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WATERTON-GLACIER INTERNATIONAL PEACE PARK UNITED STATES OF AMERICA & CANADA

These two mountain parks on the North American continental divide, were created the world's first International Peace Park in 1923. They are of exceptional scenic beauty and geologic interest, with a striking overthrust fault formation, proterozoic sediments and six species of stromatolites. They also contain the most biologically productive and ecologically intact area on the continent and are also one of its few regions where wolves, bears and mountain lions still occur in the wild.

COUNTRIES

United States of America and Canada

NAME

Waterton-Glacier International Peace Park

NATURAL WORLD HERITAGE TRANSBOUNDARY SERIAL SITE

1995: Waterton Lakes and Glacier National Parks jointly inscribed on the World Heritage List under Natural Criteria vii and ix.

STATEMENT OF OUTSTANDING UNIVERSAL VALUE

The UNESCO World Heritage Committee issued the following statement at the time of inscription.

Statement of Significance

Waterton-Glacier International Peace Park has a distinctive climate, physiographic setting, mountain-prairie interface, and tri-ocean hydrographical divide. It is an area of significant scenic values with abundant and diverse flora and fauna.

Criterion (vii): Both national parks were originally designated by their respective nations because of their superlative mountain scenery, their high topographic relief, glacial landforms, and abundant diversity of wildlife and wildflowers.

Criterion (ix): The property occupies a pivotal position in the Western Cordillera of North America resulting in the evolution of plant communities and ecological complexes that occur nowhere else in the world. Maritime weather systems unimpeded by mountain ranges to the north and south allow plants and animals characteristic of the Pacific Northwest to extend to and across the continental divide in the park. To the east, prairie communities nestle against the mountains with no intervening foothills, producing an interface of prairie, montane and alpine communities. The international peace park includes the headwaters of three major watersheds draining through significantly different biomes to different oceans. The biogeographical significance of this tri-ocean divide is increased by the many vegetated connections between the headwaters. The net effect is to create a unique assemblage and high diversity of flora and fauna concentrated in a small area.

INTERNATIONAL DESIGNATIONS

1976: Glacier National Park designated Glacier Biosphere Reserve under the UNESCO Man & Biosphere Programme (410,056 ha).

1979: Waterton Lakes National Park designated a Biosphere Reserve under the UNESCO Man & Biosphere Programme (52,597ha).

IUCN MANAGEMENT CATEGORY

Waterton Lakes National Park: II National Park
Glacier National Park: II National Park

BIOGEOGRAPHICAL PROVINCE

Rocky Mountains (1.19.12)

GEOGRAPHICAL LOCATION

The site is in the eastern Rocky Mountains on the western edge of the Great Plains, straddling both the U.S.- Canadian border and the Continental Divide. Waterton Lakes National Park is in the south-western corner of the Province of Alberta, bordering Glacier NP to the south, between 49°00' to 49°12'N and 113°40' to 114°10'W. Glacier National Park is in northern Montana, bordering Waterton Lakes NP and British Columbia along its border to the north, and the North and Middle Forks of the Flathead River on its west and south. It lies between 48°15' to 49°00'N and 113°15' to 114°30'W.

DATES AND HISTORY OF ESTABLISHMENT

- 1895: Waterton Lakes Forest Park established under the Canadian Dominion Lands Act P.C.1621;
- 1906: Reclassified as a Forest Reserve by the Dominion Forest Reserve Act;
- 1900: Glacier Forest Preserve established;
- 1910: Glacier National Park established by U.S. Congressional Act 36 Stat.354;
- 1911: Waterton Lakes re-classified as a Dominion Park by P.C.1338; 1914: enlarged to 108,556 ha;
- 1930: Reclassified as a National Park by the Canadian National Parks Act, Ch.33, R.S.C. 1930;
- 1932: The two parks combined to form the world's first International Peace Park by the Governments of Canada and the United States; the Blackfeet Confederacy was included in the designation;
- 1976: Glacier National Park (GNP) designated a UNESCO Biosphere Reserve;
- 1979: Waterton Lakes National Park (WLNP) designated part of the UNESCO Biosphere Reserve.
- 1991: The Great Northern Environmental Stewardship Area established with Burlington Northern Railroad.

LAND TENURE

Waterton Lakes National Park is Crown Land, managed by Parks Canada under the Department of Canadian Heritage. Glacier National Park is Federal government land except for approximately 155 ha of private lands within the Park's jurisdiction. The Park is managed by the National Park Service of the U.S. Department of the Interior.

AREA

The combined site area is 457,614ha (UNESCO WH List, 2008): Waterton Lakes 52,525ha and Glacier NP 405,089ha. Note that the Parks Canada *Report on the State of Conservation of Waterton Glacier International Peace Park* of 2004 cites the areas of 52,500ha for Waterton Lakes National Park and 410,187ha for Glacier National Park, totalling 462,687ha.

Waterton Lakes Park is bordered by the Blood Indian Reserve on the east, by Akamina/Kishinena Provincial Park in British Columbia on the west, and by Flathead and Bow-Crow Provincial Forests on the west and north. Glacier Park is bordered by the same Provincial Park and forest to the north; by Flathead National Forest on the west and south, by part of the Lewis and Clark National Forest on the

south-east, and by the Blackfeet Indian Reservation on the east. The North and Middle Forks of the Flathead River bordering the Park to the west and south are protected by the U.S. Wild Rivers Act.

ALTITUDE

Waterton Lakes National Park: 1,280m to 2,920m (Mt. Blakiston).

Glacier National Park: 972m to 3,190m (Mt. Cleveland). 5 peaks exceed 3,000m, 32 exceed 2,800m.

PHYSICAL FEATURES

The Waterton-Glacier Park lies along the eastern margin of the Lewis Range of the Rocky Mountains which rise in the Front Ranges abruptly from the western edge of the Great Plains without foothills. It includes semi-arid rolling prairie as well as high glaciated mountains. At this point the Rocky Mountains are at their narrowest. Glacier Park itself lies on either side of the Continental Divide.

Waterton Lakes Park lies east of the Divide centred on a long narrow lake, one of the three Waterton lakes, which fills a glacial trough crossing the 49th Parallel, joining the two Parks. Its dominant landforms are the result of both mountain and continental glaciation. These are the 2,500m peaks of the Border and Clark Ranges, which are less rugged than their continuation in Glacier National Park. The Park has no active glaciers but does contain permanent snowfields. Its Precambrian formations contain some of the oldest rocks exposed in the Rocky Mountains and a number of very early fossil assemblages, including fossil stromatolites formed from colonies of blue-green algae. Chernozem soils over glacial deposits underlie the grasslands of the Park, the only sizeable example of this soil order currently protected within the Canadian Parks system (Nomination, 1993).

In Glacier Park the mountains are composed of Precambrian sedimentary strata with major glaciated valleys and intervening northeast-southwest trending ridges. This gives wide variations in elevation and climate, which have resulted in a wide diversity of vegetation types. Pleistocene glaciation has created a landscape of horn-shaped peaks, arêtes, broad U-shaped valleys, hanging valleys, cirques and glacial lakes (totalling 10,936ha) and 2,414km of rivers and streams. The last major glacial retreat occurred about 10,000 years ago leaving some 50 small glaciers of more recent origin, covering 27 sq.km but now retreating fast, and a large number of small lakes. Two rivers, the Waterton and Belly, and several smaller drainages are shared by the two Parks. The complex is in the headwaters of three major continental drainages: to the west via the Columbia River into the Pacific, east via the Missouri River to the Gulf of Mexico, and north via the Saskatchewan River into Hudson Bay. The broad and remote valley of the North Fork of the Flathead River, much of which lies outside the Parks, is considered ecologically very valuable (Mittermeier *et al.*, 2005).

The Parks contain a sedimentary and tectonic stratigraphic record more than 1,250 million years old. The bedrock is a thick layered series of ancient sedimentary formations overlying much younger sediments. This resulted from a major Cretaceous thrust fault, the Lewis Overthrust, which displaced Precambrian sedimentary formations horizontally some 80 km towards and over the much softer Cretaceous Great Plains formations. These are highly visible in the McConnell thrust on Mt Yamanuska, Alberta and the Lewis thrust on the Alberta-Montana border. These are two of the world's largest and most explicit examples of mountain building by overthrusting, notable for the clarity of their geological structure. They occur on the very eastern edge of the mountains, as in Chief Mountain, dramatising their contrast with the plains. In the Precambrian formations in Glacier Park, layers of Proterozoic sedimentary rock are exposed in cliffs coloured by eroded minerals and intrusions of igneous diorite. Five caves, Haystack, Algal, Zoo and Poia Lake, have been discovered, the only such caves of Precambrian age known for Montana; also six species of fossil stromatolites. The scenery of both parks is superlative.

CLIMATE

The region's Cordilleran climate is rigorous but very variable, Summers are brief, cool and rainy with many thunderstorms; winters are comparatively mild and snowy. It is influenced by two systems: Arctic

Continental and Pacific Maritime, the second being dominant. A Pacific storm track brings heavy precipitation to the west of Glacier Park, moderating temperatures. In winter it produces frequent Chinook (föhn) winds which, combined with the rain-shadow effect, result in high drying winds and dramatic rises in temperature on the eastern side of the Divide. Waterton is said to be the second windiest place in Alberta, especially in January and November. Daily winds average 30km/hr but gusts of 120km/h (75mph) are not uncommon.

The mean annual precipitation varies from 480mm to 2,500mm according to location but is about 920mm in Waterton Lakes where the annual snowfall at low elevations averages 575mm. Its mean monthly temperatures are -9.4°C in January and 17.2°C in July. In Glacier Park, mean annual temperatures range between 4°C to 38°C on the west side of the Park to 12°C to 36°C on the east side. Snowfall is high on the west slopes but climate change is affecting the glaciers. In 1850 there were 150 glaciers in the area: many are now a third of the size they were then and are melting fast. The tree line in the parks is creeping higher, the subalpine meadows are filling in with trees and the alpine areas are shrinking.

VEGETATION

The Peace Park is the most biologically productive and ecologically intact part of the North Central Rocky Mountains Forest ecoregion with ecological complexes and plant communities that occur nowhere else. The Continental Divide separates two climatic zones, Pacific Maritime and Arctic Continental. Waterton Lakes Park lies to the east side and Glacier Park laps both sides of the Divide from dense boreal forests on the west to semi-arid foothills in the east. The area is near the 50°N line of floristic discontinuity between the southern and northern Rocky Mountains, and is at the southern limit for many boreal species. It is also at the northern limit for several southern alpine plants. The prevailing maritime climate brings many species related to the far western flora, here at their eastern limit. So in a relatively small area, there are five floristic ecoregions: alpine meadows and tundra, subalpine forest, montane fir-whitebark pine forest, aspen parkland, and fescue prairie (Strong & Leggat, 1981). The steep environmental gradients also create a mosaic of habitats where boundaries between zones occur higher on warmer, drier south and west slopes compared with cooler, moist north and east slopes. In WLNP 23 different habitat types are recognised, with some 870 species of vascular plants. In Glacier NP some 1,258 vascular plant species have been identified (Nomination, 1985), though this total may include some found across the border. These life zones, separated along the altitudinal gradient, contain a range of biodiversity unmatched in the Northern Rockies.

Waterton Lakes National Park: In addition to 870 vascular species, the flora has 182 bryophytes and 218 lichens, many at the edge of their geographic ranges. About 113 vascular plants (10% of the provincial total) were listed as rare within Alberta (Argus *et al.*, 1978); 34 species are unknown in Alberta outside the Park, and six species are classified as rare in Canada: *Stellaria americana*, *Townsendia condensata*, *Gayophytum racemosum*, *Papaver pygmaeum*, *Douglasia montana* and *Aquilegia jonesii*.

Alpine tundra which covers about 25% of the Park is found above 2,250m. It is dry and windy with a 60-day growing season. In addition to tundra, there are alpine meadows, fellfields with cushion plant communities and alpine bogs. High level islands of krummholz result from the high winds, ice-shear and short growing season. In summer the brief flowering season is brilliant with plants such as mountain avens *Dryas octopetala*, yellow monkeyflower *Mimulus luteus* and *Polemonium viscosa*. The rare endemic dwarf alpine poppy *Papaver pygmaeum* is found on rocky slopes and ridges above the timberline. The subalpine forest biome which covers 30% of the Park extends between 1,650m and 2,250m in two fairly distinct zones: lower forest from 1,650 to 1,950m and upper forest from 2,950 to 2,250. The drier open upper forest has a strong boreal element, with dwarf birch *Betula glandulosa*, subalpine larch *Larix lyallii*, whitebark pine *Pinus albicaulis*, scrub limber pine *P. flexilis*, lodgepole pine *P. contorta* and Douglas fir *Pseudotsuga menziesii*, smooth woodrush *Luzula hitchcockii* and fireweed *Epilobium angustifolium*. The moister lower forest is dominated by Englemann spruce *Picea engelmannii* and subalpine fir *Abies lasiocarpa*.

The montane biome in Canada lies between 1,250m and 1,500m, covering some 25% of the Park. It is largely restricted to the dry foothills and major river valleys of the eastern slopes. The dominant species are Douglas fir with limber and lodgepole pines. Much of the key ungulate winter range is found in this area. The aspen *Populus tremuloides* parkland, 10% of the park, grows on the drier eastern foothills between 1,280m and 1,500m. It is a transitional belt between prairie grasslands and coniferous forest, the dominant species being Engelmann spruce - subalpine fir forest and lodgepole pine with some trembling aspen, balsam poplar *Populus balsamifera*, cottonwood *P. trichocarpa* at lower elevations, serviceberry *Amelanchier alnifolia*, hogweed *Heracleum lanatum* and extensive areas of bunchgrass *Festuca scabrella*. In September and October the autumn colours are very striking.

The fescue grassland or bunchgrass prairie grows on rich soils and is almost entirely a rough fescue-oatgrass *Festuca scabrella*-*Danthonia parryi* association with junegrass *Koeleria macrantha*. The 3,300ha of this prairie in Waterton NP (6% of its area) is the only example of this plant association in the Parks Canada system since most is under the plough. Aquatic ecosystems (3% of the two Parks) include fens, sphagnum bogs and at low elevations, riparian communities dominated on both sides of the Divide by aspen, cottonwood, and willow *Salix* spp. Some flowering plants are found throughout the Parks: beargrass *Nolina microcarpa*, monkey flower *Mimulus luteus*, glacier lily *Erythronium grandiflorum*, balsam root *Balsamorhiza hookeri* and Indian paintbrush *Castilleja coccinea*.

Glacier National Park: Plant species in the Park have affinities with four major floristic provinces: Cordilleran (49%), characteristic of the central and southern Rocky Mountains and the mountains of the northwest; Boreal (39%), similar to much of the vegetation of Canada; Arctic-Alpine (10%); and a few representatives from the Great Plains (1%). Among its 1,258 species of vascular plants are 20 different species of tree, 93 woody shrubs or vines, 88 annual or biennial species, and 804 types of perennial herbs. There are 30 species endemic to the northern Rocky Mountain region, all but one occurring in cold open areas characteristic of harsh post-glacial environments. Many are relics of the post-glacial age or grow here because the combination of diverse environmental conditions creates unique micro-habitats. Included are 26 species described as rare within Montana (Lesica, 1984), 67 vascular and 42 non-vascular species listed as sensitive by the State of Montana (Nomination, 1985), and 127 non-native species. Besides vascular plants, the Park has at least 855 species of mosses and lichens and probably more than 200 species of fungi, though it is not a group well-studied there.

Alpine tundra of sparsely vegetated or barren rock, snow and ice which is found above 2,100m on west slopes and 1,800m on east slopes covers about 29% of the Park. It is similar to that in Waterton Lakes Park. Subalpine dry coniferous forest covers 16% of the Park between about 1,700m and 2,100m with a dry windy upper zone and a moister forest in the lower zone. Dominant species are whitebark pine *Pinus albicaulis*, limber pine *P. flexilis*, subalpine larch, subalpine fir *Abies lasiocarpa* and Douglas fir *Pseudotsuga menziesii*. On the east side of the Park, dry chinook winds sculpt trees along the high ridges, while all remains calm in the aspen groves below.

The humid coniferous forest of the west slopes covers 33% of the Park. Moist, temperate conditions have allowed the easternmost extension of western red cedar-hemlock *Thuja plicata* - *Tsuga heterophylla* forest, to develop in the Lake McDonald Valley. The west slope forests are clothed chiefly with lodgepole pine-western larch *Pinus contorta* - *Larix occidentalis* forest, subalpine larch, western white pine *Pinus monticola*, Douglas fir and grand fir *Abies grandis*, with Englemann spruce *Picea engelmanni* and alpine fir *Abies lasiocarpa* at higher elevations. In the drier northern part of the west side, rainshadowed by the Whitefish Range, cedar-hemlock forests give way to Douglas fir and lodgepole pine forests while the slopes have remnants of the ponderosa pine-blue bunchgrass *Pinus ponderosa* - *Festuca ovina* association.

The differences in rainfall either side of the mountains are not extreme but the desiccating winds make the plant communities very different, the dark west-side forests starkly contrasting with the more open

forests, glades and grasslands of the east. Deciduous open woodland covers 6% of the Park on the drier eastern foothills, dominated by trembling aspen, balsam poplar, cottonwood and extensive areas of bunchgrass. Dry fescue grassland meadows and bunchgrass prairie (8%) are dominated by the rough fescue-Parry's oatgrass association. 5% of the Park is wet meadow or fen, and 3% is lake, with aquatic plants in the shallow zones. Each of the three major river systems has a distinct aquatic community.

FAUNA

The Parks are noted for their wide diversity of habitats and abundance of wildlife. In addition, Glacier National Park is the only location in the lower United States where self-sustaining populations of the three major predators, grey wolf *Canis lupus*, grizzly bear *Ursus arctos horribilis* and mountain lion (cougar) *Felis concolor* still occur naturally, as does the wolverine *Gulo gulo*. Three of the species found there are nationally endangered in the U.S: wolf, bald eagle *Haliaeetus leucocephalus* which nests in the area, and migrant peregrine falcon *Falco peregrinus*. The grizzly bear, though regarded as threatened, has a healthy population of over 200 animals. The foothill parkland and montane biomes, especially the stream valleys and wetlands, are particularly rich in birds, and the montane and subalpine biomes, in small mammals. The upper subalpine and alpine regions are the least productive but have several species limited mainly to those areas.

In WLNP 63 species of mammals have been recorded. Other large carnivores include more than 400 American black bears *Ursus americanus*, coyote *Canis latrans*, river otter *Lutra canadensis*, Lynx *Lynx canadensis*, bobcat *Lynx rufus*. Its grasslands are important winter range for ungulates: the seasonal migrations of elk *Cervus elaphus* from summer quarters in Glacier Park to winter pastures in Waterton Park are an outstanding spectacle. Other ungulates include mule deer *Odocoileus hemionus*, white-tailed deer *O. virginianus*, moose *Alces alces*, American bison *Bison bison*, mountain goat *Oreamnos americanus* and bighorn sheep *Ovis canadensis*, the last two being indigenous to the region. Rodents include American beaver *Castor canadensis*, hoary marmot *Marmota caligata*, fisher *Martes pennantii*, pine marten *M. American*, American mink *Neovison vison*, muskrat *Ondatra zibethica*, least weasel *Mustela nivalis* and northern bog lemming *Synaptomys borealis*.

The Parks are on the margins of two major avian migratory routes, the Central and Pacific flyways and their marshes and lakes are much used as staging grounds. The bald eagle and migrant peregrine falcon pass through. In GNP some 272 bird species have been recorded, 132 being breeding species. Among the number are western grebe *Aechmophoros occidentalis*, American bittern *Botaurus lentiginosus*, Swainson's hawk *Buteo swainsoni*, long-billed curlew *Numenius americanus*, hairy woodpecker *Picoides villosus*, willow flycatcher *Empidonax traillii*, and loggerhead shrike *Lanius ludovicianus*. Only some seven amphibian species and three reptiles are recorded (Mittermeier *et al.*, 2005).

The fish fauna of the Parks includes 20 species, among them mountain whitefish *Coregonus commersoni*, cutthroat trout *Salmo clarki*, rainbow trout *S. gairdnerii*, lake trout *Salvelinus namaycush*, bull trout *S. confluentus* and Arctic grayling *Thymallus signifer*. Fish indigenous to Glacier National Park include west slope cutthroat trout *Oncorhynchus clarki lewisi*, in one of its last strongholds, and Kokanee salmon *O. nerka*, which attracts the carrion-feeding bald eagle during the spawning run. Both brook trout *Salvelinus fontinalis* and rainbow trout are introduced species. The pygmy whitefish *Proscopium coulteri* is known only from these lakes, and the presence of deepwater four-horn sculpin *Trigloopsis quadricornis* is unique in Alberta. The opossum shrimp *Mysis relicta* is a relic species of the area. Elements of three basic insect bio-communities have been identified: Nearctic, West Coast and Great Basin. Two amphipod species were recently discovered, including the first troglobites (aquatic cave dwelling insects) to be identified in GNP. One caddisfly *Helicopsyche* spp. is unusual in being found only in Waterton Lakes National Park and the State of Utah. One new species of mite from the genus *Morimotacarus* has been found in the area, the only known representative of this genus in North America.

CONSERVATION VALUE

The International Peace Park is in the centre of a mountain chain extending from the Brooks Range in Alaska to the southern United States and on the headwaters of rivers flowing into three oceans. Glacier Park is the only location in the lower states where major predator populations of wolves, bears and cougars still occur naturally. It contains superlative natural phenomena such as the Lewis Overthrust, displayed in both parks, Precambrian formations with six species of fossil algae, many rare plant species at the limits of their geographical range, and mountain scenery of exceptional natural beauty. The site contains two UNESCO Biosphere Reserves.

CULTURAL HERITAGE

Waterton Lakes National Park is archaeologically important: 212 sites have been found, with twelve dating from over 10,000 years ago - the highest density of archaeological sites of any small valley system in the northern Rocky mountains (Reeves, 1971). In Glacier Park a number of prehistoric sites are known, some dating back to 3,000 BP. The area has been used and passed through by peoples of the Blackfeet, the Salish and the Kootenai, also the Kalispel, Flathead, Shoshone and Cheyenne tribes. The massif of Chief Mountain, 8 km south of the international border, is both a spiritual site and a symbolic landmark to the Blackfeet people who controlled the plains east of the mountains from the 18th century. The remoteness of the area plus the presence of the strong Blackfeet confederacy effectively prevented exploration of the area by Europeans until the late nineteenth century.

A Hudson Bay Company surveyor recorded the first observation of Chief Mountain in early 1793. French and English trappers came later in search of beaver pelts. During the 19th century there were a number of expeditions. Settlement and cattle ranching began in the Waterton Lakes area in the 1880s. The tribes were persuaded onto reservations and in 1895 the east side of the future Park was sold by a Blackfeet chief to the government. The Great Northern Railroad crossed just to the south of Glacier in 1891, bringing settlers and miners, and encouraging tourist use of the mountains. Numerous early homesteads, mineshafts, timber and oil operations and early park buildings remain: many of the structures in Glacier Park are listed on the National Register of Historic Places. Concern for the protection of the area led to the creation of Waterton Lakes Forest Park in 1895. The 80km Going-to-the-Sun highway, built between 1921 and 1932, is an impressive monument of early 20th century road engineering, and is listed as a National Historic Road.

LOCAL HUMAN POPULATION

In 2003 Waterton had a permanent population of 60 people and a high summer population of about 2,250. Waterton Lakes Park is bordered to the north and west by forests. Privately-owned ranchlands, grazing leases, and the Blood Indian Tribal Reservation lie to its north and east. Tourism, mainly in the surrounding buffer zone, is the main source of income, but livestock raising and harvesting forest resources are also important. Historically, local ranchers have supported the Park and the Canadian Nature Conservancy is now supporting ranchers in order to preserve an 11,000ha buffer zone (Mittermeier *et al.*, 2005). Glacier National Park had a population of 50 including Park and hotel staff (PCA, 2004). It is bordered by several villages, the combined population of which may exceed 2,000 and is growing. The relative prosperity of the Flathead valley region is attributable to the permanent residents attracted to the neighbourhood of the Park. The town of Columbia Falls is 20 km southwest, the Piegan Blackfeet tribal reservation is just east and the town of Browning 20km east of the Park.

VISITORS AND VISITOR FACILITIES

Waterton Lakes National Park: The Park is open year round and a total of 406,081 visitors was recorded in 2002, rather over the average of 306,000 for the last decade, and an increase of 6% on 1995 (PCA, 2004). There are 210 km of trails, 391 auto campsites, 9 back-country campgrounds and group tent areas, stables, boat docks and a golf course. An archive of historic records and photographs is kept at the visitors' reception centre and a number of interpretive display centres are located throughout the Park. Activities include swimming and boating, golfing, riding, cycling, fishing, cross-country skiing, and snowshoeing. The town of Waterton provides most needed facilities,

including 1,300 visitor places in 24 lodges with 415 units, hotels and motels. Five leased concessions provide visitor services. Road access is good. There are airports at Lethbridge, 128km northeast and Calgary, 254km north.

Glacier National Park: The Park was originally opened for tourism by the Great Northern Railroad in 1891 which built a network of tourist chalets in 1895. Visitor numbers are consistently high: 1,905,681 people visited the Park in 2002 (PCA, 2004), most from the region, but also a large number from outside the U.S. The iconic Going-to-the-Sun Road completed in 1932 is to be preserved as a national monument. There are 8 park entrances, 1,202km of maintained roads, and 1,168km of foot and horseback trails cross the area. The Park has 1,700 visitor places in hotels and cabins in the nearby towns and 500-540 lodging units plus two back-country chalets in the Park; also 1,021 auto campsites and 65 back-country campgrounds. New lodges are being built the Park's gateway communities. Interpretive services have been provided since 1929. There are three visitor centres along the scenic road: at St Mary on the east, at Logan Pass in the middle and at Apgar on the west, and two museums, the Discovery Center being on the west side of the park. There are guided bus tours and a very wide range of activities as at Waterton Lakes Park, but also including scenic air tours, mountaineering, snow-mobiling, cycling, boating, rafting and underwater diving. Both private overflights and personal boating are banned. However, many areas are accessible only in summer. Road access is good and there is an airport at Kalispell 50km southwest.

SCIENTIFIC RESEARCH AND FACILITIES

Waterton Lakes National Park: The earliest naturalists to visit the area were Captain Thomas Blakiston with the Palliser Expedition in 1857-60, the American naturalist Elliott Coues in 1875, and George Dawson of the Geologic Survey of Canada. In 1895 and 1922-23, field work was carried out and collections made by the National Museum of Canada. The accessibility, prominence and disjunction in age between the layers of the Lewis Overthrust on the international border has given rise to important geological studies. After 1938, management-oriented scientific investigation increased, with emphases on limnology, wildlife management, ecology, pedology and archaeology by agencies such as the Canadian Wildlife Service. Establishment as a Biosphere Reserve in 1979 prompted further research. Current work aims to restore, protect, enhance and monitor endangered or threatened populations of grizzly bears, bull, cutthroat and rainbow trout and aquatic invertebrates. No research facilities currently exist but limited accommodation for researchers is available. Archives, specimens and a small reference library are maintained. Waterton Lakes and Glacier National Parks are moving toward similar geographical mapping systems, and air and water monitoring programs.

Glacier National Park: Much individual research was done before the 1960s when a formal research program was begun which accelerated with the Park's designation as a Biosphere Reserve. The aim of many projects was to establish criteria for conservation, management, or restoration of natural ecosystems, and threatened species. Current studies by Park ecologists, involving joint projects from both parks, include geology and glaciology, climate change and glacier retreat, the ecology of gray wolves, mountain goats, wintering ungulates, pine martens and grizzly bears, including the influence of people on their behaviour and ecology. Other subjects are whitebark and limber pine ecology, forest succession following mountain pine beetle *Dendronotus ponderosae* infestation and wildfire, the effect on woodpecker populations of pine beetle infestation, high elevation entomology, the movements of bald eagles, snow algae, aquatic ecosystems, amphibians, benthic invertebrates, the genetics, population and distribution of west slope cut-throat trout, the impact of Kokanee salmon and man on the chemistry and bacteriology of McDonald Creek, larvae of stonefly genera, post-fire burn assessment, the impact of fire on recreation, and trauma in victims attacked by grizzly bear.

In both parks, research supports management. There is ongoing monitoring of air and water quality, vertebrates, amphibians, climate change, glaciers and streamflow. The West Glacier Park Headquarters provides temporary facilities for research and visiting scientists. There is a research library and an expanding database closely linked with park management and with a number of the monitoring programs being conducted in the Park. Cooperating institutions include the U.S. Geological

Survey, the Flathead Lake Biological Station and the Rocky Mountains Ecosystems Studies Unit of the University of Montana in Missoula, to facilitate park science; also the Glacier Institute at Kalispell which offers college-level summer and winter courses. Its Crown of the Continent Learning Center at West Glacier is linked with the University of Montana and with local agencies and tribes, to provide a support infrastructure for scientific research. New projects include the Global Climate Change Research Program linked to the U.S.G.S. Northern Rocky Mountain Science Center in Bozeman, Montana. Both parks run programs of student education and public awareness and maintain extensive archives.

MANAGEMENT

Waterton Lakes National Park: Parks Canada administers the area largely as a wilderness or natural environment under the National Parks Act of 2000 and the Parks Canada Agency Act of 1998 through the Agency's Guiding Principles and Operational Policies. Initially, despite its status as a Forest Park, the area was an unprotected working forest where, by 1905, more than half had been reserved for petroleum development (Lothian, 1976). But since the creation of Waterton Lakes Dominion Park in 1911 (originally 3,500 a but enlarged in 1914 to 109,556ha) it has been largely free of commercial resource extraction. Logging, grazing, and commercial fishing are not permitted; power boats are permitted only on designated lakes. A Tourism Strategy was published in 1999 and an ecosystem-based General Management Plan in 2000. This preserves the ecological integrity as wilderness of 84% of the area. It zoned the Park for five different levels of land use: Class I: areas of highest protection; Class II (48.2%), wilderness; Class III (43.6%), natural environment; Class IV, recreation and Class V visitor services. Management objectives, policies and plans for the two parks are similar: since 2001 interagency management has been coordinated by the Crown of the Continent Ecosystem Managers Partnership. Cooperative projects with the U.S. National Parks Service include staff exchanges, joint staff meetings and training sessions, combined interpretive programs and mutual assistance. In 2002 the Canadian government suggested expanding the Park over Akamina/Kishinena Provincial Park and the Flathead Provincial Park in British Columbia, if granted support by the Province and Kootenay First Nation. Corridor connection with the northern Rocky Mountain parks will be essential to preserve the survival of the large carnivore ecosystems.

Glacier National Park: This is managed under the several national acts governing the National Park Service. It is one of the most intensively managed parks in North America. A detailed ecosystem-based 20-year General Management Plan by the National Park Service was adopted in 1999, with statements and guidelines for management; a Commercial Services Plan was adopted in 2004 (PCA, 2004). Over 95% of the Park is to be managed as wilderness, with the remainder managed as natural area. A visitor management plan is incorporated in the General Management Plan for both Parks. It divides the Park into four zones for tourism: Visitor Service, Day-Use, Rustic and Back-country. No visitation is allowed in certain sensitive areas, and use of much of the Park is monitored and regulated. Development is restricted, and confined to the road corridors and wastewater treatment plants. Restrictions have already been placed on building in the major valleys east and south of the Park. The two managements regularly exchange data and staff, as well as undertaking joint research project, and a Transboundary Planning and Management Program has been started. In 2010 a Memorandum of Understanding and Cooperation on Environmental Protection, Climate Action and Energy was signed by the Premier of BC and the Governor of Montana with representatives of the Ktunaxa Nation and Confederated Salish and Kootenai tribes. This was especially to ensure transboundary protection of the Flathead River basin from exploitation for oil, coal, gas and other minerals. However the Act instituting the International Peace Park states that where administration, promotion and development are concerned, the area within the United States is to be known as Glacier National Park, and remains the responsibility of the National Parks System (Saussay, 1980). The park has a comprehensive monitoring program, and both parks monitor water quality, ecological processes, threatened species including amphibians, the effects of climate change, visitor use, and (GNP) the condition of glaciers.

MANAGEMENT CONSTRAINTS

Waterton Lakes Park: Though incomparably rich, the area is developing and the Park is at risk of becoming an ecological island. It contains a heavily-used resort town and one interstate and two

provincial highways give access, one bisecting the eastern end of the Park. The Blood Indian Band has a timber reserve of 1,684ha on the east side, which is not parkland. The Park is too small to be a self-contained ecological unit, and there is some conflict with poaching along boundary areas. British Columbian logging up to the north boundary has caused stream siltation. Gas wells occur close to Waterton, disrupting wildlife habitat and there are proposals to build resorts and summer houses just beyond the park boundaries. The Waterfront Project aims to secure an adjacent lakeside 14,100ha from development. To control these proposals the exercise of land use regulations must be enforced.

Glacier National Park: The Federal State of the Parks report to Congress in 1980 rated Glacier at that time the fourth most seriously threatened park (out of 300) in the United States. Critical issues include regulating traffic on the Going-to-the Sun road, prohibiting watercraft on lakes, overflight tours and preservation of historic service buildings; also pollution by adjacent industries, logging and development on the boundaries and on the floodplain of Divide Creek. For years there was excessive fluoride emission from a nearby aluminium reduction plant and monitoring continues, as it does for logging, oil and methane extraction near the Park boundaries. A proposed open-pit coal mine at Cabin Creek in south-east British Columbia, 14 km from the boundary, was stopped in 2004 after arbitration by the International Joint Commission (PCA, 2004). Increasing winter use and recreation, poaching and growing numbers of residents along the boundaries all affect the movement of wildlife.

Other problems include conflicting alternative management approaches in the adjacent Blackfoot Reservation and on British Columbia provincial forest land, control of exotic weeds, pest management, campground rehabilitation and problem bear relocation. Bear kills while foraging spilt grain along the railroad are being reduced within the Great Northern Environmental Stewardship Area (PCA, 2004). The suppression of the natural fire regime for 75 years until the 1990s is now seen to have damaged the sustained health of the ecosystem: 10% of the west side of the Park burned in 2003. A revised fire management plan, which allows natural fires to occur, is now being followed. Natural disasters such as flooding, avalanches, landslides, windstorms and mountain pine beetle infestation are constant hazards. Under a Vital Signs Monitoring Program in the Rocky Mountain network, long term comparative monitoring was initiated in 2003. The rise in temperatures may prove the severest threat to the future of the Park's glaciers and alpine zones, which are shrinking.

STAFF

Staff totals for the Peace Park in 2003 were 153 full-time, 10 part-time, 410 seasonal and 109 others. Waterton Lakes National Park staff under the Field Unit Superintendent was 36 full-time, 5 part-time, 30 seasonal employees + 77 volunteers & students, in four divisions, Administration, Resource Conservation, Visitor Services and Technical Services. Glacier National Park staff under the Park Superintendent was 117 full-time, 5 part-time, 380 seasonal and 32 other employees in 2003 in Administration, Facility Management, Interpretation, Resource Management, Visitor Services and Concession Services, and at eight entry points. There were then 100 seasonal volunteers and 750 concession employees. The staffs of both are highly trained, and expert assistance is available from several sources (PCA, 2004).

BUDGET

Waterton Lakes Park: CAN\$4,104,000 in 2003 for operation, maintenance and salaries (PCA, 2004). Glacier Park: US\$11,103,000 in 2003, for operations, park restoration and improvement program and construction. (PCA, 2004). Both parks suffer a perennial shortage of funding.

LOCAL ADDRESSES

The Superintendent, Waterton Lakes National Park, P.O.Box 50, Waterton Park, Alberta, T0K 2M0.

The Park Superintendent, Glacier National Park, P.O.Box 128, West Glacier, Montana 59936. U.S.A.

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