Environmentally Significant Areas Inventory

of the

Rocky Mountain Natural Region

of Alberta

Final Report

by

Kevin Timoney
Treeline Ecological Research
21551 Twp. Rd. 520
Sherwood Park, AB T8E 1E3
email: ktimoney@compusmart.ab.ca

for

Corporate Management Service
Alberta Environmental Protection
12th Floor, Oxbridge Place
9820 - 106 St.
Edmonton, AB T5K 2J6

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Map. Environmentally Significant Areas of the Rocky Mountain Natural Region, scale 1:750,000 (back pocket)

Abstract

This study produced an inventory of environmentally significant areas in the Rocky Mountain Natural Region of Alberta. The Rocky Mountains are a special place; as a unit the region is unique in the world. By significance category, there were eight international, 15 national, 62 provincial, 37 regional, and four local significance polygons (a total of 126 polygons). ESA polygons cover approximately 32,790.7 km2, a large proportion of the Rocky Mountain Natural Region in Alberta. The high proportion of ESA coverage is due to a combination of factors: high topographic, landform, climatic, and ecological diversity; scarcity of commercially valuable forests, petroleum, etc.; unsuitability for agriculture, and protection within national parks and other areas. While an effort was made to document large polygons (to increase the functionality of each polygon), few polygons are large enough to retain their ecological integrity if surrounded by incompatible land uses, such as total fire suppression and logging. Thus each polygon must be seen in its greater ecosystem context, and in planning a protected areas network, emphasis should be placed on maintaining connectivity across the landscape. A method of identifying ESAs for high-priority conservation is offered. Priority polygons are those that are of high ecological significance, imminently threatened, and useful to completing a protected areas system. Examples given are Wildlife Management Unit AB418, Cardinal - McLeod Headwaters, Front Range Ridges north of Waterton Lakes National Park, Middle Castle River, Mt. Allan - Wind Valley, South Ghost Wilderness, and the Mountain (Woodland) Caribou Range.

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Color Plates: (**a**) Unique grassland vegetation characteristic of the Big Sagebrush Natural Area, 1 Sept. 97; see polygon 61, section 6.2.7; (**b**) coal exploration at the Cheviot Mine site, 24 July 97; see polygon 19, section 6.2.4; (**c**) part of Vermilion Lakes wetlands, Bow River, 30 Aug 97; see polygon 69, section 6.1.5; (**d**) prime woodland caribou range in the Willmore Wilderness near the Sulphur River, 24 July 97; see polygons 3, 4, and 5, sections 6.3.1,2,3; (**e**) morning light on face of Mt. Invincible overlooking the Kananaskis Lakes, 31 Aug 97; see polygons 84, 126, sections 6.3.30 and 6.3.57; (**f**) Howse River valley braided stream and valley walls, 24 July 97; see polygon 73, section 6.2.9; (**g**) habitat loss on Gravenstafel Ridge near the West Castle River, 7 Aug 97; see polygon 63, section 6.4.23; (**h**) high landscape diversity in the Prospect Creek/McLeod River area, view ENE, 29 Aug 97; see polygon 19, section 6.2.4; (**i**) fescue - wheatgrass - shrubby cinquefoil grasslands of the Livingstone R. valley at 50E01'17", 114E25'19", 31 Aug 97; see polygon 131, section 6.3.61; (**j**) view west to Bow Lake, the valley of the Icefields Parkway, and main range glaciers, 7 Aug 97; see polygons 71 and 72, sections 6.1.6 and 6.1.7; (**k**) extensive logging in the Racehorse Creek area affords a scientific opportunity to study effects of high elevation clearcutting, 7 Aug 97; see polygon 30, section 6.3.11.

1. Purpose of the study

The purpose of this study was to identify, map, and describe environmentally significant areas of the Rocky Mountain Natural Region of Alberta.

1.1 Definition of AESA@

What is an ESA? The abbreviation stands for Aenvironmentally significant area.@ It refers to an important and/or unique and/or sensitive part of the landscape. An ESA can be important for any number of reasons, from performing critical ecosystem services such as floodwater storage and water purification to providing critical winter habitat, spawning and nesting areas, hibernacula, travel corridors, and refugia. ESAs may contain unique landforms or old-growth forests, may support rare or endangered species; or may be areas that are excellent representatives of particular ecosystems or landscapes.

The identification and documentation of ESAs provides important information that can be used to improve land-use decisions and protect biodiversity. As well as providing land-use-decision support and protecting levels of physical and biological diversity from the gene to the landscape complex, ESAs can serve: as ecological benchmarks against which changes may be compared; as research areas; to protect water and air quality, fisheries, sensitive terrains, and soils; as places for public education and recreation; as areas that moderate global warming through sequestering of carbon dioxide; etc.

It is easy to find significant areas in the RockiesCmost of the Rockies are significant for one reason or another (see section 2 below). The challenge is to define areas that are meaningful to management and to document the reasons for significance.

1.2 Study Rationale

The rationale for this study flows from one of the implementation strategies of the Special Places 2000 program, a plan to identify and protect diverse and representative landscapes within the province of Alberta. The Special Places 2000 program supports initiatives at the international level (the Biodiversity Convention of the Earth Summit, June 1992), national level (the World Wildlife Fund Endangered Spaces Program), and provincial level (Toward 2000 Together - the Premier=s Conference on Alberta=s Economic Future). Protecting landscapes is the key to achieving the objectives of these programs. Documenting ESAs and similar research, along with local interest, should form the basis for identifying potential new special places (Public Advisory Committee 1993).

Pressure from the logging, oil and gas, mining, agricultural, tourism, housing, and commercial development industries continues in the Rocky Mountain Natural Region. Old-growth forests are disappearing and with them all the life forms and processes they support; seismic cutlines, well-drilling, logging, and other industrial activities continue to fragment the

landscape into ever smaller, isolated pieces. Outside the national parks, there is little time left to protect large, relatively undisturbed pieces of the Rocky Mountains that might serve as a functional, linked network.

In a region as diverse, heterogeneous, and significant as the Rocky Mountain Natural Region, a significant areas inventory is never complete. As time passes, the quality and quantity of information will continue to grow, allowing better understanding and finer resolution than is currently possible. On the other hand, the pace of ecological degradation continues to accelerate. As such, the information presented in this study should be applied *now,* to assist in formulating a protected areas network. If we wait, the information we gather will become simply a catalogue of what we have lost.

2. Background on the Rocky Mountain Natural Region

The Canadian Rockies are a special place. Few North Americans would dispute that opinion. In the Afterword to *Handbook of the Canadian Rockies,* Gadd (1995:783) writes:

> *Three hundred thousand words after starting this book, I have learned something about the Canadian Rockies: this place is special, unlike any other place on earth. So we have to protect it, which means we have to keep it wild.*

2.1 Geology

What makes the Canadian Rockies special? That question has many facets, from ecological to cultural and personal. Perhaps the fundamental and historical reason is geological: the movement of the Earth=s crustal plates (the following geological overview is after Gadd 1995). The collision of the North American Plate and plates underlying the Pacific Ocean, most intense from 140 to 45 million years ago, caused sedimentary rocks (mostly deposited below sea level) to be deformed, broken, and piled up to form the mountainous landscape of western Canada. The tremendous force of the collision pushed the sediments of the continental shelf inland and northeastward, tearing the sedimentary rocks free from their Precambrian basement rocks. The once flat-lying sedimentary rocks formed thrust sheets that were pushed as far as 300 km to the northeast, sliding up and over one another and stacking to form the backbone of the continent, a region of northwest/southeast-aligned ridges and valleys.

About 80 million years ago, the American and Canadian Rockies were similar regions of folded and faulted sedimentary rock. At the surface, both parts of the Rockies took the form of broken and deformed, piled-up sedimentary rock layers. Since then, in the American Rockies an oceanic plate has pushed its way eastward under the basement rock of the North American Plate, causing the basement rock to be broken and thrust up. Under Canada the oceanic plate has dipped

downward, melting deep under the Earth=s crust in the heat of the upper mantle and leaving the continental basement rock undisturbed. In the intervening millennia, the overlying sedimentary rocks of much of the American Rockies have been eroded, exposing the upthrust crystalline rocks of the North American Plate. In contrast, the Canadian Rockies still show only sedimentary rock at the surface (there are three small areas where basement rock is exposed, none of them in Alberta).

Further differentiating the Canadian Rockies from the American Rockies, additional Miocene and more recent uplift in the American Rockies has been accompanied by volcanoes and lava flows, while the Canadian Rockies experienced little of this uplift and volcanic activity.

Over the last two million years, intense glaciation has changed most of the Alberta Rockies, creating a young landscape of deep U-shaped valleys, cirques, aretes and horn peaks, moraines, kames and other glacial landforms, with a few small areas at high elevations that stood above the surrounding glaciers as unglaciated nunataks.

Thus, the Alberta Rockies are by their nature very different from the surrounding lowlands and geologically significant. Were this all, the Rockies would still be a special place, for mountains compose only a small amount of the Earth=s surface, but that is only the beginning.

Past and present climatic conditions, coupled with wind and water erosion and downhill movement of materials under the influence of gravity, have continued to add to the region=s diversity, creating a landscape of glaciers, rock glaciers, patterned ground and permafrost, silt-laden glacier-fed streams and lakes, terraces, braided streams, falls and cataracts, hoodoos, caves, canyons, sand dunes, colluvial aprons and fans, steep slopes, cliffs, plateaus, etc. The great variety of bedrock types, relief, slopes, aspects, water regimes, and particular geological and site histories has created a diversity of mesoclimates, soils as disparate as Chernozems and Cryosols, vegetation varying from nival patches and *Chlamydomonas nivalis* snow algae to dry grassland, and animal communities that differ greatly from northeast to southwest aspects and from valley bottoms to summits. Add to this a wealth of hydrogeological features such as hot springs, cold mineral springs, and disappearing rivers.

2.2 Weather and Climate

Yet the specialness of the Rockies does not stop there. The Rockies and other western mountain ranges are so large that they affect the continent=s climate and strongly influence the weather. The Canadian CordilleraCmeaning all the mountains of western CanadaCforms a barrier to the west-east flow of mild, moisture-laden Pacific airmasses, making the region west of the Cordillera relatively warm and moist and the region east of the Cordillera relatively cold and dry. The same effect can be observed on an individual mountain with its warmer, wetter west slopes and its drier rain shadow east slopes.. The climatic effect of the Cordillera is so great that

it affects the zonation of biomes in North America. The relationships between the north-south gradient in solar flux and the west-east flow of airmasses steered by the westerlies is modified by the Cordillera such that biome zonation in western Canada in general follows a northwest-southeast orientation, reaching south into the United States in the form of the great rain shadow wedge of the North American Prairies.

The topographic diversity of the Rockies results in weather that is renowned for its variability. As eastward-moving weather systems cross the Rockies, the mountain masses and valleys create turbulence in the flow patterns, resulting in rapid changes in winds and clouds, downdrafts, eddies, lenticular clouds, and other effects that are propagated eastward beyond the mountains. The best known of these effects are the rain shadow and the chinook. The latter takes place when strong westerly flow produces standing waves downwind of the mountains; the warm, moist air, on encountering the colder air east of the mountains condenses to form clouds (a chinook arch) on the wave crests and warm winds on the ground at the wave troughs.

Locally within the mountains, winds in most valleys are typically light and variable, and katabatic (downslope) evening winds are common. The prevailing southwesterly winds typically blow southwest-facing slopes free of snow and deposit the snow on northeast-facing slopes.

Breaks in the Rockies in the form of major valleys such as the Crowsnest, Bow, North Saskatchewan, and Athabasca Rivers allow the milder Pacific air to penetrate eastward, resulting in milder climatic conditions east of the mountains and in particular suites of montane landscapes, habitats, and species.

2.3 Wildlife

The significance of the Rockies extends far beyond the mountains in more than climatic and biome effects. The Rockies are a meeting place and a migratory corridor for life forms. Vegetation types and plant and animal species typical of the arctic extend southward in the Rockies at higher elevations. Likewise, species and communities from the Great Plains, the southern Cordillera, and the intermountain west all extend in one degree or another into the Rockies, finding a home within the great diversity of topography, climates, and landforms. The unbroken spine of the continent is a major northwest/southeast highland migration corridor extending from Alaska to Mexico. And non-migrants such as bighorn sheep and mountain goats find in the mountains the particular habitats or seasonal range that exists only there.

2.4 Human Use

In addition to the major geological differences between the American and Canadian Rockies there is the north-south difference manifested in different climates, vegetation, landforms, species, and processes. But there are other differences: much of the American Rockies has a long history of commercial land use in the form of logging, mills, mines, ranches, ski areas,

condominia, private lands, etc. Much of the wild character (unaltered forests, landscapes, species complement) and splendor of the American Rockies have been lost. Likewise, other north-temperate mountain ranges on the Earth, such as in southern Alaska, the Alps, and the Urals have long histories of human use and abuse. We are luckier in Canada. A smaller human population, with the presence of large national parks and protective provincial zoning, have allowed much of the Canadian Rockies to remain intact. Another major factor accounting for the relatively intact condition of the natural region is its scarcity of commercial resources. Much of the Rockies lacks extensive commercially valuable forests, petroleum, etc. and is generally unsuitable in Alberta for crop-based agriculture. But where such resources do exist in the region, protective zoning has done littleCe.g., the loss of old-growth forest landscapes both north and south of the Crowsnest Pass, and the recent approval of the Cheviot Mine at the mountain front east of Jasper. There is little reason for complacency.

2.5 International Significance

The Canadian Rockies as a whole, for all the above reasons, are internationally significant. Witness the millions of visitors from around the world who flock to the region. They come, and return, because the Rockies are specialCdiverse, unique, refreshing, rejuvenating, grand, awe-inspiring, interesting, challenging, funC different things to different people. As such, the Canadian Rockies are not only significant ecologically, geologically, climatically, etc., they are part of Canadian and world culture, part of the human experience.

3. Classification of Environmentally Significant Areas

Few would dispute that the entire Rocky Mountains of Alberta are internationally significant for a host of reasons. One large polygon delimiting the entire natural region, which encompassed all the multiple structural and functional scales of diversity, would be defensible. It would not be very useful, however, as the sheer wealth of information required to describe that polygon would overwhelm, nor would it be at a scale amenable to management. Such an approach would result in much information loss, and it would obscure the heterogeneity of the region. Nevertheless, it is axiomatic that large areas contain a greater variety of processes (especially large ones such as a natural fire regime and landscape evolution), are more driven by internal cycles and energy flows rather than external controls, contain more of the Earth=s biomass, have a greater influence on the Earth=s climate, have larger populations and metapopulations, have lower extinction rates, are more functionally connected, and support a larger share of the Earth=s biodiversity than small areas. Moreover, only in large areas can features persist long enough for organic evolution to occur. In sum, large areas have greater integrity than small areas.

Thus there is a scale-dependence to environmental significance: the larger an area, the greater the tendency toward higher significance. The significance of a region is not equal to the average significance of its ESA polygons. Since the polygons interactCmatter, energy, and organisms flow between the polygonsCthe region encompasses more processes, more diversity, has greater integrity, and thus higher significance than its constituent polygons. If we are to understand the significance of the Rocky Mountains, we need the big pictureCto see them as an interacting, evolutionary whole.

For the purposes of this study, an area was considered as an ESA if it met one or more of the following criteria:

- $ Significant environmental, ecological or hydrological feature
- $ Rare or unique geological or physiographic feature
- $ Significant, rare, or endangered plant or animal species
- $ Unique habitats with limited representation in the region or remnant habitats
- $ Unusual diversity of plant or animal communities due to a variety of geomorphological features and microclimatic effects
- $ Large, relatively undisturbed habitats and habitat for species intolerant of humans
- $ Important linking function permitting movement of wildlife over considerable distance, including migration corridors and stopover points
- $ Excellent representative of one or more ecosystems or landscapes that characterizes a natural region
- $ Intrinsic appeal due to widespread community interest or presence of highly valued features or species such as game species or sport fish
- $ History of scientific research
- $ High aesthetic value

In a study of the ESAs of the foothills of Alberta, Bentz et al. (1995) provided an overview of ESA identification and classification, and readers may refer to that study for details.

Once tentative polygons were identified, for each polygon, its degree of representivity, diversity, naturalness, and ecological integrity were considered. In some cases, areas were excluded because their naturalness/ecological integrity had been compromised by human activities. Sometimes, the degree of disturbance was so great that ESAs were created as a result, e.g., where wholesale disturbance has created valuable ecological research opportunities or where imminent liquidation required a reserve to save a remnant area.

The degree of representivity/rarity at the local, regional, provincial, national, and international scales, the diversity contained in the polygon, and an assessment of its overall ecological condition were used to assign significance codes.

An application of such an approach is that an area=s ecological significance may be considered in land use and management decisions. Wherever appropriate, polygons contained complete watersheds or groups of watersheds. Connectivity between polygons was sought to minimize isolation effects. Across much of the study region, polygons proved to be contiguous. The retention of individual but contiguous polygons, rather than consolidation into very large polygons, was based on a number of considerations: (1) consolidation results in information loss; (2) consolidation of polygons of different significance (e.g., local vs. provincial) creates problems with classification and management. In places where an area of high significance was found to bisect a pre-existing polygon of lower significance, the latter was subdivided into different polygons.

While polygons were made as large as possible to maximize landscape representivity and functional diversity, an effort was made to make each polygon homogeneous with regard to criteria and significance codes. The relatively large polygons, coupled with the high physical and biological diversity characteristic of the Rocky Mountains, made use of multiple records necessary in the CRITERIA.DB and FEATURE.DB files. For example, one polygon might be considered an ESA based on criteria of Asignificant, rare, or endangered plant or animal species@ and Aunique habitats with limited representation in region or remnant habitats.@ That same polygon might support significant hydrology/lake and wildlife/rare-endangered species, and require more than one theme and theme feature code. In many cases, the theme and theme feature codes provided are simply the most significant within the polygon, and other features are noted under the site description field in the LOCATE.DB database file.

Areas that are not covered by ESA polygons may prove to be significant; that is, the lack of a polygon may be due simply to lack of information. Clearly, a study of the ESAs of the Rocky Mountains is never really done. This is a first approximation.

4. Methods

Study methods included preliminary preparation, fieldwork, airphoto interpretation, database preparation and digital map production.

4.1 Preliminary Preparation (Literature Review, Questionnaire, and Interviews)

Literature on the Rocky Mountain Natural Region is large and varied. Many excellent studies, reports, and books exist, and these were the foundation of the data presented in this study. The major drawback of the literature was its non-uniform coverage. Many areas were well

documented, such as the Bow Valley and Banff National Park, while others had little ESA-relevant information. In order to fill information gaps, other sources were used.

A questionnaire was prepared and sent via e-mail to many experts. Responses were incorporated into the database. Telephone interviews were used to track down information on specific areas or features. The World Wide Web was used to access other information, such as planning information on proposed coal-mining in the Mountain Park/Cardinal Divide area (Cheviot Mine) and at Caw Ridge.

Extensive use was made of information supplied by the Alberta Natural Heritage Information Centre. These included: 1:250,000 maps and database of provincially rare plant occurrences in the region; 1:750,000 map of logging on crown land for the period 1966C1996; 1:600,000 map of transportation network (including roads, seismic lines, haul roads, etc.); natural area fact sheets, and use of the ANHIC library.

Occurrence data for rare/uncommon amphibians and reptiles of the region was provided via the Alberta Environmental Protection Biodiversity Observation Database.

Common and scientific names for plants follow Alberta Environmental Protection (1993); those for birds follow Semenchuk (1992); those for mammals follow Smith (1993); those for fishes follow Scott and Crossman (1973) and Gadd (1995); those for amphibians and reptiles follow Russell and Bauer (1993); and those for invertebrates follow Gadd (1995).

4.2 Fieldwork

Both airborne and ground-based fieldwork were used to find and document ESAs. Detailed flight plans were made in order to fly over as many potential ESAs as possible. Two all-day flights in a single-engine Cessna were then made: the north half of the study region was flown on 24 July 1997 and the south half on 7 August 1997. Lorna Allen of ANHIC accompanied me on both flights. Weather conditions prevented us from reaching all prospective areas, but many of these same areas were later reached on the ground.

During late summer, two days of helicopter-assisted fieldwork were planned and logistics arranged with experts to accompany me. Unfortunately, one day prior to the flights the helicopter time was canceled.

Five days of ground fieldwork were conducted from 28 August to 1 September 1997. A route plan was prepared and primary and back roads were driven from north of Grande Cache to the South Castle and West Castle area, totaling about 2200 km of ground search. Dave and Kathy Sheppard of the Castle Crown Wilderness Coalition acted as my guides during fieldwork south of the Crowsnest Pass, and Dave Sheppard provided abundant unpublished ESA information by annotating maps in the field.

4.3 Airphoto Interpretation

Sites identified from the above sources that required further documentation were studied via airphotos at the Alberta Air Photo Library. The most common use of air photos was to delimit areas and to identify features that could be seen only partially during the fieldwork.

4.4 Database Preparation and Mapping

Database files were prepared as outlined in the study terms of reference. Three Paradox 7 files (FEATURE.DB, CRITERIA.DB, and LOCATE.DB) were created and filled as information was gathered. The structure of the three Paradox files is provided in Appendix 1, along with keys to the database codes. Since the region is so diverse, additional theme feature codes had to be added (e.g., glacier, rock glacier, cave). ESA polygons were mapped onto eleven 1:250,000 NTS topographic maps. All ESAs were checked prior to digitizing. Based on all the information on hand, some polygon were changed, added, or deleted, and others were divided into new polygons.

4.5 Digital Map Production

Finalized polygons were digitized by Terrain Resources (Lethbridge, AB). A 1:500,000 ARC INFO .E00 file and map of ESA polygons was produced (see map pocket).

5. Study Region Boundaries and Divisions

The study region has a complex boundary. Nominally the study region includes the montane, subalpine, and alpine subregions of Alberta, with the exclusion of all of Jasper National Park and those montane areas already mapped as part of previous ESA studies (e.g., Porcupine Hills, Whaleback Ridge, Cypress Hills).

In order to present an ecologically whole picture, however, I felt it necessary to map beyond the above boundaries in some areas. For example (a) polygons of the woodland caribou range extend northeast out of the study region into the upper foothills; (b) some polygons of high quality mammal habitat extend eastward into the montane, upper foothills, and even into lower foothills areas; (c) polygons within the major corridors of the Crowsnest, Bow, North Saskatchewan, and Athabasca valleys include some montane areas.

The following summary of the region and subregions is modified after Achuff (1994).

The two primary mountain ranges of the study region, the easterly front ranges and the westerly main ranges, are composed mostly of thrust-faulted and folded carbonate and quartzitic sedimentary rocks. In the Kakwa area, there are folded clastic rocks more typical of the foothills. The topography is the most rugged in Alberta. Local relief exceeds 1000 m; elevations rise from east to west with minima in major river valleys at 1000 m and maxima on the continental divide at 3700 m. The major valleys trend southeast/northwest. The mountains are the source of most of the larger rivers in the province, with eventual drainage into the Mackenzie and Saskatchewan

systems. At its narrowest near Waterton Lakes National Park, the region spans only about 10 km; at its widest points, it exceeds 100 km. An overview of the natural resources of Banff (within the study region), and Jasper, Kootenay, and Yoho (outside the study region) National Parks is given by Parks Canada (undated).

In Alberta inclusive of Jasper National Park and other areas excluded from this study, the alpine subregion occupies 14,516 km^2, the subalpine subregion occupies 25,764 km^2, and the montane subregion occupies 5,987 km^2, for a total of 46,267 km^2 in the Rocky Mountain Natural Region (Achuff 1994).

5.1 Montane Subregion

Sandstone outcrops typify much of the southerly portion. In the major river valleys, landforms are mainly glaciofluvial terraces and fans along with glaciolacustrine, aeolian, and morainal deposits. Soils are mostly Chernozems, Brunisols, and Regosols under grasslands; Brunisols and Luvisols are the typical forest soils.

The mean MayCSeptember temperature is about 12°C; that for July is 15°C and for January -8°C. Chinooks are characteristic of the subregion; the ground may be snow-free intermittently in winter. The frost-free period is about 70 days. Annual precipitation ranges from 300C1280 mm.

Montane vegetation is typified by a mosaic of open forests and grasslands. Characteristic communities include (1) Douglas fir/pine grass on moderate to steep colluvial and morainal slopes. In the south, Douglas fir forests are found mainly on north and east aspects, while in the north they are found on south and west aspects in the major river valleys. (2) Open limber pine forests are generally found on exposed rock outcrops and eroding materials. Typical dominants are bearberry, junipers, bluebunch wheatgrass, Idaho fescue, northern bedstraw. (3) White spruce forests are found along streams on alluvial terraces. Aspen forests are found typically on alluvial fans and terraces. (4) Lodgepole pine/buffaloberry - pine grass - hairy wild rye forests are found on dry uplands. (5) Grasslands occupy the drier soils, and are typically species-rich. Characteristic species are bluebunch wheatgrass, fescue grasses, and oatgrasses.

Typical animals of the forests are blue grouse, mountain chickadee, Hammond=s flycatcher, yellow-rumped warbler, Oregon dark-eyed junco, chipping sparrow, red crossbill, pine siskin, MacGillivray=s warbler, warbling vireo, lazuli bunting, Clark=s nutcracker, mule deer, elk, Columbian ground squirrel, and red squirrel. In wetlands and water bodies, typical animals are Barrow=s goldeneye, common snipe, red-winged blackbird, common yellowthroat, beaver, muskrat, and western toad. The uncommon to rare spotted frog and long-toed salamander may also be found.

A review of special features, disturbances, and significance for protection, heritage appreciation, recreation, and tourism of the Alberta montane subregion has been conducted by

Natural Resources Service (1995). A salient feature of that review is the high degree of reduced habitat effectiveness due to the preponderance of human activities in montane valleys. Environmentally significant areas of the Bow River corridor east of Banff National Park have been identified by Sweetgrass Consultants (1991). There is some overlap between that and the present study in the areas of Yamnuska and Wind Valley.

5.2 Subalpine Subregion

The subalpine subregion occupies the altitudinal band between the alpine and montane subregions in the south, and between the alpine and upper foothills subregions in the north. In the south the elevational range is 1600 to 2300 m and in the north is 1350 to 2000 m.

Morainal deposits are typical, with colluvial and residual materials at higher elevations. Alluvial and glaciofluvial deposits, with lesser amounts of glaciolacustrine and eolian materials, are found in the stream valleys. Brunisols and Luvisols are the more common soils. Regosols are found on colluvium, residuum, and on floodplains. Podzols are found on moist high-elevation sites under spruce and fir stands. Cryosols are found in some upper subalpine sites associated with solifluction. Gleysols and Organics are found on wet sites.

The mean July temperature ranges from 9°C to 15°C and the mean annual temperature ranges from -1°C to +3°C. The frost-free period is probably fewer than 30 days. Annual precipitation ranges from 460 mm in the drier front ranges to more than 1400 mm in parts of the south. Winter precipitation is greater in this subregion than elsewhere in the province, with more than 200 cm of snow falling in most winters.

Subalpine vegetation is unusually diverse. It includes grassland elements on the warmer sites and alpine tundra elements at its upper margin in the forest-tundra ecotone (or treeline). Typically the vegetation zonation is subdivided into lower subalpine and upper subalpine. In the lower subalpine zone, lodgepole pine/buffaloberry - hairy wild rye forests are typical after fire, with associates of showy aster, bearberry, junipers, and heart-leaved arnica. At higher elevations, false azalea and grouseberry are typical in the lodgepole pine forest understory. In southern lodgepole pine forests, thimbleberry, western snowberry, white spirea, and Rocky Mountain maple are important. In the Waterton area, beargrass, thimbleberry, Piper=s wood rush, foam flower, and mountain lover are characteristic.

At higher elevation, moister sites, Engelmann spruce - subalpine fir forests are found on a variety of landforms. Typical understory plants are false azalea, huckleberry, white-flowered rhododendron, grouseberry, one-flowered wintergreen, one-sided wintergreen, and bunchberry. In long absence of disturbance, feather mosses *(Hylocomium splendens, Ptilium crista-castrensis, Pleurozium schreberi*), *Dicranum scoparium*, and *Peltigera* spp. carpet the forest floor.

In the open forests and forest-tundra of the upper subalpine zone, Engelmann spruce, subalpine fir, whitebark pine, and in the south subalpine larch, are typical. Herbaceous

understories are dominated by arrowleaf groundsel, subalpine fleabane, mountain valerian, western anemone, and mountain hairgrass. Dwarf shrub understories are typified by red heather, yellow heather, white mountain heather, grouseberry, and rock willow.

Grasslands are found on some steep south and west aspects in the front ranges, with the typical dominants hairy wild rye, June grass, and bearberry.

Wildlife of the conifer forests includes the characteristic Steller=s jay, varied thrush, and Townsend=s warbler, and the more-widespread spruce grouse, gray jay, golden- and ruby-crowned kinglets, yellow-rumped warbler, pine siskin, boreal chickadee, winter wren, marten, snowshoe hare, black bear, deer mouse, red-backed vole, and red squirrel. In the north, willow ptarmigan, mountain caribou, and golden-crowned sparrow are characteristic. Near treeline, typical birds are hermit thrush, white-crowned sparrow, Brewer=s sparrow (from Jasper National Park south), and golden-crowned sparrow (the latter common in the north, uncommon to rare south of the Columbia Icefield and the Helen Lake - Pipestone Pass area [Holroyd and Coneybeare 1990]). Talus and other stony areas support golden-mantled ground squirrel, yellow pine chipmunk, least chipmunk, pika, and hoary marmot. American dippers and harlequin ducks typify fast-flowing streams.

5.3 Alpine Subregion

This zone includes all lands above treeline, including tundra, rockland, snowfield, and glaciers. In the north, the alpine zone lies above 2000 m, and in the south above 2150 to 2300 m.

Surficial materials are typically residuum, colluvium, till, and bedrock. Much of the area has too little surficial material for soils to develop and is classified as rockland. Elsewhere, Regosols and Brunisols are typical. Some Podzols are found under ericad communities on eolian deposits. Cryosols are found in areas routinely blown free of snow, and Gleysols are found in poorly-drained areas. Patterned ground is present at higher elevations, particularly on slopes gentle enough to avoid significant colluviation (Anderson 1979).

Climatic data are sparse. Mean annual temperatures are likely below 0°C, and mean MayCSeptember temperatures are likely about 6°C, with no appreciable frost-free period. Mean annual precipitation ranges from 420 to 850 mm and is likely higher in areas of orographic precipitation. High winds that redistribute snow are typical and play a role in shaping both soils and vegetation.

Alpine plant communities vary over short distances due to strong controls including soil pH, soil texture and moisture, aspect, wind exposure, time of snow melt, and snow depth. Deep, late-melting snowbeds are dominated by black alpine sedge. Typical snowbed communities are dominated by dwarf ericad tundra of heathers, mountain heathers, and grouseberry. On ridges and other shallow snow areas, white mountain avens, snow willow, moss campion, and bog-sedge are common. Herb meadows are found on well-watered soils downslope of snowbanks and along

streams. Crustose and foliose lichens (e.g., *Lecidea, Lecanora, Umbilicaria*) are common on exposed bedrock and boulders, more so on quartzitic rocks than on carbonates. South of the Crowsnest Pass, mountain heathers *(Cassiope* spp.) are absent, heathers (*Phyllodoce* spp.) are restricted, and bear grass (*Xerophyllum)* meadows are occasional.

Characteristic mammals include Columbian ground squirrel, pika, hoary marmot, grizzly bear, mountain goat, and bighorn sheep. White-tailed ptarmigan, rosy finch, horned lark, and water pipit are common in summer.

6. Results

In the following, a hierarchical approach is taken. Internationally significant areas are described in detail, with progressively less emphasis given to nationally, provincially, regionally, and locally significant areas. Reference sources used to delimit international and national polygons are provided in the text. For the sake of brevity, reference sources used to delimit provincial, regional, and local ESAs are listed only in the site description field of the Paradox database (see Appendix 1) file LOCATE.DB, and in literature cited. By significance category, there were eight international, 15 national, 62 provincial, 37 regional, and four local significance polygons. The total area contained within the 126 polygons is 32,790.7 km2. Since there were exclusions of the study region (e.g., Jasper NP, the Porcupine Hills) and a few mapped polygons extended beyond the boundaries of the region, it is not possible to quantify the amount of the study region covered by ESA polygons. If exclusions and extensions canceled one another, ESA polygons would cover roughly 71% of the natural region.

6.1 Internationally Significant Areas

6.1.1 *Bow Valley West* (Polygon 39; references used to document the polygon: Achuff et al. 1986; Gadd 1995; Banff-Bow Valley Task Force 1996; Biodiversity Observation Database (G. Court, pers. comm. 1997); Komex International 1995; field observations, 1997)

The Bow Valley is a travel and migration corridor of international significance for many forms of life. Lowland corridors run both along Bow Valley and across the valley up into side valleys; highland corridors run generally north-south along ridges such as the Sundance and Rundle Ranges, and cross the Bow Valley near the Vermilion Lakes and elsewhere.

The valley includes some of the better examples of the montane ecoregion in Canada, and has high habitat value for birds, large carnivores, small mammals, ungulates, and reptiles and amphibians.

The Bow River is an internationally renowned fishery supporting native lake chub; longnose dace; longnose, white, and mountain suckers; cutthroat trout; bull trout; mountain whitefish; trout perch; burbot; and brook stickleback. It also supports introduced rainbow trout,

brown trout, brook trout, Dolly Varden, splake, cisco, lake whitefish, western mosquitofish, sailfin molly, and African jewelfish. Lake sturgeon, pearl dace, fathead minnow, northern pike, and spoonhead sculpin may be present.

The polygon contains four natural areas of significance identified by Achuff et al. (1986): (a) Hillsdale (rare fossil site; rare plants; significant montane vegetation types; rare birds; significant bird communities; elk, moose, bighorn sheep, and deer winter range; significant montane ecosites, and prehistoric cultural sites); (b) Johnston Canyon (significant canyon and falls; fossil site; Ink Pots springs; rare plants; rare birds; rare mammals; significant bird communities; significant montane vegetation types and ecosites; elk, deer and moose winter range; and prehistoric sites); (c) the Sawback Range (rare plants; significant vegetation types; rare birds; significant bird communities; bighorn sheep, elk, deer, mountain goat, and moose winter range; waterfowl staging and nesting areas, and prehistoric cultural sites); and (d) Vermilion Pass (Altrude Canyon; rare plants; rare animals, and historic sites). The polygon includes the Lake Louise area, an international tourist destination (see polygon 68 for details). It also includes Castle Mountain (a classic example of an eastern main range mountain illustrating a Cambrian geological Asandwich@ with its lower cliff of Cathedral dolomite, its middle ledge of softer Stephen shale, and its upper cliff of Eldon limestone; the Pika formation at the mountain peak and the Mt. Whyte and Gog formations at the mountain base are also visible). Silver City on Castle Mountain and prospecting remains on Protection Mountain provide historic evidence of former copper mining in the area. Other features are Helena Ridge, Mt. Avens, Eisenhower Peak, Rockbound Lake, Lipalian Mountain, and Baker Creek.

Significant amphibian occurrences include: northern leopard frog (west of Potts Lake), two tiger salamander sites (southeast of Yamnuska (Mt. Laurie)), and four spotted frog occurrences (one southwest of Castle Mountain, and three north of Lake Louise).

An estimated 100,000 to one million people travel through the corridor per month, winter and summer (highest in tourist season). The corridor contains the Bow Valley Parkway, a winding, scenic highway renowned for fitting into the landscape.

The area has been the subject of much controversy and research regarding landscape degradation and overdevelopment in Banff National Park. Serious issues facing the area include landscape fragmentation and loss of habitat connectivity; blockage of wildlife movements along and across the Bow Valley; loss of montane habitat due to development and fire control; altered predator-prey relationships; and introduction of non-native plants and fish (Banff-Bow Valley Task Force 1996).

See other Bow valley polygons for more information.

6.1.2 *Turtle Mountain and Frank Slide* (Polygon 47; references: Gadd 1995; Sweetgrass Consultants 1988)

In April 1903, a portion of Turtle Mountain broke free and slid downslope, burying the town of Frank under about 36 million cubic metres (~100 million tonnes) of Rundle Group limestone and Banff Formation shale, and killing at least 76 people. Turtle Mountain has a tight fold overlying a thrust fault, which may have made the rock unstable; coal mining at the base of the mountain may have precipitated the disaster. The rock fell with such momentum that some material came to rest 150 m above the valley floor on the opposite side of the valley (Hardy 1967). Bedrock fissures dating from the slide may be observed on Turtle Mountain. The polygon includes Frank Lake, a permanent wetland with waterfowl production.

6.1.3 *Waterton Lakes National Park* (Polygon 57; references: Achuff 1997; Van Tighem 1997; ANHIC rare plant database, 1997)

Waterton Lakes National Park (WLNP) is of international significance for a host of reasons.

At last count, there are at least 450 rare plant occurrences in the park (ANHIC rare plant database, 1997).

The park fulfills a critical role in providing landscape connectivity for cordilleran life forms moving between the United States and Canada. Together with Glacier National Park in Montana, the two parks constitute Waterton-Glacier International Peace Park (Pringle 1986).

WLNP is a vertebrate biodiversity hotspot in Alberta and Canada. Some examples are Vaux=s swift (first nest record for Alberta), restricted range species (e.g., water vole, timberline chipmunk, and wandering shrew), heather vole, water shrew, long-tailed shrew, badger, long-toed salamander, and leopard frog. The terrestrial vertebrates of the park have been inventoried by Wallis and Wershler (1997) who outlined conservation concerns and management recommendations.

Other significant features of Waterton include: the scenic red argillite of Red Rock Canyon; stromatolite fossils; opossum shrimp in Upper Waterton Lake; archeological sites; a network of hiking and equestrian trails; and recreational fishing for rainbow, brook, cutthroat, lake, and bull trout; northern pike; and Rocky Mountain whitefish (Pringle 1986).

Regarding special plant and landscape features, the following is quoted from Achuff (1997):

> WLNP currently is known to contain 971 vascular plant species, more than any other mountain national park and disproportionally rich for its size. Of these, 179 species are rare in Alberta and occur in WLNP. Of particular note are: 1) the Waterton moonwort (*Botrychium x watertonense*) which is endemic to WLNP, 2) three species that occur in Canada only in WLNP (*Agropyron x brevifolium, Botrychium paradoxum, Erigeron lackschewitzii*), and 3) twenty-two species that occur in Alberta only in WLNP (*Brickellia*

grandiflora, Carex epapillosa, Cheilanthes gracillima, Douglasia montana, Epilobium mirabile, Festuca occidentalis, Gnaphalium microcephalum, Hypericum formosum, Isoetes bolanderi, Mimulus breweri, Phacelia lyallii, Philadelphus lewisii, Physocarpus malvaceus, Polypodium hesperium, Prenanthes sagittata, Pyrola picta, Saussurea americana, Spiraea densiflora, Stellaria americana, Taxus brevifolia, and *Trillium ovatum*).

Another 28 vascular plant species that occur in WLNP are on the Alberta Watch List, species that are reasonably abundant in the WLNP area but are uncommon or rare elsewhere. The population sizes are inferred to be small since these plants have been encountered infrequently and occupy limited ranges.

Whitebark pine (*Pinus albicaulis*) and limber pine (*Pinus flexilis*) populations in WLNP are currently in decline due primarily to white pine blister rust (*Cronartium ribicola*), an introduced fungus from Eurasia, although mountain pine beetle and drought have probably increased the impact of the blister rust. Mortality is quite high in some stands, infection rates are high in nearly all stands in the park, and continued death of these trees can be expected. This loss has effects on forest community composition and structure, and also affects other species, such as Clark=s nutcracker and grizzly bear which use pine nuts extensively. Loss of such dominant keystone species may result in a serious trophic cascade effect.

Of 45 vegetation types (vts) from the recent Ecological Land Classification, 16 are considered significant because of rarity (small area in the park) or fragility coupled with threat. Notable are two grassland vts and two aspen forest vts in the Foothills Parkland Ecoregion that are threatened by non-native plant invasion coupled with disturbance and heavy grazing pressure. Five forest vts containing limber pine or whitebark pine, which occur in the Montane and Subalpine Ecoregions, are considered threatened by white pine blister rust, a non-native species.

Seasonal seepages are a restricted habitat in the park that occur where spring and early summer seepage water occurs over shallow bedrock ledges and along small stream channels, typically from early May to late June. A number of species, many rare and/or annual, occur in these ephemeral habitats.

Landscape units were based on the Ecological Land Classification, which combines landform, soil and vegetation features. Eleven units (ecosites) are considered rare (occur in <5 tracts): four in the Foothills Parkland Ecoregion, one in the Montane Ecoregion, three in the Lower Subalpine, and three in the Upper Subalpine.

Currently, 86 non-native vascular plant species are known for WLNP. These species are of concern because of their effect on native biodiversity and what they indicate about the integrity of park ecosystems. Most are associated with human disturbances. Agricultural forage species, including common timothy, smooth brome, red fescue, white clover and Kentucky bluegrass, are affecting low elevation grasslands. Other species of concern because of their aggressive nature

include spotted knapweed, blueweed, leafy spurge, Klamath weed, Dalmatian toadflax, scentless chamomile, sulphur cinquefoil and tansy. However, the non-native species of most concern is not a vascular plant but is white pine blister rust.

Also of concern are species dependent on periodic disturbance to maintain suitable habitat, especially where the disturbance regime has been altered by recent human influences, e.g. fire or grazing. Blue camas (*Camassia quamash*), in particular, needs to be further monitored and evaluated.

The management plan for the park is described in Environment Canada (1992) which identifies the fescue grasslands (*Festuca scabrella - Danthonia parryi* association) as an environmentally sensitive area.

6.1.4 *South Portion of Wildlife Management Unit BNP9* (Polygon 68; references: Achuff et al. 1986; Biodiversity Observation Database (G. Court, pers. comm. 1997); Komex International 1995; Gadd 1995)

This polygon includes the side valleys and east-facing slopes above a portion of the Bow Valley. It is the southern portion of Wildlife Management Unit BNP9 (AMiddle Bow@) of Komex International (1995), with the Bow Valley excised.

The polygon is critical range for elk, bighorn sheep, and mountain goat (Table 1). It includes most of the internationally-renowned Lake Louise natural area of significance (after Achuff et al. 1986), with Lake Louise, Valley of the Ten Peaks, Boom Lake, Moraine Lake, Giant Steps Waterfall, and tributary creeks; approximately 26 species of rare plants; significant vegetation types C9 and C23; significant birds (e.g., hawk owl, snowy owl, swamp sparrow); rare mammals (e.g., water shrew, wolverine); significant ecosites; mountain-goat winter range; and prehistoric and historic cultural sites. It includes one spotted frog occurrence northeast of Moraine Lake. The area is known to tourists, naturalists, and climbers from around the world. See polygons 11 and 39 for more information.

Table 1. Winter wildlife population estimates (after Komex International 1995, Table 7) for relevant ESA polygons defined in this study. Each of these wildlife polygons supports a high number of large mammals of at least one species. Minima were defined as 1000 mule deer and white-tailed deer, 300 elk, 450 moose, 10 woodland caribou, 200 bighorn sheep, 25 mountain goats, 20 cougars, 10 grizzly bears, and 10 wolves. Those wildlife management units (WMU=s) chosen as Asignificant@ supported the highest, or second-highest, number of selected mammals within that WMU for the study region. Values that exceed the minima are bolded. Estimates for WMU BNP 8,9 are high, because part of the WMU was excised to become part of other polygons; for polygon 10 (WMU BNP8), see also polygons 90, 91, 92; for polygon 11 (WMU BNP9), the area south of the Bow River has been excised as polygon 68.

WMU/ ESA Polygon	Location	Mule deer	White-tailed deer	Elk	Moose	Woodland caribou	Bighorn sheep	Mtn. goat	Cougar	Grizzly bear	Wolf
AB430/13	Bighorn River	113	50	100	54	**10**	**250**	**80**	7	4	**15**
AB418/12	Red Deer River	400	124	**1421**	25	0	87	10	6	3	**10**
AB406/8	Elbow/Sheep R.	**2125**	**1476**	**420**	**550**	0	138	20	**138**	**16**	**10**
AB404/9	Highwood River	600	250	**450**	120	0	46	**50**	**22**	**13**	**10**
BNP9/11	Middle Bow River	200	110	**880**	10	0	**344**	**70**	4	8	9
BNP8/10	Panther-Cascade	70	40	280	16	0	**898**	**180**	5	**16**	8

6.1.5 *Bow Valley, Vermilion Lakes - Banff Sector* (Polygon 69; references: Achuff et al. 1986; Biodiversity Observation Database (G. Court, pers. comm. 1997); Gadd 1995; Banff-Bow Valley Task Force 1996; field observations, 1997; airphoto observations (AS4317-72-73 (1992)), 1997) {Color Plate c}

This Bow Valley polygon contains a great wealth of natural areas of significance, and at the same time is under strong development pressure. The polygon includes four spotted frog occurrences: one near a pond north of Anthracite and three in the Vermilion Lakes area.

The polygon contains all or parts of six natural areas of significance (after Achuff et al. 1986):

(1) Carrot Creek (Johnson Lake, hoodoos along the Cascade River, rare plants, the oldest known Douglas fir in Alberta, significant montane grassland and forest communities, rare animals (e.g., long-toed salamander, osprey, wood duck, northern phalarope), significant bird communities, deer and elk calving areas, and both prehistoric and historic sites. It also includes the only undisturbed tracts of the HD1 ecosite (fluvial fan with C16 aspen forest in montane ecoregion) in Banff National Park);

(2) Indian Grounds (significant montane vegetation types, rare birds (e.g, upland sandpiper, calliope hummingbird), significant bird communities, and elk and deer winter range, an important migration corridor, and both prehistoric and historic sites);

(3) Mount Norquay (at least six species of rare plants, significant vegetation and bird communities, cougar and black bear habitat, deer, elk, and bighorn sheep winter range, a wildlife migration corridor, and prehistoric cultural sites);

(4) Sulphur Mountain (contains many of the hot springs of Banff National Park, rare plants, rare invertebrates (e.g., the Banff Springs snail *(Physa johnsoni= Physella johnsoni), Argia vivida*), a garter snake hibernaculum, habitat for a rare fishCthe Banff longnose dace (*Rhinichthys cataractae smithi*, which COSEWIC (1996) lists as having gone extinct in 1986)C dipper winter habitat, wildlife migration corridor). The Banff Springs snail is considered to be the most threatened species in Banff National Park, where it occupies only five of its former nine locations (Lepitzki 1997).

(5) Tunnel Mountain (Bow Falls, hoodoos along the Bow River, rare plants, significant vegetation types, long-toed salamander, barred owl, cougar, wildlife migration corridor, black bear dens, elk and deer winter range, elk calving areas, dipper winter habitat);

(6) Vermilion Lakes (a great diversity of features, including: lakes and ponds, springs, rare plants, rare herptiles (e.g., long-toed salamanders, garter snakes), rare mammals (e.g, river otter, pygmy shrew), rare resident birds (e.g., bittern, wood duck, bald eagle) and migratory birds (e.g, whistling swan, trumpeter swan), a significant bird community, deer, elk, and moose winter range, elk-calving area, mineral licks, waterfowl nesting and staging areas, prehistoric and

historic cultural sites, and one of the few areas of open water in winter which is important to resident birds).

6.1.6 *South Icefields Main Ranges* (Polygon 71; references: Gadd 1995; field observations, 1997; NTS 82N topographic map) {Color Plate j}

An internationally-renowned portion of the main ranges, this polygon is the spectacular view to the west of the south part of the Icefields Parkway. It includes Crowfoot Glacier, Wapta Icefield, Peyto Glacier, Waputik Icefield, and other glaciers; Bow Peak, Crowfoot Mountain, Mount Chephren, Mount Sarbach, Cauldron Lake, alpine lands above 3050 m, classic colluvial aprons and outwash, and world-class mountaineering opportunities.

6.1.7 *Icefields Parkway South* (Polygon 72; Achuff et al. 1986; NTS 82N topographic map; Gadd 1995) {Color Plate j}

This polygon includes the southern portion of the Icefields Parkway between Lake Louise and Saskatchewan River Crossing, an internationally renowned valley and highway in the main ranges of the Rockies. The polygon includes the Bow River valley, extending to its headwaters at Bow Lake, Hector Lake, Peyto Lake, Mistaya Lake, Waterfowl Lakes, Mistaya River, part of the lower Pipestone River, and many creeks.

It includes two natural areas of significance: (1) most of Bow Lake (after Achuff et al. 1986), which contains Bow Lake, an igneous dike near the south end of Bow Lake, the scientifically significant Peyto Lake (and Peyto Glacier in polygon 71), four species of rare plants, a significant ecosite at Bow Pass, the Num-Ti-Jah Lodge historic site; and (2) part of the Saskatchewan Crossing natural area of significance (an outlier of the montane ecoregion), which contains neoglacial landscapes and braided streams of scientific interest, canyons (Mistaya River, Owen Creek), springs, loess deposits, rare plants; significant birds, herptiles, mammals, vegetation types, bird communities; ungulate mineral licks, waterfowl nesting areas, and both prehistoric and historic cultural sites.

6.1.8 *Icefields Parkway / Saskatchewan River* (Polygon 74; references: Achuff et al. 1986; NTS 82N and 83C topographic maps; Gadd 1995)

The polygon extends from Saskatchewan River Crossing in the south to Sunwapta Pass and the Jasper National Park boundary in the north. It includes the valley of the North Saskatchewan River, reaching to near its headwaters. Like polygon 72, the polygon is traversed by the internationally renowned Icefields Parkway. It includes two natural areas of significance (after Achuff et al. 1986): (1) Graveyard Flats, centered on the confluence of the North Saskatchewan and Alexandra river, with neoglacial and fluvial landscapes of scientific and

hydrologic interest, significant animals, significant vegetation types, and mountain goat winter range; and (2) part of Parker Ridge (see polygon 75).

6.2 Nationally Significant Areas

6.2.1 *North Saskatchewan River Gap* (Polygon 2; references: Ben Gadd, pers. comm. 1997; 83B NTS topographic map)

Where the North Saskatchewan River crosses the Brazeau Range southeast of Nordegg, there is a spectacular canyon. The river is antecedent; i.e., it was there before the mountains it cuts across, and it held its ground during uplift of the range, producing a true Grand-Canyon-style canyon, not merely a gorge (there is also a gorge). Exposures of late Paleozoic and early Mesozoic bedrock in the canyon are spectacular, and collecting is permitted, making this polygon particularly valuable for geological study.

The polygon has a powerline running through it, with evidence of ATV use, but no real road, which keeps it relatively wild.

6.2.2 *Wildlife Management Unit BNP9* (Polygon 11; references: Komex International 1995; Achuff et al. 1986; field observations, 1997; Holland and Coen 1983)

The polygon is critical winter habitat for elk, bighorn sheep, and mountain goats (Table 1). Includes the Mt. Norquay natural area of significance (after Achuff et al. 1986) with the rare plants *Castilleja hispida, Crepis atrabarba, Draba reptans, Hieracium cynoglossoides, Lithophragma parviflorum*, and *Pellaea glabella*, the significant vegetation types C1 (Douglas fir / hairy wild rye), O5 (Douglas fir / juniper / bearberry), H6 (June grass - pasture sage - wild blue flax), H7 (wheatgrass - pasture sage), and H13 (Richardson needlegrass - junegrass - everlasting), two significant bird communities, cougar, black bear, and deer range, a wildlife migration corridor, and prehistoric cultural sites. It includes part of the Sawback Range natural area of significance (after Achuff et al. 1986) with rare plants, significant vegetation types, rare birds, significant bird communities, prehistorical cultural sites, etc. Polygon 68 was excised from this one (see section 6.1.4).

6.2.3 *Wildlife Management Unit AB418* (Polygon 12; Komex International 1995; Achuff et al. 1986; Alberta Wilderness Assoc. 1986; ANHIC library data files, 1997; ANHIC Scalp Creek and Eagle Creek Natural Areas factsheets, 1997; McGillis 1977; field observations, 1997; Looman 1969)

The polygon has many significant features. The area is well-known as critical winter habitat for elk and wolf. It is part of the montane ecoregion (least extensive ecoregion in the province) and its occurrence here is extralimital. The occurrence of rough fescue (*Festuca scabrella - Stipa richardsonii* association) grasslands is also extralimital, as is *Stipa comata* grassland. Looman (1969) accounted for the grasslands at Ya Ha Tinda as a combination between mesoclimate and grazing. He concluded that regional effective precipitation was more than adequate to support forest, but that topography and local weather acted to sweep the level grasslands free of winter snow, while favoring snow accumulation in wooded areas and on slopes. The redistribution of snow leads, Looman concluded, to a reversal of the normal vegetation patterns at Ya Ha Tinda: the more xeric *Stipa comata*-dominated grassland occupies the flats, and forests and fescue grasslands on the slopes. The generally sparse snow cover on the exposed grasslands leads to accumulations of elk (about 1000 in winter), accompanied by year-round grazing by horses (~200 horses spend the winter there, but they are mainly fed hay). Thus, local climate and grazing pressure favor grassland over forest.

Polygon 12 includes part of Panther Corners and Ram-Whiterabbit proposed wildlands (after Alberta Wilderness Association 1986), and it includes the Ya Ha Tinda natural area of significance (after Achuff et al. 1986) with Bighorn Falls, a vertical-walled canyon complex, plateaus, cirque basins, significant vegetation types C16 (aspen / hairy wild rye - peavine) and H6 (junegrass - pasture sage - wild blue flax), bird communities, bighorn sheep range, and prehistoric sites.

The polygon includes the Scalp Creek Natural Area, which features palsas and thermokarst, micro-hummocky and pock-marked terrain; subalpine colluvial, fluvial, morainal and organic terrain; grassland and wet meadows; Engelmann spruce - subalpine fir - lodgepole pine stands; dwarf-birch shrubland, and elk and grizzly range. It also includes the Eagle Creek Natural Area, with high landscape diversity, montane and subalpine ecoregion representation, mature white spruce/feathermoss, white spruce - lodgepole pine forests, aspen groves, and creek valleys. The Eagle Creek Natural Area is scenic, important elk and bighorn sheep winter range, and grizzly and wolf habitat.

The Ya Ha Tinda area is used as a horse wintering area by the Banff National Park warden service.

6.2.4 *Cardinal - McLeod Headwaters* (Polygon 19; references: field observations, 1997; M. Pybus, pers. comm. 1997; Komex International 1992; ANHIC rare plant database 1997; ANHIC library Cardinal River file documents and Cadomin Cave Natural Area factsheet, 1997; Achuff 1984; and various websites [see the Paradox LOCATE.DB file]) {Color Plates b, h}

This is a scenic, diverse area of great significance adjacent to Jasper National Park. It includes the valleys of the Cardinal and McLeod Rivers and many tributaries, the Nikanassin Range, Cardinal River Divide, the historic Mountain Park site, and it extends from high alpine to lower-subalpine valley bottom.

Important travel corridors traverse the area. The polygon includes at least 92 rare plant occurrences (at least three nationally significant species) and at least 25 vegetation types, three of which have not been reported elsewhere in Alberta. Approximately 27 species of threatened mammals and birds are present, and the polygon is characterized by high diversity of mammals (at least 47 species) and song birds (at least 129 species). The area supports grizzly bears, wolverines, wolves, cougars, harlequin ducks, bull trout, and other rare or sensitive species. Ecosections of the area have been described by Bentz et al. (1986b).

Much of the area is a glacial refugium, unglaciated for at least 11,000 years, perhaps for as long as 128,000 years, and it may have been part of an ice-free corridor. Patterned ground, waterfalls and cascades, diverse geomorphic features, fossil beds, rare and disjunct insects and crustaceans have been documented. At the Cardinal Divide proper, the vascular flora consists of 277 species, with 35 species significant due to rarity or range considerations.

The area includes Cadomin Cave and the Cadomin Cave Natural Area. The cave includes 3 km of mapped passages and is probably the most-visited cave in Alberta. The natural area contains cold sulphur springs, a paleontological site, and speleothems (cave deposits). The high level of visitation is causing damage, both to the cave and to the cave=s bat population.

The following information on bats is after M. Pybus (pers. comm. 1997). The cave is a confirmed hibernaculum for *Myotis lucifugus* (little brown bat), *M. volans* (the rare long-legged bat), *M. septentrionalis* (northern long-eared bat), *M. evotis* (long-eared bat), and *Eptesicus fuscus* (big brown bat). Population estimates range from 2000C5000 in winter. Cadomin Cave is one of only two known hibernacula for northern long-eared bats in the province (currently on the Blue List in Alberta) and is a confirmed swarming site in late August and early September. Swarming involves considerable admixing of populations and allows for genetic variation in offspring. Swarming populations (10C20,000?) are considerably higher than hibernating populations. Swarming is the time of mating, and disturbance should be particularly avoided, especially at dawn and dusk. The Alberta Wildlife Act states that there shall be no disturbance to bat hibernacula from 1 September to 30 April. Banding records indicate bats fly to and from Cadomin from a wide summer range throughout central Alberta.

Zoning in the area is predominantly prime protection and critical wildlife, with smaller amounts of multiple use and general recreation. (Alberta Forestry, Lands and Wildlife 1990). Open-pit coal mines, both operating and abandoned, cover a portion of this area, as do the remains of underground coal mines. At time of writing, a large new mine site (the Cheviot

project) has received most of the required approvals and is scheduled for opening in 1998. There is a high level of ATV use in the polygon. The area is undergoing habitat loss, dissection, fragmentation, extirpation of species and communities, riparian damage, water pollution, disruption of animal movement/migration, and species abandonment.

See sections 6.4.1 and 6.4.37 for related polygons.

6.2.5 *Highwood Pass* (Polygon 26; references: field observations, 1997; airphoto observations (AS4458-155,156 [1993] 1997; Gadd 1995; Alberta Forestry 1986; Trottier 1972; ANHIC rare plant database, 1997; Alberta Environment 1980)

This is a prime protection area of high scientific, ecological, geological, and recreational significance. It includes rare vegetation communities, nunataks at elevations above about 2285 m, synclines, cirque tills, a rock glacier, and rare animals (e.g., golden eagles). There are at least 16 rare plant occurrences.

The area includes the headwaters of Pocaterra Creek and the headwaters of Storm Creek (reputed locality of the Lost Lemon Mine); the Misty Range, with Mt. Rae, Storm Mountain, the northern part of Mist Mountain, and the northern part of the Elk Range.

The alpine vegetation of Highwood Pass has been classified into 10 associations, with the following dominants: *Dryas octopetala, Kobresia myosuroides, Salix nivalis, Phyllodoce, Cassiope tetragona, Thalictrum occidentale, Salix arctica, Salix barrattiana, Carex nigricans, Deschampsia cespitosa*, and three unusual vegetation types dominated by *Carex haydeniana, C. nigricans*, and *C. phaeocephala - Salix nivalis*.

Highwood Pass is the highest highway pass in Canada (2230 m above sea level).

6.2.6 *Front Range Ridges* (Polygon 60; references: Gibbard and Sheppard 1992; D. Sheppard, pers. comm. 1997; Stelfox 1993)

The ridges of the front ranges north of Waterton Lakes National Park provide key habitat for bighorn sheep, particularly as winter range. For example, during a 1988 winter census 136 animals were counted on Prairie Bluff/Yarrow Creek and 70 on Table Mountain and Castle Mountain. The area is zoned prime protection. It includes the upper elevation portion of the nationally-significant Big Sagebrush Natural Area and environs (see polygon 61, section 6.2.7).

The Front Range ridges and the intervening slopes and valleys are key habitat for grizzly bears. There are three hotspots for grizzlies remaining in the Castle IRP region - the Front Range, the upper South Castle, and the West Castle. It is doubtful that the rest of the region can support a permanent resident population, given present land use. Of these three remaining hotspots (all interconnected), the Front Range is absolutely critical for grizzlies because it provides essential spring (and sometimes fall) habitat. Given the fragmented nature of the habitat in these three

hotspots, and the threatened/vulnerable status of the grizzly, it is vital that the importance of the Front Range be recognized.

The Front Range is exceptional in its floral diversity. There has been no systematic study of the flora in the Front Range; however, quite a bit is known, through the observations of Job Kuijt, Jerry DeSanto (retired Glacier National Park biologist/ranger), Matt Fairbarns, and others. Nationally rare species found there, and in some cases only there (excluding Waterton itself) include dwarf alpine poppy (*Papaver pygmaeum*), the groundsel (*Senecio cymbalaria*), the dwarf fleabane (*Erigeron radicatus*), Lyall's scorpionweed (*Phacelia lyallii*), alpine Townsendia (*Townsendia condensata*), dwarf bitterroot (*Lewisia pygmaea*), baby blue-eyes (*Nemophila breviflora*), and Jones' columbine (*Aquilegia jonesii*).

There are other nationally rare species found there as well, but they are more broadly distributed in the region. Rare vascular (S2 status) plants include suksdorfia (*Suksdorfia ranunculifolia*) and pine drops (*Pterospora andromeda*). A thorough study would likely reveal a great number of rare species and communities in the Front Range.

The Front Range is fragmented by roads, natural gas facilities, and ATV traffic. The impacts of ATVs on land and wildlife, with emphasis on the Castle-Crown, has been reviewed by Sheppard (undated).

6.2.7 *Middle Castle River* (Polygon 61; references: Gibbard and Sheppard 1992; field observations, 1997; ANHIC Big Sagebrush Natural Area factsheet, 1997; ANHIC rare plant database, 1997; Fairbarns 1986){Color Plate a}

This area contains key riparian habitat along the Castle River, a trout fishery, diverse plant communities and species, an elk summer migration corridor, and at least 39 rare plant occurrences.

It includes the nationally-significant Big Sagebrush Natural Area (#424) and environs: the steep, dry, west-facing slope of Windsor Ridge. The lower slopes are covered by lodgepole pine and pine - subalpine fir forests, intermittent valley side creek channels, small stands of aspen, thickets of alder - willow, sparsely vegetated ridge top, 25 provincially rare and 11 nationally rare plant species, 319 species of vascular plants, and the largest area of big sagebrush *(Artemisia tridentata*) in Alberta. The big sagebrush grassland may be internationally unique.

The natural area and its environs are not typical of the southern Rocky Mountains, but rather appear to represent a unique meeting ground of elements of the Pacific, Palouse Prairie, Mixed Grasslands, and Cordilleran regions. An inventory of small mammals of the Big Sagebrush Natural Area found 12 species, with an additional 9 probable species, and 18 more species classified as possible (Sheppard 1995) Sheppard also documented the occurrence of the

plains garter snake *(Thamnophis radix)*, rare in the mountains of Alberta (Russell and Bauer 1993).

Overuse of ATVs characterizes the area. Controls on access are needed. Part of the Big Sagebrush and environs extends into polygon 60 (see section 6.2.6).

6.2.8 *Bow Range and Glaciers* (Polygon 67; references: Achuff et al. 1986; field observations, 1997)

This is a spectacular high elevation, main range alpine polygon featuring peaks exceeding 3050 m. It includes the Victoria Glacier and portions of five other glaciers; the mountains composing the Valley of the Ten Peaks surrounding Moraine Lake, and the mountains surrounding Lake Louise. The polygon includes the higher elevations of the Lake Louise natural area of significance (after Achuff et al. 1986). See polygons 39 and 68 (sections 6.1.1 and 6.1.4) for more details.

6.2.9 *Howse River Valley and Pass* (Polygon 73; references: Achuff et al. 1986; NTS 82N topographic map; Gadd 1995) {Color Plate f}

This polygon is a major low elevation pass of the main ranges that provides landscape connectivity with British Columbia via the Blaeberry River. The polygon contains a classic braided stream, a popular recreational trail, and riparian habitat. The area has been, and continues to be, threatened by a proposed highway connecting the David Thompson Highway with the Trans-Canada Highway north of Golden. The polygon contains part of the Saskatchewan Crossing natural area of significance (see polygon 72, section 6.1.7).

6.2.10 *Main Range Icefields and Saskatchewan River Glacier* (Polygon 75; references: Achuff et al. 1986; NTS 82N and 83C topographic maps; Gadd 1995)

A spectacular landscape of high mountains, including the eastern part of the Columbia Icefield, Saskatchewan Glacier, the Mons Icefield, the Freshfield Icefield, the eastern part of the Lyell Icefield, many other glaciers, high elevation valleys, numerous high mountains over 3050 m, the Castleguard River, most of the Alexandra River, and other features. The polygon includes the Castleguard Meadows natural area of significance (after Achuff et al. 1986) with the Castleguard Cave system, numerous springs, two rare invertebrates *(Salmasellus steganothrix* and *Stygobromus canadensis)*, a tract of significant ecosite, and neoglacial landscapes. It also includes most of Parker Ridge natural area of significance, with Panther Falls, four species of rare plants, peregrine falcon, mountain goat winter range, and a significant ecosite.

6.2.11 *Mt. Allan - Wind Valley* (Polygon 83; references: Environmental Sciences Program 1994; Alberta Environmental Protection 1997; Gadd 1995; NTS maps 82J and 82O; ANHIC rare plant database 1997; Sweetgrass Consultants 1991)

The polygon includes Wind Valley, Wind Ridge, Skogan Pass, Pigeon Mountain, Mt. McGillivray, Wind Tower, Mt. Allan, Mt. Allan Recreation Area, the Mt. Allan Centennial Trail, and the northeast flank of Mt. Lougheed. The Wind Valley Natural Area is known for its diverse, productive, relatively undisturbed ecosystem, with significant grasslands, Douglas fir stands, fens, and the seasonal East Wind Pond. It is important year-round range for bighorn sheep, elk, mule deer, white-tailed deer, and moose. Wind Ridge is known as one of the finer bighorn sheep ranges in the Canadian Rockies. West Wind Creek is an elk-calving area. The ungulate population helps to support wolves and cougars, in addition to grizzly bears, black bears, and wolverines.

The Wind Valley is a critical travel/migration corridor for wildlife moving to and from the Bow, Kananaskis, and Spray valleys. Seeps and springs with associated fens are important feeding areas for ungulates and bears. Cold-sulphur springs and surrounding vegetation are key features of the nearby Pigeon Mountain Candidate Natural Area. Mt. Allan is the site of the ski area built in 1988 for the Olympic Winter Games. The polygon contains at least 13 rare plant occurrences.

Disturbances in the area include the ski runs, lifts, access roads and lodge, helicopter-hiking and sight-seeing, ATV use, and equestrian and mountain-biking trails.

6.2.12 *Dinosaur Tracks* (Polygon 122; reference: Phil Currie, pers. comm. 1997)

The dinosaur tracks fossil site is actually a few sites located at the Smoky River Coal Mine. The most common fossil footprint is that of *Tetrapodosaurus*; there are also hadrosaur and theropod tracks, bird tracks, and many fossil plants. The main threat to the sites is the instability of the fossil beds after coal is removed. The beds are prone to collapse and bury the fossils.

6.2.13 *Mt. Wilson Icefield* (Polygon 123; references: Gadd 1995; field observations, 1997; NTS maps 83C and 82N)

The prime feature of this polygon is Mt. Wilson and the Wilson IcefieldCa large glacier with associated tundra and periglacial features. The feature is part of the Icefields Parkway scenic viewscape (see polygon 74, section 6.1.8). Eight geological formations are visible from base to summit on Mt. Wilson: Bison Creek, Mistaya, Survey Peak, Outram, Skoki, Owen Creek, Mt.Wilson, and Beaverfoot.

6.2.14 *South Ghost Wilderness* (Polygon 135; Alberta Wilderness Assoc. 1986; Gadd 1995; Biodiversity Observation Database (G. Court, pers. comm. 1997); ANHIC library, Mt. Yamnuska Natural Area factsheet, 1997; Bow Valley Naturalists 1974; Downing et al. 1989; Sweetgrass Consultants 1991; Bradley et al. 1977)

The polygon is typified by mountain front highlands. While only 70 km west of Calgary, visitation is relatively low and disturbances few, making this area one of the more pristine wildlands in the southern Rockies. Bold cliffs, steep slopes, high winds, and thin soil cover make much of the area sparsely vegetated to barren. The area has high recreational potential for hiking, snowshoeing, skiing, hunting, and equestrian use. The polygon is primarily alpine and subalpine, with some montane lands at lower elevations. The area is important range for bighorn sheep and mountain goats, and along its south edge, for elk. Many prominent cliffs characterize the area. The polygon includes two occurrences of spotted frog east of Mt. Yamnuska (at 51 07= and 115 05=); one spotted frog occurrence at 51 06=, 115 06=; and two occurrences of tiger salamanders at 51 06=, 115 07=.

The polygon=s most prominent feature is the Mt. Yamnuska Natural Area. The natural area is thought to be one of the more ecologically diverse in Alberta, with four distinct climatic and vegetation regions occurring within a few kilometres (Downing et al. 1989). Mixing of features typical of the montane and foothills subregions is typical of the area (Sweetgrass Consultants 1991). The natural area includes Mt. Yamnuska with the most popular rock climbing cliff in the region (300 m high cliff of Cambrian limestone); high landscape diversity; rare, uncommon and noteworthy plant species and a vascular flora of at least 362 species; the McConnell Thrust Fault (Paleozoic limestone over Cretaceous shale and sandstone); excellent views of the valley; talus slopes and a rock-fall track; stabilized colluvial slope with stunted aspen forests and some spruce, Douglas fir and pine; slow-flowing, calcareous springs with high insect, plant, and bird diversity; open grassland on coarse glaciofluvial deposits; Agreat swamp@ with floating vegetated mats, marl ponds; fluvial fan with rich extrazonal coniferous and mixedwood forests typical of Boreal Natural Region; a kame terrace with a variety of plant communities; an old lake basin with lush growth of willows, grasses and forbs; mineral licks; pitted moraine with several small lakes; hummocky, pitted glaciofluvial landform with small esker; Belly River formation sandstone outcrops; ephemeral lakes with diverse flora; moist Douglas fir - hybrid spruce forests with uncommon montane and subalpine plant species; and a diverse fauna. The Bow Valley Naturalists (1974) have noted the occurrence of garter snakes, tiger salamanders, toads, wood frogs, and leopard frogs. C.D. Bird (in Bow Valley Naturalists 1974) has suggested that the Yamnuska area has a rich moth and butterfly fauna, and has predicted that at least 300 species of moths, eight skippers, and 50 butterflies will be found there. The area is one of the few localities in the world for the white form of the yellow lady=s-slipper

(Cypripedium calceolus). Other rare or uncommon plants include *Drosera linearis, Cheilanthes feei, Oryzopsis micrantha,* and *Gentiana aquatica.* The 5C4 montane colluvial land system found at the base of Mt. Yamnuska, characterized by very steep south-facing limestone/sandstone/shale colluvium, with a sparse cover of juniper and bearberry, is believed to be unique in Alberta, and perhaps unique in Canada (McGregor 1979).

There is a sandstone-silica quarry in the center of the Mt. Yamnuska Natural Area.

6.2.15 *Pipestone River - Mt. Murchison* (Polygon 136; references: field observations, 1997; Gadd 1995; Achuff et al. 1986)

This is a diverse polygon that features the Pipestone River, Mosquito, Silverhorn, Molar, and Murchison Creeks, unnamed creeks, Mts. Murchison, Noyes, Weed, and Hector; Conical, Observation, Dolomite, and Cataract Peaks; Silverhorn, Marmot, Dip Slope, and Molar Mountains; Hector, Molar, and various unnamed glaciers; Pipestone Pass; many alpine lakes; high elevation tree communities along Pipestone River, Mosquito Creek, and Molar Creek; and hiking trails. The polygon is part of the viewscape for the Icefields Parkway South (polygon 72, section 6.1.7).

6.3 Provincially Significant Areas

In the following treatment, only highlights of each area are provided. Please see the Paradox database files for details and references.

6.3.1 *Northeast Woodland Caribou Wintering and Year-Round Range* (Polygon 3){Color Plate d}

This area includes the dwindling Little Smoky caribou herd, a migration corridor, grizzly bears, old-growth forests; a variety of peatland and upland plant communities and geomorphic features (incl. unglaciated terrain); key moose, elk, mule deer, and wolf range; bull trout, grayling, mountain whitefish, and introduced rainbow and brook trout; and critical wildlife zones.

The area is degraded and endangered by logging and oil and gas activities (e.g., seismic exploration activities, wells, cutlines, roads, etc.).

6.3.2 *Caribou Summer and Occasional Winter Range* (Polygon 4){Color Plate d}

This is important woodland caribou summer (occasional winter) range. It includes part of Willmore Wilderness, with high recreational value trails, key wildlife habitat; portions of Wildhay River, Rock Creek, Sulphur River, N. Berland and S. Berland Rivers; many creeks; Persimmon Range; and at least nine rare plant occurrences.

With regard to the Willmore Wilderness as a whole, Bork (1994) recently completed a range study that identified an interesting range type. His willow/*Festuca altaica* range type appears to have a distribution in Alberta limited to the Jasper-Willmore area (Bork 1994; Aiken and Darbyshire 1990). Note that this type is dominated by *Festuca altaica* Trinius = *F. scabrella* Torrey (not *F. altaica* var. *major* (Vasey) Gleason = *F. scabrella* var. *major* Vasey). In the Willmore, these interesting fescue grasslands undergo encroachment by willows in the absence of fire; they occupy submesic to subhygric, well-drained to moderately-well drained south-facing slopes and bottomlands.

6.3.3 *Woodland Caribou Summer Range* (Polygon 5){Color Plate d}

This is key woodland caribou winter range, and includes stretches of the Smoky, Muddywater, and Jackpine Rivers, Hardscrabble, Sheep, Cote, and minor creeks; Ptarmigan Lake; high mountain passes; landscape connectivity, migration corridor, numerous riparian zones; a few glaciers; and at least three rare plant occurrences.

6.3.4 *Northwest Woodland Caribou Winter Range* (Polygon 6)

This is important northwest woodland caribou winter range, and includes portions of Bentz et al. (1995) esa polygons 1003 to 1009 inclusive: major rivers and their valleys (Kakwa, Narraway, Wapiti) and numerous creeks; bull trout, grayling, mountain whitefish, rainbow, eastern brook, and cutthroat trout; important grizzly bear, moose, elk, mule deer, and white-tail habitat; diverse fluvial landforms and riparian communities; migration corridors. There are at least nine rare plant occurrences in the polygon. Logging and oil and gas activities (seismic, wells, roads, etc.) occur in a large part of the area.

Regarding polygons 3,4,5,6 (woodland caribou range): currently in west central Alberta, Fish and Wildlife (J. Edmonds, pers. comm. 1997) estimates about 800C900 woodland caribou, with the following breakdown: 500 in migratory mountain caribou herds, 200C250 in non-migratory mountain caribou herds (Willmore and Jasper parks), and 100-150 in boreal caribou herds (boreal caribou do not migrate to the mountains). The total Alberta woodland caribou population as of 1993 (Alberta Fish and Wildlife Division 1993; Edmonds 1991) was estimated at 3,100 to 3,500 animals.

6.3.5 *WMU AB406* (Polygon 8)

The area is critical habitat for grizzly bear, cougar, wolf, elk, mule deer, white-tailed deer, and moose (Table 1); and provides wildlife migration corridors; at least 11 rare plant occurrences and one northern leopard frog occurrence.

6.3.6 *WMU AB404* (Polygon 9)

This area has high recreational value; it is critical habitat for cougar, wolf, grizzly bear, elk, and mountain goat (Table 1), and provides wildlife migration corridors.

6.3.7 *WMU BNP8* (Polygon 10)

The polygon is critical winter habitat for bighorn sheep, mountain goat, and grizzly bear (Table 1), and includes at least 34 rare plant occurrences.

The Panther River sulphur springs, on the east side of Banff Park (~Sec.35-30-12-W5th) are used in summer as a mineral lick, and in winter as bull elk winter range.

6.3.8 *Wapiabi Cave* (Polygon 14)

Wapiabi Cave is a short but interesting, well-decorated limestone cave at treeline, practically on the ridgecrest with a steep, scenic path to the entrance. The cave is a confirmed hibernaculum and swarming site for little brown bats and long-legged bats; last count was in 1978: >200 bats seen in late winter (M. Pybus, pers. comm. 1997).

6.3.9 *Cline - Resolute - Sentinel* (Polygon 21)

This is a scenic high alpine area of ridges, crags, and plateaus, with maximum elevation of 3363 m (Mt. Cline). Significant features include the Whitegoat Peaks, Resolute Mountain, Sentinel Mountain, Elliott Peak, Mt. Sir Ernest Ross, Landslide Lake Natural Area and Lake of the Falls Natural Area. The area is used for camping, hiking, fishing, horseback riding, heli-hiking and heli-camping. Ecosections of the area have been mapped by Rayner and Dutchak (1984).

6.3.10 *Mt. Rundle* (Polygon 22)

Mt. Rundle is a classic, well-known dip-slope mountain of the front ranges. It has high recreational value for hikers, rock climbers, and naturalists; there are accessible, easy to observe geological features, such as the late Paleozoic Asandwich@ that includes the Palliser Formation, Exshaw and Banff Formations, and Rundle Group.

6.3.11 *Racehorse - Dutch Forestry Scientific Area* (Polygon 30) {Color Plate k}

This area has high scientific value for studying the effects of clearcut logging. What little forest remains in the polygon is of high ecological value and should be fully protected. The polygon delimits an area where ~75% of the forests have been logged. In much of the polygon there is poor, slow regeneration. The area presents an opportunity to study both large-scale landscape effects and local stand and microsite effects of large clearcuts at high elevations (from

~1678 to 2135 m). This area, according to Alberta Forest Service (1981), has excellent potential for Anon-mechanized traversing,@ camping, fishing, and landscape viewing. That report also noted that the general area was suffering from ATV and 4x4 land and wildlife disturbance, random camping and cattle trampling along creeks, and that the viewing was marred by logging.

6.3.12 *High Elevation ATV Scientific Area* (Polygon 31)

This area of intensive, high-elevation ATV damage is of great scientific value for studying the effects of off-road vehicle recreation on ecosystems. ATV access is from Dutch Creek. See the observations by Alberta Forest Service (1981) in section 6.3.11.

6.3.13 *Spotted Frog Occurrence* (Polygon 36)

This is a point feature of a spotted frog occurrence at 49 49.4=N, 114 28.5=W. About 101 larvae were observed 25 July 1997.

6.3.14 *Upper Crowsnest Connectivity Corridor* (Polygon 41)

This is a small but important cross valley migration route located at Crowsnest Pass proper (west side of Island Lake). It includes the Island Creek area, with rare and uncommon plants, mature forest, a beaver dam complex, diverse breeding bird communities, and key moose and elk habitat.

Note that the entire Crowsnest Valley as a unit forms an integral landscape link for low-elevation, east-west movements of animals, plants, weather systems, etc. This is the lowest pass in the southern Rockies.

6.3.15 *Upper Crowsnest Valley* (Polygon 43)

This polygon includes Crowsnest Lake, with Crowsnest Spring (one of the larger, more accessible karst springs in Alberta), Crowsnest Lake Natural Area, Crowsnest Wetlands (large permanent ponds with waterfowl production, long-toed salamanders, endangered western painted turtle); and Sentry Mountain, key bighorn sheep habitat, some western larch, and a stand of paper birch at the west end of Crowsnest Lake.

6.3.16 *Allison - Sentry Connectivity Corridor* (Polygon 44)

This is an important north-south movement/migration corridor just east of Crowsnest Lake. It includes a portion of the Crowsnest River between Sentinel and Savanna, and part of the Allison Creek area.

6.3.17 *Leach Colliery Connectivity Corridor* (Polygon 48)

This is an important north-south migration/movement corridor at the Leach Colliery. It includes part of the Redfern Lake wetlands and the Byron Hill area.

6.3.18 *Mt. Tecumseh and Deadman=s Pass* (Polygon 53)

This polygon includes the Mt. Tecumseh Natural Area and Dead Man=s Pass. The former features avalanche slopes and avalanche meadow communities; Douglas fir forests; old-growth forests; important moose, elk, and bighorn sheep habitat; numerous rare plant occurrences (seven provincially rare, one nationally rare). Dead Man=s Pass is a low-elevation pass important for east-west animal movements/migrations and plant dispersal. It includes Tory (Dry) Canyon, an ephemeral stream in a steep canyon with rare and uncommon plants such as *Adiantum pedatum* and *Polystichum lonchitis*, scarce birds such as Cassin=s finch and rock wren, high diversity of flowering plants, and key bighorn sheep habitat.

6.3.19 *Beauvais Lake Provincial Park* (Polygon 55)

Beauvais Lake is used as a staging area for waterfowl. The park is used by elk, mule deer, and at least 12 other species of mammals. Eight species of herptiles, including leopard frog, spotted frog, and boreal toad have been documented. The park is known for high butterfly diversity and showy wildflower blooms in the grasslands. There are some rare or uncommon plants, such as western white pine, Rocky Mountain maple and yellow angelica. The park supports more than a dozen Douglas firs that exceed 1 m in diameter at breast height, the four largest of which have diameters of 1.3 to 1.5 m. They may be the largest-diameter Douglas firs in Alberta.

6.3.20 *Front Range Canyons* (Polygon 58)

The area is high quality habitat for bighorn sheep, elk, and other animals, and is a hotspot for plant species diversity. This polygon includes Yarrow Falls and lower elevation portions of Prairie Bluff, and at least 12 rare plant occurrences. Zoned critical wildlife habitat. The canyons are heavily used by ATVs.

6.3.21 *Castle River Headwaters* (Polygon 59)

The polygon is a key headwaters, with prime riparian habitat, rare communities, and rare species (e.g., at least 18 rare plant occurrences). It is a summer travel route for elk. Snowmobiles and ATVs are used throughout most of the Castle-Crown, including those areas that are classed Aoff-limits.@

6.3.22 *Tornado and North Fork Passes* (Polygon 66)

The Tornado and North Fork Passes are fairly low elevation passes (below treeline) of the main ranges of the Rockies, and are thus important in east-west movements and migrations. Tornado Pass lies adjacent to Tornado Mountain (3,099 m), the highest peak in the Crowsnest Pass area.

6.3.23 *Ghost River Wilderness* (Polygon 70)

This is a spectacular wilderness area popular with hikers. It includes Mount Aylmer (3,162 m), Revenant Mountain and Apparition Mountain on the east flanks of the Palliser Range, the Ghost River valley and tributaries, bighorn sheep and mountain goat range, and critical winter range for bighorn sheep and elk. Land system types of the Ghost River Wilderness have been described by McGregor (1979) who found that the 6F4 (subalpine fluvial lodgepole pine/dryad) and 6F2 (subalpine fluvial shrubs/dryad) types, uncommon in his study region, were well-represented in the polygon along Ghost River and Spectral Creek.

6.3.24 *White Goat Wilderness / Cline River and Tributaries* (Polygon 76)

The polygon includes the White Goat Wilderness, the Cline River and its tributaries, and extends east to the shore of Lake Abraham. It includes prime subalpine and alpine riparian habitat, rare plants, small glaciers, Pinto Lake and its provincial forest recreation area, numerous small lakes, camping, and challenging hiking. The Cline River is an important travel corridor. The White Goat Wilderness supports both bighorn sheep and mountain goats. Lee et al. (1982) reported 26 vegetation types from the alpine and upper subalpine zones of the White Goat, and 329 species of vascular plants in aggregate from the White Goat and the Siffleur Wilderness Areas. A general review of features of the White Goat and Siffleur Wilderness areas is found in Albach and Olsen (1984).

6.3.25 *Kootenay Plains and Vicinity* (Polygon 77)

The Kootenay Plains are an unusual, disjunct example of the montane ecoregion, in which montane woodlands and grasslands occupy an area outside their normal range on alluvial terraces and fans. The grasslands (rough fescue is absent) appear to be a variant of the *Koeleria macrantha - Calamagrostis montanensis* type of Stringer (1973). Other significant landscape features are riparian mud flats, the diverse landscape around Whirlpool Point, dune fields, marl wetlands, and limestone/dolomite cliffs.

The area has a long history of native use (ranking it as a cultural site), horse grazing and heavy use by elk, bighorn sheep, moose, deer, and bison. It has been known for a long time as key ungulate habitat. The area supports numerous rare plant species and rare vegetation types. At least 17 rare plant occurrences have been documented.

6.3.26 *Saskatchewan River Valley* (Polygon 78)

The polygon includes a reach of the North Saskatchewan River, a glacially-fed braided stream, and its valley bottom and lower slopes, featuring key riparian habitat and a major east-west connectivity corridor for movement/migration of life forms and weather systems, and at least three rare plant occurrences. The polygon is traversed by the David Thompson Highway, a scenic travel route.

6.3.27 *Beehive Natural Area* (Polygon 80)

The area is considered by some people to be the most beautiful spot in the Canadian Rockies. The scenic Beehive (after Achuff 1985) includes parts of the alpine, subalpine, and montane ecoregions; old-growth forests with trees in excess of 400 years old, a vascular flora of 283 species (eight of which are rare in Alberta), at least 23 rare plant occurrences, at least 23 vegetation types, 26 mammal and 44 bird species, one amphibian, and cutthroat trout. The area includes habitat for bighorn sheep, elk, and grizzly bears. It is little disturbed (as of 1985) and is highly-valued by hikers, naturalists, fishermen, and equestrians. It is also used for grazing, hunting, and trapping. The Great Divide Trail passes through the area. As of 1985, ATV use was having detrimental impacts on the area (Achuff 1985).

6.3.28 *Mt. Livingstone Natural Area* (Polygon 81)

This is a spectacular provincial natural area containing a variety of special features: diverse and healthy foothills rough fescue (*Festuca scabrella*) grasslands; high elevation grasslands reaching 2200 m; deeply-incised Westrup Creek; sandstone ridges with limber pine; the Mt. Livingstone anticlinal ridge and peak; seven geological formations; a folded shale cone; high landscape diversity; scenic peaks; patterned ground (stripes and nets); seven provincially rare vascular plant species (at least eight occurrences). The area has a long history of cattle grazing; some of the grasslands, low spots, and Westrup Creek have been damaged. There is a reclaimed seismic line, and ATV use.

6.3.29 *Plateau Mountain and Vicinity* (Polygon 82)

The polygon includes Plateau Mountain Natural Area, a well-known area of alpine permafrost and patterned ground. There is a zone of continuous permafrost above ~ 2305 m. The patterned ground is in the form of sorted circles, stripes, nets, and polygons. The summit of Plateau Mountain is believed to be a nunatak. Griffiths (1982) reported seven plant communities not reported elsewhere that may be rare in the province or unique to the area. Other special features include limestone pavement; an ice cave; excellent examples of glacial cirques and

hummocky cirque moraines; a small cirque lake; a diverse plant community on unstable scree; a previously undescribed plant association of *Carex gymnoclada*; outstanding spruce-fir-whitebark pine forest in the upper Livingstone valley; an unusual, previously unrecorded spruce-fir forest type; and old-growth limber pine forest stands (including a limber pine over 400 years old growing with whitebark and lodgepole pine on the lower slopes of Mt. Burke). The area includes at least 34 rare plant occurrences. Bird (1979) documented 266 alpine plant species from Plateau Mountain (88 lichens, 48 bryophytes, and 130 vascular plants). There is a significant amount of oil and gas activity and ATV use in the area.

6.3.30 *Upper Kananaskis Lake Ranges and Glaciers* (Polygon 84) {Color Plate e}

The polygon includes spectacular main range scenery, glaciers, and extremely high recreational value areas (hiking, skiing, mountain biking, fishing); at least 11 rare plant occurrences; a spotted frog occurrence near Mt. Sir Douglas Glacier; important animal movement/migration corridors, and a road. It also includes Wakanambe (Blackfoot for AFist of God@), an awe-inspiring rockslide-modified horn on the north shoulder of Mt. McHarg, visible from Lower Kananaskis Lake.

6.3.31 *Mt. Buller Rock Glacier and Vicinity* (Polygon 85)

The polygon features a large rock glacier, which descends about 300 m down the rocky slopes of the Kananaskis Range to treeline. It is valuable for education and scientific purposes.

6.3.32 *Forgetmenot Mountain* (Polygon 86)

The area is known for its periglacial formations, where conglomerate and sandstone blocks have been sorted into polygons, and for a rock glacier on the northwest side of the mountain. The ridge provides good ungulate winter range and a panoramic view.

6.3.33 *Moose Mountain Natural Area and Vicinity* (Polygon 87)

The polygon features vistas from its alpine summits; rugged scree slopes; an alpine plateau on the south arm of Moose Mountain; the headwaters and canyon of Moose Dome Creek; Canyon Creek Cave (also known as AMoose Mountain ice cave@); undisturbed subalpine forests; scenic cliffs and deep ravines, subalpine wildflower meadows, and four geological groups exposed in the natural area. The patterned ground in the form of solifluction lobes, terracettes, sorted circles and nets, and sorted stripes may be the closest periglacial features to Calgary. There are at least five rare plant occurrences.

6.3.34 *Marvel Lake and Vicinity* (Polygon 88)

The polygon includes the Marvel Lake natural area of significance (after Achuff et al. 1986) which features Marvel Pass, Bryant Creek, Wonder Pass, and Marvel, Gloria, and Owl Lakes. The rare plants *Erigeron purpuratus, Mitella breweri, Pedicularis racemosa,* and *Rorippa tenerrima* are present, as are golden eagle nests, a significant ecosite (WH2), and pure populations of cutthroat trout.

6.3.35 *Sunshine Meadows and Vicinity* (Polygon 89)

The polygon boundaries are based on the Sunshine Meadows natural area of significance (after Achuff et al. 1986) and rare plant clusters. The former includes Fatigue Pass, Mount Bourgeau, Healy Pass, and Monarch Ramparts. Twenty-two species of rare plants are present, along with rare mammals (water shrew, Richardson=s water vole, wolverine), peregrine falcon, ungulate mineral licks, bighorn sheep summer and winter ranges, and historic sites. At least 69 rare plant occurrences have been documented for the polygon.

6.3.36 *Cascade - Flints Park* (Polygon 90)

The area supports native cutthroat trout, the highest density of grizzly bears in Banff National Park, golden eagle nest sites, ungulate mineral licks, wolf habitat, bighorn sheep fall and winter range, elk fall range, mountain goat winter range, tracts of the significant SF1 ecosite with permafrost, and one spotted frog occurrence.

6.3.37 *Lake Minnewanka* (Polygon 91)

The area includes Lake Minnewanka, a spring, hoodoos, loess deposition areas, rare plants, locally significant animals (red-necked grebe, Franklin=s gull, muskrat), significant bird communities, ungulate mineral licks, bighorn sheep, deer, and elk winter range, waterfowl staging areas, a significant ecosite, prehistoric cultural sites, and at least four rare plant occurrences.

6.3.38 *WMU BNP 8 South* (Polygon 92)

This is the south portion of polygon 10 (section 6.3.7) estranged by delineation of polygon 91. It is critical winter habitat for bighorn sheep, mountain goat, and grizzly bear (Table 1), and includes at least two rare plant occurrences.

6.3.39 *Bonnett Glacier* (Polygon 93)

This is the easternmost glacier in the area, and only glacier on map NTS 82O.

6.3.40 *Skoki* (Polygon 94)

The area includes the Drummond and Mt. Richardson Glaciers, Skoki Mountain, Lake Merlin, Redoubt and Baker Lake, Oyster Peak, and the Red Deer Lakes. The polygon contains a natural bridge, springs, rare plants, peregrine falcons, northern phalarope, cliff swallow, wolverine, grizzly bear, mountain goat winter range, a significant ecosite, and the historic Skoki Lodge and Cyclone cabin.

6.3.41 *Burnt Timber* (Polygon 95)

The area includes subalpine and alpine ecoregions. It extends from poorly-drained valley bottoms and riparian forests to high alpine tundra. Prominent features are Devil=s Head, Black Rock Mountain, Phantom Crag, Otuskwan Peak, and North Burnt Timber, Burnt Timber, Pinto, and Sheep Creeks. The area supports grizzly and black bears, moose, elk, bighorn sheep, mountain goats, mule deer, coyotes, mink, fishers, and lynx. Bull trout are native to Burnt Timber, Pinto, and North Burnt Timber Creeks. Stocked cutthroat, rainbow, and brook trout, and Rocky Mountain whitefish are found in some of the area=s streams. There are at least three rare plant occurrences. Devil=s Head Mountain is a native religious site. The area has been disturbed by logging, oil and gas activities, and increasing ATV use.

6.3.42 *Panther Corners,* in part (Polygon 96)

The area includes Dormer, Jap, and Barrier Mountains, the Panther and Dormer Rivers, and Dogrib Creek. The area, formerly part of Banff National Park, provides high quality habitat for elk, moose, deer, mountain goats, bighorn sheep, wolves, grizzlies, and cougars. Paleo- and recent native encampments abound in the area. Grasslands similar to those at Ya Ha Tinda (see polygon 12) are said to be found in the area. The area is popular with equestrians, hunters, skiers, and guided outfitters. It is zoned prime protection. Despite this designation, ATV use, oil and gas activity, and logging have occurred.

6.3.43 *Upper Red Deer River and Tributaries* (Polygon 97)

This polygon is dominated by the valley of the Red Deer River, and includes McConnell, Divide, and Tyrrell Creeks, and various unnamed creeks, the Valley of the Hidden Lakes, Douglas Lake, and Skeleton Lake. The area provides important landscape connectivity for movements/migrations in the network of valleys. It includes part of the Scotch Camp natural area of significance after Achuff et al. (1986) which features hoodoos, permafrost on tracts of the SF1 ecosite, subalpine Chernozems, Snowflake Lake (of scientific interest), loess deposition areas, seven species of rare plants, great gray owls, cougars, wolves, grizzly bears, bighorn sheep and elk winter range, bighorn sheep summer range, ungulate mineral licks, significant bird communities and vegetation types, and prehistoric and historic cultural sites.

6.3.44 *Prow Mountain - Mt. White Col / Scotch Camp* (Polygon 98)

This polygon is dominated by Prow and Gable Mountains. Its boundaries generally follow those of rare plant occurrences. It includes part of the Scotch Camp natural area of significance after Achuff et al. (1986) (see polygon 97, section 6.3.43 above). There are at least nine rare plant occurrences.

6.3.45 *Clearwater River* (Polygon 99)

This polygon is dominated by the valley of the Clearwater River, and includes Roaring and Malloch Creeks, various unnamed ponds, Martin Lake, Martin Creek, Mount Malloch, and Indian Lookout. It includes in part the Clearwater River natural area of significance (after Achuff et al. 1986), which features hoodoos along the Clearwater River, tracts of SF1 ecosite with permafrost, rare plants, western meadowlark, ungulate mineral licks, elk fall range, bighorn sheep summer and winter range, wolf habitat, and prehistoric cultural sites.

6.3.46 *Siffleur Headwaters and Vicinity* (Polygon 100)

This high elevation polygon includes Dolomite Creek, glaciers, Devon Lakes, Devon Mountain, the northwest part of Pipestone Pass, Mt. Willingdon, Mt. Harris, and the south part of Mount Kentigern. The boundaries follow in part those of the Siffleur River natural area of significance (after Achuff et al. 1986). The area features a significant vegetation type, upland sandpiper, fisher, the only woodland caribou in Banff National Park, ungulate mineral licks, elk winter range, and historic sites. There are at least six rare plant occurrences.

6.3.47 *Siffleur Wilderness and Saskatchewan River Connection* (Polygon 101)

The area provides important connectivity with the North Saskatchewan River and is known as a spectacular subalpine and alpine wilderness area. The area supports elk, bighorn sheep, mountain goats, moose, grizzly and black bears, cougars, lynx, wolves, coyotes, hoary marmots, pikas, and Columbian ground squirrels. The streams support native Dolly Varden trout and Rocky Mountain whitefish, and introduced rainbow trout. Elevations range from 1,464 m along the Siffleur River to 3,358 m on an unnamed peak. Lee et al. (1982) identified 24 vegetation types from the upper subalpine and alpine zones of the Siffleur.

6.3.48 *Ram - Whiterabbit* (Polygon 102)

This is a large and wild polygon that includes reaches of the Clearwater, Ram, and North Ram Rivers, numerous creeks, the Ram Range, Mt. Michener, Mt. William Booth, and many unnamed front range mountains. The major and minor river valleys provide a network of high

quality riparian and valley habitat for movement and migration. High elevation Agrasslands@ (needing investigation) cover part of the plateau between the Ram and North Ram Rivers. The area supports wolves, grizzly bears, bighorn sheep, elk, deer, black bears, cougars, and small numbers of mountain goats. The area includes Cline Natural Area, with river terraces, kame deposits and Douglas fir stands. Some ATV use is causing landscape damage, particularly in the Clearwater River, Onion Creek, and Forbidden Creek valleys.

Fossils draw many visitors to the eastern boundary of the area (primarily Hummingbird Creek and Onion Creek), where there are excellent examples of trilobites, crustaceans, and plants. Prehistoric sites are found along the Clearwater River, which is used by both bull trout and Rocky Mountain whitefish for spawning, overwintering, and rearing. Ecosections of the polygon have been described by Rayner and Dutchak (1984) and by Rayner (1984); the latter noted that a small ecosection adjacent to Forbidden Creek (6FQ1, 1 km^2) contained the only significant organic deposits in that study area: a seepage slope dominated by dwarf birch/sedge/moss on a Rego Humic Gleysol to Terric Mesisol.

6.3.49 *Brazeau River - Job Creek* (Polygon 106)

The area features the riparian zone and valley of Brazeau River, Job Creek, Job Lake, Whisker Lake, many unnamed creeks, and also includes the north part of Job Pass, Mt. McDonald, Longview Mountain, Obstruction Mountain, and anomalous high elevation treed areas above 2286 m west of Longview Mountain. The major river valleys provide critical landscape connectivity with both Jasper and Banff National Parks. The polygon includes an ecologically significant area centered on the Job Lakes area. Cutthroat trout spawn in the outlet of Job Lake. The area supports grizzly bear, elk, white-tailed and mule deer, moose, mountain goat, bighorn sheep, black bear, cougar, wolf, and wolverine.

6.3.50 *Muskiki Lake and Area* (Polygon 108)

The polygon features a relatively-undisturbed lake surrounded by old-growth spruce forests. At the southeast end of the lake the wetland is damaged by seismic activities. Muskiki Lake is the highest elevation Alarge@ lake along the Cardinal River watershed. There is a major new road (not on the existing 1:250,000 map) between the Cardinal River road and the lake, and thus the lake and its environs may not be undisturbed for long. This ESA includes the Muskiki Lake Natural Area (#438) with upland conifer forests of white spruce, subalpine fir, black spruce, and lodgepole pine; in the valley bottom is a rich patterned fen with rare or uncommon plant species; a wet sedge meadow is adjacent to the fen.

6.3.51 *Ram Mountain* (Polygon 109)

This is a critical wildlife zone cordilleran outlier known as a prime bighorn sheep range and as a scientific study area. The area supports good populations of deer, moose, elk, cougar, and wolf. The mountain as a whole is relatively undisturbed. There are at least 18 rare plant occurrences.

6.3.52 *Smoky River and Tributaries* (Polygon 113)

The valley and its tributaries are a main travel/connectivity corridor for plants and animals, particularly for woodland caribou. It includes a major mountain river valley with riparian vegetation types and landforms, and key bull trout, grayling, and Rocky Mountain whitefish populations; and excellent moose, elk, and mule deer habitat. The area likely contains montane-type grasslands on its drier slope breaks (see polygons 15 and 16).

6.3.53 *Kakwa Wildland Provincial Park and Area* (Polygon 116)

The polygon includes reaches of the Kakwa and South Kakwa Rivers, Kakwa Falls, Francis Peak Creek Falls, Caw Creek, numerous other creeks; Caw Ridge, Mt. May and Mt. Torrens, Dinosaur Ridge, Torrens Ridge, Kakwa Mountain, La Creche Mountain; high elevation passes; critical woodland caribou summer range, northwest woodland caribou winter range; a large mountain goat population; undisturbed subalpine and alpine riparian landforms and ecosystems; periglacial features such as solifluction lobes and stone stripes; at least 19 rare plant occurrences; southwest-facing grasslands and shrublands along the South Kakwa; classic gullied shale topography along Putzy Creek; knob and kettle topography; canyons; extensive valley bottom wet meadows; good to excellent ungulate habitat/winter range, and grizzly bear and wolf habitat. Disturbances include coal exploration activities, logging, and use by ATVs and snowmobiles.

6.3.54 *Brûlé Dunes* (Polygon 121)

The Brûlé Dunes are one of the finer examples of montane sand dunes and sandhills in Alberta. The geomorphology here is driven by wind deposition and erosion of sand originating on the floodplain of the Athabasca River, creating a dynamic, ever-shifting landscape of scientific and ecological significance. The polygon includes Brûlé Lake, a widening of the sandy floodplain of the Athabasca River. While white spruce/bearberry forests are the Aclimax,@ the impacts of wind and fire have created a diversity of successional stages that require further study. Brûlé Lake supports a mountain whitefish sport fishery (Bentz et al. 1986a). Past logging has eliminated most of the old-growth forests in the general area; ATV use is heavy (Natural Resources Service 1995).

6.3.55 *Kananaskis Range* (Polygon 124)

This is a high elevation area (primarily alpine) with great recreational value. It includes a large number of scenic peaks and ridges, such as Mt. Kent, Mt. Lawson, The Fortress, Mts. Kidd, Galatea, Bogart, Sparrowhawk, and Lougheed. Various provincial recreation areas are included or nearby, such as Buller Creek and Galatea Creek. The polygon includes multiple treelines on the flanks of Mt. Lawson.

6.3.56 *Spray Valley* (Polygon 125)

This is an important north-south migration/movement corridor between Banff National Park and the Spray Lakes Reservoir, with southern branches into three low passes into British Columbia (Cross, Albert, and Palliser Rivers). The area supports wolf, grizzly bear, elk fall and winter range, and bighorn sheep winter range.

6.3.57 *Spray Reservoir - Kananaskis Corridor* (Polygon 126) {Color Plate e}

Like polygon 125, this area is also an important north-south migration/movement valley corridor between Banff National Park and the Spray Lakes Reservoir, with southern branches into three low passes into British Columbia (Cross, Albert, and Palliser Rivers). The area is visited by large numbers of tourists and recreationists. Prominent features include the Spray Lakes Reservoir, Smith-Dorrien Creek, Lower Kananaskis Lake, provincial recreation areas, hiking trails, fishing, boating, and camping opportunities. The Spray Lakes are dammed and subject to water height fluctuations; thus, they are not used extensively by birds or mammals due to the scarcity of food plants and to the barren shorelines.

6.3.58 *Evan-Thomas Critical Wildlife Area (*Polygon 127)

This is a critical wildlife subalpine zone known to support healthy populations of elk, bighorn sheep, and mountain goat. It includes Evan-Thomas Creek, Rocky Creek, unnamed creeks, and The Wedge, a scenic alpine area.

6.3.59 *Kananaskis River Valley and Slopes* (Polygon 129)

This is an area with high levels of recreation activity, such as downhill and cross-country skiing, hiking, camping, canoeing, kayaking, and fishing. In addition to the Kananaskis River, the polygon includes many other streams, including parts of Ribbon, Wasootch, Porcupine, and unnamed creeks; Barrier Lake, Heart Mountain, Mt. Baldy and the Mount Lorette Natural Area. A major spring migration of raptors takes place over the natural area. There is good education potential. The Kananaskis River is well known for its gamefish. Part of the area is reserved for

scientific research. Wildlife move between the Kananaskis valley and the Wind Valley hub via Skogan Pass.

6.3.60 *Oldman River Valley* (Polygon 130)

This area contains significant riparian woodlands and a renowned Class 1 trout stream. It is an important river valley, providing landscape connectivity for the region, and is zoned critical wildlife, general recreation, and multiple use. The riparian grasslands of the Oldman River and Livingstone River valleys require a systematic study. Bradley et al. (1977) noted that they are typically dominated by *Festuca idahoensis, Danthonia parryi, Agropyron spicatum,* and *Poa* spp.). Specific to the Oldman River valley, Jeffrey et al. (1968) believed that riparian grasslands were rare and more or less restricted to the northwest branch of the Oldman, and provided a different description of dominants (e.g., *Carex microptera, C. vesicaria,* and *C. siccata).* The area is heavily-used by ATVs. The forests of the valley are being logged.

6.3.61 *Livingstone River Valley* (Polygon 131) {Color Plate i}

Like the Oldman River valley, this area contains significant riparian woodlands and a renowned trout stream. It provides landscape connectivity. It is zoned critical wildlife, yet is heavily-used by ATVs. Logging and oil/gas activity is increasing in the area. There are some significant patches of foothills rough fescue grassland. It is a popular hunting area.

6.3.62 *Ma Butte* (Polygon 132)

One of only three known explosive volcanic centers in the Canadian Rockies (the other two are under the town of Coleman, and southeast of Coleman), Ma Butte is an example of Crowsnest Formation bedrock. The Crowsnest Formation is one of only two units of volcanic rock known from the Canadian Rockies (the other is the Purcell Lava in Waterton/Glacier). The Crowsnest Formation is a hardened volcanic mudflow about 160 m thick, composed mainly of fragments of trachyte.

6.4 Regionally Significant Areas

In the following treatment, only highlights of each area are provided. Please see the Paradox database files for details and references.

6.4.1 *Redcap Mountain* (Polygon 1)

This is a unique large anticlinal foothill in Mesozoic rock; beautiful alpine meadows full of rodents and sparrows attract many hawks and falcons; there are at least five rare plant occurrences; it will be affected by the Cheviot Mine.

6.4.2 *Wildlife Management Unit AB430* (Polygon 13)

This is critical habitat for woodland caribou, bighorn sheep, mountain goat, and wolf (Table 1).

6.4.3 *Winniady West Grasslands* (Polygon 15)

These are nice extralimital southeast-facing grasslands, probably montane in character.

6.4.4 *Winniady East Grasslands* (Polygon 16)

These are nice extralimital southeast-facing grasslands, probably montane in character.

6.4.5 *Hell=s Gate* (Polygon 17)

The area contains scenic sandstone/pebbly conglomerate canyons of the Smoky and Sulphur rivers. It has high recreational value for equestrian users, hunters, naturalists, and hikers.

6.4.6 *Folding Mountain* (Polygon 18)

This area is noted for its wildflower-rich tundra meadows, which are easily accessible on foot from a side road of the Yellowhead Highway. The area has high recreational value for day hikers, backpackers, naturalists, equestrian, and guided trips. It includes Sphinx MountainCa classic glacially-formed amphitheatreCDrinnan Creek and Mystery Lake, with native bull trout populations and bighorn sheep habitat (population about 100 animals). ATV activity is heavy.

6.4.7 *Cardinal Hills Colluviating Grasslands/Shrub* (Polygon 20)

This polygon contains regionally uncommon *Eleagnus commutata* shrublands and true grasslands, southwest-facing on the southern tip of the Cardinal Hills. This area requires scientific study.

6.4.8 *Opal Range* (Polygon 24)

This is an area of scientific, geological, and esthetic significance, featuring spectacular sawtooth ridges and Carboniferous marine fossils of the Rundle Group. Multiple treelines occur, due to patterns of soil and water availability, slope, and nutrient status as influenced by daylighting of bedding planes on up-dip slopes; fire history and chance may also influence multiple treelines.

6.4.9 *Mist Mountain Grasslands* (Polygon 27)

These are the northernmost grasslands found along Highway 40. They extend to high elevations and merge with graminoid tundra.

6.4.10 *South Plateau Mountain Low Elevation Treelines* (Polygon 28)

Interesting low elevation treelines have developed here, due to a substrate of coarse colluvium and unstable slopes. Treeline descends nearly to the road on the north aspect. This polygon includes at least three rare plant occurrences.

6.4.11 *Grassy Ridge High Elevation Grasslands* (Polygon 29)

This area includes extensive and beautiful high elevation grasslands. It is clearcut and roaded heavily to the west and south of these grasslands. At least five rare plant occurrences are found in the polygon.

6.4.12 *Drywood Mountain Hanging Valley* (Polygon 32)

This is a scenic hanging valley with about 300 m of elevational drop in the creek across the polygon. The area is used by bighorn sheep for grazing.

6.4.13 *Western Plains Garter Snake Hibernaculum* (Polygon 33)

This hibernaculum for western plains garter snakes is located at 49 34.2=N, 114 24.3= W. About 100 individuals were observed in or near hibernaculum on 30 May 1997.

6.4.14 *Canadian Toad Occurrence* (Polygon 37)

Canadian toad spring vocalizations were recorded at 52 31.1=N, 116 23.1=W on 19 May 1996.

6.4.15 *Middle Crowsnest Valley* (Polygon 40)

This polygon includes the Bellevue wetlands, Drum Creek, and part of the Redfern Lake wetlands. There is a hibernaculum for wandering garter snakes located at 49 33.7=N, 114 23.7= W, where about 100 individuals were observed in or near the hibernaculum on 15 September 1996.

6.4.16 *Ptolemy Creek and Area* (Polygon 42)

This is scenic area of limestone karst, caves, and a large spring. This area has the greatest concentration of large caves known in the Canadian Rockies. Most of the entrances occur at high

elevations, and the passages are difficult to explore, requiring special techniques and equipment. Some of the caves (particularly Gargantua Cave and Yorkshire Pot) attract cavers from around the world.

6.4.17 *Middle - Upper Crowsnest Valley* (Polygon 45)

This polygon includes the portion of the Crowsnest River between Sentinel and Savanna, part of the Allison Creek area, key mule deer and elk habitat in the Coleman area, part of the York Creek area, two long-quiescent explosive volcanic centers (one under the town of Coleman, the other southeast of Coleman), and the Crowsnest and Coleman Natural Areas.

6.4.18 *Blairmore Connectivity Corridor* (Polygon 46)

This is a north-south travel corridor for wildlife crossing the Crowsnest valley.

6.4.19 *Seven Sisters - Crowsnest Mountain* (Polygon 52)

Rugged and unspoiled, barren and semi-barren highlands characterize this polygon, with small amounts of forested lower slopes surrounded by intense logging and ATV use. Crowsnest Mountain is/was sacred to native peoples. Both mountains are prominent, scenic local landmarks and offer classic geological profiles.

6.4.20 *Mountain Goat Concentration* (Polygon 54)

A population of mountain goats concentrate in this polygon.

6.4.21 *Western Red Cedar Stand on Snowshoe Creek* (Polygon 56)

A nice western red cedar *(Thuja plicata)* stand occurs here, on Snowshoe Creek.

6.4.22 *West Castle Headwaters* (Polygon 62)

This is a key riparian and valley side landscape in the headwaters of the West Castle River. It functions as a spring/summer migration route for elk. Unfortunately for the wildlife, there is a high level of ATV use. I recommend that the polygon be closed to motorized recreation.

General comments on the West Castle and Castle River areas: over 100 species of plants have been documented here that grow nowhere else in Alberta. One-hundred and sixty-one species of vascular plants here are provincially rare. Fifty-two species of vertebrates are vulnerable, threatened, or endangered (e.g., the wandering shrew). Since the 1970s, there has been clearcut Asalvage@ logging of large tracts of mountain pine beetle-affected forests; very little old-growth forest remains.

In 1934 the South Castle area burned, with some unburned stands in valley bottoms, draws, etc. (the fire came in from Sage Creek). In 1936, there was another big fire, this time in the West Castle. After the two fires, about 20-25% of the forests were old-growth. Presently, about 9% remain; the other old-growth forests have been logged. Much fine valley bottom spruce - cottonwood old-growth forest has been lost as part of mountain pine beetle Asalvage.@

6.4.23 *West Castle River Valley* (Polygon 63) {Color Plate g}

This is another key riparian and valley side landscape in the headwaters of the West Castle River, used extensively by elk in their spring/summer migrations. Bull trout occur in the West Castle River, and long-toed salamanders breed in the West Castle wetlands. In Alberta, outside of Waterton Lakes National Park, the red-tailed chipmunk (*Tamias ruficaudus*) is known only from the West Castle valley. The regionally rare wood duck has also been recently reported from the West Castle valley.

This area is under development pressure. Expansion of the West Castle ski resort is creating a town in a narrow valley, with impacts on wildlife movement, winter air quality, water quality, etc. The area suffers from ATV overuse.

6.4.24 *Gardiner Creek* (Polygon 64)

The stream course is key habitat for grizzly bears. Some old-growth forests remain; they are under logging pressure.

6.4.25 *Livingstone Range* (Polygon 79)

This is a high to low elevation front range landscape with little industrial/logging disturbance and high landscape connectivity due to lack of disturbance. It includes a diversity of habitats, from talus slopes to ephemeral and permanent streams, subalpine meadows, and productive trout habitat on Gold Creek.

6.4.26 *White Goat Lakes* (Polygon 103)

The polygon is a calcareous rich fen fed by a shallow stream. The rare *Salix lanata* var. *calcicola* and *Primula mistassinica* have been documented. The area is located within the White Goat Lakes development node (zoned for facility construction and general recreation) and may come under increasing development pressure.

6.4.27 *Coliseum Mountain* (Polygon 104)

This mountain is a cordilleran outlier, critical wildlife zone with a classic geomorphic amphitheatre. The area is popular with recreationists (e.g, hikers, equestrians, hunters) and is a

prominent scenic landmark viewable from the David Thompson highway. The area contains at least two rare plant occurrences. Logging and Atransportation network@ activities continue on its north side.

6.4.28 *Shunda Mountain* (Polygon 105)

Shunda Mountain is a cordilleran outlier, critical wildlife zone. Overridden by glacial ice and characteristically rounded, the gentle summit area may be reached easily along a gated road from a trailhead partway up, offering visitors a classic hike up through the subalpine life zone to treeline and grassy tundra above. The mountain is popular with recreationists (e.g, hikers, equestrian, hunters). The area contains at least three rare plant occurrences. Logging and Atransportation network@ activities are ongoing. From the mountain, the view to the west displays a drumlin field, the mountain front, and other outstanding geomorphic features that make the site valuable for educational field trips.

6.4.29 *Tarpeian Rock - Opabin Creek* (Polygon 107)

This is a subalpine and alpine area featuring riparian old-growth forests along the fish-bearing Opabin Creek and the rugged and scenic Tarpeian Rock. The area is zoned prime protection. A vehicle trail follows Opabin Creek to its headwaters.

6.4.30 *Baseline Mountain* (Polygon 110)

This is the easternmost cordilleran outlier on map 83B. The area is threatened by logging and oil and gas activities. It supports extra-limital/disjunct populations and landscape types and needs study.

6.4.31 *Rock Lake - Wildhay* (Polygon 111)

Key riparian habitat for wildlife occurs in this polygon. The area is heavily used by recreationists (equestrians, guided outfitting trips, hikers, hunters, fishermen, and campers). The Mountain Trail (along the Wildhay River) provides the main access to the east side of the Willmore Wilderness. The polygon contains at least six rare plant occurrences.

6.4.32 *Sheep Creek* (Polygon 114)

This broad-valleyed tributary of the Smoky River provides an important travel/migration route for plants and animals, particularly for woodland caribou. While little-affected by logging/mining, it is threatened. It includes Swift Creek and some southeast-facing slopes in the Willmore.

6.4.33 *Smoky River (Gustavs Flats to Wanyandie Creek)* (Polygon 115)

The valley and its tributaries are a travel/connectivity corridor for plants and animals, particularly for woodland caribou. The polygon includes riparian vegetation types and landforms, and key bull trout, grayling, and Rocky Mountain whitefish populations. It is moose, elk, and mule deer habitat. The area might contain montane-type grasslands on its drier slope breaks. This reach of the Smoky River has been affected by mining and logging. Due to industrial activities in this area, Natural Resources Service (1995) has classified the valley from Gustavs Flat downstream to Twp 59 R6 W5, and the Muskeg River from the confluence with the Smoky upstream to McDonald Flats area, as an Aarea of reduced habitat effectiveness.@ What little habitat remains in its natural state is critically important.

6.4.34 *Blood Reserve 148A* (Polygon 120)

This enclave of the Blood Reserve is surrounded by Waterton Lakes National Park along a reach of the Belly River. The area includes at least 4 rare plant occurrences and needs study.

6.4.35 *Fisher Range* (Polygon 128)

This is a prime protection alpine area on the west slopes of the Fisher Range, located upslope of the critical wildlife area of polygon 127. It includes Fisher Peak and Mt. McDougall. Together, the watershed of the Fisher, Opal, and Highwood ranges supplies 45C50% of Calgary=s municipal water (Legault 1997).

6.4.36 *Barnaby Ridge* (Polygon 133)

Bighorn sheep winter range is the main feature here. Data from a 1988 winter survey indicated that 32 animals use the ridge.

6.4.37 *Grave Flats* (Polygon 134)

This natural area includes extensive valley floor habitat along Grave Creek, willow-birch shrublands with uncommon species, upland forests of mature lodgepole pine and mixed conifer white spruce - lodgepole - Engelmann spruce, and a string fen perched on the slope above Grave Creek. The area, which includes the grave of Chief Cardinal and other native people, will be disturbed by the planned access road to the Cheviot Mine.

6.5 Locally Significant Areas

In the following treatment, only highlights of each area are provided. Please see the Paradox database files for details and references.

6.5.1 *Rock Creek Connectivity Corridor* (Polygon 50)

Rock Creek valley is a likely corridor for north/south animal movements (e.g., black bear).

6.5.2 *Carbondale Hill* (Polygon 65)

The area is known locally for its rare plants. Scientific study is needed.

6.5.3 *Childear - Mawdsley - Kvass Creek* (Polygon 117)

Traversed by the Kvass Creek trail, the area is used by hikers, equestrians, hunters, trappers, and guided horse groups. The area includes Kvass Creek, Wolverine Creek, Delorme Pass (providing connectivity with the Smoky River valley), Delorme Creek, Childear and Knife Mountains, and Mounts McQueen, Mawdsley, and Braithwaite.

6.5.4 *Turret - Ambler* (Polygon 119)

The area is used by hikers, equestrians, hunters, trappers, and outfitted parties. The area includes the Dry Canyon - Sheep Creek trail, Turret Ridge, Llama Mountain, Mount Stern, Ambler Mountain, and numerous creeks. There are at least three rare plant occurrences northwest of Ambler Mountain.

7. Discussion: Is the Status Quo Sufficient for Protected Areas in the Rocky Mountain Natural Region?

While the percentage of the Rocky Mountain Natural Region that is Aprotected@ is high relative to most other natural regions of Alberta, there is much work to be done.

Firstly, the tabulation and analysis of the target vs. protected land base need updating. Protected areas targets are based on Arepresenting@ Alberta=s biodiversity, and are lower than targets needed to Aprotect@ Alberta=s biodiversity (Achuff 1994)-- in the former case the target is based on presenting to the public a variety of natural history themes-- protection is a secondary consideration. Protected land base targets need revision: is 2, 5, 12, or 20% sufficient, and in what spatial arrangement? There are no assessments for the cover of most wetland types, nor for exposed slopes, protected slopes, and springs. The analyses should be updated following recent advances in conservation biology methods and geographic information systems, such as gap analysis (Scott et al. 1993), perhaps focussing on representivity, and augmented by sensitivity analysis and error-propagation routines (Flather et al. 1997). Reserve boundaries should consider not only the presence or absence of elements, but also the processes that create and maintain those elements (Angermeier and Karr 1994). Any analysis of the adequacy of protected areas must consider the ecological integrity of each area and the spatial connectivity of the network.

Secondly, no park or protected area is Asafe,@ be it a World Heritage Site/national park such as Banff National Park (Banff-Bow Valley Task Force 1996), a provincial park such as Peter Lougheed (field observations, 1997; ANHIC Atransportation network@ disturbance map, 1997), a natural area such as Mt. Livingstone (Timoney 1991a), an ecological reserve such as the Kootenay Plains (ANHIC Atransportation network@ disturbance map, 1997), a wilderness area such as the Siffleur (Albach and Olsen 1984), or a zone 1 prime protection area such as the Cardinal River headwaters (ANHIC library Cardinal River file documents, 1997; www.web.net/~awa/cheviot/; and other websites). Currently, there is an assortment of Aprotected@ areas with varying degrees of ecological integrity, and to date there has been no systematic study of how those areas function as a network.

The Special Places 2000 program holds great potential to provide Alberta with an effective protected areas network. Schneider (1997) and Ure (1997), however, have recently criticized the Special Places 2000 initiative: (1) emphasis has been changed to representing a range of land types, without regard to ecological integrity; (2) limits have been placed on the amount to be protected, regardless of ecological requirements; (3) all industrial commitments within protected places will be met; (4) pressure from industry has meant that special places are becoming synonymous with areas unsuitable for industrial use, rather than sites best suited for maintaining biodiversity, and (5) proposed protected areas are, in general, too small and too far apart.

Whether all the above criticisms apply to special places in the Rocky Mountain Natural Region is not clear. What is clear is that environmentally significant areas in the study region are being lost to development and are being degraded, primarily by the logging and oil and gas industries. The pace of degradation has accelerated in recent years.

The present is critical to establishing an effective protected areas system in the mountains, as recently recognized at the September 1997 Yellowstone to the Yukon (Y2Y) Conservation Initiative Conference held in Waterton Lakes National Park. Clearly much work needs to be done, and soon. The following two sections highlight principles of landscape ecology relevant to Special Places 2000, then offer recommendations on how the ESA inventory data can be applied.

8. Principles of Landscape Ecology as Applied to Special Places 2000

Based on a wealth of studies, Forman (1995) recently summarized general principles of landscape ecology. Those that bear directly on planning for a protected areas network are excerpted below.

(1) AThe arrangement or structural pattern of patches, corridors, and a matrix that constitute a landscape is a major determinant of functional flows and movements through the landscape, and of changes in its pattern and process over time... flows create structure... structure determines flows and movements...@

(2) ALarge natural vegetation patches... are the only structures in a landscape that protect aquifers and interconnected stream networks, sustain viable populations of most interior species, provide core habitat and escape cover for most large home range vertebrates, and permit near-natural disturbance regimes... Consequently, a landscape without large patches is eviscerated, picked to the bone... an optimum landscape has large patches of natural vegetation, supplemented with small patches scattered throughout the matrix.@

(3) AFor subpopulations on separate patches, the local extinction rate decreases with greater habitat quality or patch size, and recolonization increases with corridors, stepping stones, a suitable matrix habitat, or short inter-patch distance.@

(4) AThe arrangement of spatial elements, especially barriers, conduits, and highly heterogeneous areas, determines the resistance to flow or movement of species, energy, material, and disturbance over a landscape... Heterogeneous fine-grained areas... have a high resistance.@

(5) AThe grain size of a landscape mosaic is measured as the average diameter or area of all patches present... a coarse-grained landscape containing fine-grained areas is optimum to provide for large patch ecological benefits, multihabitat species including humans, and a breadth of environmental resources and conditions.@

(6) ALand is transformed by several spatial processes... Perforation is the process of making holes in an object such as a habitat or land type... Dissection is the carving up or subdividing of an area using equal width lines (e.g., by roads or powerlines). Fragmentation is the breaking of an object into pieces... Shrinkage is the decrease in size of objects, and attrition is their disappearance.@ These five spatial processes overlap in time during the transformation of a landscape, with A... perforation and dissection both peaking in relative importance at the outset. Fragmentation and shrinkage predominate in the middle phases, and attrition peaks near the end.@

(7) AA mosaic sequence is a series of spatial patterns over time. Five sequences are widespread: edge, corridor, nucleus, nuclei, and dispersed. The edge sequence (in which a new cover type spreads unidirectionally across an area) is believed to be ecologically >best= since it has no perforation, dissection, or fragmentation.

(8) ALand containing humans is best arranged ecologically by aggregating land uses, yet maintaining small patches and corridors of nature throughout developed areas, as well as outliers of human activities spatially arranged along major boundaries. Seven, mainly landscape ecological attributes are incorporated or solved by this spatial principle or model...: (a) large

patches of natural vegetation; (b) grain size; (c) risk spreading; (d) genetic diversity; (e) boundary zone; (f) small patches of natural vegetation; and (g) corridors.@ This model, known as the Aaggregate with outliers,@ has numerous ecological benefits.

(9) ATop priority patterns for protection, with no known substitute for their ecological benefits, are a few large natural vegetation patches, wide vegetated corridors protecting water courses, connectivity for movement of key species among large patches, and small patches and corridors providing heterogeneous bits of nature throughout developed areas...(emphasis mine) The indispensables should be essential foundations in any land plan, since they accomplish major ecological or human objectives, and no other practical mechanism is known to accomplish them.@

Stripped to its essentials, a protected areas network aimed at preserving biodiversity would have the following features:

- $ Short distances between large, rounded patches of high diversity
- $ Patches connected by corridors, or, at least partially linked by stepping stones
- $ Each patch surrounded by buffer zones of decreasing levels of protection
- $ Disturbances limited to patch perimeters
- $ High representation of old-growth communities

9. Where to from Here? Using the Inventory Data

Conservation action priorities can be set by following the flow chart shown in Figure 1.

The assignment of conservation priority requires the consideration of varied information. Ecological significance is related to environmental significance, with the difference that some sites that are environmentally significant for primarily cultural or esthetic reasons (e.g., Frank Slide, or barren, scenic cliffs) may have lower ecological significance. A large polygon of high diversity with little or no disturbance connected to established protected areas by important corridors would have high ecological significance.

Sensitivity to disturbance is also important to consider in setting priorities. Glaciers, rock glaciers, and periglacial features, for example, are less Asensitive@ in this context than old-growth forests outside national parks, because the old-growth forests are under imminent threat.

Usefulness to the protected areas system requires an evaluation of how the site helps to fill gaps in important themes, how the site might act to link other protected areas, etc. In other words, Ausefulness@ is protected areas network specific, in that a similar polygon in a different province or spatial context might have a different usefulness.

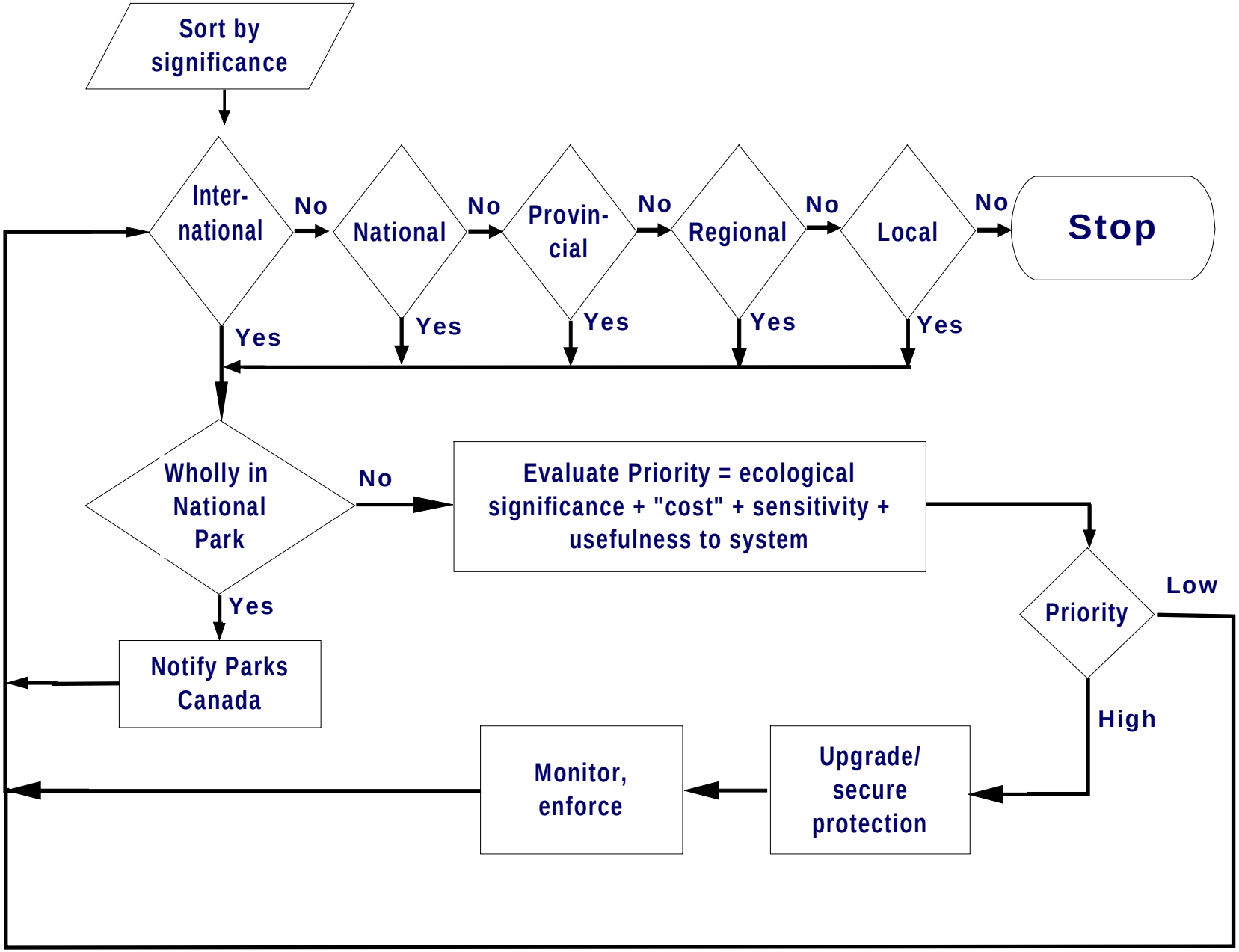
Finally, the cost (including intangibles) of protecting each prospective area must be considered. AExpensive@ areas might have a lower priority than Ainexpensive@ areas.

Applying the flow chart to the ESA database would help to identify immediate priority areas, such as Wildlife Management Unit AB418 (Polygon 12), Cardinal - McLeod Headwaters (Polygon 19), Front Range Ridges (Polygon 60), Middle Castle River (Polygon 61), Mt. Allan - Wind Valley (Polygon 83), South Ghost Wilderness (Polygon 135), and the Mountain Caribou Range (Polygons 3, 4, 5, 6).

Another application of this study is the identification of information gaps. For example, the front range ridges and canyons of the Castle-Crown region north of Waterton require spatially explicit ground level ecological study. The ecological information gathered by the Castle - Crown Wilderness Coalition is an excellent beginning point, but much of that information is general to the entire Castle-Crown and cannot be explicitly transferred to a specific plot of ground. Similarly, a recent study of ecosites in southwestern Alberta (Archibald et al. 1996) is a general guide. The plot data used for the generalization of the ecosites, however, might prove useful to Alberta Environmental Protection staff charged with establishing protected areas.

In light of the strong logging pressure, high levels of ATV use, and commercial pressures (e.g. the West Castle resort), it is imperative that more study of the Castle-Crown be undertaken immediately. The international significance of Waterton Lakes National Park clearly does not stop at the jurisdictional boundary with the Castle-Crown.

Special Places 2000 is an important initiative. It is my hope that the information gathered in this and other ESA studies will be applied to ensure protection of a functional network of ecosystems and landscapes. While special areas may be selected on the basis of diverse ecological criteria, their elevation to protected status is not done within a political vacuum. Hopefully the choice of what areas to protect will be made on a level playing field which incorporates informed and forward-thinking policies.


Sort by significance
Inter-national
No
National
No
Provin-cial
No
Regional
No
Local
No
Stop
Yes
Yes
Yes
Yes
Yes
Wholly in National Park
No
Evaluate Priority = ecological significance + "cost" + sensitivity + usefulness to system
Priority
Low
High
Yes
Notify Parks Canada
Upgrade/ secure protection
Monitor, enforce

10. References Cited

Note that the reference list includes citations from both the report and the Paradox LOCATE.DB database file.

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Appendix: ESA Database Information

Structure of database file LOCATE.DB

Field Name	Field Code	Field Type	Field Size
Site No.	SITENO	A	4
Site Name	SITENAME	C	45
Area	AREA	N	6
Township	TWP	C	3
Range	RG	C	2
Meridian	MER	C	2
NTS Map Sheet	NTS	C	3
Subregion 1	SUB1	C	2
Subregion 2	SUB2	C	2
Significance Code	SIG	C	1
Site Description	SITEDESCRIP	Memo	
References	REFERENCES	Memo	

Structure of database file CRITERIA.DB

Field Name	Field Code	Field Type	Field Size
Site No.	SITENO	A	4
Site Name	SITENAME	A	45
Criteria	CRIT	A	2

Structure of database file FEATURE.DB

Field Name	Field Code	Field Type	Field Size
Site No.	SITENO	A	4
Site Name	SITENAME	A	45
Theme	THEME	A	1
Feature	FEATURE	A	2

Key to Subregion Codes

Code	Subregion
7	Alpine
8	Subalpine
9	Montane

Key to Significance Codes

Code	Significance
1	International
2	National
3	Provincial
4	Regional
5	Local

Key to Criteria Codes

Code	Criteria
2	Environmental, ecological or hydrological feature
3	Rare or unique geological or physiographic feature
4	Significant, rare or endangered plant or animal species
5	Unique habitats with limited representation in the region or remnant habitats
6	Unusual diversity of plant or animal communities due to a variety of geomorphological features and microclimatic effects
7	Large, relatively undisturbed habitats and habitat for species intolerant of humans
8	Important linking function permitting movement of wildlife over considerable distance, including migration corridors and stopover points
9	Excellent representative of one or more ecosystems or landscapes that characterizes a natural region
10	Intrinsic appeal due to widespread community interest or presence of highly valued features or species such as game species or sport fish
11	History of scientific research
12	High aesthetic value

Key to Theme Codes

Code	Theme
1	Landform
2	Wetland
3	Hydrology
4	Vegetation
5	Wildlife
6	Fisheries
7	Scientific
8	Cultural

Key to Theme Feature Codes

1 - Landform

MG - Ground Moraine
MH - Moraine hummocky
ES - Esker
KA - Kame
FL - Flutings
CF - Crevasse fillings
OC - Outwash channel
FM - Fluvial meander scars
FO - Fluvial oxbows
RA - Rapids
FT - Fluvial terrace
FP - Floodplain
FA - Falls
BR - Beach ridge
DE - Delta
FN - Fan
ED - Eolian dune field
EX - Eolian/wetland complex
BO - Bedrock outcrops
SS - Steep slopes
SL - Slumps
ES - Escarpment
DV - High landform diversity
CY - Canyon
CV - Cave
HD - Hoodoos
PG - Patterned Ground
RG - Rock Glacier
FI - Fossils
GL - Glacier

2 - Wetland

BP - Bog-palsa/raised
BF - Bog-flat
BB - Bog-basin
FR - Fen-ribbed
FB - Fen-basin
FH - Fen-horizontal
FX - Fen/bog complex
WW - Willow wetland
MA - Marshland

3 - Hydrology

RI - River
CR - Creek
LA - Lake
SP - Spring
SE - Seep
AQ - Aquifer

4 - Vegetation

DV - High community diversity
PC - Significant plant community
RS - Rare plant species
SP - Significant plant species
OG - Old-growth forest

5 - Wildlife

UH - Key ungulate habitat
MH - Critical moose habitat
EH - Critical elk habitat
DH - Critical deer habitat
CH - Critical caribou habitat
FT - Critical terrestrial furbearer habitat
FS - Critical semi-aquatic furbearer habitat
CO - Colonial nesting birds
RA - Critical raptor habitat
TB - Key terrestrial bird habitat
TS - Trumpeter swan nesting
SB - Key shorebird habitat
WS - Waterfowl staging
WN - Waterfowl nesting
WF - Waterfowl feeding
WA - Waterfowl habitat all
MC - Key movement corridor
ML - Mineral lick
DV - High species diversity
RS - Rare/endangered species

6 - Fisheries

FS - Fisheries spawning
FR - Fisheries rearing/feeding
FA - Fisheries habitat all
CF - Commercial fishery
SF - Sport fishery
TL - Trophy lake
RS - Rare/endangered species
DV - High species diversity
UN - Unknown

7 - Scientific

ER - Ecological Reserve
NA - Natural Area
SO - Site of Interest
RS - Research site

8 - Cultural (none applied)

Criteria.db database for Rocky Mountain ESA

SITENO	SITENAME	CRIT
1	Redcap Mountain	3
1	Redcap Mountain	2
2	North Saskatchewan Gap	3
3	NE Woodland Caribou Winter, Year-Round Range	4
3	NE Woodland Caribou Winter, Year-Round Range	8
4	Caribou Summer + Occasional Winter Range	4
4	Caribou Summer + Occasional Winter Range	2
5	Woodland Caribou Summer Range	4
5	Woodland Caribou Summer Range	8
6	NW Woodland Caribou Winter Range	4
6	NW Woodland Caribou Winter Range	2
8	WMU AB406	7
9	WMU AB404	7
10	WMU BNP8	4
11	WMU BNP9	6
11	WMU BNP9	8
12	WMU AB418	5
12	WMU AB418	9
13	WMU AB430	7
14	Wapiabi Cave	5
14	Wapiabi Cave	3
15	Winniady West Grassiands	5
16	Winniady East Grassiands	5
17	Heii's Gate	3
18	Foiding Mountain	2
18	Foiding Mountain	3
19	Cardinal-McLeod Headwaters	6
19	Cardinal-McLeod Headwaters	7
19	Cardinal-McLeod Headwaters	8
20	Cardinal Hiiis Coiluviating Grassiands/Shrub	5
21	Cline - Resolute - Sentinel	12
22	Mt. Rundle	3
24	Opal Range	12
24	Opal Range	5
24	Opal Range	3
26	Highwood Pass	2
26	Highwood Pass	11
27	Mist Mountain Grassiands	5
28	South Plateau Mtn. Low Elevation Treelines	2
29	Grassy Ridge High Elevation Grassiands	5
30	Racehorse - Dutch Forestry Scientific Area	2

SITENO	SITENAME	CRIT
31	High Elevation ATV Scientific Area	2
32	Drywood Mountain Hanging Valley	3
33	Western Plains Garter Snake Hibernaculum	5
36	Spotted Frog Occurrence	4
37	Canadian Toad Occurrence	4
39	Bow Valley West	9
39	Bow Valley West	8
39	Bow Valley West	12
40	Middle Crowsnest Valley	5
40	Middle Crowsnest Valley	4
41	Upper Crowsnest Connectivity Corridor	8
42	Ptolemy Creek and Area	3
43	Upper Crowsnest Valley	9
44	Allison - Sentry Connectivity Corridor	8
45	Middle - Upper Crowsnest Valley	9
46	Blairmore Connectivity Corridor	8
47	Turtle Mountain and Frank Slide	10
48	Leach Colliery Connectivity Corridor	8
50	Rock Creek Connectivity Corridor	8
52	Seven Sisters - Crowsnest Mountains	9
53	Mt. Tecumseh and Deadman's Pass	9
54	Mountain Goat Concentration	4
55	Beauvais Lake Provincial Park	10
56	Red Cedar Stand on Snowshoe Creek	5
57	Waterton Lakes National Park	9
57	Waterton Lakes National Park	5
57	Waterton Lakes National Park	4
58	Front Range Canyons	9
59	Castle River Headwaters	9
60	Front Range Ridges	9
61	Middle Castle River	9
61	Middle Castle River	5
62	West Castle Headwaters	5
63	West Castle River Valley	5
64	Gardiner Creek	4
65	Carbondale Hill	4
66	Tornado and North Fork Passes	8
66	Tornado and North Fork Passes	3
67	Bow Range and Glaciers	3
68	S. portion of WMU BNP9	10
68	S. portion of WMU BNP9	3
69	Bow Valley, Vermilion Lakes - Banff Sector	9
69	Bow Valley, Vermilion Lakes - Banff Sector	8

SITENO	SITENAME	CRIT
69	Bow Valley, Vermilion Lakes - Banff Sector	10
70	Ghost River Wilderness	10
71	South Icefields Main Ranges	3
71	South Icefields Main Ranges	12
72	Icefields Parkway South	12
72	Icefields Parkway South	9
73	Howse River Valley and Pass	8
73	Howse River Valley and Pass	9
74	Icefields Parkway / Saskatchewan River	9
74	Icefields Parkway / Saskatchewan River	12
75	Main Range Icefields / Saskat. R. Glacier	9
76	White Goat Wilderness / Cline R. and Tributaries.	9
77	Kootenay Plains and Vicinity	6
78	Saskatchewan River Valley	8
78	Saskatchewan River Valley	9
79	Livingstone Range	9
80	Beehive Natural Area	9
80	Beehive Natural Area	12
81	Mt. Livingstone Natural Area	9
81	Mt. Livingstone Natural Area	6
82	Plateau Mountain and Vicinity	3
82	Plateau Mountain and Vicinity	9
83	Mt. Allan - Wind Valley	9
83	Mt. Allan - Wind Valley	8
84	Upper Kananaskis Lake Ranges and Glaciers	9
84	Upper Kananaskis Lake Ranges and Glaciers	12
85	Mt. Buller Rock Glacier and Vicinity	3
86	Forgetmenot Mountain	3
87	Moose Mountain NA and Vicinity	9
88	Marvel Lake and Vicinity	9
89	Sunshine Meadows and Vicinity	4
90	Cascade - Flints Park	4
91	Lake Minnewanka	9
92	WMU BNP 8 South	4
93	Bonnett Glacier	3
94	Skoki	9
94	Skoki	4
95	Burnt Timber	9
95	Burnt Timber	10
96	Panther Corners, in part	9
96	Panther Corners, in part	4
97	Upper Red Deer River and Tributaries	8

SITENO	SITENAME	CRIT
97	Upper Red Deer River and Tributaries	9
98	Prow Mountain - Mt. White Col / Scotch Camp	4
99	Clearwater River	9
100	Siffleur Headwaters and Vicinity	9
101	Siffleur Wilderness and Saskat. R. Connection	9
101	Siffleur Wilderness and Saskat. R. Connection	8
102	Ram - Whiterabbit	9
102	Ram - Whiterabbit	8
103	White Goat Lakes	4
104	Coliseum Mountain	5
104	Coliseum Mountain	10
105	Shunda Mountain	5
105	Shunda Mountain	10
106	Brazeau River - Job Creek	8
106	Brazeau River - Job Creek	7
107	Tarpeian Rock - Opabin Creek	5
108	Muskiki Lake and area	5
109	Ram Mountain	5
109	Ram Mountain	4
110	Baseline Mountain	5
111	Rock Lake - Wildhay	10
113	Smoky River and tributaries	8
113	Smoky River and tributaries	9
114	Sheep Creek	8
115	Smoky River (Gustav Flats to Wanyandie Ck)	8
116	Kakwa Wildland Provincial Park and Area	9
117	Childear - Mawdsley - Kvass Creek	10
119	Turret - Ambler	10
120	Blood Reserve 148A	4
121	Brule Dunes	5
122	Dinosaur Tracks	3
123	Mt. Wilson Icefield	3
123	Mt. Wilson Icefield	12
124	Kananaskis Range	2
124	Kananaskis Range	10
124	Kananaskis Range	12
125	Spray Valley	8
126	Spray Reservoir - Kananaskis Corridor	8
126	Spray Reservoir - Kananaskis Corridor	10
127	Evan-Thomas Critical Wildlife Area	7
128	Fisher Range	9
129	Kananaskis River Valley and Slopes	10
129	Kananaskis River Valley and Slopes	8

SITENO	SITENAME	CRIT
130	Oldman River Valley	8
130	Oldman River Valley	9
131	Livingstone River Valley	9
132	Ma Butte	3
133	Barnaby Ridge	7
134	Grave Flats	9
135	South Ghost Wilderness	5
135	South Ghost Wilderness	6
135	South Ghost Wilderness	9
136	Pipestone River - Mt. Murchison	9
136	Pipestone River - Mt. Murchison	12

Feature.db database for Rocky Mountain ESA

SITENO	SITENAME	THEME	FEATURE
1	Redcap Mountain	1	BO
1	Redcap Mountain	5	RA
2	North Saskatchewan Gap	3	RI
3	NE Woodland Caribou Winter, Year-Round Range	5	CH
3	NE Woodland Caribou Winter, Year-Round Range	5	RS
4	Caribou Summer + Occasional Winter Range	5	CH
4	Caribou Summer + Occasional Winter Range	3	RI
5	Woodland Caribou Summer Range	5	CH
5	Woodland Caribou Summer Range	3	RI
6	NW Woodland Caribou Winter Range	5	CH
6	NW Woodland Caribou Winter Range	3	RI
8	WMU AB406	5	UH
8	WMU AB406	5	RS
9	WMU AB404	5	FT
9	WMU AB404	5	RS
10	WMU BNP8	5	UH
10	WMU BNP8	4	RS
11	WMU BNP9	4	DV
11	WMU BNP9	5	UH
12	WMU AB418	4	DV
12	WMU AB418	4	PC
12	WMU AB418	5	UH
13	WMU AB430	5	UH
14	Wapiabi Cave	5	RS
14	Wapiabi Cave	1	CV
15	Winniady West Grasslands	4	PC
16	Winniady East Grasslands	4	PC
17	Heil's Gate	1	CY
18	Folding Mountain	4	SP
18	Folding Mountain	1	BO
19	Cardinal-McLeod Headwaters	4	DV
19	Cardinal-McLeod Headwaters	7	DV
19	Cardinal-McLeod Headwaters	5	RS
19	Cardinal-McLeod Headwaters	1	CV
20	Cardinal Hills Colluviating Grasslands/Shrub	4	PC
21	Cline - Resolute - Sentinel	1	BO
22	Mt. Rundle	1	BO
24	Opal Range	1	BO
24	Opal Range	7	PC
26	Highwood Pass	4	DV
26	Highwood Pass	5	RS

SITENO	SITENAME	THEME	FEATURE
26	Highwood Pass	7	RS
27	Mist Mountain Grasslands	4	PC
28	South Plateau Mtn. Low Elevation Treelines	4	PC
29	Grassy Ridge High Elevation Grasslands	4	PC
30	Racehorse - Dutch Forestry Scientific Area	7	RS
31	High Elevation ATV Scientific Area	7	RS
32	Drywood Mountain Hanging Valley	1	FA
33	Western Plains Garter Snake Hibernaculum	5	RS
36	Spotted Frog Occurrence	5	RS
37	Canadian Toad Occurrence	5	RS
39	Bow Valley West	4	PC
39	Bow Valley West	6	FA
39	Bow Valley West	5	RS
40	Middle Crowsnest Valley	5	RS
40	Middle Crowsnest Valley	3	LA
41	Upper Crowsnest Connectivity Corridor	5	MC
41	Upper Crowsnest Connectivity Corridor	4	RS
42	Ptolemy Creek and Area	3	SP
43	Upper Crowsnest Valley	3	SP
43	Upper Crowsnest Valley	4	PC
43	Upper Crowsnest Valley	5	WA
44	Allison - Sentry Connectivity Corridor	5	UH
44	Allison - Sentry Connectivity Corridor	4	DV
45	Middle - Upper Crowsnest Valley	4	DV
45	Middle - Upper Crowsnest Valley	5	UH
45	Middle - Upper Crowsnest Valley	6	FA
45	Middle - Upper Crowsnest Valley	7	NA
46	Blairmore Connectivity Corridor	5	MC
47	Turtle Mountain and Frank Slide	1	SL
47	Turtle Mountain and Frank Slide	8	
48	Leach Colliery Connectivity Corridor	5	MC
50	Rock Creek Connectivity Corridor	5	MC
52	Seven Sisters - Crowsnest Mountains	1	BO
52	Seven Sisters - Crowsnest Mountains	8	
53	Mt. Tecumseh and Deadman's Pass	4	DV
53	Mt. Tecumseh and Deadman's Pass	4	RS
53	Mt. Tecumseh and Deadman's Pass	5	MC
53	Mt. Tecumseh and Deadman's Pass	5	UH
53	Mt. Tecumseh and Deadman's Pass	7	NA
54	Mountain Goat Concentration	5	UH
55	Beauvais Lake Provincial Park	3	LA
55	Beauvais Lake Provincial Park	4	SP

SITENO	SITENAME	THEME	FEATURE
56	Red Cedar Stand on Snowshoe Creek	4	RS
56	Red Cedar Stand on Snowshoe Creek	4	PC
57	Waterton Lakes National Park	4	DV
57	Waterton Lakes National Park	4	PC
57	Waterton Lakes National Park	4	RS
58	Front Range Canyons	4	RS
58	Front Range Canyons	5	UH
59	Castle River Headwaters	4	RI
59	Castle River Headwaters	5	PC
60	Front Range Ridges	5	UH
60	Front Range Ridges	7	NA
61	Middle Castle River	3	FA
61	Middle Castle River	4	DV
61	Middle Castle River	4	RS
62	West Castle Headwaters	3	RI
62	West Castle Headwaters	4	PC
62	West Castle Headwaters	5	MC
63	West Castle River Valley	3	RI
63	West Castle River Valley	4	PC
63	West Castle River Valley	6	SF
64	Gardiner Creek	5	RS
65	Carbondale Hill	4	RS
66	Tornado and North Fork Passes	1	BO
66	Tornado and North Fork Passes	5	MC
67	Bow Range and Glaciers	1	GL
67	Bow Range and Glaciers	1	BO
68	S. portion of WMU BNP9	1	BO
68	S. portion of WMU BNP9	4	RS
68	S. portion of WMU BNP9	5	RS
69	Bow Valley, Vermilion Lakes - Banff Sector	1	DV
69	Bow Valley, Vermilion Lakes - Banff Sector	4	DV
69	Bow Valley, Vermilion Lakes - Banff Sector	5	RS
69	Bow Valley, Vermilion Lakes - Banff Sector	8	
69	Bow Valley, Vermilion Lakes - Banff Sector	1	SP
69	Bow Valley, Vermilion Lakes - Banff Sector	5	WN
69	Bow Valley, Vermilion Lakes - Banff Sector	5	ML
70	Ghost River Wilderness	1	BO
70	Ghost River Wilderness	5	UH
71	South Icefields Main Ranges	1	GL
71	South Icefields Main Ranges	1	FN
71	South Icefields Main Ranges	1	BO
72	Icefields Parkway South	3	LA
72	Icefields Parkway South	3	RI

SITENO	SITENAME	THEME	FEATURE
72	Icefields Parkway South	4	PC
73	Howse River Valley and Pass	1	DV
73	Howse River Valley and Pass	5	MC
74	Icefields Parkway / Saskatchewan River	1	DV
74	Icefields Parkway / Saskatchewan River	3	RI
75	Main Range Icefields / Saskat. R. Glacier	1	FA
75	Main Range Icefields / Saskat. R. Glacier	3	RI
75	Main Range Icefields / Saskat. R. Glacier	5	RS
76	White Goat Wilderness / Cline R. and Tributaries	3	RI
76	White Goat Wilderness / Cline R. and Tributaries	4	PC
76	White Goat Wilderness / Cline R. and Tributaries	7	ER
77	Kootenay Plains and Vicinity	3	RI
77	Kootenay Plains and Vicinity	4	DV
77	Kootenay Plains and Vicinity	5	UH
78	Saskatchewan River Valley	3	RI
78	Saskatchewan River Valley	4	DV
78	Saskatchewan River Valley	5	MC
79	Livingstone Range	4	DV
80	Beehive Natural Area	4	DV
80	Beehive Natural Area	3	RI
81	Mt. Livingstone Natural Area	4	DV
81	Mt. Livingstone Natural Area	4	RS
81	Mt. Livingstone Natural Area	7	NA
82	Plateau Mountain and Vicinity	1	PG
82	Plateau Mountain and Vicinity	4	PC
83	Mt. Allan - Wind Valley	4	PC
83	Mt. Allan - Wind Valley	5	MC
83	Mt. Allan - Wind Valley	5	UH
84	Upper Kananaskis Lake Ranges and Glaciers	1	GL
84	Upper Kananaskis Lake Ranges and Glaciers	1	BO
84	Upper Kananaskis Lake Ranges and Glaciers	5	MC
85	Mt. Buller Rock Glacier and Vicinity	1	RG
86	Forgetmenot Mountain	1	PG
86	Forgetmenot Mountain	1	RG
86	Forgetmenot Mountain	5	UH
87	Moose Mountain NA and Vicinity	1	PG
87	Moose Mountain NA and Vicinity	1	CV
87	Moose Mountain NA and Vicinity	4	RS
88	Marvel Lake and Vicinity	3	LA
88	Marvel Lake and Vicinity	4	RS
89	Sunshine Meadows and Vicinity	4	RS
89	Sunshine Meadows and Vicinity	5	RS

SITENO	SITENAME	THEME	FEATURE
90	Cascade - Flints Park	5	RS
90	Cascade - Flints Park	5	ML
90	Cascade - Flints Park	5	UH
90	Cascade - Flints Park	6	FA
91	Lake Minnewanka	3	LA
91	Lake Minnewanka	3	SP
91	Lake Minnewanka	5	ML
91	Lake Minnewanka	5	UH
92	WMU BNP 8 South	4	RS
92	WMU BNP 8 South	5	UH
93	Bonnett Glacier	1	GL
94	Skoki	1	GL
94	Skoki	3	LA
94	Skoki	5	RS
95	Burnt Timber	3	CR
95	Burnt Timber	5	RS
95	Burnt Timber	8	
96	Panther Corners, in part	4	PC
96	Panther Corners, in part	5	RS
96	Panther Corners, in part	5	UH
97	Upper Red Deer River and Tributaries	3	RI
97	Upper Red Deer River and Tributaries	4	PC
97	Upper Red Deer River and Tributaries	5	RS
98	Prow Mountain - Mt. White Col / Scotch Camp	1	HD
98	Prow Mountain - Mt. White Col / Scotch Camp	4	RS
98	Prow Mountain - Mt. White Col / Scotch Camp	4	PC
98	Prow Mountain - Mt. White Col / Scotch Camp	5	ML
98	Prow Mountain - Mt. White Col / Scotch Camp	5	RS
98	Prow Mountain - Mt. White Col / Scotch Camp	5	UH
99	Clearwater River	3	RI
99	Clearwater River	3	LA
99	Clearwater River	3	CR
99	Clearwater River	5	RS
100	Siffleur Headwaters and Vicinity	1	BO
100	Siffleur Headwaters and Vicinity	3	LA
100	Siffleur Headwaters and Vicinity	5	RS
101	Siffleur Wilderness and Saskat. R. Connection	3	RI
101	Siffleur Wilderness and Saskat. R. Connection	5	RS
101	Siffleur Wilderness and Saskat. R. Connection	5	MC
101	Siffleur Wilderness and Saskat. R. Connection	6	FA
102	Ram - Whiterabbit	1	FI
102	Ram - Whiterabbit	3	RI
102	Ram - Whiterabbit	5	MC

SITENO	SITENAME	THEME	FEATURE
102	Ram - Whiterabbit	6	FA
103	White Goat Lakes	4	RS
104	Coliseum Mountain	1	BO
104	Coliseum Mountain	4	PC
104	Coliseum Mountain	5	UH
105	Shunda Mountain	4	PC
105	Shunda Mountain	5	UH
106	Brazeau River - Job Creek	3	CR
106	Brazeau River - Job Creek	3	RI
106	Brazeau River - Job Creek	5	MC
106	Brazeau River - Job Creek	5	RS
107	Tarpeian Rock - Opabin Creek	1	BO
107	Tarpeian Rock - Opabin Creek	3	CR
107	Tarpeian Rock - Opabin Creek	4	OG
108	Muskiki Lake and area	2	FR
108	Muskiki Lake and area	3	LA
108	Muskiki Lake and area	4	OG
108	Muskiki Lake and area	7	NA
109	Ram Mountain	4	RS
109	Ram Mountain	5	UH
109	Ram Mountain	7	RS
110	Baseline Mountain	4	PC
110	Baseline Mountain	5	RS
111	Rock Lake - Wildhay	4	PC
111	Rock Lake - Wildhay	5	UH
111	Rock Lake - Wildhay	6	SF
113	Smoky River and tributaries	5	MC
113	Smoky River and tributaries	5	RS
113	Smoky River and tributaries	6	SF
114	Sheep Creek	5	MC
114	Sheep Creek	5	RS
115	Smoky River (Gustav Flats to Wanyandie Ck)	5	MC
115	Smoky River (Gustav Flats to Wanyandie Ck)	5	RS
115	Smoky River (Gustav Flats to Wanyandie Ck)	6	SF
116	Kakwa Wildland Provincial Park and Area	1	FA
116	Kakwa Wildland Provincial Park and Area	1	MH
116	Kakwa Wildland Provincial Park and Area	1	PG
116	Kakwa Wildland Provincial Park and Area	3	RI
116	Kakwa Wildland Provincial Park and Area	4	RS
116	Kakwa Wildland Provincial Park and Area	5	CH
117	Childear - Mawdsley - Kvass Creek	3	CR
117	Childear - Mawdsley - Kvass Creek	5	MC

SITENO	SITENAME	THEME	FEATURE
119	Turret - Ambler	4	RS
119	Turret - Ambler	5	UH
120	Blood Reserve 148A	4	RS
120	Blood Reserve 148A	3	RI
121	Brule Dunes	1	ED
121	Brule Dunes	3	LA
121	Brule Dunes	4	PC
122	Dinosaur Tracks	1	FI
123	Mt. Wilson Icefield	1	PG
123	Mt. Wilson Icefield	1	GL
123	Mt. Wilson Icefield	1	BO
124	Kananaskis Range	1	SS
124	Kananaskis Range	4	PC
125	Spray Valley	5	MC
125	Spray Valley	5	RS
125	Spray Valley	5	UH
126	Spray Reservoir - Kananaskis Corridor	5	MC
126	Spray Reservoir - Kananaskis Corridor	6	SF
127	Evan-Thomas Critical Wildlife Area	3	CR
127	Evan-Thomas Critical Wildlife Area	5	UH
128	Fisher Range	4	PC
129	Kananaskis River Valley and Slopes	1	FN
129	Kananaskis River Valley and Slopes	3	CR
129	Kananaskis River Valley and Slopes	3	RI
129	Kananaskis River Valley and Slopes	5	MC
129	Kananaskis River Valley and Slopes	6	SF
129	Kananaskis River Valley and Slopes	7	NA
130	Oldman River Valley	3	RI
130	Oldman River Valley	4	OG
130	Oldman River Valley	5	MC
130	Oldman River Valley	6	SF
131	Livingstone River Valley	4	PC
131	Livingstone River Valley	5	MC
132	Ma Butte	1	BO
133	Barnaby Ridge	5	UH
134	Grave Flats	2	FR
134	Grave Flats	4	SP
135	South Ghost Wilderness	1	DV
135	South Ghost Wilderness	1	SS
135	South Ghost Wilderness	1	KA
135	South Ghost Wilderness	3	SP
135	South Ghost Wilderness	5	DV
135	South Ghost Wilderness	5	ML

SITENO	SITENAME	THEME	FEATURE
135	South Ghost Wilderness	5	TB
136	Pipestone River - Mt. Murchison	1	BO
136	Pipestone River - Mt. Murchison	1	GL
136	Pipestone River - Mt. Murchison	3	CR
136	Pipestone River - Mt. Murchison	3	LA
136	Pipestone River - Mt. Murchison	4	PC

Locate.db database for Rocky Mountain ESA

SITENO	SITENAME	AREA	TWP	RG	MER	NTS	SUB1	SUB2	SIG	Sitedescrip	References
1	Redcap Mountain	38.5	45	22	5	83C	7	8	4	East of the Cardinal Divide. Unique large anticlinal foothill in Mesozoic rock; beautiful alpine meadows full of rodents and sparrows that attract many hawks and falcons; will be affected by the Cheviot Mine. >/= 5 rare plant occurrences.	Ben Gadd, pers. comm. 1997; ANHIC rare plant database 1997.
2	North Saskatchewan Gap	45.8	39	14	5	83B	9	8	2	Where the river crosses the Brazeau Range SE of Nordegg; spectacular canyon. The river is antecedent; i.e., has held its ground during uplift of the range and so produced a true baby Grand-Canyon-style canyon, not merely a gorge (although there's one of those, too). Main threat to the polygon: oil and gas activities. The polygon has a powerline running through it, with evidence of ATV use, but no real road, which keeps it relatively wild.	Ben Gadd, pers. comm. 1997; 83B NTS topographic map.
3	NE Woodland Caribou Winter, Year-Round Range	5245.43	57	2	6	83L	8	7	3	Area extends onto NTS 83E,F, and K. Boundaries extend beyond study region. Incl. NE part of Willmore Wilderness. Includes portions of Bentz et al. 1995 esa polygons 501, 502, 503, 504, 912, 1001 (Little Berland - Fox Drainage; Berland R.- Donald Flats; Berland R. - Hendrickson Ck; Muskeg - Little Smoky Rivers; Little Smoky Caribou Range; Simonette R.). Includes dwindling Little Smoky caribou herd; migration corridor; grizzly bears, old-growth forests; variety of peatland and upland plant communities and geomorphic features (incl. unglaciated terrain); key moose, elk, mule deer, and wolf range; bull trout, grayling, mountain whitefish; introduced rainbow and brook trout; Critical Wildlife Zones. Area degraded and endangered by logging and "transport network" (i.e., seismic, wells, cutlines, roads, etc.). "Notes regarding polygons 3,4,5,6: Currently in west central Alberta Fish and Wildlife (J. Edmonds, pers. comm. 1997) are estimating about 800 - 900 woodland caribou, with the breakdown as: 500 in the migratory mountain caribou herds, 200 - 250 in the non-migratory mountain caribou herds (Willmore and Jasper Parks), and 100 - 150 in the boreal caribou herds (do not migrate to the mountains). Total Alberta woodland caribou population as of 1993 (Alberta Fish and Wildlife Division 1993; Edmonds 1991) was estimated at 3,100 to 3,500 animals.	J. Edmonds, pers. comm. 1997; field observations, 1997; ANHIC cutblock and transport network maps 1997; Bentz et al. 1995; Alberta Fish and Wildlife Division 1993; Edmonds 1991.
4	Caribou Summer + Occasional Winter Range	891.37	x	x	x	83E	8	7	3	Important woodland caribou summer (occasional winter) range. Part of Willmore Wilderness, incl. high recreational value trails, key wildlife habitat; incl. portions of Wildhay R., Rock Ck, Sulphur R., N. Berland and S. Berland Rivers; many creeks; Persimmon Range; >/= 9 rare plant occurrences.	J. Edmonds, pers. comm. 1997; field observations 1997; ANHIC rare plant database 1997; Alberta Wilderness Assoc. 1973; 83E NTS map.
5	Woodland Caribou Summer Range	2209.77	x	x	x	83E	8	7	3	Extends onto map 83L. Incl. large portion of Willmore Wilderness. Key woodland caribou winter range. Incl. stretches of Smoky, Muddywater, and Jackpine Rivers, Hardscrabble, Sheep, Cote, and minor creeks; Ptarmigan Lake; high mountain passes; landscape connectivity, migration corridor, numerous riparian zones; small amount of glaciers; >/= 3 rare plant occurrences; s. border on Jasper NP, west borders on British Columbia; n. borders on Kakwa Wildland. Technically, the polygon extends well into north part of Jasper NP, but stopped at north boundary for jurisdictional purposes.	J. Edmonds, pers comm. 1997; Alberta Wilderness Assoc. 1973; ANHIC rare plant database 1997; NTS map 83E.
6	NW Woodland Caribou Winter Range	3427.8	61	10	6	83L	8	7	3	Boundaries extend n. beyond study region. Important northwest woodland caribou winter range. Incl. portions of Bentz et al. 1995 esa polygons 1003 to 1009 inclusive. Major rivers and their valleys (Kakwa, Narraway, Wapiti) and numerous creeks; bull trout, grayling, mountain whitefish, rainbow, eastern brook, and cutthroat trout; important grizzly bear, moose, elk, mule deer, and whitetail habitat; diverse fluvial landforms and riparian communities; migration corridors; incl. >/= 9 rare plant occurrences. Logging and oil and gas activities (seismic, wells, roads, etc.) occur in a large part of the area. "Regarding polygons 3,4,5,6 (woodland caribou range): currently in west central Alberta Fish and Wildlife (J. Edmonds, pers. comm. 1997) estimates about 800 - 900 woodland caribou, with the breakdown an: 500 in the migratory mountain caribou herds, 200 - 250 in the non-migratory mountain caribou herds (Willmore and Jasper Parks), and 100 - 150 in the boreal caribou herds (do not migrate to the mountains). Total Alberta woodland caribou population as of 1993 (Alberta Fish and Wildlife Division 1993; Edmonds 1991) was estimated at 3,100 to 3,500 animals.	J. Edmonds, pers. comm. 1997; Bentz et al. 1995; NTS map 83L; ANHIC rare plant database 1997; ANHIC cutblock and transport network maps 1997.
8	WMU AB406	1979.97	20	7	5	82J	8	7	3	"Elbow-Sheep Rivers" WMU. Includes a large part of Kananaskis Country (Elbow-Sheep Wilderness); high recreation value. Boundaries extend onto NTS 82O and east beyond study region. Abuts on Highwood River. Critical habitat for grizzly bear, cougar, wolf, elk, mule deer, whitetail deer, and moose; wildlife migration corridors, incl. Front Ranges of the Rockies; >/= 11 rare plant and 1 northern leopard frog occurrences.	Komex International 1995; G. Court (Alberta Biodiversity Observation Database), pers. comm. 1997; Alberta Wilderness Assoc. 1972, 1986; field observations, 1997; ANHIC rare plant database 1997;

SITENO	SITENAME	AREA	TWP	RG	MER	NTS	SUB1	SUB2	SIG	Sitedescrip	References
											NTS maps 82O,J.
9	WMU AB404	728.69	15	5	5	82J	8	7	3	"Highwood River" WMU. High recreation value. Abuts on Highwood River. Critical habitat for cougar, wolf, grizzly bear, elk, and mountain goat; wildlife migration corridors. Incl. Front and Main Ranges of the Rockies and many creeks, including Cataract Creek.	Komex International 1995; field observations, 1997; NTS map 82J.
10	WMU BNP8	828.7	x	x	x	82O	8	7	3	"Panther - Cascade" WMU, Polygons 90, 91, 92 excised from this. Critical winter habitat for bighorn sheep, mountain goat, and grizzly bear. Includes >/= 34 rare plant occurrences. "Includes Panther R. sulfur springs on east side of Banff Park (~Sec.35-30-12-W5th) -- in summer used as a mineral lick, and in winter as a bull elk winter range; a historic wolf den site there; threats to Panther R. sulfur springs are competitive grazing by horses and harassment of the animals during the summer by backcountry campers; Banff Warden Service has been known to allow large horse groups to camp near here for several weeks at a time.	Komex International 1995; ANHIC rare plant database 1997; E. Bruns, pers. comm. 1997.
11	WMU BNP9	274.74	x	x	x	82O	8	7	2	"Middle Bow" WMU. Polygon 68 excised from this. Critical winter habitat for elk, bighorn sheep, and mountain goat. Includes Mt. Norquay natural area of significance (after Achuff et al. 1986) with the rare plants Castilleja hispida, Crepis atrabarba, Draba reptans, Hieracium cynoglossoides, Lithophragma parviflorum, and Pellaea glabella, the significant vegetation types C1 (Douglas fir / hairy wild rye), O5 (Douglas fir / juniper / bearberry), H6 (June grass - pasture sage - wild blue flax), H7 (wheatgrass - pasture sage), and H13 (Richardson needlegrass - junegrass - everlasting), 2 significant bird communities (1, 13), cougar, black bear, and deer range, a wildlife migration corridor, and prehistoric cultural sites. Includes part of the Sawback Range natural area of significance (after Achuff et al. 1986) with rare plants, significant vegetation types, rare birds, significant bird communities, prehistorical cultural sites, etc.	Komex International 1995; Achuff et al. 1986; field observations, 1997; Holland and Coen 1983.
12	WMU AB418	608.65	32	12	5	82O	9	8	2	"Red Deer River" WMU. Critical winter habitat for elk and wolf. Includes part of Panther Corners and Ram-Whiterabbit proposed wildlands (after Alberta Wilderness Assoc. 1986). Includes the Ya Ha Tinda natural area of significance (after Achuff et al. 1986) with Bighorn Falls, vertical-walled canyon complex, table-top plateaus, cirque basins, significant vegetation types C16 (aspen / hairy wild rye - peavine) and H6 (junegrass - pasture sage - wild blue flax), bird communities (1,9,13), bighorn sheep range, and prehistoric sites. Part of montane ecoregion (least extensive ecoregion in province). Includes Scalp Creek Natural Area which features palsas and thermokarst, micro-hummocky and pock-marked terrain, subalpine colluvial, fluvial, morainal and organic terrain, grassland and wet meadows, Engelmann spruce-alpine fir-lodgepole pine stands, dwarf birch shrubland, and elk and grizzly range. Includes Eagle Creek Natural Area with high landscape diversity, montane and subalpine ecoregion representation, mature white spruce/feathermoss, white spruce - lodgepole pine forests, aspen groves, creek valleys, etc.; very scenic, important elk and sheep winter range, grizzly and wolf habitat. "Occurrence of montane ecoregion and rough fescue (+/- Stipa richardsonii) grasslands is extralimital. Ya Ha Tinda area used as horse wintering area by Banff NP warden service.	Komex International 1995; Achuff et al. 1986; Alberta Wilderness Assoc. 1986; ANHIC library data files, 1997; ANHIC Scalp Creek and Eagle Creek Natural Areas factsheets, 1997; McGillis 1977; field observations, 1997; Looman 1969.
13	WMU AB430	878.21	39	17	5	83C	8	7	4	"Bighorn River" WMU. Critical habitat for woodland caribou, bighorn sheep, mountain goat, and wolf. Eastern boundary extends beyond study region.	Komex International 1995; field observations, 1997.
14	Wapiabi Cave	0.72	40	17	5	83C	8	7	3	West of Nordegg where Wapiabi Creek cuts through the Bighorn Range at approx. 52-29'N, 116-26'W. Sometimes misidentified as "Chungo Cave." Short but interesting, well-decorated limestone cave at treeline, practically on the ridgecrest. Steep, scenic path to the entrance. As in the case of Cadomin Cave, needs instructive signage to prevent unintentional vandalism. Thus far, no ATV damage. Confirmed hibernaculum and swarming site for little brown bats and long-legged bat; last count was in 1978: >>200 bats seen in late winter.	B. Gadd, pers. comm. 1997; M. Pybus, pers. comm. 1997; Smith 1993.
15	Winniady West Grasslands	18.74	58	8	6	83L	9	8	4	Extends onto NTS 83E. Nice extralimital SE-facing grasslands (probably montane in character). Area investigated in fieldcheck was dominated by Agropyron albicans and Artemisia frigida, with lesser amounts of Prunus virginiana, Koeleria macrantha, and Galium boreale. Grazed by cattle (numerous cattle "terracettes" on the slopes). Parent material is rubbly, loamy colluviating till; soil had a deep (>20 cm) Ah, grading into a Bm; probably a Melanic Brunisol on semi-stable slopes, Regosol on unstable slopes; the blue-green colour of the grasslands is probably due to both Agropyron albicans and Artemisia frigida; Eleagnus commutata clones around edges of these grasslands; mapped based on AS4436-16,17,95,96 (1993). Includes >/= 2 rare plant occurrences. Includes some formerly-mined disturbed areas. These grasslands need study.	Field and airphoto observations, 1997.
16	Winniady East Grasslands	30.35	57	8	6	83L	9	8	4	Extends onto NTS 83E. Nice extralimital West-facing grasslands (probably montane in character). Area investigated in fieldcheck was dominated by Agropyron albicans and Artemisia frigida, with lesser amounts of Prunus virginiana, Koeleria macrantha, and Galium boreale. Grazed by cattle (numerous cattle "terracettes" on the slopes). Parent material is rubbly,	Field and airphoto observations, 1997.

SITENO	SITENAME	AREA	TWP	RG	MER	NTS	SUB1	SUB2	SIG	Sitedescrip	References
										loamy colluviating till; soil had a deep (>20 cm) Ah, grading into a Bm; probably a Melanic Brunisol on semi-stable slopes, Regosol on unstable slopes; the blue-green colour of the grasslands is probably due to both Agropyron albicans and Artemisia frigida; Eleagnus commutata clones around edges of these grasslands; mapped based on AS4436-16,17,95,96 (1993). Includes >/= 1 rare plant occurrence. Includes some formerly-mined disturbed areas. These grasslands need study. There are likely many more of these grasslands in the area; polygons 15 and 16 are two of more accessible examples.	
17	Hell's Gate	9.13	56	8	6	83E	8		4	Scenic sandstone/pebbly conglomerate joint canyons of the Smoky and Sulphur Rivers. High recreation value for equestrian users, hunters, naturalists, and hikers (Hell's Gate Staging Area in the polygon). Technically just outside the study area.	Field observations, 1997.
18	Folding Mountain	188.75	48	25	5	83F	7	8	4	Prime protection zone on west boundary of Jasper National Park at interface between the Foothills and the Front Ranges. Area is noted for its rich wildflower tundra meadows which are easily accessible on foot from the Yellowhead Highway. High recreational value for day hikers, backpackers, naturalists, equestrian, and guided trips. Area includes Sphinx Mountain -- a classic glacially-formed amphitheatre, Drinnan Creek and Mystery Lake with native bull trout populations, bighorn sheep habitat (population about 100 animals), valley bottom balsam poplar forests, lodgepole pine, white spruce, and Engelmann spruce forests, Engelmann spruce and subalpine fir forest-tundra, and alpine tundra communities. Include >/=2 rare plant occurrences. Some damage to trails by horses and ATVs (ATV damage to tundra meadows).	Alberta Wilderness Assoc. 1986; ANHIC rare plant database 1997; ANHIC Folding Mountain data file, 1997; field observations, 1997.
19	Cardinal-McLeod Headwaters	591.04	45	23	5	83C	7	8	2	Extends onto NTS 83F. Scenic, diverse area of great significance adjacent to Jasper NP (World Heritage Site). Includes valleys of Cardinal and McLeod Rivers and many tributaries, the Nikanassin Range, Cardinal River Divide, from high alpine to low subalpine valley bottom. Important travel corridors traverse the area. Includes >/= 92 rare plant occurrences (>/=3 nationally significant species) and at least 25 vegetation types (three of which have not been reported elsewhere in Alberta). Approximately 27 species of threatened mammals and birds. High diversity of mammals (at least 47 species) and song birds (at least 129 species). Area supports grizzly bears, wolverines, wolves, cougars, harlequin ducks, bull trout, and other rare/sensitive species. Much of area was a glacial refugium (unglaciated for at least 11,000 years, perhaps as long as 128,000 years); area may have been part of an ice-free corridor. Patterned ground, waterfalls and cascades, diverse geomorphic features, fossil beds, rare and disjunct insects and crustaceans. At the divide proper, the vascular flora consists of 277 species, with 35 species significant due to rarity or range considerations. "Includes Cadomin Cave and Natural Area, one of longest caves in Alberta, and a popular site for caving. The cave contains a cold sulphur springs, a paleontological site, and speleothems. High level of visitation is causing damage, both to the cave, and as disturbance to the bat populations. The cave is a confirmed hibernaculum for Myotis lucifugus (little brown bat), M. volans (the rare long-legged bat), M. septentrionalis (northern long-eared bat), M. evotis (long-eared bat), and Eptesicus fuscus (big brown bat). Population estimates range from 2000-5000 in winter. It is one of only two known hibernacula for northern long-eared bats in the province (currently on Blue List in Alberta) and a confirmed swarming site in late August and early September. Swarming involves considerable admixing of populations and allows for genetic variation in offspring. Swarming populations are considerably higher than hibernating (10-20,000?). Swarming is the time of mating, and disturbance should be particularly avoided, especially at dawn and dusk. The Alberta Wildlife Act states that there shall be no disturbance to hibernacula from 1 September to 30 April. Banding records indicate bats fly to and from Cadomin from a wide summer range throughout central Alberta. "Zoning in the area is predominantly prime protection and critical wildlife, with smaller amounts of multiple use, general recreation. (Alberta Forestry, Lands and Wildlife 1990). Existing and new open pit coal mines cover a portion of this area. There is a high level of ATV use in the polygon. The area is undergoing habitat loss, dissection, fragmentation, extirpation of species and communities, riparian damage, water pollution, disruption of animal movement/migration, and species abandonment.	Field observations, 1997; M. Pybus, pers. comm. 1997; Komex International 1992; ANHIC rare plant database 1997; www.web.net/~awa/cheviot/; www.newswire.ca/releases/; www.southam.com/Edmonton journal/; www.rockies.ca/cpaws/cheviot.htm/; www.incentre.net; Alberta Natural Heritage Protection, Cardinal River file documents, and Cadomin Cave Natural Area factsheet, 1997; Achuff 1984.
20	Cardinal Hills Colluviating Grasslands/Shrub	0.95	45	18	5	83C	9	8	4	Uncommon Eleagnus commutata shrublands and true grasslands, SW-facing, on south tip of the Cardinal Hills. Area requires scientific study. Presence of grasslands due to combination of slope, aspect, and active colluviation.	Field observations, 1997; airphoto observations (AS4420-58,59 (1993)), 1997.
21	Cline - Resolute - Sentinel	167.96	36	19	5	83C	7	8	3	High alpine area of ridges, crags, and plateaus, with maximum elevation at Mt. Cline (11027 feet). Extremely scenic. Area includes Whitegoat Peaks, Resolute Mountain, Sentinel Mountain, Elliott Peak, Mount Sir Ernest Ross, Landslide Lake (LL Natural Area includes a glaciated, steep-sided valley, large rockslide impounds the lake; scenic with mountains enclosing on three sides; subalpine and alpine plant communities; and grizzly bear habitat), headwaters of Entry Ck., and smaller creeks. "Also includes Lake of the Falls Natural Area (#562): wild and scenic, rich alpine and subalpine ecosystem with bogs, meadows, and stands of spruce and subalpine fir, hanging valley, glacier-fed lake, and cutthroat trout in the	Field observations, 1997; airphoto observations (AS3811-160, 161,162,163 (1988)).

SITENO	SITENAME	AREA	TWP	RG	MER	NTS	SUB1	SUB2	SIG	Sitedescrip	References
										lake; area used for camping, hiking, fishing, and horseback riding; heli-hiking and heli-camping.	
22	Mt. Rundle	56.51	x	x	x	82O	8	7	3	Classic, well-known southwestern dip slope mountain of the Front Ranges. High recreational value for hikers, rock climbers, and naturalists. Accessible, easy-to-observe geological formations (the Late Paleozoic "Sandwich" Palliser Formation, Exshaw and Banff Formations, and Rundle Group).	Gadd 1995; field observations, 1997.
24	Opal Range	125.25	20	8	5	82J	7	8	4	Prime protection zone. Area of scientific, geological, and esthetic significance. Spectacular sawtooth ridges and marine fossils of the Rundle Group. Multiple treelines due to patterns of soil and water availability, slope, and nutrient status as influenced by daylighting of bedding planes on up-dip slope; fire history and chance may also influence multiple treelines.	Gadd 1995; field observations, 1997; airphoto observations (AS4458-155,156,156,158,176,177,178,179 (1993)), 1997; Alberta Forestry 1986.
26	Highwood Pass	102.93	19	7	5	82J	8	7	2	Prime protection area of high scientific, ecological, geological and recreational significance. Includes rare vegetation communities, nunataks, synclines, rock glacier, rare animals (e.g., golden eagles). Area includes headwaters of Pocaterra Creek, headwaters of Storm Creek (reputed locality of the Lost Lemon Mine), the Misty Range with Mt. Rae, Storm Mtn., northern part of Mist Mountain, and northern part of Elk Range. At least 16 rare plant occurrences. Highest highway pass in Canada (2230 m asl).	Field observations, 1997; airphoto observations (AS4458-155,156 (1993)); Gadd 1995; Alberta Forestry 1986; Trottier 1972; ANHIC rare plant database, 1997.
27	Mist Mountain Grasslands	7.75	18	7	5	82J	9	8	4	Prime protection zone. First extensive grasslands encountered while travelling south on Highway 40. These grasslands extend to high elevations and merge with graminoid tundra. South from this point the landscape is drier and warmer, with lower mountains, often treed to the summit. This area marks the northern limit of observed cattle grazing.	Field observations, 1997; Alberta Forestry 1986.
28	South Plateau Mtn. Low Elevation Treelines	8.02	14	4	5	82J	8	7	4	Interesting low elevation treelines due to coarse colluvium and unstable slopes. Treeline descends to near road on the north aspect. Includes >/=3 rare plant occurrences. Zoned multiple use and prime protection.	Field observations, 1997; airphoto observations (AS4458-7,8,9 (1993)), 1997; ANHIC rare plant database, 1997; Resource Appraisal Group 1979.
29	Grassy Ridge High Elevation Grasslands	11.08	11	4	5	82G	9	8	4	Extensive and beautiful high elevation grasslands. Zoned prime protection and critical wildlife. Clearcut and roaded heavily to west and south of these grasslands. Includes >/= 5 rare plant occurrences.	Field observations, 1997; ANHIC rare plant database, 1997; Resource Appraisal Group 1979; airphoto observations (AS4708-190, 191 (1996)), 1997; ANHIC cutblock and transportation network maps, 1997.
30	Racehorse - Dutch Forestry Scientific Area	127.92	10	5	5	82G	8		3	Extensive high elevation liquidation logging. Zoned multiple use. Area of high scientific value for studying the effects of clearcut logging. What little forests remain in the polygon are of high ecological value and should be protected from logging. The polygon delimits an area where ~75% of the forests have been logged. In much of the polygon there is very poor, slow regeneration. The "best" regeneration is where Engelmann spruce forests have been converted to lodgepole pine plantations. Area presents an opportunity to study both large-scale landscape effects and local stand and microsite effects of clearcuts at high elevations (from ~5500 to 7000 feet). "Deceptive signage has been placed by Atlas Lumber in effort to deceive the public. For example, in one cutblock there is a sign "ATLAS LMBR HAND SEEDED '89". The sign is located in an area where residual growth was left (small, valueless subalpine fir, with some lodgepole pine and spruce) which is 3 to 12 m tall. The actual seeded trees are ~ 1 m tall in protected hollows and 50 cm to 1 m elsewhere, if they exist at all.	Field observations, 1997; airphoto observations (AS4708-112,113,148,149,185-190 (1996)), 1997; Resource Appraisal Group 1979; ANHIC cutblock and transportation network maps, 1997.
31	High Elevation ATV Scientific Area	1.23	11	4	5	82G	8		3	Area of intensive, high elevation ATV damage of great scientific value for studying the effects of off-road vehicle recreation on ecosystems. ATV access is from Dutch Creek. Zoned multiple use. Polygon in area of cutblocks and numerous roads.	Airphoto observations (AS4708-148-149 (1996)), 1997; Resource Appraisal Group 1979; ANHIC cutblock and transportation network maps. 1997.
32	Drywood Mountain Hanging Valley	1.91	3	1	5	82G	9	8	4	Classic, scenic hanging valley with about 1000 feet elevational drop of the creek across the polygon. Area used by mountain sheep for grazing.	Field observations, 1997; airphoto observations (AS4425-81,82 (1993)), 1997; Anderson 1978.
33	Western Plains Garter Snake Hibernaculum	0.88	7	3	5	82G	9		4	Western plains garter snake hibernaculum located at 49 34.2'N, 114 24.3' W; ~ 100 individuals observed in or near hibernaculum, 30 May 1997.	Species Biodiversity Observation Database, G. Court, pers. comm. 1997.

SITENO	SITENAME	AREA	TWP	RG	MER	NTS	SUB1	SUB2	SIG	Sitedescrip	References
36	Spotted Frog Occurrence	0.32	10	4	5	82G	8		3	Spotted frog occurrence at 49 49.4'N, 114 28.5'W. Approximately 101 larval forms observed, 25 July 1997.	Species Biodiversity Observation Database, G. Court, pers. comm. 1997.
37	Canadian Toad Occurrence	0.22	41	17	5	83C	8		4	Canadian toad spring vocalizations recorded at 52 31.1'N, 116 23.1'W, 19 May 1995. Point is located at the transition from subalpine to upper foothills subregions.	Species Biodiversity Observation Database, G. Court, pers. comm. 1997.
39	Bow Valley West	381.76	x	x	x	82O	9	8	1	Corridor of international significance. Includes some of the best examples of montane ecoregion in Canada; high habitat value for birds, large carnivores, small mammals, ungulates, and herptiles. The valley is a critical travel and migration corridor for many forms of life. "The Bow River is an internationally renowned fishery supporting native lake chub, longnose dace, longnose, white, and mountain suckers, cutthroat trout, bull trout, mountain whitefish, trout perch, burbot, brook stickleback; introduced rainbow trout, brown trout, brook trout, dolly varden, splake, cisco, lake whitefish, western mosquitofish, sailfin molly, and African jewelfish; and possibly lake sturgeon, pearl dace, fathead minnow, northern pike, and spoonhead sculpin. "Contains four natural areas of significance identified by Achuff et al. (1986): Hillsdale (rare fossil site; rare plants; significant montane vegetation types; rare birds; significant bird communities; elk, moose, sheep, and deer winter range; significant montane ecosites, and prehistoric cultural sites); Johnston Canyon (significant canyon and falls; fossil site; Ink Pots springs; rare plants; rare birds; rare mammals; significant bird communities; significant montane vegetation types and ecosites; elk, deer and moose winter range; and prehistoric sites); the Sawback Range (rare plants; significant vegetation types; rare birds; significant bird communities; sheep, elk, deer, goat, and moose winter range; waterfowl staging and nesting areas; and prehistoric cultural sites); and Vermilion Pass (Altrude Canyon; rare plants; rare animals; and historic sites). Also includes the Lake Louise area (see polygon 68 for details). "Includes occurrences of northern leopard frog (w. of Potts Lake), two tiger salamander sites (se of Mt. Laurie), and four spotted frog occurrences (one sw of Castle Mtn, and three n. of Lake Louise). "An estimated 100,000 to one million people travel through the corridor per month, winter and summer (highest in tourist season). The corridor contains the Bow Valley Parkway, a winding, scenic highway renowned for fitting into the landscape. Includes Lake Louise (an international tourist destination). " It also includes Castle Mountain (a classic example of an eastern main range mountain illustrating a Cambrian geological "sandwich" with its lower cliff of Cathedral dolomite, its middle ledge of softer Stephen shale, and its upper cliff of Eldon limestone; the Pika formation at the mountain peak and the Mt. Whyte and Gog formations at the mountain base are also visible). Silver City on Castle Mountain and prospecting remains on Protection Mountain provide historic evidence of former copper mining in the area. Other features are Helena Ridge, Mt. Avens, Eisenhower Peak, Rockbound Lake, Lipalian Mountain, and Baker Creek. "Polygon is being degraded by overdevelopment. "See other Bow valley polygons for more information.	Achuff et al. 1986; Gadd 1995; Banff-Bow Valley Task Force 1996; Biodiversity Observation Database (G. Court), pers. comm. 1997; Komex International 1995; field observations, 1997.
40	Middle Crowsnest Valley	20.55	7	3	5	82G	9		4	Includes Bellevue wetlands (with garter snake hibernaculum, large undisturbed permanent pond, and locally uncommon breeding habitat for ring-necked duck and stands of Nuphar variegatum). Includes Drum Creek (with gorge and cascade along Drum Creek, steep grassy ridges with wildflowers, uncommon plants, western flycatcher, key deer, moose, and elk habitat). Includes part of Redfern Lake wetlands (permanent ponds used by waterfowl for breeding, key white-tailed deer habitat). There is another hibernaculum for (wandering garter snakes) located at 49 33.7'N, 114 23.7' W; ~ 100 individuals observed in or near hibernaculum, 15 September 1996.	Species Biodiversity Observation Database, G. Court, pers. comm, 1997; Sweetgrass Consultants 1988.
41	Upper Crowsnest Connectivity Corridor	3.72	8	6	5	82G	9		3	A small but important cross valley migration route located at the Crowsnest Pass proper (west side of Island Lake). Includes Island Creek area with rare and uncommon plant (western larch stand, individual western red cedar trees on Island Ridge, mature forest, beaver dam complex, diverse breeding bird communities, key moose and elk habitat). There is a significant population of western larch (Larix occidentalis) in SE11 and NE2, Twp 8, Range 6, W5, along with the rare Lonicera utahensis and Mitella trifida. "Note the entire Crowsnest Valley as a unit forms an integral landscape link for low elevation, east-west movements of animals, plants, air masses, weather systems, etc. It is the lowest pass in the southern Rockies.	Wallis 1980; D. Shepperd, pers. comm. 1997; Sweetgrass Consultants 1988.
42	Ptolemy Creek and Area	43.32	7	5	5	82G	8		4	A scenic area of limestone karst, caves, and a large spring. Most of area is zoned prime protection. This area has the greatest concentration of large caves known in the Canadian Rockies. Most of the entrances occur at high elevations, and the passages are difficult to explore, requiring special techniques and equipment. Some of the caves (particularly Gargantua Cave and Yorkshire Pot) attract cavers from around the world.	C. Wallis, pers. comm. 1997; Resource Evaluation and Planning, 1987; B. Gadd, pers. comm. 1998.
43	Upper Crowsnest Valley	14.12	8	5	5	82G	9		3	Polygon includes Crowsnest Lake with Crowsnest Spring (one of largest, most spectacular karst springs in Alberta), Crowsnest Wetlands (large permanent ponds with waterfowl production, long-toed salamanders, endangered western painted turtle); and Sentry Mountain (key bighorn	Sweetgrass Consultants 1988.

SITENO	SITENAME	AREA	TWP	RG	MER	NTS	SUB1	SUB2	SIG	Sitedescrip	References
										sheep habitat, some western larch, and a stand of paper birch (Betula papyrifera (locally rare)) at west end of Crowsnest Lake. "Includes Crowsnest Lake Natural Area (#225) with Emerald Lake (a small deep lake), montane vegetation of grassland, Douglas fir and limber pine; dense stands of aspen and lodgepole pine, and south-facing steep slope with sparse vegetation. "Also includes Island Lake and Island Lake Natural Area (#59), a popular roadside stopping place with high diversity of tree species, including Rocky Mountain juniper and western larch (both rare in Alberta).	
44	Allison - Sentry Connectivity Corridor	9.75	8	5	5	82G	9		3	Important north-south movement/migration corridor just east of Crowsnest Lake. Includes portion of Crowsnest River between Sentinel and Savanna (with extensive riverine shrub and adjacent grassland and mature aspen, high diversity and density of breeding birds, extensive flower blooms in grasslands, and productive trout fishery). Also includes part of Allison Creek area (with diverse habitat mosaic of grassland, deciduous and conifer woodland, ravines, and a permanent stream; some large spruce, Douglas fir, alder, and aspen; key mule deer and elk habitat; marl wetland, productive trout habitat along Allison Creek). See also polygon 45.	Sweetgrass Consultants 1988.
45	Middle - Upper Crowsnest Valley	64.24	8	4	5	82G	9		4	Includes portion of Crowsnest River between Sentinel and Savanna (with extensive riverine shrub and adjacent grassland and mature aspen, high diversity and density of breeding birds, extensive flower blooms in grasslands, and productive trout fishery). Also includes part of Allison Creek area (with diverse habitat mosaic of grassland, deciduous and conifer woodland, ravines, and a permanent stream; some large spruce, Douglas fir, alder, and aspen; key mule deer and elk habitat; marl wetland, productive trout habitat along Allison Creek). See also polygon 44. "Also includes Coleman area key mule deer and elk habitat; and part of York Creek area (diverse, relatively undisturbed habitat; exposure of Crowsnest Formation volcanic rock, key habitat for moose, elk, and mule deer, rare plants (Lonicera utahensis, Ceanothus velutinus), and regionally uncommon bird species (e.g. LeConte's sparrow). "Includes two explosive volcanic centres (under the town of Coleman, and southeast of Coleman). The Crowsnest Fm is one of only two units of volcanic rock known from the Canadian Rockies (the other is the Siyeh Fm in Waterton/Glacier. The Crowsnest Fm is volcanic mudflow rock about 160 m thick composed mainly of fragments of trachyte. "Includes Crowsnest Natural Area (#392) with steep, high rocky ridge sloping to McGillivray Creek; aspen forest; open lodgepole - Douglas fir forest, white spruce forest, mixedwood forest, and heavy use by ungulates. "Includes Coleman Natural Area (#58) with rolling to steep slopes dominated by Douglas fir - lodgepole pine, white spruce/horsetail along creek, aspen and balsam along creek, and a scenic waterfall in a deep canyon.	Sweetgrass Consultants 1988; Gadd 1995.
46	Blairmore Connectivity Corridor	7.56	7	4	5	82G	9		4	Important north-south travel corridor for wildlife.	D. Sheppard, pers. comm. 1997.
47	Turtle Mountain and Frank Slide	8.53	7	3	5	82G	9		1	The internationally significant Frank Slide. In 1903 a portion of Turtle Mountain broke free and slid downslope, burying the town of Frank under about 36 million cubic metres of Rundle Group limestone and Banff Fm. shale, and killing at least 76 people. Turtle Mtn. has a tight fold overlying a thrust fault which may have made the rock unstable; coal mining at the base of the mountain may have precipitated the disaster. The polygon includes Frank Lake, a permanent wetland with some waterfowl production.	Gadd 1995; Sweetgrass Consultants 1988.
48	Leach Colliery Connectivity Corridor	6.53	7	3	5	82G	9		3	Important north-south migration/movement corridor at the Leach Colliery. Includes part of Redfern Lake wetlands (permanent ponds used by waterfowl for breeding, key white-tailed deer habitat). Includes Byron Hill area with diverse montane ridges; key habitat for elk and mule deer; and the rare Phacelia linearis.	D. Shepperd, pers. comm. 1997; Sweetgrass Consultants 1988.
50	Rock Creek Connectivity Corridor	3.23	7	2	5	82G	9		5	Rock Creek valley is a likely corridor for north-south animal movements (e.g., black bear).	D. Shepperd, pers. comm. 1997
52	Seven Sisters - Crowsnest Mountains	22.52	9	5	5	82G	8	7	4	Rugged and unspoiled, barren and semi-barren highlands with small amount of forested lower slopes surrounded by intense logging and ATV use. Crowsnest Mountain is/was sacred to native peoples. Both mountains are prominent and scenic local landmarks and offer classic geological profiles, from top to bottom: Rundle Group cliffs, Banff Formation, Palliser Group, Lewis Thrust Fault, and the Belly River Formation. Zoned prime protection.	Gadd 1995; field observations, 1997; Resource Evaluation and Planning 1987; Resource Appraisal Group 1979; Gibbard and Shepperd 1992.
53	Mt. Tecumseh and Deadman's Pass	22.49	8	5	5	82G	9	8	3	Includes Mt. Tecumseh Natural Area and Dead Man's Pass. Avalanche slopes and avalanche meadow communities; douglas fir forests; old-growth forests; important moose, elk, and bighorn sheep habitat; numerous rare plant occurrences (7 provincially rare, one nationally rare), For example, western red cedars have been documented from both Dead Man's Pass and Mt. Tecumseh. Dead Man's Pass is a low elevation pass important for east-west animal movements/migration and plant dispersal. Includes Tory (Dry) Canyon, an ephemeral stream in steep canyon with rare and uncommon plants such as Adiantum pedatum and Polystichum lonchitis, scarce birds such as Cassin's finch and rock wren, high diversity of flowering plants, and key bighorn sheep habitat. There is some recreational use (e.g., cross-	Field observations, 1997; ANHIC library data files, 1997; Mt. Tecumseh Natural Area factsheet, 1997; D. Shepperd, pers. comm. 1997; Resource Appraisal Group 1979; Resource Evaluation and Planning 1987; Sweetgrass Consultants 1988.

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										country ski trails, hiking trail). Zoned multiple use and prime protection.	
54	Mountain Goat Concentration	13.87	6	5	5	82G	7	8	4	A local population of mountain goats concentrate in this polygon; no data are available on numbers. Impacts of winter snowmobiling on goats in their winter range has not been quanitified but could be significant. The mountain goat is on the Alberta blue list (potentially vulnerable).	D. Sheppard, pers. comm. 1997; field observations, 1997; Gibbard and Sheppard 1992.
55	Beauvais Lake Provincial Park	7.72	5	1	5	82G	9		3	Beauvais Lake is used as a staging area for waterfowl. Used by elk, mule deer, and at least 12 other species of mammals. Eight species of herptiles, including leopard frog, western spotted frog, and boreal toad. High butterfly diversity and showy wildflower blooms in the grasslands. There are some rare/uncommon plants such as western white pine, Rocky Mountain maple and yellow angelica. The park supports more than a dozen Douglas firs that exceed 1 m diameter at breast height, the four largest of which have dbh's of 1.3 to 1.5 m-- they may be the largest diameter Douglas firs in Alberta. "A popular recreation area in largely montane foothills. In summer, fishing and camping are popular, as are ice-fishing, x-country skiing, snowshoeing, and camping in winter. The recreational fishery of Beauvais Lake is currently based on annual stocking with rainbow trout. Eight species of fish are native to the lake: white sucker, longnose sucker, fathead minnow, brook stickleback, pearl dace, northern redbelly dace, Iowa darter, and spoonhead sculpin.	ANHIC library data files (correspondence of David McIntyre to Cliff Henderson re: rare Alberta plants in the Crowsnest area, 1997; Finlay and Finlay 1987; Spalding 1980; Crosby 1990b.
56	Red Cedar Stand on Snowshoe Creek	1.08	7	4	5	82G	8		4	A nice western red cedar (Thuja plicata) stand on Snowshoe Creek.	D. Sheppard, pers. comm. 1997.
57	Waterton Lakes National Park	492.69	1	29	4	82G	9	8	1	WLNP is of international significance for a host of reasons, some of which are touched on below. "The park fulfills a critical role in providing landscape connectivity for life forms moving between the United States and Canada. "At last count, there are >/= 450 rare plant occurrences in the park. "WLNP is a vertebrate biodiversity hotspot in Alberta and Canada. Some examples are: Vaux's swift (first nest record for AB), restricted range species (water vole, timberline chipmunk), wandering shrew, heather vole, water shrew, long-tailed shrew, badger, long-toed salamander. "Regarding special plant and landscape features, the following is quoted from Achuff (1997): "WLNP currently is known to contain 971 vascular plant species, more than any other mountain national park and disproportionally rich for its size. Of these, 179 species are rare in Alberta and occur in WLNP. Of particular note are: 1) the Waterton moonwort (Botrychium x watertonense) which is endemic to WLNP, 2) three species that occur in Canada only in WLNP (Agropyron x brevifolium, Botrychium paradoxum, Erigeron lackschewitzii), and 3) twenty-two species that occur in Alberta only in WLNP (Brickellia grandiflora, Carex epapillosa, Cheilanthes gracillima, Douglasia montana, Epilobium mirabile, Festuca occidentalis, Gnaphalium microcephalum, Hypericum formosum, Isoetes bolanderi, Mimulus breweri, Phacelia lyallii, Philadelphus lewisii, Physocarpus malvaceus, Polypodium hesperium, Prenanthes sagittata, Pyrola picta, Saussurea americana, Spiraea densiflora, Stellaria americana, Taxus brevifolia, and Trillium ovatum). Another 28 vascular plant species that occur in WLNP are on the Alberta Watch List, species that are reasonably abundant in the WLNP area but are uncommon or rare elsewhere. The population sizes are inferred to be small since these plants have been encountered infrequently and occupy limited ranges. "Whitebark pine (Pinus albicaulis) and limber pine (Pinus flexilis) populations in WLNP are currently in decline due primarily to white pine blister rust (Cronartium ribicola), an introduced fungus from Eurasia, although mountain pine beetle and drought have probably increased the impact of the blister rust. Mortality is quite high in some stands, infection rates are high in nearly all stands in the park, and continued death of these trees can be expected. This loss has effects on forest community composition and structure, and also affects other species, such as Clark's nutcracker and grizzly bear which use pine nuts extensively. Loss of such dominant keystone species may result in a serious trophic cascade effect. "Of 45 vegetation types from the recent Ecological Land Classification, 16 are considered significant because of rarity (small area in the park) or fragility coupled with threat. Notable are two grassland vts and two aspen forest vts in the Foothills Parkland Ecoregion that are threatened by non-native plant invasion coupled with disturbance and heavy grazing pressure. Five forest vts containing limber pine or whitebark pine, which occur in the Montane and Subalpine Ecoregions, are considered threatened by white pine blister rust, a non-native species. "Seasonal seepages are a restricted habitat in the park that occur where spring and early summer seepage water occurs over shallow bedrock ledges and along small stream channels, typically from early May to late June. A number of species, many rare and/or annual, occur in these ephemeral habitats. "Landscape units were based on the Ecological Land Classification, which combines landform, soil and vegetation features. Eleven units (ecosites) are considered rare (occur in <5 tracts); 4 in the Foothills Parkland Ecoregion, 1 in the Montane Ecoregion, 3 in the Lower Subalpine, and 3 in the Upper Subalpine. "Currently, 86 non-native vascular plant species are known for WLNP. These species are of concern because of their effect on native biodiversity and what they indicate about the integrity of park ecosystems. Most are	Achuff 1997; Van Tighem 1997; ANHIC rare plant database, 1997.

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										associated with human disturbances. Agricultural forage species, including common timothy, smooth brome, red fescue, white clover and Kentucky bluegrass, are affecting low elevation grasslands. Other species of concern because of their aggressive nature include spotted knapweed, blueweed, leafy spurge, Klamath weed, Dalmatian toadflax, scentless chamomile, sulphur cinquefoil and tansy. However, the non-native species of most concern is not a vascular plant but is white pine blister rust. "Also of concern are species dependent on periodic disturbance to maintain suitable habitat, especially where the disturbance regime has been altered by recent human influences, e.g. fire or grazing. Blue camas (Camassia quamash), in particular, needs to be further monitored and evaluated."	
58	Front Range Canyons	193	3	1	5	82G	9	8	3	High quality range/habitat for bighorn sheep, elk, and other animals. Hotspot for high plant species diversity. Includes lower elevation portions of Prairie Bluff and >/= 12 rare plant occurrences. Includes Yarrow Falls. Zoned critical wildlife habitat. Includes hiking trails. "Heavily used by ORVs. Gladstone Ck should be closed to ORVs southwest from the boundary of the polygon. Mill Creek should be closed southward from the Shell wellsite. Both Pincher (North) and Drywood Ck valleys are presently in good shape; their roads should be closed and reclaimed after wells are dry. The South Drywood Ck trail is technically closed from just east of the alpine pond west to the South Castle, but it is still being used. The South Drywood Ck valley should be closed to motorized traffic in its entirety. Spionkop Ck road is technically "closed", but the closure is being ignored by ORV users. Yarrow Ck is in good shape because ORV access is prevented by a Waterton park gate. A butchered moose bone artifact has been found on Spionkop Creek at LSD 15, Section 25, Range 1, Twp. 3, W5.	Gibbard and Shepperd 1992; D. Shepperd, pers. comm. 1997; field observations, 1997; ANHIC rare plant database 1997; ANHIC library data files (Spionkop Creek), 1997.
59	Castle River Headwaters	89.94	3	2	5	82G	8		3	Key headwaters watershed with prime riparian habitat, rare communities, rare species (e.g., >/=18 rare plant occurrences). Summer travel route for elk. Snowmobiles and ORVs are used throughout most of the Castle-Crown, including those areas that are classed "off-limits". The impacts of these users are obvious in most places, from illegal trails, habitat damage, soil erosion, wildlife harrassment, litter, to campsites, etc. This polygon should be classed as no motorized access, with no vehicles allowed south of Scarpe Ck.	D. Shepperd, pers. comm. 1997; Gibbard and Shepperd 1992.
60	Front Range Ridges	111.41	3	2	5	82G	8	7	2	Key habitat for bighorn sheep (1988 winter census: 136 animals counted on Prairie Bluff/Yarrow Creek and 70 on Table Mtn. and Castle Mtn.). Zoned prime protection. Includes upper elevation portion of Big Sagebrush NA and environs (see polygon 61). "Both the Front Range ridges and the intervening slopes and valleys are key habitat for grizzly bears. There are three hotspots for grizzlies left in the Castle IRP region - the Front Range, the upper South Castle, and the West Castle. It is doubtful if the rest of the region can support a permanent resident population, given present land use. Of these three remaining hot spots (all interconnected of course), the Front Range is critical for grizzlies as it provides essential spring (and sometimes fall) habitat. Given the fragmented nature of the habitat in these three hotspots, and the threatened/vulnerable status of the grizzly, it is vital that the importance of the Front Range be recognized. "The Front Range is the exceptional in its floral diversity. There has been no systematic study of the flora in the Front Range. Even so, quite a bit is known, through the observations of Job Kuijt, Jerry DeSanto (retired Glacier NP biologist/ranger), Matt Fairbarns, and others. Nationally rare species found there, and in some cases only there (excluding Waterton itself) include dwarf alpine poppy, the groúnsel (Senecio cymbalaria), the dwarf fleabane (Erigeron radicatus), Lyall's scorpionweed, cushion Townsendia, dwarf bitterroot (Lewisia pygmaea),baby blue-eyes (Nemophila breviflora), and Jones' columbine. "There are other nationally rare species found there as well, but they are more broadly distributed in the region. Rare vascular (S1 status) include white suksdorfia and pine drops (Pterospora andromeda). A thorough study would likely reveal a great number of rare species and communities in the Front Range. "The Front Range is fragmented by roads and natural gas facilities; levels of ORV use are high. The area likely has a higher density of disturbance than the South Castle.	Gibbard and Sheppard 1992; D. Sheppard, pers. comm. 1997; Stelfox 1993.
61	Middle Castle River	84.65	4	3	5	82G	9	8	2	Key riparian habitat along Castle River; trout fishery; diverse plant communities and species; elk summer migration corridor; >/= 39 rare plant occurrences. "Includes nationally significant Big Sagebrush Natural Area (#424) and environs; steep, dry, west-facing slope of Windsor Ridge, lower slopes covered by lodgepole pine and pine - subalpine fir forests, intermittent valley side creek channels, small stands of aspen, thickets of alder - willow, sparsely vegetated ridge top, 25 provincially rare and 11 nationally rare plant species; 319 species of vascular plants; largest population of big sagebrush (Artemisia tridentata) in Alberta; the big sagebrush grassland may be internationally unique. The natural area and its environs are not typical of the southern Rocky Mountains, but rather appear to represent a unique meeting ground of elements of the Pacific, Palouse Prairie, Mixed Grasslands, and Cordilleran regions. "Overuse of ORVs characterizes the area. Controls are needed. Part of the Big Sagebrush and environs extends into polygon 60.	Gibbard and Sheppard 1992; field observations, 1997; ANHIC Big Sagebrush NA factsheet, 1997; ANHIC rare plant database 1997; Fairbarns 1986.

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62	West Castle Headwaters	46.07	3	3	5	82G	8		4	Key riparian and valley side landscape in the headwaters of the West Castle River. Spring/summer migration route for elk. High level of ORV use. I recommend that the polygon be closed to motorized recreation. "General comments on the West Castle and Castle River areas: over 100 species of plants have been documented here that grow nowhere else in Alberta. One-hundred and sixty-one species of vascular plants here are provincially rare. Fifty-two species of vertebrates are vulnerable, threatened, or endangered (e.g., the wandering shrew). Since the 1970s, there has been clearcut "salvage" logging of large tracts of mountain pine beetle-affected forests; very little old-growth forest remains. "In 1934, the South Castle area burned, with some unburned areas in valley bottoms, draws, etc.(the fire came in from Sage Creek). In 1936, there was another big fire, this time in the West Castle. After the two fires, about 20-25% of the forests were old-growth. Presently, about 9% remain, the other old-growth forests have all been logged. Much fine valley bottom spruce - cottonwood old-growth forest has been lost as part of mountain pine beetle "salvage" .	D. Sheppard, pers. comm. 1997; field observations, 1997; Alberta Wilderness Assoc. 1986; Gerrand and Shepperd 1995.
63	West Castle River Valley	35.87	4	4	5	82G	8		4	Key riparian and valley side landscape in the headwaters of the West Castle River. Spring/summer migration route for elk. Area suffering from ORV abuse. Long-toed salamanders breed in the West Castle wetlands. Bull trout fishery in the West Castle River. In Alberta, outside of Waterton Lakes National Park, the red-tailed chipmunk (Tamias ruficaudus) is known only from the West Castle valley. The regionally rare wood duck has also been recently reported from the West Castle valley. "The area is under development pressure as West Castle housing development proceeds. The housing development, used to fund expansion of the West Castle ski resort, will create a town in a narrow valley with impacts on wildlife movement, winter air quality, water quality, etc.	D. Sheppard, pers. comm. 1997; field observations, 1997; Gibbard and Sheppard, 1992; Gerrand and Sheppard, 1995; Smith 1993.
64	Gardiner Creek	20.72	5	4	5	82G	8		4	Key habitat for grizzly bears. Some old-growth forests remain; they are under logging pressure.	D. Sheppard, pers. comm. 1997.
65	Carbondale Hill	9.1	5	3	5	82G	8		5	An area known locally for its rare plants. Scientific study is needed.	D. Shepperd, pers. comm. 1997.
66	Tornado and North Fork Passes	28.69	11	5	5	82G	8	7	3	The Tornado and North Fork Passes are fairly low elevation passes (below treeline) of the Main Range of the Rockies important in east-west movements and migrations.Tornado Pass lies adjacent to Tornado Mountain, the highest peak in the southern Canadian Rockies (10,167 feet).	D. Shepperd, pers. comm. 1997.
67	Bow Range and Glaciers	117.92	x	x	x	82N	7		2	High elevation Main Range alpine polygon featuring peaks exceeding 10,000 feet, Victoria Glacier, and portions of five other glaciers, the mountains composing the Valley of the Ten Peaks surrounding Moraine Lake, and the mountains surrounding Lake Louise. The polygon includes the higher elevations of the Lake Louise natural area of significance (after Achuff et al. 1986). See polygons 39 and 68 for more details.	Achuff et al. 1986; field observations, 1997.
68	S. portion of WMU BNP9	216.71	x	x	x	82N	8	7	1	Side valleys and east facing slopes above the Bow Valley. Southern portion of Wildlife Management Unit BNP9 ("Middle Bow"), with Bow Valley excised; the polygon is important range for elk, bighorn sheep, and mountain goat. Includes most of the spectacular Lake Louise natural area of significance (after Achuff et al. 1986), with Lake Louise, Valley of the Ten Peaks, Boom Lake, Moraine Lake, Giant Steps Waterfall, and tributary creeks; approximately 26 species of rare plants, 2 significant vegetation types, significant birds (e.g., hawk owl, snowy owl); rare mammals (e.g., water shrew, wolverine); significant ecosites, and prehistoric and historic cultural sites. Includes one spotted frog occurrence NE of Moraine Lake. Area known to tourists, naturalists, and climbers around the world. See polygons11 and 39 for more information.	Achuff et al. 1986; Biodiversity Observation Database (G. Court, pers. comm.), 1997; Komex International 1995; Gadd 1995.
69	Bow Valley, Vermilion Lakes - Banff Sector	173.03	x	x	x	820	9	8	1	This Bow Valley polygon contains a great wealth of natural areas of significance, and at the same time is under strong development pressure. The polygon contains all or parts of the natural areas of significance: (1) Carrot Creek (Johnson Lake, hoodoos along the Cascade River, rare plants, the oldest Douglas fir in Alberta, significant montane grassland and forest communities, rare animals (e.g., long-toed salamander, osprey, wood duck, northern phalarope), significant bird communities, deer and elk calving areas, and both prehistoric and historic sites. It also includes the only undisturbed tracts of the HD1 ecosite (fluvial fan with C16 aspen forest in montane ecoregion) in Banff NP.); (2) Indian Grounds (significant montane vegetation types, rare birds (e.g. upland sandpiper, calliope hummingbird), significant bird communities, elk and deep winter range, an important migration corridor, and contains both prehistoric and historic sites); (3) Mount Norquay (at least six species of rare plants, significant vegetation and bird communities, cougar and black bear habitat, deer, elk, and sheep winter range, a wildlife migration corridor, and prehistoric cultural sites); (4) Sulphur Mountain (contains many of the hot springs of Banff NP, rare plants, rare invertebrates (e.g., Physa johnsi, Argia vivida), a garter snake hibernaculum, a rare fish (Banff longnose dace), dipper winter habitat, wildlife migration corridor, etc.)' (5) Tunnel Mountain (Bow Falls, hoodoos along the Bow River, rare plants,	Achuff et al. 1986; Biodiversity Observation Database (G. Court, pers. comm.), 1997; Gadd 1995; Banff-Bow Valley Task Force 1996; field observations, 1997; airphoto observations (AS4317-72-73 (1992)), 1997.

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										significant vegetation types, long-toed salamander, barred owl, cougar, a wildlife migration corridor, black bear dens, elk and deer winter range, elk calving areas, dipper winter habitat, etc.); (6) Vermilion Lakes (a great diversity of features, including: lakes and ponds, springs, rare plants, rare herptiles (long-toed salamanders, garter snakes), rare mammals (e.g, river otter, pygmy shrew) rare resident (e.g., bittern, wood duck, bald eagle) and migratory (e.g, whistling swan, trumpeter swan), a significant bird community, deer, elk, and moose winter range, elk calving area, mineral licks, waterfowl nesting and staging areas, prehistoric and historic cultural sites, and one of the few areas of open water in winter which is important to resident birds. Includes four spotted frog occurrences near pond north of Anthracite and three spotted frog occurrences in the Vermilion Lakes area.	
70	Ghost River Wilderness	157.07	27	10	5	82O	7	8	3	Spectacular wilderness area popular with hikers. Area includes Mount Aylmer (3162 m), Revenant Mountain and Apparition Mountain on the east flanks of the Palliser Range, and the Ghost River valley and tributaries. Bighorn sheep and mountain goat range, and in particular, critical winter range for bighorn sheep and elk. The Ghost River valley has been used by 4WD and dirt bike users in the past as access to the Ghost River Wilderness (McGregor 1979).	Komex International 1995; NTS 82O topographic map; Bradley et a. 1977; McGregor 1979.
71	South Icefields Main Ranges	277.89	x	x	x	82N	7	8	1	Internationally-renowned portion of the Main Ranges, it is the spectacular view to the west of the south part of the Icefields Parkway. Includes Crowfoot Glacier, Wapta Icefield, Peyto Glacier, Waputik Icefield, and other glaciers, Bow Peak, Crowfoot Mountain, Mount Chephren, Mount Sarbach, Cauldron Lake, alpine lands above 10,000 feet, classic colluvial aprons and outwash, and mountaineering opportunities.	Gadd 1995; field observations, 1997; NTS 82N topographic map.
72	Icefields Parkway South	318.13	x	x	x	82N	8	9	1	This polygon includes the southern portion of the Icefield Parkway between Lake Louise and Saskatchewan River crossing, an internationally-renowned valley and highway in the Main Ranges of the Rockies. The polygon includes the Bow River valley extending to its headwaters at Bow Lake, Hector Lake, Peyto Lake, Mistaya Lake, Waterfowl Lakes, Mistaya River, part of the lower Pipestone River, and many creeks. Includes two natural areas of significance: most of the Bow Lake (after Achuff et al. 1986) with Bow Lake, an igneous dike near the south end of Bow Lake, the scientifically significant Peyto Lake (and Peyto Glacier in polygon 71), four species of rare plants, a significant ecosite at Bow Pass; Num-Ti-Jah Lodge is a historic site; and part of Saskatchewan Crossing; an outlier of montane ecoregion, it contains neoglacial landscapes and braided streams of scientific interest, canyons (Mistaya R., Owen Ck.), springs, loess deposition areas, rare plants, significant birds, herptiles, mammals, vegetation types, bird communities, ungulate mineral licks, waterfowl nesting areas, and both prehistoric and historic cultural sites.	Achuff et al. 1986; NTS 82N topographic map; Gadd 1995.
73	Howse River Valley and Pass	100.02	x	x	x	82N	8		2	A major low elevation pass of the Main Ranges that provides landscape connectivity with BC via the Blaeberry River. The polygon contains a classic braided stream, a popular recreational trail, and riparian habitat. The area has been, and continues to be, threatened by a proposed highway connecting the David Thompson Highway with the Trans-Canada Highway north of Golden. The polygon contains part of the Saskatchewan Crossing natural area of significance (see polygon 72).	Achuff et al. 1986; NTS 82N topographic map; Gadd 1995.
74	Icefields Parkway / Saskatchewan River	256.63	x	x	x	82N	8	7	1	Extends onto NTS 83C. The polygon extends from Saskatchewan R. Crossing in the south to Sunwapta Pass and the Jasper NP boundary in the north. It includes the valley of the North Saskatchewan River reaching to near its headwaters. Like polygon 72, the polygon is traversed by the internationally-renowned Icefields Parkway. Includes two natural areas of significance (after Achuff et al. 1986): (1) Graveyard Flats centered on the confluence of the North Saskatchewan and Alexandra river; it contains neoglacial and fluvial landscapes of scientific and hydrologic interest, significant animals, significant vegetation types, and goat winter range; and (2) part of Parker Ridge (see polygon 75).	Achuff et al. 1986; NTS 82N and 83C topographic maps; Gadd 1995.
75	Main Range Icefields / Saskat. R. Glacier	846.26	x	x	x	83C	7	8	2	A spectacular landscape of high mountains, the eastern part of the Columbia Icefield, Saskatchewan Glacier, the Mons Icefield, the Freshfield Icefield, the eastern part of the Lyell Icefield, many other glaciers, high elevation valleys, numerous high mountains over 10,000, the Castleguard River, most of the Alexandra River, etc. The polygon includes the Castleguard Meadows natural area of significance (after Achuff 1986) with the Castleguard Cave system, numerous springs, two rare invertebrates (Salmasellus steganothrix and Stygobromus canadensis), a tract of significant ecosite, and neoglacial landscapes. It also includes most of Parker Ridge natural area of significance with Panther Falls, four species of rare plants, peregrine falcon, goat winter range, and a significant ecosite.	Achuff et al. 1986; NTS 82N and 83C topographic maps; Gadd 1995.
76	White Goat Wilderness / Cline R. and Tributaries	726.5	37	20	5	83C	7	8	3	Includes the White Goat Wilderness, the Cline River, and its tributaries (e.g., Cataract, Coral, and McDonald Cks, part of Entry Ck); extends east to the shore of Lake Abraham. Includes prime subalpine and alpine riparian habitat, rare plants, small glaciers, Pinto Lake and its provincial forest recreation area, numerous small lakes, camping, and challenging hiking. While hunting, fishing, trapping, and non-foot travel are prohibited in the White Goat Wilderness, the adjoining valley are popular for outfitted trips, hunting, and fishing. Bull trout occupy the Cline River. The Cline River is an important travel corridor. The White Goat Wilderness supports both bighorn sheep and mountain goats. Lee et al. (1982) reported 26 vegetation	Lee et al. 1982; Alberta Environmental Protection 1994; NTS 83C topographic map; Alberta Wilderness Assoc. 1986; Alberta Forestry, Lands and Wildlife 1992.

SITENO	SITENAME	AREA	TWP	RG	MER	NTS	SUB1	SUB2	SIG	Sitedescrip	References
										types from the alpine and upper subalpine zones of the White Goat, and 329 species of vascular plants from the White Goat and the Siffleur Wilderness Areas. Zoned prime protection in the White Goat and critical wildlife along the Cline River.	
77	Kootenay Plains and Vicinity	39.81	36	17	5	83C	9		3	An unusual, disjunct example of the montane ecoregion in which montane woodlands and grasslands occupy an area outside their normal range on alluvial terraces and fans. The grasslands (rough fescue is absent) appear to be a variant of the Koeleria macrantha - Calamagrostis montanensis type of Stringer (1973). C. montanensis is absent in most of the grasslands, however, and the dominants along with K. macrantha are Antennaria nitida, Artemisia frigida, Astragalus striatus, with Agropyron dasystachyum, Erigeron caespitosus, and Linum lewisii. "Other significant landscape features are the riparian mud flats, the diverse landscape around Whirlpool Point, dune fields, marl wetlands, and calcareous cliffs. "The presence of montane vegetation at the Kootenay Plains has been attributed to a combination of factors, the chief of which appears to be the major east-west pass of the Howse-Saskatchewan in which there is a strong Pacific airmass influence with high winds, low precipitation, and high evapotranspiration. Other factors responsible for the vegetation mosaic there are soil textural differences in the alluvial fan surficial deposits due to sorting (with forest on the coarse materials, and grasslands on the fine), groundwater differences, fire history, and heavy grazing pressure. The absence of many typical montane species at the Kootenay Plains argues for a west-to-east migration of elements from BC, rather than a north-to-south. "The area has a long history of native use (ranking it as a cultural site), horse grazing and heavy use by elk, bighorn sheep, moose, deer, and bison, and has been known for a long time as key ungulate habitat. The area supports numerous rare plant species and rare vegetation types. At least 17 rare plant occurrences have been documented. The area includes a portion of the Kootenay Plains Road Corridor Wildlife Sanctuary, and a part of the Kootenay Plains WMU AB 426 which supports a variety of large mammals including a winter population of about 10 wolves. "Zoned prime protection (Kootenay Plains east) and general recreation. Recreation use in the area is high and increasing, particularly west of the highway in the Two-O'Clock Creek area. ORV damage to the area still occurs.	Wallis and Wershler, 1981; Gadd 1995; field observations, 1997; Alberta Forestry, Lands and Wildlife 1992; Stringer 1973; ANHIC rare plant database, 1997; Geographic Dynamics Corp. 1997.
78	Saskatchewan River Valley	177.76	35	18	5	83C	9	8	3	Extends onto NTS 82N from Saskatchewan R. Crossing to Kootenay Plains. Includes a reach of the North Saskatchewan River, a glacially-fed braided stream, and its valley bottom and lower slopes, featuring key riparian habitat and a major east-west connectivity corridor for movement/migration of life forms and weather systems. Includes >/= 3 rare plant occurrences. "The area includes a portion of the Kootenay Plains Road Corridor Wildlife Sanctuary, and a part of the Kootenay Plains WMU AB 426 which supports a variety of large mammals including a winter population of about 10 wolves. Traversed by the David Thompson Highway, a scenic travel route. Zoned general recreation in the valley proper.	Field observations, 1997; Alberta Forestry, Lands and Wildlife 1992; ANHIC rare plant database, 1997; NTS 82N and 83C topographic maps.
79	Livingstone Range	156.68	9	3	5	82G	8	7	4	Includes part of Gold Creek. High to low elevation Front Range landscape with little industrial/logging disturbance, zone prime protection due to sensitive alpine and subalpine lands; high landscape connectivity due to lack of disturbance. Includes a diversity of habitats from talus slopes to ephemeral and permanent streams, subalpine meadows, productive trout habitat on Gold Creek. Includes >/= 1 rare plant occurrence and >/= 1 spotted frog occurrence.	Resource Evaluation and Planning 1987; Sweetgrass Consultants 1988; Resource Appraisal Group 1979; Biodiversity Observation Database, G. Court, pers. comm. 1997; ANHIC rare plant database, 1997.
80	Beehive Natural Area	70.1	13	5	5	82J	8	7	3	The area includes part of the High Rock Range, Beehive Mountain, Windy Pass, the headwaters of the Oldman River, many clear, fast-flowing trout creeks. Considered by some people to be the most beautiful spot in the Canadian Rockies. The scenic Beehive (after Achuff 1985) includes parts of the alpine, subalpine, and montane ecoregions; old-growth forests with trees in excess of 400 years old, a vascular flora of 283 species (eight of which are rare in Alberta, and >/= 23 rare plant occurrences), at least 23 vegetation types, and 26 mammal and 44 bird species, one amphibian, and cut-throat trout. The area includes habitat for bighorn sheep, elk, and grizzly bears. The area is little disturbed (as of 1985) and is highly-valued by hikers, naturalists, and fishermen, and is also used for grazing, equestrian, hunting, and trapping. The Great Divide Trail passes through the area; as of 1985, ORV use was having detrimental impacts on the area (Achuff 1985).	Achuff 1985; Alberta Wilderness Assoc. 1986; NTS 82J topographic map; ANHIC rare plant database, 1997.
81	Mt. Livingstone Natural Area	12.65	13	3	5	82J	9	8	3	A spectacular provincial natural area containing a variety of special features: diverse and healthy foothills rough fescue (Festuca scabrella) grasslands; high elevation grasslands reaching 2200 m (some of which is Festuca scabrella type-- second highest elevation known occurrence of rough fescue grassland in Canada west of interior BC (see Plateau Mountain)); scenic, deeply-incised Westrup Creek; sandstone ridges with limber pine; Mt. Livingstone anticlinal ridge and peak; seven geological formations; a folded shale cone; high landscape diversity; scenic peaks; patterned ground (stripes and nets); seven provincially rare vascular plant species (>/= eight occurrences) and other uncommon plants and range extensions. "The area has a long history of cattle grazing; some of the grasslands, low spots, and Westrup Creek have been damaged. There is a reclaimed seismic	Timoney 1991a; ANHIC rare plant database, 1997.

SITENO	SITENAME	AREA	TWP	RG	MER	NTS	SUB1	SUB2	SIG	Sitedescrip	References
										line, and ORV use.	
82	Plateau Mountain and Vicinity	45.87	15	4	5	82J	7	8	3	Includes Plateau Mountain NA, a well-known area of alpine permafrost and patterned ground. Boundaries for the polygon follow both the jurisdictional boundaries of the natural area and rare plant clusters. There is a zone of continuous permafrost about 2305 m. The occurrence of permafrost is due to a combination of factors: high elevation; high winds that sweep off the snow cover, allowing deep frost penetration; and partial relict status. The permafrost is estimated to exceed 60 m in thickness. The patterned ground is in the form of sorted circles, stripes, nets, and polygons. The summit of Plateau Mtn. is believed to be a nunatak (glacial refugium). Looman (1969) noted some individuals of rough fescue at 2250 m, making it the highest known occurrence of that species in Canada west of interior BC. Griffiths (1982) reported seven plant communities not reported elsewhere that may be rare in the province or unique to the area. Other special features include limestone pavement; ancient limber pine forest stands; an ice cave; excellent examples of glacial cirques and hummocky cirque moraines; a small cirque lake; a diverse plant community on unstable scree; a previously undescribed plant association of Carex gymnoclada; outstanding spruce-fir-whitebark pine in upper Livingstone valley; an unusual, previously unrecorded spruce-fir forest type; and ancient limber pine over 400 years old growing with whitebark and lodgepole pine on the lower slopes of Mt. Burke. The area includes >/= 34 rare plant occurrences. Bird (1979) documented 266 alpine plant species from Plateau Mtn (88 lichens, 48 bryophytes, and 130 vascular plants. There is a significant amount of oil and gas activity and ORV use in the area.	Griffiths 1982; Karpuk and Levinsohn 1980; Bird 1979; Harris and Brown 1978; field observations, 1997.
83	Mt. Allan - Wind Valley	83.9	24	10	5	82J	8	9	2	Extends onto NTS 82-O. The polygon includes Wind Valley, Wind Ridge, Skogan Pass, Pigeon Mtn, Mt. McGillivray, Wind Tower, Mt. Allan, Mt. Allan Recreation Area, the Mt. Allan Centennial Trail, and NE flank of Mt. Lougheed. The Wind Valley Natural Area is known for its diverse, productive, relatively-undisturbed ecosystem with significant grasslands, Douglas fir stands, fens, and the seasonal East Wind Pond. It is important year-round to bighorn sheep, elk, mule deer, white-tailed deer, and moose. Wind Ridge is known as one of the finest bighorn sheep ranges in the Canadian Rockies. The ungulate population helps to support wolf and cougar, in addition to grizzly and black bears and wolverines. The Wind Valley is a critical travel/migration corridor of wildlife travelling to and from the Bow, Kananaskis, and Spray Valleys. Seeps and springs with associated fens are important feeding areas for ungulates and bears. Cold sulphur springs and surrounding vegetation are key features of the nearby Pigeon Mountain Candidate Natural Area. Mt. Allan is the site of the ski hill and lodge built in 1988 for the Olympic Winter Games. The polygon contains >/= 13 rare plant occurrences. "Disturbances in the area include the ski hill and its lodge, helicopter-hiking and sight-seeing, ORV use, and equestrian and mountain biking trails.	Environmental Sciences Program, 1994; Alberta Environmental Protection 1997; Gadd 1995; NTS maps 82J and O; ANHIC rare plant database 1997.
84	Upper Kananaskis Lake Ranges and Glaciers	222.28	x	x	x	82J	7	8	3	Includes spectacular main ranges, glaciers, prime protection zones, and extremely high recreational value areas (hiking, skiing, mountain biking, fishing; >/= 11 rare plant occurrences; >/= 1 spotted frog occurrence near Mt, Sir Douglas Glacier; important animal movement/migration corridor and human transportation corridor. "Includes Wakanambe (Blackfoot Indian for Fist of God), an awe-inspiring rockslide-modified horn on the north shoulder of Mt. McHarg (caused by glacial cirque headwall erosion followed by rockslide) visible from Lower Kananaskis Lake.	B. Gadd, pers. comm. 1997; W. Bilozir, pers. comm. 1997; G. Court, pers. comm (Species Biodiversity Observation Database) 1997; ANHIC rare plant database 1997; ANHIC library files, 1997; Alberta Forestry 1986; McGregor 1984; Bradley et al. 1977; field observations, 1997.
85	Mt. Buller Rock Glacier and Vicinity	6.11	22	10	5	82J	8	7	3	"On the north slopes of Mt. Buller (W1/2 26 22 2 W5M) there is a huge rock glacier which descends about 1000 feet down the bare rocky slopes of the Kananaskis Range to the tree line. The snout of the glacier is about 2.5 miles from the Spray Lake Road. The feature should be assigned protection for interpretive and scientific purposes." (Landals 1974)	Landals 1974.
86	Forgetmenot Mountain	11.15	21	6	5	82J	8	7	3	"Its undisturbed periglacial formations, where large lichen crusted conglomerate and sandstone blocks have been thrust into huge polygons, together with a rock glacier on the northwest side of the mountain, are of value for education and scientific purposes. The ridge also supports good ungulate winter range and offers spectacular views in all directions." (Landals 1974) Prime protection zone.	Landals 1974; Alberta Forestry 1986.
87	Moose Mountain NA and Vicinity	6.51	23	6	5	82J	8	7	3	The Moose Mountain NA and its environs offer scenic vistas from the alpine summits; rugged scree slopes; an alpine plateau on the south arm of Moose Mtn.; headwaters and canyon of Moose Dome Creek; the Moose Mtn. ice cave; undisturbed subalpine forests; there are scenic cliffs, deep ravines; subalpine wildflower meadows; four geological groups are exposed in the natural area; patterned ground in the form of solifluction lobes, terracettes, sorted circles and nets, and sorted stripes may be the closest periglacial features to Calgary; rare, uncommon, or disjunct plants such as Hypnum bambergeri, Mnium arizonicum, Dryas integrifolia, Carex petricosa, Thamnolia subuliformis, Saxifraga aizoides, Silene furcata, and Sedum stenopetalum are present; >/=5 rare plant occurrences in the polygon.	Timoney 1991; ANHIC rare plant database 1997.
88	Marvel Lake and Vicinity	94.75	x	x	x	82J	8	7	3	The polygon includes the Marvel Lake natural area of significance (after Achuff et al. 1986) which features Marvel Pass, Bryant Creek, Wonder	Achuff et al. 1986.

SITENO	SITENAME	AREA	TWP	RG	MER	NTS	SUB1	SUB2	SIG	Sitedescrip	References
										Pass, and Marvel, Gloria, and Owl Lakes. The rare plants Erigeron purpuratus, Mitella breweri, Pedicularis racemosa, and Rorippa tenerrima are present, as are golden eagle nests, a significant ecosite (WH2), and pure populations of cutthroat trout.	
89	Sunshine Meadows and Vicinity	74.5	x	x	x	82O	8	7	3	The polygon boundaries are based on the Sunshine Meadows natural area of significance (after Achuff et al. 1986) and rare plant clusters. The former includes Fatigue Pass, Mount Bourgeau, Healy Pass, and Monarch Ramparts. Twenty-two species of rare plants are present, along with rare mammals (water shrew, Richardson's water vole, wolverine), peregrine falcon, ungulate mineral licks, sheep summer and winter ranges, and historic sites. At least 69 rare plant occurrences have been documented for the polygon.	ANHIC rare plant database 1997; Achuff et al. 1986.
90	Cascade - Flints Park	160.33	x	x	x	82O	8	7	3	The polygon follows the Cascade - Flints Park natural area of significance after Achuff et al. (1986). It supports native cutthroat trout, the highest density of grizzly bears in Banff NP, golden eagle nest sites, ungulate mineral licks, wolf habitat, sheep fall and winter range, elk fall range, goat winter range, and tracts of the significant SF1 ecosite with permafrost. Also includes one spotted frog occurrence.	Achuff et al. 1986; Species Biodiversity Observation Database (G. Court, pers. comm.), 1997.
91	Lake Minnewanka	57.72	x	x	x	82O	8		3	The polygon follows the Lake Minnewanka natural area of significance after Achuff et al. (1986). It includes Lake Minnewanka, a spring, hoodoos, loess deposition areas, rare plants, locally significant animals (red-necked grebe, Franklin's gull, muskrat), significant bird communities, ungulate mineral licks, bighorn sheep, deer, and elk winter range, waterfowl staging areas, a significant ecosite, and prehistoric cultural sites. It also includes >/= 4 rare plant occurrences.	Achuff et al. 1986; ANHIC rare plant database 1997.
92	WMU BNP 8 South	76.7	x	x	x	82O	8	7	3	South portion of polygon 10 (which, see for details) estranged by delineation of polygon 91. Includes >/= 2 rare plant occurrences.	Komex International 1995; ANHIC rare plant database 1997.
93	Bonnett Glacier	6.74	x	x	x	82O	7		3	Easternmost glacier in the area, and only glacier on map NTS 82O.	NTS map 82O.
94	Skoki	188.41	x	x	x	82N	7	8	3	Extends onto NTS 82O. The polygon follows for the most part the Skoki natural area of significance after Achuff et al. (1986). It includes the Drummond and Mt. Richardson Glaciers, Mount Skoki, Lake Merlin, Redoubt and Baker Lake, Oyster Peak, and the Red Deer Lakes. The polygon contains a natural bridge, springs, rare plants, peregrine falcons, northern phalarope, cliff swallow, wolverine, grizzly bear, goat winter range, a significant ecosite, and the historic Skoki Lodge and Cyclone cabin.	Achuff et al. 1986.
95	Burnt Timber	426.33	29	10	5	82O	7	8	3	A wild and scenic area that George Simpson, Governor in Chief of the Hudson's Bay Company, described as "Cold, bare and rugged crags, almost perpendicular. The demon of the mountains alone could fix his dwelling there." The area includes subalpine and alpine ecoregions and extends from poorly-drained valley bottoms and riparian forests to high alpine tundra. Prominent features are Devil's Head, Black Rock Mtn., Phantom Crag, Otuskwan Peak, the North Burnt Timber and Burnt Timber Creeks, Pinto and Sheep Creeks. It borders on the Ghost River Wilderness (polygon 70) in the SW, and with Banff NP (polygon 10) in the west. The area supports grizzly and black bear, moose, elk, bighorn sheep, mountain goats, and mule deer, coyote, mink, fisher, and lynx. Bull trout are native to Burnt Timber, Pinto, and North Burnt Timber Creeks. Stocked cutthroat, rainbow, and brook trout, and Rocky Mountain whitefish are found in some of the area's streams. There are >/=3 rare plant occurrences. "The area is popular with hikers, photographers, hunters, cross-country skiers, snowshoers, campers, fishermen, outfitters, climbers, and ORV users. Due to high levels of ORV use in some areas, non-motorized recreationists avoid the area at times. Devil's Head Mountain is a native religious site. The area has been disturbed by logging, oil and gas activities, and increasing amounts of ORVs.	Alberta Wilderness Assoc. 1986; field observations, 1997; ANHIC rare plant database 1997; ANHIC logging cutblock and transportation network disturbance maps 1997.
96	Panther Corners, in part	91.9	31	11	5	82O	7	8	3	The polygon follows in part those of Alberta Wilderness Assoc. (1986) and includes Dormer, Jap, and Barrier Mtns., the Panther and Dormer Rivers and Dogrib Creek. The area, formerly part of Banff NP, provides high quality habitat for elk, moose, deer, mountain goat, and bighorn sheep, wolves, grizzlies, and cougars. Paleo and recent native encampments abound in the area. Grasslands similar to those at YaHa Tinda (see polygon 12) are said to be found in the area. The area is popular with equestrians, hunters, skiers, and guided outfitters. The area is zoned prime protection. ORV use, and oil and gas and logging activity have occurred in the area.	Alberta Wilderness Assoc. 1986; field observations, 1997; ANHIC logging cutblock and transportation network disturbance maps 1997.
97	Upper Red Deer River and Tributaries	161.98	x	x	x	82O	8	7	3	This polygon is dominated by the valley of the Red Deer River, and includes McConnell, Diyide, Tyrrell, and various unnamed creeks, the Valley of the Hidden Lakes, Douglas Lake, and Skeleton Lake. The area provides important landscape connectivity for movements/migrations in the network of valleys. It includes part of the Scotch Camp natural area of significance after Achuff et al. (1986) which features hoodoos, permafrost on tracts of the SF1 ecosite, subalpine Chernozems, Snowflake Lake (of scientific interest), loess deposition areas, seven species of rare plants, great gray owls, cougar, wolf, grizzly bear, sheep and elk winter range, sheep summer range, ungulate mineral licks, significant bird communities and	Achuff et al. 1986; NTS topographic map 82O; field observations, 1997.

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										vegetation types, and prehistoric and historic cultural sites.	
98	Prow Mountain - Mt. White Col / Scotch Camp	62.85	x	x	x	82O	8	7	3	This polygon is dominated by Prow and Gable Mtns, and its boundaries in general follow those of rare plant occurrences. It includes part of the Scotch Camp natural area of significance after Achuff et al. (1986) which features hoodoos, permafrost on tracts of the SF1 ecosite, subalpine Chernozems, Snowflake Lake (of scientific interest), loess deposition areas, seven species of rare plants, great gray owls, cougar, wolf, grizzly bear, sheep and elk winter range, sheep summer range, ungulate mineral licks, significant bird communities and vegetation types, and prehistoric and historic cultural sites. There are >/=9 rare plant occurrences.	Achuff et al. 1986; NTS topographic map 82O; field observations, 1997; ANHIC rare plant database, 1997.
99	Clearwater River	223.78	x	x	x	82N	8	7	3	Extends onto NTS 82O. This polygon is dominated by the valley of the Clearwater River, and includes Roaring and Malloch Creeks, various unnamed ponds, Martin Lake, Martin Creek, Mount Malloch, and Indian Lookout. It includes in part the Clearwater River natural area of significance (after Achuff et al. 1986). The area includes hoodoos along the Clearwater River, tracts of SF1 ecosite with permafrost, rare plants, western meadowlark, ungulate mineral licks, elk fall range, sheep summer and winter range, wolf habitat, and prehistoric cultural sites.	Achuff et al. 1986; NTS topographic map 82N and O; field observations, 1997; ANHIC rare plant database, 1997.
100	Siffleur Headwaters and Vicinity	186.12	x	x	x	82N	7		3	This high elevation polygon includes Dolomite Creek, glaciers, Devon Lakes, Devon Mtn, the NW part of Pipestone Pass, Mt. Willingdon, Mt. Harris, Devon Mtn., and the south part of Mount Kentigern. The boundaries follow in part those of the Siffleur River natural area of significance (after Achuff et al. 1986) and features a significant vegetation type, upland sandpiper, fisher, the only woodland caribou in Banff NP, ungulate mineral licks, elk winter range, and historic sites. There are >/=6 rare plant occurrences.	Achuff et al. 1986; NTS topographic map 82N; field observations, 1997; ANHIC rare plant database, 1997.
101	Siffleur Wilderness and Saskat. R. Connection	471.66	x	x	x	82N	8	7	3	Extends onto NTS 83C. The polygon is dominated by the valley headwaters of the Siffleur River, and includes Escarpment River, the glacier on Mt. Kentigern, Porcupine, Corona, Spreading, Loudon and various unnamed creeks, Siffleur Mtn, Mount Loudon, Totem Tower, and two unnamed glaciers east and NE of Mt. Noyes. The area provides important connectivity with the North Saskatchewan River and is known as a spectacular subalpine and alpine wilderness area. The area supports elk, bighorn sheep, mountain goat, moose, grizzly and black bears, cougar, lynx, wolf, coyote, hoary marmot, pika, and Columbian ground squirrel. The streams support native Dolly Varden trout and Rocky Mountain whitefish, and introduced rainbow trout. Elevations range from 1,464 m along the Siffleur River to 3,358 m on an unnamed peak. Lee et al. (1982) identified 24 vegetation types from the upper subalpine and alpine zones of the Siffleur. The area is popular with hikers, photographers, and backcountry campers.	Spaulding 1980; Lee et al. 1982; field observations, 1997; NTS mapsheets 82N and 83C.
102	Ram - Whiterabbit	1340.34	35	15	5	82O	8	7	3	Extends onto NTS 82N, 83C, and 83B. A large and wild polygon that includes reaches of the Clearwater, Ram, and North Ram Rivers, numerous creeks, the Ram Range, Mt. Michener, Mt. William Booth, and many unnamed Front Range mountains. "The major and minor river valleys provide a network of high quality riparian and valley habitat for movement and migration. High elevation "grasslands" cover part of the plateau between the Ram and North Ram Rivers. The area supports populations of wolf, grizzly, bighorn sheep, elk, deer, black bear, cougar, and small numbers of mountain goats. The area includes Cline Natural Area (#50) with river terraces and kame deposits and Douglas fir stands, "The area is zoned prime protection. It is little disturbed because it lacks significant amounts of oil, gas, coal, and timber. Seismic lines cut through part of the area. The area is known for its relatively undisturbed back country, and is popular with hikers, backpackers, equestrians, and for fall guided hunting. Numerous trails cross the area providing hikers with access to the Siffleur Wilderness and Banff NP. Some ORV use is causing landscape damage, particularly in the Clearwater River, Onion Creek, and Forbidden Creek valleys. Fossils draw many visitors to the eastern boundary of the area (primarily Hummingbird and Onion Creek) where there are excellent examples of trilobites, crustaceans, and plants. The spectacular horn on Mt. Michener caused by headward glacial erosion on all sides, is a popular scenic stop for tourists who use the view as a backdrop for family photos. There are small populations of bull trout, Rocky Mountain whitefish, and stocked cutthroat trout. Prehistoric sites are found along the Clearwater River which is used by both bull trout and Rocky Mountain whitefish for spawning, overwintering, and rearing.	Alberta Wilderness Assoc. 1986; field observations, 1997; NTS sheets 82O and N and 83C and B; Komex International 1995; ANHIC protected areas factsheet #50; Alberta Forestry, Lands and Wildlife 1988.
103	White Goat Lakes	2.65	37	18	5	83C	9		4	Includes a small cluster of rare plants (>/=4 occurrences). The polygon is a calcareous rich fen fed by a shallow stream. Salix lanata var. calcicola and Primula mistassinica have been documented. Tire tracks have been found in the fen. The area is located within the White Goat Lakes development node (zoned facility and general recreation) and may come under increasing development pressure.	ANHIC rare plant database, 1997; Alberta Forestry, Lands and Wildlife 1992; Geographic Dynamics Corp. 1997.
104	Coliseum Mountain	9.09	41	15	5	83C	8	7	4	A cordilleran outlier, critical wildlife zone with a classic geomorphic amphitheatre. The area is popular with recreationists (e.g. hikers, equestrian, hunters) and is a prominent scenic landmark viewable from the David Thompson highway. The area contains >/= 2 rare plant occurrences. Logging and "transportation network" activities continue on its north side	ANHIC rare plant database 1997; ANHIC logging cutblock and transportation network maps, 1997; Alberta Forestry, Lands and Wildlife 1988; field observations,

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											1991 and 1997.
105	Shunda Mountain	12.28	41	15	5	83C	8	7	4	A cordilleran outlier, critical wildlife zone. There is a fire tower and road to its summit. Overridden by glacial ice and characteristically rounded, the gentle summit area may be reached easily along a gated road from a trailhead partway up, offering visitors a classic hike up through the subalpine life zone to treeline and grassy tundra above. The mountain is popular with recreationists (e.g, hikers, equestrian, hunters). The area contains at least three rare plant occurrences. Logging and "transportation network" activities are ongoing. From the mountain, the view to the west displays a drumlin field, the mountain front, and other outstanding geomorphic features that make the site valuable for educational field trips.	ANHIC rare plant database 1997; ANHIC logging cutblock and transportation network maps, 1997; Alberta Forestry, Lands and Wildlife 1988; field observations, 1997; B. Gadd, pers. comm. 1998.
106	Brazeau River - Job Creek	277.25	39	20	5	83C	8	7	3	Prime protection zone that features riparian zone and valley of Brazeau River, Job Creek, Job Lake, Whisker Lake, many unnamed creeks, and also includes the north part of Job Pass, Mt. McDonald, Longview Mtn., Obstruction Mtn., and anomalous high elevation treed areas above 7500 feet west of Longview Mtn. Borders on the White Goat Wilderness and Jasper NP. The major river valleys provide critical landscape connectivity with both Jasper and Banff NPs. Includes an ecologically significant area centered on the Job Lakes area (after Alberta Forestry, Lands and Wildlife 1988). Cutthroat trout spawn in the outlet of Job Lake. The area supports grizzly bear, elk, white-tailed and mule deer, moose, mountain goat, bighorn sheep, black bear, cougar, wolf, and wolverine. The Brazeau River boundary is artificial (stops at border of Jasper NP).	Alberta Forestry, Lands and Wildlife,1988; field observations, 1997; NTS map 83C.
107	Tarpeian Rock - Opabin Creek	49.13	41	20	5	83C	8	7	4	Subalpine and alpine prime protection zone featuring riparian old-growth forests along the fish-bearing Opabin Creek and the rugged and scenic Tarpeian Rock. The area is zoned prime protection. A vehicle trail follows Opabin Creek to its headwaters.	Alberta Forestry, Lands and Wildlife,1988; field observations, 1997; NTS map 83C; ANHIC logging cutblock and "transportation network" disturbance maps, 1997.
108	Muskiki Lake and area	4.63	45	20	5	83C	8		3	Features a relatively-undisturbed lake surrounded by old-growth spruce forests. At SE end of lake the wetland is damaged by seismic activities. Muskiki Lake is the highest elevation "large" lake along the Cardinal River watershed. There is a major new road (not on map) between the Cardinal River road and the lake, and thus the lake and its environs may not be undisturbed for long. Includes the Muskiki Lake Natural Area (#438) with upland conifer forests of white spruce, subalpine fir, black spruce, and lodgepole pine; in the valley bottom is a rich patterned fen with rare/uncommon plants species; a wet sedge meadow is adjacent to the fen.	Field observations, 1997; ANHIC rare plant database, 1997; ANHIC logging cutblock and "transportation network" maps, 1997; ANHIC library data files and Muskiki Lake Natural Area #438 factsheet.
109	Ram Mountain	23.74	39	13	5	83B	8	7	3	Critical wildlife zone cordilleran outlier known as prime bighorn sheep range and as a scientific study area. The area supports good populations of deer, moose, elk, cougar, and wolf. The mountain as a whole is relatively-undisturbed. There are >/=18 rare plant occurrences. There is a large literature focussed on bighorn sheep of the Ram Mtn research area-- some recent references are provided in the references field.	Field observations, 1997; Komex International 1995; NTS map 83B; Alberta Forestry, Lands and Wildlife, 1988. Some examples of bighorn sheep research from Ram Mtn: Festa-Bianchet, M. 1992, 1991, 1989, 1988, 1986; L'Heureux et al. 1996; Ross et al. 1997; Jorgenson et al. 1993, 1997, "
110	Baseline Mountain	24.77	36	10	5	83B	8	7	4	Easternmost cordilleran outlier on map 83B. The area is threatened by logging and oil and gas activities. The area likely supports extra-limital/disjunct populations and landscape types.	Field observations, 1997; NTS map 83B; ANHIC logging cutblock and "transportation network" maps, 1997.
111	Rock Lake - Wildhay	48.69	52	2	6	83E	8		4	Key riparian habitat for wildlife. The area is heavily used by recreationists (equestrians, guided outfitting, hikers, hunters, fishermen, and campers). The Mountain Trail (along the Wildhay River) provides the main access to the east side of the Willmore Wilderness. The polygon contains >/=6 rare plant occurrences.	Alberta Wilderness Assoc. 1973; field observations 1997; ANHIC rare plant database 1997.
113	Smoky River and tributaries	254.84	x	x	x	83E	8		3	This reach of the Smoky River is little-affected by logging. Extends (unmapped) into polygon 5. The valley and its tributaries are a main travel/connectivity corridor for plants and animals, particularly woodland caribou. It includes a major mountain river valley with riparian vegetation types and landforms, and key bull trout, grayling, and Rocky Mountain whitefish fishery; excellent moose, elk, and mule deer habitat. The area likely contains montane-type grasslands on its drier slope breaks (see polygons 15 and 16).	Bentz et al. 1995; field observations, 1997; NTS 83E; ANHIC logging cutblock and "transportation network" disturbance maps, 1997.
114	Sheep Creek	164.15	57	10	6	83E	8		4	Extends onto NTS 83L. Boundaries set to exclude mining areas. Extends (unmapped) into polygon 5. A broad-valleyed tributary of the Smoky River providing important travel/migration route for plants and animals, particularly woodland caribou. While little-affected by logging/mining, it is threatened. Includes Swift Creek and SE facing slopes in the Willmore.	Field observations, 1997; NTS maps 83E and L; ANHIC logging cutblock and "transportation network" disturbance maps, 1997.

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115	Smoky River (Gustavs Flats to Wanyandie Ck)	64.91	57	8	6	83E	8		4	This reach of the Smoky River has been affected by mining and logging. The valley and its tributaries are a disturbed travel/connectivity corridor for plants and animals, particularly woodland caribou. It includes a major mountain river valley with riparian vegetation types and landforms, and key bull trout, grayling, and Rocky Mountain whitefish fishery; excellent moose, elk, and mule deer habitat. The area might contain montane-type grasslands on its drier slope breaks (see polygons 15 and 16). Due to the industrial activities in this area, Natural Resources Service (1995) has classified the valley from Gustavs Flat downstream to Twp 59 R6, W5, and the Muskeg River from the confluence with the Smoky upstream to McDonald Flats area as "area of reduced habitat effectiveness".	Field observations, 1997; NTS maps 83E and L; ANHIC logging cutblock and "transportation network" disturbance maps, 1997; Natural Resources Service 1995.
116	Kakwa Wildland Provincial Park and Area	1151.36	58	12	6	83E	8	7	3	Extends onto NTS 83L. Includes reaches of the Kakwa and South Kakwa Rivers, Kakwa Falls, Francis Peak Creek Falls, Caw Creek, numerous other creeks; Caw Ridge, Mt. May and Mt. Torrens, Dinosaur Ridge, Torrens Ridge, Kakwa Mtn., La Creche Mtn.; high elevation passes; critical woodland caribou summer range, northwest woodland caribou winter range; undisturbed subalpine and alpine riparian landforms and ecosystems; solifluction lobes and stripes; >/= 19 rare plant occurrences; southwest-facing grasslands and shrublands along the South Kakwa; classic gullied shale topography along Putzy Creek; knob and kettle topography; canyons; extensive valley bottom wet meadows; good to excellent ungulate habitat/winter range, and grizzly bear and wolf habitat. "With specific reference to Caw Ridge (CPAWS 1997): the area is a 21 km2 alpine ridge; it was once part of Willmore Wilderness; it is a provincial Watchable Wildlife Area; it is 1 of 6 remaining unprotected biodiversity hotspots in the Rocky Mountain region; nominated several times under Special Places 2000; includes Caw Pass (primary spring and fall migration corridor for 250 caribou of the Prairie Creek - Redrock herd); home to largest mountain goat population in Alberta; other animals using the ridge are bighorn sheep, elk, moose, mule and white-tailed deer, grizzly bear, black bear, lynx, wolf, coyote. "Disturbances include coal exploration activities, logging by Weyerhauser, and unauthorized use of ORVs and snowmobiles.	ANHIC library data files, 1997; ANHIC logging cutblock and "transportation network" disturbance maps, 1997; Hanley 1973; Alberta Wilderness Assoc. 1986; CPAWS 1997; NTS maps 83L and E.
117	Childear - Mawdsley - Kvass Creek	166.84	x	x	x	83E	8	7	5	Locally significant prime protection area in the north part of the Willmore Wilderness. Traversed by the Kvass Ck trail, the area is used by hikers, equestrians, hunters, trappers, and for guided outfitting. The area includes Kvass Ck., Wolverine Ck , Delorme Pass (providing connectivity with the Smoky River valley), Delorme Ck, Childear and Knife Mtns, and Mounts McQueen, Mawdsley, and Braithwaite. There is >/=1 rare plant occurrence.	Alberta Wilderness Assoc. 1973; NTS map 83E; ANHIC rare plant database, 1997.
119	Turret - Ambler	251.99	56	10	6	83E	8	7	5	Locally significant highland prime protection area within and NE of the Willmore Wilderness. The area is used by hikers, equestrians, hunters, trappers, and for guided outfitting. The area includes Dry Canyon - Sheep Ck trail, Turret Ridge, Llama Mtn., Mount Stern, Ambler Mtn., and numerous creeks. There are >/=3 rare plant occurrences NW of Ambler Mtn.	Alberta Wilderness Assoc. 1973; NTS map 83E; ANHIC rare plant database, 1997.
120	Blood Reserve 148A	20.14	1	28	4	82H	9		4	Blood Reserve enclave surrounded by Waterton Lakes NP along a reach of the Belly River. The area includes >/=4 rare plant occurrences. See polygon 57 for other features that might exist in this polygon.	ANHIC rare plant database, 1997; NTS map 82H.
121	Brule Dunes	67.81	50	27	5	83F	9		3	The Brule Dunes are one of the finer examples of montane sand dunes and sandhills in Alberta. While observed by many thousands of people en route to and from Jasper, little has been written about them (see Dowding 1929). The landscape is driven by wind deposition and erosion of sand originating on the floodplain of the Athabasca River, creating a dynamic, ever-shifting landscape of scientific and ecological significance. The polygon includes Brule Lake, a widening of the sandy floodplain of the Athabasca River. While white spruce/bearberry forests are the "climax", the forces and wind and fire have created a diversity of successional stages that require further study.	Dowding 1929; Gadd 1995; field observations, 1997; ANHIC library data files, 1997.
122	Dinosaur Tracks	7.03	58	8	6	83L	8		2	The dinosaur tracks fossil site is actually a few sites located at the Smoky River Coal Mine. The most common member of the fossil footprints is of Tetrapodosaurus; there are also hadrosaur and theropod tracks, bird tracks, and many fossil plants. The main threat to the sites is the instability of the fossil beds after coal is removed. The beds are prone to collapse and bury the fossils.	Phil Currie, pers. comm. 1997.
123	Mt. Wilson Icefield	70.89	x	x	x	83C	7	8	2	Extends onto NTS 82N. The prime feature of this polygon is Mt. Wilson and the Wilson Icefield-- a large glacier with associated tundra, periglacial features. The feature is part of the Icefields Parkway scenic viewscape (see polygon 74). Eight geological formations are visible from base to summit on Mt. Wilson.	Gadd 1995; field observations, 1997; NTS maps 83C and 82N.
124	Kananaskis Range	124.6	22	10	5	82J	7	8	3	High elevation area (primarily alpine) with high recreation value. Includes a great number of scenic peaks and ridges, such as Mt. Kent, Mt. Lawson, The Fortress, Mts. Kidd, Galatea, Bogart, Sparrowhawk, and Lougheed. Various provincial recreation areas are included or nearby such as Buller Creek and Galatea Creek. Includes multiple treelines on flanks of Mt. Lawson.	Field observations, 1997; NTS map 82J; McGregor 1984.

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125	Spray Valley	285.23	x	x	x	82O	8	7	3	Extends onto NTS 82J. An important north-south migration/movement valley corridor between Banff NP and the Spray Lakes Reservoir with southern branches into three valley passes into British Columbia (Cross, Albert, and Palliser Rivers). The area supports wolf, grizzly bear, elk fall and winter range, and sheep winter range.	Achuff et al. 1986; Komex International 1995; NTS map 82J; Kananaskis Country brochures and maps.
126	Spray Reservoir - Kananaskis Corridor	382.69	24	10	5	82O	8	7	3	Extends onto NTS 82O. Like polygon 125, this area is also an important north-south migration/movement valley corridor between Banff NP and the Spray Lakes Reservoir with southern branches into three valley passes into British Columbia (Cross, Albert, and Palliser Rivers). The area has high numbers of tourists and recreationists. Prominent features include the Spray Lakes Reservoir, Smith-Dorrien Creek, Lower Kananaskis Lake, provincial recreation areas, hiking trails, fishing, boating, and camping opportunities. The fishery of the Spray River and Reservoir has had a long history of manipulation, introductions, and population declines (Crosby 1990). Presently, lake trout and Rocky Mountain whitefish are the two prime fishery species. The Spray Lakes are not used extensively by birds or mammals due to the scarcity of food plants and the barren shorelines.	Crosby 1990a; NTS maps 82O and J; Komex International 1995; field observations, 1997; Kananaskis Country brochures and maps.
127	Evan-Thomas Critical Wildlife Area	74.95	22	8	5	82J	8		3	A critical wildlife subalpine zone known to support healthy populations of elk, bighorn sheep, and mountain goat. Includes Evan-Thomas Creek, Rocky Creek, unnamed creeks, and The Wedge (a scenic alpine area).	Alberta Forestry 1986; field observations, 1997; NTS map 82J.
128	Fisher Range	62.58	22	8	5	82J	7		4	Prime protection alpine area on the west slopes of the Fisher Range located upslope of the critical wildlife area of polygon 127. Includes Fisher Peak and Mt. McDougall.	Alberta Forestry 1986; field observations, 1997; NTS map 82J.
129	Kananaskis River Valley and Slopes	272.63	22	9	5	82J	8	7	3	Extends onto NTS 82O. An area with high levels of recreation activity such as downhill and cross-country skiing, hiking, camping, canoeing, kayaking, and fishing. In addition to the Kananaskis River, the polygon includes many other streams, including parts of Ribbon, Wasootch, Porcupine, and many unnamed creeks; Barrier Lake, Heart Mtn., and Mt. Baldy. Includes Mount Lorette Natural Area (#448) with aspen forest on alluvial fan, part of Kananaskis River, large beaver dam complex, white spruce floodplain forest, Lorette Creek; a major spring migration of raptors takes place over the natural area. Good education potential. The Kananaskis River is well known for its gamefish. Part of the area is reserved for scientific research. The area includes the Evan-Thomas, Galatea Creek, Eau Claire, Lillian Lake, Guinn Pass, Terrace Trail, Mt. Lorette ponds, Wasootch Creek, Porcupine Creek, Old Baldy, Barrier Lake, and Skogan Pass Provincial Recreation Areas. Wildlife move between the Kananaskis valley and the Wind Valley hub via the Skogan Pass.	ANHIC library, Mount Lorette NA factsheet, 1997; Alberta Forestry 1986; Environmental Science Program 1994; field observations, 1997.
130	Oldman River Valley	44.08	11	4	5	82G	8	9	3	Extends onto NTS 82J. Significant riparian woodlands; renowned Class 1 trout stream. Important river valley providing landscape connectivity for the region. Zoned critical wildlife, general recreation, and multiple use. The area is heavily-used by ATVs. The forests of the valley are being logged.	Resource Evaluation and Planning 1987; field observations, 1997; Wallis 1980; Resource Appraisal Group 1979.
131	Livingstone River Valley	39.27	12	3	5	82J	8	9	3	Extends onto NTS 82G. Significant riparian woodlands; renowned trout stream. Important river valley providing landscape connectivity for the region. Heavily-used by ATVs. Logging threatens the valley's forests. Increasing level of oil/gas activities in the area. Zoned critical wildlife. Some significant patches of foothills rough fescue grassland. Popular hunting area.	Resource Evaluation and Planning 1987; field observations, 1997; Resource Appraisal Group 1979.
132	Ma Butte	9.34	9	4	5	82G	8		3	One of three explosive volcanic centres in the Canadian Rockies (the other two are: under the town of Coleman, and southeast of Coleman), Ma Butte is an example of Crowsnest Formation rock. The Crowsnest Fm is one of only two units of volcanic rock known from the Canadian Rockies (the other is the Siyeh Fm in Waterton/Glacier). The Crowsnest Fm is volcanic mudflow rock about 160 m thick composed mainly of fragments of trachyte.	Gadd 1995.
133	Barnaby Ridge	14.41	4	3	5	82G	8	7	4	Bighorn sheep winter range. Data from the 1988 winter survey indicated 32 animals use the ridge.	Gibbard and Sheppard 1992.
134	Grave Flats	12.59	45	21	5	83C	8		4	Natural Area #436 with extensive valley of Grave Creek, willow-birch shrublands with uncommon species; upland forests of mature lodgepole pine and mixedwood white spruce - lodgepole - Engelmann spruce; string fen perched on slope above Grave Creek. Includes grave of Chief Cardinal. Camping and ORV use. The following is quoted from Canadian Press (1997): ""Aboriginal leaders warned officials of the planned Cheviot coal mine Thursday they " could have another Oka on their hands if the site cuts across ancient burial grounds. ""It's a sacred area for our people," said Jean Aquash, wife of Peter O'Chiese, leader " of the O'Chiese First Nation. "But they don't want to hear anything about the Indians." ""An access road to the 23 kilometer, $250 million mine would cut across the Grave " Flats region east of Jasper Park and south of Hinton, connecting the mine	ANHIC library, Grave Flats fact sheet, 1997.

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										site to Highway " 40. ""Goodstriker said at an anti Cheviot rally that the Grave Flats region is also " considered sacred by the Stoney, Saulteaux and Cree First Nations. ""Fred Munn, an official for Cardinal River, the company developing the mine, said " the burial grounds issue is an attempt by Cheviot's opponents to throw a roadblock in front " of the project and that it had not been mentioned during walkthroughs in the area. ""The Rocky Mountain Cree at Smallboy Camp and several environmental groups are " also taking the company to court, hoping to block the mine project.	
135	South Ghost Wilderness	268.8	25	9	5	82O	8	9	2	Mountain front highlands only 70 km west of Calgary, this area is range for bighorn sheep and mountain goats. While close to Calgary, visitation is relatively low and disturbances few, making this area one of the more pristine wildlands in the southern Rockies. Bold cliffs, steep slopes, high winds, and thin soil cover makes much of the area sparsely vegetated to barren. High recreational potential for hiking, snowshoeing, skiing, hunting, and equestrian. Primarily alpine and subalpine, with some montane at the lower elevations. Many prominent cliffs characterize the area. Includes 2 occurrences of spotted frog east of Yamnuska (at 51 07 and 115 05); one spotted frog occurrence at 51 06, 115 06; and two occurrences of tiger salamanders at 51 06, 115 07. The Bow Valley Naturalists (1974) have noted the occurrence of garter snakes, tiger salamanders, toads, wood frogs, and leopard frogs. C.D. Bird (in Bow Valley Naturalists 1974) has suggested that the Mt. Yamnuska area has a rich moth and butterfly fauna, and has predicted that least 300 species of moths, eight skippers, and 50 butterflies will be found there. "Includes Mt. Yamnuska NA, located at convergence of several natural subregions; includes Mt. Yamnuska (Mt. Laurie) with the most popular rock-climbing cliff in the region (300 m high cliff of Cambrian limestone); several rare, uncommon & noteworthy plant species; McConnell Thrust Fault (Paleozoic limestones over Cretaceous limestones & sandstones); excellent views of valley; talus slopes & rockfall track; stabilized colluvial slope with stunted aspen forests & some spruce, Douglas fir & pine;slow-flowing, probably calcareous springs with high insect, plant & bird diversity; open grassland on coarse glaciofluvial deposits; "great swamp" with floating vegetated mats, marl ponds; fluvial fan with rich extrazonal coniferous & mixedwood forests typical of Boreal Natural Region; recent kame terrace with variety of plant communities; old lake basin with lush growth of willows, grasses & forbs; mineral licks; pitted moraine with several small lakes;- hummocky, pitted glaciofluvial landform with small esker; Belly River formation sandstone outcrops;ephemeral lakes with diverse flora; moist Douglas fir - hybrid spruce forests with uncommon montane-subalpine plant species; a diverse fauna. The natural area is thought to be one of the most ecologically diverse in Alberta with four distinct climatic and vegetation regions occurring within a few kilometres (Downing et al. 1989). "There is a sandstone-silica quarry in the centre of the Yamnuska Natural Area.	Alberta Wilderness Assoc. 1986; Gadd 1995; Biodiversity Observation Database (G. Court, pers. comm.), 1997; ANHIC library, Mt. Yamnuska NA factsheet, 1997; Bow Valley Naturalists 1974; Downing et al. 1989.
136	Pipestone River - Mt. Murchison	528.62	x	x	x	82N	8	7	2	Extends onto NTS 82O. A diverse polygon featuring the Pipestone River, Mosquito, Silverhorn, Molar, and Murchison Creeks, unnamed creeks, Mts. Murchison, Noyes, Weed, and Hector; Conical, Observation, Dolomite, and Cataract Peaks; Silverhorn, Marmot, Dip Slope, and Molar Mountains; Hector, Molar, and various unnamed glaciers; Pipestone Pass; many alpine lakes; high elevation tree stands along Pipestone River, Mosquito Creek, and Molar Creek; hiking trails. Polygon is part of the viewscape for the Icefields Parkway (polygon 72).	Field observations, 1997; Gadd 1995; Achuff et al. 1986.