sheet that had spread across the Great Plains from the north and east. During their flow the glaciers gouged out and deepened their valleys. Waterton Lake, above the "Bosporus", occupies one vastly overdeepened segment. The valleys were eroded to produce the U-shaped cross section with steep walls so typical of glaciated regions, and truncated spurs, hanging valleys, and waterfalls (e.g. Cameron Falls) are seen along the sides of all the valleys. Most of the valleys in the Park experienced a series of glaciations-neither their total number nor their ages are known - with each successive glacier gouging a U-shaped valley into the lower part of the earlier such valley. The heights reached by the successive glaciers are shown by changes, far up the valley walls, from steep to less steep slopes. Such breaks in slope are well displayed in the main Waterton Valley, one 500 feet above Waterton Lake, another about 1,000 feet higher.

the Park gates and the Belly Valley glacier undoubtedly much farther. During

at least one advance these glaciers combined with the vast continental ice

Ice erosion produced basins in many of the cirques, some of which now contain tarns (Crypt, Upper Rowe, Carthew, Lineham, Goat, Crandell, Lost, Lone, and Twin Lakes). The larger basins occupied by Cameron, Bertha, and Alderson Lakes resemble those cirques in many ways but were formed at the heads of valleys, rather than along their sides. Where ice formerly spilled over the cirque lips, waterfalls or fast streams are now found. Higher in the mountains ice sculptured opposing sides of peaks to produce horns, a good example being Anderson Peak, which is readily seen from Blakiston Valley. In addition to these erosional features, the active ice left a few depositional forms, such as the drumlins which run parallel to the highway southwest of the park gates.

A change to warming climate increased melting, and the glaciers waned. Those in Waterton and Belly Valleys thinned and retreated from their maximum limits. The tributary glaciers also became sluggish and decreased in size and finally stopped contributing to the two trunk glaciers. As a result the glacier system soon consisted of large, but nearly stagnant, bodies of ice in Waterton and Belly Valleys, with minor shrinking glaciers in the side valleys. Further warming melted the valley glaciers and finally the last remnants of ice in the cirques; the park was then ice free.

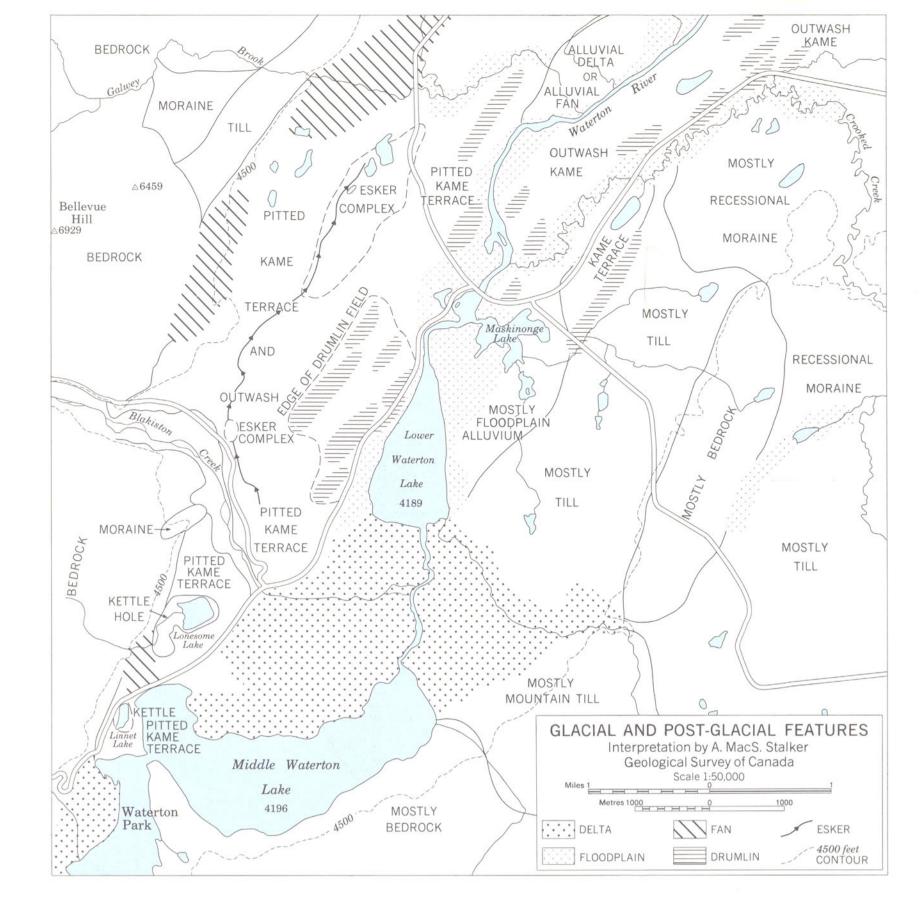
During the recession of the glaciers many depositional features were produced. Moraines were constructed along former ice fronts or ice margins beyond the park gates, in the vicinity of the juncture of Blakiston and Waterton

(K9). All these are poorly developed but a ridge crossing Chief Mountain highway (No. 6) near Sofa Mountain lookout is easily recognized as a moraine. Most of the other moraines along that highway between Waterton and Belly Valleys, such as those near Crooked Creek, mark the limits of the continental, rather than the mountain, ice. The melting glaciers also liberated vast quantities of water that was heavily laden with debris. This meltwater built the small eskers and kames found near the juncture of Blakiston and Waterton Valleys and near Belly Valley, and it deposited silt in several small, glacial lakes. Its most important creations, however, were the Kame terraces found in several valleys but most magnificantly displayed along the west side of Waterton Valley down-valley from the Prince of Wales Hotel. The flattopped, silt, sand, and gravel terraces found there were constructed by meltwater streams that flowed alongside the shrinking glacier lying in the middle of the valley. Blocks of glacier ice buried in this debris left depressions (kettle holes) upon melting; Linnet Lake, Lonesome Lake, and of course Waterton Lake occupy the most conspicuous of these depressions.

During the Little Ice Age (Neoglacial Episode of the geologists), which lasted from about four thousand years ago until fairly recently, ice reformed in many of the cirques and glaciers in the head portions of some valleys (e.g. Cameron and Blakiston Valleys), but it is unlikely that glaciers were present in the Canadian portions of either Waterton or Belly Valleys. Most of the side valleys display in their upper sections the typical flat floor caused by glaciation, but deep, V-shaped notches or canyons are incised into their lower segments. The stream erosion that cut these notches started when the glaciers withdrew up the valleys towards the end of the last major glaciation and has continued ever since, but it was most severe during Neoglacial time. Above those notched segments the Little Ice Age glaciers degraded the valley floors deep enough to destroy the notches, and there has not been sufficient time since for the streams to carve new ones. The glacier in Cameron Valley evidently advanced as far as Oil City, where the V-shaped notch starts. Blakiston Falls marks the change from U to V shape in Blakiston Valley. Snow lasts long into the summer at the south end of Cameron Lake; some years it does not fully melt, and a minor cooling of climate would see glaciers form there anew.

Waterton Park townsite lies on a delta built by Cameron Creek into Waterton Lake. The material forming the delta is coarse, and it was formerly thought that the delta was, in the main, constructed by meltwater from Cameron Valley towards the end of the last major glaciation and during the Little Ice Age. However, Cameron Creek added large amounts of coarse material to the delta during the flood of 1964, including boulders several feet in diameter, and much of the delta may have been built during such periodic, largescale floods which occur perhaps every few hundred years.

Blakiston and Sofa Creeks have built large deltas opposite each other on the west and east side of Waterton Valley respectively, effectively constricting the valley at the "Dardanelles" and so separating the Middle Waterton Lake from the Lower Waterton Lake. Unlike the Waterton delta, these deltas consist of fine material from normal stream deposition, though coarse material laid down by glacial meltwater may be present at depth. The two deltas are increasing in size as the creeks wander back and forth across them, adding material faster than Waterton River can carry it away at the "Dardanelles"



Waterton Lakes National Park is different from the other Canadian brush and mariposa lily are present in both the mountain and prairie regions. Further information on the flowers of the Park may be obtained from the parks because two major regions, the prairie and the Rocky Mountains, National Parks Service publication, "Wild Flowers of Waterton Lakes distinct in every way and vastly different from one another, meet and lie immediately adjacent to one another within the confines of the park. The National Park," which contains descriptions of the more abundant flowers Cordilleran or mountain flora stands in great contrast to the prairie flora.

large-flowered gaillardia, wild geranium, pasque flower, double wind flower

False hellebores, yellow columbines, avalanche lilies, Jacob's ladders

and bear grass are found in the mountains, while the aster, Indian paint

and balsamroot.

This is further emphasized by the sudden and drastic change in topography. Some of the more common shrubs found in the prairie part of the park There is only a narrow zone of what can be termed transitional vegetation are shrubby cinquefoil, bear berry, silver berry, dogwood, juniper, saskatoon between the two regions. The flowers present an ever-changing carpet of colour for most of the mountainous coniferous forest part of the park. summer season. Among the better-known prairie flowers are the wild rose,

and chokecherry, while the buffalo berry occurs most commonly in the The table below lists the most common species of trees found in the Park, and gives details as to how each species may be recognized. Since the

occurrence of each species is influenced by altitude, aspect, rock exposure,

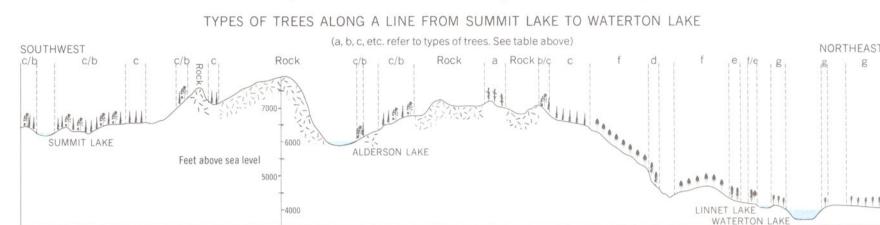
moisture, and soil conditions, a diagram is included to show the relationships

along a line from Summit Lake to Waterton Lake.

PRINCIPAL TREES TO BE SEEN IN THE PARK

THE VEGETATION OF THE PARK

	SPECIES	WHERE FOUND	AVERAGE HEIGHT		LEAF TYPE	OF TREE
а	ALPINE LARCH	Timber line tree 6.000-7.000 feet Not found on southern exposures: prefers moist, lee NE slopes	30-40 feet	Irregularly spaced, short, gnarled branches, often with dead branch stubs, give a ragged, unkempt look Scaly bark	Needles, 1-1½" long Pale bluish-green Arranged spirally Oval Cones, 1½"-2" long	The same of the sa
b	WHITEBARK PINE	5,800-7,000 feet Prefers dry SW slopes can grow on very thin soil, rocky ledges	30-50 feet	Mixed with other species, does not form pure stands in this park	Needles, 1½-3½" long in bundles of 5 Slightly curved Very distinctive egg-shaped cones, 1½-3"	
С	ALPINE FIR	5,000-7,000 feet Prefers well drained, loamy soils, but survives as smaller tree on dry soil	15-40	Crown is narrow and dense Short branches Spire-like top Second dominant species of the subalpine forest in Park	1-1¾" long, needles curved upwards, in bunches Greyish-green to pale bluish-green Oblong cones, 2½-4"	
d	SPRUCE (White and Engleman)	4,200-6,000 feet Wide distribution but prefers moist areas, gentle slopes	40-80 feet	Rarely forms pure stands Trunk has pronounced taper Crown is spire like Branches extend almost to ground	Needles, ½-1" long Four-sided in cross section, bluish-green Long, slender cones, 2" long	
е	DOUGLAS FIR	Prefers slopes with deep soils, moisture Commonly occurs on SW slopes in pure stands	40-60	Interior variety does not reach the majestic heights of coastal variety	Single linear leaves, %-1¼" long, bluish-green. Cones usually shorter than 3", narrowly oval	
f	LODGEPOLE PINE	4,200-6,000 feet Wide variety of sites	20-60 feet	Interior variety tall, straight, slender Forms very dense stands	Needles, 1-3" long in bunches of 2, stiff and sharp. Yellow-green tinge Cones 1-2" long	
g	POPLAR (Black Cottonwood, Balsam Poplar,	Lowlands, prairie fringe moist soil, marshy areas	15-40 feet	Slender, graceful trees Short crown Intolerant of shade	Egg-shaped leaves 3-5" long, dark green above, silvery green underneath Nearly circular leaves on aspen	*
	Aspen)			een, except for the Alpine larch and poplar which are e Trees of Canada" by R.C. Hosie (Canada Forestry		
		TYPES OF TREES ALC	NG A LIN	E FROM SUMMIT LAKE TO WATERTO	ON LAKE	
		la la	h a ata rafa	ar to tunos of trace. Con table about		



outside the Park

The four important native hoofed animals (ungulates) in the lower lands in the area were open range and public grazing lands. Park records canadensis canadensis Shaw), mule deer (Odocoileus hemionus hemionus (Rafinesque)), Yellowstone moose (Alces alces shirasi Nelson), and elk (Cervus canadensis nelsoni Bailey).

Bighorn sheep in Waterton Lakes National Park feed in the alpine and sub-alpine areas in summer, and either move down to the montane zone in winter or stay at high elevations on exposed, snow-free ridges, primarily on north- and east-facing slopes. They are rarely seen in the low-elevation grassland areas, except for a small herd which frequents the townsite area, and during the spring period when they are common on the low elevation grasslands which turn green before those at higher elevations. Their total number in the Park in 1971 was approximately 350 - 400 (Stelfox, 1971). In winter they graze mainly on grass-like species, whilst in summer they also feed on forbs, especially pod-bearing species such as Hedysarum mackenzii and species of Astralagus and Oxytropis.

past fifty years. Banfield (1947) estimated the number at 1,700. Since the number of elk in the Park increased in the 1930's, mule deer numbers decreased, falling to about 250 by 1971 (Courtney, 1971). Mule deer range over the whole Park, but are especially frequent in the aspen parkland - grassland transition areas. They graze on such preferred species as Amelanchier alnifolia, Populus tremuloides, Salix spp. and Cornus stolonifera. Large numbers of deer remain in the valley bottoms throughout the year where they frequent shrubby areas and forest edges, although they make extensive use of grasslands during spring and fall periods. They avoid deep snow in winter. In some areas where the preferred species have been depleted by elk, they feed on species of low palatability, such as Arctostaphylos uva ursi, Juniperus horizontalis, Shepherdia canadensis, and Potentilla fruti-

As white-tailed deer (Odocoileus virgianus ochrourus Bailey) seem to be better adapted to living near human settlements, they have been replacing mule deer in much of the aspen parkland in Western Canada. However, they have been described as "occasional visitors only" in Waterton Lakes National Park, and observations since 1947 show that the population is fairly stable, with 40 being recorded in 1971 (Courtney, 1971). They are found in the prairie-grassland, shrubland, and low-lying aspen woodlands

in the northeast section of the Park. Amongst the larger animals which prefer the shade and protection offered by the forests at middle elevations is the moose, the population of which Courtney estimated to be 30 - 40 in 1971. The first authentic record of an elk in Waterton Lakes National Park was in 1920. Migration from Glacier National Park and the Flathead Lake and Valley areas in Montana increased the numbers of elk considerably. In 1945, Cowan estimated their number at about 500, and in 1967 surveys by the Canadian Wildlife Service showed that this number had increased to about 700. Their winter feeding ranges, which include prairie, aspen parkland, and some mixed forest areas, are in the open or semi-open eastern foothills areas of the Park. Their summer ranges are generally at higher elevations in the sub-alpine and alpine zones, mainly

Before Waterton Lakes was established as a National Park, the grass-

valleys of the Waterton Lakes National Park are the bighorn sheep (Ovis indicate that in 1910 - 1911 there were about 15 square miles of grazing land, and during that winter approximately 15,000 cattle and 100 horses entered the Park for shelter and to graze. Although grazing was by permit only after 1915, there were still 2,900 head of domestic cattle in the Park in 1919. Grazing of domestic livestock was not prohibited until 1947, but private saddle-horses and saddle-horse concessions were still permitted. Since 1947 the former horses have been allowed to graze in special communal pastures within the Park, while horses from the concession stables may graze on a

four square mile area of fescue prairie on the Badlands. The pattern of elk grazing in the Waterton grasslands is largely a result of the movements of three herds of elk. Elk in the first two herds spend summer in the high mountains in the southeast part of the Park and over the United States border. They come down to lower elevations South of the Chief Mountain Highway (Highway 6) for the winter. The larger of the two herds spends the winter in the Belly River grasslands, and the smaller The population of mule deer in the Park has been large for at least the in the Stoney (Sofa) Creek area, and other grasslands on the East side of the Lower Waterton Lake. Part of Lookout Butte has been heavily grazed in the past but elk have not reached the area in recent years. Some of the elk

> must reach the Cardston road (Highway 5) but do not appear to cross it. The third herd of elk spends the summer in the Upper Galwey Brook -Horseshoe Basin area and spreads out at lower elevations in the winter. It is thought that they keep to the areas near the bases of Lakeview Ridge, Bellevue Hill, etc., but generally do not move out to the open areas. The prairie on the South-facing slopes of certain side valleys, notably Blakiston Creek, is frequented by bighorn sheep. Other native ungulates are relatively unimportant. Mule deer and white-tailed deer were common in the eastern areas but their browsing habit made them of little consequence in the open grassland areas. Mule deer and bighorn sheep compete heavily for grassland forage on the grasslands adjacent to the East and South slopes of Bellevue Hill, Mt. Galwey, and Mt. Crandell, especially during the spring period when both species are on a grass diet.

The Park has a display herd of about 15 - 20 plains bison (Bison bison bison Linnaeus), one of the two living races of bison recognized in North America. The herd lives in a large, fenced pasture between Maskinonge Lake and Bellevue Hill, an area of fescue prairie enclosed in 1952 when the herd was established. The prairie is characteristic of the original habitat of the plains bison, which is estimated to have numbered 60 million head in the late eighteenth century, but by the end of the following century had been reduced to about 1,000 head throughout North America.

Finally, mention of the larger animals in the Park would be incomplete without reference to bears. Both grizzly (Ursus arctos horribilis Ord.) and black (Ursus americanus cinnamomum Aud. and Bach.) bears are to be found in the Park. The adult grizzly tends to be heavier and taller than the adult black bear, and the grizzly possesses the conspicuous hump above the shoulders. The average park visitor is unlikely to see a bear in the Park, but those who walk the back-country trails, camp in the wilderness, or use the serviced campgrounds, may well. All bears in the wild are potentially dangerous, and visitors are advised to exercise extreme caution. A brochure entitled "Bear Facts" is available from the Park Information Centre.

HIKING IN THE PARK

The trails in the Park which are maintained by the National Parks staff

Since the prospective hiker may feel apprehensive about walking in such mountainous country, a simple classification of the trails has been undertaken by the Parks staff. This classification places each trail in one of the following classes, the class being shown in red alongside the name of the trail

> Difficult, denoted by A Moderately Difficult, by B Moderately Easy, by C

In addition, the time which an average hiker would take to walk the trail

Lake in Square J13. The trail climbs steadily until the last quarter mile,

There are a number of easy trails which can be walked by visitors of all ages, who are encouraged to explore them with the aid of the map. Further Walks, details of which can be obtained from the Information Centre.

and wilderness areas, a copy of the regulations should be consulted. To assist the hiker who is less experienced in the reading of maps, Trail Profiles have been drawn and reproduced here for selected trails in the Park. Each shows the general steepness of the ground crossed by the trail. The Profile also shows where the trail passes through tree vegetation, which will offer shade during the heat of the day. The locations of water supplies along the trail, camp sites, camp washrooms, and horse corrals are marked, as are the ground distances in miles along the trail. The prospective hiker can see that the trails have been laid out in such a way that, except for a few places, steep slopes have

When planning a hike the visitor should consult the pamphlet on the Trails of the Park, and the map. The visitor should examine the trail on the map and the country through which it passes. He should note the classification for that trail and the time which will be required to walk it. The picture will be completed if there is a Trail Profile for that trail. Remember that if the hiker intends to stop at points along the trail, or to travel leisurely when accompanied by less experienced walkers, then the time allowed should be increased

are shown in the map area overleaf. Each is named in red on the map, and in the Gazetteer there is a listing of these names. The map references for the terminal points of each trail are also stated so that the hiker may easily locate the ends of each trail and thereby follow the trail on the map.

is stated in hours, also in red. As an example, the Bears Hump Trail starts at the roadside near Linnet

where the final steep slopes are negotiated in a series of zigzags. Although the trail is rated as Moderately Difficult (B), it requires only an hour from beginning to end and the hiker is rewarded with a magnificent view South over the townsite and along the deeply-glaciated valley now occupied by the Upper Waterton Lake.

information may be sought from any Park Warden, the Park Information Centre, or the Administration Building; and a pamphlet on the Trails of the Park is available from the Information Centre. The Park Interpretive Program organized by the staff includes conducted Wilderness Hikes and Nature For those who contemplate longer hikes in the more mountainous

been avoided.

accordingly.

THE SIGHTS OF WATERTON

For many, the automobile will be the means of viewing the sights of the Park. National Parks staff have installed viewpoint indicators at three locations, to each of which you can drive. The indicators are at the Buffalo Paddocks (square O15); close to the Prince of Wales Hotel (J13); and at a point on Chief Mountain Highway some 4½ miles from the Main Entrance to the Park (J18). The wooden indicator shows the directions and names of the principal peaks which can be seen from the scenic viewpoint.

However there are other well-known scenic viewpoints accessible by vehicle, at which scenic viewpoint indicators have not been installed. To help the visitor become acquainted with the Park, panoramas have been drawn for a selected number of such points. When driving West along the road to Red Rock Canyon, fine views may be obtained from two points. The first (L14) is 1½ miles north-west of the junction of the road to Red Rock Canyon with the road from the Park Entrance to Waterton Townsite. From this viewpoint there is an impressive view South along the deeply-glaciated trench now occupied by the Waterton Lakes, a view which includes peaks South of the international boundary. From the second viewpoint, named Bison's Jump (M13), which is 2½ miles north-west of the road junction described above, there are interesting views to the Vimy Ridge area and of the peaks to the West including Mount Blakiston.

From the head of the Akamina Highway at the northern end of Cameron Lake (G7), the mountains of the Continental Divide can be seen behind the lake, which include Mount Custer and the Herbst Glacier across the border in Montana.

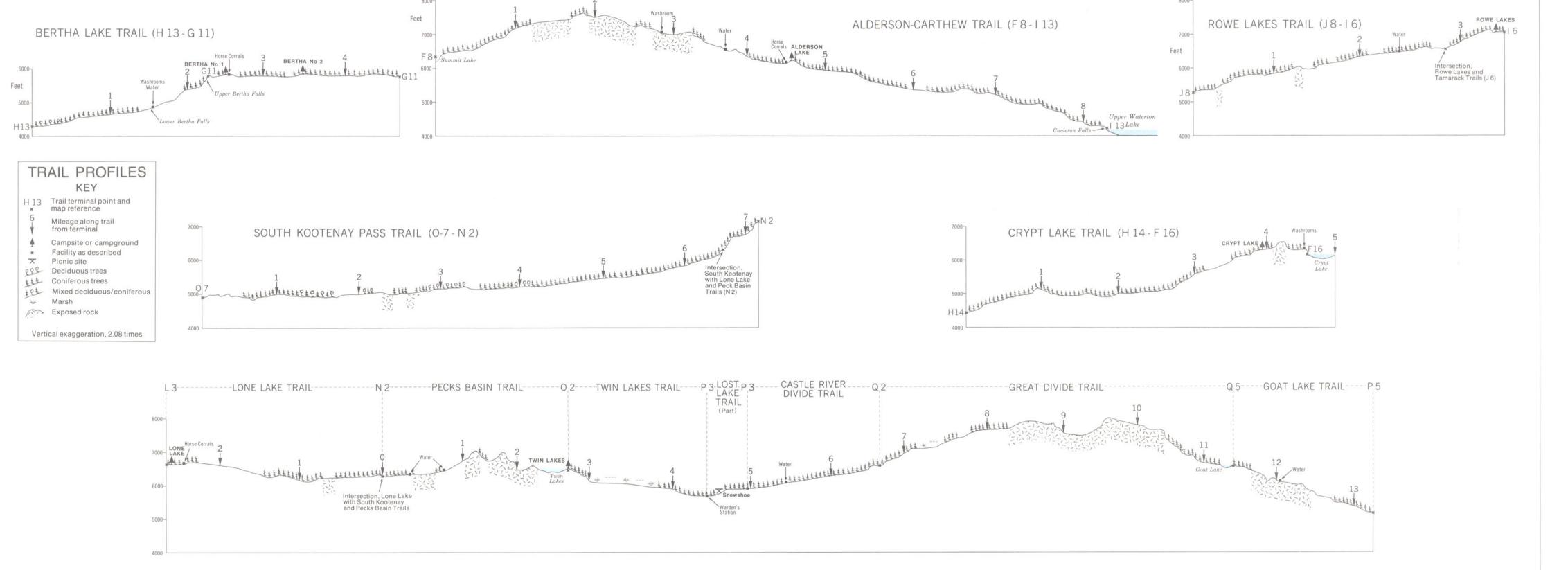
Finally, from the Belly River Viewpoint (F24) a number of peaks may be seen to the East of the deep glacial trough containing the Waterton Lakes. This impressive array of mountains lies in the Glacier National Park, Montana and in the Waterton Lakes National Park. The directions to distant peaks recorded on a wooden, scenic indicator,

or to named peaks in the panoramas shown on this page, may easily be related

to the detail shown in the map overleaf. If you are visiting a scenic indicator and wish to orientate the map properly; select one of the major peaks shown on the indicator, then locate the position of this peak on the map (you will find the name in the Gazetteer. together with the square in which the peak lies). The scenic indicator which you are visiting may be found on the map by looking for the appropriate symbol. Draw a line on the map to join the positions of the chosen peak and the viewpoint indicator. Rotate the map until this line on the map is pointing towards the distant peak you have selected. Other peaks named on the scenic indicator may then be identified on the map by searching clockwise or

anti-clockwise from this line. The same procedure may be followed when visiting a point at which a viewpoint indicator has not been installed, but for which there is a panorama. Select a peak from the appropriate panorama and then proceed as above to

draw a line which will help in orientating the map.



FISHING IN THE PARK

THE LARGER ANIMALS OF THE PARK

There are ample opportunities for the angler to exercise his skills in the Park, as the general information in the table below may suggest. However it is important to note that the occurrence of individual fish species in a particular lake or river is influenced by many factors, including the severity of the winter and the re-stocking of the lake or river by the staff of the Park. Fish rearing ponds are located southeast of Cameron Falls in the townsite (16 in the Gazetteer of Facilities overleaf), and are open to the public during advertised hours.

All fishermen over the age of 16 require a permit to fish which, together with fishing regulations and the current fishing bulletin, should be obtained from the Park Information Centre, the Administration Building, or from a Warden. If in doubt, consult a Warden about fishing conditions and the best way to fish.

WHERE TO FISH, AND FOR WHAT

AKAMINA G7 no improved trail ALDERSON (1) H 10 trail BERTHA (1) G 11 trail BUFFALO CR. PONDS N 16 vehicle CAMERON (2) F 6 vehicle CARTHEW - LOWER (1) H 9 trail CARTHEW - UPPER (1) G 9 trail CRANDELL L 10 trail CRYPT (1) F 16 trail GOAT Q 5 trail GIANT'S MIRROR 1 23 vehicle	S Jee Jee Jee Jee Jee Jee Jee Jee Jee Je	40 17 50 175 50 168 50 5 45 150 50 39 50 39 99 43	se rainbow trout	cutthroat trout	laketi	dolly varden trout northern pike	longnose sucker	white sucker	barbot	rocky mt. whitefish	lake whitefish
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