which any population is found is around 1000 m, along the southern edge of the Sweetgrass Hills and on the south side of the Milk River canyon. Most of the rest of the southern populations are found at 900 m. The Chin Coulee populations are found at 800 m, as is the one at Grassy Lake, while those lying along the South Saskatchewan River reside at 700 m.

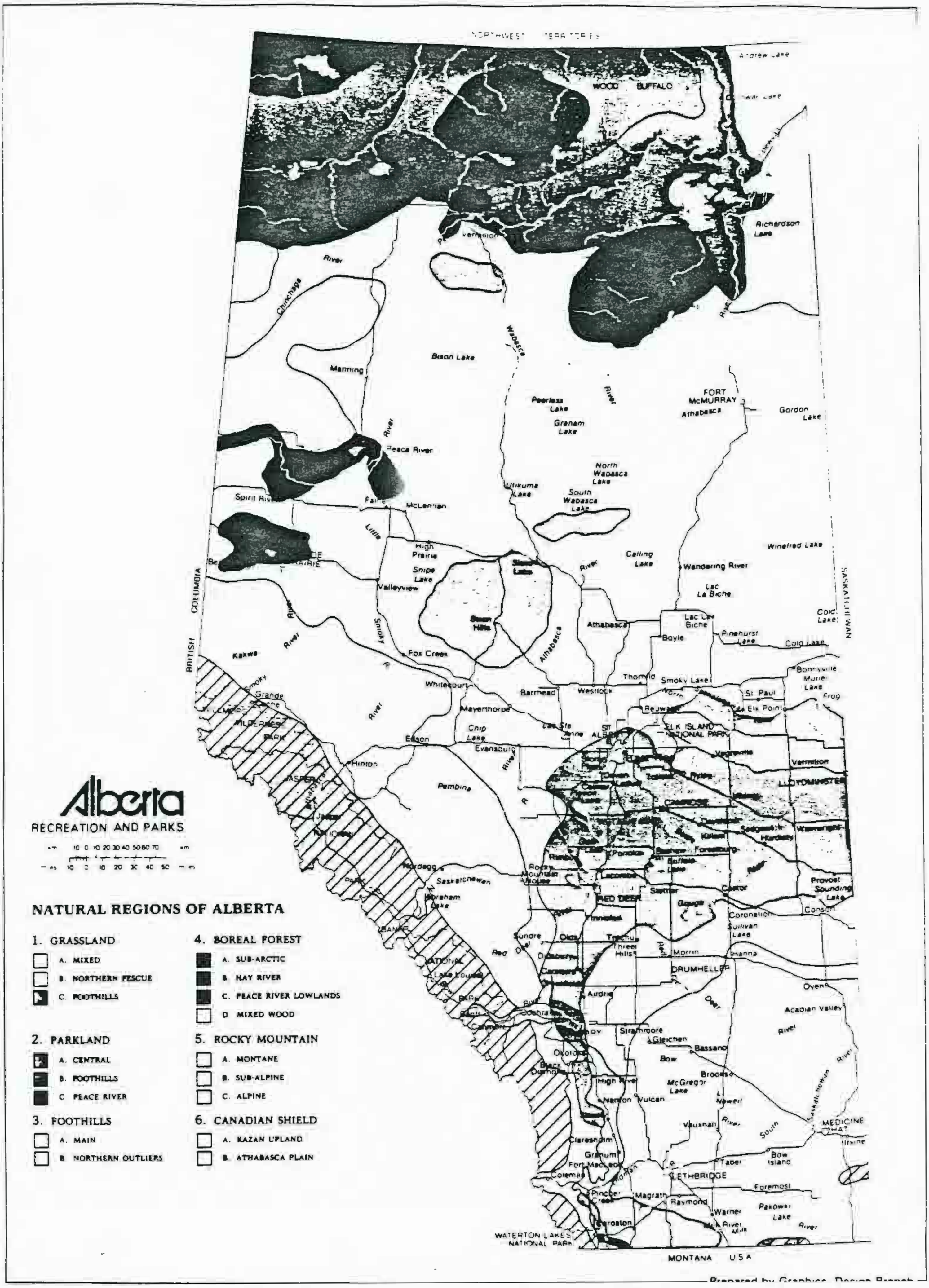
The soil in the vicinity of Manyberries and Onefour is classified as Bl_5 in the Soils of Canada Inventory (Clayton et al. 1977), a brown solonetz with a loamy texture. The soils of the remainder of the eastern short-horned lizard's range in Alberta are classified as Al_{22} and Al_{23} (Clayton et al. 1977), both brown chernozemic soils, loamy in texture. These soil types are typical of the prairie regions, and all three have similar temperatures and moisture characteristics. They experience

temperatures of 25°C or warmer for less than 120 days of the year. The moisture class is subarid, the soils being mainly dry when their temperature is 5°C or higher.

The eastern short-horned lizard is found within the dry steppe climatic region of Alberta (Longley 1977). The growing season begins around April 15, and the mean date of the last spring frost is between May 15 and June 1 (Longley 1977). Summers are hot, the mean July temperature over the range varying between 19°C and 20°C (Longley 1977). There is a mean of 1300 hours of sunlight between May and September over most of the range, increasing to 1400 hours in the area around Bow Island and Grassy Lake (McKay 1965). This region receives the most sunlight in July (Coupland 1950). The average date of the first fall frost is later than Sept. 15 over the range, for an average frost-free period of 120 days (Longley 1977). Total annual precipitation over the range averages 33 cm, most of which falls between April and October, with a peak in July. The climate in the summer over the range can best be described as hot and dry.

The vegetation of the range in Alberta has been described by Coupland (1950, 1961) and North (1976). Wallis (1976) has described in some detail the vegetation of the eastern part of the Milk River valley. The climax vegetation in this area is the mixed grass prairie association. Its dominant faciation is the Stipa - Bouteloua (Coupland 1950). In the drier area south of the Cypress Hills this is replaced by the Bouteloua - Stipa faciation (Coupland 1950). Eroded areas throughout the range typically feature the Agropyron - Muhlenbergia facies, a varied assortment of drought-resistant species (Coupland 1950).

There are relatively few records of the eastern short-horned lizard in



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A. KAZAN UPLAND
B. ATHABASCA PLAIN
Alberta
RECREATION AND PARKS
WOOD BUFFALO
Andrew Lake
Richardson Lake
FORT McMURRAY
Athabasca
Gordon Lake
Bison Lake
Manning
Peerless Lake
Graham Lake
North Wabasca Lake
South Wabasca Lake
Utikuma Lake
Peace River
Spirit River
Falher
McLennan
High Prairie
Snipe Lake
Valleyview
Calling Lake
Wandering River
Winefred Lake
Lac La Biche
Lac La Biche
Boyle
Pinehurst Lake
Cold Lake
Fox Creek
Kakwa
Whitecourt
Barrhead
Westlock
Thorhild
Smoky Lake
St. Paul
Elk Point
Mayerthorpe
Chip Lake
Evansburg
ELK ISLAND NATIONAL PARK
Edson
Hinton
Pembina
Vegreville
Vermilion
LLOYDMINSTER
Wainwright
Hardisty
Nordegg
Provost
Sounding Lake
RED DEER
Stettler
Castor
Coronation
Consort
Sullivan Lake
Sundre
Olds
Three Hills
Morrin
Hanna
DRUMHELLER
Airdrie
Oyen
Acadian Valley
Strathmore
Gleichen
Bassano
Brooks
McGregor Lake
High River
Nanton
Vulcan
Vauxhall
MEDICINE HAT
Claresholm
Granum
Fort Macleod
Coleman
Pincher Creek
Magrath
Raymond
LETHBRIDGE
Taber
Bow Island
Foremost
Warner
Milk River
Pakowki Lake
Cardston
WATERTON LAKES NATIONAL PARK
MONTANA U.S.A.
BRITISH COLUMBIA
SASKATCHEWAN
Prepared by Graphics Design Branch

Saskatchewan (Secoy 1976). Its range in this province seems to be disjunct from that in Alberta (Fig. 2). It is recorded from Gergovia (Logier and Toner 1961; Cook 1966; Secoy 1976) and Rosefield (Nero 1957; Logier and Toner 1961; Cook 1966; Secoy 1976), in the Frenchman River valley. Chandler (1965) notes a single specimen from seven miles south of Val Marie. Secoy (1976) records it from Killdeer and Val Marie as well, and stated that distribution is limited to the Frenchman River valley. However, the Killdeer locality lies in the Poplar River drainage system, which like the Frenchman River is a tributary of the Missouri. NMC records list additional sightings from Ten Mile Butte, near Wood Mountain, and from Whitemud Creek where it crosses the U.S. border, but these specimens do not appear to have been collected. Secoy (1976) suggests that the eastern short-horned lizard may occur in the area of the Big Muddy Creek. Nero's (1957) correspondent reported it to be found anywhere in the Rosefield area where there are shale outcrops.

The range of the subspecies in Saskatchewan appears to be restricted to the northwest by the Cypress Hills, to the northeast and east by Pinto Butte and Wood Mountain, and to the west by the Boundary Hills. The distribution thus extends no further north than 49°30'N. The populations in the area of Val Marie and Rosefield lie at approximately 790 m altitude, while those in the Wood Mountain area are found at an altitude of roughly 910 m. All of the Saskatchewan populations are found in relatively flat, rolling river bottoms. The area is underlain mainly by the Bearpaw formation (Richards and Fung 1969). The soil is classed as Al_{18} over most of the range, with some occurrence of Bl_5. These soils have similar characteristics to their counterparts in Alberta (Clayton et al. 1977). The climate is

classified as dry steppe (Longley 1977), with short hot summers and 30-35 cm of precipitation annually (Richards and Fung 1969). The average frost-free period ranges in length from 60 to 80 days, beginning from June 1 to June 10, and ending between Sept. 1 and Sept. 10 (Richards and Fung 1969). The vegetation is mainly Bouteloua - Stipa faciation (Coupland 1950), in other regards being similar to the range in Alberta.

Protection

Orchard (1980) recommended that the pygmy short-horned lizard should be accorded immediate protection, along with its habitat, should any be found. At present, the uncertainty surrounding its present-day persistence in the province, and its ambiguous status, along with the rest of the reptiles in B.C., as a non-wildlife species, leave it without any legal protection (C. Dodd, pers. comm., Oct. 30, 1984). The problem of legal protection for non-wildlife species in B.C. is presently being studied (C. Dodd, pers. comm., Oct. 30, 1984), and the subspecies may be protected by law in the near future if any populations turn up.

The Alberta Committee on Rare and Endangered Species (Alberta Recreation, Parks and Wildlife) has determined the status of the eastern short-horned lizard to be "threatened" (C.J. Ward, in litt., Feb. 9, 1979; Roberts 1982). Very few of the populations in Alberta lie within protected areas. The last reported sighting in Writing-on-Stone Provincial Park was in 1934, and the current park staff are apparently unfamiliar with the lizard in the field. The proposed Milk River Ecological Preserve encompasses the Comrey population, and any populations which lie on the south side of the Milk River (Anon. 1984). However, the plans for this reserve have

not, as of time of writing, been finalized (C. Wallis, pers. comm., Oct. 4, 1984).

All reptiles and amphibians are protected under the provincial Wildlife Act in Saskatchewan, and the eastern short-horned lizard has no particular status in that province. The area of the proposed Val Marie National Park harbours short-horned lizards and suitable habitat, which will be protected by the National Parks Act when the park is incorporated. This process, however, may take some time (P. Minton, pers. comm., Nov. 14, 1984).

Population Size and Trends

Alberta is the only province for which we have any data regarding short-horned lizard population sizes. The species is evidently very rare in B.C. (Orchard 1980). Secoy (1976) states that localities in Saskatchewan are represented by single specimens, although Nero's (1957) correspondent implied that lizards were relatively common in the Rosefield area.

Some data on population sizes of the eastern short-horned lizard in Alberta were accrued by Powell (1982), in a study of the ecology of the subspecies in this province. Five populations were examined in this study (Fig. 3) in 1979, 1980, and 1981. 316 individuals were captured, marked and released at these five localities in the course of the study (Comrey - 87; Nemiskam Community Pastures - 78; McKinley's Ranch - 18; Rose Ranch - 8; Bow Island - 125). These figures represent total number of individuals captured at each of these sites, and no effort was made to estimate population size due to irregular sampling intervals and low population densities (Powell 1982). Long-term recapture success at these localities was high (Powell and Russell in press b), implying that the populations examined are relatively

stable in size. Phrynosome population densities are generally relatively low (Pianka and Parker 1975), and this was found to be the case in Alberta. The lizard, however, is by no means rare in the localities where it is found - two to three individuals were captured a day, on the average, at the localities examined by Powell (1982). Local residents in the area of the range in Alberta are generally familiar with the species. The populations examined by Powell (1982) seem to be strongly localized and isolated, although this is, of course, difficult to determine with any assurance. Phrynosomes are, however, quite sedentary (Pianka and Parker 1975), and there is probably little contact between populations in Alberta, unless there are many more populations than have hitherto been enumerated.

Habitat

Cowan (1936) described the area in which the pygmy short-horned lizard is found in B.C. as "Upper Sonoran Zone", but nothing else is available on the habitat favoured by the subspecies in this province.

There is little information on the habitat of the eastern short-horned lizard in Saskatchewan. Nero's (1957) correspondent reported it as being found in the badlands where there are outcrops of blue shale. Secoy (1976) indicated that it is found in the badlands, and Chandler (1965) also recorded it from badlands near Val Marie. It is likely that the habitat of this species in Saskatchwan does not differ greatly from that in Alberta.

In Alberta, the eastern short-horned lizard is generally held to favour south-facing slopes and the upper reaches of coulee or canyon slopes (Williams 1946; Soper 1949; Lewin 1963; Halladay 1965; Wallis 1976; Milner 1979), or Bearpaw shale outcrops (McCorquedale 1965). This was generally

found to be the case by Powell (1982). Lizards at the Comrey, McKinley's Ranch, Rose Ranch, and Bow Island sites were usually found on gully or coulee slopes, where vegetation was sparse. They were seldom found either on coulee bottoms or venturing far into the grass at the top of these slopes. Most slopes on which lizard were found faced southwards. At Nemiskam Community Pastures short-horned lizards were found in an extensive area of Bearpaw shale badlands situated in a series of wide, shallow, flat bottomed ravines dissecting the sides of a low ridge running southeast to northwest. The substrate on the sides and bottoms of these ravines consisted of finely divided Bearpaw shale, dark gray in colour and ranging in texture from that of fine silt to that of coarse gravel. This material forms extensive areas of 2 m dunes, interspersed with alluvial fans, on the ravine floors. Creeping juniper (Juniperus horizontalis) is the dominant plant on this substrate, forming large mats which serve to anchor the dunes, but total vegetation cover is not greater than 50%. The high ground between the ravines, and the upper slopes of the ravines themselves, are grassy. Short-horned lizards were found both in the ravines at this site, and in the grassland between ravines. Further details of the habitat of the eastern short-horned lizard in Alberta can be found in Powell (1982) and Powell and Russell (1984).

General Biology

The short-horned lizard is viviparous (Smith 1946; Pianka and Parker 1975; Sherbrooke 1981), an unusual reproductive mode among reptiles and one that may permit it to persist in colder climates (Spellerberg 1976). Few data on clutc ize are available for this species elsewhere in its range.

Smith (1946) states that clutch sizes range from 5 to 30 neonates. Milne and Milne (1950) recorded clutch sizes ranging from 7 to 21 neonates, and gave some details on parturition. These authors indicated that the gestation period is approximately three months long, mating taking place in early May and parturition occurring in late July to mid-August.

No data on reproduction in the B.C. and Saskatchewan populations of the short-horned lizard are available, but some observations on clutch size and parturition in Alberta eastern short-horned lizards have been made. Laird and Leech (1980) observed parturition in a specimen from a South Saskatchewan River population, in which seven young were born. One specimen (UAMZ 131) taken in Medicine Hat gave birth to 13 young. Powell and Russell (in prep.) examined six clutches delivered by females from Bow Island and Comrey. Clutch size ranged from six to eleven young. Neonates averaged about 24.0 mm in snout-vent length (SVL), and weighed an average of 0.7 g. Sex ratios varied between clutches, but overall approximated 50:50, with a slight bias in favour of females. Parturition occurs from the last week of July to the first week of August, and seems to be synchronized - no gravid females were found in any of the Alberta populations examined after the first week of August. There are indications that parturition takes place around noon. Survivorship of the young cannot be assessed at present.

Powell and Russell (in press b) examined growth and sexual size dimorphism in the Alberta populations of the eastern short-horned lizard. Sexual maturity is attained, in males, in the summer after the first winter dormancy; the onset of sexual maturity in females could not be determined. Males attain an average adult SVL of 50 mm and an average adult weight of 10 g. Females continue growing to an average adult SVL of approximately 70 mm

and an adult non-gravid weight of approximately 18 g. This disparity in adult size between the sexes is probably related to the species' viviparity (Powell and Russell in press b). Recapture records suggest that females live as long as five years, but no such estimate could be made of male lifespan (Powell and Russell in press b).

The earliest activity record for the eastern short-horned lizard in Alberta is April 27 (Laird and Leech 1980), and the latest is Sept. 25 (pers. obs.), but most activity has ceased by the second week of September. The active season is thus approximately 150 days long at the most. The mean date of the last spring frost is well after the start of yearly activity, which suggests some ability to resist freezing or at least to avoid freezing conditions. These populations exhibit considerable eurythermality (Powell and Russell in press a) and this may be important in extending daily activity periods early in the active season and in permitting activity on cool overcast days. Most lizards have disappeared by the mean date of the first fall frost, presumably having entered winter dormancy. It is possible that the yearly activity pattern is controlled by an endogenous cycle and photoperiod cues; Mayhew (1965) found such a mechanism in Phrynosoma mcalli. A photoperiod cue probably induces the start of winter dormancy in the Alberta populations of the eastern short-horned lizard, as there appears to be little change in environmental temperature over the period in which the lizards cease to be active. The field thermal ecology of this species in Alberta has been studied in some detail by Powell and Russell (in press a).

Phrynosomes are specialized as ant eaters (Pianka and Parker 1975). The eastern short-horned lizard does feature a high proportion of ants in its diet in Alberta, but also preys on a variety of other insects (Powell

and Russell 1984). There is some partitioning of the dietary niche between the two sexes; females, due to their greater size, take larger prey items and also a wider size range of prey (Powell and Russell 1984).

Limiting Factors

The distribution of the short-horned lizard in Canada seems to be relictual (Figs. 2, 3). There appears to have been a warm, dry xerothermic period from 6000 to 4000 BP in the area of Alberta and Saskatchewan, during which isotherms were displaced some 150-450 km north of their present positions and the North American prairie was more extensive than it is now (Smith 1965). A number of species which exist in relictual populations in southeastern Alberta (McCorquedale 1965; Wallis 1976; Pendlebury 1976, 1977) probably expanded their ranges into these areas at this time, subsequent climatic cooling causing contraction of these species' ranges into the scattered pockets in which they are found today (McCorquedale 1965). The tributaries of the Missouri River extending into Alberta and Saskatchewan undoubtedly served as the avenues through which these species entered this region. The strong localization and habitat specificity of the eastern short-horned lizard, together with the scattered distribution in this area, suggests that it is in fact only persisting in scattered localities. Undoubtedly climate is the chief factor affecting the distribution of the species so close to the northern edge of its distribution, but it is difficult to say, on the basis of what is known about its thermal ecology (Powell and Russell in press a), precisely what climatic factor is limiting.

South-facing slopes are the usual habitat of the eastern short-horned lizard in the prairie provinces. Slopes are excessively drained, due to

the lack of thick soil and vegetation (Coupland 1961), and south-facing slopes are more arid than most due to the higher temperatures they experience as a consequence of greater total insolation (Coupland 1961). A south-facing slope has a constant symmetric distribution of temperature and insolation across it during the day, determined by its orientation and grade; south-facing slopes are the warmest at any latitude in the northern hemisphere (Geiger 1965). The strong association of eastern short-horned lizard populations with such slopes suggests that in fact it is temperature and insolation which limit the species in the prairie provinces.

The range of the eastern short-horned lizard in Alberta is underlain entirely by rocks of the Belly River formation (Williams and Dyer 1930). Pendlebury (1977) hypothesized that the surface occurrence of this formation is a range-limiting factor in the northern distribution of the prairie rattlesnake Crotalus viridis. He noted that the subsoil produced from Belly River rocks is dry and well drained, and that the rock itself tends to slump and form subsurface cavities which could serve as hibernacula. These features could also be important in determining the northern range limits of the eastern short-horned lizard in Alberta. A lizard of this size could not dig itself very deep, and would have to use some natural cavity below the frost line for overwintering. Similarly, the association of the species with shale outcrops in Saskatchewan (Nero 1957) and badlands (Chandler 1965; Secoy 1976) implies a reliance on natural cavities for overwintering. The range in Saskatchewan is mostly underlain by Bearpaw formation rocks (Richards and Fung 1969), which are also likely to slump.

Special Significance of the Species

Short-horned lizards are of no commercial value except possibly to the

pet trade, which is unlikely to find them in Canada in sufficient numbers to exploit profitably. The main value of the Canadian populations of this species lies in their scientific interest. There are only five species of lizard in Canada, and these are all at their northern range limits (Logier and Toner 1961; Cook 1964, 1984). The ecology of high latitude lizards is very poorly understood (Cloudsley-Thompson 1971; Spellerberg 1976), and studies of the ecology of the short-horned lizard in Canada, such as those of Powell and Russell (1984, in press a, in press b) have contributed to an increased understanding of this matter. The Canadian populations of this species also have an intrinsic value as unusual components of this country's fauna, which is not particularly rich in reptile species (Cook 1984). Finally, they are noteworthy as the world's most northerly representative of the much studied family Iguanidae (Burghardt and Rand 1982).

Evaluation

Efforts should be made to ascertain whether or not the pygmy short-horned lizard persists in British Columbia. Much of the area around Osoyoos is presently farmed, and there is some doubt as to whether the species is still to be found there (Orchard 1980; Gregory and Campbell 1984). If any are found, the species should be accorded immediate legal protection, as should their locality. For the present, we recommend that the subspecies be classified as endangered in B.C., if it is not actually extirpated.

The legal status of the eastern short-horned lizard in Alberta, together with the nature of human activity over much of its range, afford it considerable protection in this province, and it is doubtful that it is in any danger of disappearing. Most of the area of its range is suitable only

for rangeland, and the activity of cattle does not seem to disturb the lizards unduly. In addition, most of the localities in this province are on coulee or canyon slopes, or in Bearpaw shale badlands, which are unlikely to be developed for any reason, even if adjoining land is developed. Its "threatened" status (Roberts 1982) should be maintained, however, as population densities, being typical of those of phrynosomes in general, are low and recruitment also appears to be low. Such populations cannot withstand any more than mild manipulation or loss of individuals.

We do not have enough information on the species in Saskatchewan to make any evaluation or recommendations other than those already in effect. It is probably more common than reports indicate. The proposed Val Marie National Park will include at least one eastern short-horned lizard population within its boundaries, and will contain suitable habitat (P. Minton, pers. comm., Nov. 14, 1984). We would recommend that the legal status of the subspecies in Alberta and Saskatchewan be more widely disseminated, as most people do not (at least in Alberta) know that it has any legal protection at all. At present, we feel that the eastern short-horned lizard should be classified as rare in this country.

Acknowledgements

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he gave. Dave Schowalter of the Alberta Fish and Wildlife Division gave us directions to the Bow Island site, and Linda Strong and Lawrence Harder gave us details of their own observations of short-horned lizards in Alberta. We are grateful to Francis Cook, of the National Museum of Natural Sciences, and Vic Lewin, of the University of Alberta, for sharing their data on phrynosome distribution with us. We are also obliged to Dianne Secoy, Cliff Wallis, Phil Minton, and Chris Dodd for information on the protection of short-horned lizards. Comments by Francis Cook, Fred Schueler, and Richard Montanucci greatly improved an earlier version of this MS. Financial support for this project came partially from the Department of Biology, University of Calgary, and partially from Natural Science and Engineering Research Council Grant A-9745 to A.P. Russell. Field work was conducted under a permit issued to us by the Alberta Department of Lands and Forests. Photographs were taken by Jim Peacock. Marg Hunik typed the manuscript.

Figure Captions

Figure 1. Phrynosoma douglassi brevirostre. A. Dorsal view, adult female (Comrey, Alberta). B. Lateral view, adult female (Comrey, Alberta). C. Female with litter of ten neonates (Bow Island, Alberta).

Figure 2. The distribution of the pygmy short-horned lizard (Phrynosoma douglassi douglassi -▲) and the eastern short-horned lizard (P. d. brevirostre -•) in Canada.

Figure 3. The distribution of Phrynosoma douglassi brevirostre in south-eastern Alberta (hatched area of inset map), in relation to elevation and drainage. Elevation in meters. 1 - Manyberries; 2 - Onefour; 3 - Medicine Hat; 4 - Foremost; 5 - Bear Gulch; 6 - Nemiskam National Park; 7 - Comrey; 8 - Wildhorse; 9 - 16 km NE of Medicine Hat; 10 - Bow Island; 11 - Gilchrist Ranch; 12 - Rose Ranch; 13 - north bank of Milk River; 14 - Redcliff; 15 - 11 km W of Redcliff; 16 - Lost River Ranch; 17 - Grassy Lake; 18 - Writing-on-Stone Provincial Park; 19 - 20 km SE of Manyberries; 20 - Lost River Canyon; 21 - 20 km SE of Manyberries; 22 - Nemiskam Community Pasture; 23 - McKinley's Ranch; 24 - north edge of Milk River canyon; 25 - Lost River canyon. Further details available in text.

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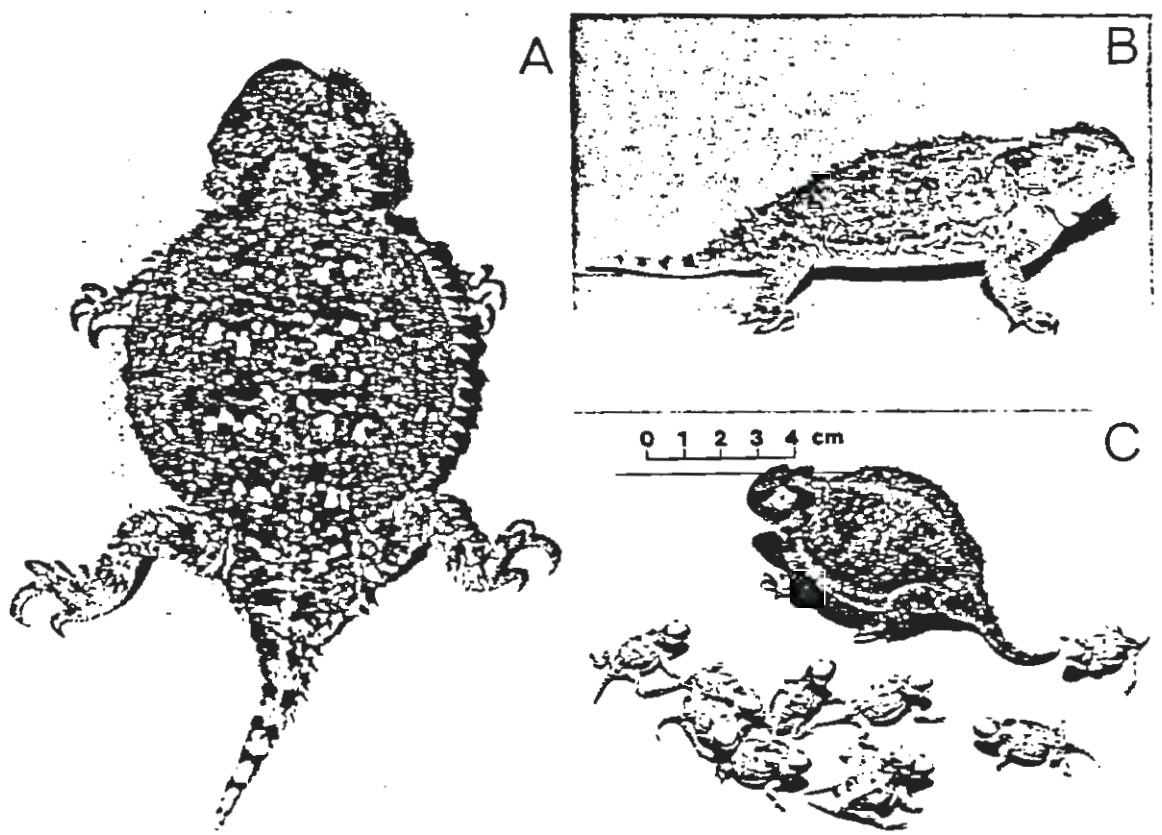
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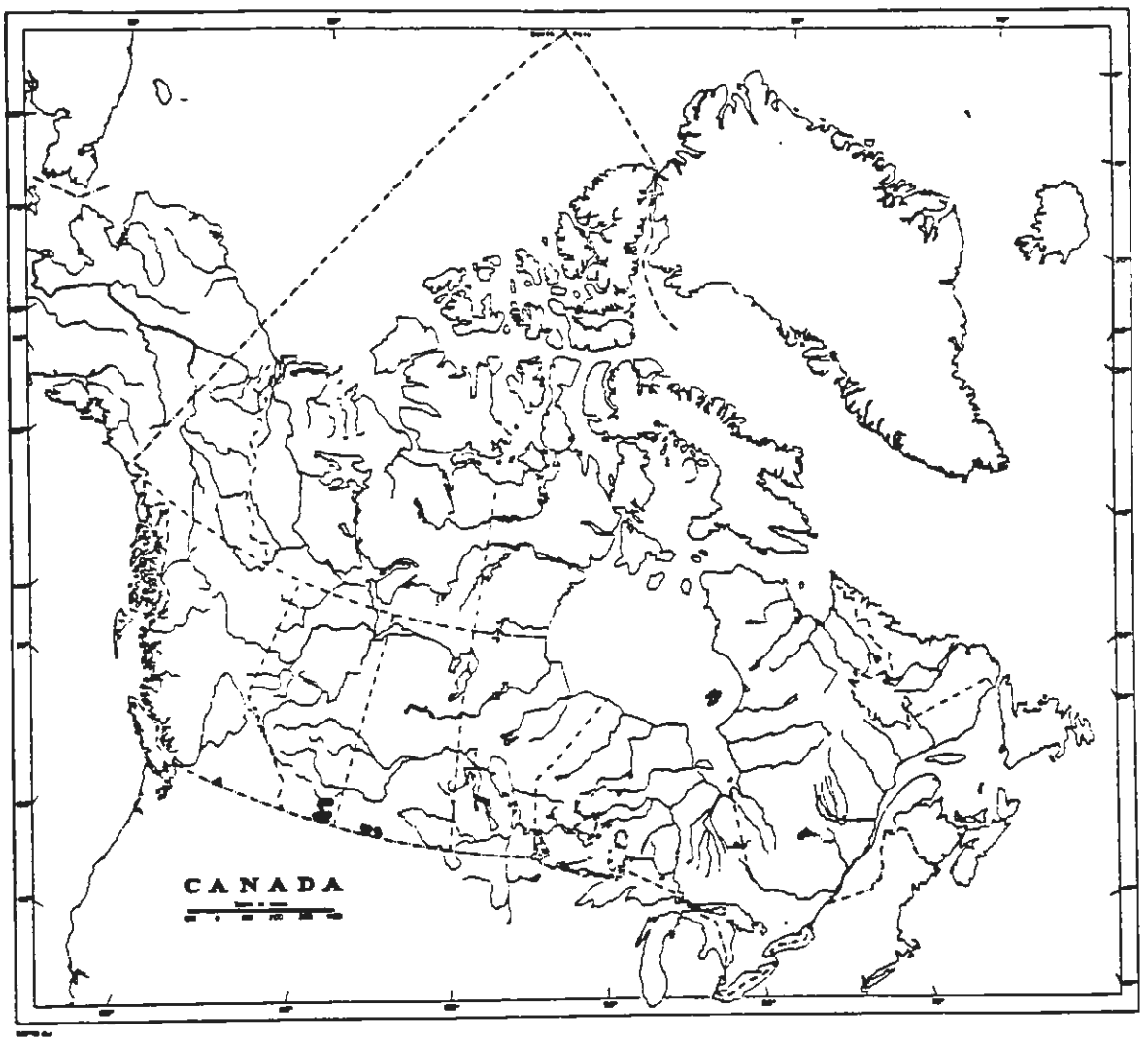

Fig. 2

predatory fishes and of adequate depth to escape freezing. Such habitat locations, and these oversize inhabitants which can exceed 300 mm in length, are deserving of special recognition.

Populations on the extreme of their distributional range offer interesting opportunities for behavioral studies. The edge of a species range is a dynamic and changing environment where adaptive changes in organisms, behaviourly or physiologically often facilitate their range expansion. Eight species of amphibians and reptiles reach their northernmost limits in Alberta, and others mark their western and eastern limits here. These pioneering extralimital populations may give us insights into active evolutionary processes, and are deserving of special attention. The increasing discovery of widespread tendencies towards neoteny or delayed transformation 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 highly 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. The recognition and protection of fragmental, rudimentary populations of such as *Buto cognatus* and *Scaphiopus bombifrons* especially when it contains viable reproductive numbers should receive important provisions toward protection. Populations of species such as *Phrynosoma douglassi* probably are relicts of previously 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 *Thamnophis sirtalis*, *T. radix*, *T. elegans*, *Pituophis melanoleucus*, and *Crotalis viridis*. Such locations must be recognized as important and critical wildlife habitats and be granted the full capacity of protection.

The proper management of natural amphibian and reptile populations in Alberta must extend beyond the species level to the recognition of distinct genetic populations and the maintenance of genetic variation within populations. This takes an increased importance in Alberta where restricted populations will be an increasing factor, and where genetic drift and inbreeding may be increasingly highly pronounced. Electrophoretic separation of proteins will make it possible to identify unique allozymes which may assist in defining what are really distinctive groups within an overall species range.

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

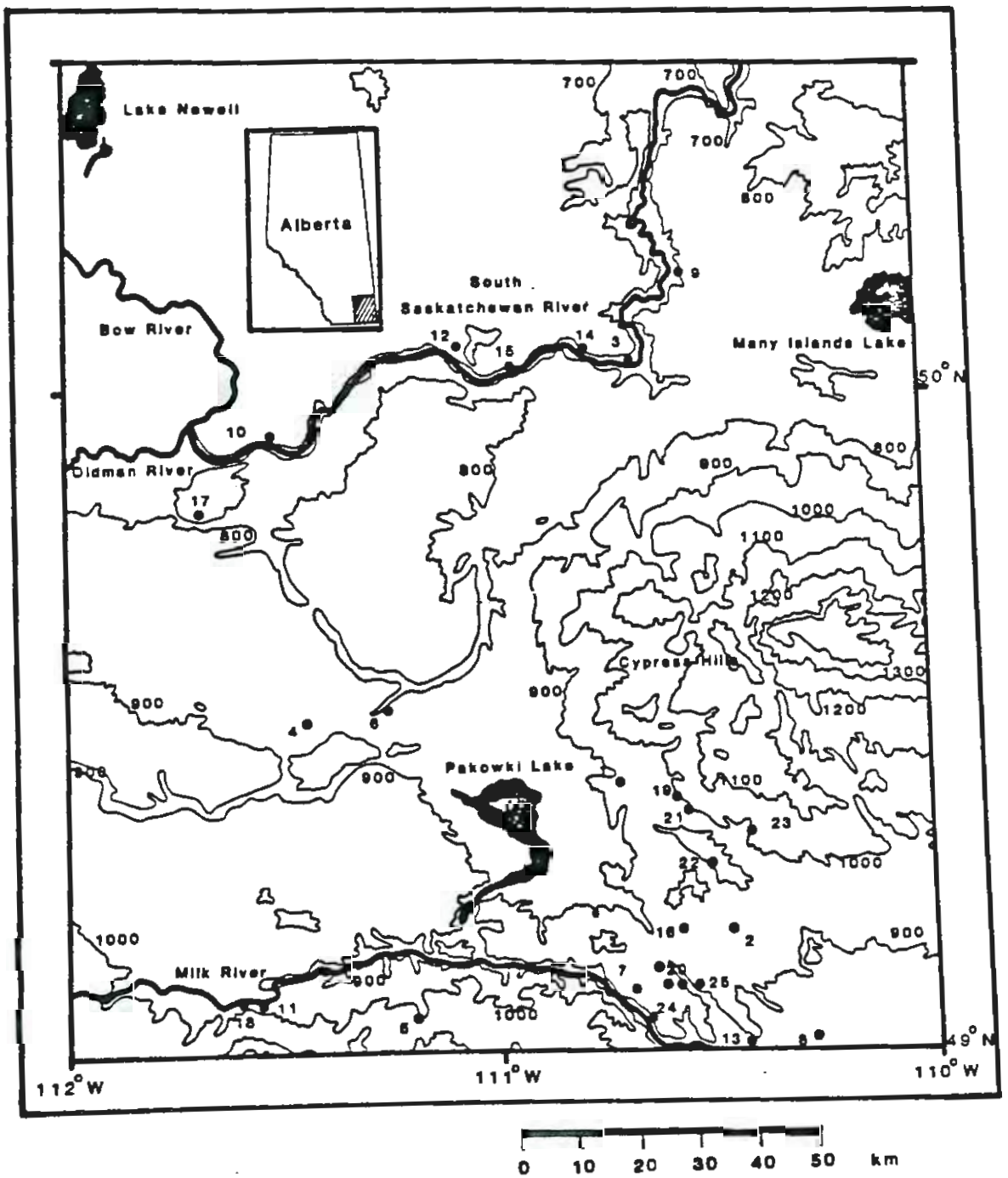
Lake Newell
Alberta
South
Saskatchewan River
Bow River
Many Islands Lake
Oldman River
Cypress Hills
Pakowki Lake
Milk River
700
800
900
1000
1100
1200
1300
50°N
49°N
112°W
111°W
110°W
0 10 20 30 40 50 km

Fig. 3

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

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Alberta's herpetofauna consists of eighteeen known species of amphibians and reptiles, of which 39%, or seven species are uncommon enough to be recognized as potentially threatened with extirpation in the forseeable future. All seven, and certain populations of one more, are deserving of special management consideration or at the very minimum immediately warrant some form of population monitoring. The majority of those species and populations under concern (63%) are associated with prairie environments.

The majority of those species deserving of special consideration are found in limited, scattered distributions within southeast Alberta, often confined to specific habitat requirements. 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 established itself in Alberta from three distinct dispersal corridors probably through mountain passes following post glacial colonization of intermontagne corridors in British Columbia from glacial refugia to the southwest. While widespread along certain 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 1986). Investigators find this apparent scarcity or population crash alarming, and not fully understood.

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 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, which is known as *neoteny*. Neotenous Tiger Salamander habitats, must be free of

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 *Ambystoma macrodactylum*, and here at an abrupt mountain-grassland ecotone in its only sympatric location with the Tiger Salamander *Ambystoma tigrinum*. 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 prominantly portrayed 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 possessed a higher knowledge of amphibians and reptiles (54% correctly recognized) than they did common wild flowers (46% correctly recognized).

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 rare, (*A. macrodactylum*) threatened (*Phrynosome*) endangered (Chrysemys, Heterodon) and declining (*R. pipiens*) with a defined long-term goal of monitoring population status and ensuring viable populations (Alberta Fish and Wildlife, 1984).

Expanded attention to non-game species within the Alberta Fish and Wildlife Division is very much necessary to ensure the adequate management and conservation of amphibian and reptile populations in Alberta. As a relatively low-profile, yet important wildlife group expanded public educational and interpretive approaches are desirable.

An expanded framework for the identification, and protection of sites of special natural interest, such as recently developed by Braidwood (1986) is very much 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 is very much in need of implementation.

Funding is very much needed to conduct much needed field surveys concerned with species distribution and population numbers. Funding sources are also very much needed to permit the completion of the book, the Amphibians and Reptiles of Alberta, which would document our existing knowledge, identify gaps in the knowledge base, and expand awareness toward this group and encourage their wise conservation.

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SWIFT FOX REINTRODUCTION PROJECT

PROGRESS REPORT 1987

WORLD WILDLIFE FUND

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The swift fox (Vulpes velox) is the smallest, and arguably the most agile, of North America's wild canids. Once abundant in short and mid-grass prairie regions of Canada a combination of drastic habitat changes, poisoning for wolves, and hunting and trapping pressure, reduced populations to the point where the last individual was taken in 1928 and the last sighting was made near Manyberries, Alberta in 1938.

The species survived in portions of its range in the United States. Beginning in 1974 swift fox from the United States have been brought to Canada and bred at the Wildlife Reserve of Western Canada, near Cochrane, Alberta. Since then other institutions have joined the captive breeding programme.

In 1976 I began a Project with the goal of reintroducing swift fox into the wild in Canada. Since then myself and several graduate students have worked cooperatively with numerous agencies, but especially the Canadian Wildlife Service, to rehabilitate swift fox in Canada.

Our primary objective was originally stated to be the establishment of 3 - 4 viable, independent and free-ranging populations of swift fox. Because we have found that the best swift fox habitat left in the prairie region of Canada is clustered in the southeast portion of Alberta and the southwest portion of Saskatchewan this objective has been redefined. We are now trying to establish one minimum viable population of swift fox that has about a 95% chance of surviving for 50 years. We have not yet attained this objective, however, considerable

progress has been made.

We have achieved major success both in trapping swift fox in the United States and in bringing them into Canada for captive breeding. This has been done because numbers in the United States don't currently allow for enough animals to be captured to support direct reintroduction in Canada. 1987 culminated many years of work with the captive population in Canada. During 1987 we were able to release 95 swift fox in Alberta and Saskatchewan.

In 1983 we began experimental releases of swift fox. By attaching radio-collars to most released animals we have gained knowledge of habitat components that influence mortality, survivorship and establishment. This knowledge was applied in 1987 to systematic evaluation of 10 different potential release sites. Based on this evaluation and previous work, releases took place on two of the sites (Alberta-Saskatchewan border area (ASBA) and Lost River Ranch (LRR) Alberta). A previous release had occurred on a third site in Saskatchewan (Nashyln). Results to date are <u>preliminary</u> since most of the foxes were released in fall of 1987.

Release sites were chosen relying on our ever increasing knowledge of swift fox habitat requirements, coupled with experimentation with two different release methods, soft versus hard release. In a soft release, pairs of foxes are held for about six months or a year in pens at the release site. They are fed and cared for but their exposure to people is minimised. Adults and any off-spring are then released together during the normal dispersal period in the fall. This has been the primary

technique employed at the Lost River Ranch site in Alberta. The technique has been successful in getting most adults and many young to establish themselves in the vicinity of their pens. Mortality, due primarily to predation by coyotes, has been high and has prevented successful population establishment. Table 1 summarises results to date regarding 1987 soft releases.

TABLE 1 - SWIFT FOX SOFT RELEASE AND PREVIOUS SURVIVORSHIP RESULTS AT LOST RIVER RANCH (LRR) FOR 1987.

	Adults released or alive	Adult Mortalities	Pups Born	Pup Mortalities	Total Released	Total Known Dead	Total known alive from previous releases
Captive	20*	6	18	4	38	10	
Free	3	0	1	Unknown			4

* Two of these foxes were single, free-roaming females which were captured and placed in pens with captive males.

Because so many variables are uncontrolled in this type of project considerable licence and caution are necessary in interpreting results. Our impression is that mortality at the LRR site has been unacceptably high due to predation by coyotes and other predators. This appears to be partly due to lack of suitable escape terrain for swift fox. Specifically, the low numbers of badgers and ground squirrels at LRR mean few escape holes for a fox to use when it is pursued by a coyote or other predator. Swift fox prefer using holes dug by other species for escape as opposed to digging their own. In summary then, by the end of 1987 we had found a way to get swift fox to stay in a new area, but the specific area chosen, LRR, did not seem to contain all necessary habitat components.

Since our understanding concerning the importance of escape terrain had been developing well before 1987, we chose a hard release site with abundant badgers, ground squirrels, and lesser opportunities for coyote concealment (flat prairie vrs. undulating, coulee-incised prairie). In the hard release, foxes are let go on site without being penned there. Our worry was that being unfamiliar with the area, foxes might disperse long distances, and not enough would end up in any one area to help establish a population.

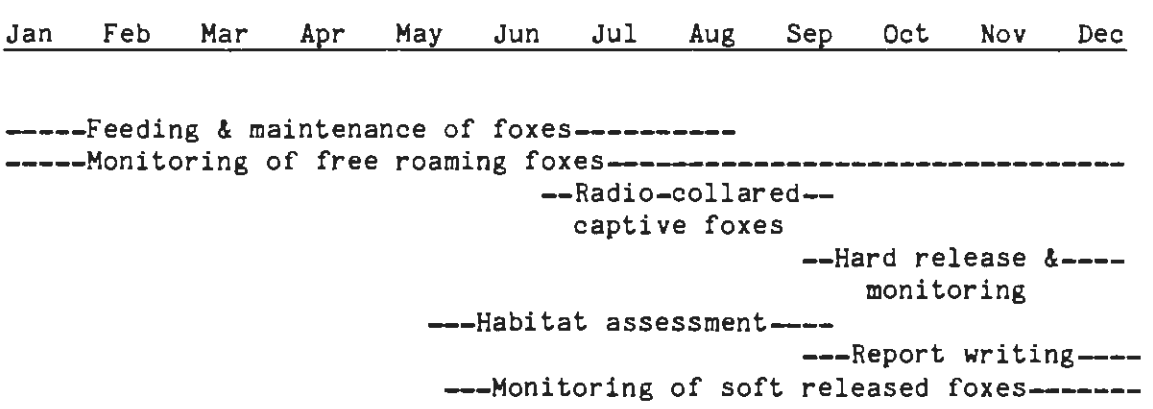
Results on the 1987 hard release at the ASBA are very preliminary. Cost considerations only allowed us to radio-collar 17 of 57 released animals. Table 2 summarises results to date. These results suggest that mortality has been low when compared to the LRR site, and that at least 13 of 17 released foxes showed reasonable fidelity to the release site. We hope that this means that if swift fox are released in unoccupied areas of suitable habitat, they will, under certain conditions, remain. While their short term survival is encouraging their longer term survival remains to be determined.

TABLE 2 - SWIFT FOX HARD RELEASE RESULTS AT THE ALBERTA-SASKATCHEWAN BORDER AREA (ASBA)

	# Released	# Radio-collared	Known Mortalities	Radio-collared known Alive to date
Alberta	47	14	2	10
Saskatchewan	10	3	0	1

Figure 1 outlines field work accomplished during 1987. Expenses during this period are summarised in an attachment.

FIGURE 1 - OUTLINE OF FIELD WORK IN 1987



During 1988 we intend to continue with both breeding foxes in captivity and also with capturing and bringing foxes from the United States. Additional hard releases will take place in priority habitats identified during the 1987 habitat evaluation program. Mortality, survivorship and dispersal will be monitored as funds permit. A study will begin on the nature of holes used by swift fox for escape, denning and other functions. No additional soft releases will take place, however, the soft-released LRR foxes will be monitored.

A rough budget for 1988 would be:

Salaries: $18 000 for full-time technical assistant.

Transportation: $7,000 for 4-wheel drive ground travel and one trip to the U.S.A.

$4,000 for aerial surveys.

Radio-collars: $6,000 for purchase of 20 collars at $300 each.

Lodging: $3,750 including rental of quarters at LRR.

Miscellaneous: $2,500 phone, photography, computer, etc.

TOTAL: $41 250 of which WWF is asked to provide $20 000. Costs of captive breeding operations are not included.

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PILOT RARE PLANT MONITORING PROGRAM IN THE OLDMAN REGIONAL PLAN AREA OF SOUTHWESTERN ALBERTA

by

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ABSTRACT

In 1986, Alberta's Natural Areas Program, the Alberta Forest Service and the World Wildlife Fund initiated a pilot project to monitor high priority rare plants in the Oldman Regional Plan Area of southwestern Alberta. The study area transects several of Alberta's major biogeographical regions and includes a high proportion of Alberta's priority rare species. Herbaria were surveyed and label information recorded. Population and habitat assessments were made of known occurrences of high priority species. Of 42 priority species known to occur in the study area or Waterton, 26 species were actively searched for in the field. 21 priority species were located, threats defined and recommendations made on management and status. During the field surveys, many other non-priority rare plants were also found, habitats documented and, in some cases, determinations of status made.

Different approaches to rare plant monitoring are evaluated and recommendations are made for initiating monitoring plans. Iris missouriensis, Castilleja cusickii, Cypripedium montanum and Allium geyeri should be treated as endangered and recovery and monitoring plans prepared for the first three species. Astragalus lotiflorus, Polanisia dodecandra, Chenopodium subglabrum and Carex nebraskensis should be treated as threatened and further research is needed to better define these threats.

Other species are considered rare but not threatened. Of those, no habitat for either Oxytropis lagopus and Suaeda moquinii is currently protected. In addition, Erigeron flagellaris, Haplopappus uniflorus and Stephanomeria runcinata are considered worthy of greater protection because of their low numbers or restricted populations and their occurrence at lower elevations.

Major threats include conversion of native habitat to non-native pasture or cropland, crowding by non-native species and heavy grazing in Foothills Parkland, Foothills Grassland and Mixed Grassland areas. In portions of the Montane and Subalpine, flower-picking and forestry operations are the greatest potential threats.

It is recommended that Alberta Parks and Parks Canada be informed of the significance of rare plant habitats under their jurisdiction at Waterton, Writing-on-Stone and Police Outpost and that they be encouraged to monitor and protect them. Within the study area, designation and wise management of natural areas or ecological reserves at South Castle, Verdigris Coulee and Ross Lake would protect significant populations of rare plants.

Recommendations are also made for removal of several species from priority or rare plant lists.

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G. Scotter, Canadian Wildlife Service

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APPENDICES

1. INTRODUCTION

The need for recognition and consideration of rare plants in land use decisions is becoming increasingly important. Alberta's flora is being put at increasing risk through the spread of man's activities -- urban centres, road networks, forestry operations, irrigation and water storage projects, grazing of domestic livestock and conversion of native habitats to cropland. There are a number of sites which are under consideration for designation as natural areas or ecological reserves and additional information is needed for boundary definition and management.

Packer and Bradley (1984) provide the most recent list of rare plants for Alberta. Analysis of the maps provided therein shows that there are major areas of concentration of rare plant species. These include the Lake Athabasca area of northeastern Alberta, the botanically diverse southwestern corner of Alberta and the dry Grassland region along the United States boundary. Many rare plants in the last two areas are priority species and several occur nowhere else in Canada.

In 1986 a pilot project was initiated to assess and monitor known populations of numerous southern Alberta plant species identified as having "high priority". It is hoped that this pilot program will provide the first steps toward the conservation and wise use of significant rare plant habitats. The study was sponsored jointly by the Alberta Natural Areas Program, the Alberta Forest Service, and World Wildlife Canada's "Wild West" Program.

The intent was to relocate the original collection sites of of priority vascular plants which had previously been collected in the study area. From data collected in the field and a review of herbarium material, an assessment of potential habitat and the threats to the habitat of many species was made.

Manual and computer-assisted literature searches were undertaken to locate additional sources of biological information on several of the priority species. A review of the literature on rare plant monitoring forms the basis for recommendations on implementing a monitoring program in Alberta. Considerations for maintaining populations of threatened and endangered plants have also been outlined.

2. STUDY AREA

The study area encompasses over 30,000 sq. km of varied terrain in Oldman Regional Plan Area in the southwest corner of the province of Alberta. The area extends from the continental divide along the British Columbia-Alberta boundary (Castle drainage north to Upper Oldman River) east to the Bow River, Chin Coulee and Writing-on-Stone areas. The southern limit lies along the United States border and Waterton Lakes National Park boundary. The northern limit extends across an area north of the Porcupine Hills through Nanton to the Bow River.

Included are three major natural regions (Rocky Mountains, Aspen Parkland, and Grassland) and six sub-regions (Alpine, Subalpine, Montane, Foothills Parkland, Foothills Grassland, and Mixed Grassland). Contained within these natural regions are a wide variety of habitats: wetlands, active sand dunes, rock outcrops, active riparian zones, mature coniferous forests, lush aspen woodland and rough fescue grassland, and dry grasslands.

Greater attention was given to a proposed planning area on the Milk River Ridge and to proposed or existing protected areas such as natural areas, ecological reserves or provincial parks which lie outside Waterton Lakes National Park. Areas within the study area boundary and which have a significant natural component include:

a. natural areas - Lomond, Beehive, Wolf Island, Carseland, Verdigris Coulee, East Porcupine, Fort Macleod, South Castle, Outpost Wetland
b. ecological reserves - Upper Bob's Creek, Ross Lake
c. provincial parks - Beauvais Lake, Police Outpost, Writing-on-Stone
d. proposed Milk River Ridge planning area

Beehive, East Porcupine, Fort Macleod, Lomond, Wolf Island, and Carseland either have unsuitable habitats or are beyond the range boundaries for the priority species identified in this study. Several sites have had preliminary biological surveys. These were not investigated in the 1986 field season.

Verdigris Coulee, South Castle, Ross Lake, Police Outpost and Writing-on-Stone potentially had populations of rare plants including several priority species. Upper Bob's Creek, Outpost Wetland and Beauvais Lake have a high potential for rare plants but priority species have not yet been identified there. The Milk River Ridge planning area has several populations of priority rare plants. All these areas were surveyed during the 1986 field season.

3. METHODS

Initially, a literature review and herbaria survey were undertaken. Literature on rare plant monitoring was gathered and field survey forms designed and techniques finalized.

Canadian herbaria containing "priority" plant species from Alberta were visited. Most of the relevant specimens are housed in the University of Alberta (ALTA), Edmonton collection. Alberta collections from other Canadian herbaria had previously been recorded by Dr. J. Packer for a revised Alberta flora. Dr. Packer provided summary information for many of the priority species.

Where this information was insufficient, or where the species were not represented at the University of Alberta, other herbaria were consulted including the Northern Forest Research Centre herbarium in Edmonton (CAFB), the National Museum of Canada (CAN) and Canada Department of Agriculture (DAO) facilities in Ottawa, and the University of Calgary in Calgary (UAC) and University of Lethbridge in Lethbridge.

Specimens were examined by researchers who would later conduct the field surveys and representative herbarium material was photographed for future reference. Data from the labels was recorded to aid in relocating the former collection sites. This included general and legal descriptions, elevation, all habitat information, collection date, collector and phenological state of the plant.

Where possible, known collection sites were mapped on 1:50,000 scale topographic maps. Aerial photograph interpretation and analyses of bedrock and surficial geology maps were carried out to define additional areas of potential habitat similar to the known collection sites.

A field itinerary was constructed to ensure that most of the species could be found in the field. This was kept flexible so that changes could be made if plant phenology was advanced or delayed. Field visits were timed to coincide with the most favorable times for locating each species, usually at the height of flowering. An attempt was made to visit all known collection locales unless the available information was unclear.

Representative "potential" habitats within the study area were also surveyed. Less field time was spent on habitats of rare species which subsequently proved to be widespread or common and on habitats which appear secure, for example, the high alpine. More field time was devoted to habitats which are vulnerable to land use pressures or which support rare species with low populations, for example, lower elevations and particularly native habitats in Foothills Parkland and moist Foothills Grassland.

Surveys were conducted from late May to late October 1986 with a concentration of effort from late May to early August. Concurrently, rare plant researchers were also involved in a field assessment of

"environmentally significant areas" -- these included sites which were of botanical, wildlife, geological, or hydrological interest. This allowed extensive evaluation of numerous sites in the study area. Field researchers included Cliff Wallis, Cheryl Bradley, Matt Fairbarns and Cleve Wershler.

In the field, rare plant habitats were documented on data sheets, maps, aerial photographs and photographically. Information noted included:

1. Species
2. General Location
3. Legal Description of Location, Latitude and Longitude
4. Elevation
5. Map No.
6. Aerial Photograph No.
7. Site Specific Directions
8. Distribution in Area Occupied
9. Number of Individuals
10. Habitat Description including landform, soil texture, aspect, moisture, microsite location, slope position
11. Reproductive Evidence (type and abundance)
12. Major Natural Threats
13. Human and Other Threats

Following the field survey, an additional literature review was undertaken. This included manual searching through library material and computerized searching of a number of data bases for high priority species. Detailed searches were undertaken for the following species:

Allium geyeri
Iris missouriensis
Cypripedium montanum
Astragalus lotiflorus
Oxytropis lagopus
Castilleja cusickii
Erigeron radicatus
Stephanomeria runcinata
Thelesperma marginatum
Townsendia condensata

Databases were searched for entries made up to the end of December 1986. Databases searched included:

BIOSIS - BioSciences Information Service; this is the computerized version of Biological Abstracts and BioResearch Index and covers the period from 1969 to the present
BOREAL - Boreal Institute for Northern Studies, Edmonton
CAB - Commonwealth Agiculture Bureau Abstracts, London
ELIAS - Environment Canada Departmental Library network, Ottawa
MICROLOG - Micromedia, Toronto
NTIS - National Technical Information Service; computerized listings of all United States government funded research and publications, Washington

OON - Canadian Institute for Scientific and Technical Information, Ottawa
OONL - National Library of Canada, Ottawa

4. RARE PLANTS CONSIDERED

From unpublished rare plant documentation previously prepared by the Natural Areas Program, a number of "priority" species were identified. At a minimum, these are rare in Canada. Some also have highly restricted global ranges while others are rare in all of, or a significant part of, their global range. Twenty-eight priority species have previously been recorded in the study area:

Melica spectabilis
Carex geyeri
Allium geyeri
Iris missouriensis
Polygonum engelmannii
Suaeda moquinii
Minuartia nuttallii
Stellaria obtusa
Draba densifolia
Saxifraga oregana var. montanensis
Suksdorfia violacea
Astragalus kentrophyta
Lupinus pusillus
Oxytropis lagopus
Epilobium glaberrimum
Mertensia lanceolata
Castilleja cusickii
Penstemon eriantherus
Cirsium scariosum
Erigeron purpuratus
Erigeron radicatus
Hymenopappus filifolius
Machaeranthera tanacetifolia
Prenanthes sagittata
Senecio hydrophiloides
Senecio megacephalus
Stephanomeria runcinata
Townsendia condensata

Upon investigation of herbaria and the literature, three species were deleted from the priority lists: Carex geyeri, Penstemon eriantherus and Senecio hydrophiloides. It was found that the habitats of these species were relatively secure; that some species were very adaptable to disturbance; and that collection sites were more numerous than previously known, although they were restricted to a small geographic area.

We were unable to locate the only Alberta specimen of Saxifraga oregana var. montanensis at the National Museum of Canada (CAN) herbarium where it had previously been housed. It was not in any of the probable Saxifraga folders. As there is some ongoing taxonomic debate over this species, it is possible that the specimen has been revised to a more common species. Collection data was also unavailable for Stellaria obtusa Engelm. Neither of these species was actively searched for in 1986 field studies.

When surveys of herbaria were undertaken, an additional three priority species were noted to occur within the study area:

Astragalus lotiflorus
Haplopappus uniflorus
Thelesperma marginatum

With these changes, field searches for 26 priority vascular plant species were carried out. Of these, 20 were again located in 1986 field studies.

A new location was also found for Cypripedium montanum which had previously been reported for Waterton Lakes National Park but not for the study area. It is on a list of priority species which have been collected at Waterton Lakes National Park on lands adjoining the study area:

Botrychium paradoxum
Trisetum montanum
Cypripedium montanum
Polygonum austiniae
Stellaria umbellata
Aquilegia jonesii
Papaver pygmaeum
Epilobium mirabile
Douglasia montana
Phacelia lyallii
Erigeron flagellaris

No detailed field surveys were undertaken for several species which have been considered rare in Canada. These occur in the study area or along its periphery but have not been placed on the priority list. Many are common in other parts of their range. Several of these are no longer considered rare in Alberta while others should probably be included on the priority list.

Isoetes bolanderi - one location, Summit Lake (Waterton), abundant at one end
Cheilanthes feei - no longer considered rare in Alberta; frequent along the eastern slopes and foothills of the Rockies
Carex paysonis - Waterton
Calochortus apiculatus - no longer considered rare in Alberta; frequent in its restricted southwest Alberta range
Xerophyllum tenax - no longer considered rare; common in its restricted southwest Alberta range
Atriplex canescens - widely scattered localities in the Grassland region
Stellaria americana - in Canada, known only from Sofa Mt. (Waterton)

Conimitella williamsii - no longer considered rare in Alberta; frequent in its restricted southwest Alberta range
Physocarpus malvaceus - Waterton, rare
Lupinus lepidus (incl. minimus) - no longer considered rare in Alberta; not uncommon within its restricted southwest Alberta range
Hypericum formosum - Waterton
Gayophytum racemosum - southwestern Alberta
Iliamna rivularis - Waterton
Angelica dawsonii - no longer considered rare in Alberta; common within its restricted southwest Alberta range
Lomatium sandbergii - no longer considered rare in Alberta; common within its restricted southwest Alberta range
Osmorhiza occidentalis - no longer considered rare in Alberta; common within its restricted southwest Alberta range
Linanthus septentrionalis - scattered locations in southern Alberta
Gentiana calycosa - Waterton, common in places
Phlox alyssifolia - no longer considered rare in Albera; common within its restricted southwest Alberta range
Asclepias viridiflora - Writing-on-Stone, Lost River, very rare
Nemophila breviflora - scattered locations in southwest Alberta, rare
Mimulus floribundus - very rare, Hillcrest, Red Rock (Waterton)
Penstemon albertinus - no longer considered rare in Alberta; common within its restricted southwest Alberta range
Penstemon lyallii - no longer considered rare in Alberta; common within its restricted southwest Alberta range
Galium bifolium - West Castle drainage, rare
Bahia oppositifolia - possibly in Coaldale area, rare
Brickelia grandiflora - Waterton
Erigeron ochroleucus - southwestern Alberta
Saussurea americana - extremely rare, also extremely rare in Montana and B.C., lush meadow at 1675 m just east of South Kootenay Pass, should be considered for the priority list

5. DISCUSSION

Generally, 1986 growing conditions were excellent. This contrasted sharply with the previous few years when a series of droughts suppressed plant growth making the location of many rare plants almost impossible.

However, some problems encountered in defining the distributions of rare plants included:

1. taxonomic confusion, including incipient or poorly defined species, subspecies, and varieties, as well as misidentification of herbarium specimens

2. inadequate documentation on herbarium labels; often locations are imprecisely defined and critical biological information is lacking

3. lack of research in several areas of the province; collection of herbarium voucher specimens or high quality photographs should be encouraged, provided native plant populations are not put at risk.

Based on herbarium and field investigations, the priority species have been divided into four categories:

1. recovery and monitoring plans required
2. threatened
3. rare, but not threatened
4. more information required

For convenience, some species which were considered non-priority were also evaluated and comments can be found in the priority species listings.

Records of priority and non-priority rare plants in proposed natural areas and ecological reserves can be found in the species' accounts.

5.1 Recovery and Monitoring Plans Required

Three species should be treated as endangered and have been recommended for the preparation of detailed recovery and monitoring plans:

Iris missouriensis
Castilleja cusickii
Cypripedium montanum

The first two species are confined to very small populations, often less than one hectare in size and whose Foothills Parkland and Foothills Grassland habitats are still being impacted by human activities. Major features of the habitat are the presence of groundwater flow just below the surface and lush forb and graminoid meadow vegetation. Iris missouriensis is a showy species which appears tolerant of and may actually benefit from some grazing by cattle. Castilleja cusickii appears to have a requirement for ungrazed or lightly grazed lands. Historical populations have been lost due to cultivation of habitat and planting of introduced grasses and forbs for hay crops. Modification of these habitats, competition from non-native plants, and heavy cattle grazing pose continuing threats.

Previously unreported for the study area, Cypripedium montanum, was found in the Southcastle area in 1986. It occurs in small numbers in mesic shrub and woodland vegetation in the Rocky Mountains. Threats include forestry operations, road expansion, increased vehicle access and, because it is a showy species, picking.

5.2 Threatened

Astragalus lotiflorus should be treated as threatened. The study area is peripheral to this species' main range in Alberta so assessment of other Alberta populations should be made. Previous studies (C. Wallis, unpublished field notes 1974-1985) indicate that the species is rare and local within its main range and that there has been considerable habitat loss. It may also be affected by vegetation encroachment on open dune areas.

Three non-priority species were also identified as being threatened: Carex nebraskensis, Chenopodium subglabrum and Polanisia dodecandra. None of these species was reported for the study area prior to 1986. Carex nebraskensis is possibly being affected by heavy grazing while Chenopodium subglabrum and Polanisia dodecandra may be declining due to vegetation encroachment on open dune areas. The last two species require assessments of populations in other parts of Alberta.

5.3 Rare, but not Threatened

Another 15 species are considered rare or have a restricted range in Alberta but their habitats are not known to be in any immediate danger. These include many species whose habitat within the study area is relatively well-protected in Waterton Lakes National Park (*), Writing-on-Stone Provincial Park (+) or the Prime Protection Zone (#) under the East Slopes Policy:

Melica spectabilis*
Polygonum engelmannii*
Suaeda moquinii
Minuartia nuttallii*#

Draba densifolia*#
Astragalus kentrophyta+
Lupinus pusillus+
Oxytropis lagopus
Epilobium glaberrimum*#
Mertensia lanceolata*#
Erigeron flagellaris*
Haplopappus uniflorus
Hymenopappus filifolius+
Senecio megacephalus*#
Stephanomeria runcinata

In Alberta, Haplopappus uniflorus habitat could be considered somewhat protected in Police Outpost Provincial Park. It is also protected outside the study area in Kootenay Plains Natural Area and Wood Buffalo National Park.

Sizeable populations of Oxytropis lagopus, Suaeda moquinii and Stephanomeria runcinata are not found in any protected areas in Alberta but their habitat does not appear to be threatened at present. A small population of Stephanomeria runcinata occurs at Dinosaur Provincial Park.

Polygonum engelmannii is considered to be very restricted in its Alberta distribution but it is abundant within that limited range. While not abundant, Minuartia nuttallii, Lupinus pusillus and Senecio megacephalus are relatively common and their habitat seems secure. A non-priority species, Microseris nutans occurs in a variety of sites, sometimes commonly. All these species can probably be removed from the rare plant list for Alberta along with Senecio hydrophiloides. Senecio hydrophiloides was previously deleted from the priority list and field work showed it to be abundant.

Bupleurum americanum, a non-priority rare plant, is protected in Waterton Lakes National Park and the remainder of its habitat generally appears to be out of danger.

5.4 More Information Required

In addition to the two species for which collection data was unavailable (Saxifraga oregana var. montanensis and Stellaria obtusa), the status of six species could not accurately be assessed as available collection data was imprecise or populations of these plants could not be located in the field. In some cases, the lack of good label information related to early historical data where reference points were non-existent or where they have now disappeared because of human activities. Extensive searching in apparently suitable habitats for five of these species was unsuccessful. Other means of locating these species will have to be devised:

Allium geyeri
Suksdorfia violacea
Erigeron purpuratus
Machaeranthera tanacetifolia

Prenanthes sagittata
Thelesperma marginatum

Because of the limited number of known collection localities, the loss of native habitats, the potential for crowding by non-native species and the difficulty in locating existing populations, it is recommended that Allium geyeri be treated as endangered pending the receipt of further information.

Suksdorfia violacea was searched for but could not be located. The habitat is vulnerable to forestry operations and additional assessments should be done.

Erigeron purpuratus is a high elevation species which should be evaluated in the context of its total provincial range. This should include an herbarium and field assessment of recent collections in the National Parks.

Machaeranthera tanacetifolia, collected only once in the late 1800's along a well-travelled trail, may be the result of a chance introduction. The collection label data is confusing. G. Dawson was in the Pakowki Lake area on the date indicated but the collection locality s given as Belly River. Further research on Blood Indian Reserve land t "Slide-out" would be useful.

Prenanthes sagittata is localized in Waterton but its habitat eems secure. While it could not be located at Police Outpost rovincial Park, no major developments are planned for its habitat. It s recommended that this species be treated as rare but not threatened.

H. Scoggan, collector of Thelesperma marginatum, passed away in the spring of 1986. He had destroyed his field notes and this could make relocation of the original collection site difficult. This species is apparently very rare in Alberta. Further assessments of this plant should include investigation of the type locality at Medicine Hat.

Cirsium scariosum could not be fully evaluated because of continuing taxonomic confusion. From our field surveys, it appears to be relatively common, regardless of the taxonomy used to define the species and its habitat seems secure. Ongoing cytotaxonomic studies at the University of Alberta should help in this area.

The status of two early-blooming species could not be completely assessed as there was an unusually early spring and the field program began somewhat late in the season. Despite intensive searches in known locations, no sign of Erigeron radicatus or Townsendia condensata could be found. However, habitats for both species appear relatively secure and extensive. It is recommended that they be treated as rare but not threatened.

S.5 Status Undetermined, Non-Priority Plants

In addition to the above evaluations, several non-priority species were noted in new localities during the field work or information was recorded during the herbarium label survey. The status for these plants remains undetermined but field or herbarium data is included in the species' accounts:

Bromus vulgaris
Danthonia californica
Danthonia unispicata
Festuca subulata
Melica smithii
Melica subulata
Trisetum canescens
Trisetum wolfii
Vulpia octoflora
Parieteria pensylvanica
Atriplex canescens
Myosurus aristatus
Polanisia dodecandra
Draba reptans
Rorippa truncata
Rorippa tenerrima
Iliamna rivularis
Androsace occidentalis
Crepis occidentalis

Draba reptans and Rorippa truncata are new additions to the rare list for Alberta. Draba reptans was considered introduced but is now thought to be native (J. Packer, personal communication). Its occurrence in large blocks of undisturbed native habitat would seem to confirm that conclusion. Rorippa truncata was only recently defined for Alberta (Harms et al 1986).

Atriplex canescens continues to present problems on herbarium sheets. The distinction on herbarium sheets between A. canescens and A. nuttallii is not always clear, although the two seem readily separable in areas further south. In its strictest sense, Danthonia californica is probably rare in Alberta. Taxonomic confusion was introduced in Baum and Findlay's revision of the genus (Boivin 1967-81).

Juncus regelii was collected in the Southcastle area (L. Allan, personal communication) but the specimens need verification. This is a new species for Alberta and is considered rare in Canada.

Castilleja sessiliflora is extremely rare in Alberta and occurs in the study area near Writing-on-Stone Provincial Park (C. Wershler, personal communication). It is not considered rare in Canada but is an example of rare plants which probably should be on the priority list in Alberta. Another possible priority species, which is not rare in Canada, is Tellima grandiflora. In Alberta, it is known only from the proposed Southcastle Natural Area (M. Fairbarns, personal communication).

5.6 Management Considerations

Once natural habitat is legally protected it should not be thought of as static. This ignores what we know about ecosystem dynamics, disturbance and succession, geological time, natural selection, population genetics and human influence (Bratton and White 1981). Changes in preserves can be initiated by either direct or

indirect human or natural causes, or by interaction of the two.

Knudsen (1986) and Dawson (1986) recommend the development of recovery or management plans for endangered and threatened species. These are needed to maintain and enhance habitats and ecosystems. The ultimate aim is to get plants off lists of rare, threatened and endangered species. The recovery plan identifies limiting factors then works to overcome them. Knudsen further states that private land holdings are an impediment to some recovery plans. Agencies are now spending tens of millions of dollars in California to get back critical habitats into public ownership.

Dunn (1986) suggests caution in enhancing habitat for only one species. He cites a case where managing for one endangered species is threatening another endangered species. He also notes that critical habitat sometimes extends beyond the boundaries of the habitat in which the plants are actually growing. This is true in cases where essential insect pollinators need adjacent habitat to complete portions of their life cycles. If adjacent habitat is destroyed, the pollinators are no longer present and the plants will ultimately disappear. In most cases, it is a habitat complex that is endangered and a variety of habitat needs protection to meet the needs of a variety of species. Continued single species management will further intensify the conflicts between the species.

Non-native plants have displaced native plants in other areas (McClintock 1986) and it is thought that we face similar problems with tame forage species such as timothy and brome.

Fire may be important in the management of certain species which are adapted to repeated burning of their habitats (Boyd 1986). Interference with such disturbance processes is significantly affecting certain rare species (Bratton and White 1981). Monitoring programs may be combined with controlled burns to demonstrate positive and negative effects of burning.

5.6 Other Findings

Particularly noteworthy is a link between the discovery of some significant butterfly populations and the identification of previously unknown localities of one of our rarest plants. Clouded Parnassian butterflies (*Parnassius phoebus*) which feed on *Sedum lanceolatum* were noted in an area of the Milk River Ridge, far from their normal range in Alberta. The stonecrop, a common plant species elsewhere in Alberta, is an indicator of Tertiary gravel exposures in an unglaciated area of the Milk River Ridge. These gravels support the major populations of hare-footed locoweed (*Oxytropis lagopus*) in Canada, one of our priority species. Several other rare plants also thrive there. The importance of maintaining contacts in other disciplines was amply demonstrated.

From our review of the literature, it appears that very little information exists on the biology of most species. The major information sources are primarily taxonomic in nature. Some information also exists in synecological work. The most detailed autecological information has been found in obscure government memoranda and unpublished notes.

It should be noted that some very attractive plants may be more threatened than the collection data indicates. Some species' biology (for example, low reproductive rates) may make them more sensitive to disturbance than others. The problem is that our knowledge of most species' biology is extremely limited. While some relatively common species should be removed from the rare plant lists others should be added to the priority lists or placed on lists of "sensitive" species.

6. MONITORING RARE PLANTS

Monitoring is the quantitative assessment of populations and individuals over time. It includes the location of individual populations, quantification of population condition and verification of potential threats and disturbances.

Monitoring is important before requesting legal protection for a species as it gives precision to predictions and allows critical situations to be identified. After legal protection is achieved, monitoring helps assess how effective protection is (White and Bratton 1981). Assessments of change in surviving natural habitats are needed for presentation to politicians, the general public and other scientists.

The first steps in a monitoring program are to:

1. assess which taxa are rare or threatened;
2. establish a permanent record of locations of rare taxa from herbarium surveys and published literature; and
3. field verify old sites and survey to find new sites.

Through the 1986 studies, the above tasks have been completed for many priority species in southwestern Alberta. Herbarium collections can provide valuable historic records, but there is usually no information on population size and location data is often vague.

While inventories which establish the rarity of species and assess population trends are needed to establish conservation priorities, they do not provide a scientific basis for practical management (Davy and Jeffries 1980). Protecting the habitat is often only one of many steps in protecting species. Rare plants may require management and a field monitoring program to ensure their continued survival. Detailed monitoring can make a major contribution if the research gives a predictive understanding of the population structure and function. However, Davy and Jeffries also suggest that it is important not to expend a great effort in plant biology studies if the primary cause of rarity is wholesale habitat destruction.

The next stage of monitoring is to create a permanent record of populations, including establishment of permanent plots, mapping of individuals, establishment of photo points and collection of demographic information (White and Bratton 1981). Establishment of a permanent plot data base must done with the assurance that plots can be relocated and measurements repeated. In Alberta's case, agencies and private interest groups will have to get permission from, and work together with, land managers and landowners if any monitoring program is to succeed.

Before natural habitats began to disappear, there was no perceived need to establish baselines. Now that species loss is

occurring, we need historical data which is largely unavailable. For changes in populations of rare plants, the only usual data base available is the information on herbarium labels, in the memories of collectors or in the chance survival of photographs. Establishment of monitoring programs now will give certainty and site specificity to future evaluations. Large, independent random samples can also document change, but repeated measurements on established permanent plots are most useful. Permanent plot sampling and rapid survey techniques should probably be used together, to compensate for deficiencies of scale in the former and the lack of precision in the latter (Williams 1981).

Other considerations include: selection of data to be recorded; control of data quality; provision for archival storage of information; and planning for resampling. A computerized system of storage is most practical for this type of study where periodic updating is required.

The ultimate objective of monitoring is to help maintain stable or healthy populations of plants. As there is great variability in health and reproductive success from season to season, it is necessary to carry out monitoring programs over many years. Three years is often the time required to obtain initial data, after which a decision can be made on long term and short term needs (Camp 1986).

In California, both scientific and popular approaches have been taken to monitoring. The popular approach utilizes volunteers and collects less detailed but still scientifically useful information (Callizo and Clifton 1986; Fellers 1986). In many cases, this is sufficient as an ongoing method of population assessment. The type of data collected will largely be dependent on time and budgets.

Human activity by researchers in plots may represent a significant impact and care should be taken by researchers to keep their disturbance at rare plant sites to a minimum (de Becker and Leitner 1986; Bradshaw 1981).

6.1 Types of Monitoring

Several specific approaches to monitoring have been defined and field-tested. While individual approaches may be sufficient for some studies, integrated approaches show much promise in helping to unravel complexities of rare plant populations (Davy and Jeffries 1981). There are two basic types of monitoring (Pavlick 1986):

Type I - demographic and long-term

This type is based on numbers of individuals and looks at population dynamics -- whether the population is stable, increasing or declining. Data is collected on survivorship, seed production, age structure, seed dispersal, germination patterns, phenology, distribution. This requires tagging plants and tracking survival. This is considered a standard part of population management regardless of the degree of endangerment.

Davy and Jeffries (1981) suggest demographic and genetic monitoring possibilities under this approach. Demographic studies can be long-term or intensive. The type selected for a particular study

should be appropriate to life-cycle and morphology of species in question.

Long-term monitoring approaches involve setting out permanent quadrats and mapping their vegetation at regular intervals over periods of several decades. Recording is commonly carried out annually, at about same time each year in order to exclude, as far as possible, variation arising from phenology and life-cycle. Alternatively, plots may be mapped two or three times a year, so as to take some account of such variation. This information is valuable to determine whether changes observed are cyclic or due to long-term directional changes. The disadvantage of this approach is that it reveals nothing of the internal processes of populations and, by monitoring at same time each year, only one stage of the life-cycle or phenological stage is considered.

Intensive monitoring approaches look at individual plants and provides autecological information by recording recruitment, losses, reproductive success and dispersal strategy. If a suitable range of population densities is studied, then density-dependent processes may be identified and mechanisms of population regulation discovered. This type of study rarely extends beyond a few years because the majority of herbaceous plants in temperate habitats must be mapped very frequently -- perhaps as often as every two to three weeks. Williams (1981) and Bradshaw (1981) indicate that following individual plants through their life-span and constructing age-specific life tables for important species enables the status of the species to be determined. These actuarial types of records provide information that the easier annual count of the total population or population sample cannot. It can pinpoint the exact stage in life cycle where changes in a population are initiated. The results show that rare plant populations fluctuate considerably. Studies of recruitment, regular or episodic, and survivorship enable calculations to be made of age composition and assessment of future trends. Bradshaw provides instructions for detailed monitoring and construction of a sampling frame (see appendices).

The problem with either type of demographic monitoring is that genetic factors are not addressed. Genetic approaches involve monitoring small-scale differences within populations. Local populations may be genetically distinct with respect to almost any aspect of their population biology, physiology or morphology which provides selective advantage. In rare plants, whose populations are often small and disjunct, there is a danger of losing variation associated with whole populations.

Type II - ecophysiological and short-term approach

This type of monitoring measures individual plants. Davy and Jeffries (1981) refer to this type of monitoring as a resource allocation approach. It is based on studies of the capture, transformation and use of resources, such as energy, water, a nutrient or metabolite, at any stage of development by analysis of plant organs. The major focus is on scarce or episodic resources. It yields insight into how populations cope with stresses and changing environments or, alternatively, their failure to survive. Various aspects of plant

physiology are analyzed to determine which stresses are present and which limiting factors may be modified to alleviate the stress.

This is extremely detailed research which is usually done only in precarious situations when the populations are in immediate danger. The status of individuals is determined instantaneously. It is probably of greatest value for species close to the limits of geographical distribution or in otherwise marginal habitats which is the case for several extremely rare or sensitive plant species.

The methods of monitoring employed would depend on species and the specific conservation problem to be resolved. Data collected can include whole plant growth, plant water status and leaf gas exchange (stomatal conductance). Techniques and instrumentation are available to allow for non-destructive in situ studies.

6.2 Data Collection

Prior to monitoring, the habitat should be clearly defined including plant composition, substrate, aspect, slope, moisture regime, land use and details of microhabitat. Permanent plots are an integral component of any long-term monitoring program (Graber 1986). Population biology information to be recorded each time a population is visited (Ayensu 1981) includes:

1. Number of individuals in each population, area covered by population, and distribution pattern (clumped, widely spaced, etc.)

2. Size/age classes present (define terms used) and number (or percentage) of individuals in each class.

3. Phenology -- estimate of percentage for each population in vegetative, flowering, fruiting, or senescent stages.

4. Number of seedlings observed.

5. Observations relating to survivorship and nature of mortality at each life stage (predation on seedlings, competition, etc.).

6. Evidence of herbivores, predators, diseases, and/or pests.

7. Evidence of disturbance by exotic plants, animals, microbes.

8. Human impacts observed or suspected (trampling, damage by vehicles, wild flower collecting, etc.).

9. Other threatening factors and their severity (land development, grazing, etc.). Give both existing and potential threats.

10. Assessment of the vigor and status of individuals in the population.

Other useful population biology information that may be recorded

each time population is visited:

1. Types of reproduction noted (seeds, vegetative, etc.).

2. Pollinators (wind, water, insect, etc.). Distinguish between observed and suspected pollinators.

3. Observations on seed dispersal (general mechanisms, dispersal patterns, amount of seed, germination requirements).

4. Seedling ecology (morphology, microhabitat, localized conditions restricting establishment).

5. Other species of this genus at or near site, and hybrids observed, if any.

6. Evidence of symbiosis or parasitic relationships.

7. Response of taxon to disturbance.

In the Great Smoky Mountains National Park, there is an ongoing program of plant monitoring which uses 0.1 hectare permanent sample plots with mapping of individuals from established reference points (Bratton and White 1981). Fixed-point photography is a valuable adjunct to detailed quadrat and plot investigations and is also used for non-plot sites at mapped locations of rare plants.

7. RECOMMENDATIONS

7.1 General Recommendations

Many of these recommendations may seem obvious to experienced researchers but they may be of some use when initiating research and monitoring programs:

1. Conduct all pre-field season interviews and herbaria examination prior to the growing season, and be prepared for unusually early breaks in the weather.

2. Sample over several years if climatic conditions appear to be temporarily suppressing plant growth.

3. Focus field programs on a narrow range of habitats and species in order to obtain the most effective use of field time. Broadscale surveys help in initial determination of additional research needs but they are not the preferred method for a thorough assessment of potential habitat.

4. Cooperate with researchers in other disciplines who may be able to provide insights into rare plant habitats through identification of other environmentally significant areas.

5. Precisely label all collections to help future researchers. Species which are common now may not be in the future, therefore, this recommendation applies equally to common and rare species. The single biggest problem in initiating assessment and monitoring programs is the lack of sufficient label data.

6. Permanent plot establishment is important for a long-term monitoring program, however, other methods should also be explored. These include random and selective sampling in similar habitats and periodic re-assessment of threats to actual and potential habitat.

7.2 Recommendations Specific to the Study Area

The following is a summary of the recommended status and action for species from the 1986 studies. An asterisk (*) indicates that the species was on the original priority list for the study area or Waterton.

7.2.1 Treat as Endangered

The most pressing requirement is to initiate recovery and monitoring plans for the following species which should be treated as endangered:

*Iris missouriensis - few populations, threats include grazing and cultivation of native habitats; showy species
*Cypripedium montanum - few populations, threats include picking, road construction and forestry operations; showy species
*Castilleja cusickii - low numbers, threats include cultivation and crowding by non-native species

A considerable amount of habitat for Iris missouriensis and Castilleja cusickii is on privately owned lands although there are some occurrences on land controlled by Public Lands Division in the Paine Lake area or Provincial Parks at Police Outpost. Landowner agreements should be sought to implement monitoring programs on private lands. Included in assessments of these two species should be a detailed evaluation of the effects of various levels of grazing and the effect of crowding by non-native species. Cypripedium montanum occurs entirely on land managed by the Alberta Forest Service or Parks Canada.

More field research is required prior to the implementation of a recovery and monitoring plan for another species which should be treated as endangered:

*Allium geyeri - threats include clearing of native habitats and crowding by non-native species

7.2.2 Treat as Threatened

Assessment, monitoring and research programs should be established for four species to be treated as threatened. Included should be an assessment of rare species and vegetation encroachment on active dunes as well as research into the effects of grazing on vegetation along permanent streams flowing out of the Sweetgrass Hills. Several areas are located on land controlled by the Public Lands Division. The most significant include an area by an igneous dike on the lower Sweetgrass Hills and the Turin Dunes northeast of Lethbridge. Protection and monitoring of these sites should be an integral part of the conservation of these species.

Carex nebraskensis - possibly affected by heavy grazing
Chenopodium subglabrum - possibly affected by vegetation encroachment on open dune areas
*Astragalus lotiflorus - possibly affected by vegetation encroachment on open dune areas; requires assessment of populations in other parts of Alberta
Polanisia dodecandra - possibly affected by vegetation encroachment on dune areas; requires assessment of populations in other parts of Alberta

7.2.3 Consider Rare or Local, No Habitat Protected

The following species are considered rare or local. Although the habitat generally seems secure, no formal protection has been afforded any of these lands. Formal protection in natural areas or ecological reserves is recommended. Suaeda moquinii also occurs outside the study area in the proposed Lost River natural area and the Milk River Canyon natural area/ecological reserve. Oxytropis lagopus occurs in the proposed Ross Lake ecological reserve. Gravel operations on the Milk River Ridge should be encouraged to locate on lower benches instead of the unglaciated rims of the upper plateau where there is a higher concentration of rare species.

*Suaeda moquinii
*Oxytropis lagopus

7.2.4 Consider Rare or Local, Some Habitat Protected

The following are rare or local species which occur in National or Provincial Parks and other habitats generally seem secure. Occurrence within a park does not automatically confer protection. Park agencies need to be made aware of the significance of the habitats for these plants and encouraged to monitor and protect them. Designation and wise management of the natural areas or ecological reserves will also protect significant habitats for several species. These habitats should also be monitored on a periodic basis to assess any changes in status.

*Melica spectabilis - Southcastle Natural Area and Waterton
*Draba densifolia - Southcastle Natural Area and Waterton
*Astragalus kentrophyta - Writing-on-Stone and Verdigris Coulee
*Epilobium glaberrimum - Southcastle Natural Area and Waterton
Bupleurum americanum - Ross Lake, Police Outpost and Waterton
*Mertensia lanceolata - Waterton
*Erigeron flagellaris - Waterton
*Erigeron radicatus - Waterton
*Haplopappus uniflorus - Police Outpost, Kootenay Plains and National Parks
*Hymenopappus filifolius - Writing-on-Stone and Verdigris Coulee
*Prenanthes sagittata - Waterton and Police Outpost
*Stephanomeria runcinata - Dinosaur
*Townsendia condensata - Waterton

Because of their occurrence at lower elevations and their apparently greater rarity, Erigeron flagellaris, Haplopappus uniflorus and Stephanomeria runcinata should be given protection in all areas where they occur.

7.2.5 Remove from Priority Plant List

There are numerous records for these species and the habitat seems secure. They should be removed from the priority plant list.

*Carex geyeri - possibly common
*Penstemon eriantherus - local

7.2.6 Priority Plant Species, Status Undetermined

The status of several species remains undetermined. In some cases, the habitat is being threatened or the collection data is inadequate and the 1986 studies were unsuccessful in locating populations.

The following group needs to be assessed principally outside existing protected areas like National Parks:

*Saxifraga oregana - needs verification
*Suksdorfia violacea - southwestern Alberta, habitat vulnerable
*Cirsium scariosum - needs taxonomic clarification
*Machaeranthera tanacetifolia - mislabelled, locality in doubt
*Thelesperma marginatum - grasslands, apparently very rare

The following species need to be assessed principally within National Parks with some searches made in surrounding habitat:

*Botrychium paradoxum - confined to Waterton, rare throughout range
*Trisetum montanum - confined to Waterton
*Polygonum austiniae - mountain National Parks
*Stellaria obtusa - southwestern Alberta, herbarium label data needed, taxonomic problem
*Stellaria umbellata - mountain National Parks
*Aquilegia jonesii - Waterton
*Papaver pygmaeum - Waterton
*Epilobium mirabile - Waterton
*Douglasia montana - Waterton
*Phacelia lyallii - Waterton
*Erigeron purpuratus - high mountains

7.2.7 Remove from Alberta Rare Plant List

Depending on the criteria used, the following plants could be removed from the rare plant list for Alberta. While most have a significant range restriction, they are common and their habitats are secure. At the very least, they can be removed from priority consideration.

*Polygonum engelmannii - southwestern Alberta
*Minuartia nuttallii - southwestern Alberta

*Lupinus pusillus - sandy soil sites in Mixed Grassland
Microseris nutans - southwestern Alberta, Milk River Ridge and lower Sweetgrass Hills
*Senecio hydrophiloides - southwestern Alberta
*Senecio megacephalus - southwestern Alberta

7.3 Other Considerations

It is clear from distribution maps that certain parts of Alberta have a higher occurrence of rare plants than others. Serious consideration should be given to the protection of sufficiently large habitats in order to protect the rare plants found there. In particular, attention should be given to Foothills Parkland and Foothills Grassland sites because of the ongoing habitat destruction in these regions. Designation and wise management of sites such as the Outpost Wetlands and Ross Lake could be useful in protecting such areas. On-site preservation is the most important and effective method of protection and should have priority over all other types of conservation.

Consideration should be given to protection of unique habitats such as the higher slopes of Mokowan Butte in the Pollhaven Community Pasture. Several non-priority species have been found in this area and it is possible that their status may be upgraded following assessments conducted in Waterton Lakes National Park. Opening up the forest to increase cattle grazing could be detrimental to some rare plants. The Cloudy Ridge area has several non-priority rare species on Public Land. The current land management is excellent. The site should be monitored periodically, particularly if the lease changes hands.

Resource developments in high elevation lands should be watched to determine the extent of their impacts on high elevation species which, up to now, have been minimally impacted.

Transplantation of species to suitable natural habitats or preservation through cultivation off-site should be seen as back-up systems for worst-case scenarios. However, off-site programs can provide valuable scientific knowledge about species' biology to improve on-site management.

With respect to native orchids, Luer (1975) suggests that their future is perilous and that the only solution is the preservation of habitat. He goes on to state that trade in native orchids should be prohibited because of the low survival rate and impact on native populations. Picking, regardless of how carefully executed, causes sufficient injury which may permit an attack by fungus resulting in the death of the plant. It should therefore be discouraged via education programs or regulation.

Taxonomic research should be encouraged to resolve some of the problems related to rare plant identification. Specific problems noted in 1986 studies related to: Cirsium scariosum, Danthonia californica and Atriplex canescens.

Government agencies and private landowners should be encouraged to support preservation of natural habitats, monitoring programs and research into appropriate management of these sites. Incentives to

private landowners and cooperative approaches with public interest groups should also be considered.

8. SPECIES' ACCOUNTS

The following is a listing of all data collected and evaluations undertaken during this study. Included are priority and non-priority species from herbarium records, literature surveys and field assessments.

The following information is generally provided:

LATIN NAME:

Scientific nomenclature generally follows Moss (1983) except where noted otherwise.

COMMON NAME:

Common plant names generally follow Packer and Bradley (1984).

BRIEF SUMMARY OF STATUS:

This is a summary of the known information about the plant's rarity; distribution restrictions and habitat security.

GENERAL ALBERTA DISTRIBUTION:

The general Alberta distribution is based on Moss (1983).

SPECIFIC LOCALITIES:

This generally is herbarium data taken from specimen labels but, in a few instances, is based strictly on published information.

1986 FIELD SURVEY DATA:

This provides information on the 1986 field survey program. Often included on the following pages are field checksheets for several priority and a few non-priority species.

HABITAT:

Habitat notations attempt to provide information on actual site requirements and are drawn from the specimen label data and published information.

BIOLOGY:

Very little biological data is available for most species but an attempt has been made to point out any known aspects of the plant's biology. This usually includes some indication as to the flowering

time, whether the plant is annual, biennial or perennial and, where possible, any aspects of reproductive life history.

THREATS:

Any of the major threats which are actual or potential are defined here. These include human activities such as cultivation, logging and grazing but also include assessments of any natural threats such as vegetation encroachment on active sand dunes.

POPULATION SIZE AND TREND:

Except where noted, population size estimates are largely subjective assessments to indicate relative rarity and type of distribution. Population trend indicates any known changes to plant abundance since records started to be kept.

PROTECTIVE STATUS:

This indicates whether a plant occurs in an existing or proposed protected area such as a natural area, ecological reserve, provincial park or national park. It should be pointed out that, while national and provincial parks generally protect habitats from major disturbances, local developments can severely impact rare plant populations. In all cases, the habitat is generally protected but there is no formal protection mechanism for habitats of rare plants.

RECOMMENDATIONS/MANAGEMENT ACTION:

Recommendations are based on the experience of the authors and published information. Where a species has been thoroughly studied in the field and sufficient data has been assessed, a recommendation for deletion from the rare plant list or to treat as endangered or threatened status can be given. Any management actions which would help the species are also outlined here. These include recovery and monitoring programs, dissemination of information, designation of protected areas and additional research requirements.

REFERENCES:

With the exception of the standard Alberta rare plant list (Packer and Bradley 1984) and provincial flora (Moss 1983), any pertinent references regarding taxonomy, status, distribution, biology or threats are provided here.

APPENDIX 1. CRITERIA FOR ASSESSING RARE PLANTS

Ayensu (1981) suggests a list of recommended criteria to use in the assessment of rare plants:

1. Similarity of appearance to closely related species that may occur in the same area.

2. Vigor or populations, whether stable, increasing or declining.

3. Extent to which variablility in numbers or individuals may be due to particular environmental factors that affect long-term population trends.

4. Frequency and density of populations.

5. Species biology, including reproduction, breeding systems, pollinators, dispersion, establishment of new individuals, maintenance of age and maturation classes.

6. Species in the area which may be highly competitive to the species under study.

7. Aspect of the species: attractive to collectors, both casual and commercial, versus inconspicuous.

8. Location of marginal or disjunct rare of the populations.

9. Tolerance of the species to disturbance; ability to colonize disturbed land.

10. Natural factors such as herbivore predation, disease, fire, affecting the species.

11. Stability or instability of the preferred habitat, as to the amound ot suitable habitat being changed due to natural or human causes.

12. Impact of natural succession of plant communities, particularly if frequency of a short-term successional species is involved.

13. Habitat or genetic characteristics earmarking a possible or potential occurrence on an 'ecological island' requiring conservation or more habitat than usual.

14. Human threats

15. Accessibility of localities, both protected and unprotected, to the public

16. Accessibility of plants to humans at the site

17. Recommendations for 'critical habitat' designation, including that of pollinators and dispersal agents in the habitat.

18. Ownership of habitat, including existing regulations or policies.

19. Discernible economic impact deriving from conservation of the species in a proposed development area.

20. Importance for possible chemical screening fro medicines, drugs, pharmaceuticals; potential for propagation in botanic gardens or legal nursery trade to alleviate stress to natural populations.

The concepts of rarity and endangerment are profoundly different from one jurisdiction to the next. The following types are outlined as they may prove useful in further evaluations of rare Alberta plants.

Straley et al (1985) suggest the following categories of rarity for British Columbia plants:

R1 - plant taxa that are represented by a single or few known populations, usually with only a few individuals in the populations.

R2 - plant taxa that have few to several populations, but usually with a relatively large number of individuals in each populations.

R3 - plant taxa that have no distinct geographical range or distribution, usually scattered in the province, in isolated populations consisting of small numbers of plants.

R4 - plant taxa that are restricted in their general distribution in the province and often represent the northern or southern limits of more commonly distributed plants. The populations often consist of numerous individuals, but with a narrow geographical range in the province.

California (Cochrane 1984) uses the following definitions of rare and endangered:

RARE

1. limited to unusual substrate or sharply defined habitat not representative of a region; or

2. generally limited or infrequent in number, such that it complies with at least three of the following conditions:

a. fewer than 20 definable populations
b. maximum interpopulation distance of less than 100 km
c. most populations of fewer than 10,000 individuals

d. most populations less than one hectare; or

3. limited in total area of occurrence to less than five hectares; or

4. limited to one or two populations.

ENDANGERED

1. most populations undergoing imminent or active destruction of range or fundamental habitat; or

2. native plant reproductive strategy in danger of failure due to limited plant numbers or occurrences or loss of support organisms; or

3. low potential for effective coordination of land management due to fragmentation of ownership and land use regulatory-management authorities or occurrences on sites where adopted land use management plans and policies preclude its continued survival; or

4. subject to heavy collection pressure due to high horticultural, economic, aesthetic, commercial or research value.

The following categories are used by the International Union for the Conservation of Nature and Natural Resources (IUCN) to categorize rare plants:

1. Extinct - species no longer known to exist in the wild after repeated searches of the type localities and other known or likely places

2. Endangered - taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included are taxa whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be immediate danger of extinction

3. Vulnerable - taxa believed likely to move into the Endangered category in the near future if the causal factors continue operating. Included are taxa of which most or all the populations are decreasing because of over-exploitation, extensive destruction of habitat or other environmental disturbance; taxa with populations that have been seriously depleted and whose ultimate security is not yet assured; and taxa with populations that are still abundant but are under threat from serious adverse factors throughout their range

4. Rare - taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk. These taxa are usually localized within restricted geographical areas or habitats or are thinly scattered over a more extensive range

5. Indeterminate - taxa known to be Extinct, Endangered, Vulnerable or Rare but where there is not enough information to say which of the four categories is appropriate

APPENDIX 2. CRITERIA FOR RARE PLANT STATUS IN ALBERTA

For the purposes of this study, the following definitions of rarity and endangerment were adopted:

Status Undetermined - insufficient or inconclusive information to allow categorization

Rare - small numbers within Alberta; may be restricted to a few small sites or it may occur sparsely over a wider area. They occur in sufficiently small numbers that they may become threatened if their habitats deteriorate.

Threatened - likely to become endangered within the foreseeable future over all or a significant portion of a defined geographical area if factors affecting its vulnerability are not reversed.

Endangered - threatened with extinction throughout all or a significant portion of Alberta, usually owing to the action of man.

Extirpated - has disappeared from Alberta within historical time but which survives elsewhere.

Extinct - has disappeared from its entire range.

No plant species are known to be extirpated or extinct in Alberta.

APPENDIX 3. DETAILED MONITORING TECHNIQUE

Bradshaw (1981) provides details of a technique used to monitor individuals and methods for constructing a sampling frame.

The first step is to determine the size and position of each plot according to density and distribution of species requiring monitoring.

Mark corners of plots with pegs sunk flush with soil, so no attraction is made to animals or humans. Relocate by measuring a recorded distance along a compass bearing from one or more easily found fixed objects. Rock exposures and large heavy boulders are good reference points. If no natural object is available, a large marker can be buried flush with the ground and its top surface painted for easy recognition and its position identified by triangualtion to more distant objects. The distance from the reference point to the plot should be less than 15 m and preferably under 10 m. One reference point is adequate but a second provides additional insurance.

The positions of at least two corners of each plot should be recorded. The corner pegs are of nylon tube, about 1 cm in diameter, stiffened with steel rods. Most are about 15 cm long, none are less than 10 cm. Some had to be sunk into rock, bored with a star-drill and hammer. Placement of a small colored stone over each peg facilitates recognition.

Construction of the Grid

The grid frame is 100 X 30 cm, a more practical width than a metre square. The frame is of an aluminum alloy 1 X 0,25 inch, glued and rivetted at the corners and bored to take a coarse milled brass rod as a leg, with two milled nuts to use as levelling screws. When in position, the legs fit into the tops of the pegs in the corners of the plots. The frame and legs need to be strong enough to prevent accidental bending.

A loose cross-bar as long as the outer width of the frame, about 0.75 X 0.25 inches, has recessed ends so it will lie across the frame without slipping. Both long and short sides of the frame and the cross-bar are inscribed and numbered at one cm intervals. On the cross-bar these are perforated to take needles made of 16 gauge stainless steel welding rods which have a blunt point at one end and a loop at the other. When several of these are positioned vertically through the cross-bar into the vegetation, a very accurate record of the position of each plant can be made. The length of the legs and the needles can be varied according to the height of the vegetation.

Sampling Technique

The plots varied in length from 50 cm to several metres. Where the plots are more than two metres long it is helpful to stretch a string taut between each corner peg in order to keep the frame in line. The first metre is thoroughly searched and the position of each plant marked by pressing a colored marker like a cocktail stick into the soil This ensures that no plants are missed when making the written record. With the frame accurately positioned over the corner pegs and using the cross-bar and needles, the coordinates of each plant, shoot and seedling can be determined and recorded.

A visual record of the position of each plant is made to scale on drafting film. Both the material and method are weatherproof. Working at a scale of 1 cm to .1 inch, the details of 2 m can be recorded on a piece of hardboard about 35 X 25 cm. This is large enough to hold comfortably and not too large to be caught by the wind.

Different colored markers can be used to record different visits. The first record of the next year is made on a new film laid over that of the previous year. For accurate identificaiton of each plant it is helpful to have the previous record at hand as, for a variety of causes, plants do disappear.

APPENDIX 4: RARE PLANT FIELD SURVEY GUIDELINES

The California Native Plant Society and the California Department of Fish and Game have prepared a set of rare plant field survey guidelines which are applicable to Alberta (Nelson 1984). They are intended to help determine when a botanical survey is needed, who should be considered qualified to conduct such surveys, how field programs should be conducted and what information should be contained in the final report:

1. Botanical surveys that are conducted to determine the environmental impacts of development activities should be directed to all rare and endangered plants and plant communities. Rare and endangered plants are not necessarily limited to those species which have been "listed" by state and federal agencies, but include any species that, based upon all available data, can be shown to be rare and/or endangered.

2. It is appropriate to conduct a botanical field survey to determine if, or the extent to which, rare plants will be affected by a proposed project when:

   a. based upon an initial biological assessment it appears that the project may damage potential rare plant habitats;

   b. rare plants have historically been identified on the project site, and yet adequate information for impact assessment is lacking; or

   c. no initial biological assessment has been conducted and it is not known whether rare plant habitats exist on the site.

3. Botanical consultants should be selected on the basis of possession of the following qualifications, in order of importance:

   a. experience as a botanical field investigator, with experience in field sampling design and field methods;

   b. taxonomic experience and a knowledge of plant ecology;

   c. familiarity with the plants of the area, including rare species; and

   d. familiarity with the appropriate statutes related to rare plants and plant surveys.

4. Field searches should be conducted in such a manner that they will locate any rare or endangered plants that may be present.

Specifically, such field searches should be:

a. conducted at the proper time when rare or endangered plants are both evident and identifiable. Field surveys should be scheduled (1) to coincide with known flowering periods, and/or (2) during periods of phenological development that are necessary to identify the plants of concern.

b. floristic in nature. Predictive surveys, which predict the presence of rare plants based upon the occurrence of habitats or other physical features, rather than actual field inspection, should be reserved for studies of single species; not for impact assessment. Every species noted in the field should be identified to the extent necessary to ensure that it is neither rare nor endangered.

c. conducted in such a manner that they are consistent with conservation ethics. Collections of voucher specimens of rare (or suspected rare) plants should be made only when such actions do not jeopardize the continued existence of the population and in accordance with applicable state and federal permit regulations. Voucher specimens should be deposited at recognized public herbaria for future reference. Photography should be used to document plant identifications and habitat whenever possible, but especially when rare plant populations cannot withstand collection of vouchers.

d. conducted using systematic field techniques in all habitats of the site to ensure a reasonably thorough coverage of potential impact areas.

e. well documented. When rare or endangered plants or unusual plant communities are located, a California Native Plant Field Survey Form (or some equivalent written form) should be completed and sent to the Natural Diversity Data Base.

S. Reports of botanical field surveys should be included in or with environmental impact reports and should contain the following information:

a. project description, including a detailed map of the project location and study area;

b. a written description of the biological setting, referencing the plant community nomenclature used and a vegetation map;

c. detailed description of survey methodology;

d. dates of field visits;

e. results of the survey, including detailed maps:

f. an assessment of potential impacts;

g. discussion of the importance of rare plant populations, with

consideration of those nearby, and total species distribution;

h. recommended mitigation measures to reduce impacts;

i. list of all species identified;

j. copies of all California Native Plant Field Survey Forms or Natural Community Field Survey Forms, when unusual communities are found;

k. name of the field investigator(s); and

l. references cited, persons contacted, herbaria visited and location of voucher specimens.

CALIFORNIA NATIVE SPECIES FIELD SURVEY FORM

OFFICE USE ONLY

Document Code _____ Quad Code _____
Index Code _____ Occurrence # _____
Copy Sent To _____

PLEASE ENTER ALL INFORMATION AVAILABLE TO YOU. USE THE BACK FOR COMMENTS IF NECESSARY. ***PLEASE ATTACH OR DRAW A MAP ON BACK.***

Scientific name (no codes): _____

Reporter: _____ Phone: ( ) _____

Address: _____

Date of Field Work: ___ (day) ___ (mo) —19 (yr.) County: _____ Collection? If yes, # _____ Mus./Herb _____

Location: _____

_____

_____

_____

Quad Name: _____ T _____ R _____ ____ ¼ of _____ ¼ Sec ____

____ 7½' ____ 15' Elevation: _____ ft(m) T _____ R _____ ____ ¼ of _____ ¼ Sec ____

Landowner/Manager _____

Species found? ____ Yes ____ No If not, reason: _____

Is this a new location record? ____ Yes ____ No ____ Unknown

Total # of Individuals= ____ Is this a subsequent visit? ____ Yes ____ No Compared to your last visit: ____ more ____ same ____ few

Phenology (plants): _____ # vegetative _____ # flowering _____ # fruiting

Population Age Structure (animals): _____ # adults _____ # juveniles _____ # othe

Site Function for Species (animals): ____ breeding ____ foraging ____ wintering ____ roosting ____ denning ____ othe

Habitat Description: (plant communities, dominants, associates, other rare spp., substrate/soils, aspect/slope)

Current Land Use/Visible Disturbances/Possible Threats

Overall Site Quality: _____ Excellent _____ Good _____ Fair _____ Poor
Comments:

Should/Could this site be protected? How?

Other comments:

DETERMINATION (Check one or more, fill in blanks)

- _____ Keyed in a site reference: _____
- _____ Compared with specimen housed at _____
- _____ Compared with photo/drawing in: _____
- _____ By another person (name) _____
- _____ Other _____

OTHER KNOWLEDGEABLE INDIVIDUALS (Name/Address, Phone)

PHOTOGRAPHS (Check one or more)

Subject	Type
_____ Plant/Animal	_____ Slide
_____ Habitat	_____ Print
_____ Diagnostic Feature	
_____ Other	

May we obtain duplicates at our cost?

MAIL TO: NATURAL DIVERSITY DATA BASE, CALIFORNIA DEPARTMENT OF FISH AND GAME, 1416 NINTH ST., SACRAMENTO, CA 95814

APPENDIX 5: NATIVE PLANT COLLECTION GUIDELINES

The California Native Plant Society has also issued a policy on educational-scientific collecting:

California Native Plant Society recognizes the educational and scientific justifications for plant collecting. However, two important questions should be considered before taking plant specimens, i.e., will the collecting of this plant contribute to educational or scientific advancement, and what will be the impact on the population of thje removal of this plant? To assist in answering these questions, we propose the following guidelines:

1. Educational and scientific collections should be done inconspicuously. Casual observers may not understand the reasons for such activities and may feel they may do likewise.

2. Undirected and excessive collecting by students in beginning classes should be discouraged, since it often results in duplication of specimens without an increase in knowledge. It may also result in unknowingly taking rare plants and thereby possibly reducing already critically small populations.

3. Instructors are encouraged to use common, especially weedy or garden species, for demonstrating collecting techniques, plant structures and diagnostic features.

4. Students in advanced botany courses should be made aware of the rare and endangered plants in their region. Of even greater importance is engendering an ethic whichemphasizes the impact of collection on populations.

5. The primary justification for plant collecting is that it contributes to an increased knowledge of the California flora. Repeated collecting in well-known areas may serve no useful function. While it is important to document the distribution of plants including rare species, it is critical to evaluate the impact of such activities.

E

PIPING PLOVER STUDIES

ALBERTA 1987

Prepared by: C. R. Wershler
Sweetgrass Consultants Ltd.
Calgary, AB

For: Alberta Recreation and Parks
World Wildlife Fund Canada
Alberta Fish and Wildlife
Canadian Wildlife Service

February 1988

PIPING PLOVER BREEDING HABITAT

CENSUS AND MONITORING PROGRAM

ALBERTA 1987

Prepared by: C. R. Wershler
Sweetgrass Consultants Ltd.
Calgary, AB

For: World Wildlife Fund Canada
Alberta Fish and Wildlife
Canadian Wildlife Service

February 1988

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1.0 INTRODUCTION

This project was based on recommendations contained in the 1987 report, "STATUS OF THE PIPING PLOVER IN ALBERTA - 1986" by Wershler and Wallis. The 1987 Piping Plover work in Alberta included three components: field surveys, monitoring of selected key habitats, and management planning. The last component is covered in separate reports for the Little Fish Lake and Reflex Lake areas.

Field surveys were conducted at:

1. sites missed in 1986, and

2. sites not intensively surveyed in 1986.

Sites which had very limited potential for breeding in 1986 because of extremes in water levels were to be surveyed in 1987. However, habitat conditions did not improve at these sites -- Miquelon Lakes, Chain Lakes and Dowling Lake -- and comprehensive field surveys were not conducted.

Monitoring activities took place in three key habitats -- Chain Lakes, Chappice Lake and an unnamed lake south of Sunken Lake. These areas were censused early in the breeding season. Notes were made on the numbers of adults, nesting activities, water levels, and disturbances. Although a number of nests were found during the surveys, researchers spent only enough time in the nesting habitats to census birds and determine whether or not they were nesting.

2.0 SURVEY PROGRAM RESULTS

Only one new breeding site was discovered, at an unnamed water body north of Metiskow. Good potential breeding habitat was found at an unnamed water body north of Buffalo Lake, a site which probably corresponds to a historic nesting site referred to in the 1986 report by Wershler and Wallis (listed under "Table 2" - page 49).

Sites missed in 1986

Reservoir east of Vauxhall (Twp. 13, Rge. 15, W4M) and other reservoirs in the general region, August 11: looked potentially good from aerial photography but there was no suitable habitat

Reservoirs (south end Lake Newell, Rolling Hills Lake, Johnson Reservoir) and ponds (Twp. 16 and 17, Rge. 14 and 15, W4M), May 8 and June 12: no potential -- islands in Lake Newell where Piping Plovers had been seen in 1986 were flooded

Northeast end McGregor Lake (Twp. 18, Rge. 21 and 22, W4M), August 12: rocks and mud

Water bodies in Matzhiwin sandhill area (Twp. 22, Rge. 15, W4M), June 4: no suitable habitat

Lakes in C.F.B. Suffield, June 13-14 and June 26
- Waters Lake (Twp. 17, Rge. 17, W4M): muddy alkali
- Easy Lake (Twp. 18, Rge. 6, W4M): dry but some potential shore
- Oishpan Lake (Twp. 19, Rge. 4, W4M): dry, muddy alkali
- Beveridge Lake (Twp. 20, Rge. 7, W4M): water level low but some potential shore (best of all lakes in C.F.B. Suffield)
- Weber Lake (Twp. 20, Rge. 7, W4M): muddy alkali
- Cross Lake (Twp. 20, Rge. 7, W4M): very restricted shoreline
- White Horse Lake (Twp. 20, Rge. 4, W4M): dry, muddy alkali
- all other water bodies seen were dry alkali

Cochrane Lake (Twp. 26, Rge. 4, W5M), August 28: potential habitat on large point on southwest shore

Northwest shore of Dowling Lake (Sec. 15, 16 and 22, Twp. 32, Rge. 15, W4M), April 26: no suitable shore

Permanent water body north of Buffalo Lake (Sec. 26, Twp. 41, Rge. 21, W4M), June 22: good nesting shore but was not checked for Piping Plovers; not saline -- probable historic nesting area

Northwest shore of unnamed lake southwest of Gough Lake (Twp. 34, Rge. 18, W4M), June 9: no suitable habitat

Whitewater Lake (Twp. 45, Rge. 13, W4M), May 18: no suitable habitat -- historic collection site

North shore of unnamed water body north of Metiskow (Sec. 15, Twp. 39, Rge. 12, W4M), June 23: at least 8 adult Piping Plovers, 3 nearly fledged young, and 2 large downy young; water levels very low in this area -- new nesting site

North shore of Miquelon Lake (Twp. 49, Rge. 29, W4M), July 24: no suitable habitat -- water level high

West side of Jamieson Lake, C.F.B. Wainwright (Twp. 43, Rge. 7, W4M), September 14: no potential habitat; east side of lake not checked because it is an off-limits, contaminated area due to military activities.

Sites not intensively surveyed in 1986

Plover Lake (Twp. 29, Rge. 19, W4M), June 9: high water level and very restricted shoreline (Ducks Unlimited project)

Grays Lake (Twp. 32, Rge. 7, W4M), June 9: very restricted rocky shore; no alkali

Unnamed lake north and east of Grays Lake (Twp. 33, Rge. 7, W4M), June 9: dry and grassy

Farrell Lake (Twp. 33, Rge. 17, W4M), June 9: marshy; no suitable habitat

3.0 MONITORING PROGRAM RESULTS

Chain Lakes Region

Date: May 14

Pearl Lake

Total adults: 1

- 1 flew over west shore from the southeast and possibly landed at north end
- fairly good nesting habitat but lake dry; wet mud indicated that there must have been water in the basin within the last few weeks

Large Chain Lake north-northwest of Clear Lake

Total adults: 13

Location A: Southwest shore (E half Section 2, Township 33, Range 16)

4 adults and 2 nests

- 1 nest (4 eggs) and 1 adult just west of line between Sections 1 and 2; 1 nest (4 eggs) and pair of adults on sloping land on point; and 1 adult on northwest-most portion of point with possible nest

Location B: Northeast shore (W half Section 12 and NW corner Section 1, Township 33, Range 16)

6 adults and 1 nest on point

- 3 (1 giving courtship flight) near south end of point; 2 (possible pair) and 3 individuals (northern-most bird, near fence, had a nest with 3 eggs) on east side of point

3 adults on east side of lake, north of point

- 1 bathing where creeklet flows into lake; 1 male giving courtship flight and female nearby, north of fence

Notes:

- recent disturbance on south shore, consisting of a bladed trail leading from the gravel road south of the lake to dugout-like ponds next to the lake -- the purpose of these ponds was unclear; the water level in the lake was low and any drawing of water from the basin could have disastrous effects on nesting Piping Plovers
- other lakes in the Chain Lakes complex were dry
- 12 adults recorded June 13, 1986
- water level was higher than in 1986 visit, but 1987 survey was one month later

Chappice Lake - North Shore

Date: June 7

Total Adults: 11

- 2 males feeding in springs area on northeast shore
- 7, all apparently nesting, on point
- 2, a pair, with newly hatched chicks on northwest shore

Notes:

- water level lower than one year ago (1986)
- 14 adults recorded May 30, 1986

Date: June 12

Total Adults: 7, possibly 8

- 5, possibly 6, on point as well as a nest with 3 eggs
- 2, with at least 1 downy young, in alkali west of point

Notes:

- water level lower than on previous visit (June 7)

Unnamed Lake South of Sunken Lake

Date: June 8

Total Adults: 13

- 2 on island
- 11 on point -- 2 on west part, 9 on east part

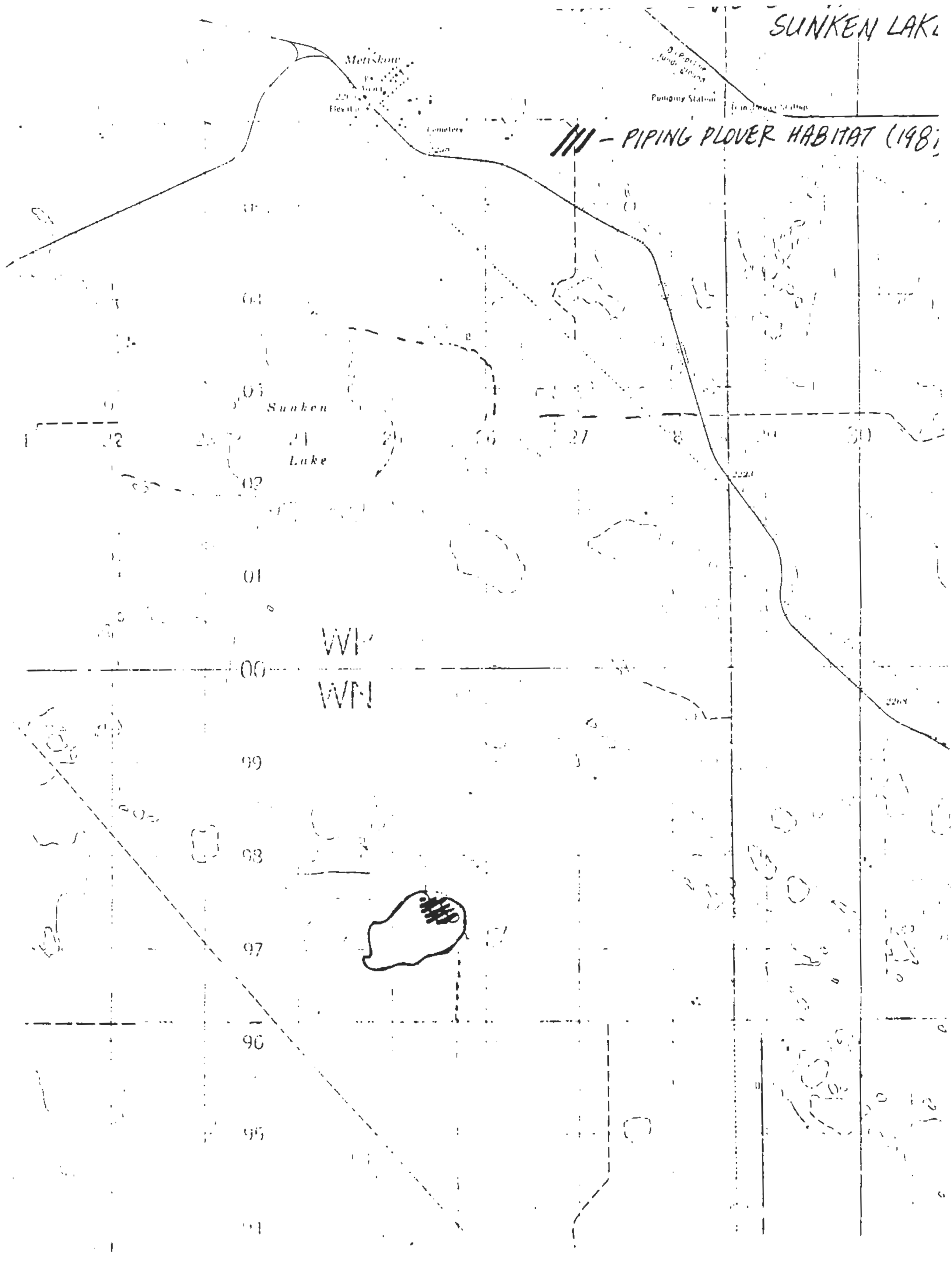
Notes:

- recent clearing of trees south of lake; additional clearing closer to the lake basin could be detrimental to nesting Piping Plovers
- 15+ adults recorded June 9, 1986
- water level slightly lower than in 1986

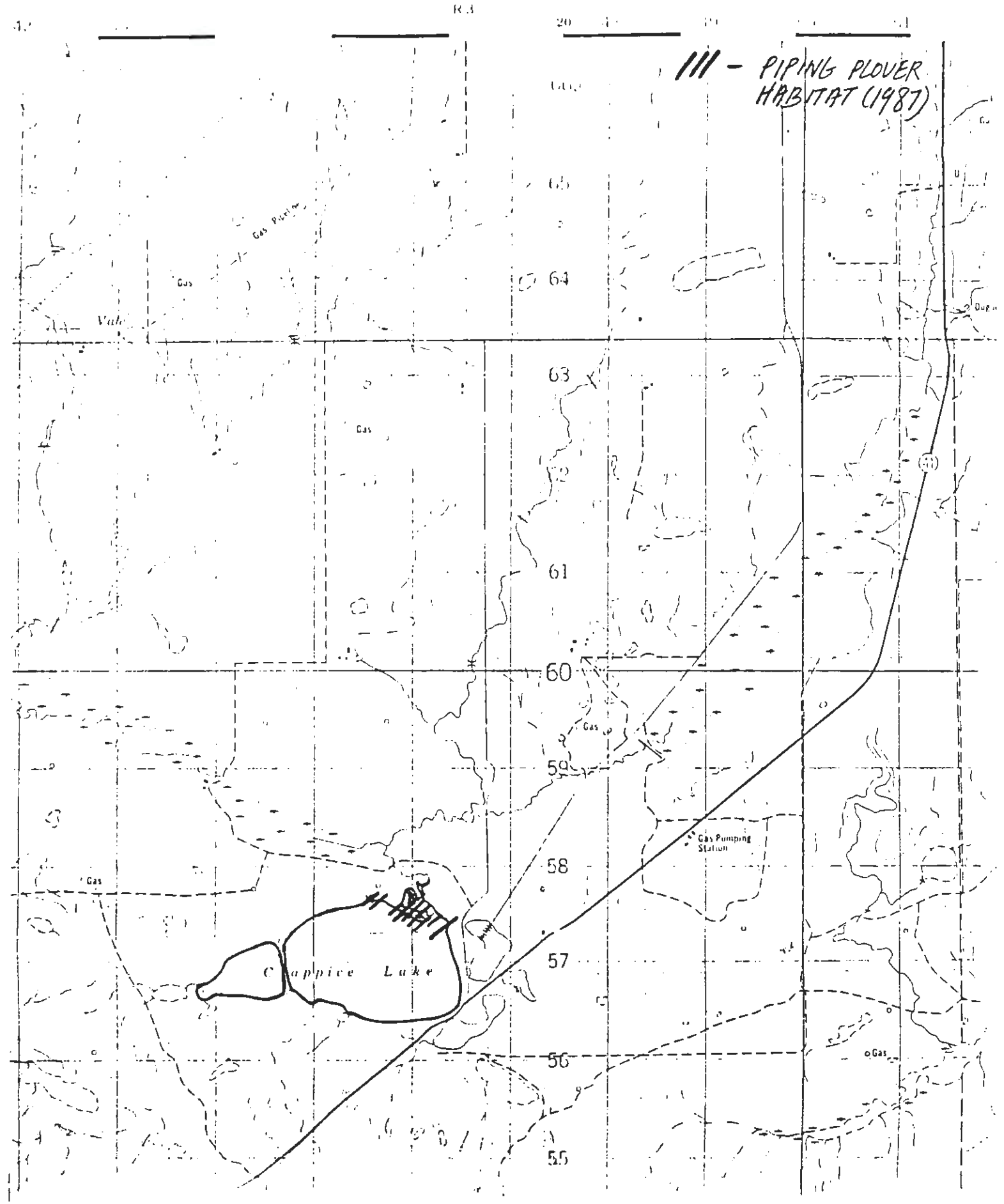
4.0 DISCUSSION AND RECOMMENDATIONS

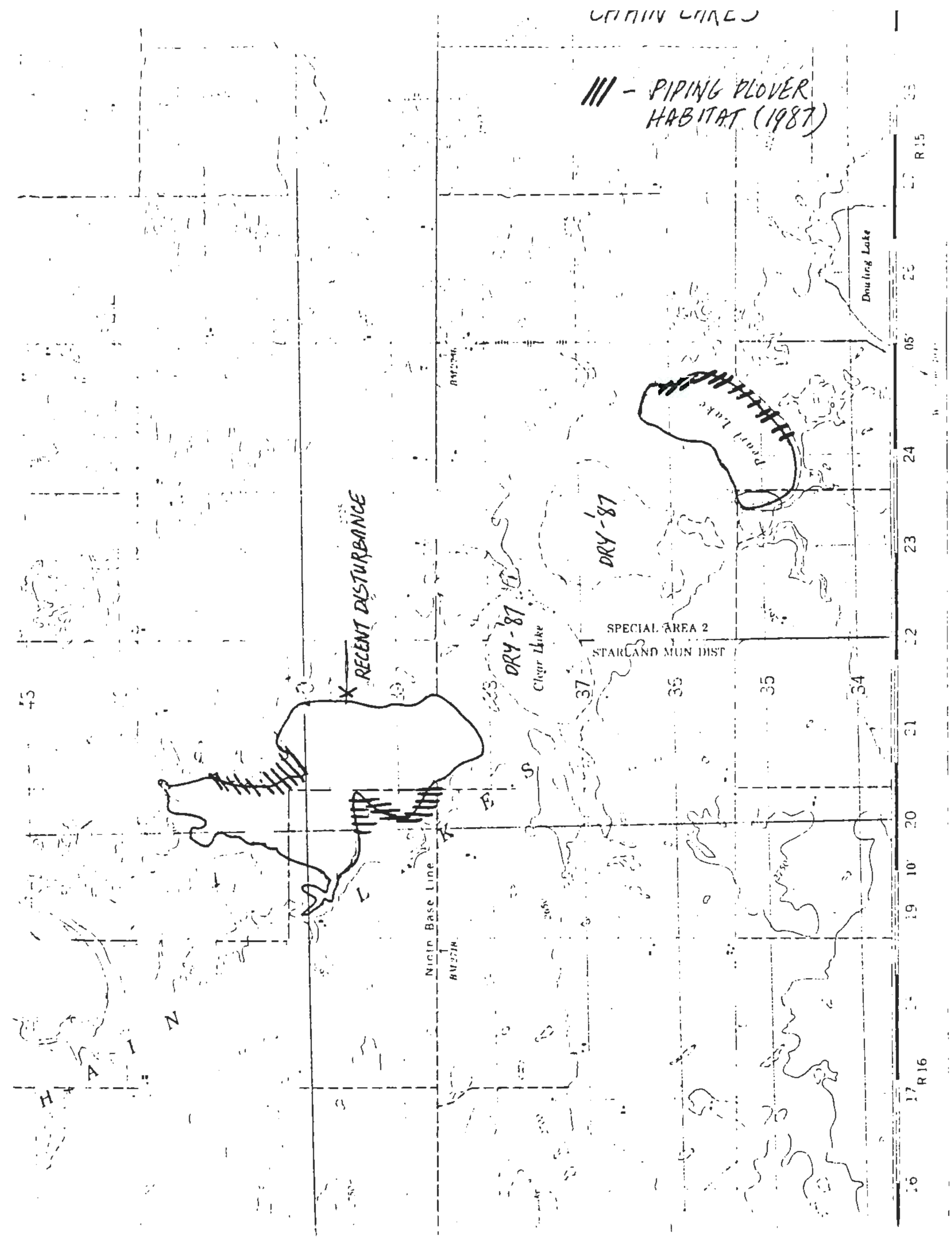
Traditional nesting habitats continue to support the only significant populations of Piping Plovers in Alberta. Several of these areas may be threatened by ongoing incompatible uses, by habitat alteration and by fluctuations in lake levels. These findings, combined with the notable lack of discoveries of major new Piping Plover breeding habitats in 1987, clearly point out the importance of the few key Piping Plover breeding habitats outlined in the 1987 status report for Alberta (Wershler and Wallis 1987). Management and protection of those habitats should be incorporated into recovery and management plans being developed for Piping Plovers.

There is an ongoing problem of low water levels and dry lakes in the Dowling-Chain Lakes area. A hydrologist should be consulted to determine if these lakes and associated springs are drying out solely because of natural factors or if water withdrawals in the basin are having an effect.


SUNKEN LAKE
/// - PIPING PLOVER HABITAT (198
Metiskow
Cemetery
Pumping Station
Sunken
Lake
WM

CHAPPICE LAKE

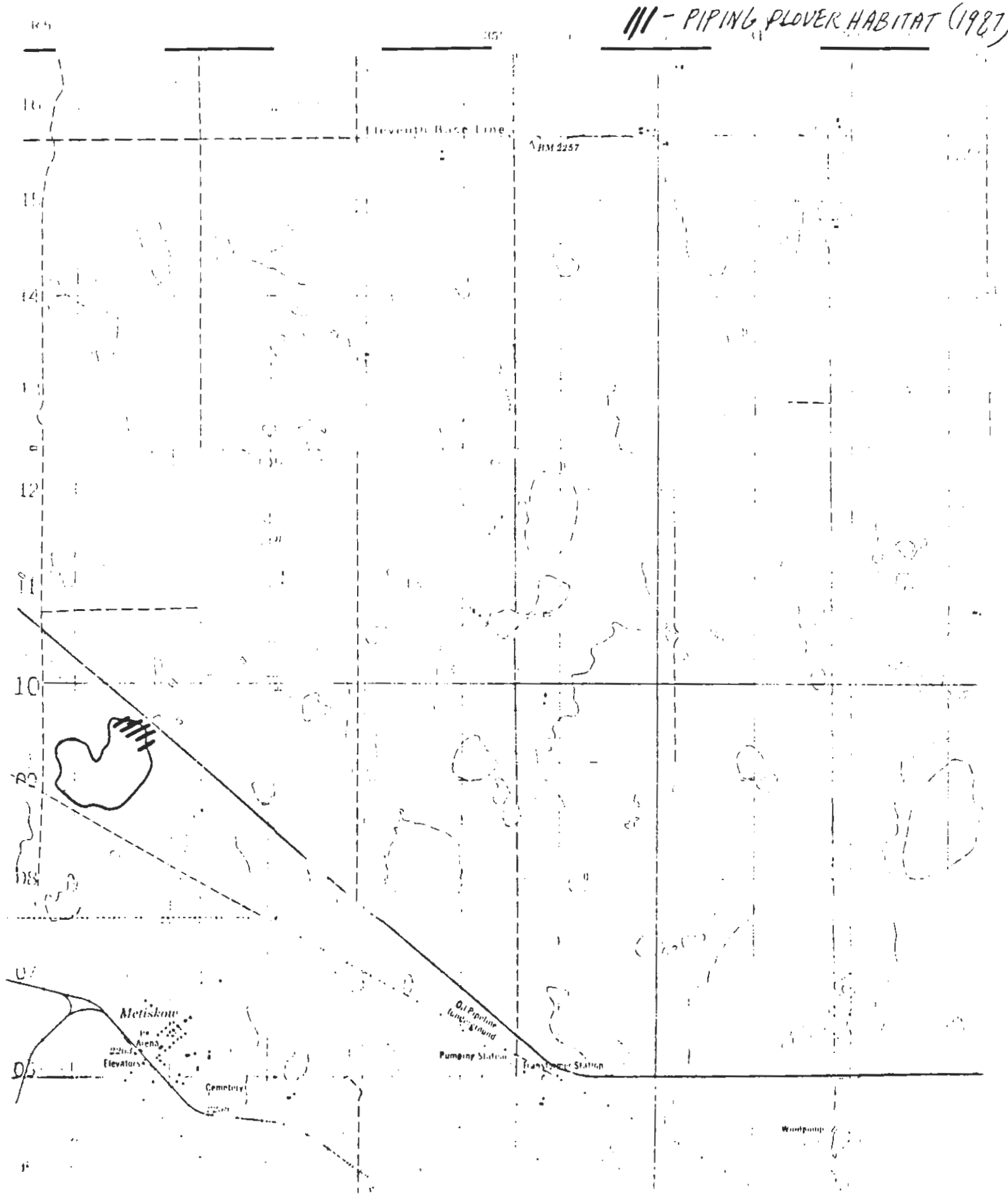



/// - PIPING PLOVER HABITAT (1987)
RECENT DISTURBANCE
DRY - '87
DRY - '87
Pearl Lake
Clear Lake
Dowling Lake
SPECIAL AREA 2
STARLAND MUN DIST
North Base Line
R 15
R 16
H A I N L K E S

UNNAMED LAKE NORTH OF METISKOW

EDITION 2

/// - PIPING PLOVER HABITAT (1987)



MONITORING OF PIPING PLOVERS, HABITAT, AND LAND USE AT LITTLE FISH LAKE, ALBERTA

Prepared by: C. R. Wershler
Sweetgrass Consultants Ltd.
Calgary, AB

For: Alberta Recreation and Parks
World Wildlife Fund Canada
Alberta Fish and Wildlife
Canadian Wildlife Service

February 1988

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1.0 INTRODUCTION

The Piping Plover, a "threatened" Alberta species and "endangered" Canadian species, has been known to nest along the northwest portion of Little Fish Lake since 1974. Studies from 1981 to 1986 indicated that cattle use of Piping Plover nesting beach was negatively affecting Piping Plover reproduction (Wershler and Wallis 1987). Based on recommendations contained in that report, a project was conducted in 1987 on the shore in the northwest portion of Little Fish Lake to undertake the following:

1. survey breeding Piping Plovers and delineate habitat to be protected from cattle activity

2. meet with leaseholders and representatives of the Alberta Ecological Reserves Program, Alberta Fish and Wildlife Division, and Canadian Wildlife Service to define current management and management problems in the area

3. make recommendations for fencing and grazing which would allow for the protection of Piping Plover breeding habitat

The study area included old and recent shore along the northwestern portion of Little Fish Lake, within the proposed "Handhills Ecological Reserve" (Sections 12 and 13, Township 28, Range 17, W4M) and adjacent shore in Sections 6, 7 and 18, Township 28, Range 16, W4M -- see Map 1.

2.0 METHODS

Regular visits were made to the study area throughout the breeding season and notes were made on numbers, locations and breeding activities of Piping Plovers, condition and trend of Piping Plover habitats, and the effects of cattle activity on Piping Plover habitats. Researchers attempted to keep their disturbance to nesting Piping Plovers to a minimum.

On August 28, the site was visited with Ron Bjorge (Head, Wildlife Management - Alberta Fish and Wildlife Division, Red Deer Region) to provide orientation to the study area and to discuss the various options for the management of cattle and the conservation of Piping Plovers in the study area.

An analysis of aerial photography, covering a period from 1950 to 1986, was conducted in order to establish maximum and minimum water levels. In turn, this was used to construct a model of the range of potential Piping Plover breeding habitat with respect to fluctuating water levels.

3.0 PIPING PLOVER ECOLOGY AT LITTLE FISH LAKE

Piping Plovers arrive at Little Fish Lake from late April to early May. The nesting season (from egg-laying to the fledging of young) extends from mid-May to early August. Nesting habitat is gravelly beach with little or no vegetation. Nests are located in dry backshore areas, away from the flooded or periodically flooded active shore, often on peninsulas or small islands. Typical feeding shore is the narrow "muddy" band along the edge of the water; some feeding also takes place on the backshore (Wershler and Wallis 1987).

From a combination of aerial photograph analysis and field surveys, it has been determined that the extent of potential Piping Plover habitat at Little Fish Lake varies from very small localized areas during near maximum water levels, such as in 1974, to very extensive areas during the lowest recorded water levels, such as in 1986 and 1987. In all years surveyed, the most extensive and productive habitat on the lake has been within the study area.

In years of high water levels, potential nesting habitat has been restricted to the extreme northwest corner of the lake (Habitat B-1) within the proposed ecological reserve, and possibly the peninsula of land on the north shore (Habitat A-1) just east of the proposed ecological reserve.

In years of low water levels, habitat has been most extensive along the west shore (Habitats C-1 and B-2) within the proposed ecological reserve and on the peninsula on the north shore (Habitat A-2) just east of the proposed ecolgical reserve. During the lowest recorded water levels, in 1987, newly created habitat was forming on the west shore just southeast of the ecological reserve (Habitat C-2). Documented and potential Piping Plover habitats are plotted on Map 1.

During periods of shoreline instability, when water levels are either rising or falling, areas of nesting habitat may last for only one or two years. During a period of years when water levels continue to fall, new habitats are created yearly. Because Little Fish Lake is only slightly saline, vegetation invades bare areas on the beach at a more rapid rate compared to most other Piping Plover habitats in Alberta where higher salinity tends to limit the growth of vegetation. Therefore, as water levels continue to drop, active Piping Plover nesting and feeding habitats shift further and further into the lake basin.

4.0 POPULATION DYNAMICS

Populations of Piping Plovers at Little Fish Lake fluctuate with respect to fluctuations in available habitat. During high-water periods when very little breeding habitat is available, as few as one or two pairs of Piping Plover occur in the study area. During low-water periods when more habitat is available, as many as 18 adults have been recorded.

The shore of the northwest portion of Little Fish Lake has been at least partially surveyed for Piping Plovers during five years since 1974:

1. in 1974, during a high-water period, there were two adults within the proposed ecological reserve (Habitat B-1);

2. in 1981, during a low-water period, there were 8 adults within the proposed ecological reserve (Habitat C-1);

3. in 1982 there were no Piping Plovers in Habitat C-1, following the release of cattle into this area;

4. in 1986 there were a maximum of 18 adults, including 8 within the proposed ecological reserve (Habitats B-2 and C-1) and 10 on the peninsula just east of the ecological reserve (Habitat A-2);

5. in 1987 there were from 9 to 12 within the proposed ecological reserve (Habitats B-2 and C-1) and an additional 1 to 5 outside of the proposed ecological reserve (Habitats A-2 and C-2).

5.0 LAND USE

Since June 1981, large numbers of cattle have been allowed access to the entire stretch of beach within the proposed ecological reserve. The grassy upland area bordering the study area is leased out to several lessees for cattle grazing. Lessees have added sections of fence onto the former lake bottom as the lake levels have receded. This has been done on an informal basis; additions to the fence lines often do not follow the proper alignment of the legal sections and, because the fencing has lagged behind the creation of new shore, the cattle from one leaseholder (T. Vogstad & P. McKnight - Section 12) have in at least one instance wandered onto the land of another leaseholder (R. & W. Hoff - Section 13).

The following is a summary of land use within the study area during 1987:

Land Within Proposed Ecological Reserve

Section 12 (Leaseholder - T. E. Vogstad; Robert & Patricia McKnight)

- in 1987, cattle were given access to this section by May 22
- very heavily used by cattle -- at least 125 cattle were counted in this area on June 18
- entire shore very heavily trampled
- free movement between two pastures in this section
- throughout the breeding season, a few cattle from this section would wander north into Hoff's lease in Section 13, however, by early September these two sections were totally fenced off from one another

Section 13 (Leaseholder - Randolph & Wayne Hoff)

- according to lessee Wayne Hoff, cattle are not released into this area until late summer but, due to falling water levels in 1987, cattle from Section 12 were able to enter this pasture by going around the fence through very shallow water
- habitat showed signs of concentrated use by cattle, but not as heavily trampled as Section 12

Land Outside of Proposed Ecological Reserve

Section 18 and NW Section 7 (Leaseholder - Agnes Gammie)

- considerable cattle activity noted in Section 18 by June 18, but relatively small numbers tended to walk out onto the peninsula in Section 7
- Section 18 heavily trampled but Section 7 less trampled than Section 13

SW Section 7 (Leaseholder - Douglass Ranches Ltd.)

- relatively undisturbed, with no cattle seen in 1987

6.0 IMPACT OF CATTLE ACTIVITY

Cattle activity has resulted in the severe trampling of the active shoreline and backshore habitats, including areas used by Piping Plovers for nesting and feeding. The hard-packed, level, gravel "pavement" which characterized the west shore (Habitat C-1) prior to the introduction of cattle in 1981, has been transformed into an uneven, stirred-up shore with loose sand, dislodged gravels, and deep hoof prints.

Habitat C-1, in 1982, harbored no Piping Plovers compared to 7 or 8 adults in 1981; in 1986 only one brood of young were seen and it is not known if they survived to the fledged stage; in 1987 there was no evidence of nesting.

In Habitat B-2, a single nesting attempt in 1986 failed -- eggs were laid prior to the introduction of cattle into the habitat and nest failure coincided with recent trampling of the habitat by cattle. In 1987, recently created habitat was frequented by at least 8 adults with at least 2 nests in the early part of the breeding season, but was heavily trampled by cattle by the end of the breeding season. It is not known if any young were fledged from this habitat.

In 1986 and 1987, Habitat A-2 -- the peninsula just east of the proposed ecological reserve -- received only occasional, light use by cattle. The low level of disturbance in this habitat apparently accounts for a higher nesting success: in 1986, two young of different ages were seen, and in 1987, 6 to 8 fledged young were seen at the tip the peninsula and just west, in Habitat B-2.

The trampling of eggs and nestlings of Piping Plover by livestock has been well documented (Haig 1985; McNicholl 1985). In the study area, other impacts associated with cattle activity include the disturbance of feeding areas in mud and shallow water through trampling, defecation and urination, and the physical disruption of gravels and sands in backshore nesting habitats. Concentrated cattle disturbance has resulted in nest trampling and several years of such activity has made formerly productive nesting beach unsuitable for breeding Piping Plovers. Other factors, such as predation, could potentially cause some nest failure in the study area; however, it is evident from observations that use of beach habitats by cattle poses a major threat to the maintenance of suitable Piping Plover breeding habitat in the study area.

Four other species of shorebirds -- American Avocet, Marbled Godwit, Willet and Upland Sandpiper -- were regular breeders within the study area prior to the introduction of cattle, in 1981. The American Avocet nested in habitat similar to that used by the Piping Plover but with slightly more vegetation. The remaining three species nested in grassy backshore areas. All four species have declined in numbers since 1981, and in 1987 there was no evidence of successful nesting by any of these species, and all four avoided areas which had been heavily trampled or grazed by cattle.

7.0 CONDITION AND TREND OF NESTING HABITATS

Habitats A-1 and A-2

Location: peninsula on north shore

Legal Description: NW 1/4 Section 7

- not frequented and trampled by cattle as much as areas within proposed ecological reserve, but some cattle do get into this area throughout the nesting season

Habitats B-1 and B-2

Location: northwest corner of lake

Legal Description: SE 1/4 Section 13 and NE 1/4 Section 1

- SE 1/4 Section 13 heavily trampled by cattle during later stages of breeding season
- NE 1/4 Section 12 heavily trampled throughout breeding season

Habitat C-1

Location: west shore, northwest of fence extension between Sections 12 and 7

Legal Description: E 1/2 Section 12; SW 1/4 Section 7

- very heavily trampled by cattle
- most severely disturbed area due to high numbers of cattle on the shore throughout the nesting season

Habitat C-2

Location: west shore, southeast of fence extension between Sections 12 and 7)

Legal Description: SW 1/4 Section 7

- as this habitat became exposed due to falling water levels in 1987, Piping Plovers began to frequent the area; if water levels remain the same or drop during 1988, nesting could occur here

- relatively undisturbed; no cattle seen here in 1987

8.0 MANAGEMENT CONSIDERATIONS

The protection of a viable breeding population of Piping Plovers within the study area requires the restriction of cattle from potential Piping Plover breeding habitat, including the range of habitats which have existed with respect to maximum and minimum lake levels. This could be accomplished through the following management options:

Option A:

Fence out Piping Plover habitats (A, B and C) following the alignment of the bank of the oldest shoreline and along cattle access areas (Map 2). This would give cattle watering access to the lake only in those areas which are not likely to be used by Piping Plovers.

Three access areas are shown in Map 2, one for each of the three lessees whose cattle have access to the lakeshore at the present time. It is also recommended that Habitat C-2 (Section 7), which contains potential Piping Plover breeding habitat during very low water levels, be kept free of cattle -- if the lessee should want to release cattle into this area in the future, it is recommended that lakeshore access be in Section 6.

The proposed access points to the lake will concentrate cattle activity to much smaller areas than is presently allowed. To avoid severe damage to the lake shore in these areas it is recommended that the number of head of cattle grazing the respective leases be lowered and that cattle be allowed access only when necessary.

Providing a system of fencing to accommodate rising and falling water levels would present a challenge, as higher water levels would tend to wash out portions of the fence which lie furthest into the lake basin. These would have to be rebuilt with the return of lower water levels. Also, the additional fencing required to protect Piping Plover habitat would further compromise the landscape qualities within the ecological reserve.

Option B:

Elimination of cattle grazing from grasslands on the west side of Little Fish Lake (Section 12 and SE 1/4 Section 13).

This would greatly reduce the total amount of fencing required to protect Piping Plover habitat and would eliminate some of the fencing which currently exists in the area. It would also allow the return, in Section 12, of a diverse fescue grassland characterized by extensive flower blooms. This was the typical vegetation in this area during the early 1970's before it was grazed (Cottonwood Consultants 1986).

It should be noted that the management of Piping Plovers at Little Fish Lake cannot be carried out without considering other aspects of resource

management within the ecological reserve. A future grazing plan will determine the grazing areas, stocking rates, grazing leases, and fencing. At the same time, an assessment should be made of the available watering sites for cattle and whether or not cattle even require access to Little Fish Lake. A Ducks Unlimited project exists along the intermittent stream channel just west of the northwest corner of the lake, and several dugouts have been built north and west of the lake within the last few years.

Consolidation of existing leases within the study area under one leaseholder would simplilfy the management of the study area.

Following the restriction of cattle access, Piping Plover habitats should be monitored to assess the rate of recovery.

9.0 LITERATURE CITED

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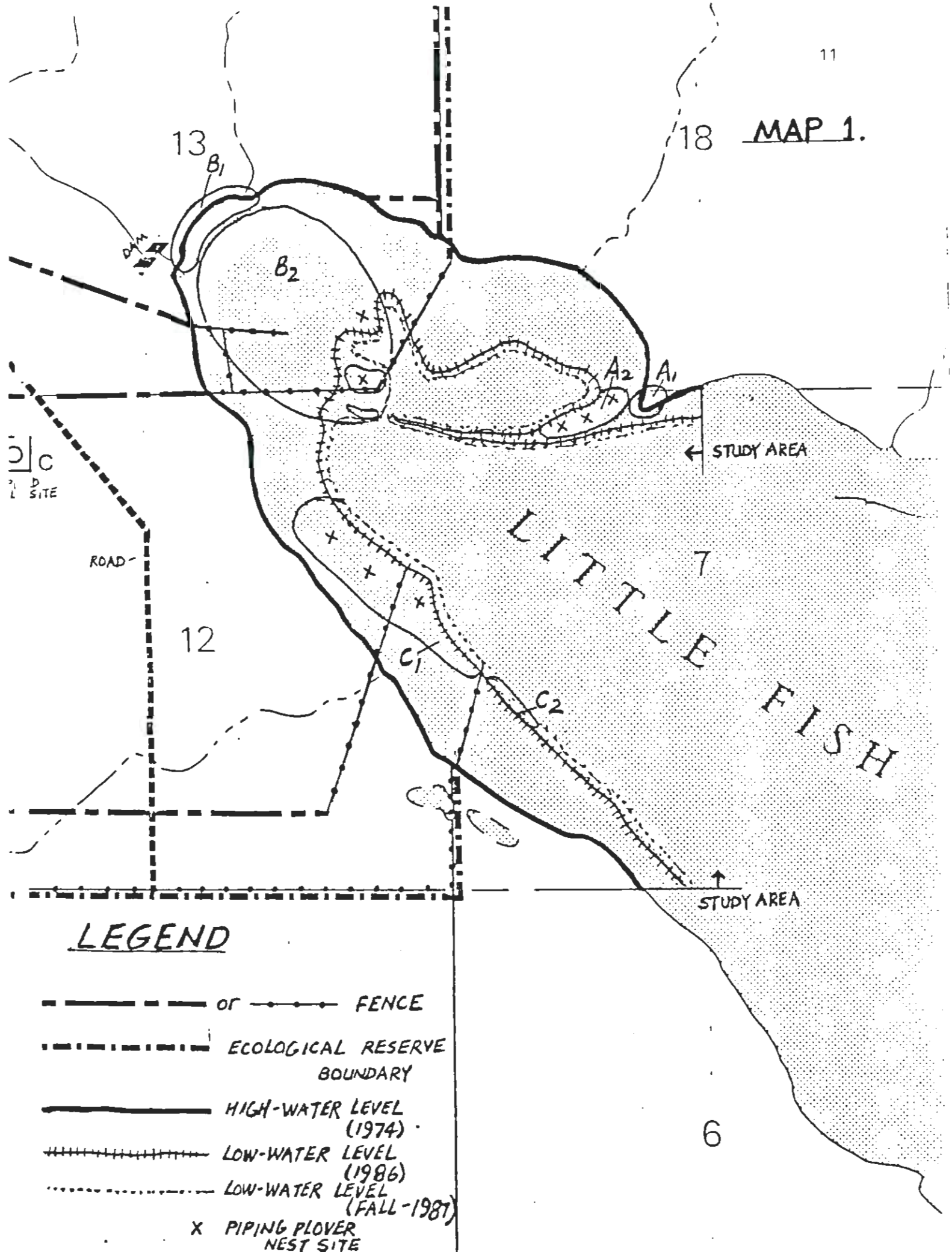
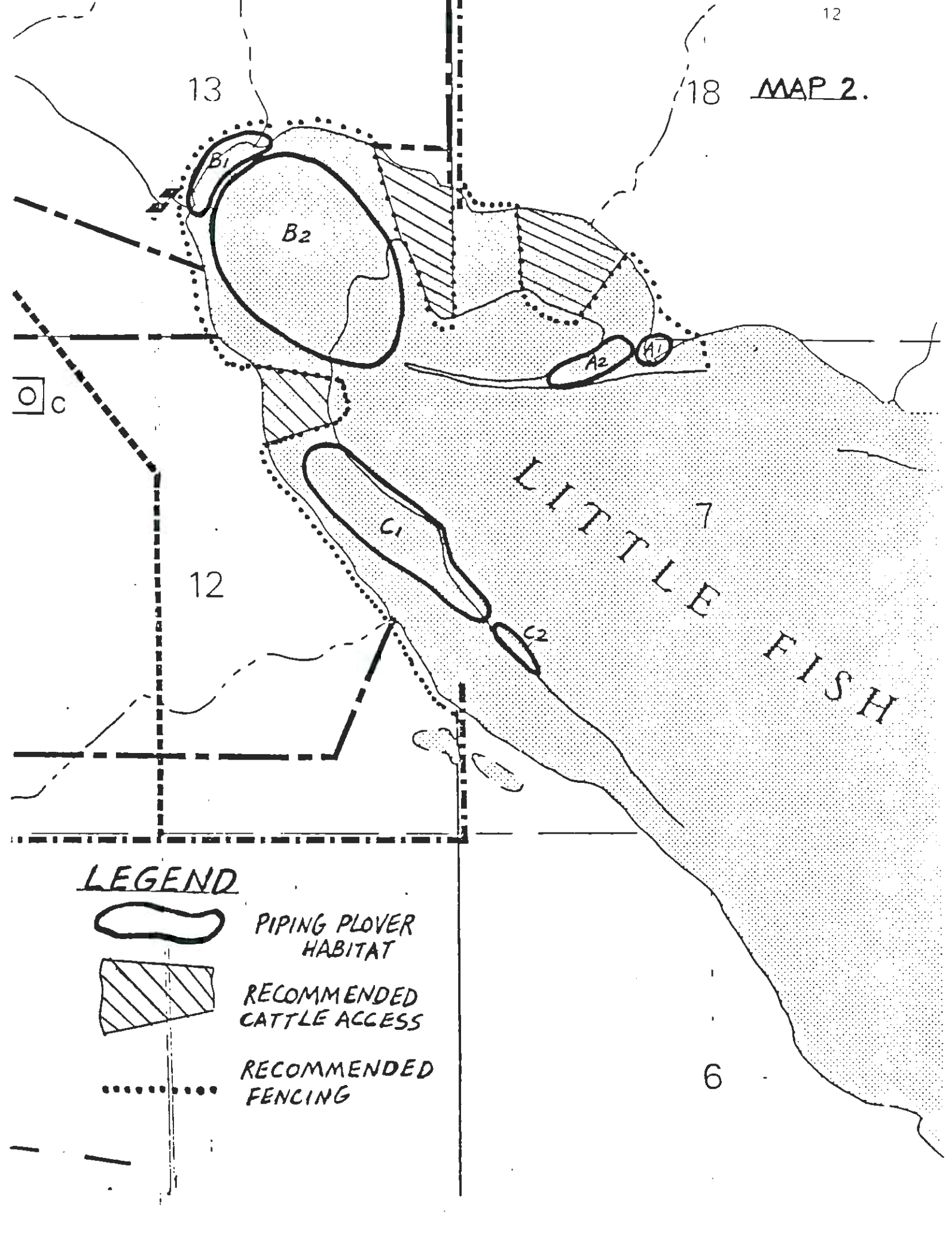
Wershler, C. R. and C. A. Wallis. 1987. Status of the Piping Plover in Alberta - 1986. Prepared by Sweetgrass Consultants Ltd. for World Wildlife Canada, Canadian Wildlife Service and Alberta Fish and Wildlife.

MAP 1.


13
18
B_1
B_2
DAM
A_2
A_1
STUDY AREA
C
SITE
ROAD
12
LITTLE FISH
7
C_1
C_2
STUDY AREA
6
LEGEND
FENCE
ECOLOGICAL RESERVE BOUNDARY
HIGH-WATER LEVEL (1974)
LOW-WATER LEVEL (1986)
LOW-WATER LEVEL (FALL-1987)
X PIPING PLOVER NEST SITE


12
13
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MAP 2.
B1
B2
A2
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LITTLE FISH
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LEGEND
PIPING PLOVER HABITAT
RECOMMENDED CATTLE ACCESS
RECOMMENDED FENCING

MONITORING OF PIPING PLOVERS, HABITAT, AND LAND USE AT REFLEX LAKE, ALBERTA

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For: World Wildlife Fund Canada
Alberta Fish and Wildlife
Canadian Wildlife Service

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1.0 INTRODUCTION

The Piping Plover is an "endangered" Canadian species and a "threatened" Alberta species. Reflex Lake contains one of the largest and most stable breeding populations of Piping Plovers in Alberta. The extensive gravel backshore at the site constitutes some of the best breeding habitat for that species in Alberta, and the lake is relatively deep and permanent compared to many other sites (Wershler and Wallis 1987).

Wershler and Wallis (1987) listed several activities which may threaten the breeding success of Piping Plovers at this site: off-road motorized travel in the vicinity of nesting and feeding areas, humans visiting nesting areas, trampling of nesting and feeding areas by cattle, and possible expansion of cottage-recreational beach developments into existing nesting areas. Based on recommendations in the 1986 study, a project was initiated in 1987 to:

1. determine access points to the site used by recreationists as well as the timing and extent of recreational use, and how these relate to location and timing of Piping Plover nesting and brood-rearing activities.

2. determine fencing requirements for restricting cattle access to nesting habitats.

3. draft a management plan which would minimize conflicts between recreational use and the conservation of the site for Piping Plovers. This could include determination of new fencing for the area, restricted access during key periods in the breeding cycle, and signage.

4. finalize and implement this management plan based on meetings with landowners, local conservationists, and Alberta Fish and Wildlife personnel.

The original study area (Map 1) was the west shore of Reflex Lake including Section 1, Township 42, Range 1, W4M and Sections 1 and 2, Township 43, Range 1, W4M, as well as a small pond adjacent to the west shore in Section 35, Township 43, Range 3. Upon finding new disturbances on the south shore in 1987, the study area was expanded to include Section 36, Township 42, Range 1, W4M.

2.0 METHODS

Regular visits were made to the study area throughout the breeding season and notes were kept on numbers, locations and breeding activities of Piping Plovers, condition and trend of Piping Plover habitats, and land use practices affecting Piping Plover habitats and breeding activities. Researchers attempted to keep their disturbance to nesting Piping Plovers to a minimum.

On September 14, the study area was visited with Blair Rippin (Head, Wildlife Management - Alberta Fish and Wildlife Division, St. Paul Region) to provide orientation to the study area and to discuss the various management strategies for the short and long-term protection of Piping Plover breeding habitat in the study area.

An analysis was made of aerial photographic coverage for the site to gain insight into the extent of fluctuations in water level and their significance on the availability and quality of Piping Plover breeding habitat.

3.0 HABITATS AND LAND USE

From an analysis of aerial photography from 1949 to 1982, water levels at Reflex Lake fluctuated from a high in 1975 to a low in 1982. No aerial photography was available for the period 1983 to 1987, but it is evident from field studies conducted by the researchers during that period that water levels have dropped further. During high-water periods, such as in 1975, the width of unvegetated shore is reduced and there is more discharge from the numerous springs and seepages around the lake. However, during high-water periods, unvegetated shore including the major Piping Plover habitats is still extensive.

The following is a summary of Piping Plover habitats (Map 1), including 1987 information on Piping Plover breeding populations, habitat condition and trend, disturbances, as well as general notes on land ownership and significant wildlife and plants.

A. West shore from large point of land north to section fence (Section 35, Township 42, Range 1, W4M)

Piping Plover Habitat

- very extensive, high quality nesting habitat

Piping Plover Populations

- highest density at Reflex Lake -- maximum of 17+ adults in 1987 and 22+ in 1986
- in both years there appeared to be a large incidence of nest failure for first clutches

Other Significant Wildlife

- during May, the active shore and seasonally wet areas on the sandy backshore are frequented by mixed flocks of migrating shorebirds including the White-rumped Sandpiper, a species which is uncommon and local in Alberta

- large flocks of Sanderling rest on the large point of land; Reflex Lake is a provincially important staging area for this species (Wershler 1987)

Disturbances

- in 1986 and 1987, there were signs that at least one person, not associated with government-sponsored studies, had visited and marked nests at this site; at least some of these nests are known to have failed
- more cattle visited this habitat in 1987 than in 1986; trampling was not severe but habitat on the point is quite confined and contains a high density of nesting Piping Plovers and so is vulnerable to trampling by even a few cattle

- a few sets of vehicle tracks were noted running close to nest sites during both 1986 and 1987
- at least 2 sets of bird watchers visited this area during the 1987 nesting season

Land Ownership

- private: A. C. Schopher Farming Ltd.

B. West Shore north of section fence (south 1/2 Section 2, Township 43, Range 1, W4M)

Piping Plover Habitat

- isolated patches of nesting habitat
- extensive sandy beach may be important for non-breeding adults -- 17 were recorded June 23, 1987, between the two fences

Piping Plover Populations

- one pair of breeding adults in this area during both 1986 and 1987

Other Significant Wildlife

- during May, mixed flocks of migrating shorebirds, including the uncommon and local White-rumped Sandpiper and large flocks of Sanderling (as many as 3,000) feed along the active shore and in seasonally wet areas on the sandy backshore

Disturbances

- human tracks and nest marker noted at nest site in 1987
- vehicle tire tracks near nesting habitat in 1987 -- vehicle had become stuck in the soft shore materials and had left very deep tracks
- one set of cow tracks in 1987; the animal had walked around the section fence on the water side

Land Ownership

- private: A. C. Schopher Farming Ltd.

C. North Shore (south 1/2 Section 1, Township 43, Range 1, W4M)

Piping Plover Habitat

- isolated patches of pebbly shore in northwest corner adjacent to very extensive sandy beach

Piping Plover Populations

- maximum of 2 pairs in 1986; 1 pair in 1987

Other Significant Wildlife

- active shore used by large flocks of Sanderling (as many as 3,000) during late May

Disturbances

- high density of off-road vehicle activity; more prevalent in 1986 than 1987
- timing of this motorized recreation is mostly during the latter part of the nesting season; recreationists include teenagers from Chauvin
- vehicles apparently enter the area via the gate on the north side of Section 35, Township 42, Range 1, W4M

Land Ownership

- private: A. C. Schopher Farming Ltd.

D. Pond just west of West Shore (east 1/2 Section 35, Township 42, Range 1, W4M)

Piping Plover Habitat

- patchy nesting habitat on small island in southeast, on point of land on west shore, and on northwest shore
- water levels dropped during the course of breeding season in 1986 and 1987, joining the island to the main shore

Piping Plover Populations

- maximum of 8 adults in 1986 and 4 adults in 1987

Disturbances

- site heavily disturbed by cattle trampling in 1986 and 1987, but more severely impacted in 1987; it appeared as if higher numbers of cattle were frequenting the pond and the lake during 1987; cattle travel across the south end of the pond to the southwest shore of the lake
- nest site on small island trampled in 1987
- no young have ever been seen at the pond
- an informal vehicle track runs to the southwest side of the pond from the secondary road; there seemed to be more use of this track in 1987 than in 1986

Land Ownership

- private: either O. Hawthorn or A. C. Schopher Farming Ltd. (unclear from municipal district ownership map)

E. Springs area in Southwest Corner of Lake (northeast 1/4 Section 35 and west 1/2 Section 36, Township 42, Range 1, W4M)

Piping Plover Habitat

- feeding habitat for adult and immature Piping Plovers; apparently most frequently used during latter half of breeding season

Other Significant Wildlife and Flora

- one of the most productive feeding habitats on the entire lake for migratory and resident species of shorebirds, especially important for Marbled Godwits which nest in the general area
- three provincially rare plants (Scirpus nevadensis, Muhlenbergia asperifolia, and Aster pauciflorus) grow in the springs area (Wershler 1987)

Disturbances

- damage from cattle trampling has been relatively light to date, but in 1987 there appeared to be an increase in the numbers of cattle using the area; if this trend continues then damage will be more severe in the future

Land Ownership

- private: O. Hawthorn

F. South Shore (southeast 1/4 Section 36, Township 42, Range 1, W4M)

Piping Plover Habitat

- patchy nesting habitat in vicinity of point of land next to Saskatchewan border

Piping Plover Populations

- maximum of 10+ adults in 1987 and 6 adults in 1986

Other Significant Wildlife

- large numbers of Sanderlings (as many as 3,000) rest and roost on the point just west of the Saskatchewan border

Disturbances

- an informal trail along the woody backshore leads from the cottage development to just south of this area; in recent years, the cottage development has expanded slowly to the east toward this habitat
- in the spring of 1987, fresh motor vehicle tracks followed the open backshore from near the cottages to the border fence, actually cutting through a patch of gravel where Piping Plovers had nested in previous years

- there was no sign of cattle activity in this area in 1986 or 1987; however, just across the border fence in Saskatchewan, potentially similar habitat has been disturbed to the extent that Piping Plovers no longer nest

Land Ownership

- Crown

4.0 RECOMMENDATIONS

1. Ideally, off-road motorized vehicular travel should be prohibited from the vicinity of all habitats which harbour nesting Piping Plovers, because of possible disturbance to incubating and brooding adults, destruction of nesting habitat, and damage to eggs and chicks. Even though the density of breeding Piping Plovers is low on the north and northwest shores, the use of these areas by large flocks of Sanderlings, at least during the spring migration period, adds to the importance of these beach habitats.

   Fencing would be necessary to close off access to the west shore (Map 1) and any access points which may exist from the Saskatchewan side of the north shore. Fencing would also be required to block existing trail access to the west side of the pond west of the lake (Habitat D) and to the south shore east of the cottage development (Habitat F).

2. If possible, cattle use in the vicinity of the west pond, large point on the west shore, and springs area on the southwest shore should be discontinued. The south portion of the pond (Habitat D) and a portion of the springs (Habitat E) is disturbed by trampling, and in 1987 more cattle walked on the large point (Habitat A) than previously recorded. It is not known if water access in this area is necessary for the cattle, or whether cattle are attracted to green forage in the springs area. The lake and pond water is quite saline, but it is possible that cattle are able to drink from the springs.

   In order to keep cattle out of these areas, new fencing would be required along the west and south sides of the pond and along the southwest shore of the lake.

3. If human visitation continues to be a problem, signage should be considered for the south shore (Habitat F) and west shore (Habitat A) prohibiting human entrance during critical times in the nesting season. Piping Plovers return in the spring during late April or early May, nest from mid-May to early July, and fledge young from mid-July to early August. The most critical period to avoid human disturbance is during incubation and downy chick stages. Local conservationists should be approached to act as custodians of the Piping Plover habitat.

4. The recreational beach area, presently confined to a point of land on the southwest shore, should not be expanded. The cottage development, in the backshore to the west and south of the recreational beach, should be confined to the existing disturbed area (Map 1).

5. Meetings should be arranged with landowners, Fish and Wildlife personnel, and Piping Plover researchers to discuss the significance of the site and the various management options, and to arrive at a common strategy for management and conservation of Piping Plovers.

6. As one of the key breeding sites for Piping Plover in Alberta and a key staging area for Sanderling in the province, the natural habitats on the shores of Reflex Lake should be protected through landowner agreements or land purchase and protected area status. Provincially rare plant species, regionally unique hydrogeological features, and an attractive landscape setting all add to the natural significance of this site.

5.0 LITERATURE CITED

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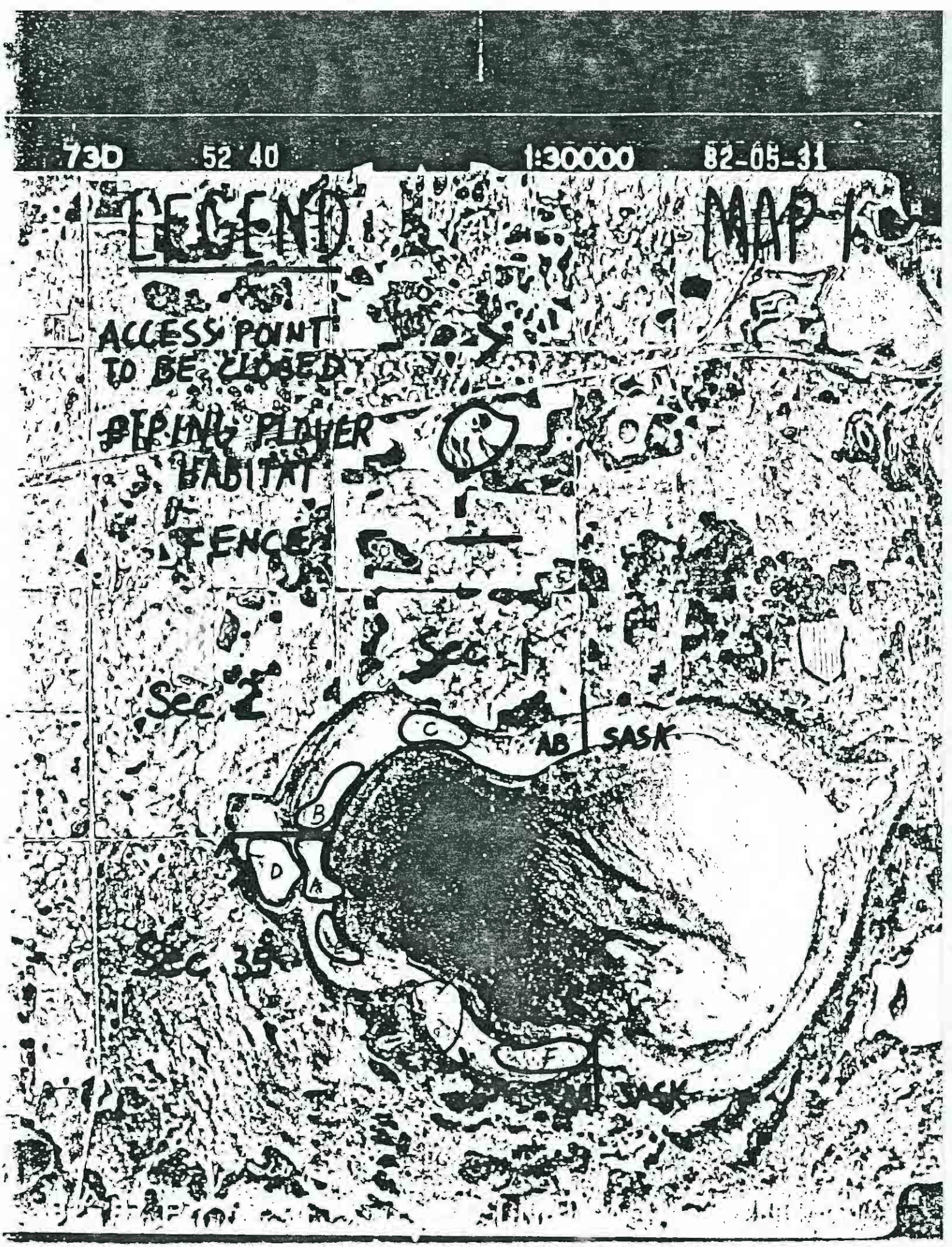
Wershler, C. R. and C. A. Wallis. 1987. Status of the Piping Plover in Alberta - 1986. Prepared by Sweetgrass Consultants Ltd. for World Wildlife Fund Canada, Canadian Wildlife Service, and Alberta Fish and Wildlife.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LEGEND
MAP
ACCESS POINT TO BE CLOSED
PIPING PLOVER HABITAT
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F

A STRATIFIED RANDOM SURVEY FOR BURROWING OWLS ON THE WEYBURN (62E) AND REGINA (72I) MAP AREAS

BY

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INTRODUCTION

The Burrowing Owl has been designated as a threatened species by the Committee On The Status of Endangered Wildlife In Canada (COSEWIC). The Burrowing Owl has disappeared as a breeding species in British Columbia (Munro, Lincoln and Ritcey 1984) and declined to 35 pair in Manitoba (Ratcliff 1986). Although Alberta and Saskatchewan are the heart of the Burrowing Owl's range in Canada, field surveys to determine population status in Saskatchewan have been confined to the Saskatoon region. (Haug 1985 and Wedgewood 1976).

One problem when doing population surveys for a scarce bird is that large areas are not occupied by the species. Searching these vacant areas demands large amounts of time and result in finding very few individuals. One approach to this problem is to identify preferred areas and concentrate survey efforts there. This technique may under estimate the total population, but it offers substantial labour savings and was selected for this study.

The objectives of the study were to (1) provide a statistically valid estimate of size of the Burrowing Owl population in southeastern Saskatchewan and to estimate rates of occupancy of suitable habitat; (2) to study habitat preferences of Burrowing Owls; (3) to test a stratified random sample technique on a rare species, and (4) to gather other information relevant to management of the Burrowing Owl.

STUDY AREA

This survey was confined to the Weyburn (62E) and Regina (72I) 1:250,000 map areas of the National Topographic Survey. The survey block thus consisted of 2 rectangles touching each other at one corner. Each map area was treated as a separate block.

The Weyburn map area is bounded by the 49 and 50 N. latitude and 102 and 104 W. longitude. Major geographic features are the cities of Weyburn and Estevan, the Souris River Valley and the Missouri Couteau. Most of the land lies within the Moose Mountain Upland and the Souris River Plain. The latter region includes extensive areas of solonetzic soils which appeared attractive to Burrowing Owls.

The Regina map area is bounded by 50 and 51 N latitude and 104 and 106 W. longitude. Important geographic features include the cities of Regina,and Moose Jaw, the Qu'Appelle River Valley, and the Missouri Couteau. Much of the map sheet is occupied by the Assiniboine River Plain. While it is extensively cultivated the lacustrine soils of this plain were attractive to Burrowing Owls in the few areas where grassland remained. Larger grassland areas are found in the Missouri Couteau and Old Wives Lake plain along the western side of this map area.

METHODS

The actual survey was confined to areas believed to be most attractive to Burrowing Owls. These were defined according to lands systems as mapped by Stelfox (1979) and Flory (1980) and presence of grassland.

Selection of land systems for the survey was based on Harris and Lamont (1985) who plotted all known Burrowing Owl locations and investigated nest densities on different land systems. This data indicated selection by Burrowing Owls for the alluvium, drainage, fluvial, fluvial-lacustrine, lacustrine and solonetzic land systems on the Regina Map Sheet and the solonetzic land system on the Weyburn Map sheet. These land systems were selected as primary habitat for the survey, all other areas were left out of the survey design.

Within the primary habitat all areas of grassland were identified from 1979 aerial photographs and marked on 1:50,000 topographic maps. Grassland areas were then assigned to one of the 4 survey strata according to plot size (Table 1). Plot numbers were assigned separately for each statra, and 10% of the plots in each strata on each of the 2 map areas were then randomly selected for field surveys.

Table 1. Definition of Strata

Strata #	Definition
1	Plot less than 5 acres (2ha).
2	Plot between 4 and 30 acres (2 and 12 ha).
3	Plots larger than 30 acres (12 ha). Large blocks of grassland were split into adjacent plots of approximately 40 acres (16 ha) each.
5	Linear plots 1 km (.625 miles) in length, usually along a road or railroad.

To test the assumption that all Burrowing Owls nested on grassland on the primary habitat additional Burrowing Owl observations were obtained from:

(a) A direct mailing to all farmers at Belle Plaine, Drinkwater, Kronau, Pense, Rouleau, Sedley and Wilcox (Appendix 1),
(2) incidental observations by observers working on the project, and
(3) other sightings reported in response to information in the press or other contact.

All observations were plotted on 1:50,000 maps to determine whether they fell within the selected habitats.

All study plots were surveyed between 8 May and 9 August 1986. The junior author surveyed approximately 70% of the areas with SPRR staff and SNHS volunteers doing the remaining areas. Seventy-five per cent of all plots were searched in the morning although surveys were accepted throughout the day provided the wind remained at or below 5 on the Beaufort Scale.

Plots were initially scanned with binoculars, then searched on foot. Type 5 plots along roads were normally surveyed from a slow moving car. The stratum 3 plots were covered by walking two transects 125 m in from either edge. The surveyor thus inspected an area approximately 100 m wide on either side of her path. Surveyors detoured to inspect burrow sites, ground squirrel or badger holes and areas which appeared to contain better habitat during the walking survey. These areas included open sites with few shrubs, hill tops and ridges. Active burrows were identified by seeing owls or by the presence of fresh tracks and pellets at mounds.

Locating actual plot boundaries was challenging where plots were located on large pastures. Surveyors used compass angles to known points and pacing to help locate the plot boundary. The junior author, who surveyed most of these areas, found 500 paces closely approximated the width of a 40 acre plot and used this measure in open pastures.

For each plot, the surveyor recorded the time, weather, number of owls and a series of habitat features. The land system and soil type for each plot were identified later from Land System Maps (Stelfox 1979 and Flory 1980) and soil survey maps (Mitchell, J., H.C. Moss and J.S. Clayton 1944 and Ellis et al 1965). The actual instructions to surveyors are included as Appendix 2.

Exceptions to normal survey procedure occurred when plots were cultivated or did not fit their size category. Cultivated plots were not surveyed for owls. Twelve plots did not fit the assigned strata. They were reallocated as follows: 2 from strata 1 to strata 2, 4 from strata 2 to strata 1, 1 from strata 3 to strata 1 and 5 from strata 3 to strata 2. These plots were then surveyed in the normal fashion.

Survey data from each plot was keypunched and analysed using the Statistical Analysis System. All actual observations of Burrowing Owls were forwarded to the Canadian Wildlife Service and added to their computerized list of nest sites of endangered species.

RESULTS

Habitat Loss

In total 9371 plots were identified and 911 surveyed on the 2 map areas (Table 2). Since the air photos were taken in 1979, 21% of all plots had been cultivated, a substantial loss of potential Burrowing Owl habitat in 7 years. The rate of loss was highest in the 5-30 acre plots (stratum 2) on the Weyburn Map Area and in both strata 1 and 2 (smaller than 30 acres) on the Regina Map Area. Only the roadside linear transects were relatively secure (Table 3).

Table 2: Numbers of plots identified and surveyed in each strata on the Regina and Weyburn Map Areas.

	Regina Map Area		Weyburn Map Area	
Strata	Total Plots	Plots Surveyed	Total Plots	Plots Surveyed
1	662	73	706	59
2	988	99	514	50
3	3842	367	1807	185
5	570	55	282	23
Total	6062	594	3309	317

Table 3: Number and percentage of survey plots cultivated between 1979 and 1986 on the Weyburn and Regina Map Areas.

Map Area	Strata	# Plots Surveyed	# Plots Cultivated	Percent Cultivated
Weyburn	1	59	10	16.9%
Weyburn	2	50	19	38.0%
Weyburn	3	185	37	20.0%
Weyburn	5	23	0	0.0%
Regina	1	73	22	30.1%
Regina	2	99	29	29.3%
Regina	3	367	72	19.6%
Regina	5	55	2	3.6%
Total		911	191	21.0%

Table 4: Estimated Burrowing Owl population on Weyburn and Regina Map Areas. The total number of plots has been reduced by the percentage shown to be cultivated.

Strata	Number of Uncultivated Plots	Number of Uncultivated Plots Surveyed	Mean # of Owls/ Plot	Standard Deviation	Variance	Population Estimate With 95% Confidence Limit (Pairs)
Weyburn						
1	587	45	0	0	0	0
2	319	31	.129	.562	.316	41
3	1445	147	.054	.256	.066	78
5	282	23	0	0	0	0
Total	2633	246				119 ± 82.5
Regina						
1	463	51	0	0	0	0
2	699	67	0	0	0	0
3	3089	285	.028	.324	.105	86.5
5	549	53	0	0	0	0
Total	4800	456				86.5 ± 107

Burrowing Owl Population

This survey confirmed that the Burrowing Owl is a rare resident of south-eastern Saskatchewan. Of 703 suitable plots surveyed (we examined 911 plots, 191 of which were cultivated and 17 of which were not suitable for other reasons such as being flooded) only 13 were occupied by Burrowing Owls. The number of pairs on each occupied plot varied from 1 to 5 with a mean of 2.7 pair. Only 1.8% of plots were occupied; 98.2% of all grasslands in the area we designated as primary habitat were not occupied by Burrowing Owls.

A population estimate and 95% confidence limits for each Map Area were calculated according to Stewart (1983). Owls were only found in strata 2 and 3 (Table 4). The population for the Weyburn Map Area is estimated to be 119 $\pm$ 82.5 pair, while the Regina Map Area is estimated to have 86.5 $\pm$ 107 pair of Burrowing Owls.

Reports from the public and incidental observations provide a check on the accuracy of the surveys. These checks did not reveal any owls which we missed on surveyed plots, suggesting that the field surveys were accurate. Burrowing Owls were reported from 28 plots which were not surveyed. This is within the predicted number, but the distribution of the sightings amongst strata indicates some error in the population estimate.

The survey found no Burrowing Owls on strata 1 or 5, or on stratum 2 in the Regina Map Area. However incidental reports of Burrowing Owls we received on 5 unsurveyed plots in stratum 1, 6 on stratum 2, and 1 on stratum 5, all on the Regina Map Area. This includes 41% of the 29 plots where owls were reported on the Regina Map Area, suggesting that the population estimate for the selected primary habitat could be as much as 40% too low.

A second possible source of error arises in the case of owls nesting on areas not selected as primary Burrowing Owl habitat. Burrowing Owls were reported from 29 sites excluded by our survey. Table 5 shows the most common reason was that grassland areas had been missed in interpretation of aerial photographs.

Table 5: Burrowing Owl Reports from sites included in the survey.

Reason Site Was Not In the Survey	Number of Sites Regina	Weyburn
Land system not designated as primary habitat	3	3
Land cultivated	2	0
Grassland not identified from air photos	13	2
Narrow road ditch not selected as a type 5 plot	6	0
Total	24	5

On the Regina Map Area, the owl observations at 24 sites not covered by this survey represented 45% of all reported Burrowing Owl sites. On the Weyburn Map Area 31% of the occupied sites were not covered by the survey. This suggests the relative magnitude of this source of error for the survey.

Combining these two sources of error suggests the population of Burrowing Owls could be double that estimated in Table 4. This would produce a total population of about 200 pair on each map area with large amounts of vacant habitat but does not alter the basic conclusion that the Burrowing Owl is a rare and threatened species in southeastern Saskatchewan. This conclusion was reinforced during the survey by repeated comments from farmers who where familiar with the Burrowing Owl but "hadn't seen them for a few years now".

Habitat Selection

The study was designed to compare habitat composition between occupied and unoccupied vacant sites. Unfortunately the number of occupied sites was far too small to allow statistical comparison. Actual data on habitat features is presented for surveyed plots in Tables 6 to 11. Data are combined for the Regina and Weyburn Map Areas and for all strata in these tables.

Table 6: Vegetation at surveyed plots on Weyburn and Regina Map Areas.

Vegetation Type	# of Plots Occupied by Burrowing Owls	# of Unoccupied Plots
Native Grass	3	70
Native Grass and Shrubs	4	215
Alfalfa and Brome Grass	0	120
Other Domestic Grass Mixtures	4	160
Mixed Native and Domestic Grasses	2	114
Other	0	3
Total	13	691

Table 7: Vegetation condition at surveyed plots on Weyburn and Regina Map Areas.

Vegetation Condition	# of Plots Occupied by Burrowing Owls	# of Unoccupied Plots
Not mowed or grazed	1	221
Recently Mowed	1	59
Mowed last year	0	71
Heavily grazed	1	26
Grazing leaves mix of short and tall grass areas	4	69
Grazing leaves grass more than 1 inch tall	0	43
Grazing leaves grass more than 6 inches tall	6	193
Other	0	9
Total	13	691

Table 8: Land system at surveyed plots on Weyburn and Regina Map Areas.

Land System	# of Plots Occupied by Burrowing Owls	# of Unoccupied Plots
Alluvium	0	34
Drainage	1	20
Fluvial	2	131
Fluvial-Lacustrine	1	65
Lacustrine	0	133
Saline	0	11
Solenetzic	9	251
Other	0	46
Total	13	691

Table 9: Soil type at surveyed plots on Weyburn and Regina Map Areas.

Soil Type	# of Plots Occupied by Burrowing Owls	# of Unoccupied Plots
Sandy loam gravel	1	96
Silt	0	0
Silt loam	0	1
Loam	4	114
Sandy loam	0	83
Loamy sand	0	21
Sand	0	0
Sandy clay loam	0	3
Clay loam	5	162
Sandy clay	0	1
Silty clay loam	0	7
Silty clay	0	0
Clay	0	21
Heavy clay	0	119
Other	3	54
Unknown	0	8
Other	13	691

Table 10: Availability of Richardson Ground Squirrel burrows at surveyed plots on Weyburn and Regina Map Areas.

# of Burrows on Plots	# of Plots Occupied by Burrowing Owls	# of Unoccupied Plots
0	1	310
1-5	2	125
6-10	1	56
11-20	3	55
More than 20	6	116
Data not collected	0	28

Table 11: Availability of Badger Holes at surveyed plots on Weyburn and Regina Map Areas.

# of Badger Holes on Plot	# of Plots Occupied by Burrowing Owls	# of Unoccupied Plots
0	8	531
1-5	4	104
6-10	1	17
11-20	0	13
More than 20	0	2
Data not collected	0	24
	13	691

We observed 17 nests on the surveyed plots. Eleven of these nests were in expanded ground squirrel holes, 3 were in nest boxes, and 3 were of other origin.

Discussion

The stratified random survey technique used in this study has advantages and disadvantages. The advantage is that the relative abundance of the species is established and the perceived rarity of the Burrowing Owl in south-eastern Saskatchewan cannot be discounted as an artifact of not looking. Other approaches, such as soliciting reports from landowners, always leave that possibility untested. The drawback to this design is that it is labour intensive. With a rare species this results in large

confidence limits on the population estimate. For the Regina Map Area the confidence limit exceeds the population estimate, yet to significantly increase the number of owls observed would require doubling the survey and an additional 15 weeks work. In addition, the decision to survey only designated primary habitats in order to save labour created a potential source of error.

We recommend this survey be used for threatened and endangered species which can be surveyed relatively easily or which are locally common enough to reduce the number of vacant plots. This design may also be used in order to determine actual rarity when the population is unknown. However, for future Burrowing Owl surveys in Saskatchewan we recommend use of other techniques, such as landowner contact, which will more efficiently provide a minimum population estimate even though we will not know what portion of the population the survey missed.

This survey showed the Burrowing Owl population is small in south-eastern Saskatchewan and probably does not exceed 400 pair. Comments from farmers suggest the population is declining. This observation is supported by the large number of unoccupied plots, many of which appeared suitable for Burrowing Owls. The fact that only two Burrowing Owl colonies containing more than 5 pair were located is also of concern, as these larger colonies are more stable and may be very important to retention of the population.

While vacant habitat was observed, cultivation of 21% of all designated primary habitat plots since 1979 indicates that habitat loss is a real and continuing threat to the Burrowing Owl. We suspect the problem is greater than simple habitat loss. Increasing isolation of remaining habitat blocks probably reduces their chances of being found by Burrowing Owls and contributes to the high percentage of unoccupied sites. However, the present study was not designed to test this hypothesis.

CONCLUSION AND RECOMMENDATION

The Burrowing Owl population in southeastern Saskatchewan is small and declining. Habitat loss contributes to the decline, but is not the only cause. The threatened designation should be maintained for burrowing owls in Saskatchewan.

Additional management efforts are needed for the Burrowing Owl. These include:

1. A survey based on advertising to farmers to determine locations and numbers of owls across the rest of the species range in Saskatchewan;

2. Initiation of a habitat protection program for known nesting areas, especially those supporting colonies of Burrowing Owls;

3. Determining whether pesticide use poses a threat to Burrowing Owls;

4. Development of techniques to attract or transplant Burrowing Owls to secure but unoccupied habitats which could support colonies of 5 or more pair;

5. Study of survival and movements of Burrowing Owls between colonies to determine the importance of the large colonies in maintaining peripheral breeding populations.

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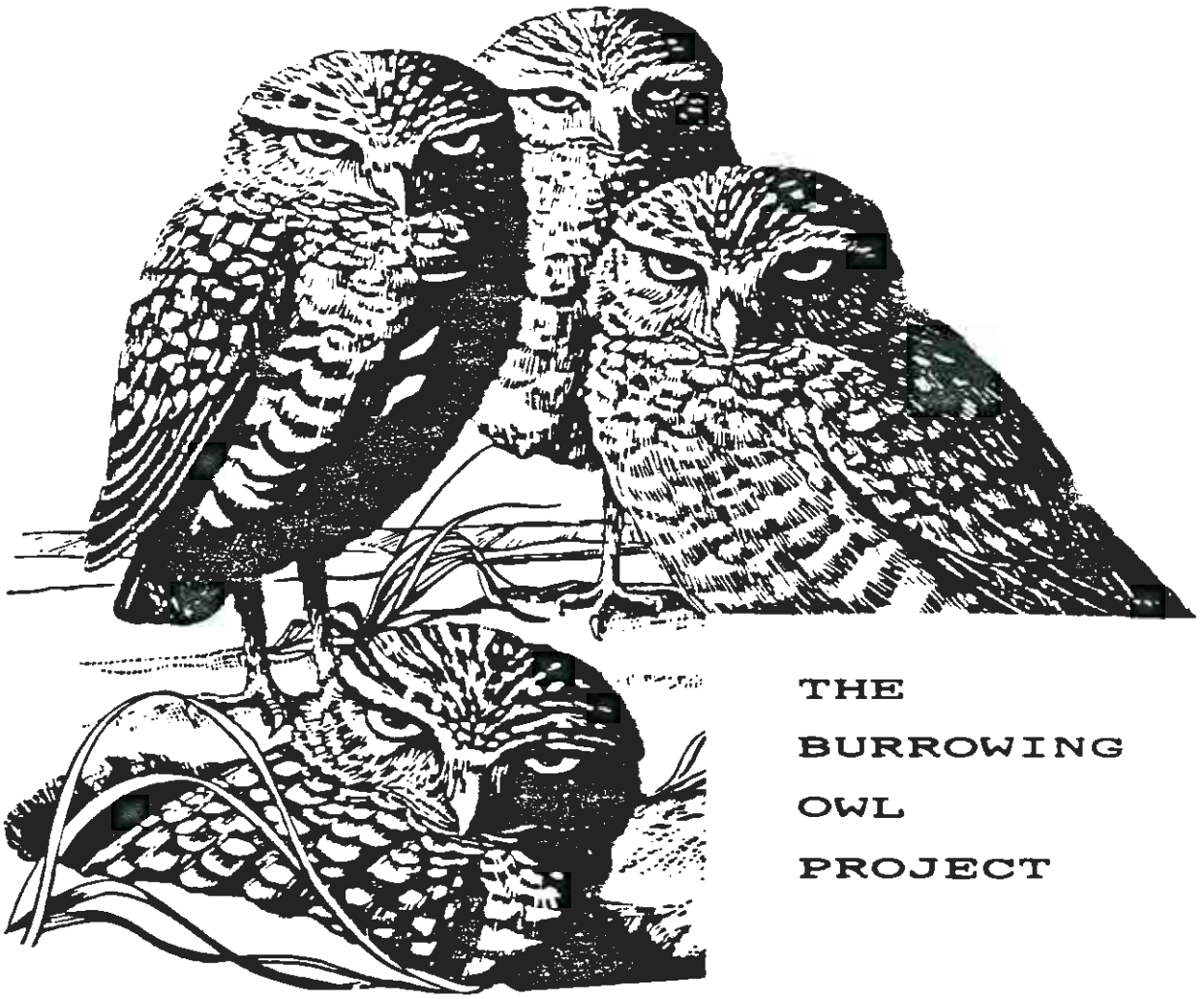
Appendix 1: Burrowing Owl Mail Questionnaire



THE BURROWING OWL PROJECT

ALSO CALLED THE GROUND OWL, THE BURROWING OWL IS A RARE SPECIES IN CANADA. THEY USUALLY NEST IN OLD BADGER OR GOPHER HOLES, WHERE IT LAYS SEVEN TO EIGHT EGGS. IT FEEDS ON MICE, GRASS HOPPERS, CRICKETS AND SIMILAR SMALL PREY. THE OWL HUNTS OVER PASTURE AND CULTIVATED FIELDS, BUT PREFERS A PLOT OF GRASS FOR NESTING. THE LOSS OF PASTURE LAND AND THOUGHTLESS SHOOTINGS ARE RESPONSIBLE FOR THE DECLINE OF THIS SPECIES. THESE ATTRACTIVE LITTLE BIRDS ARE HARMLESS AND IN FACT HELPFULL TO THE ENVIRONMENT, THEY ARE THE FARMERS FRIEND.

THE SASKATCHEWAN NATURAL HISTORY SOCIETY IS STUDYING THIS OWL TO LEARN HOW MANY ARE LEFT IN THE PROVINCE AND WHERE THEY ARE MOST COMMON.

IF YOU HAVE SEEN ANY BURROWING OWLS THIS YEAR, WE WOULD LIKE TO KNOW. PLEASE FILL IN AND SEND US THE QUESTIONARE

HOW MANY? _____ WHEN? (date) _____

WHERE? _____ SEC _____ TP _____ RANGE _____ CLOSEST TO _____

IN THE RURAL MUNICIPALITY OF _____

NAME _____ ADDRESS _____

Thank you for helping us with the Burrowing Owl Project. Please fold this questionare so that our address shows, staple or scotch tape closed and mail your information to us.

34c
STAMP

THE BURROWING OWL PROJECT
PO BOX 1000,
BELLE PLAINE,
SASKATCHEWAN,
S0G 0G0

TO THE FARM RESIDENT

FROM THE BURROWING OWL PROJECT

Appendix 2: Instruction for Burrowing Owl Survey

1 Light breeze, wind direction shown by smoke drift
2 Wind can be felt on face, leaves rustle.
3 Leaves and small twigs are in constant motion; light flag is extended.
4 Raises dust and loose paper; small branches are moved.
5 Small trees in leaf sway; crested wavelets on water.
6 Windier than that and probably too windy to be doing surveys.

6 Sky Condition (1 digit)
0 Clear or few clouds
1 Partly cloudy or variable sky
2 Cloudy(broken) or fully overcast
4 Fog or smoke
5 Drizzle
8 Showers

7 Total Number of adult owls seen on plot (2 digits)

8 Number of pairs believed to be on plot. This might be determined by seeing pairs or because you see the male and think it represents a pair or even because a burrow has fresh tracks and many owl pellets around it. For example if I saw 1 pair together by a burrow, a male sitting by a second burrow, and found a third burrow some distance away with fresh tracks and owl pellets around it, I would enter 3 under point 8 because I saw 3 owls. I would enter 3 here as well because I believe there are 3 burrows occupied by 3 pair.

Be careful interpreting occupied burrows. Owls may have secondary burrows, but these should not be heavily used. If you see a probable burrow with no owls watch it a while. You will probably see an owl after a while. (2 digits).

9 Number of badger holes (1 digit)
These are a main source of nest sites. Enter the appropriate code according to how many burrows you saw.
0 No badger holes.
1 1-5 badger holes.
2 5-10 badger holes.
3 10-20 badger holes.
4 more than 20 holes.

10 Number of Richardson Ground Squirrel holes (1 digit)
Again this is a source of nest sites and enter the appropriate code. Note that I don't expect you find every hole, this is based on what you notice while walking.
0 No gopher holes.
1 1-5 gopher holes.
2 5-10 gopher holes.
3 10-20 gopher holes.
4 more than 20 holes.

11-14 Source of nest sites (1 digit each)

INSTRUCTIONS FOR SURVEYING OWL SURVEY

The goal of this survey is to determine how many Burrowing Owls there are on a series of preselected plots and to record characteristics of the habitat. In total we will be looking at about 10 % of the Burrowing Owl habitat. The survey will allow the first ever accurate estimate of total population in the area and allow a better understanding of the Burrowing Owl's habitat preferances.

It is important that each plot be surveyed carefully, preferably by walking(of course the long road transects may be driven slowly). Investigate holes that look active. An active Burrowing Owl nest will have owl pellets around it, a very good indicator of an active site. Generally, of course, you will see the owls.

If you find your plot is now cultivated, totally forested or cannot be done for some other reason such as a hostile landowner simply note that fact and go on to the next one. All plots were selected according to air photos and should have native vegetation. However the photos are seven years old so a number of changes may have occurred. Please do try to get to and do all plots in your area, nonetheless I realise that one or two plots somewhere will be impossible.

Please record the following data on the data sheet provided using numeric codes. If my instructions confuse you and you are not certain how to fill in the sheet, please record all the data requested on other paper and I will fill in the data sheat. If you see Burrowing Owls off the study blocks please record their location on the map and report the site to me. I am interested in all nest locations and am using off plot sitings as part of a larger study.

1 MAP SHEAT SURVEYED (1 digit)
- 1 Weyburn (62E) and Virden (62F)
- 2 Mellville (62L and 62K)
- 3 Regina (72I)
- 4 Willowbunch (72H)

2 Plot Type (1 digit)
- 1 less than 5 acres = NG1
- 2 5-30 acres = NG2
- 3 Larger than 30 acres = NG 3 or 4
- 5 Linnear blocks, usually road ditches or raillines

3 Plot #(3 digits)
- The number on the map

4 Temperature (2 digits)
- Estimate of degres in Celsius

5 Wind Speed (1 digit)
- Please enter according to the Beaufort Code rather than in miles or kilometres per hour. The code follows.
- 0 . Calm, smoke rises vertically.

G

THE TALL-GRASS PRAIRIE COMMUNITY IN MANITOBA

by Sheila M. Anderson

September, 1986

THE TALL-GRASS PRAIRIE COMMUNITY IN MANITOBA

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THE TALL-GRASS PRAIRIE COMMUNITY IN MANITOBA

by Sheila M. Anderson

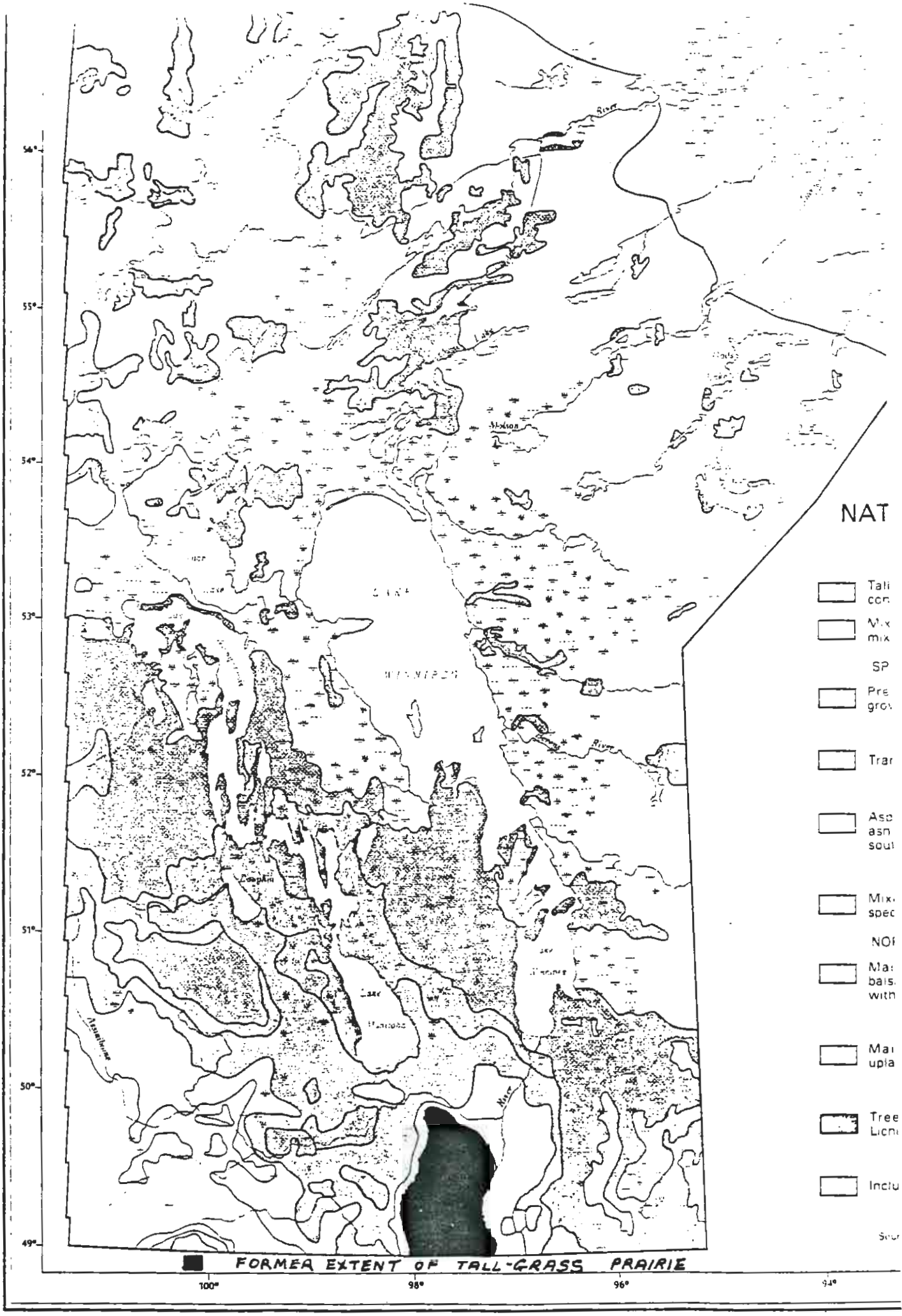
Introduction

The aim of this project was to survey the known existing sites of Tall-grass Prairie in Manitoba and to search for unrecorded sites in both the original Tall-grass Prairie and Aspen Parkland zones.

Tall-grass Prairie, or "true prairie" (Weaver 1954), occupied the central part of North America before white settlement. It extended from Texas northward to southern Manitoba where it lay in the Red River Valley to the south of Winnipeg and west of the river to the Manitoba Escarpment. The former extent of the Tall-grass Prairie is shown by the area coloured red in the map on page 2 (from Weir 1983).

Because the original Tall-grass Prairie was established predominantly on the rich, highly-productive black soils of the Red River Valley, it was put to the plow by the early settlers around the turn of the century and, because of increasing cultivation since that time, the native vegetation is now virtually extinct. As a result, the best existing examples of relatively undisturbed Tall-grass Prairie occur in the Aspen Parkland.

The International Biological Program (IBP), working in Manitoba from 1967 to 1973, surveyed the province for natural areas, including Tall-grass Prairie. The only prairie remnants of reasonable size were found in the Aspen Parkland zone. The largest of these is now preserved as the Living Prairie Museum. However an even larger Tall-grass Prairie was discovered by a wildlife biologist at Oak Hammock. The land was bought and added to the Wildlife Management Area in 1974.


NAT
Tali
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with
Mai
upla
Tree
Lich
Inclu
FORMER EXTENT OF TALL-GRASS PRAIRIE
100°
98°
96°
94°
56°
55°
54°
53°
52°
51°
50°
49°

TALL-GRASS PRAIRIE COMMUNITY

Methods

As a starting point for this survey, the records of the IBP were reviewed. All locations of the Tall-grass Prairie areas were noted from IBP site descriptions. In addition, suggestions and comments in letters solicited by the IBP from individuals and organizations were considered. All sites were visited, but two were considered not to be worthy of further study. About half the sites described in this report were located originally by the IBP. Others were found as a result of leads from Dr. Karen Johnson of the Manitoba Museum of Man and Nature and Helios Hernandez of the Manitoba Parks Branch. The remaining sites were located by driving through the project area and looking for the presence of Big Bluestem (Andropogon gerardi Vitman) with its characteristic tall, dull purple stems. It is one of the most widespread and important grasses of the Tall-grass Prairie. Timing is important for its presence is not obvious until midsummer. This year it began blooming around July 20 and by August 3 some of the areas where it was growing were being hayed. Earlier in the season other species can be indicators, such as Wolf Willow (Eleagnus commutata Bernh.) with its silvery leaves, or forbs such as Camas (Zigadenus elegans Pursh), the tall stems of which are flowering in June.

When a site was visited, the area was photographed and traversed, a species list drawn up, and then each species was assigned a symbol on an abundance scale (Tansley 1954). This estimate of abundance is rather subjective but, given the survey nature of the project, it was considered the fastest way of conveying useful floristic information on the vegetation of each area.

The scientific botanical nomenclature is after Scoggan (1978-79). Common names vary a great deal and there are often several names for the same species. Since Scoggan does

not always give a common name, the names used here are taken from various manuals.

The soil descriptions of the different areas are taken from the reports of the Manitoba Soil Survey. About 1960, soil nomenclature in Canada changed so some of the terms used in describing the soils of the St.Ambroise and Lake Francis areas (Manitoba Soil Survey Report No. 12, 1961) vary somewhat from those used for the other sites described in earlier reports.

Distribution of Tall-grass Prairie Sites

The present day extent of the Tall-grass Prairie is indicated by the distribution of the sites examined.

Very little trace of Tall-grass Prairie remains in the Red River Valley south of Winnipeg in the area delineated as such in the Atlas of Manitoba (Weir 1983). Big Bluestem does occur, but mostly rather sparsely in areas along railway lines such as the one which parallels Highway 75 from Winnipeg down to the U.S. border, and the one along Highway 23 west from Morris. The site investigated in this area is a ditch angling northeast from Highway 23 through cultivated fields. Here the Big Bluestem is quite dense, but only in patches along the length of the ditch.

Some of the areas described are protected sites or located within them in or near Winnipeg. They are the Living Prairie Museum, Oak Hammock Prairie, prairie remnants in Birds Hill Provincial Park and vestiges of prairie in Beaudry Provincial Park.

Several sites were examined in the Aspen Parkland area south and west of the southern end of Lake Manitoba. Here there are many open grassy areas with varying amounts of Big Bluestem on the higher ground. The landscape is characterized by a ridge and swale topography, and the soils

are largely Rego Blacks. The land is best suited for forage. One of the best stands of Big Bluestem encountered during this survey is located in this general area, near Lake Francis.

Three sites were examined east of the Red River in an area of aspen-oak woodland with large clearings of cultivated fields, pastures or meadows. Two of the sites, Grunthal and the Indian Reserve, are in woodland clearings and one, near Vita, is along a road ditch (P.R. 201).

A number of sites are located along railways north and northwest of Winnipeg. Stands of Big Bluestem with associated prairie species are found along the C.N. line which parallels Highway 6 and adjoining the C.P.R. line along Provincial Road 221. This vegetation is found in a relatively narrow strip between the railway and adjacent fields. A wedge-shaped site of about four hectares is located along the C.P.R. line at Stony Mountain.

Two sites are within the Winnipeg Perimeter northwest of the city. One is on C.P.R. property and one is bounded along one side by an abandoned railway bed.

It is evident that there is a relationship between the railway lines and the survival of prairie vegetation. The railways were established in the late 1800's and early 1900's about the time the land was being settled and before all the prairie sod was broken. The prairie vegetation has survived along the track because it has been relatively undisturbed since then. Woody species are kept down by regular burning. There has been varying degrees of invasion by weedy species.

Species Composition

One fact which becomes clear after a study of the prairie is that the floristic appearance changes markedly over the summer. It has already been mentioned that Big Bluestem with

its forked inflorescences does not become evident until after the middle of July. By that time the flowering period of some other grasses, such as June Grass (Koeleria cristata (L.) Pers.) and Sweet Grass (Hierochloe odorata (L.) Beauv.) is over. One has to visit the prairie in May and June to see such forbs as the Prairie Buttercup (Ranunculus rhomboideus Goldi), Stargrass (Hypoxis hirsuta (L.) Coville) and Blue-eyed Grass (Sisyrinchium montanum Greene) in bloom. In midsummer, Prairie Clover (Petalostemum purpureum (Vent.) Rydb.) and BLazing-star (Liatris ligulistylis (Nels.) K. Schum.) are among the many flowers in evidence and in late summer the Sunflowers (Helianthus spp.), Goldenrods (Solidago spp.) and Asters (Aster spp.) take over as the dominant forbs. Even within one genus such as Solidago there is a sequence in blooming. Solidago missouriensis Nutt. and Solidago rigida L. are in flower earlier than other species in the genus.

The presence of Big Bluestem, even in sparse amounts, was a criterion in choosing a site. It is a widely distributed species and also occurs outside the Tall-grass Prairie and Aspen Parkland zones. It is found on dry or moist prairie and sandhills in the southern third of the province. Big Bluestem is the best native prairie grass for pasture and hay. If it is overgrazed it will be replaced by other species. It is best cut for hay in early bloom, hence the importance of timing in locating stands of Big Bluestem.

One of the principal grasses of the Tall-grass Prairie in the southern U.S. that is similar in habit to Big Bluestem is Indian Grass (Sorghastrum nutans (L.) Nash). It is less frequent northwards and very scarce in Manitoba. However, it was found once this summer in a dense stand of Big Bluestem in the Lake Francis Prairie, making this small site rather unique.

TALL-GRASS PRAIRIE COMMUNITY

Porcupine Grass (Stipa spartea Trin.) is found associated with Big Bluestem in many of the sites. It occurs in dry or moist sites. Another species in the genus, Stipa comata Trin. & Rupr., is confined to dry prairie. Both species lose their seed by midsummer and later in the season they are difficult to separate as to identity. In a few of the later species lists they are identified simply as Stipa sp. A third species, Stipa viridula Trin., is much less common but does occur in a number of the sites, although not to any great extent.

Two grasses of moist prairie, Switchgrass (Panicum virgatum L.) and Prairie Dropseed (Sporobolus heterolepis Gray), are frequent components of the prairie in the sites examined.

Grasses commonly found in wet areas are Prairie Cord Grass (Spartina pectinata Link) and Northern Reed Grass (Calamagrostis inexpansa Gray var. brevior (Vasey) Stebbins).

June Grass (Koeleria cristata (L.) Pers.) is widespread but never abundant on any site.

Slender Wheat Grass (Agropyron trachycaulum (Link) Malte) and its varieties is found in over half the sites. Prior to 1940 it was grown for hay.

Prairie Wedge Grass (Sphenopholis obtusata (Michx.) Scribn.) was recorded in only one site, Oak Hammock Prairie. It resembles June Grass and for this reason perhaps gets overlooked.

Kentucky Bluegrass (Poa pratensis L.) is very common. It is generally regarded as being introduced from Europe but has spread so rapidly in North America that it appears like a native plant and is regarded as such by some authors. It invades and can become dominant in moist prairie. Its success is largely due to its early vigorous growth.

Many of the sites are invaded by Smooth Brome (Bromus

inermis Leyss.). It is the commonly cultivated Brome which was introduced to Canada in about 1875.

The most commonly occurring shrub in the sites is the Wild Rose (Rosa sp.). Because of identification difficulties within the genus the roses are simply referred to here as Rosa sp., with one exception. Wolfberry (Symphoricarpos occidentalis Hook.) is also widespread. Wolf Willow or Silverberry (Eleagnus commutata Bernh.) is found in about half the sites. Less common, but characteristic of dry prairie is the Fragant False Indigo (Amorpha nana Nutt.) and in the same genus, the Leadplant (A. canascens Pursh). A few of the sites in wooded areas are being invaded by taller shrubs such as Saskatoon (Amelanchier alnifolia Nutt.) and young trees of Aspen (Populus tremuloides Michx.) and Oak (Quercus macrocarpa Michx.).

Forbs, an integral part of the prairie, add a touch of colour and interest to the landscape. Many are conspicuous due to brightly-coloured flowers or silvery foliage. The changing appearance of the prairie from spring to fall is due partly to the sequence in blooming of the forbs referred to earlier.

Of the many forbs present, about 130 different species in our sites, many are members of the Composite Family (Compositae). The familiar Sunflowers (Helianthus spp.), Goldenrods (Solidago spp.), Asters (Aster spp.) and Blazing-star (Liatris ligulistylis (Nels.) K. Schum.) are common in almost all sites and form a conspicuous component of the prairie vegetation. The Mugwort or White Sage (Artemisia ludoviciana Nutt. var. gnaphalodes (Nutt.) T.&G.) occurs in many sites and stands out because of its whitish appearance.

The Legume Family (Leguminosae) is also well represented in the Tall-grass Prairie. The Purple Prairie Clover

(Petalostemum purpureum Vent.) is found in most of the sites and the White Prairie Clover (Petalostemum candidum Michx.) in some. Both Psoraleas are present in a number of the sites. The conspicuous Silver Leaf Psoralea (Psoralea argophylla Pursh) with its tall, branching stems and silver leaves is a good indicator of prairie. The smaller Breadroot (Psoralea esculenta Pursh) occurs less frequently in any one site. The Purple Milkvetch (Astragalus goniatus Nutt.) is quite frequent, but another member of the genus, the Ground Plum (Astragalus carvocarpus Ker), is scarce. Fortunately, it is protected at the Living Prairie Museum. A last example of a prairie legume, Wild Licorice (Glycyrrhiza lepidota (Nutt.) Pursh), is found in many sites.

Northern Bedstraw (Galium septentrionale R.&S.), which is wide-ranging in habitat, occurs frequently on the prairie, often forming a dense understory. Also found in the understory is the Wild Strawberry (Fragaria virginiana Duchesne). On some of the drier sites, Prairie Anemone (Anemone patens L. var.wolfgangiana (Bess.) Koch) and Three-flowered Avens (Geum triflorum Pursh) are present, and because they bloom so early in the season their presence may be underestimated. Similarly with Hoary Puccoon (Lithospermum canescens (Michx.) Lehm.), a common prairie plant. About mid-July the delicate Pale-spike Lobelia (Lobelia spicata Lam. var. hirtella Gray) is in flower and its presence is obvious in a number of sites, both moist and dry. In August, the Gentians (Gentiana spp.) are blooming and four different species were found in the moister sites.

Many other species are present and these are listed for each site following its description.

SMITHS SPUR

What little remains of the original Tall-grass Prairie in the Red River Valley south of Winnipeg and west of the river is confined to ditches and railway embankments. Intensive cultivation of the rich black soils of this area has led to its almost total disappearance. One ditch remnant was located on a farm at Smiths Spur, 10 km west of Morris, along Highway 23. The ditch runs diagonally through section 2, township 5, range 1 west, north of the highway, and is about one km in length, the adjacent strip of prairie being approximately 8 m wide and forming the berm and bank on the south side of the ditch. Although this strip of prairie forms part of the drainage right-of-way and is public property, the surrounding farmland is presently owned by Charles Anderson, but on April 1, 1987 the ownership will pass to Joe and Andrew Anderson of Morris.

The soil of the immediate area is an Osborne Clay, the poorly-drained associate of the Red River Association. It is a Blackearth developed on lacustrine fine clay. The ditch was dug in the early 1900's, some years before all the land in the area was broken, and, apart from an occasional burning, has been relatively undisturbed since. It seems logical to assume that the native prairie species growing there now are a reflection of what was growing in the general area before the prairie sod was plowed.

The most abundant grasses on this site are Smooth Brome (Bromus inermis Leyss.) and Kentucky Bluegrass (Poa pratensis L.), but large patches of Big Bluestem (Andropogon gerardi Vitman) frequently occur. In addition, there is a little June Grass (Koeleria cristata (L.) Pers.) and Green Needle Grass (Stipa viridula Trin.). In the lower areas, Prairie Cord Grass (Spartina pectinata Link) is frequent. There is a

thick shrubby layer of Wild Rose (Rosa sp.) and Wolfberry (Symphoricarpos occidentalis Hook.) with Meadow Sweet (Spiraea alba Du Roi) in places. Among the forbs are Prairie Clover (Petalostemum purpureum (Vent.) Rydb.), Wild Onion (Allium stellatum Fraser), Blazing-star (Liatris ligulistylis (Nels.) K. Schum.), Sunflowers (Helianthus spp.), Goldenrods (Solidago spp.) and Asters (Asterspp.).

SMITHS SPUR SPECIES LIST July 18 & 28; Aug. 1

WOODY SPECIES

Rosa sp. a
Spiraea alba Du Roi a
Symphoricarpos occidentalis Hook. a

GRASSES, SEDGES AND RUSHES

Agropyron repens (L.) Beauv. o
Agropyron trachycaulum (Link) Malte var. unilaterale (Cassidy) Malte o
Andropogon gerardi Vitman f
Bromus inermis Leyss. a
Elymus canadensis L. o
Koeleria cristata (L.) Pers. o
Poa pratensis L. a
Spartina pectinata Link f
Stipa viridula Trin. o

FORBS

Achillea millefolium L. f
Allium stellatum Nutt. f
Anemone canadensis L. f
Anemone cylindrica Gray o
Apocynum cannabinum L. var. hypericifolium (Ait.) Gray o
Apocynum cannabinum L. var. hypericifolium (Ait.) Gray o
Artemisia ludoviciana Nutt. var. gnaphalodes (Nutt.) T.&G. f
Asclepias ovalifolia Dcne. o
Asclepias speciosa Torr. o
Aster laevis L. f
Aster pansus (Blake) Cronq. f
Aster simplex Willd. o
Astragalus goniatus Nutt. f
Cirsium flodmanii (Rydb.) Arthur o
Convolvulus sepium L. r
Erigeron asper Nutt. o

Fragaria virginiana Duchesne o
Galium septentrionale R.&S. f
Gentiana andrewsii Griseb. r
Glycyrrhiza lepidota (Nutt.) Pursh f
Helianthus laetiflorus Pers. var. rigidus (Cass.) Fern. f
Helianthus laetiflorus Pers. var. subrhomboideus (Rydb.) Fern. f
Helianthus maximilliani Shrad f
Lactuca tatarica (L.) Meyer f
Liatris ligulistylis (Nels.) K.Schum. o
Petalostemum purpureum (Vent.) Rydb. f
Solidago canadensis L. var. gilvocanescens Rydb. f
Solidago gigantea Ait. var. serotina (Ait.) Conq. o
Solidago rigida L. a
Thalictrum venulosum Trel. f
Vicia americana Muhl. var. truncata (Nutt.) Brewer f
Zizia aptera (Gray) Fern. f

INDIAN RESERVE 2A (ROSEAU RAPIDS)

Indian Reserve 2A lies about 75 km south of Winnipeg and 30 km west of the Red River in the Aspen Parkland transition zone. In general, the landscape is characterized by very gently undulating topograpghy with aspen-oak uplands and open meadows. The soil is a Grey-Black, which is transitional between the Blackearth soil developed under grassland and the Grey Wooded soil developed under forest vegetation. The Grey-Black soil was originally developed under grassland and originally had Blackearth characteristics but forest invasion of grassland has advanced to a point where the soils now show varying degrees of degradation. The soil is a Pelan (deep phase) sandy loam which is developed on a thin sandy mantle over till. In the deep phase the mantle is 40 to 75 cm thick.

The area examined is a grassy clearing of about three hectares in aspen-oak woodland. The grassland is being invaded by young Aspen (Populus tremuloides Michx.), Oak (Quercus macrocarpa Michx.), Dwarf Birch (Betula glandulosa Michx. var. glandulifera (Regel) Gl.) and Chokecherry (Prunus virginiana L.). The dominant grasses are Big Bluestem (Andropogon gerardi Vitman) and Smooth Brome (Bromus inermis Leyss.) with a mixture of other grasses such as Kentucky Bluegrass (Poa pratensis L.), June Grass (Koeleria cristata (L.) Pers.) and Sweet Grass (Hierochloe odorata (L.) Beauv.). The associated forbs include typical prairie species such as Prairie Clover (Petalostemum purpureum (Vent.) Rydb.), Blazing-star (Liatris ligulistylis (Nels.) K. Schum.), Smooth Camas (Zigadenus elegans Pursh) and Wild Onion (Allium stellatum Fraser). The site is of interest because it shows the invasion of Tall-grass Prairie by the surrounding woodland.

Another area in this Indian Reserve, although not characterized by Tall-grass Prairie, is worthy of mention. It was studied on August 21, 1968 by an International Biological Program worker. Because of its interesting species diversity, it was examined briefly by the author. The approximately eight acre site on a gravel ridge with a stony surface can be described as Mixed-grass Prairie with Blue Grama (Bouteloua gracilis (HBK.) Lag.) and Porcupine Grass (Stipa spartea Trin.) as the dominant grasses. Prairie Anemone (Anemone patens L. var. wolfgangiana (Bess.) Koch), Three-flowered Avens (Geum triflorum Pursh) and Dotted Blazing-star (Liatris punctata Hook.) are quite common. Also present are both Manitoba species of Psoralea - Breadroot (Psoralea esculenta Pursh) and Silverleaf Psoralea (Psoralea argophylla Pursh). The rather rarely-occurring Shrubby Evening Primrose (Oenothera serrulata Nutt.) and the Silver Aster (Aster sericeus Vent.) were also found. The Ground Plum (Astragalus caryocarpus Ker) is on the 1968 species list but was not noticed on this visit.

The different vegetational aspects of the two sites can be accounted for by the soil and surface deposits. The soil of the latter site belongs to the Leary Association which is a Grey-Black soil developed on gravelly and sandy beach and glacial outwash deposits.

INDIAN RESERVE 2A SPECIES LIST July 27 1986

WOODY SPECIES

Betula glandulosa Michx. var. glandulifera (Regel) Gl. f
Populus tremuloides Michx. f
Potentilla fruticosa L. o
Prunus virginianus L. o
Quercus macrocarpa Michx. o
Rhus radicans L. var. Rydbergii (Small) Rehd. o
Rosa sp. f

GRASSES, SEDGES AND RUSHES

Andropogon gerardi Vitman a
Bromus inermis Leyss. a
Bromus purgans L. r
Calamagrostis canadensis (Michx.) Nutt. o
Calamagrostis inexpansa Gray var. brevior (Vasey) Stebbins o
Hierochloe odorata (L.) Beauv. o
Koeleria cristata (L.) Pers. o
Poa pratensis L. f
Spartina pectinata Link o

FORBS

Agastache foeniculum (Pursh) Ktze r
Agoseris glauca (Nutt.) Greene o
Allium stellatum Fraser o
Anemone canadensis L. o
Anemone cylindrica Gray o
Aster laevis L. o
Aster pansus (Blake) Cronq. f
Astragalus canadensis L. o
Campanula rotundifolia L. o
Cirsium flodmanii (Rydb.) Arthur o
Erigeron canadensis L. r
Erigeron glabellus Nutt. r

Erigeron philadelphicus L. r
Fragaria virginiana Duchesne f
Galium septentrionale R.&S. f
Gentiana crinita Froel. o
Geum triflorum Pursh o
Glycyrrhiza lepidota (Nutt.) Pursh f
Helianthus maximilliani Shrad. o
Hieracium umbellatum L. o
Lathyrus palustris L. o
Liatris ligulistylis (Nels.) K. Schum f
Lilium philadelphicum L. o
Lobelia spicata Lam. var. hirtella Gray f
Melilotus alba Desr. r
Oenothera biennis L. r
Pedicularis canadensis L. o
Penstemon gracilis Nutt. o
Petalostemum candidum (Willd.) Michx. r
Petalostemum purpureum (Vent.) Rydb. f
Prenanthes racemosa Michx. o
Rudbeckia serotina Nutt. f
Sanicula marilandica L. o
Solidago canadensis L. o
Solidago hispida Muhl. f
Solidago rigida L. o
Steironema ciliatum (L.) Raf. o
Thalictrum dasycarpum Fisch. & Lall. f
Thalictrum venulosum Trel. f
Vicia americana Muhl. o
Zigadenus elegans Pursh o
Zizia aptera (Gray) Fern. f

GRUNTHAL PRAIRIE

This small area of approximately 0.8 hectares lies to the south of the village of Grunthal in the northeast corner of section 9, township 5, range 5 east. It is owned by George and Helen Warkentin. The surrounding landscape is characterized by a mixture of cultivated fields and shrubby aspen groves. The soil of the area, a Pelan (deep phase) sandy loam, is a Grey-Black which is transitional between the Blackearth developed under grassland and the Grey Wooded Soil developed under forest vegetation.

The site was examined by International Biological Program workers on July 30, 1970. It does not appear much disturbed since then. At that time it was noted that, although it had not been recently heavily grazed or mowed, it had been burned. No sign of burning was noted by the author. The main difference in the vegetation today is a decrease in the abundance of Big Bluestem (Andropogon gerardi Vitman). Perhaps the site is due for another burn! On our first visit on July 6 the presence of Big Bluestem was not noticed, but on a subsequent visit on July 27 its presence was obvious. However it is by no means the dominant grass on the site. It is quite abundant, however, by the side of the dirt road approach from Provincial Road 216. The dominant grasses now on the site are Porcupine Grass (Stipa spartea Trin.) and Kentucky Bluegrass (Poa pratensis L.), with a mixture of others such as Little Bluestem (Andropogon scoparius Michx.) and Prairie Dropseed (Sporobolus hetetrolepis Gray). A low, shrubby layer of vegetation is quite evident, made up largely of Wild Rose (Rosa sp.) and Wolfberry (Symphoricarpos occidentalis Hook.). The dominant forbs are members of the Legume Family, including species of the Milk-Vetch (Astragalus spp.), Vetchling (Lathyrus sp.) and Vetch (Vicia

sp.). One or two plants of the Breadroot (Psoralea esculenta Pursh), a good prairie indicator, were noted.

The soil at this site is in the same soil association as the one at Indian Reserve 2A, but the Grunthal Prairie is better drained. The presence of Porcupine Grass and Little Bluestem at Grunthal indicate more xeric conditions.

GRUNTHAL PRAIRIE SPECIES LIST July 6 & 27 1986

WOODY SPECIES

Amelanchier alnifolia Nutt. o
Arctostaphylos uva-ursi (L.) Spreng. o
Crataegus sp. r
Potentilla fruticosa L. o
Prunus pumila L. r
Rosa sp. a
Spiraea alba Du Roi r
Symphoricarpos occidentalis Hook. a

GRASSES, SEDGES AND RUSHES

Agropyron trachycaulum (Link) Malte var. unilaterale (Cassidy) Malte o
Agrostis scabra Willd. r
Andropogon gerardi Vitman o
Andropogon scoparius Michx. o
Koeleria cristata (L.) Pers. o
Poa pratensis L. a
Sporobolus heterolepis Gray o
Stipa spartea Trin. a

FORBS

Achillea millefolium L. f
Agastache foeniculum (Pursh) Ktze. o
Agoseris glauca (Nutt.) Greene o
Allium stellatum Nutt. f
Artemisia ludoviciana Nutt. var. gnaphalodes (Nutt.) T.&G. a
Aster laevis L. f
Aster ptarmicoides (Nees) T.&G. o
Astragalus canadensis L. f
Astragalus goniatus Nutt. f
Astragalus striatus Nutt. o
Campanula rotundifolia L. o
Erigeron glabellus Nutt. r

Erigeron strigosus Muchl. o
Fragaria virginiana Duchesne f
Galium septentrionale R.&S. f
Geum triflorum Pursh f
Glycyrrhiza lepidota (Nutt.) Pursh o
Heuchera richarsonii R.Br. o
Lathyrus venosus Muhl. var. intonsus Butt. & St.John a
Liatris ligulistylis (Nels.) K.Schum. o
Lilium philadephicum L. o
Lithospermum canescens (Michx.) Lehm. o
Lobelia spicata Lam. var. hirtella Gray o
Monarda fistulosa L. f
Orthocarpus luteus Nutt. r
Penstemon gracilis Nutt. o
Petalostemum candidum (Willd.) Michx. r
Petalostemum purpureum (Vent.) Rydb. o
Potentilla anserina L. o
Potentilla arguta Pursh o
Potentilla millegrana Engelm. r
Potentilla pensylvanica L. var. bipinnatifida (Dougl.) T.&G. o
Psoralea esculenta Pursh r
Smilacina stellata (L.) Desf. o
Solidago missouriensis Nutt. a
Solidago rigida L. f
Thalictrum venulosum Trel. o
Vicia americana Muhl. var. angustifolia Nees o
Zizia aptera (Gray) Fern. o

VITA

Along the north side of Provincial Road 201, west of Vita, there are good, dense stands of Big Bluestem (Andropogon gerardi Vitman). One such stand examined was 3.5 km west of Vita in a strip between the road ditch and oak woods on the north side of the road. The Soil Survey map of 1953 shows a Canadian Natonal Railways line through Vita which turns south five km west of the town. Perhaps the Big Bluestem is growing over the old railbed. The soils of this area are in the Garson soil complex which contains degrading Rendzinas and Grey Wooded soils developed on stony calcareous till.

Big Bluestem is the dominant grass, but also present are the introduced species, Smooth Brome (Bromus inermis Leyss.), Redtop (Agrostis stolonifera L.) var. major (Gaud.) Farw.) and Red Fescue (Festuca rubra L.). There is some invasion by woody species such as Wolf Willow (Eleagnus commutata Bernh.) and Shrubby Cinquefoil (Potentilla fruticosa L.). Among the forbs there is Blazing-star (Liatris ligulistylis (Nels.) K. Schum.) and the Upland White Aster (Aster ptarmicoides (Nees) T.&G.).

WOODY SPECIES

Eleagnus commutata Bernh. o

Potentilla fruticosa L. o

Rosa sp. o

Symphoricarpos occidentalis Hook. o

GRASSES, SEDGES AND RUSHES

Agrostis stolonifera L. var. major (Gaud.) Farw. o

Andropogon gerardi Vitman a

Bromus inermis Leyss. o

Festuca rubra L. o

FORBS

Aster laevis L. o

Aster pansus (Blake) Cronq. f

Aster ptarmicoides (Nees) T.&G. f

Campanula rotundifolia L. f

Erigeron strigosus Muchl. r

Fragaria virginiana Duchesne o

Galium septentrionale R.&S. f

Glycyrrhiza lepidota (Nutt.) Pursh o

Hieracium umbellatum L. o

Liatris ligulistylis (Nels.) K.Schum. f

Lobelia spicata Lam. var. hirtella Gray f

Medicago sativa L. o

Melilotus alba Desr. o

Penstemon gracilis Nutt. o

Prunella vulgaris L. var. lanceolata (Barton) Fern. r

Rudbeckia serotina Nutt. o

Solidago canadensis L. o

Solidago graminifolia (L.) Salisb. var. major (Michx.) Fern. o (near ditch)

Solidago hispida Muhl. o

Solidago rigida L. o

Trifolium hybridum L. o

THE LIVING PRAIRIE MUSEUM

This area was located by International Biological Program workers in 1968 in what was then the city of St. James and is now incorporated into the city of Winnipeg. About 10 hectares of the original 40 hectares surveyed was set aside in 1971 as a city park, called the Living Prairie Museum. At the time it was described in the International Biological Program it was the largest known remnant of Tall-grass Prairie in Manitoba, a distinction now enjoyed by the Oak Hammock Prairie.

The site, although grazed and hayed in the past, is mostly unplowed, possibly due to the shallow nature of the soil. The Living Prairie, which now caters to thousands of visitors and groups of school children, has an interpretive centre and a self-guiding trail. There is also a managemant plan with regular controlled burning and the introduction of prairie species by seeding and transplanting.

The great diversity of species at the Living Prairie is well-documented, and there is an up-to-date list of well over 200 plants, published in January, 1986. For this reason, no species list is included here. Both Big and Little Bluestem (Andropogon gerardi Vitman and A. scoparius Michx.) are common. In view of the presence of a large population of Prairie Anemone (Anemone patens L. var. wolfgangiana (Bess.) Koch) there is a special weekend in late April to celebrate their blooming. Another noteworthy species is the Ground Plum (Astragalus caryocarpus Ker).

The surprising feature of this prairie is the fact that it survived at all, with the burgeoning development going on all around it.

OAK HAMMOCK PRAIRIE

This 24-hectare prairie is part of the Oak Hammock Wildlife Management Area which lies about 25 km north of Winnipeg. It is located in section 8, township 14, range 3 east. It was found in 1973 by a wildlife biologist and it is the largest area of Tall-grass Prairie known in Manitoba. In 1974 it was bought and added to the adjacent Wildlife Management Area. The prairie had been hayed and burned, but not broken.

The topography of the site is quite level. The soil is mapped as a Lakeland Clay Loam to Clay. This soil is described as a weakly developed calcic blackearth-like soil. It is a shallow soil developed on clayey lacustrine deposits. The high lime content and poor internal drainage of the soil have probably been factors in the land being used for hay instead of being cultivated.

A species list for the site was compiled by the author during the summer of 1982 and June of 1983 and one or two species were added this summer. A few species were added to the list in 1984 by a Summer Canada Project worker who also drew up a blooming schedule of the common wild flowers. The identification manual used by this worker was Budd's Flora of the Canadian Prairie Provinces, so there are some discrepancies in nomenclature between the two lists.

Both Big and Little Bluestem (Andropogon gerardi Vitman and A. scoparius Michx.) are abundant on the site and a variety of other grasses are present, including Porcupine Grass (Stipa spartea Trin.), Prairie Dropseed (Sporobolus heterolepis Gray) and Switchgrass (Panicum virgatum L.). In June the Red Lily (Lilium philadelphicum L.), Smooth Camas (Zigadenus elegans Pursh), Blue-eyed Grass (Sisyrinchium montanum Greene) and Stargrass (Hypoxis hirsuta (L.) Coville)

are among the forbs in bloom. In July, Prairie Clover (Petalostemum purpureum (Vent.) Rydb.) and Blazing-star (Liatris ligulistylis (Nels.) K. Schum.) add more colour to the prairie. In August, the Sunflowers (Helianthus spp.), Goldenrods (Solidago spp.) and Asters (Aster spp.) are the dominant forbs in bloom. Polygala verticillata L. var. isocycla Fern. was collected in flower on August 29, 1982 from a small bare area in the Prairie. It is listed in The Rare Vascular Plants of Manitoba (White and Johnson 1980).

OAK HAMMOCK SPECIES LIST July & Aug. 1982; June 1983

WOODY SPECIES

Rosa arkansana Porter a

GRASSES, SEDGES AND RUSHES

Agropyron trachycaulum (Link)Malte var. novae-angliae (Scribn.)Fern. o
Agropyron trachycaulum (Link) Malte var. unilaterale (Cassidy) Malte f
Andropogon gerardi Vitman a
Andropogon scoparius Michx. a
Bromus purgans L. r
Calamagrostis inexpansa Gray var. brevior (Vasey) Stebbins o
Carex aurea Nutt. o
Carex scirpoidea Mchx. r
Carex tetanica Schkuhr r
Elymus canadensis L. o
Hierochloe odorata (L.) Beauv. o
Hordeum jubatum L. r
Koeleria cristata (L.) Pers. f
Muhlenbergia asperifolia (Nees & Mey.) Parodi r
Panicum virgatum L. f
Poa pratensis L. la
Spartina gracilis Trin. o
Spartina pectinata Link o
Sphenopholis obtusata (Michx.) Scribn. r
Sporobolus heterolepis Gray f
Stipa spartea Trin. f

FORBS

Achillea millefolium L. f
Agoseris glauca (Nutt.) Greene f
Allium stellatum Nutt. f
Ambrosia psilostachya DC. var. coronopifolia (T.&G) Farw. o
Anemone cylindrica Gray o
Anemone neodioica Greene o

OAK HAMMOCK SPECIES LIST July & Aug. 1982; June 1983

Apocynum cannabinum L. var. hypericifolium (Ait.) Gray o
Asclepias ovalifolia Dcne. o
Asclepias speciosa Torr. o
Asclepias verticillata L. r
Aster laevis L. f
Aster pansus (Blake) Cronq. f
Aster ptarmicoides (Nees) T.&G. f
Aster simplex Willd. o
Astragalus goniatus Nutt. f
Campanula rotundifolia L. o
Chenopodium rubrum L. o
Cirsium flodmanii (Rydb.) Arthur f
Comandra umbellata (L.) Nutt. var. umbellata o
Cypripedium calceolus L. var. parviflorum (Salisb.) Fern. r
Erigeron asper Nutt. o
Erigeron strigosus Muchl. o
Erysimum inconspicuum (Wats.) MacM. o
Galium septentrionale R.&S. a
Gentiana affinis Griseb. r
Geum triflorum Pursh o
Glycyrrhiza lepidota (Nutt.) Pursh o
Helianthus laetiflorus Pers. var. rigidus (Cass.) Fern. f
Helianthus laetiflorus Pers. var. subrhomboideus (Rydb.) Fern. o
Helianthus maximilliani Shrad o
Heuchera richarsonii R.Br. f
Hypoxis hirsuta (L.) Colville f
Lactuca tatarica (L.) Meyer o
Lepidium densiflorum Schrad. o
Liatris ligulistylis (Nels.) K.Schum. f
Lilium philadephicum L. f
Lithospermum canescens (Michx.) Lehm. o
Lobelia spicata Lam. var. hirtella Gray f
Medicago sativa L. o

Oenothera biennis L. o
Petalostemum candidum (Willd.) Michx. o
Petalostemum purpureum (Vent.) Rydb. f
Plantago eriopoda Torr. o
Polygala verticillata L. var. isocycla Fern. r
Polygonum convolvulus L. o
Potentilla pensylvanica L. var. bipinnatifida (Dougl.) T.&G. o
Prenanthes racemosa Michx. o
Psoralea esculenta Pursh r
Rudbeckia serotina Nutt. o
Senecio congestus (R. Br.) DC. o
Senecio plattensis Nutt. o
Sisyrinchium montanum Greene f
Smilacina stellata (L.) Desf. o
Solidago canadensis L. var. gilvocanescens Rydb. o
Solidago graminifolia (L.) Salisb. var. major (Michx.) Fern. r
Solidago hispida Muhl. f
Solidago missouriensis Nutt. f
Solidago nemoralis Ait. var. decemflora (DC.) Fern. o
Solidago rigida L. a
Sonchus arvensis var. glabrescens Guenth., Grab., & Wimm. r
Stachys palustris var. pilosa (Nutt.) Fern. r
Thalictricum venulosum Trel. o
Viola pedatifida G. Don o
Zigadenus elegans Pursh. f
Zizia aptera (Gray) Fern. f