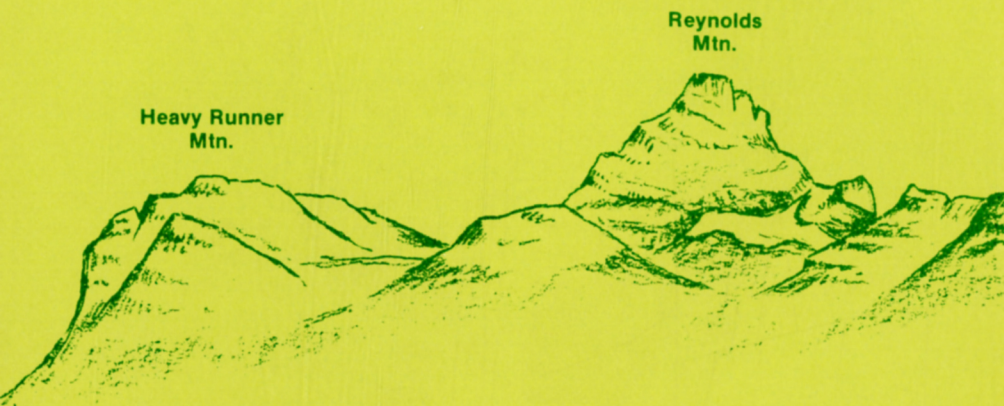




The Hanging Garden

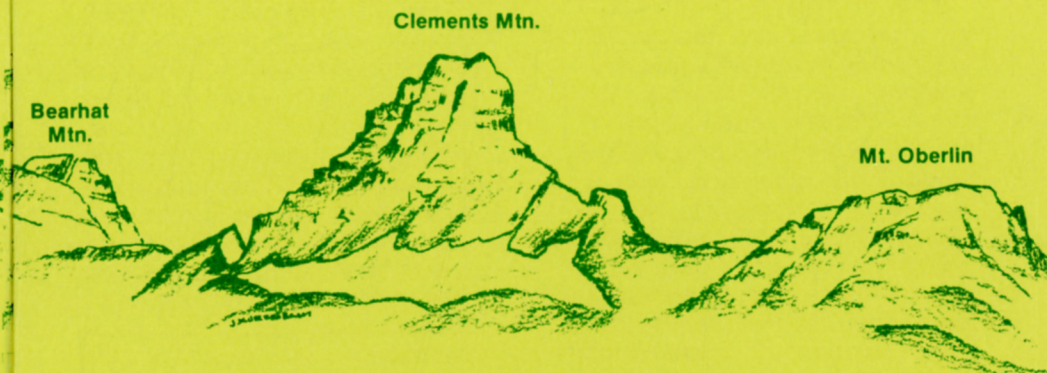
An Alpine Meadow Walk



View of the mountains

The Hanging Garden, not of the cultivated variety, is a bountiful array of colorful plants growing in a vast alpine meadow which is bordered by massive mountains and craggy peaks often gilded with snow. The seemingly endless vistas across the valleys are miles upon miles of pristine wilderness areas. This booklet may be read from any location on the boardwalk, so choose some unhurried places and discover, using the booklet as a guide, the unique intricacies of this alpine ecosystem.

This wooden walkway helps to control the random movement of people over the alpine meadows. The landscape evolved without people for millions of years. The hearty tundra plants survive satisfactorily in the severe climate to which they have adapted. It is only in relation to people that alpine plants are considered fragile. The vegetation is easily damaged and once destroyed some areas will require hundreds of years to rebuild to a natural and persistent ecosystem. Please remain on the boardwalk while enjoying the alpine gardens!



as you face the boardwalk

A chilling wind is an almost constant element in alpine areas. There is little warmth in the short, unpredictable growing season. The wind shapes the plants, erodes the earth, scatters seeds, spores, pollen, and distributes the snow.

Snow, also, is an ever-present possibility on these high slopes! Snow protects the plants from the wind and maintains a stable ground temperature which is often warmer than the erratic air temperature. But the weight of the snow compresses the plants beneath it, thus restricting their ultimate height while at the same time shortening the growing season.

Both these large gentle sloping meadows and the rocky ledges and moraines above are drained by a network of streamlets and creeks which are fed by the receding snowfields. This strikingly shaped land and the severe alpine climate limits the variety of plants that can grow here and, in turn, the number of animals. Even though the variety of plants is limited, there is a profusion of individual species which produces the patchwork splashes of plant color on the distant green meadows.

On the protected level slope about you, a meadow was formed. All alpine plants are small so that they are out of the worst of the weather and less energy is required for the production of their plant tissues. Most alpine plants are perennials, taking several years to develop, and depend upon a stable root system. Early flowering and frost resistance are essential for growth at this altitude.



Glacier Lily



Springbeauty



Fireweed



**Indian
Paintbrush**



Mountain Heath



**Red
Monkeyflower**

The showy alpine flowers change from week to week, but follow a general pattern of budding. In early July, you can see an abundance of yellow glacier lilies, white and pink springbeauties, and the yellow subalpine buttercup. By the end of July, these are replaced

by red monkeyflowers, red Indian paintbrush, purple fireweed, purple anemones, yellow hawkweed, yellow arnica and mountain heath, a small evergreen shrub with pink urn-shaped flowers. Flowering in early August are the purple aster and yellow St. Johnswort.



Hawkweed



St. Johnswort



Anemone



Krummholz

This alpine meadow is at timberline, the highest elevation at which trees grow. Interacting factors determining tree line limit are winter snow-cover, slope exposure, frozen soil, low temperature, dryness and wind. Tiny pockets of warmer air or spaces that are wind-protected enable small groves of trees to develop higher than the general tree line limit. The trees visible towards Bearhat Mtn. have advanced on just such a sun-warmed ridge.

The last groves of trees you pass through on the boardwalk are known as krummholz. Krummholz is a descriptive German word meaning "elfin timber" or "crooked wood." The subalpine firs so characterized are shrubby and dense, becoming more twisted and contorted as a result of the snow and the dessicating force of the wind. The wind blows up to Logan Pass from the west side and then down the St. Mary Valley. Notice that there are almost no tree limbs on the windward side of the tree trunks!



Cinquefoil



**Moss
Campion**



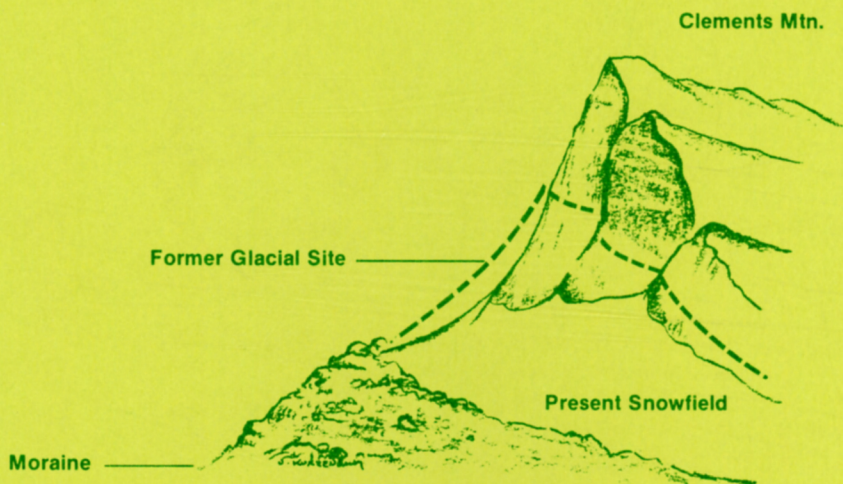
**Alpine
Willow**

As you continue walking along the boardwalk by the rockier areas higher up, notice that only about half of the ground has plant growth. This is an intermediary growth stage between the lichen-covered slopes of Clements Mtn., the mountain directly in front of you, and the plant-filled alpine meadows at the beginning of the walkway. Look here for the alpine grasses, yellow shrubby cinquefoil, pink moss campion and alpine willows that are only two inches tall! As these rocky ledges are further broken down into rich humus, more soil will be available for the growth of the largest alpine plants that are capable of survival in this area.

Only lichens can grow on the wind-abraded rock surfaces. An example is the yellow lichen on the slopes of Clements Mtn. Spongy lichen can survive in the driest places, and acids secreted by them help dissolve rocks into smaller and smaller particles, thus creating a thin soil. Mosses are also among the earliest plants to be able to grow in a given area. The remains of each successive plant contributes to the humus enrichment of the ground beneath. Tiny seedlings can then take root and more progressive stages of plant life will become established.

From the end of the boardwalk with almost no foreground to give perspective, the surrounding peaks and ridges seem dramatically near! Glacial erosion, primarily, has carved these mountains from some of the oldest, most well-preserved sedimentary rocks known. This landscape has been left intact since the last sheets of glacial ice melted some 10,000 years ago. Gem glacier, seen in the niche on the far side of the Garden Wall, was formed some 4,000 years ago and is so small that it, and the other glaciers visible today, performs only superficial sculpture work on the rock walls.

A main glacier is fed by many tributary glaciers. A tributary glacier flowed down from this cirque but was not as effective at deepening and gouging out these rock walls as the main glacier that flowed down the St. Mary Valley. So, when the ice melted away, this tributary valley was left hanging high above the valley floor, hence the name—hanging garden. Until just recently, a small glacier further eroded this alpine meadow. All that remains of the glacier is the snowfield at the base of Clements Mtn. In this sketch, the dotted lines outline the probable site of the former glacier. At the end of the boardwalk is a good view of the terminal moraine, the rock debris deposited when the glacial ice melted.



Once a glacier has retreated, the erosive effects of thawing and freezing continue to chip away at the remaining rock. When snow melts or when it rains, the moisture fills rock crevices. When this moisture subsequently freezes and expands, chunks of rock are broken off. Red boulders have thus been broken down and are

numerous along the boardwalk. Their smooth, polished surfaces are good evidence of the abrasive power of the glacial ice which works almost like a sanding block. Striations on the rock surfaces are caused by rock frozen into the glacier bottom scraping the underlying rocks as the glacier slowly flowed down from the mountaintops.

Mountain goats and bighorn sheep live among these seemingly inhospitable rock cliffs and ledges. These large, agile animals are vegetarians and find security on vertical footholds among the age-old rocks where few predators can reach them. For mountain goats death most frequently results from rock slides and avalanches. Watch for these nimble goats on the right hand slopes of Clements Mtn. or, turning eastward, look on Mt. Pollock. Sheep are most often spotted along the Highline Trail between Haystack Butte and the Garden Wall.



**Mountain
Goat**



**Bighorn
Sheep**



Grizzly Bear

As you scan the horizon, watch for the grizzly bear. This large, brownish animal is at home in these alpine meadows and may be seen digging for glacier lily bulbs or spring-beauty roots. The grizzly, who may be aggressive when encountered at close range, is normally a shy animal. This alpine meadow is an ideal place

for the grizzly to roam; however, the grizzly has recently become scarce in this area during the summer. It is imperative for the grizzly's survival that all alpine meadows are not as heavily populated by people as the Logan Pass area.

The gray Columbian ground squirrel, about 12" (30 cm) long, can best be seen at the beginning of the boardwalk. These ground burrowers are important because they help to create a porous soil which allows rain to soak into the ground instead of running off. Higher up, watch the tops of rock ledges for the hoary marmot sunning itself! It's about 30" (75 cm) long with white forequarters blending into a yellowish brown color toward the rear. Meadow mice might also be spotted as they scurry about the fields.



Columbian Ground Squirrel



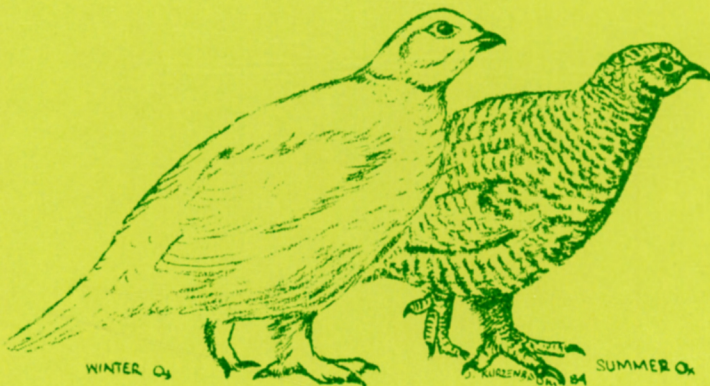
Hoary Marmot



Golden Eagle

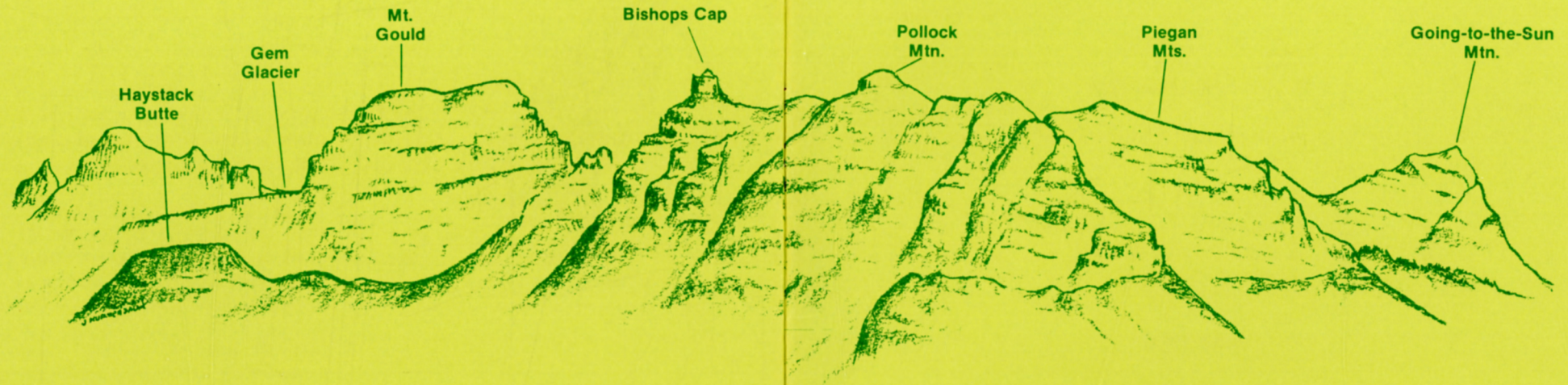
Soaring gently with the breeze, golden eagles look for hoary marmots and ground squirrels to eat. Sparrow hawks, mountain bluebirds, swallows and Rufous hummingbirds migrate to tree line regions such as the hanging valley after nesting in search of insects which are more plentiful in late summer.

Three of the birds that nest at this elevation are the water pipit, rosy finch and ptarmigan. The water pipit may build a nest on the meadow floor while the gray-crowned rosy finch is a bird of the rock ledges and snowfields. Only the ptarmigan is a year-round resident. Its plumage changes from a pure white during winter to a brown and white mottled appearance in the summer which best blends into the rocky terrain. The ptarmigan is a slow-moving ground bird which makes it difficult for predators to detect it. If you watch closely, you may spot one.



White-tailed
Ptarmigan

"GARDEN WALL"



View of mountains as

you face the Visitors Center

After you have returned to the Visitor Center, you may wish to remain a little longer in this alpine climate. Why not hike a little way along the

Highline Trail? There is a good chance that you might see at close range the bighorn sheep or the mountain goat.

The many moods of this alpine world are related to the elements. Here on the tundra, the clouds gather often in the late afternoon bringing needed moisture. The chilling wind may be gusty. But at times, the blue hues of the sky are vivid and the warmth of the sun's

rays seems such a treat! Only a few hearty plants and animals survive in this rigorous climate and rugged landscape. Perhaps the best thing we can do for the high country is to enjoy it briefly and then refrain from disturbing the natural progression of life in this alpine world.

Written by Barbara Blair

Illustrations by Jerry Kurzenbaum

This book was published by the
Glacier Natural History Association
in cooperation with the
National Park Service

June 1986

