COUNTY OF VULCAN

ENVIRONMENTALLY SIGNIFICANT AREAS IN THE OLDMAN RIVER REGION

VOLUME I
NATURAL FEATURES

ENVIRONMENTALLY SIGNIFICANT AREAS IN THE OLDMAN RIVER REGION

COUNTY OF VULCAN

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1.0 INTRODUCTION

1.0 INTRODUCTION

Environmentally Significant Natural Areas (ESA's) are important, useful and often sensitive features of the landscape. They provide long-term benefits to our society by maintaining essential ecological processes and by providing useful products. Large portions of many of Alberta's natural landscapes have been converted to other uses. Surface mining, agricultural, industrial and urban developments will continue to put pressure on the remaining natural areas. The identification and management of important natural areas is a valuable addition to the traditional socio-economic factors which have largely determined land use planning in the past. The social and economic benefits which ESA's and other natural areas provide are major and are just beginning to be recognized (Butler 1983; Power 1985; Wallis 1983 and 1985).

A few of the functions and uses of natural ESA's are defined by Eagles (1984):

1. Protection of gene pools for future use, including reclamation of disturbed lands, breeding of genes into commercial species or development of new commercial products such as antibiotics.

2. Protection of rare or endangered species and their habitat.

3. Provision of travel corridors and resting places for migratory species.

4. Preservation of mature, stable climax ecosystems with their constituent complete ecological complexity.

5. Providing benchmarks against which man-altered areas can be compared.

6. Conservation of large blocks of habitat for species that require extensive areas for breeding and survival.

7. Conservation of representative samples of different plant and animal habitats characteristic of each natural region.

8. Maintenance of habitat for wildlife and plants that require undisturbed natural areas.

9. Research areas for earth and life science studies.

10. Sources of groundwater recharge, low stream flow supplementation, flood peak reduction and headwater protection for hydrological systems.

11. Filtration and cleaning of air and water flows.

12. Conservation of soil and protection from erosion.

13. Protection of significant geological features.

14. Identification of lands with severe development constraints such as those on floodplains, steep and unstable slopes, or permanent wetlands.

15. Provision of areas for public education of resources and their management.

16. Maintenance of aesthetically pleasing environments.

17. Provision of commercial products such as outdoor recreation.

By means of funding provided by Alberta Forestry, Lands and Wildlife, Cottonwood Consultants Ltd. was contracted to undertake a study of Environmentally Significant Natural Areas in a portion of the Oldman River Region. The primary purpose of the study was to develop an information base that would be useful in planning exercises in the area. Concurrently, other studies were funded to identify culturally significant sites and areas with high paleontological (fossil) potential (see Volume II of this report).

The study area included the rural portions of the County of Vulcan and the Municipal District of Taber.

The objectives of the study were:

1. To provide an inventory of environmentally significant areas of regional, provincial, national or international importance.

2. To evaluate the relative sensitivity of sites classed as environmentally significant areas.

3. To develop management strategies for environmentally significant areas.

Areas considered environmentally significant included:

1. "Hazard" lands and areas which are unsuitable for development in their natural state such as floodplains, permanent wetlands, and steep and unstable slopes; or which pose severe constraints on types of development such as areas of artesian flow and aeolian surficial deposits.

2. Areas which perform a vital environmental, ecological or hydrological function such as acquifer recharge.

3. Areas which contain unique geological or physiographic features.

4. Areas which contain significant, rare or endangered species.

5. Areas which are unique habitats with limited representation in the region or are a small remnant of once large habitats which have virtually disappeared.

6. Areas which contain an unusual diversity of plant and/or animal communities due to a variety of geomorphological features and microclimatic effects.

7. Areas which contain large and relatively undisturbed habitats and provide sheltered habitat for species which are intolerant of human disturbance.

8. Areas which contain plants, animals or land forms which are unusual or of regional, provincial or national significance.

9. Areas which provide an important linking function and permit the movement of wildlife over considerable distance.

Several means of data presentation are used. The report is organized so that the user can get an overview of the major biophysical resources, management considerations, and future study needs as well as more detailed information on each environmentally significant area.

Areas of cultural significance are presented in a separate volume in summary, tabularized, and map form. Areas of sensitivity based on fossil (paleontological) potential are outlined on a separate map. Where site specific paleontological information is well-known, this information has been incorporated into the descriptions of environmentally significant natural areas.

Each of the environmentally significant natural areas is described in outline form so the reader can, at a glance, determine the following:

1. name of the area
2. location
3. major biophysical features which characterize the area
4. level of significance (regional, provincial, national, international)
5. background for determining level of significance
6. management considerations
7. references which will provide more scientific or detailed information should the user require it

Illustrations and a map are used to further portray each site.

Original references or copies have been provided to the client in file form, indexed by author and date for easier retrieval. In addition, a set of colour slides illustrating the natural sites is provided for each County or Municipal District.

To facilitate use by planners, the number of map types has been kept to a minimum:

1. environmentally significant areas (natural)
2. areas with major physical constraints
3. culturally significant areas (historical and archeological)
4. areas of paleontological sensitivity

Where available, more detailed locational data for sites within each significant area is provided in background reference material or in area descriptions.

2.0 DATA COLLECTION METHODS

2.0 DATA COLLECTION METHODS

Researchers involved in the natural history portion of the study included Cliff Wallis, Cleve Wershler, Ray Wershler, John Godfrey, Cheryl Bradley and Dave Spalding. Their research backgrounds included the fields of botany, zoology, and geology.

The following methods of collecting environmental data were employed:

1. Aerial photograph interpretation.
2. Reviews of published and unpublished information in government files and reports, scientific and popular publications, and consultant reports.
3. Interviews with experts and other knowledgeable persons.
4. Extensive field surveys.

2.1 AERIAL PHOTOGRAPH INTERPRETATION

Aerial photographs of the study area were evaluated at the beginning of the project. Complete 1981 coverage in black and white was available at a scale of 1:60,000.

Cultivated or otherwise intensively disturbed lands were noted on 1:50,000 scale National Topographic System base maps. Natural sites less than 160 acres in extent were not mapped unless there were readily identifiable major features. In areas of native vegetation, more detailed evaluations of the landscape and habitat features were made. Specifically, the following types of areas were searched for:

1. areas of vegetation diversity
2. major rock outcrops
3. major spring/seepage areas
4. sand dune areas
5. extensive riparian woodland and shrubbery
6. extensive areas of grassland
7. areas with interesting or unusual landscape features
8. major marshes and wetlands

The next step involved interpretation of bedrock geology and surficial geology maps. Major features noted included:

1. wind deposits
2. outwash sands and gravels
3. drumlin fields
4. eskers and kames
5. bedrock outcrops

Representative field study sites were identified to enable reconnaissance of as many of the geological features and natural habitats as possible. In addition, the natural condition of some areas was unclear from the aerial photographs. Where these fell within larger natural landscapes, they were targeted for field checking.

2.2 LITERATURE REVIEW

Alberta Fish and Wildlife reports, files and key area maps were surveyed in the Lethbridge regional office and in the non-game section in the Edmonton head office. Canadian Wildlife Service, Alberta Forestry, Lands and Wildlife (including the Natural Areas Program), Alberta Environment, Alberta Culture and Alberta Recreation and Parks reports were also reviewed.

Numerous natural history articles, reports and books were also surveyed and relevant information was noted for further field checking and for incorporation into the final report.

2.3 INTERVIEWS

Government personnel were interviewed during and after the literature review sessions at the various agency offices. In addition to these interviews, several non-government specialists with specific regional knowledge were contacted and their contributions are gratefully acknowledged:

D. Borneuf - Hydrogeology
R. Barendregt and C. Beaty - Geology
J. Packer - Rare Plants
H. Pinel and W. Smith - Wildlife

In addition, local residents and naturalists were interviewed and provided valuable insights into current and historic aspects of the life and landscapes.

2.4 FIELD SURVEYS

Field surveys were carried out to check boundaries of natural areas, and to confirm the significance of potential sites identified from aerial photograph interpretation, literature reviews and interviews.

Field work was undertaken in several stages from late May to January, with the majority occurring from June through early September. Breeding bird surveys were completed by mid-July. Rare plant surveys were undertaken throughout the growing season and were based on a knowledge of rare plant habitats and phenology. Limited winter surveys were undertaken. Geological and landscape information was collected throughout the snow-free portion of the study period.

Photographs were taken of most sites and field notes were taken, noting the major characteristics and plants, animals and interesting geological or landscape features observed. Field site evaluations involved a subjective evaluation based on professional judgement and a limited amount of formalized data collection. Field evaluations were later reviewed taking into account information available from literature reviews and interviews.

3.0 OVERVIEW OF NATURAL FEATURES

3.0 OVERVIEW OF NATURAL FEATURES

The study area includes a variety of plains landscapes and habitats. The following is a summary of the major physical landscapes and natural regions of each of the administrative districts in the study area:

County of Vulcan

Physical Landscape - Great Plains
Natural Regions - Mixed Grassland, Foothills Grassland (minor component)

M.D. of Taber

Physical Landscape - Great Plains
Natural Region - Mixed Grassland

3.1 THE PHYSICAL SETTING

The physical setting is described in some detail by Beaty (1975) and several geological reports. Only one major physical landscape, the Great Plains, is represented in the study area. It is an area which is underlain by essentially flat-lying rocks. These have been modified extensively by glacial action and are dissected by major river valleys and glacial spillways.

The Great Plains are quite distinct from other landscapes in the Oldman River Region. While large areas are essentially level, there are some areas of strongly rolling terrain. Elevations range from 705 m along the eastern boundary of the study area to 1165 m on Buffalo Hill.

The Plains owe their surface character primarily to events surrounding glaciation. These surficial features include: a variety of moraines, glacial lake basins, meltwater channels and spillways, dune fields, eskers and kames, drumlinized terrain, and outwash plains.

Along the stream valleys of the South Saskatchewan, Bow, Oldman and Little Bow Rivers, and along glacial spillways such as Chin Coulee, there are local areas of eroded bedrock some of which have a characteristic "badlands" appearance. Some of these spillway channels are very distinctive and include one of the best examples in Alberta. Massive slumping is found along portions of the Oldman and Bow Rivers.

The Plains region is underlain by Tertiary and Cretaceous, marine and non-marine, sandstones and shales of the Paskapoo, Oldman, Bearpaw and Foremost Formations.

3.2 THE LIVING COMPONENT

The study area is representative of the Grassland Natural Region, principally the Mixed Grassland Section. A small remnant of Foothills Grassland is found on Buffalo Hill.

Spear grasses (Stipa spp.) and wheat grasses (Agropyron spp.) predominate. Plant and animal species in Mixed Grasslands have adapted to a variety of grazing regimes ranging from light to extremely heavy (Wallis 1982). Detailed descriptions of Mixed Grassland vegetation can be found in Coupland (1950).

Inhabitants of these dry grasslands include typical Mixed Grassland plants and animals. Some areas are important habitat for Antelope and provide feeding areas for rare or threatened birds of prey like the Ferruginous Hawk and Burrowing Owl. Rare plants and animals tend to concentrate in springs, sand plains and sand dunes, badlands, and along the rims of valleys and coulees.

In western portions and on higher elevations such as Buffalo Hill, Mixed Grassland gives way to lusher Foothills Grassland which is dominated by fescue grasses (Festuca spp.) and oat grasses (Danthonia spp.). Foothills Grasslands are forb rich and have some of the best spring flower displays in Alberta. More detailed descriptions of this vegetation type can be found in Moss and Campbell (1947). Native plants and animals in Foothills Grasslands appear more adapted to lighter grazing regimes than those lifeforms found in the Mixed Grasslands.

Wetlands are locally numerous, especially in areas of rolling topography and in association with irrigation developments. Most large water bodies are man-made or man-maintained, the largest of which are McGregor, Badger, Little Bow, Chin and Travers Reservoirs. Natural wetlands in the Mixed Grasslands tend to be more alkaline and temporary. Many of these wetlands are important for waterfowl production and migration and support a variety of marsh birds. A few sites provide important shorebird habitat. Some wetlands in sand dune areas are important breeding sites for endangered Great Plains Toads.

Riverside (riparian) woodlands are confined to the Bow and Oldman Rivers. Extensive woodlands are very localized. Plains cottonwood (Populus deltoides) dominates, however, there are areas of balsam poplar (Populus balsamifera) and narrow-leaved cottonwood (Populus angustifolia) forests along the Bow River in the Carseland area.

Riparian areas are typically diverse with habitats ranging from newly-forming sand and gravel bars to low and tall shrub thickets, grassland, open-growth cottonwoods, cottonwoods with a dense shrub understory, and abandoned channel wetlands. These habitats are dependent on major flood events for renewal.

Riparian habitats are some of the most productive breeding bird habitats in the semi-arid plains. About three-quarters of birds occurring in Alberta's Grassland region use riparian habitats for some portion of their life cycle (Wallis 1982). Some uncommon birds like Pileated Woodpeckers are found in these habitats. Colonies of Great Blue Herons nest in a few of the riparian woodlands.

Other valley habitats such as badland outcrops and eroded banks are important for birds of prey including the threatened Ferruginous Hawk. A small area of white spruce woodland occurs on north-facing slopes along the Bow River near Carseland in the County of Vulcan. The diverse valley environments also support significant deer populations. Widely distributed fish species characterize the study area's rivers and reservoirs.

Significant areas of grassland still persist in the study area, however, most of the native vegetation, especially Foothills Grassland, has been converted to cropland.

There is locally heavy grazing in the grasslands. Heavy grazing is the major disturbance in riparian habitats -- few areas of ungrazed or lightly grazed riparian vegetation remain.

4.0 EVALUATION OF ENVIRONMENTALLY SIGNIFICANT AREAS

4.0 EVALUATION OF ENVIRONMENTALLY SIGNIFICANT AREAS

Eagles (1984) stresses the need to have a standardized set of criteria for evaluating Environmentally Significant Areas (ESA's). These criteria fulfil several functions:

1. They allow a relatively systematic comparison of different sites and allow ranking schemes to be developed.
2. They help to outline the importance of sites to decision makers.
3. They stimulate research efforts towards refinement of definitions and concepts of significance.
4. They help to ensure similar approaches in other jurisdictions.
5. They aid in the process of boundary delineation as only those features that fulfil the criteria are included.

4.1 CRITERIA FOR ENVIRONMENTALLY SIGNIFICANT AREAS

Under the terms of reference, areas which had the following attributes were to be considered for this study:

1. "Hazard" lands and areas which are unsuitable for development in their natural state such as floodplains, permanent wetlands, and steep and unstable slopes; or which pose severe constraints on types of development such as areas of artesian flow and aeolian surficial deposits.
2. Areas which perform a vital environmental, ecological or hydrological function such as acquifer recharge.
3. Areas which contain rare or unique geological or physiographic features.
4. Areas which contain significant, rare or endangered plant or animal species.
5. Areas which are unique habitats with limited representation in the region or are a small remnant of once large habitats which have virtually disappeared.
6. Areas which contain an unusual diversity of plant and/or animal communities due to a variety of geomorphological features and microclimatic effects.
7. Areas which contain large and relatively undisturbed habitats and provide sheltered habitat for species which are intolerant of human disturbance.
8. Areas which provide an important linking function and permit the movement of wildlife over considerable distances, including migration corridors and migratory stopover points.

To the above, the following criteria were added based on a review of Eagles (1984) and the criteria established for the Calgary Region ESA's (Calgary Regional Planning Commission 1983):

9. Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region.

10. Areas with intrinsic appeal due to widespread community interest or the presence of highly valued features or species such as game species or sport fish.

11. Areas with lengthy histories of scientific research.

Size played some role throughout the evaluation. Areas were not initially rejected because of size, however, in the final analysis, some areas were only considered of local significance if they were relatively small areas and several larger areas of the same feature were available elsewhere in the region.

As most of the areas have experienced some degree of disturbance (roads, oil and gas development, pipelines, grazing) sites were not eliminated unless the natural vegetation cover had been completely removed. Several key areas designated on Alberta Fish and Wildlife maps are now cultivated. These include some waterfowl production areas which have been drained. Such sites have not been shown as ESA's, however, some have good potential for wetland restoration and development. Except for small inclusions, cultivated lands included in Fish and Wildlife's key ungulate areas have not been shown as ESA's in this study. This distinction is made as cultivated lands are abundant and increasing whereas natural habitats are more restricted and decreasing in areal extent.

Although they have been used in other jurisdictions, aesthetic factors were not used as a primary criteria for evaluating sites in the study area. However, many of the diverse landscapes and habitat areas are aesthetically pleasing to many people and add to the value of the ESA's. All areas with regionally, provincially or nationally significant, aesthetically pleasing natural landscapes have been identified as ESA's based on other criteria.

4.2 LEVEL OF SIGNIFICANCE

Evaluating areas in terms of their level of significance requires considerable knowledge of significant features outside the jurisdiction under study. In some cases, this is facilitated by lists of rare, threatened and endangered species (Wershler 1985; Wallis 1977; and Packer and Bradley 1984) or evaluations of natural ecosystem complexes or landscapes (Coupland 1973; Cottonwood Consultants 1983) which are available at provincial, national and international levels. In some fields, notably geology, there have been very few studies which summarize the significance or distribution of features. In these cases, professional judgement by several researchers has been used to determine the level of significance. The history of assigning significance levels shows that areas are generally underrated. As more information and methods of evaluation become available, then levels of significance can be altered accordingly.

With the exception of "hazard" lands, ESA's in the study area were further subdivided on the following basis:

Significance Level	Criteria
Regional	Features which are of limited distribution or are the best examples of a feature in the Oldman Regional Planning area.
Provincial	Features which are limited in distribution at a provincial level or which are the best examples of a feature in Alberta.
National	Features which are limited in distribution in Canada or which are the best or only representatives at a national level.

Map 1 shows the locations of Nationally, Provincially and Regionally Significant Sites in the County of Vulcan.

Included in the areas of regional significance are:

1. Extensive areas of native grassland.

2. Key areas for Mule Deer, White-tailed Deer, Antelope, Sharp-tailed Grouse, Great Blue Herons and colonial nesting waterfowl.*

3. Production and staging areas, including man-made reservoirs, for waterfowl or shorebirds.*

4. Nesting and feeding areas for birds of prey.

5. Diverse areas of natural habitat.

6. Habitats which support significant populations of plants or animals which are rare in the Oldman River Region.

7. Landforms, landscapes or geological features which are rare in the Oldman River Region.

8. Landforms, landscapes or geological features which remain in a natural state and which are the best examples of their types in the Oldman River Region.

Included in the areas of provincial significance are:

1. Relatively undisturbed and sizeable remnants of natural habitats which, elsewhere in Alberta, have been disturbed.

2. Habitats which support significant populations of plants or animals which are rare in Alberta.

3. Native plant communities or habitat assemblages which are the best examples of their type in Alberta.

Included in the areas of national significance are:

1. Areas which support some of the largest or only populations of rare plants or animals in Canada.

2. Relatively undisturbed and sizeable remnants of natural habitats which, elsewhere in Canada, have been disturbed.

3. Habitats for significant populations of plants or animals which are rare in Canada.

4. Areas which support natural habitat types which are rare in Canada.

"Significant populations" of rare plants or animals generally refers to populations which are self-sustaining. Occurrences of individuals or single nest sites are not considered significant unless they are one of very few localities for the species.

*Note: Where sufficient information is available, some of these areas have been upgraded in significance levels.

Areas of local significance are not presented on the maps. These are areas which may be important in a limited part of the Oldman River Region but which do not have sufficient biophysical resources to allow consideration at the regional level.

4.3 AREAS WITH MAJOR PHYSICAL CONSTRAINTS

Areas with major physical constraints or "hazard" lands include lands with the following characteristics:

1. floodplains
2. steep and unstable slopes
3. permanent wetlands
4. aeolian (often sand dune) areas
5. areas of artesian flow

Map 2 shows the locations of various types of "hazard" lands in the County of Vulcan.

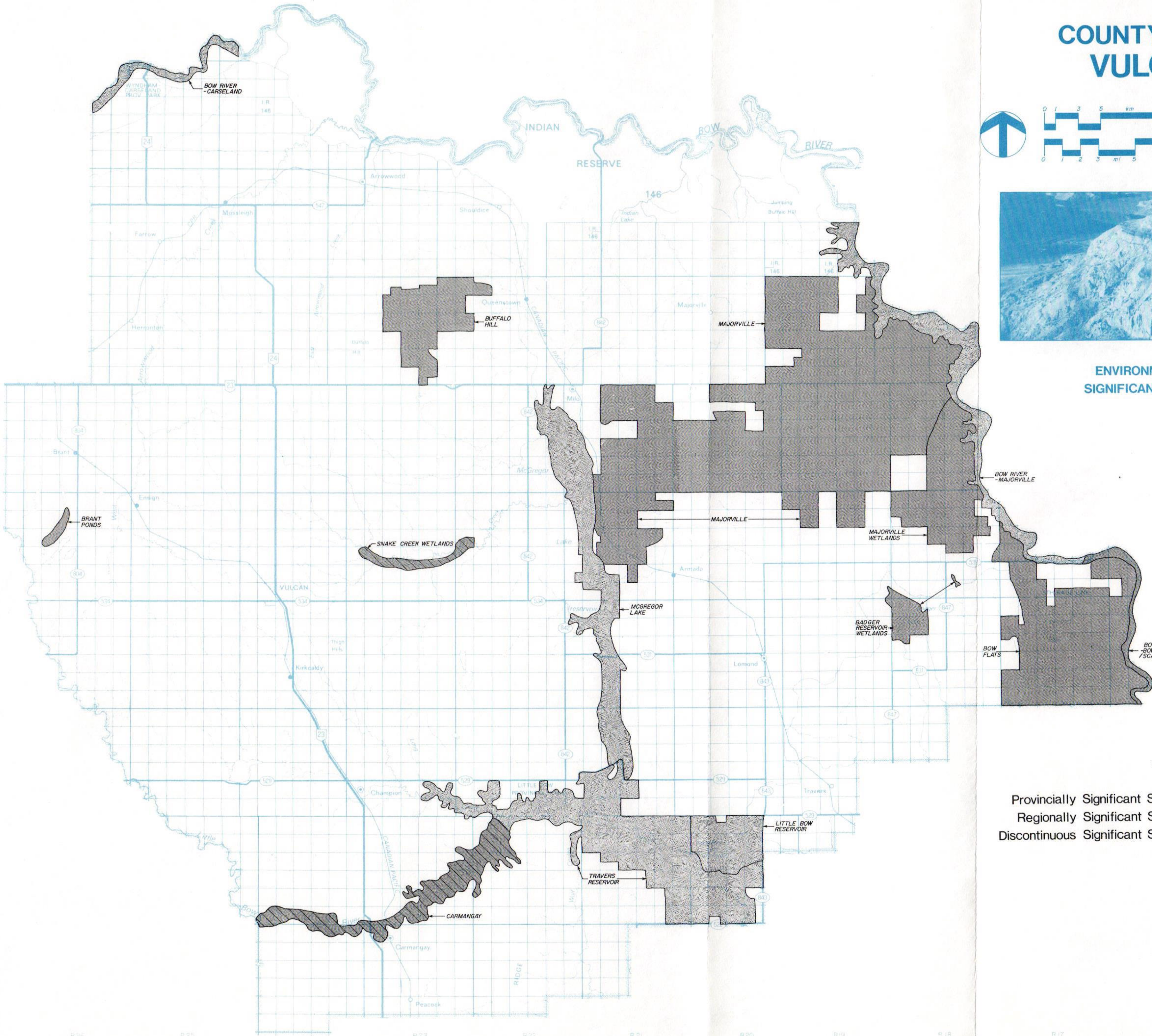
There is a history of significant flooding along the major rivers in the study area. All streams with mountain headwaters and those which are known to have experienced major flooding have been identified on the map showing areas with major physical constraints.

There are many steep slopes in the study area, however, not all are particularly hazardous. Because of non-environmental considerations, it is likely that the steepness of slope will limit development in most of these areas. Slopes identified as "hazards" in this study are both steep and unstable. Many of these occur on unconsolidated glacial lake deposits along the major river valleys in areas where recent slumping is apparent.

Permanent wetlands are unsuitable for the majority of developments. Aeolian (dune sand) areas have been identified from surficial geology maps (McPherson 1972; Shetsen 1987; Stalker 1955, 1961, 1965; Westgate 1968). Due to the ease with which soils on these sites can be eroded, significant problems could arise should the natural vegetation be removed.

Areas of artesian flow have been identified from hydrogeology maps (Tokarsky 1974; Stevenson and Borneuf 1977; Ozoray and Lytviak 1974; and Borneuf 1976). These are subsurface features which can create major and costly problems during construction or excavation, particularly if they are in low-lying areas.

COUNTY OF VULCAN


BOW RIVER -CARSELAND
WYNDHAM CARSELAND PROV. PARK
INDIAN
RESERVE
146
BOW
RIVER
Arrowwood
Mossleigh
Shouldice
Farrow
Queenstown
BUFFALO HILL
MAJORVILLE
Majorville
Herronton
Milo
Brant
Ensign
BRANT PONDS
SNAKE CREEK WETLANDS
VULCAN
McGregor
Lake
MAJORVILLE
MAJORVILLE WETLANDS
BOW RIVER -MAJORVILLE
Armada
MCGREGOR LAKE
BADGER RESERVOIR WETLANDS
BOW FLATS
BOW RIVER -BOW CITY /SCANDIA
Lomond
Kirkcaldy
Champion
LITTLE BOW RESERVOIR
TRAVERS RESERVOIR
Travers
CARMANGAY
Carmangay
Peacock
RIDGE
CANADIAN PACIFIC

ENVIRONMENTALLY SIGNIFICANT AREAS

·NATURAL

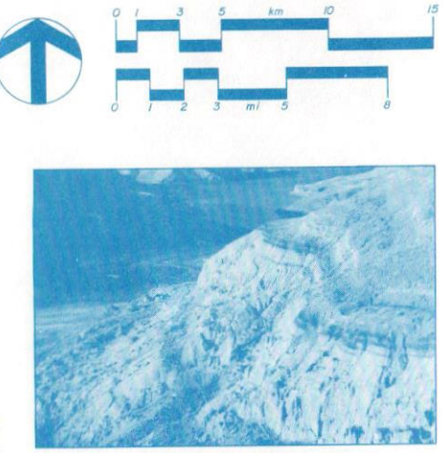
Provincially Significant Sites

Regionally Significant Sites

Discontinuous Significant Sites

MAP 1

COUNTY OF VULCAN



ENVIRONMENTALLY SIGNIFICANT AREAS

INDIAN RESERVE 146

BOW RIVER

VULCAN

LITTLE BOW PROVINCIAL PARK

5TH BASE LINE

HAZARD AREAS

- Aeolian Sand
- Floodplains
- Permanent Wetlands
- Unstable Slope Potential
- Area Of Artesian Flow

MAP 2

5.0 MANAGEMENT OF ENVIRONMENTALLY SIGNIFICANT AREAS

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5.0 MANAGEMENT OF ENVIRONMENTALLY SIGNIFICANT AREAS

The appropriate management of Environmentally Significant Areas (ESA's) is one essential component of a general environmental management strategy. Considering the extent of these resources and the compatibility of many existing land uses, it would neither be feasible nor desirable to achieve conservation goals through direct government ownership and control.

The various administrative agencies can provide assistance in the conservation of these sites through Integrated Plans, General Municipal Plans, Area Structure Plans, Area Redevelopment Plans and Land Use Bylaws. However, many land use practices, especially those on private lands, are not regulated at any level of government. Success in meeting objectives for ESA's on these lands can only be achieved through cooperative approaches with private landowners. Administrative agencies can provide support in these situations through information programs and acting as sources of resource information.

Key elements of ESA management include:

1. The integration of ESA conservation into existing administrative structures.
2. The maintenance of an environmental data base.
3. The development of administrative staff expertise in environmental management.
4. The use of environmental education to foster public awareness.

Effective ESA management will ensure the long-term maintenance of the area's features. Intensive manipulation may be necessary in a few instances but the most frequent management activity will probably be to guard against negative impacts. The specific management approaches for each ESA should be based on the requirements and sensitivities of the area's features.

5.1 GUIDING PRINCIPLES

Some guiding management principles have been set forth by Eagles (1984):

1. No major development should be permitted in ESA's due to detrimental impact or physical constraints.

2. Certain developments may be carried out subject to environmental impact analysis and appropriate mitigation if no feasible alternatives are available.

3. Long-term resource protection and management (and therefore long-term economic benefits) should have priority over short-term economic gains which result in the loss of future options.

4. Recognition of a site as an ESA does not imply that it will be purchased by a public agency or that it is open for public use.

5. Maintaining an environmental data bank is useful.

6. In-depth studies may be necessary in those areas that are subject to development threats in the near future. Proactive actions are preferable to reactive ones.

7. Further precision in delineating boundaries of ESA's can be obtained by more detailed field surveys. Environmental impact assessments can provide data that are useful for detailed boundary delineation, comparison of alternatives, assessment of long-term consequences, and development of management plans.

8. Buffers may be necessary but cannot be designed until the proposed activity is known and its impacts assessed.

9. Information dissemination is an important feature. Agencies and individuals cannot fully assist with site management if documentation is lacking. Publish ESA maps and supporting data so that all interested and involved parties, especially landowners, can be made aware of the features, their significance and management considerations.

10. ESA's should appear as a land-use designation in official plans and zoning by-laws, and not as an overriding development control over a variety of land use designations.

11. Appropriate procedures and staff must be available to ensure effective implementation and supervision of policies, plans and regulations.

12. Regulations, by-laws and policies should permit innovative approaches, including management agreements with owners of ESA's.

Some legal considerations have also been outlined by Eagles (1984):

1. A balance must be made between the land development rights of the landowner and the ecological common property rights of the public.

2. It is necessary to shift proposed incompatible uses out of ESA's.

3. An attempt should be made to allow private economic land use while limiting negative environmental impact. This is preferable to outright activity prohibition. The amount of restriction should not be greater than necessary.

4. ESA management should be intergrated with other resource management efforts such as recreation, forestry, and agriculture.

5. Regulation should be applied fairly and equally in private as well as government activities.

6. Local policy plans should contain broadly-based resource management policies as well as specific ESA policies.

7. Adjacent administrative districts should be encouraged to develop similar programmes to ensure consistency across jurisdictions.

5.2 SITE MANAGEMENT PLANS

Ultimately, it may be desirable to develop site management plans for each ESA. The first step is to determine management objectives such as protecting ecological diversity, maintaining or enhancing populations of rare species, increasing habitat diversity, commercial product exploitation and water level manipulation. Next, a detailed biophysical inventory of the ESA and adjacent lands should be carried out, and the current level and type of human impact should be documented. Based on this, management priorities for each feature (e.g. landform, process, species, habitat type) can be established including:

- level of alteration allowed or encouraged
- preferred amount of resource extraction
- methods for reducing harmful uses
- manipulative methods (e.g. burning, cutting, damming, grazing)
- protective methods (e.g. fencing, education, wardens)

Once the management priorities have been defined, then the various interested parties should cooperate in developing suitable arrangements to manage each site. Through simple techniques of encouragement, provision of information, and legal agreements, many management objectives can be met provided landowners are sympathetic.

5.3 SPECIFIC MANAGEMENT CONSIDERATIONS

In the Calgary Region ESA study several recommendations with respect to management of the major types of ESA's were made (Calgary Regional Planning Commission 1983). For natural sites, major types included significant natural landscapes, significant wildlife habitats, key fish habitats, and other areas of biological importance. To these we have added significant geological sites.

More detailed discussions of fire, grazing, off-road vehicle use and buffer zones with respect to the management of "natural areas" can be found in Bradley (1984).

5.3.1 Significant Natural Landscapes

Residential developments, extraction activities, transportation and utilities corridors, and cultivation are not compatible with the maintenance of the natural character of significant landscapes. The subdivision of a natural landscape into a number of parcels undermines ecological processes in the area. Properly sited individual dwellings may not greatly affect an area's overall character.

Highway commercial development, trailer parks, most commercial campgrounds, amusement attractions, all forms of non-extractive industrial development and intensive forms of agriculture, such as feedlots, poultry farms and nurseries are also considered incompatible with maintaining significant natural landscapes.

Commercial land uses such as guest ranches and destination resorts, which seek to conserve a large component of the natural landscape, may be quite appropriate provided that development and siting proceed in an environmentally responsive manner.

In some cases, buffer zones adjacent to significant natural landscapes may be needed to help screen these areas from adjacent residential, agricultural or industrial activities. Examples include the location of upland residences sufficiently far away from edges of significant natural valleys so that they are not visible from valley bottom positions. This will also provide the added benefit of avoiding soil stability problems which are encountered in several valley situations.

Recreation is often an important activity in natural landscapes. The effects on terrain, vegetation and wildlife can be significant. Some of the problems include garbage and human waste disposal and damage caused by all-terrain vehicles, illegal hunting and vandalism. While most land management and administrative agencies have limited powers in recreation management, they can help by:

1. Providing forums for landowners and recreationists to discuss their concerns and cooperate in formulating solutions such as designated access sites and designated travel routes.
2. Monitoring or coordinating the monitoring of recreational use in ESA's.
3. Providing funds for basic facilities and improvements, such as fencing and signage, which would help maintain environmental quality in ESA's on which landowners are permitting public access.

5.3.2 Significant Wildlife Habitats

Many of the management considerations discussed for natural landscapes would also benefit significant wildlife habitats. Alberta Fish and Wildlife maintains and updates its key area maps on a regular basis and keeps some of this information confidential. Potential changes in land use in ESA's should be discussed with Fish and Wildlife to determine any additional considerations beyond those expressed in this document. Some of the major wildlife management approaches are outlined below.

Riverside (riparian) woodland and shrub habitats are extremely important for deer and many species of migrating and nesting birds. Because of heavy grazing, water storage projects, cultivation of bottomlands, and stream flow regulation, these habitats have become some of the most threatened ecosystems in arid and semi-arid regions of the world (Johnson et al 1985; Boldt et al 1978; Tubbs 1980). Bradley and Smith (1986) and Rood and Heinze-Milne (1988) suggest that, without adequate consideration, these habitats may become extinct by the end of the next century. Regeneration of these habitats is dependent upon major flood events. Channelization and stream flow regulation can have serious negative impacts on ecosystem survival. Water storage projects and cultivation are not compatible with maintenance of these habitats. Gravel operations and road-building can be mitigated to prevent large-scale negative changes in riparian habitats.

Heavy grazing, particularly during early stages of cottonwood development, has been cited as a major cause of habitat loss in other jurisdictions (Gjersing n.d.; Smith and Flake 1981). High livestock densities associated with many rest-rotation systems may cause more damage to woody vegetation than other grazing systems. Complete rest for degraded riparian areas from livestock grazing may be required (Platts 1978) to reestablish healthy native plant communities. Severson and Boldt (1978) suggest that winter use of these habitats is less detrimental than use in other seasons. Kusler (1985) provides a model statute for riparian habitat management.

Big game species such as Mule Deer, White-tailed Deer and Antelope are highly valued species. Protection of critical wintering ranges and protecting animals from disturbance while on those ranges are important management considerations. Certain resource activities may be compatible in certain seasons but not during others. In many instances, the best methods of conserving big game habitat are to maintain natural habitat through native rangeland ranching operations or other non-intensive land uses.

Controlled burning should be considered in certain areas which have been protected from fire for so long that the habitat quality has deteriorated in grasslands or because of stagnation of shrub growth.

Significant waterfowl and marsh bird production areas are very local in the Oldman River Region. Currently dry water bodies, if not cultivated, could once again be productive during wet years. Wetland conservation involves maintaining existing water regimes; operating man-made water-bodies with waterfowl, colonial birds and marsh habitats in mind; protecting wetlands, including dry lake beds, from encroachment by non-compatible land uses such as cultivation; and protection of adjacent shoreline and upland vegetation where it still exists.

Perhaps the most significant consideration is to allow natural water flows to enter the wetland basins and augment these where water is removed for other purposes. Drainage, in-filling and cultivation of wetlands are clearly not compatible with wetland maintenance. Moreover, adjacent shorelines and uplands are important to nesting waterfowl and certain land use activities may have to be curtailed at least on a seasonal basis if wetland productivity is to be maintained. Cultivation to the edge of significant wetlands should be discouraged.

Water storage projects may provide additional wetland habitat, however, impacts on existing marsh systems should be assessed. In some cases, valuable habitat for rare shorebirds may be flooded out to produce duck species which may already be common in the area.

Certain colonial nesting birds such as gulls and highly localized species like the Double-crested Cormorant and American White Pelican are able to nest on man-made lakes provided islands are made available. Water levels during the nesting season cannot flood the islands if nesting is to be successful.

Several birds of prey, including the threatened Ferruginous Hawk, are sensitive to human activities especially during early stages of the nesting season. As in the case of some of the big game species, it may be necessary to curtail certain activities on a seasonal basis to ensure successful nesting and rearing of young. Additionally, maintenance of adjacent uplands in natural cover is necessary in providing an ample supply of prey species.

A variety of grazing regimes in native grasslands is essential to maintaining the full complement of native animals (Wallis 1982). Some uncommon or threatened birds like the McCown's Longspur, Ferruginous Hawk and Burrowing Owl thrive in heavily grazed Mixed Grasslands while others like the Baird's Sparrow and Grasshopper Sparrow require ungrazed or lightly grazed areas (Kantrud and Kologiski 1982). Species in the Mixed Grassland are adapted to a wider variety of grazing intensities than those of the Foothills Grassland. Foothills Grassland birds show a distinct preference for ungrazed and moderately or lightly grazed areas.

Overwintering areas (hibernacula) for snakes are very locally distributed in Alberta and the availability of these sites is a major limiting factor in their life cycles. Excavation of hibernacula, cultivation of adjacent lands and large-scale elimination of snakes will result in the loss of these local populations.

5.3.3 Key Fish Habitats

The management of key fish habitats is more problematical than management of other ESA's. Fish migrate extensively within the drainage system. While certain reaches may be more significant than others, land uses well outside those areas may have profound impacts on them. While direct conservation and protection of spawning habitat may be helpful in the most significant reaches, it is important to promote sound land management practices throughout the drainage basins. These are essential to the maintenance of fish migration routes and water quality and quantity. While no major sport fisheries are found in the study area, many of the recommendations for maintaining fish habitat also improve water quality and keep the rivers suitable for a variety of other lifeforms.

Detailed information on current impacts and water management considerations for fish can be found in Longmore and Stenton (1981) and Platts (1978; 1979). The following is a summary of their major findings.

Logging, agriculture and former stripmining activities have resulted in increased runoff and channel erosion in tributary streams throughout the Oldman drainage. Elsewhere in the study area, abstraction of water for irrigation has significantly reduced flows and agricultural activities have resulted in a significant deterioriation of the water quality. This has greatly reduced fish habitat along some streams.

Water quality and quantity are affected by sewage disposal, storm sewer runoff, runoff from agricultural land and feedlots, water abstraction for domestic and agricultural use, stream regulation and water storage, and disruption of streambeds by channelization, diking, seismic line crossings, and construction of bridges and pipelines. Cattle can trample streambanks, making them unstable and susceptible to erosion and also cause local pollution and eutrophication.

Nutrient loading of streams and rivers because of municipal sewage or feedlot waste disposal combined with seasonally low flows can substantially affect water quality. Residues from fertilizers, herbicides, pesticides and a number of other toxins find their way into waterbodies via storm sewers and runoff from agricultural lands and feedlots. While there is little direct action that can be taken in many of these instances, major pollution sources such as feedlots should be located away from watercourses. There is evidence in some areas of nutrient loading exceeding the maximum acceptable levels for adequate protection of fisheries and aquatic life. Monitoring of existing operations would help to more fully determine the extent of any current problems.

Reduced flows from diversion of water for other uses results in higher water temperatures, lower dissolved oxygen levels and a reduced ability of the streams to assimilate waste. Flow augmentation may be necessary to counteract the negative effects. Stabilization of water flows by impoundment structures may increase overall stream productivity but may have adverse effects on riparian habitats if peak floods are controlled (see previous section).

Impoundment structures such as weirs and dams act as barriers to fish movement, thereby reducing the viability of populations which are dependent on a variety of reaches in the drainage basin. The potential impact of any in-stream barrier requires careful consideration. Fish often migrate long distances to spawn in headwater streams. Improperly designed weirs, road crossings, or man-made channel constrictions in small tributary streams may have significant impacts on important downstream fisheries. Design of fish passage facilities into these structures can significantly reduce impacts.

Significant spawning habitats must be protected from major inputs of silt which can cause the loss of viability in developing eggs. Land use and construction practices adjacent to spawning streams should be carefully considered. Maintaining a buffer zone of natural vegetation along streambanks is helpful in controlling runoff problems. Fencing streambanks from cattle use can significantly increase stream productivity. Sewer outfalls and other direct input sources of toxins or effluent should not be located in spawning streams. The deposition of material on the bed or banks of spawning streams should be prohibited.

5.3.4 Other Considerations for Areas of Biological Importance

Specific management guidelines should be drawn up for rare and endangered plant and animal species. Where known, these have been cited in the wildlife and fish management sections and in the area descriptions. The management and monitoring of most rare and endangered plants and animals is still in its infancy. As knowledge increases, management techniques will improve.

Major concerns already identified in the study area include:

1. Stabilization of active blowouts in sand dune areas could ultimately eliminate or further reduce populations of rare plants.

2. While heavy grazing may be beneficial to several upland Mixed Grassland plants, it may reduce or eliminate populations of rarer plants along stream valleys and wetlands in the Mixed Grassland and generally decrease the plants which are characteristic of Foothills Grassland.

3. Large blocks of habitat are generally preferable to small parcels in that native plants and animals are better able to withstand the direct and indirect effects of adjacent land uses over the longer term (Graul 1980).

5.3.5 Significant Geological Sites

All geological sites identified in this study are most significant in their undisturbed state. With the exception of intensive developments such as mining, sand and gravel extraction, and flooding by water storage projects, most current land uses are compatible with maintenance of geological features. Recreational users sometimes vandalize features but these instances are relatively limited in scope.

5.3.6 Areas with Major Physical Constraints

Extreme care should be taken when considering developments in areas which have major physical constraints:

1. floodplains
2. steep and unstable slopes
3. permanent wetlands
4. aeolian deposits
5. artesian flow areas

Several floods in this region have had major impacts (Warner 1973), especially on the Oldman River.

In addition to the usual cautions related to siting permanent structures in floodplains, planners should be aware that the alluvial gravels found along most stream valleys act locally as major aquifers (D. Borneuf, Alberta Research Council, personal communication). Even though they may be situated well-back from the modern floodplain, septic tanks and other sources of pollution such as feedlots situated on these areas can contaminate large areas of precious groundwater supplies in a short period of time.

The slopes identified on the maps are both steep and unstable with active slumping occurring in many areas. It should be noted that because of the map scales, it was impossible to delineate some minor areas on the maps. Developments should be sited well-back from these slopes. Additional moisture from irrigation amplifies any problems which may exist under natural conditions and this should be taken into account when locating permanent structures.

Aeolian deposits are very susceptible to erosion should the natural cover be removed. In addition, improperly constructed irrigation canals in aeolian areas can create salinization problems by allowing salts to be carried further during spring runoff. One of the best management strategies for these areas is to leave them in native rangeland.

Areas of artesian flow pose severe constraints for construction and excavation, especially where these occur in low-lying areas. Water well drilling in such areas tends to be ineffective and extremely costly.

Groundwater is a precious resource in the arid plains. Improperly cased wells drilled into Milk River Formation sandstone have caused leakage into other formations with a resulting drop in water levels and increase in salinity. Some wells which used to be flowing at the surface are now almost 100 m below ground (Meyboom 1960; D. Borneuf, personal communication).

Most upland areas are important to local groundwater flows as they serve as groundwater recharge sites. Summerfallowing and cultivation of upland sites can lead to salinization of soils at lower elevations. Disposal or placement of toxic materials and wastes in regionally significant recharge areas could result in contamination of large areas of precious groundwater supplies. Researchers at the Alberta Research Council provide excellent advice with respect to precious groundwater resources.

6.0 DATA GAPS

6.0 DATA GAPS

The most well-studied resources are the hydrological (Cherry et al 1972) and geological features, although significant paleontological resources probably still remain undiscovered.

The most conspicuously lacking information is with respect to the site specific distribution of rare plants and animals. While the critical habitats for some species such as birds of prey are reasonably well-documented, only patchy research has been undertaken on smaller mammals, songbirds, reptiles, amphibians, non-sport fish, invertebrates, and plants.

We are, however, confident that all rare species known for the study area are represented in habitats which have been incorporated into Environmentally Significant Areas (ESA's) for other reasons. While minor areas of rare plant and animal habitats may still not be defined, the most significant concentrations of rare plants and animals should be accounted for by this study. The details of rare plant and animal distribution within most of the ESA's are not known. Although areas of potential habitat could be extracted from existing data, further field studies are required to accurately define the specific distribution of rare plants and animals.

Considerably more work is needed at regional, provincial and national levels to assess the significance of sites for lower plants and animals.

7.0 FUTURE RESEARCH

7.0 FUTURE RESEARCH

More detailed studies should be undertaken in areas which are considered a priority either because of their high significance levels or because of planned developments. Suggestions for the type of information to be gathered and the level of detail are provided in the Environmentally Significant Area Checksheet which follows. A map of each site showing the principal biological and landform features should also be prepared.

Further research into the interactions of groundwater and surface water bodies such as lakes and smaller wetlands would contribute greatly to the management of significant water bodies.

An ongoing program of data acquisition and storage will build upon the basic information provided by this study. The cooperation of the Oldman River Regional Planning Commission, agencies at all levels of government, landowners, researchers and naturalists would greatly enhance the type and amount of information collected. Initial studies should be directed to further identification of sites of rare, threatened or endangered plants and animals. Integration with other studies such as the Alberta Bird Atlas project would also be helpful.

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8.0 REFERENCES

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9.0 ENVIRONMENTALLY SIGNIFICANT AREA CHECKSHEETS

9.0 ENVIRONMENTALLY SIGNIFICANT AREA CHECKSHEETS

Results of the inventory of Environmentally Significant Areas in the County of Vulcan are represented on the following checksheets.

Preceding the detailed checksheets is an overview of the Environmentally Significant Areas arranged by level of significance (regional, provincial, national or international). Included in this summary are brief outlines of the major features for each Environmentally Significant Area.

The more detailed Environmentally Significant Area checksheets are arranged in alphabetical order. A map and photograph accompany each ESA description along with details of the site location, major features, other biophysical features, level of significance, criteria for significance rating, major management considerations, and pertinent references.

OVERVIEW OF ENVIRONMENTALLY SIGNIFICANT AREAS
COUNTY OF VULCAN

REGIONALLY SIGNIFICANT SITES

Site Name	Major Features
BADGER RESERVOIR WETLANDS	Reservoir and Pond Waterfowl Staging and Production Area Migrating Shorebirds
BOW FLATS	Extensive Mixed Grassland on level Terrain Rare and Threatened Bird of Prey Feeding Area Numerous Permanent Wetlands Waterfowl Staging and Production Area Variety of Marshbirds Minor Sand Dunes Rare Plants
BOW RIVER - BOW CITY/SCANDIA	Shallow River Valley Exposed Banks and Rock Outcrops Rare Bird of Prey Nesting Area Waterfowl Staging Area American White Pelican Feeding Area
BRANT PONDS	Alkaline Ponds Nesting and Migrating Shorebirds Waterfowl Staging and Production
BUFFALO HILL	Strongly Rolling Hummocky Moraine Well-managed Foothills Fescue Grassland Deer Habitat Kame
CARMANGAY	Narrow River Corridor Discontinuous Natural Habitat Nesting Area for Birds of Prey Key Deer Habitat

MAJORVILLE	Well-managed Native Mixed Grassland Hummocky Moraine Nesting Burrowing Owls Bird of Prey Feeding Area Wintering and Migrating Birds of Prey Numerous Wetlands
MAJORVILLE WETLANDS	Small Ponds Waterfowl Production and Staging Area Shorebird Protection Extensive Mixed Grassland Rare and Threatened Bird of Prey Feeding Area
SNAKE CREEK WETLANDS	Waterfowl Production Area

PROVINCIALLY SIGNIFICANT SITES

Site Name	**Major Features**
BOW RIVER - MAJORVILLE	Shallow River Valley Coulees, Badlands and Cliff Faces Extensive Nesting Area for Rare Birds of Prey Historic Peregrine Falcon Nesting Area Major Waterfowl Staging Area American White Pelican Feeding Area
BOW RIVER - CARSELAND	Shallow River Valley Extensive Riparian Woodland and Shrubbery Great Blue Heron Colony Waterfowl Production and Staging Area High Diversity of Breeding Birds Ungrazed Riparian Woodland Islands Key Deer habitat White Spruce Stands
LITTLE BOW RESERVOIR	Reservoir with Islands Waterfowl Staging and Production Area Double-crested Cormorant Colony American White Pelican Feeding Area Native Mixed Grassland Nesting Burrowing Owls
MCGREGOR LAKE	Large Reservoir Major Waterfowl Staging and Production Area Large Numbers of American White Pelicans Shorebird Production and Migration
TRAVERS RESERVOIR	Large Reservoir Major Waterfowl Staging and Production Area American White Pelican Feeding Area Badlands and Eroding Coulees Key Deer Habitat High Density of Nesting Rare Birds of Prey Historical Peregrine Falcon Nesting Area

ENVIRONMENTALLY SIGNIFICANT AREA CHECKSHEETS (Format)

Name: Short name which readily identifies the site.

Location: Describe the general location, Section, Township, Range, Meridian, or UTM coordinates. Map the area on 1:50,000 map or aerial photograph.

Significant Features: Only those features which are significant should be described here; general biophysical descriptions should be provided in an overview report and major biophysical units should be outlined on maps. Significant features to be described include:

Wildlife (Rare Mammals, Birds, Reptiles, Amphibians, Fish, Invertebrates)

Wildlife Habitats (diverse or productive areas)

Rare Plants

Vegetation (representative or excellent examples of plant communities)

Landforms and Geological Features (unusual or uncommon types as well as excellent examples of the feature)

Hydrological Features (major springs and seepage areas)

Level of Significance: Regional, provincial, national, international (see Section 4.0 of this report).

Criteria: Criteria used in determining significance should be well-defined (see Section 4.0 of this report).

Management Considerations: Describe current land uses and potential impacts of current or proposed land uses and any management strategies which may be useful in maintaining the significant features.

References: Any references which describe biophysical resources in further detail or which provide insight into management or significance of the resources.

BADGER RESERVOIR WETLANDS

COUNTY OF VULCAN

SCALE - 1:125,000

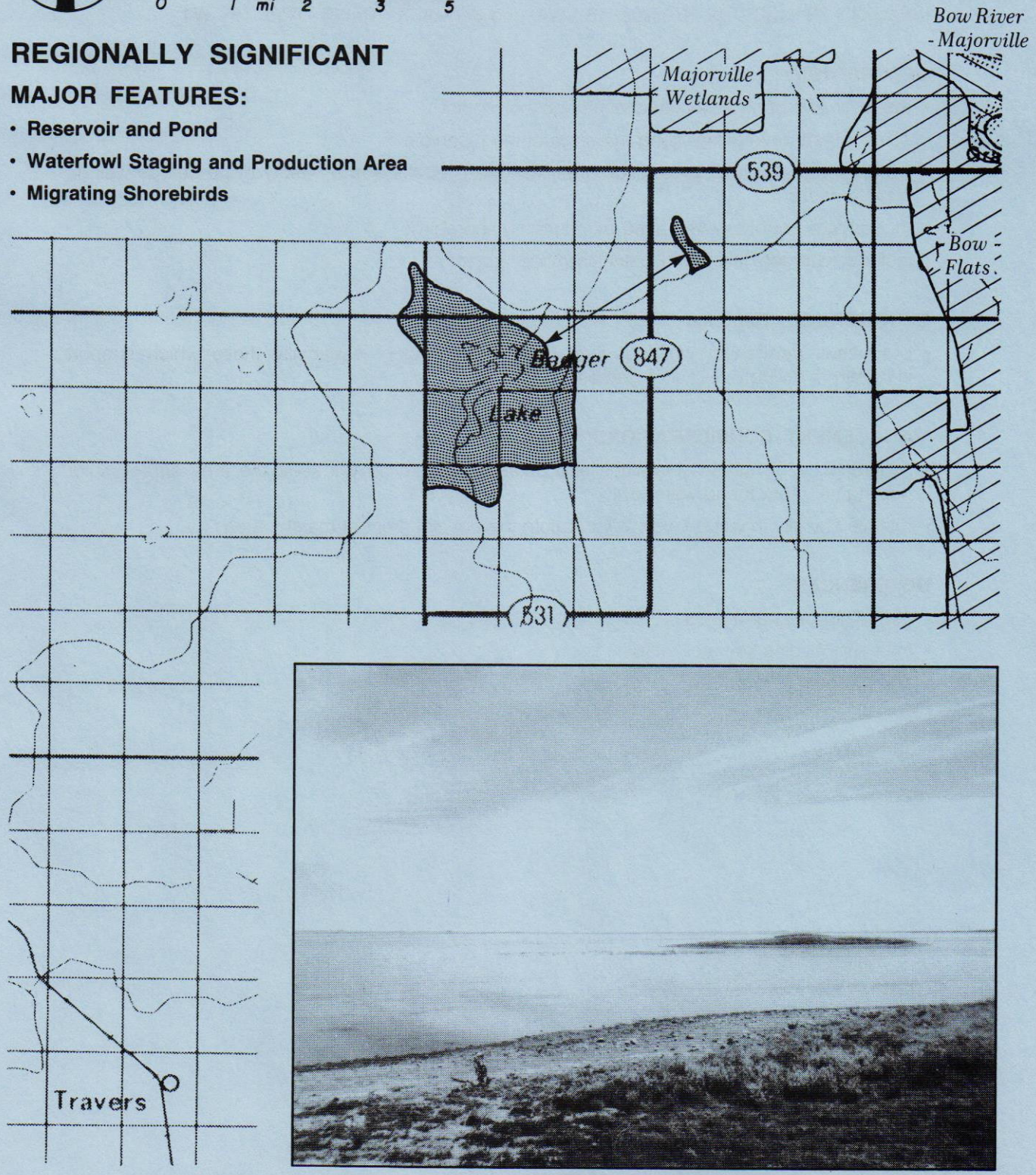
0 1 km 3 5 7

0 1 mi 2 3 5

REGIONALLY SIGNIFICANT

MAJOR FEATURES:

- Reservoir and Pond
- Waterfowl Staging and Production Area
- Migrating Shorebirds



BADGER RESERVOIR WETLANDS
COUNTY OF VULCAN

SITE LOCATION:

- 12 km northwest of Lomond
- Sections 29 to 32 - Tp. 16 - Rge. 18 - W4, and Section 3 - Tp. 17 - Rge. 18 - W4

DESCRIPTION:

- reservoir and pond associated with irrigation project
- some marsh developing along the edge of the reservoir
- waterfowl staging and production area, for diving ducks and a variety of grebes as well as puddle ducks
- muddy and pebbly shores used by migrating shorebirds
- includes Badger Reservoir Ducks Unlimited project

SIGNIFICANCE: Regional

- productive permanent wetlands are local in the region, especially those which support shorebirds, diving ducks and grebes

MANAGEMENT CONSIDERATIONS:

- maintenance of natural shorelines and adjacent vegetation will keep the area attractive for nesting shorebirds and waterfowl
- relative stability in water levels will promote the development of marshy areas

REFERENCES:

- 1987 field program notes
- Fish and Wildlife key area maps

BOW FLATS
COUNTY OF VULCAN

SCALE - 1:125,000

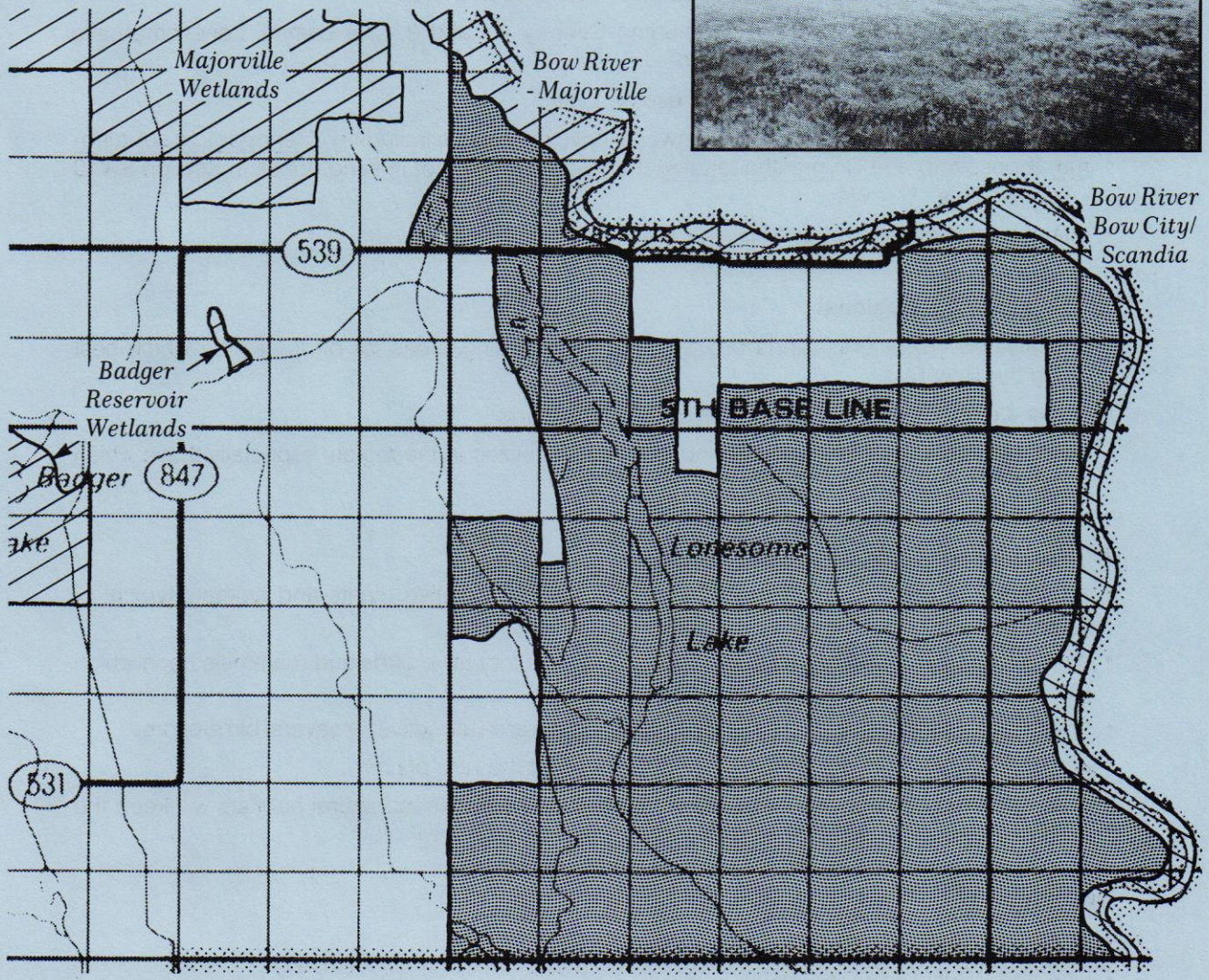
0 1 km 3 5 7

0 1 mi 2 3 5

REGIONALLY SIGNIFICANT

MAJOR FEATURES:

- Extensive Mixed Grassland on Level Terrain
- Rare and Threatened Bird of Prey Feeding Area
- Numerous Permanent Wetlands
- Waterfowl Staging and Production Area
- Variety of Marshbirds
- Minor Sand Dunes
- Rare Plants



BOW FLATS
COUNTY OF VULCAN

SITE LOCATION:

- west side of Bow River directly south of Bow City
- Tp. 16 and 17 - Rge. 16 and 17 - W4

DESCRIPTION:

- extensive mixed grassland on level terrain
- feeding area for several rare birds of prey, including Golden Eagle, Prairie Falcon and Ferruginous Hawk (a threatened species)
- numerous permanent wetlands, including cattail and bulrush marshes, along western boundary associated with irrigation development and habitat enhancement projects
- important waterfowl staging and production area, for diving ducks and several grebe species as well as puddle ducks
- habitat for a variety of marshbirds and some shorebird migration
- Black-crowned Night Heron and Great Blue Heron feeding area
- several Ducks Unlimited projects including Century #1 and 2, Lost Lemon, Lonesome Lake Extension, Kapkey, and Hamm's Dam
- American White Pelicans feed on Lonesome Lake
- minor sand dunes with small active blowouts have rare plants including Chenopodium subglabrum (goosefoot) and Cryptantha fendleri (Fendler's cryptanthe) in sand dunes in Section SW13 - Tp. 16 - Rge. 17 - W4
- unit extends southward into M.D. of Taber

SIGNIFICANCE: Regional

- uncultivated native grasslands provide important feeding areas for birds of prey which nest along the Bow River
- active sand blowouts are rare in the mixed grasslands
- major staging and production wetlands are very localized in the region, especially those which support "diving" ducks and grebes

MANAGEMENT CONSIDERATIONS:

- a diversity of grazing regimes will maintain a variety of native plants and animals typical of mixed grasslands
- cultivation reduces the productivity of the grasslands for native birds and mammals upon which rare birds of prey are dependent
- maintenance of ground squirrel numbers will keep the area attractive for several birds of prey
- active sand blowouts are essential to the survival of the rare plants
- relative stability in the water levels and maintenance of adjacent natural habitats will keep the area attractive for a variety of migratory and nesting waterfowl

REFERENCES:

- 1987 field program notes
- Fish and Wildlife key area maps
- Wallis (1986) and Packer and Bradley (1984) for rare plant status

BOW RIVER – BOW CITY/SCANDIA
COUNTY OF VULCAN

SCALE - 1:125,000

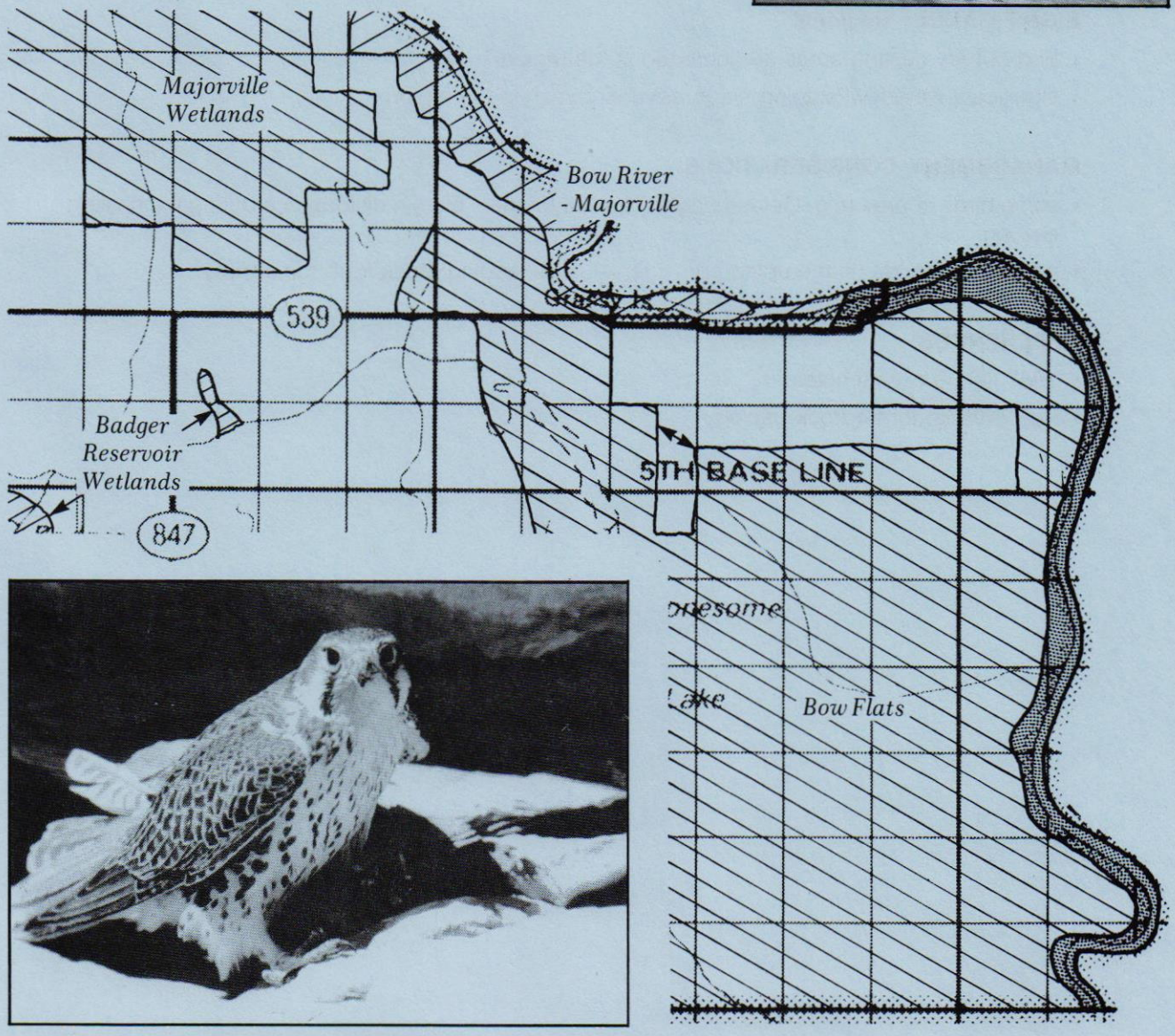
0 1 km 3 5 7

0 1 mi 2 3 5

REGIONALLY SIGNIFICANT

MAJOR FEATURES:

- Shallow River Valley
- Exposed Banks and Rock Outcrops
- Rare Bird of Prey Nesting Area
- Waterfowl Staging Area
- American White Pelican Feeding Area



BOW RIVER – BOW CITY/SCANDIA
COUNTY OF VULCAN

SITE LOCATION:

- Bow River valley south of Bow City
- Tp. 16 and 17 - Rge. 16 - W4

DESCRIPTION:

- shallow river valley with exposed banks and rock outcrops
- nesting area for rare birds of prey including Prairie Falcons and Golden Eagles
- feeding area for American White Pelicans
- waterfowl staging area in summer and fall, especially for puddle ducks
- unit extends southward into M.D. of Taber

SIGNIFICANCE: Regional

- bird of prey nesting areas are localized in the region
- significant waterfowl staging areas are uncommon in the region

MANAGEMENT CONSIDERATIONS:

- some birds of prey (e.g. Golden Eagles) are intolerant of human disturbance during the nesting season
- native grasslands on the upland provide valuable feeding areas for birds of prey

REFERENCES:

- 1987 field program notes
- Irish (1967a) for bedrock geology

BOW RIVER – CARSELAND
COUNTY OF VULCAN

SCALE - 1:125,000

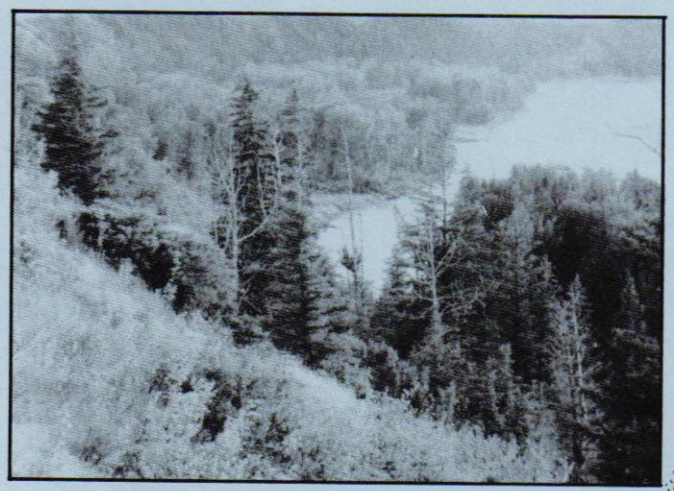
0 1 km 3 5 7

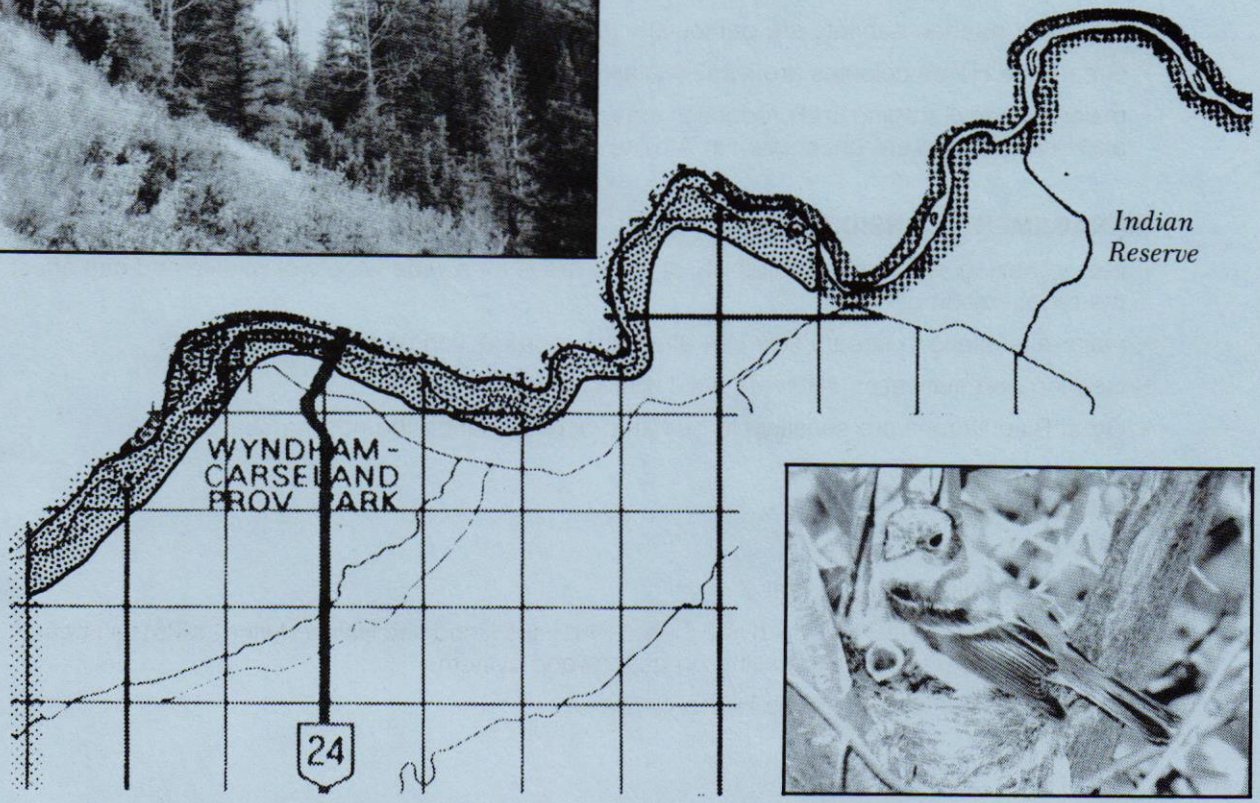
0 1 mi 2 3 5

PROVINCIALLY SIGNIFICANT

MAJOR FEATURES:

- Shallow River Valley
- Extensive Riparian Woodland and Shrubbery
- Great Blue Heron Colony
- Waterfowl Production and Staging Area
- High Diversity of Breeding Birds
- Ungrazed Riparian Woodland Islands
- Key Deer Habitat
- White Spruce Stands





BOW RIVER – CARSELAND
COUNTY OF VULCAN

SITE LOCATION:

- Bow River valley south of Carseland
- Tp. 21 and 22 - Rge. 25 - W4

DESCRIPTION:

- narrow natural corridor along shallow river valley
- extensive riparian woodland and shrubbery
- high diversity of breeding birds
- ungrazed riparian woodland islands
- Pileated Woodpecker habitat
- key Mule Deer and White-tailed Deer habitat
- Great Blue Heron colony in Section 35 - Tp. 21 - Rge. 25 - W4
- white spruce stands on north-facing slopes
- major waterfowl staging and production area
- used extensively by Double-Cormorants and Common Mergansers in addition to a variety of other waterfowl

SIGNIFICANCE: Provincial

- extensive and productive riparian habitats are very localized in Alberta and are some of the most threatened habitats in arid and semi-arid regions of the world
- ungrazed riparian habitats are particularly rare
- Great Blue Heron colonies are local in Alberta
- major waterfowl staging and production areas, especially those used by mergansers, cormorants and diving ducks are uncommon in Alberta

MANAGEMENT CONSIDERATIONS:

- heavy grazing reduces the suitability of these areas for a wide variety of wildlife and can affect the regeneration of trees
- major alterations in stream flow can affect the reproduction of cottonwood forests
- clearing and cultivation eliminate habitat diversity
- Great Blue Herons are sensitive to human presence during the nesting season

REFERENCES:

- 1987 field program notes
- Fish and Wildlife key area maps
- Bradley and Smith (1986), Smith and Flake (1981) and Rood and Heinze-Milne (1988) for impacts of altered stream flow and grazing on cottonwood systems
- Vermeer (1969) for Great Blue Heron colony

BOW RIVER – MAJORVILLE
COUNTY OF VULCAN

SCALE - 1:125,000

0 1 km 3 5 7

0 1 mi 2 3 5

I.R. 146

Majorville

Majorville Wetlands

Bow Flats

539

PROVINCIALLY SIGNIFICANT

MAJOR FEATURES:

- Shallow River Valley
- Coulees, Badlands and Cliff Faces
- Extensive Nesting Area for Rare Birds of Prey
- Historic Peregrine Falcon Nesting Area
- Major Waterfowl Staging Area
- American White Pelican Feeding Area

BOW RIVER – MAJORVILLE
COUNTY OF VULCAN

SITE LOCATION:

- Bow River valley from Bow City upstream to Blackfoot Indian Reserve
- Tp. 17 to 20 - Rge. 17 to 19 - W4

DESCRIPTION:

- shallow valley with some coulees and exposed badlands and cliff faces
- extensive nesting area for birds of prey including Prairie Falcons, Golden Eagles and Ferruginous Hawks (a threatened species)
- major waterfowl staging area in summer and fall, especially for puddle ducks
- staging area for several shorebirds
- American White Pelican feeding area
- minor geological faults in 29-17-17-W4 and 2-18-18-W4

SIGNIFICANCE: Provincial

- waterfowl numbers along this portion of the Bow River are of provincial significance
- productive bird of prey nesting habitat is very localized in Alberta
- major waterfowl staging areas are local in the region
- American White Pelicans are considered "vulnerable" in Alberta

MANAGEMENT CONSIDERATIONS:

- some birds of prey (e.g. Golden Eagles) are intolerant of human disturbance during the nesting season
- maintaining adjacent upland grassland in native species provides feeding habitat for birds of prey

REFERENCES:

- 1987 field program notes
- Irish (1967a) for bedrock geology
- Wayne Smith (personal communication) for birds of prey

BRANT PONDS
COUNTY OF VULCAN

SCALE - 1:125,000

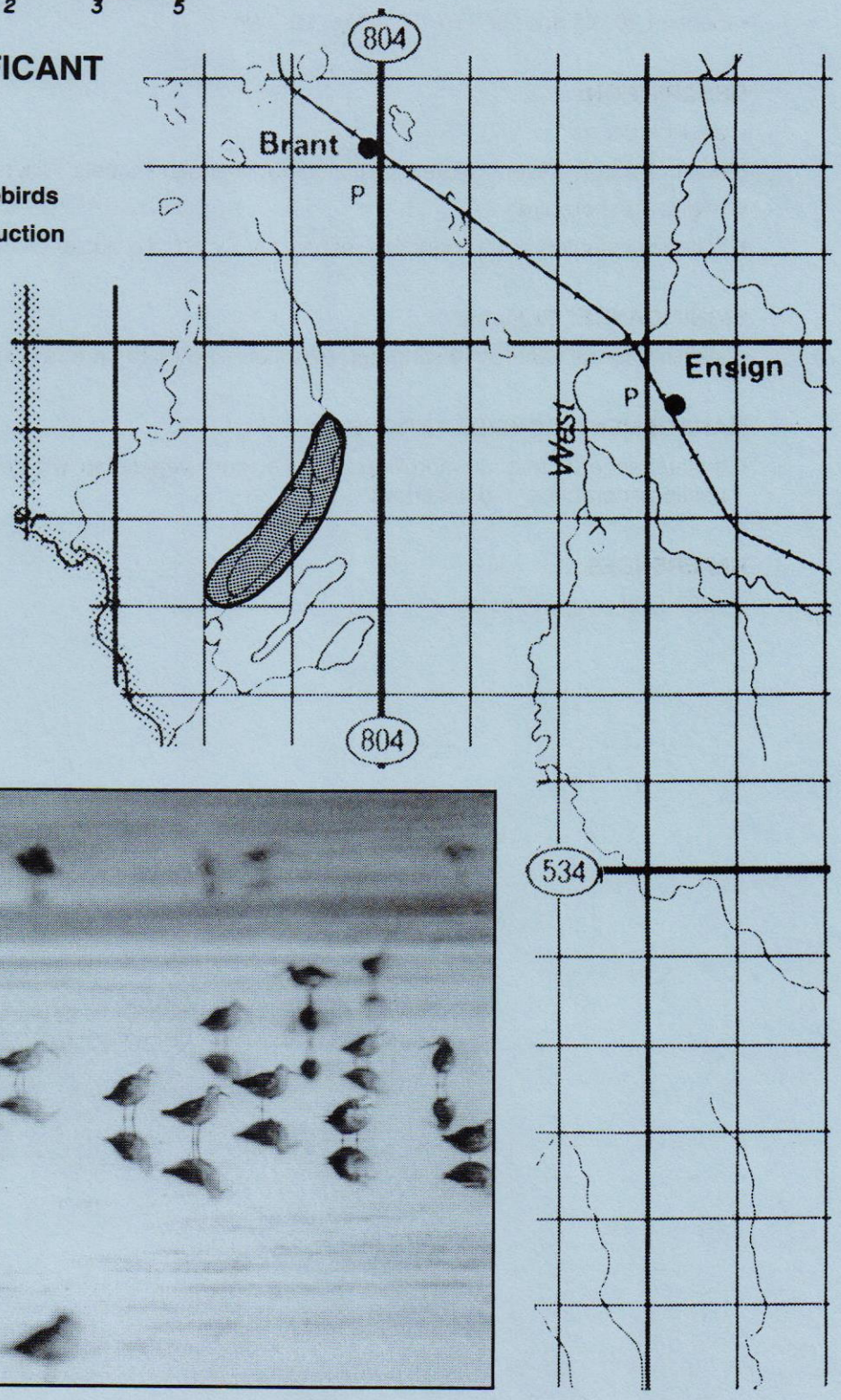
0 1 km 3 5 7

0 1 mi 2 3 5

REGIONALLY SIGNIFICANT

MAJOR FEATURES:

- Alkaline Ponds
- Nesting and Migrating Shorebirds
- Waterfowl Staging and Production



Tp 17

BRANT PONDS
COUNTY OF VULCAN

SITE LOCATION:

- 5 km south of Brant
- Section 20, 28 and 29 - Tp. 17 - Rge. 26 - W4

DESCRIPTION:

- alkaline ponds
- nesting area for several shorebirds including American Avocets, Willets and Wilson's Phalaropes
- migrating shorebirds
- waterfowl staging and production, especially for puddle ducks

SIGNIFICANCE: Regional

- alkaline ponds used by nesting and migratory shorebirds are rare in the region

MANAGEMENT CONSIDERATIONS:

- maintenance of natural shorelines and adjacent vegetation will keep the area attractive for nesting shorebirds and waterfowl

REFERENCES:

- 1987 field program notes

BUFFALO HILL
COUNTY OF VULCAN

SCALE - 1:125,000

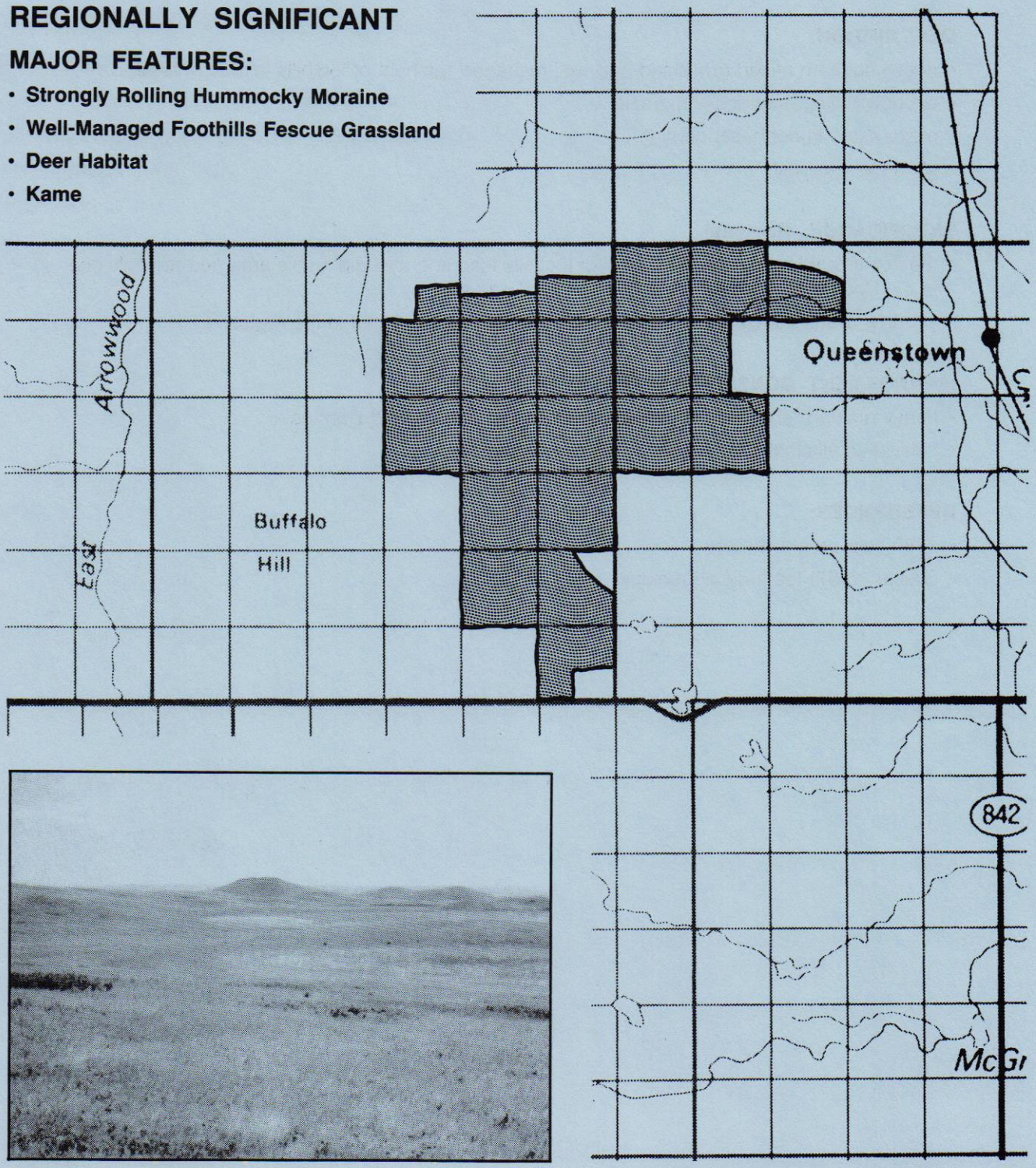
0 1 km 3 5 7

0 1 mi 2 3 5

REGIONALLY SIGNIFICANT

MAJOR FEATURES:

- Strongly Rolling Hummocky Moraine
- Well-Managed Foothills Fescue Grassland
- Deer Habitat
- Kame



BUFFALO HILL
COUNTY OF VULCAN

SITE LOCATION:

- 11 km south of Arrowwood
- Tp. 19 - Rge. 22 and 23 - W4

DESCRIPTION:

- native northern mixed grassland and well-managed remnant of foothills fescue grassland
- strongly rolling hummocky moraine
- major kame in northeast corner
- Mule Deer habitat

SIGNIFICANCE: Regional

- the last sizeable uncultivated parcel of foothills fescue grassland in this area and the only one in the County of Vulcan
- strongly rolling landscapes in the grasslands are very localized in the region

MANAGEMENT CONSIDERATIONS:

- heavy grazing reduces many characteristic fescue grassland species
- cultivation eliminates many native plants and animals

REFERENCES:

- 1987 field program notes
- Stalker (1957) for surficial geology

CARMANGAY
COUNTY OF VULCAN

SCALE - 1:125,000

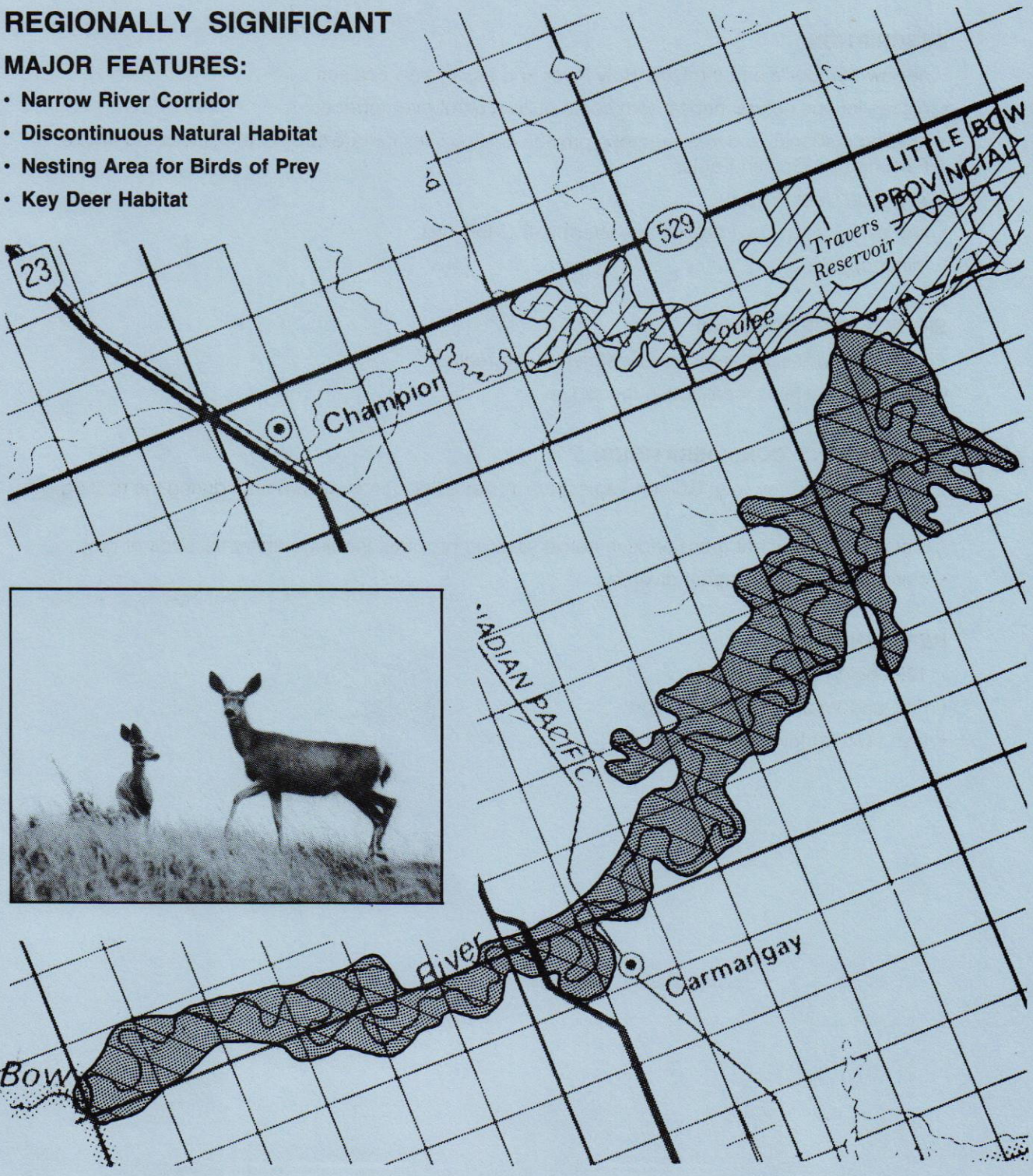
0 1 km 3 5 7

0 1 mi 2 3 5

REGIONALLY SIGNIFICANT

MAJOR FEATURES:

- Narrow River Corridor
- Discontinuous Natural Habitat
- Nesting Area for Birds of Prey
- Key Deer Habitat



CARMANGAY
COUNTY OF VULCAN

SITE LOCATION:

- Little Bow River valley east and west of Carmangay
- Tp. 13 and 14 - Rge. 22 to 24 - W4

DESCRIPTION:

- narrow corridor along the Little Bow River and associated coulees
- discontinuous natural habitat with some cultivation of river terraces
- eroding cutbanks and rock outcrops provide nesting sites for rare birds of prey including Prairie Falcons and Golden Eagles
- key Mule Deer habitat
- key White-tailed Deer habitat in eastern half of this unit
- minor springs

SIGNIFICANCE: Regional

- bird of prey nesting areas are restricted in the region
- key deer habitat is localized in the region

MANAGEMENT CONSIDERATIONS:

- some birds of prey (e.g. Golden Eagles) are intolerant of human disturbance during the nesting season
- maintaining adjacent grasslands in native species provides feeding habitat for birds of prey
- cultivation reduces habitat diversity

REFERENCES:

- 1987 field program notes
- Fish and Wildlife key area maps
- Irish (1967a) for bedrock geology

LITTLE BOW RESERVOIR
COUNTY OF VULCAN

SCALE - 1:125,000

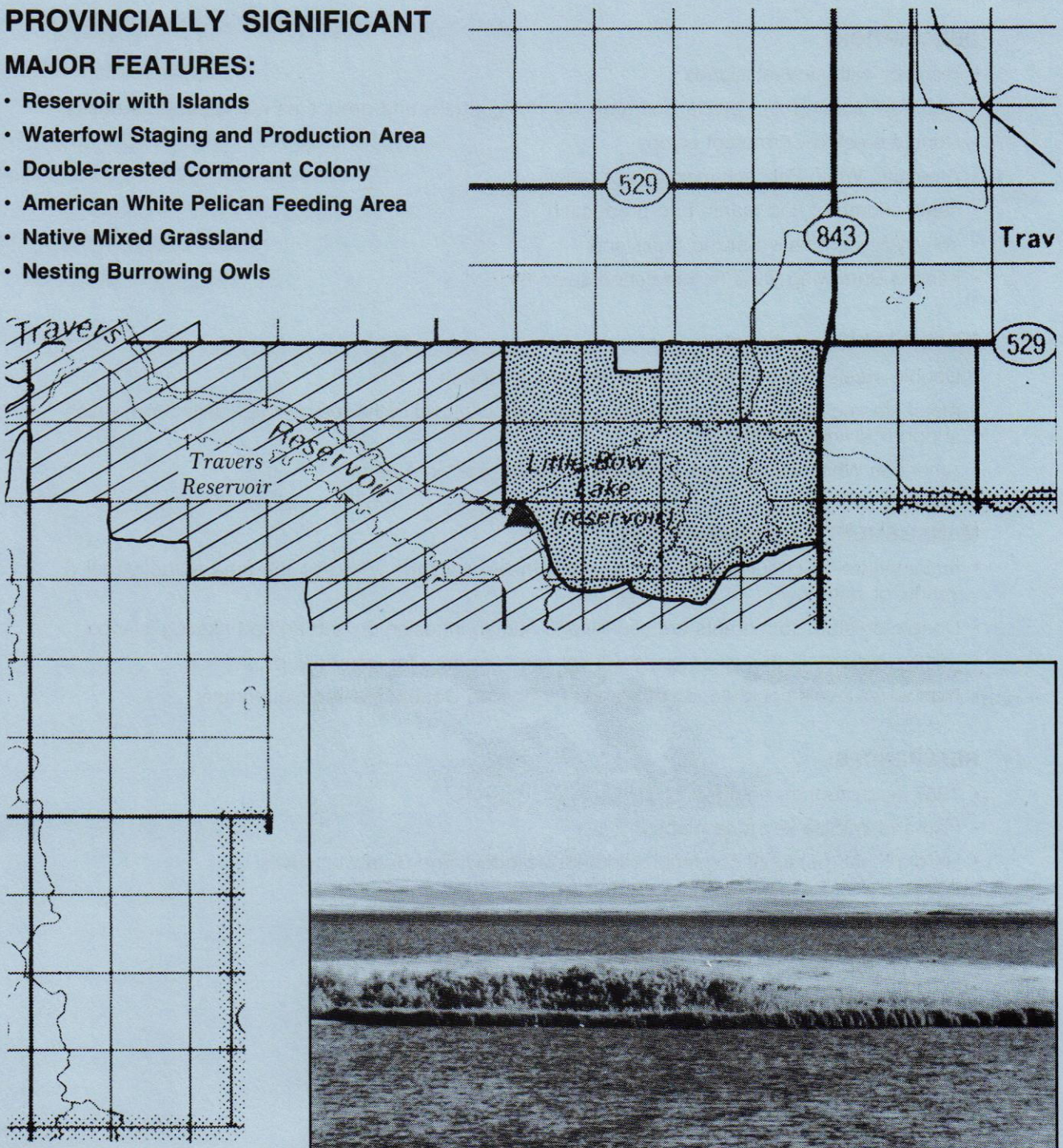
0 1 km 3 5 7

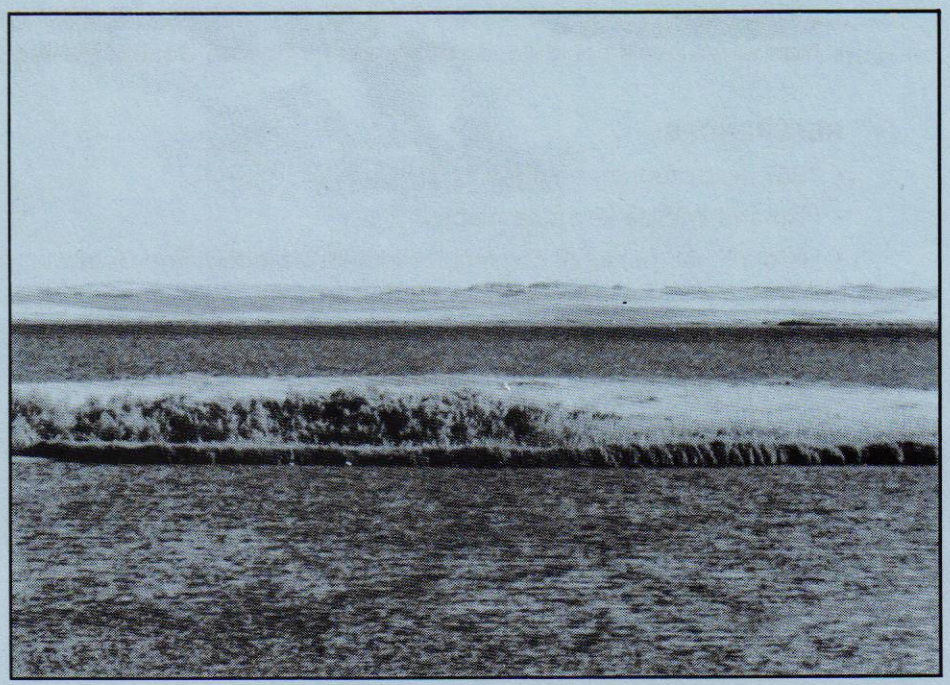
0 1 mi 2 3 5

PROVINCIALLY SIGNIFICANT

MAJOR FEATURES:

- Reservoir with Islands
- Waterfowl Staging and Production Area
- Double-crested Cormorant Colony
- American White Pelican Feeding Area
- Native Mixed Grassland
- Nesting Burrowing Owls





LITTLE BOW RESERVOIR
COUNTY OF VULCAN

SITE LOCATION:

- Little Bow Reservoir, 16 km south of Lomond
- Tp. 14 - Rge. 20 - W4

DESCRIPTION:

- reservoir with several islands
- waterfowl staging and production area, for diving ducks and grebes as well as puddle ducks
- Double-crested Cormorant colony
- American White Pelicans feed on this reservoir
- some shorebird and marsh bird production
- some adjacent native mixed grassland
- nesting Burrowing Owls (a threatened species)

SIGNIFICANCE: Provincial

- Double-crested Cormorant colonies are rare in Alberta
- major staging and production wetlands are very localized in the region, especially those which support "diving" ducks
- American White Pelicans are considered "vulnerable" in Alberta

MANAGEMENT CONSIDERATIONS:

- maintenance of uncultivated land adjacent these wetlands will keep the area attractive for a variety of waterfowl
- Double-crested Cormorants are sensitive to human intrusion on and around nesting islands
- relative stability in the water levels will enhance the area for waterfowl production
- high water levels could flood out islands for nesting Double-crested Cormorants

REFERENCES:

- 1987 field program notes
- Fish and Wildlife key area maps
- Harold Pinel (personal communication) for waterfowl and Burrowing Owls

MAJORVILLE

COUNTY OF VULCAN

SCALE - 1:125,000

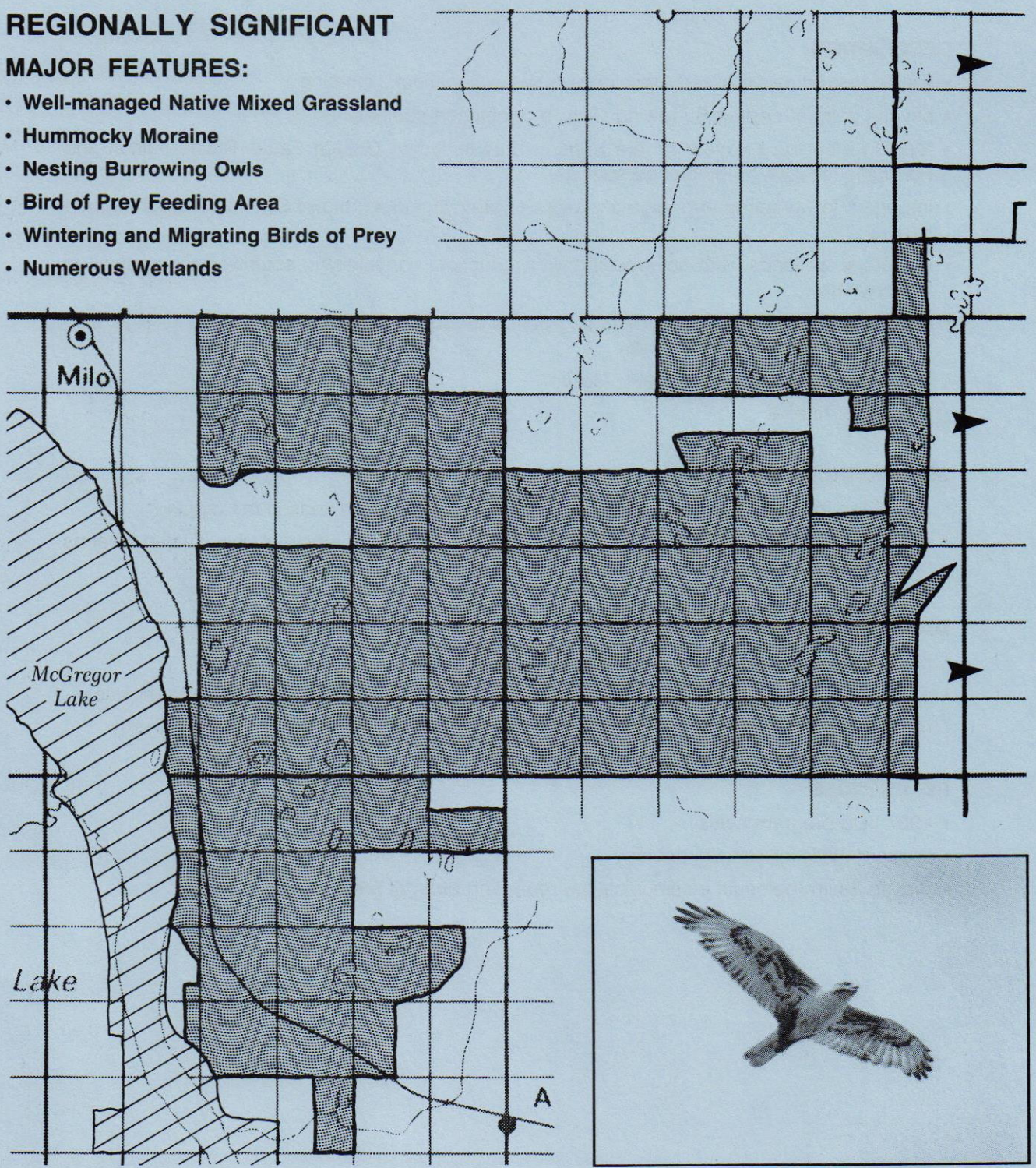
0 1 km 3 5 7

0 1 mi 2 3 5

REGIONALLY SIGNIFICANT

MAJOR FEATURES:

- Well-managed Native Mixed Grassland
- Hummocky Moraine
- Nesting Burrowing Owls
- Bird of Prey Feeding Area
- Wintering and Migrating Birds of Prey
- Numerous Wetlands



MAJORVILLE
COUNTY OF VULCAN

SITE LOCATION:

- south and east of Majorville
- Tp. 17 to 19 - Rge. 18 to 21 - W4

DESCRIPTION:

- well-managed native mixed grassland on rolling hummocky moraine
- several pairs of nesting Burrowing Owls, a threatened species
- feeding area for a variety of rare birds of prey including Golden Eagle, Prairie Falcon and Ferruginous Hawk (a threatened species)
- important for wintering and migrating birds of prey, including Snowy Owls and Rough-legged Hawks
- numerous wetlands, with some waterfowl production, especially in southwestern portions in wetter years
- major waterfowl production and staging ponds are found in Sections 36 - Tp. 17 - Rge. 21 - W4 and 3 - Tp. 18 - Rge. 21 - W4
- includes Ducks Unlimited project "Mason"
- Mule Deer habitat

SIGNIFICANCE: Regional

- one of the few sizeable areas well-managed native mixed grasslands in the region
- extensive Burrowing Owl habitats and bird of prey nesting sites adjacent uncultivated uplands are local in the region

MANAGEMENT CONSIDERATIONS:

- cultivation eliminates many native plants and animals
- a diversity of grazing regimes is needed to maintain a variety of native plants and animals
- maintenance of ground squirrel numbers will keep the area attractive for several birds of prey

REFERENCES:

- 1987 field program notes
- Stalker (1965) for surficial geology
- Wayne Smith (personal communication) regarding birds of prey

MAJORVILLE
COUNTY OF VULCAN

SCALE - 1:125,000

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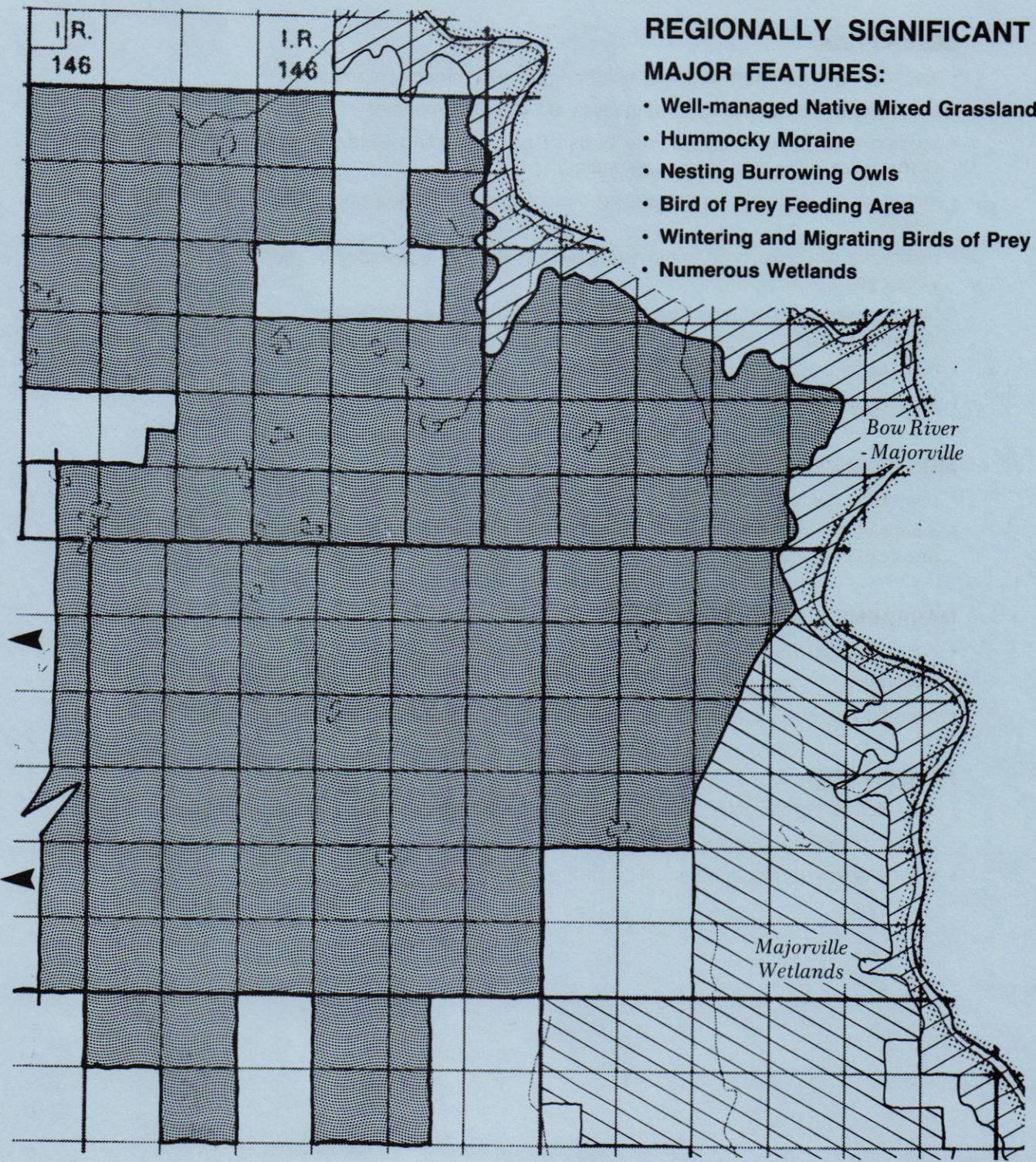


REGIONALLY SIGNIFICANT

MAJOR FEATURES:

- Well-managed Native Mixed Grassland
- Hummocky Moraine
- Nesting Burrowing Owls
- Bird of Prey Feeding Area
- Wintering and Migrating Birds of Prey
- Numerous Wetlands

MAJORVILLE
COUNTY OF VULCAN

SITE LOCATION:

- south and east of Majorville
- Tp. 17 to 19 - Rge. 18 to 21 - W4

DESCRIPTION:

- well-managed native mixed grassland on rolling hummocky moraine
- several pairs of nesting Burrowing Owls, a threatened species
- feeding area for a variety of rare birds of prey including Golden Eagle, Prairie Falcon and Ferruginous Hawk (a threatened species)
- important for wintering and migrating birds of prey, including Snowy Owls and Rough-legged Hawks
- numerous wetlands, with some waterfowl production, especially in southwestern portions in wetter years
- major waterfowl production and staging ponds are found in Sections 36 - Tp. 17 - Rge. 21 - W4 and 3 - Tp. 18 - Rge. 21 - W4
- includes Ducks Unlimited project "Mason"
- Mule Deer habitat

SIGNIFICANCE: Regional

- one of the few sizeable areas well-managed native mixed grasslands in the region
- extensive Burrowing Owl habitats and bird of prey nesting sites adjacent uncultivated uplands are local in the region

MANAGEMENT CONSIDERATIONS:

- cultivation eliminates many native plants and animals
- a diversity of grazing regimes is needed to maintain a variety of native plants and animals
- maintenance of ground squirrel numbers will keep the area attractive for several birds of prey

REFERENCES:

- 1987 field program notes
- Stalker (1965) for surficial geology
- Wayne Smith (personal communication) regarding birds of prey

MAJORVILLE WETLANDS
COUNTY OF VULCAN

SCALE - 1:125,000

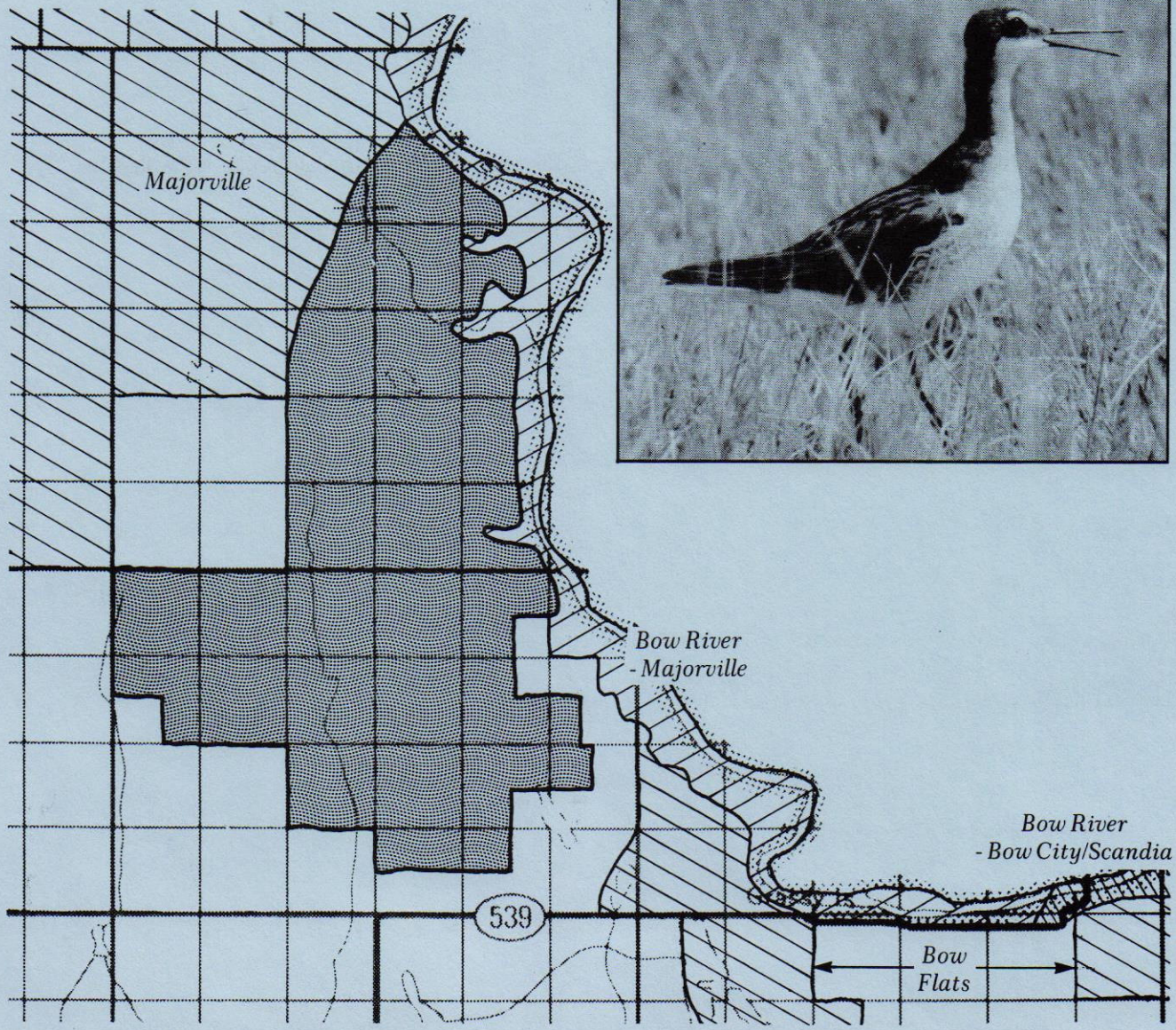
0 1 km 3 5 7

0 1 mi 2 3 5

REGIONALLY SIGNIFICANT

MAJOR FEATURES:

- Small Ponds
- Waterfowl Production and Staging Area
- Shorebird Production
- Extensive Mixed Grassland
- Rare and Threatened Bird of Prey Feeding Area



MAJORVILLE WETLANDS
COUNTY OF VULCAN

SITE LOCATION:

- 26 km southeast of Majorville
- Tp. 17 and 18 - Rge. 18 - W4

DESCRIPTION:

- small ponds in extensive mixed grasslands on level terrain
- waterfowl staging area, mostly for puddle ducks but also for some diving ducks and eared grebes
- some waterfowl and marsh bird production
- moderate numbers of nesting Wilson's Phalaropes
- feeding area for rare and threatened birds of prey

SIGNIFICANCE: Regional

- significant wetlands are local in the region

MANAGEMENT CONSIDERATIONS:

- maintaining natural habitat around these wetlands will keep the area attractive for waterfowl and shorebirds
- relative stability in the water levels will enhance the area for waterfowl production

REFERENCES:

- 1987 field program notes

MCGREGOR LAKE
COUNTY OF VULCAN

SCALE - 1:125,000

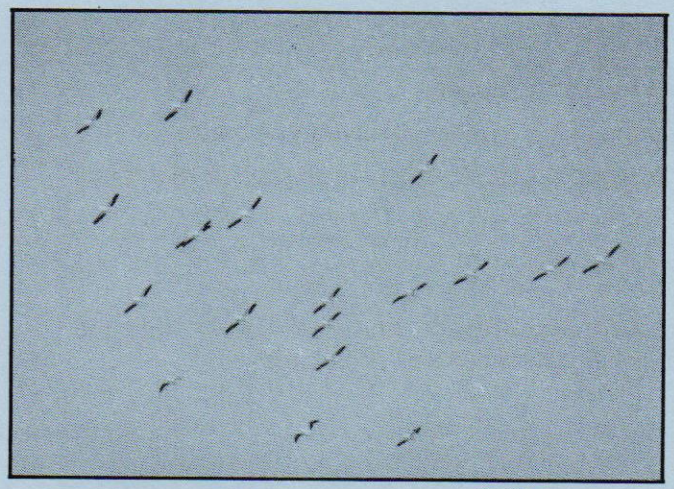
0 1 km 3 5 7

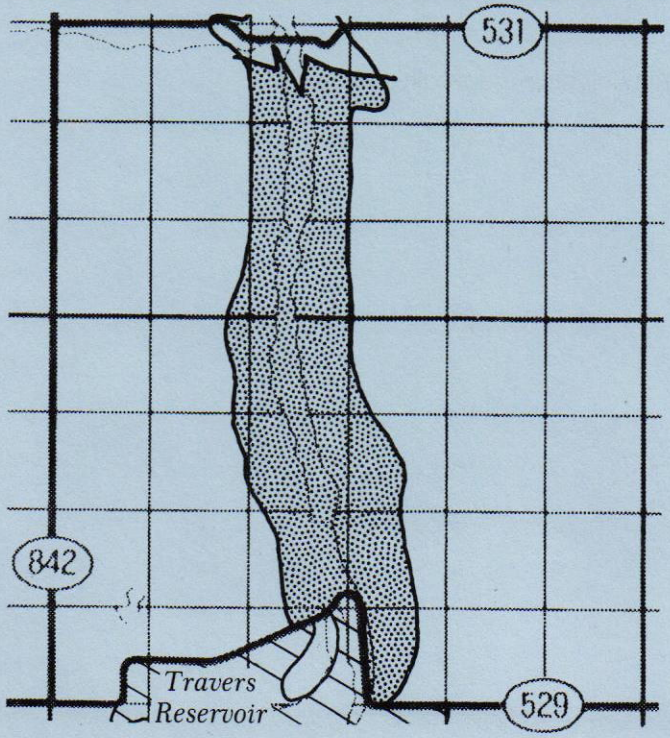
0 1 mi 2 3 5

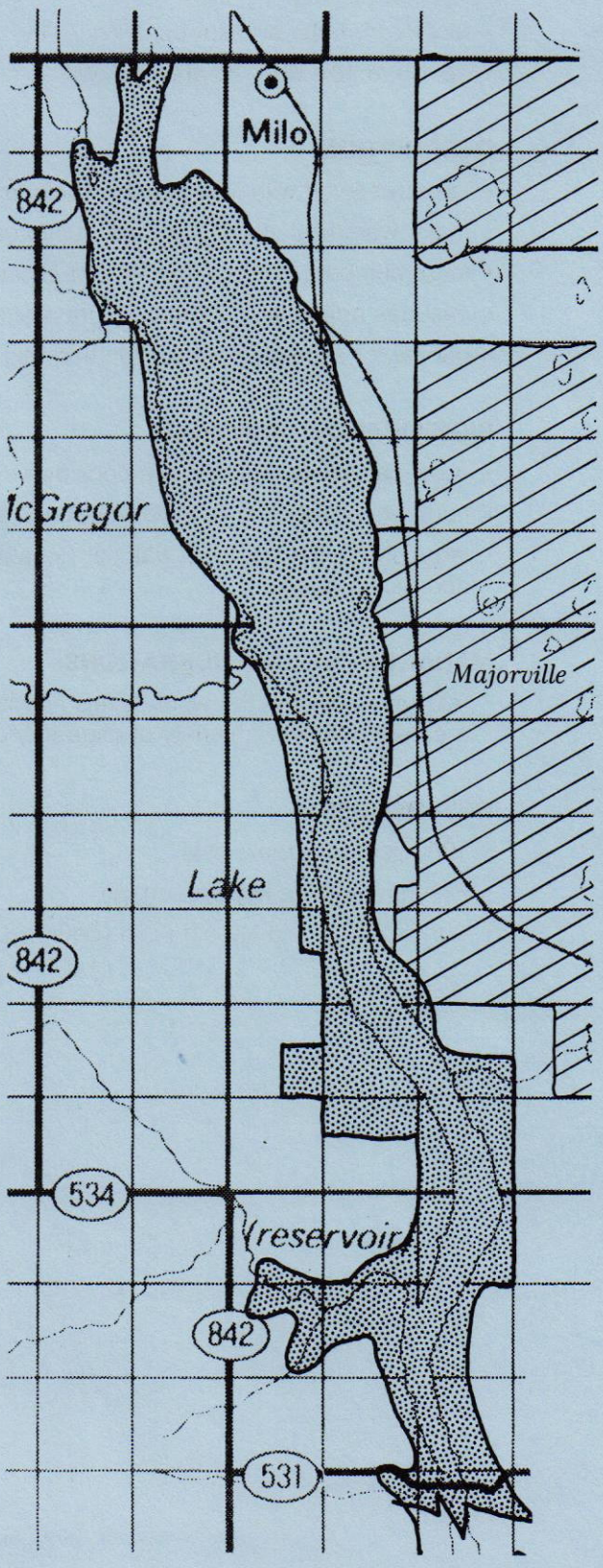
PROVINCIALLY SIGNIFICANT

MAJOR FEATURES:

- Large Reservoir
- Major Waterfowl Staging and Production Area
- Large Numbers of American White Pelicans
- Shorebird Production and Migration







MCGREGOR LAKE
COUNTY OF VULCAN

SITE LOCATION:

- McGregor Lake and surrounding valley
- Tp. 15 to 18 - Rge. 21 and 22 - W4

DESCRIPTION:

- large reservoir with little marsh development
- major waterfowl staging and production area
- large numbers of American White Pelicans feed on the reservoir
- includes adjacent native mixed grassland
- habitat for shorebird production and migration, especially at north end of reservoir

SIGNIFICANCE: Provincial

- American White Pelicans are considered "vulnerable" in Alberta
- numbers of pelicans at McGregor Lake are some of the highest observed in Alberta
- large productive bodies of water are local in the region, especially those which support shorebirds and diving ducks

MANAGEMENT CONSIDERATIONS:

- relative stability in the water levels and maintenance of adjacent natural habitats will keep the area attractive for a variety of migratory and nesting waterfowl and shorebirds

REFERENCES:

- 1987 field program notes
- Fish and Wildlife key area maps
- Wayne Smith and Harold Pinel (personal communication) regarding waterfowl

SNAKE CREEK WETLANDS
COUNTY OF VULCAN

SCALE - 1:125,000

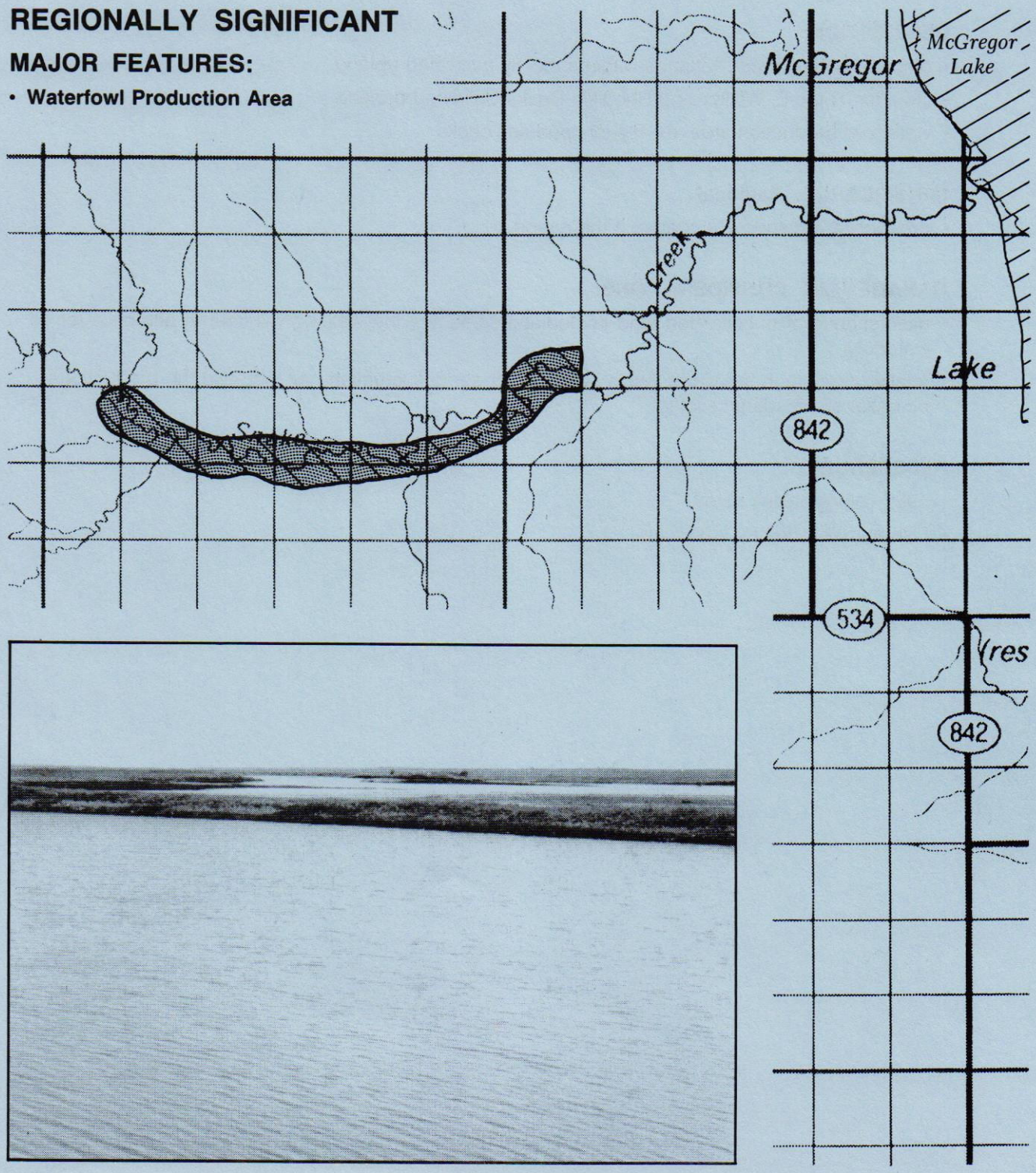
0 1 km 3 5 7

0 1 mi 2 3 5

REGIONALLY SIGNIFICANT

MAJOR FEATURES:

- Waterfowl Production Area



SNAKE CREEK WETLANDS
COUNTY OF VULCAN

SITE LOCATION:

- Snake Creek valley, 11 km northeast of Vulcan
- Tp. 17 - Rge. 22 and 23 - W4

DESCRIPTION:

- discontinuous natural wetlands within a mostly cultivated upland
- includes Triple E, Walker and Rebalkin Ducks Unlimited projects
- waterfowl production area, mainly for "puddle" ducks

SIGNIFICANCE: Regional

- productive wetlands are scarce in the region

MANAGEMENT CONSIDERATIONS:

- maintenance of uncultivated land immediately adjacent the wetland will keep it attractive for waterfowl
- relative stability in the water levels, allowing for some fluctuation, will increase the production potential of this marsh system

REFERENCES:

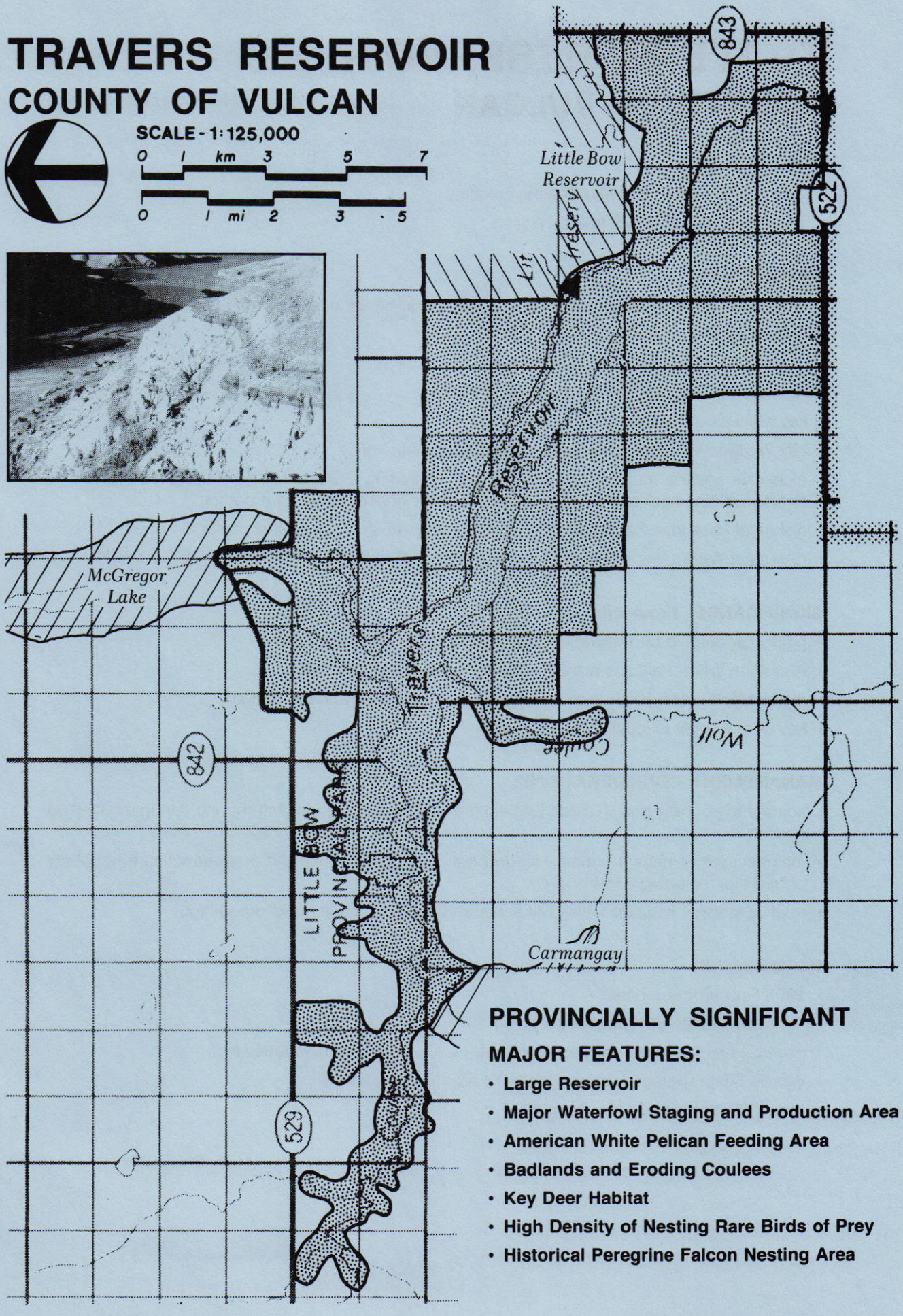
- 1987 field program notes
- Fish and Wildlife key area maps

TRAVERS RESERVOIR
COUNTY OF VULCAN

SCALE - 1:125,000

0 1 km 3 5 7

0 1 mi 2 3 5



PROVINCIALLY SIGNIFICANT

MAJOR FEATURES:

- Large Reservoir
- Major Waterfowl Staging and Production Area
- American White Pelican Feeding Area
- Badlands and Eroding Coulees
- Key Deer Habitat
- High Density of Nesting Rare Birds of Prey
- Historical Peregrine Falcon Nesting Area

TRAVERS RESERVOIR
COUNTY OF VULCAN

SITE LOCATION:

- Travers Reservoir and Little Bow River valley
- Tp. 14 and 15 - Rge. 20 to 23 - W4

DESCRIPTION:

- large reservoir, adjacent native mixed grasslands, badlands and eroding coulees
- section of Little Bow River valley
- major waterfowl staging and production area
- American White Pelicans feed on this reservoir
- key Mule Deer habitat
- key White-tailed Deer habitat along Little Bow River valley
- extensive nesting area for rare birds of prey including Golden Eagles, Ferruginous Hawks (a threatened species) and Prairie Falcons; highest density in western portion
- historical Peregrine Falcon nesting area along north shore of western arm
- rare plant Astragalus lotiflorus (low milk vetch) in Section NW19 - Tp. 14 - Rge. 20 - W4

SIGNIFICANCE: Provincial

- highly productive bird of prey nesting habitat is restricted in Alberta
- American White Pelicans are considered "vulnerable" in Alberta
- major staging and production wetlands are very localized in the region
- key deer habitat is localized in the region

MANAGEMENT CONSIDERATIONS:

- some birds of prey (e.g. Golden Eagles) are intolerant of human disturbance during the nesting season
- maintenance of natural habitats around the reservoir will keep the area attractive to a variety of bird life, including birds of prey
- relative stability in water levels will enhance the area for waterfowl production

REFERENCES:

- 1987 field program notes
- Fish and Wildlife key area maps
- Harold Pinel (personal communication) for birds of prey and waterfowl
- Wayne Smith (personal communication) regarding waterfowl
- Irish (1967a) for bedrock geology

VOLUME II
HISTORICAL RESOURCES

OLDMAN RIVER REGIONAL PLANNING COMMISSION

HISTORICAL RESOURCES OVERVIEW AND PRELIMINARY INVENTORY AND ASSESSMENT

Prepared for:

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1.0 METHODS

1.1 PALEONTOLOGICAL RESOURCES

Fossil finds have been made in the Oldman River Region. Those of regional, provincial and national/international significance are relatively uncommon. These finds are published in various reports and have not been summarized in the geological literature. A search of this literature was not undertaken for this study, rather the "Paleontological Sensitivity Map" published by Alberta Culture 1:3,000,000 based on the known or probable outcrop of fossiliferous bedrock, was utilized for mapping purposes.

1.2 PREHISTORIC RESOURCES

An archaeological site inventory file is maintained by the Archaeological Survey of Alberta (Alberta Culture). This paper-based file consists of individual site records of sites found and reported upon by archaeologists working in the area. Site recording began with the Glenbow Foundation in 1956, continued with the University of Calgary in 1963, and after passage of the Alberta Historical Resources Act in 1973, became a responsibility of the Archaeological Survey of Alberta. All archaeological work in Alberta is carried out under Permit, a requirement of which is filing of site inventory forms.

The data base for the County of Vulcan and Municipal District of Taber study area consists of some 220 sites, most of which were recorded in Historical Resource Impact Assessment studies. Regional inventories have not been undertaken.

The former studies have been based primarily on linear developments outside of the city and towns -- highways, powerlines, pipelines and well sites. On a regional level, the data base is both extremely variable, and grossly underrepresentative.

The Archaeological Survey of Alberta site files were searched. Those sites which appeared to be of at least regional significance were extracted and mapped, either individually or where the density is very high as a group. Because of the widely disparate and varying data base, these represent only a portion of sites of regional significance within the Oldman River Region.

1.3 HISTORIC RESOURCES

Historic site inventory searches were limited to a search of Alberta Culture's Historic Sites Service files in Edmonton. The inventory forms have not yet been ranked by significance or theme, and comprise an eclectic number of structures and sites. This inventory is most cursory and is not included. Three historic site inventories were also consulted. An inventory of NWMP outposts in southern Alberta (Gardner 1975) compiled in 1974, an inventory of Whiskey Posts in southern Alberta (Kennedy and Reeves 1984), and a survey of major historic ranches (Tatro 1974). All deal with regionally/nationally important historic period sites and, in the case of the NWMP and Whiskey Posts, are comprehensive in both field inventory, archival searches and site assessment.

2.0 OVERVIEW

2.1 The Fossil Record

2.2 Native History

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2.3.1 Whoop-up Country
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2.0 OVERVIEW

2.1 THE FOSSIL RECORD

Fossils in the Oldman River Region consist of the remains of plants and animals dating from more than 70,000,000 to less than 10,000 years in age. Fresh water and marine fossils of Late Cretaceous Age (ca. 60,000,000 years ago) occur in strata within the area. Scattered dinosaur fossils occur in some of these beds. No major dinosaur collecting locales occur within the study area.

The most recent fossils date to the Ice Age and more recent times - mammoth, horse, camel and bison, which occur in gravel terrace fills along the river valleys. They date as recently as 10,000 years ago. Few finds have been made in the area. More recent fossils consist of bone beds, "natural traps" in springs and wetlands where various mammals died.

2.2 NATIVE HISTORY

The Oldman River Region encompasses the Alberta Plains, Foothills and Front Ranges of the Rocky Mountains. Our mild winter climate made it a favored wintering range for plains and mountain bison, which, combined with high overall productivity, resulted in a large wintering native population, represented in most recent times by the Peigan on the plains and the Kootenay in the mountains. Prehistoric sites, some dating back 12,000 years in age, are extremely common, reflecting the significance of the region as a settlement locale. The region has the highest site density in Alberta. Campsites situated on terraces in sheltered stream valleys, as well as on the prairie level, are very common. Many contain stone tipi rings, used to hold down the tipi. Bison kills, "pounds" where the animals were trapped in a corral, or jumps where they were run off a cliff occur; Head-Smashed-In is a site of world significance. Rare ceremonial/religious sites, stone "medicine wheels", cairns, and other features of stone occur, as do pictographs and petroglyphs. Writing-On-Stone, for example, is of international significance.

Sites are not uniformly distributed over the landscape. Many occur in certain locales, generally where tributary streams join the main valley or special areas, for example the Bow-Oldman junction, and upstream along the Oldman. Morainal areas characterized by diverse terrain, the moraines west of the Bow and south of the Blackfoot Reserve, for example, also contain a significantly large number of sites, even though very few have ever been recorded.

The Region straddles the "Ice Free Corridor" of the Eastern Slopes, a route along which man may first have migrated into the new world some 30,000 or more years ago. Evidence of these Early peoples may someday be found in deeply buried sites covered by later glacial ice or lakes, as in caves and rock shelters. The first recognized people are those known as "Clovis" who, armed with spears, hunted mammoths and other large animals during the closing centuries of the last Ice Age. Surface finds of their distinctive spear points have been found in a number of locales. Following Clovis were a series of spear hunting cultures, one of whom known as Cody dates ca., 8,500 - 7,500 years. They were the first highly specialized bison hunters of the plains and occupied the lands during a time when the climate, while droughtier than today, resulted in expanded grasslands and bison herds. A significant site of their culture lies in the M.D. of Taber, near Chin Coulee. A sudden climatic reversal occurred around 8,500 years ago and Cody disappeared. They were too specialized. An older culture present in the mountains replaced them.

Around 7,500 years ago the climate again began droughtier. A new bison hunting culture known as Mummy Cave appeared, utilizing the throwing spear. They occupied both the plains and mountains until 5,000 years ago, when the climate again reversed itself. Their culture underwent considerable change as new peoples -- known as "McKean" spread out from the Northern Great Basin, occupying the plains but not the mountains. There the older people persisted. One thousand (1,000 B.C.) marks a major change in the prehistoric settlement patterns and population in the area. At this time the bison hunting culture reached its historic form. Sites from then on are more common, camps and settlement more intensive than before.

Cultures continued to change through time. Around A.D. 100 the bow and arrow appears, associated with a culture known as Avonlea which obtained the weapon from people in the Interior of B.C. Pottery from the east also appears at this time. These people -- the ancestors of the Kootenay and Peigan, were superb bison hunters and technologists, producing the best stone work in 8,000 years. Around 1,000 years ago their culture changed to that characterizing the prehistoric Peigan and Kootenay, both distinct in character and location.

2.3 WHITE HISTORY

2.3.1 Whoop-up Country

Although not a vitally productive area within the scope of the western fur trade, the southern Alberta Plains were absorbed into the control of more rapacious commercial enterprises, such as the gold explorations, the whiskey trade, and the Fort Benton merchant interests. This period of Alberta's history witnessed the debauchery and dissolution of the native population through whiskey and rivalry, and saw the near-complete extinction of the once vast bison herds for the hides which comprised the currency of Whoop-Up country trade.

Confederation in 1867 and the desire to connect the crown colonies of the pacific coast with upper and lower Canada necessitated a revised attitude towards the vast northwest, which had, during earlier scientific expeditions, been described as a dry, infertile area not suitable for settlement. Its potential for natural resource development to supply the markets of eastern Canada was tremendous. The transcontinental railway, a major undertaking of the early 1880s, brought a new focus to the undeveloped lands of the northwest. The railway required settlement and industry to create western markets with transportation needs, and coal to fuel its engines. Much of the early agrarian settlement of southern Alberta was due to the concerted colonizing efforts of both the Canadian Pacific Railway, the Alberta Railway and Irrigation Co. and other interests of the Galt family and their arrangements with the Mormon Church.

2.3.2 The Ranching Frontier

For 25 years before the entrenchment of farming as the mainstay of early Alberta economy, the foothills and short grass plains were the domain of the great ranches, which formed a unique and significant stage in the development and settlement of the Canadian west.

In 1881, the government passed an order-in-council which made it possible for one man or company to lease up to 100,000 acres at one cent per acre per year. This enabled the foundation of the famed Bonanza Ranches, many of which were situated within the Oldman River Region. Well-known big ranches include the Alberta, Cochrane, Oxley and Walrond. By 1904, the attitude of the Canadian government began to change towards the west. In seeking to fulfill its vision of a settled, industrial west, it encouraged the taking up of lands for farming purposes. Farming, fencing and railway branch line construction were in direct conflict with the open range procedures used by the large ranches, and a bitter struggle to preserve cattlemen's interests

ensued. The severe winter of 1906-1907 in which thousands of head of cattle were lost can be seen as the death blow to the era of big ranches in Alberta. The open range was abandoned in favour of isolated semi-arid areas, and mixed farming was dropped in favour of cash grain farming.

2.3.3 Agriculture, Irrigation and Other Industries

By the conclusion of the large ranching era, the major population centers in southern Alberta had been established, with Lethbridge as the major trade and service center. The foothills remained largely a ranching area while the prairie lands were quickly taken up by homesteaders for farming purposes, encouraged by the construction of branch lines by Alberta Railway and Irrigation Company, which actively encouraged colonization of its railway land grants. The Alberta Railway and Irrigation Company, working with the Mormon Church, was instrumental in establishing the St. Mary's Irrigation System. It was the greatest incentive to attract settlers to the drier short-grass prairies.

St. Mary's was the first large-scale works in the province. Many of the workings associated with these and other early irrigation systems are now gone (e.g. the Lethbridge Northern). Some structures remain. (A systematic inventory of these remains to be done.)

Accompanying settlement and farming were the vital resource exploitation industries such as coal mining (on both an individual, farm-related level, and company organized level), lumbering, quarrying, and later the oil and gas industries, which were intricately involved in development of the area.

3.0 SIGNIFICANT ARCHAEOLOGICAL SITES

3. SIGNIFICANT ARCHAEOLOGICAL SITES

The artifacts prehistoric peoples left behind, the structures they made and the locales or "sites" they utilized are all part of a larger regionally oriented land use pattern. It can be broken into various themes relating to man's use of the land.

3.1 PREHISTORIC CAMPSITES

Prehistoric campsites are the focal points of native peoples' activities. Their contents vary depending upon the site location, activities that went on, the number of people who used the site, at what season, the age of the site, the culture that used it, and whether it was a favored locale reoccupied through time.

A campsite may be a very large and repeatedly occupied site, generally located in a stream or river bottoms. Alternatively, it may be a small site representing a one time occupation, often situated on the prairie overlooking a stream or around a small slough. A campsite may be an integral part of a bison kill, to which the carcasses were hauled for processing. The site may contain a wide variety of tools, fire cracked rock from cooking fires, and various cultural features, hearths, storage pits and the like.

Campsites are by far the most common site of potential regional significance in the Oldman River Region (as compared to isolated, lost or discarded artifacts which occur all over the landscape). Many of the prairie camps in plowed fields represent former tipi ring sites. The majority of campsites of regional significance are stream valley camps. These include major campsites at the junction of the Bow and Oldman and upstream in the valleys of the Oldman and Bow. While some, on small streams may date back as early as 10,000 years, most are relatively recent, dating within the last 5,000 years. Most of the earlier alluvial fills in the valleys eroded out between 7,000 and 5,000 years ago.

3.2 BISON KILLS

Bison kills consist of the remains of a number of animals which were captured by use of cooperative group hunting, driving and trapping techniques.

The kill may be a single event - only five or so animals, trapped in a snow drift, pond, or bog - represented by scattered butchered bones, appearing as a "bone bed" with few if any tools left behind. In contrast are large bison kills, characterized by thick bone beds of many animals taken in a single drive or repeated drives through the fall/winter/spring, over one or a number of years.

The numbers and kinds of stone tools found in a kill vary considerably depending on the intensity, repetitiveness, the kind of kill, and the activities which went on. Processing and meat stripping may occur on site, or the quarters and sides butchered out and removed to a nearby processing camp.

Bison kills are divided into a variety of "types" based on the kind of trap employed.

- **Jumps** - where the animals were jumped over a cliff usually 8-10 m high, and maimed or killed in the fall. These sites are often large, complex and repeatedly used. They are of provincial significance.

- **Pounds** - where the animals were driven into a "corral" constructed below a hill, or in a valley where the animals would not see the entrance until upon it. These sites are often relatively large and repeatedly used and of regional or provincial significance.

- **Surrounds** - where the animals were surrounded by encircling a small herd with a wall of hand-held hides and killing the animals as they milled about. This technique was often used on the open plains. Most are single events. They vary in their significance.

- **Natural Traps** - where the animals were driven into box canyons, snow drifts, steep sided arroyos, springs, seeps, bogs, lakes, rivers, or onto ice in winter. The natural features served as the trap. Some of these sites, particularly where a small number of animals were taken, are difficult to differentiate from ambush/confrontation hunting at water holes and fords. Most of these kills are small single events. They vary in significance depending upon size, age, preservation, etc. Old sites are rare and provincially significant.

Associated with the kills, particularly the pounds and jumps, are processing campsites, and gathering basins. The processing camps are generally found immediately adjacent to the kill. Here the bison carcasses were taken and processed into stripped and dried meat and various cuts for immediate consumption, robes, tipi hides, leather, sinew, horn and bone tools,hoof glue, tallow and fat for lamps, etc. A processing camp is characterized by large quantities of butchered bone, fire cracked rock, bone boiling, pits, hearths, and a limited variety and number of stone tools. Activities were directed towards processing the animals and their products for use at other times.

Processing camps associate with the large fall/winter/spring kills used when the bison were in their wintering and calving range. At other seasons, including midwinter, when large drives were not possible because of the dispersal of the herds, the pattern is one of small drives (e.g. snow drift kills) butchering on site, meat stripping and return of the meat to a midwinter base campsite, which is characterized by limited amounts of butchered bone, a variety of small tools related to maintenance activities -- hide, tools, clothing etc., as well as hearths and other habitation features.

Large processing and base campsites, while they vary in significance depending on age, preservation, artifact yield, content, etc. are generally of regional significance.

Gathering basins are the areas from which the bison were gathered and driven toward the kill. They may contain drive lanes, marked by lines of stone piles or cairns through which the bison were driven. Few exist because of agricultural activities. All are of regional or provincial significance.

A number of bison kills have been recorded in the Oldman River Region including major bison jumps: the Head-Smashed-In Provincial Historic Resource and World Heritage Site and others in the Porcupine Hills. These are some of the major jumps in the province; their distribution centers around the Porcupine Hills.

In addition there are many smaller bison kills and traps, some of which are exposed and preserved. Others lie buried below ground. Many have been lost over the years in the stream valleys through lateral stream erosion. Consequently they are now uncommon and are regionally significant sites.

3.3 TIPI RING SITES

Tipi ring sites are campsites with stone rings which range from 2-8 m in diameter and were used to hold down tipi covers. Hearths often occur within and various stone features outside -- small cairns or "rock piles".

The tipi ring sites within the Oldman River Region occur in the plains and foothills. They are not found in the forested mountains and foothills valleys. They range in size from small clusters of three to five rings, for example, along the Oldman, on coulee spurs overlooking the river, to sites of over 100 rings on the Oldman. In the larger more complex sites, other stone constructions -- large cairns, medicine wheels, rocklines and effigies -- often occur.

The smaller sites generally represent a single encampment of a group of related families, while the large ones represent both "tribal gatherings" as well as repeated use of a favourite camping locale. The large complex sites are "rare". They occur both on the Oldman and Bow Rivers. Some are of regional and provincial significance.

3.4 "SPIRITUAL" STONE FEATURES

A number of stone structures exist, most of which are spiritual constructions associated with religious activities. Those present in the Oldman River Region include:

3.4.1 Cairns

Large cairns, up to 4 m in diameter and 1 m high, may represent burial cairns, constructions associated with religious activities, or "trail shrines". Constructed as early as 5,500 years ago, their original purpose is lost, but they were apparently revered as a "holy" place, with offerings left on and in it as recently as 100 years ago. Large cairns are very rare, as many have been destroyed. Some appear to have been reused as farmers' rock piles for rocks pulled from plowed fields. They are of provincial significance.

3.4.2 Stone Mosaics, "Boulder Pavements" and Effigies

Geometric or abstract designs, stylized human and animal figures or symbols have been found constructed from boulders and cobbles. Some tell stories and were used to record events as recently as the 1870s by the Blackfoot. They are uncommon and may occur as an isolated site or part of a larger complex. All are of regional or provincial significance.

3.4.3 Medicine Wheels

Medicine wheels, large stone circles with spokes radiating out to the rim from a central cairn, are rare features, often found on prominent hill tops, or as part of large stone features sites. They vary considerably in their size and complexity. Some were initially built as early as 5,500 years ago. They are of provincial significance. The Majorville Cairn and Medicine Wheel lies within the study area (Calder 1975). It is a designated Provincial Historic Resource.

3.5 ROCK ART SITES

Rock art sites in the Oldman River Region consist of pictographs - sites characterized by painted designs, located on sandstone outcrops or glacial erratics and petroglyphs - carved or incised designs. The sites are rare and of provincial significance. Those recorded include the Writing-On-Stone, a designated Provincial Historic Resource, and glacial erratics in the M.D. of Willow Creek.

3.6 PRIORITY AREAS

The Oldman River Region, as based on the present incomplete inventory data, contains both individual prehistoric sites of regional and provincial value, as well as provincially significant settlement areas. The latter include the Oldman and Bow, where particularly high densities of prehistoric sites have been found, and the morainal areas south of the Blackfoot Reserve. All lack regional archaeological surveys.

3.7 RECOMMENDATIONS

The Oldman River Region contains a significant set of prehistoric sites of interest to both the scientific community and general public. General policies and guidelines should be developed to maximize the conservation of these sites for their eventual study and interpretation to the public.

Prehistoric sites vary considerably in value, and only those of outstanding value merit avoidance and preservation when in conflict with planned development. While most impacts can be mitigated by detailed archaeological studies, these are of considerable cost to the developer, and the physical site is still lost. Often sites can be avoided if their presence and value are known early in the planning process and if effective mechanisms can be established on a regional and municipal level to maximize on site conservation through early inventory and identification of sites and their incorporation in parks, recreational areas, and environmental and municipal reserves.

Municipal planning documents should address these concerns, and bylaws be considered to provide zoning mechanisms which will enhance both the conservation of archaeological sites in place, minimize potential conflicts with planned development and impact, both in terms of loss of the significant prehistoric sites and costs to mitigate these impacts, as may be required by the Alberta Historical Resources Act.

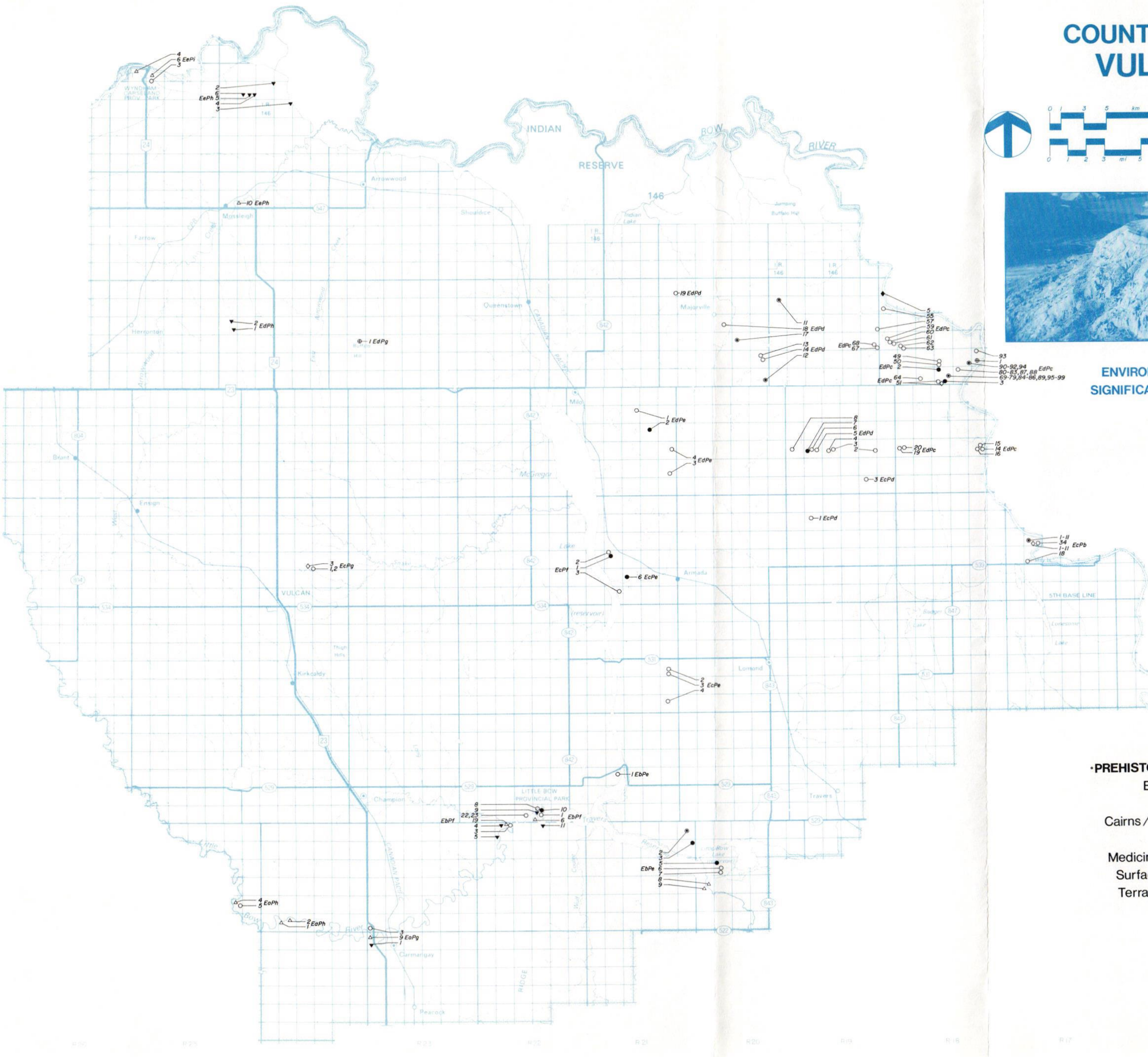
Inventories should be made to provide a data base which can be used early in the planning process, minimizing potential conflicts later in development. This is particularly important for all areas associated with stream valleys -- the focal prehistoric settlement locales.

Prehistoric settlement focuses on the river and stream valleys and flood plains which are also the focus of settlement today. Gravel extraction and house sites, for example, are often the locations of campsites, tipi rings, and ceremonial stone features. Opportunities exist to develop both general management plans and guidelines for known and potential archaeological sites within these areas -- sites which may be adversely affected by planned development; as well as direct control where development permits are required from the municipality for a planned development.

At a municipal level agricultural activities are the major source of impact and loss of prehistoric sites on a regional level. While little or no opportunity exists under existing legislation to control these activities, systematic inventories should be made of the unbroken grazing and range lands extant in the Oldman River Region to ensure stone feature sites in these areas are documented and those of particular significance studied, in the event that changing agricultural land use practices eventually destroy them.

Map 3 shows the locations of Prehistoric Sites in the County of Vulcan. A detailed guide to this inventory of Archaeological Sites is provided in Tables 1-5.

COUNTY OF VULCAN



0 1 3 5 km 10 15
0 1 2 3 mi 5 8
INDIAN
RESERVE
BOW
RIVER
146
Arrowwood
Mossleigh
Shouldice
Farrow
Jumping Buffalo Hill
Queenstown
Majorville
Herronton
Milo
McGregor
Lake
Brant
Ensign
Armada
VULCAN
(reservoir)
Lomond
5TH BASE LINE
Kirkcaldy
Champion
LITTLE BOW PROVINCIAL PARK
Travers
Carmangay
Peacock
RIDGE
4
6 EePi
3
EePh
10 EePh
2 EdPh
1
1 EdPg
19 EdPd
11
18 EdPd
17
13
14 EdPd
12
EdPc
1
2 EdPe
5 EdPd
20
19 EdPc
15
14 EdPc
16
4
3 EdPe
3 EcPd
1 EcPd
1-11
34
1-11 EcPb
18
3
1,2 EcPg
EcPf
6 EcPe
2
3 EcPe
4
1 EbPe
EbPf
EbPe
4
5 EoPh
2
1 EaPh
3
9 EoPg
1
MAP 3

ENVIRONMENTALLY SIGNIFICANT AREAS

PREHISTORIC SITES

- Bison Kills ◆
- Cairns ●
- Cairns/Tipi Rings ⦿
- Effigy ◇
- Medicine Wheels ⊕
- Surface Camps ▼
- Terrace Camps △
- Tipi Rings ○

MAP 3

TABLE 1

ARCHAEOLOGICAL SITES - COUNTY OF VULCAN

REGISTRATION NUMBER	CAMP		BISON KILL		STONE FEATURES							SI	Comments
	TR	PR	Trap	Jump	TP	CN	EF	WH	CA	PG	Other		
EaPg-1		X										L	
EaPg-3					X							M	
EaPg-9	X											L	
EaPh-1	X											M	
EaPh-2	X											M	
EaPh-4	X											H	
EaPh-5		X			X							L	
EbPe-1					X							H	
EbPe-2					X	X						L	
EbPe-3						X						L	
EbPe-5						X						L	
Eb-Pe-6					X							L	
EbPe-7					X							L	
EbPe-8	X											L	
EbPe-9	X											L	
EbPf-1					X							L	
EbPf-3					X							L	
EbPf-4		X										L	
EbPf-5		X										L	
EbPf-6	X											?	
EbPf-8					X		X					L	
EbPf-9		X										L	
EbPf-10						X						L	
EbPf-11		X										L	
EbPf-19	X				X							M	
EbPf-22					X							L	
EbPf-23					X							L	

TR - Terrace
PR - Prairie
TP - Tipi Rings
CN - Cairn
EF - Effigy
WH - Wheel
CA - Cairn Alignment
PG - Pictographs
SI - Significance

TABLE 2

ARCHAEOLOGICAL SITES - COUNTY OF VULCAN

REGISTRATION NUMBER	CAMP		BISON KILL		STONE FEATURES								
	TR	PR	Trap	Jump	TP	CN	EF	WH	CA	PG	Other	SI	Comments
EcPb-1					X							L	
EcPb-2					X	X						M	
EcPb-3					X	X						H	
EcPb-4					X							L	
EcPb-5							X					M	
EcPb-6					X	X						L	
EcPb-8							X					H	
EcPb-9					X	X						L	
EcPb-10					X							L	
EcPb-11					X							L	
EcPb-18					X							L	
EcPb-34					X							L	
EcPd-1					X							L	
EcPd-3					X							L	
EcPe-2					X							L	
EcPe-3					X							L	
EcPe-4					X							L	
EcPe-6						X						M	
EcPf-1						X						L	
EcPf-2					X							L	
EcPf-3					X							L	
EcPg-1					X							L	
EcPg-2					X							L	
EcPg-3							X					M	
EdPc-1					X	X	X	X				H	Majorville Medicine Wheel
EdPc-2						X						H	
EdPc-3						X						M	

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TABLE 3

ARCHAEOLOGICAL SITES - COUNTY OF VULCAN

REGISTRATION NUMBER	CAMP		BISON KILL		STONE FEATURES								
	TR	PR	Trap	Jump	TP	CN	EF	WH	CA	PG	Other	SI	Comments
EdPc-5				X								M	
EdPc-14					X							L	
EdPc-15					X							L	
EdPc-16					X	X						M	
EdPc-19					X							L	
EdPc-20					X							L	
EdPc-49					X							L	
EdPc-50					X							L	
EdPc-51					X		X					M	
EdPc-55					X							L	
EdPc-57					X							L	
EdPc-59					X							L	
EdPc-60					X							L	
EdPc-61					X							L	
EdPc-62					X							M	
EdPc-63					X							L	
EdPc-64					X								
EdPc-67					X							L	
EdPc-68					X							L	
EdPc-69					X	X						H	
EdPc-70					X							L	
EdPc-71						X						L	
EdPc-72						X						M	
EdPc-73					X							L	
EdPc-74					X	X						L	
EdPc-75						X						L	
EdPc-76					X							L	

TR - Terrace
PR - Prairie
TP - Tipi Rings
CN - Cairn
EF - Effigy
WH - Wheel
CA - Cairn Alignment
PG - Pictographs
SI - Significance

TABLE 4

ARCHAEOLOGICAL SITES - COUNTY OF VULCAN

REGISTRATION NUMBER	CAMP		BISON KILL		STONE FEATURES							SI	Comments
	TR	PR	Trap	Jump	TP	CN	EF	WH	CA	PG	Other		
EdPc-77					X	X						M	
EdPc-78					X							L	
EdPc-80					X							H	
EdPc-81					X							L	
EdPc-82					X							L	
EdPc-83					X							M	
EdPc-84					X							L	
EdPc-85						X						L	
EdPc-86					X	X						M	
EdPc-87					X							L	
EdPc-88					X							L	
EdPc-89					X							L	
EdPc-90					X							L	
EdPc-91					X							L	
EdPc-92						X						L	
EdPc-93					X							L	
EdPc-94						X						L	
EdPc-95					X							L	
EdPc-96						X						M	
EdPc-97						X						L	
EdPc-98						X						L	
EdPc-99					X							L	
EdPd-2					X							L	
EdPd-3					X	X						L	
EdPd-4					X							L	
EdPd-5					X	X						L	

TR - Terrace
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EF - Effigy
WH - Wheel
CA - Cairn Alignment
PG - Pictographs
SI - Significance

TABLE 5

HISTORIC SITES - COUNTY OF VULCAN

REGISTRATION NUMBER	CAMP		BISON KILL		STONE FEATURES							SI	Comments
	TR	PR	Trap	Jump	TP	CN	EF	WH	CA	PG	Other		
EdPd-6					X							L	
EdPd-7						X						M	
EdPd-8					X							L	
EdPd-11					X	X						L	
EdPd-12					X	X						M	
EdPd-13					X							L	
EdPd-14					X							M	
EdPd-17					X				X			M	
EdPd-18					X							L	
EdPd-19					X							L	
EdPe-1					X							L	
EdPe-2						X						L	
EdPe-3					X							L	
EdPe-4					X							L	
EdPg-1					X	X		X				H	
EdPh-1		X										L	
EdPh-2		X										L	
EePh-2		X										M	
EePh-3		X										L	
EePh-4		X										M	
EePh-5		X										L	
EePh-6		X										L	
EePh-10	X											L	
EePi-1													
EePi-3					X							M	
EePi-4	X											M	
EePi-6	X											L	

TR - Terrace
PR - Prairie
TP - Tipi Rings
CN - Cairn
EF - Effigy
WH - Wheel
CA - Cairn Alignment
PG - Pictographs
SI - Significance

4.0 SIGNIFICANT HISTORIC SITES

4. SIGNIFICANT HISTORIC SITES

In an attempt to deal in a systematic fashion with a burgeoning quantity of data on the province's historic resources, with the intent to provide for their protection and commemoration, an Alberta Culture Task Force produced the Master Plan, Prehistoric and Historic Resources in 1980. The Plan is organized thematically on an event/date pattern, and attempts to incorporate the major themes of relevance to Alberta History. We have employed the Historic Sites Service structure for the Oldman River study, since it highlights the significant themes and events occurring in the study area. Historic Sites Service identifies 1925 as a general cut-off date for its inventory. We extend this date another 15-20 years (i.e. World War II), should a site represent a unique or first occurrence in a region, even though the represented activity has taken place elsewhere at an earlier date.

4.1 THEME: FUR TRADE

The southern short grass areas of the northwest, in what eventually became the Province of Alberta, were not directly involved in the fur trade ventures so active in the north. This was due largely to two reasons: the rapid depletion of the limited fur resources along southern waterways, and the hostile nature of the Blackfoot towards both whites and other native groups. This situation accounted for the eventual closure of most forts established in the south.

In 1832, the Hudson's Bay Company established Peigan Post on the Bow River to create a southern terminus with which to compete against James Kipp's successful trading post on the Marias River. Peigan Post was to replace Rocky Mountain House as the focal point of trade with the Peigans, but as the latter were unable to reach the post after their defeat by the Peigan, trade was poor. The post was abandoned in 1834 in favour of reopening Rocky Mountain House, which was maintained until 1875, at which point a Hudson's Bay Company post was erected on the east side of the Bow opposite the Northwest Mounted Police Fort Calgary.

The fur trade is very poorly represented by sites in the Oldman River Region, as most related thematic resources are trails, historic viewpoints or temporary camp spots at which few physical remains exist.

4.2 THEME: TRANSITION FROM A NOMADIC ECONOMY

SUBTHEME: MISSIONS

The proselytizing efforts of Roman Catholic, Methodist and Anglican missionaries in the mid to late nineteenth century wrought profound changes upon native culture and economy. Much of the pioneering missionary work involved itinerant travel to the widely dispersed native peoples, although a few small but important missions had been established throughout the province in order to provide the native community with a sound Christian education. The Roman Catholic mission at Lac St. Anne, the Methodist mission at Victoria and the Anglican mission of St. Savior's at Dunvegan are examples of the religious commitment to effecting a permanent change to the nomadic way of life. Within the Oldman River Region are the first missions to be established on or adjacent to the Peigan and Blood reserves.

4.3 SUBTHEME: THE MAINTENANCE OF LAW AND ORDER

The incorporation of liquor into native lifeways, the ravages of disease, loss of the buffalo and the incursion of the white man onto native lands proved disastrous to maintenance of Indian culture. In an attempt to deal with the dislocated native group, the Canadian government initiated

the treaty system which concentrated the native peoples on reserves. Schools were established to train the Indians in sedentary farming practices. Industrial schools were built on and off the reserves, to which children would be sent, thus further severing them from traditional ways and beliefs.

The administration of treaty signings and the enforcement of law and order not only on the reserves but throughout Alberta was the responsibility of the Northwest Mounted Police, one of the most important components in the growth and development of the Canadian northwest. The NWMP were formed in 1873 in response to fears regarding a potential Indian and Metis uprising across the west. This potential situation had arisen from years of degenerate, corrupt dealings with the Indians by the whiskey traders, who plied the former with liquor in return for hides and furs. The whiskey traders operated from strategically located posts across southern Alberta. The most significant of these posts lie within the study area -- e.g. Fort Whoop-up, Standoff, and Kipp. They are provincially significant.

The numerous and varied responsibilities handled by the NWMP were carried out through an efficient hierarchical administrative network comprised in descending order of Divisional Headquarters, District Headquarters, Subdistrict Headquarters, local detachments and horseback patrols ("Flying Patrol"). Some of the outposts in the study area are St. Mary, Standoff and Writing-On-Stone. They are provincially significant.

4.4 THEME: RANCHING

SUBTHEME: RANCHING AS THE BASIS OF THE SOUTHERN ALBERTA ECONOMY

By 1879, the near extinction of the buffalo had reduced the native population to starvation. Thus, nucleus breeding herds were established by the federal government at Fort Macleod and Calgary to provide beef for the Indian Reserves. This new incentive to an ensured market, combined with the stability and security afforded by the presence of the Northwest Mounted Police, who had arrived in southern Alberta in 1874, ensured the successful growth and development of ranching in southern Alberta. The Northwest Mounted Police played a vital role in the Alberta ranching frontier. Many policemen turned rancher upon retiring from the force. Additionally, they formed the core social milieu of the Canadian ranching community, which gave it a distinctive Anglo-Canadian character, as differentiated from the American ranching frontier.

The Bonanza Ranches were quickly established in the 1880s, aided by the establishment of the "closed lease" form of land tenure, which allowed for huge tracts of grazing land. One man or company was allowed to lease up to 100,000 acres at one cent per year, according to an order-in-council passed by the federal government in 1881. The Cochrane, Alberta and Waldrond are some of the large ranches established at this time.

The days of the Bonanza Ranches were short-lived, for in 1896 the newly elected Laurier government cancelled the closed lease system. By 1904, the Canadian government sought to fulfill its vision of a settled industrial west, and encouraged the taking up of lands for farming purposes. When the government also began to dispose of the region's water reservations, which had formerly been specially allotted to the ranching industry, the latter seriously began to wane. Other serious considerations, such as avid branch line construction which segmented the once open ranges, and competition from other countries in marketing of beef, saw an end to the Bonanza Ranches. Although ranching certainly played an important part in the Alberta economy after 1910, it never regained the status achieved during the days of the Bonanza Ranches. Smaller ranches relating to this theme occur throughout the study area.

4.5 THEME: SETTLEMENT

With growing realization of the potential of the northwest, serious attempts were made in the 1880s and 1890s to settle the region and incorporate farming as a major activity. The era of rapid railway construction began at this time, and most prevalent at the turn of the century, considerably aided the influx of settlers to Alberta. The Northwest Coal and Navigation Railway had reached Lethbridge by 1883, the Calgary-Lethbridge line was completed in the 1890s, and the Crowsnest Branch in 1897.

Large colonization companies, some connected with the railways, were established. Irrigation companies, such as the Alberta Railway and Irrigation Company, also enticed settlers to drier, less arable portions of southern Alberta.

The nature of settlement in the late 19th and early 20th centuries, was largely in concentrated blocks along railway lines. Many of the settlers during this period had immigrated to southern Alberta in large numbers from the United States and tended to settle together in groups, a factor which fostered and maintained distinct ethnic communities with the province. The Mormon communities of the M.D. of Cardston are the most important example.

4.6 THEME: RESOURCE DEVELOPMENT

Once again, the railways were the vital catalyst which spurred settlement and development of natural resources. Aided by branch lines which allowed access to undeveloped regions, settlers quickly took up most available agriculture land by the turn of the century. The exploitation of Alberta's great prairie and mountain coal resources was also intricately tied up with the expansion of railway networks and early settlement in the province's history.

Once the methods of dry land farming and irrigation had been introduced, agricultural production increased at a rapid rate. Advances in new technology and agronomy were displayed in the unique experimental farms, which were often established by the railway companies and situated close to main routes of travel where potential settlers could be influenced. The lumber and clay industries, closely allied with the expansion of settlement, first provided only local and regional demands before becoming important production units with provincial and larger markets.

The oil and gas industry became prominent after World War II, and composed a second period of economic growth for the province. The Pincher Creek area is one of the most significant locales of sour gas resource development in the province.

4.7 PRIORITY AREAS

Priority areas cannot be thoroughly outlined at this level of assessment without complete evaluation information. However, those areas exhibiting definite historic integrity and cohesiveness of theme are worthy for notice as priority areas; for example, the Cardston and district sites, Crowsnest Pass historic groupings, abandoned sites with no present active protection, and historic sites threatened by erosion and vandalism.

4.8 RECOMMENDATIONS

The Oldman River Region contains a significant set of historic sites relating to the exploration, settlement, economic growth and development of the region. The sites vary widely in size, condition, and significance. Some merit preservation protection and interpretive development, while others if in conflict with planned development require detailed study to mitigate development impacts. Often historic sites can be preserved in place if their presence is

known early in the planning process, and mechanisms can be established on a regional and municipal level. Bylaws should be considered which will provide effective zoning and control mechanisms to enhance in place conservation of historic sites which may be adversely affected by proposed development.

It cannot be stressed too highly that this present document be taken as a most preliminary overview inventory only; the assessment level is too low to allow for evaluation as to the overall significance of a particular site in relation to:

(1) Regional Criteria

(2) Provincial Criteria

The inventory has identified some sites; the recommended action would be to continue a follow-up study that incorporates field assessment, structured in accord with the stages of overall regional and municipal planning.

The most notable theme inventory gaps are:

(1) Early Ranches and Farmsteads

(2) St. Mary and Other Irrigation Works

(3) Ethnic and Religious Settlements

The Municipal District of Taber and the County of Vulcan are areas which generally were settled late in the province's history. Few sites of interest to the early settlement history and other historic themes are expected to exist.

5.0 CRITERIA FOR REGIONALLY SIGNIFICANT FOSSIL SITES

5.1 Bedrock - Paleontological Remains

5.1.1 Plants and Invertebrates

5.1.2 Marine Vertebrates, Dinosaurs, and Mammals

5.2 Unconsolidated Sediments-Gravels, etc.

5.0 CRITERIA FOR REGIONALLY SIGNIFICANT FOSSIL SITES

Paleontological resources consist of the remains of past plants and animals. These include the fossil shells and corals (invertebrates) of Paleozoic Age (120,000,000 + years in age) exposed in the limestone formations of the Rocky Mountains; the plants and dinosaurs (vertebrates) of Upper Cretaceous age (80,000,000 years) such as those found in the formations along the Red Deer River; primitive mammals such as those found in the Paskapoo Formations of Paleocene Age (60,000,000 years ago) and the ice age mammals - mammoth, horse, camel, bison of the glacial ages, as recent as 10,000 years ago, found in gravel deposits along river valleys.

Fossil finds vary considerably in their value and significance, depending on their rarity/uniqueness, representativeness, preservation-completeness, and concentration of remains in a locale. Another important consideration is whether they are in "primary context" -- i.e. where the animals originally died and all or most of the skeleton is preserved; or in "secondary context" -- moved after death and redeposited in other sediments in another locale.

Map 4 shows the locations of Paleontological Zones of Low, Medium and High Sensitivity in the County of Vulcan.

In general, complete or near complete vertebrate skeletons of any age (except most of those of the last 10,000 years, which are bison), are very rare/unique finds, and considered to be of provincial significance. Scattered elements of particularly rare species, because of their preservation or rare occurrence, are of provincial significance, for example, the Porcupine Hills mammals.

In contrast, scattered broken elements of more common species, for example the Duckbill Dinosaurs of Upper Cretaceous Age or fossil clamshells, could be of local significance; a section, where an invertebrate fossil species was first described, of provincial and possibly international significance, even though the fossil remains are not particularly common at that locale; a good collecting locality for this fossil but not the type section might only be of regional significance.

Significance for paleontological remains can only be established on a site specific basis. The following is a first approximation.

5.1 BEDROCK - PALEONTOLOGICAL REMAINS

Fossils found in the bedrock formations of the plains, foothills and mountains in either primary or secondary contexts.

5.1.1 Plants and Invertebrates

Type sections, major collecting locales - provincial or national significance. Minor collecting locales (others of higher value elsewhere in province) - regional; scattered remains - local.

5.1.2 Marine Vertebrates, Dinosaurs, and Mammals

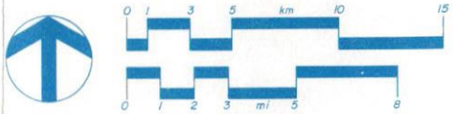
	Significance
Primary, deposit skeletal remains - (skeleton relatively complete and representative, or rare/new species). Type localities and major collecting localities.	Provincial or National
Primary, deposit scattered skeletal remains, and minor collecting locales.	Regional
Scattered, isolated and broken secondary deposited elements.	Local

5.2 UNCONSOLIDATED SEDIMENTS-GRAVELS ETC.

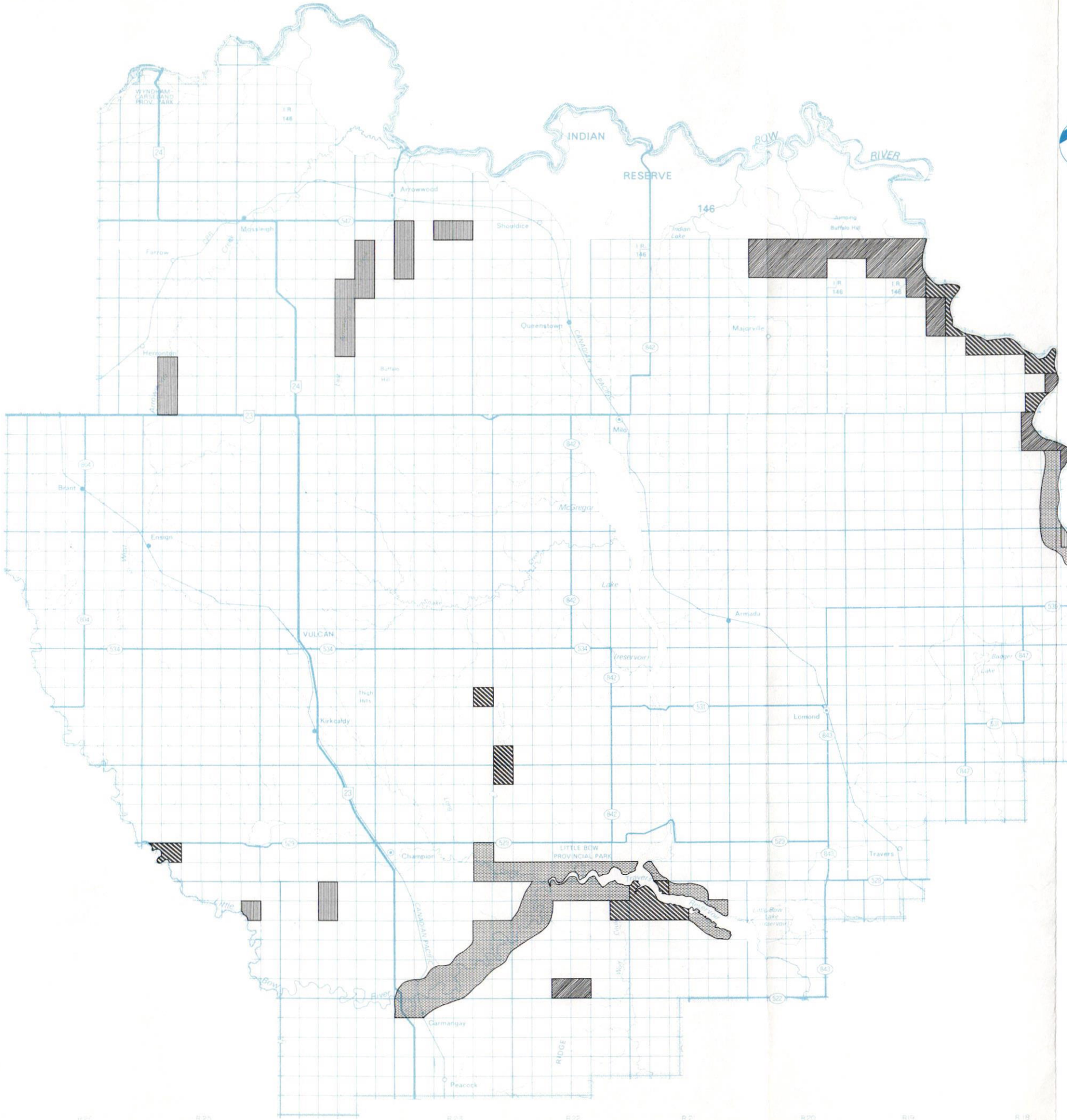
Pleistocene and Holocene Vertebrates

	Significance
Primary skeletons or parts of rare species - other than bison.	Provincial or National
Complete/broken elements of rare/unique species in secondary deposits.	Provincial or National
Primary skeletons and parts of common species (Bison).	Regional or Provincial
Partial skeletons and secondary deposited elements of common species (Bison).	Local

COUNTY OF VULCAN



ENVIRONMENTALLY SIGNIFICANT AREAS



·PALEONTOLOGICAL SENSITIVITY ZONES

- High
- Medium
- Low
- Probable

MAP 4

6.0 CRITERIA FOR REGIONALLY SIGNIFICANT ARCHAEOLOGICAL SITES

6.1 Environmental Parameters

6.1.1 Landform/Location
6.1.2 Water Bodies

6.2 Internal Site Parameters

6.2.1 Site Contents
6.2.2 Site Stratigraphy
6.2.3 Site Dating
6.2.4 Site Paleoenvironmental Data
6.2.5 Site Uniqueness
6.2.6 Site Integrity
6.2.7 Site Size

6.3 Additional Criteria - Bison Kills

6.4 Additional Criteria - Stone Feature Sites

6.0 CRITERIA FOR REGIONALLY SIGNIFICANT ARCHAEOLOGICAL SITES

Two basic criteria were used to establish prehistoric significance in the Oldman River Region: the scientific value of the site and the rareness/uniqueness of the site within the study area.

Scientific values relate to the kind and quality of information (artifacts, butchered bones, and features) a site contains which are of value in understanding prehistoric native peoples' land use and culture history. In most cases, while a site must be excavated to assess these values, generally one can observe enough from the surface to determine what the potential is. Sites judged to be of scientific significance include relatively small sites, which because of their age are worth studying. As one goes back in time fewer sites are preserved. Consequently, an older site may contain less information than a recent site of the same type -- e.g. a small bison kill, but would be of greater significance because there are so few left.

Small sites also provide information on culture patterns, and while most are of local significance; some, again because of their age, are regionally significant. Some kinds of sites are simply very rare; for example, pictographs and ceremonial sites - medicine wheels because very few were ever made or used. They may not contain a great deal of information or be in a good state of repair, but are still significant as a representative of a rare find.

Uniqueness/rarity must also be considered in relationship to the patterns of agricultural land use, which have resulted in massive loss of the most common kinds of sites - tipi rings -- through breaking and plowing of the prairies and terraces. Relatively few of these sites remain today, and those that do are of enhanced value, even though the scientific information they contain, relating to past land use and culture history is extremely variable. Tipi rings represent a single family occupation and are the closest archaeologists can come to excavating a single event.

The following are scientific criteria and weightings, proposed for the study area. These criteria are generally applicable to isolated finds, lithic scatters, campsites, workshops, quarries, bison kills, and some of them to stone feature sites. In a matrix, the sites constitute the rows and the criteria the columns, which are summed by row and squared to increase the value dispersal. Care must be taken to avoid comparing apples and oranges -- i.e. different site types, as each major group must be compared only within itself.

6.1 ENVIRONMENTAL PARAMETERS

6.1.1 Landform/Location

The nature of the landform associated with the site in part reflects the activities at the site.

6.1.1.1 PRAIRIE EDGE - WEIGHTED VALUE 3

Sites overlooking river/stream valleys, generally within less than 100 m of edge. Often have buried deposits because of cliff top deposition - if less than 100 m + 0.5 bonus point to score.

6.1.1.2 HUMMOCKY MORAINE - WEIGHTED VALUE 4

Sites in hummocky moraine, depending on their location, may contain deeply stratified deposits. Locational variation is significant -- base of hummock + 0.5 bonus point.

6.1.1.3 HILL TOPS/RIDGE CRESTS - WEIGHTED VALUE 2

Sites on top of these features often associate with diverse activities - game watching, ceremonial, camp, defense, workshops; stone features may or may not occur. If the site is in a swale or depositional situation + 0.5 bonus.

6.1.1.4 GLACIAL TILL/LAKE PLAINS - FLAT LANDS - WEIGHTED VALUE 1

Sites associated with uniform landscapes tend to be small isolates, unless a water body is present, although one can get surrounds/kills. May get stratified dune deposits if the site is associated with lacustrine/aeolian deposits + 1 bonus point.

6.1.1.5 STREAM/RIVER VALLEY - WEIGHTED VALUE 4

The preferred habitat locales for sites. Internal ranking involves stream classes / landforms.

Major River - +3 bonus points
Minor River - +2 bonus points
Major Stream - +3 bonus points
Minor Stream - +2 bonus points
Erosional Gulley/Coulee - +1 bonus point

Nested within these categories are a subset of land forms:

(a) Elevated Benchland

Generally glacial - +.1 bonus point.

(b) Elevated Terrace

Generally glacial/gravel fill - +.2 bonus point.

(c) Lower Terrace

Post glacial - +.5 bonus point.

(i) Gravel fill
(ii) Silt fill - +.1 bonus point

(d) Slump Block

(i) Colluvial fill - +.1 bonus point
(ii) Erosional - -.1 bonus point

6.1.2 Water Bodies

The second environmental variable which is significant is the relationship of the site to present/past water bodies. (One problem is the prediction of past water body locations.) The following categories will be considered.

(a) Lake - Weighted Value 4

Large standing permanent body of potable water, nesting habitat and fish. If site is less than 100 m distant +.5 bonus point.

(b) Kettle/Slough - Weighted Value 3

Small body of water which holds water all year. If less than 100 m distant +.5 bonus point.

(c) Seasonal Slough/Pond - Weighted Value 2

Small water body which generally dries up every year or on a larger cycle - not reliable water source except in certain seasons. If less than 100 m +.5 bonus point.

(d) Spring - Weighted Value 4

Spring located in varying kinds of lands, may be moraines, seeps, etc. If less than 100 m +.5 bonus point.

(e) Flowing Water - Permanent - Weighted Value 5

Permanent streams/rivers which flow year round. If less than 100 m +.5 bonus point.

(f) Flowing Water - Intermittent - Weighted Value 1

Small water courses which have water on a seasonal basis only. If less than 100 m +.2 bonus points.

6.2 INTERNAL SITE PARAMETERS

A number of parameters inherent in the site provide the major evaluative criteria to assess significance. Sites exposed in plowed fields may rank higher in this category because of visibility. They must be examined separately from buried sites.

6.2.1 Site Contents

The artifacts and other data contained within the site.

6.2.1.1 SITE CONTENTS - LITHICS

The numbers and diversities of chipped stone artifacts within a site.

	Weighted Values
Stone artifacts present	1
Formed tool present	2
More than one class of tools	3
More than five formed tools	4

If exotic or unusual artifacts are found, a bonus of +1 point is added.

6.2.1.2 SITE CONTENT - FAUNAL REMAINS

The presence of preserved faunal materials has important implications for scientific interpretive potential.

	Weighted Values
Faunal materials present	1
Diagnostic (species)	2
Diversity elements	3
Diversity element/species	4

6.2.1.3 SITE CONTENT - FIRE BROKEN ROCK

Fire broken rock is both a chronological and activity type indicator.

	Weighted Values
Present - small amount	1
Present - large amount	2

6.2.1.4 SITE CONTENT - ACTIVITY AREAS

	Weighted Values
Activity areas definable	1
Activity/functional areas	2

Indicates areas can be defined by artifact scatters and differential distributions / associations of tools.

6.2.1.5 SITE CONTENT - FEATURES

	Weighted Values
Hearth/feature present	1
More than one type/number (others can be added as required)	2

6.2.1.6 SITE CONTENT - TRADE/LITHIC PROCUREMENT

The kinds of lithic materials in the site.

	Weighted Values
Local microcrystalline only	1
Local cryptocrystalline only	2
Local microcrystalline and cryptocrystalline	2.5
Exotic non-local - one	3
Exotic non-local - 2 or more	4

6.2.2 Site Stratigraphy

The resolution of the internal stratigraphy of the site both vertically and horizontally.

6.2.2.1 NUMBER OF OCCUPATIONS

	Weighted Values
Stratified (1/2 one occupation)	1
Vertical/horizontal separation	2

6.2.2.2 CHARACTERISTICS OF THE OCCUPATIONS

	Weighted Values
Thin discontinuous	1
Discontinuous	2
Continuous - dense	3

6.2.2.3 STRATIGRAPHIC COMPLEXITY

	Weighted Values
Simple	1
Moderate	2
High	3

6.2.2.4 STRATIGRAPHIC QUALITY

The quality of the stratigraphy to resolve various events/use episodes through time.

	Weighted Values
Undifferentiated	1
Moderate	2
Good	3
Excellent	4

6.2.2.5 DEPTH OF DEPOSITS

The maximum observable depth of the campsite/kill deposits.

	Weighted Values
Greater than 10 cm	1
30 - 50 cm	2
50 cm - 1 m	3
1 - 2 m	4
2 - 3 m	5
3m +	6

6.2.2.6 USE FREQUENCY

The number of times that different individual events are represented in the site.

	Weighted Values
Low	1
Moderate	2
Intense	3

6.2.2.7 CULTURAL PHASES

Number of different cultural groups represented at the site.

	Weighted Values
One	1
Two... three	2, 3, etc

6.2.3 Site Dating

Presence of materials which will allow chronological/cultural placement of the site.

	Weighted Values
Potential time diagnostic tool types	1
Known time diagnostic tool type	2
Datable obsidian	3
Datable organics	4
Diversity of datable materials	5

6.2.4 Site Paleoenvironmental Data

	Weighted Values
Presence of geological sediments	1
Presence of soils	2
Presence of sediments/soils	3

6.2.5 Site Uniqueness

The uniqueness of rarity of the site in age or type within the study region in comparison to all other sites.

	Weighted Values
Moderately rare - less than 25%	1
Extremely rare - less than 10%	2
Unique	3

6.2.2 Site Stratigraphy

The resolution of the internal stratigraphy of the site both vertically and horizontally.

6.2.2.1 NUMBER OF OCCUPATIONS

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Vertical/horizontal separation	2

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Greater than 10 cm	1
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The number of times that different individual events are represented in the site.

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6.2.2.7 CULTURAL PHASES

Number of different cultural groups represented at the site.

	Weighted Values
One	1
Two... three	2, 3, etc

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Presence of materials which will allow chronological/cultural placement of the site.

	Weighted Values
Potential time diagnostic tool types	1
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Datable obsidian	3
Datable organics	4
Diversity of datable materials	5

6.2.4 Site Paleoenvironmental Data

	Weighted Values
Presence of geological sediments	1
Presence of soils	2
Presence of sediments/soils	3

6.2.5 Site Uniqueness

The uniqueness of rarity of the site in age or type within the study region in comparison to all other sites.

	Weighted Values
Moderately rare - less than 25%	1
Extremely rare - less than 10%	2
Unique	3

6.2.6 Site Integrity

The integrity/preservation of the site. (NOTE: Need to further factor, plowed versus other land uses.)

	Weighted Values
Destroyed - greater than 75%	0
50 - 75%	1
25 - 50%	2
Less than 25%	3
Intact	4

6.2.7 Site Size

The overall size of the site.

	Weighted Values
Less than 10 sq. m	1
10 - 20 sq. m	2
20 - 50 sq. m	3
50 - 100 sq. m	4
100 - 250 sq. m	5
250 - 500 sq. m	6
500 - 1000 sq. m	7
1000 - 2000 sq. m	8
2000 sq. m +	9

6.3 ADDITIONAL CRITERIA - BISON KILLS

In addition to the variables listed earlier which are applicable to kills as well as campsites, lithic scatters and isolated finds, etc. there are certain criteria which are of value for ranking/comparison within a group. The principal of these is the association of the various elements of a bison kill -- kill, campsites and gathering basin.

	Weighted Values
Kill only	1
Kill and camp	2
Kill, camp and gathering basin (plowed)	3
Kill, camp and gathering basin (intact)	6

6.4 ADDITIONAL CRITERIA - STONE FEATURE SITES

Weighted values are generally indicative of the range, and can/should be expanded.

TIPI RINGS

Number of Rings	Weighted Values
1 ring	1
2 - 3 cluster	2
4 - 10 cluster	3
10 - 20	4
20 - 50	5
50 - 100	6
100+	7

Definition of Rings	Weighted Values
Poorly defined	0
Variable definition	1
Good definition	2

Internal Features	Weighted Values
Absent	0
Present	1

CAIRNS

Size of Cairns	Weighted Values
Small ca. 1 m single tier	1
moderate ca. 1 - 2 m stacked	4
Large ca. 2 m+ stacked	10

Number of Cairns	Weighted Values
1	1
2 - 3	2
4 - 6	3
6+	4

Definition	Weighted Values
Well defined - not vandalized	2
Partially vandalized	1
Destroyed	-1

RARE/UNIQUE STONE FEATURES

	Weighted Values
Medicine wheel	10
Stone circles	10
Effigies	10
Mosaics	10
Drive lanes	10
Stone lines	5
Stone walls	10
Stone arcs	5
Vision quests	10

Rock Art Sites

Portable	Weighted Values
Rib stones	10
Petroglyph boulders	10

Non-Portable - pictograph, petroglyph	Weighted Values
Single	5
Multiple	10

Definition	Weighted Values
Faded/vandalized	1
Good	3
Excellent	5

Earth Features

	Weighted Values
Earth mounds	10
Pits	10
Trails	5
Earth lodge	10
Pit house	10

7.0 CRITERIA FOR REGIONALLY SIGNIFICANT HISTORIC SITES

7.0 CRITERIA FOR REGIONALLY SIGNIFICANT HISTORIC SITES

A number of criteria evaluation systems for historic resource significance identification and ranking are now in use across Canada.

In Alberta, there is a separate format within federal (i.e. Parks Canada) and provincial (Historic Sites Service) levels of government and both Calgary and Edmonton have developed evaluation systems for their own use.

The Historic Sites Service evaluation ranking is aimed at determining a site's qualifications for inclusion as a Provincial or Registered Historic Resource, and is numerically ranked for such purpose. It is, however, heavily weighted towards urban, standing structures.

The City of Calgary's "A Handbook for Evaluating Calgary's Heritage Resources" is a flexible system which was a result of a review of procedures used in cities across North America. It also is heavily weighted towards the urban context.

The proliferation of endless numbers of evaluation systems on a project-per-project basis is not a desirable scenario, and one that should be avoided here if at all possible, if the existing systems took into account the rural or non-standing structure situation. An evaluation checklist has thus been compiled, utilizing information from the City of Calgary, Historic Sites Service and British Columbia Guidelines for Heritage Resource Impact Assessment, and suitably amended to incorporate the rural landscape and appropriate historic themes. A multi-dimensional scaling system is currently being used in evaluating historic period sites in the Oldman River Dam Project area. Designed with the above in mind, it will be generally applicable to the Oldman River Region and should be utilized in developing regional criteria.

8.0 REFERENCES

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