Autumn arrives...

When the arctic gentian blooms.

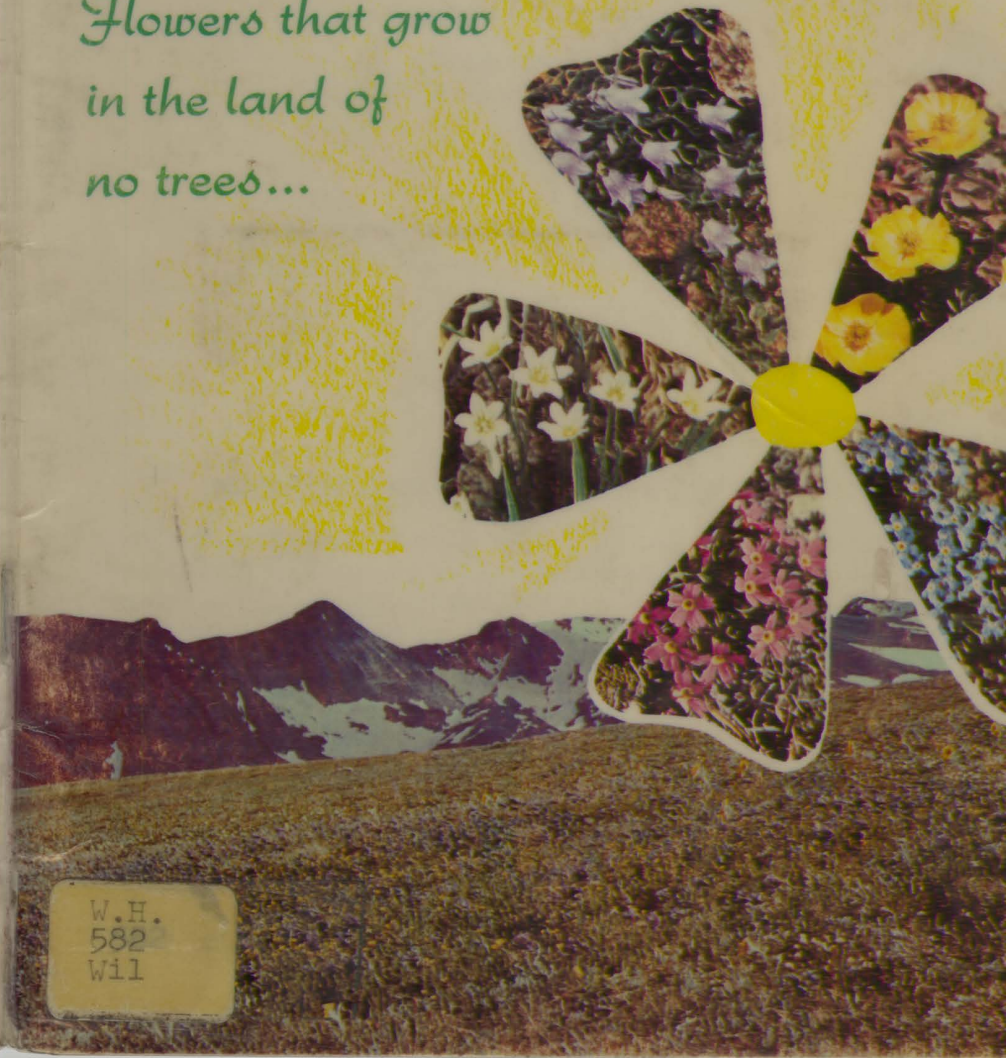
The first snows of winter...

Are soon to follow.

Alpine wildflowers

of ROCKY MOUNTAIN NATIONAL PARK

Flowers that grow in the land of no trees...



Published by the Rocky Mountain Nature Association,
Estes Park, Colorado

The Rocky Mountain Nature Association is a nonprofit organization which, as a cooperating agency of the National Park Service, Rocky Mountain National Park, assists in the interpretive program of the Park. The Association's activities include the publication of educational material pertinent to the Park, the encouragement of scientific investigation and research in the field of natural history, the development of the Park library, and similar objectives. Association publications may be obtained by mail from the above address.

in cooperation with the National Park Service
U. S. Department of the Interior

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ROCK ... PARK

Published by the Rocky Mountain Nature Association

Printed by Vivid Color Printing
Estes Park, Colorado

PREFACE

The fact that the flowers illustrated on the following pages have been shown in full color, in their natural settings, makes this booklet the first of its kind on alpine tundra plants in the United States. Three people are primarily responsible for the production of this work—Bettie Willard, who has spent the past five years studying the alpine tundra of the Park; Chester Harris, who was Assistant Chief Park Naturalist for more than four years and assisted Miss Willard in much of her work; and John R. Klein, whose excellent techniques of color printing and interest in this project brought the ideas of Miss Willard and Mr. Harris into realization.

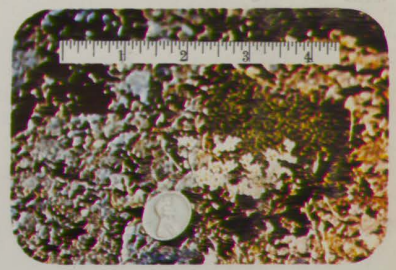
It is with great pleasure that we present this publication to the visitors of Rocky Mountain National Park.

(sgd) Allyn F. Hanks
Superintendent

FOREWORD

Ever since man has traveled in the Rocky Mountains, he has been lured by the small but brilliantly colored flowers that grow above the limit of trees. This publication illustrates a number of the more common and interesting of these flowers. Included are a few helpful facts about where, when, and how to find them.

All of the plants, except one, growing in this region are perennial; that is, they continue to grow year after year. The flower buds are formed during a previous growing season, and this enables them to burst into bloom at the earliest opportunity in summer. These photographs make these flowers appear to be as large as your rose bush at home; this alpine forget-me-not and draba, typical alpine flowers, present an idea of size.



The diminutive size, together with the short growing season, perennial nature, and fragility of these plants makes them particularly susceptible to damage by trampling. Therefore, you are encouraged to stay on established roadsides and trails.

Anywhere above tree line during the summer in the Rocky Mountains, particularly in June and July, you can expect to see some or all of these flowers. Alpine tundra vegetation is a complex mosaic of many different plant communities, intricately woven together and determined by such habitat factors as snow cover, wind, soil, and moisture. The wildflowers illustrated have been arranged according to the major types of ecological areas in which they will be found:

Alpine Meadows (pages 6—11), Fellfields (pages 12—15), Moist Areas (pages 16—17), Snow Accumulation Areas (pages 18—20), Rugged Pioneers (pages 21—22).

The common names used agree with *Plants of Rocky Mountain National Park,* R. A. Nelson, 1953; scientific names used follow *Handbook of Plants of the Colorado Front Range,* W. A. Weber, 1961.

ALPINE MEADOWS

Alpine meadows make up the largest part of the tundra regions of the Park. These meadows, windswept, free of snow in winter and well-drained, are characterized by a great variety of plants, predominantly grasses and sedges. All of the plants on the next six pages are found in these meadows.

Alpine avens

Geum rossii

Alpine avens is the commonest and most widespread plant of the tundra. In addition to occurring in the meadows, it is found in almost all areas above tree line. Rose Family.

Alpine forget-me-not

Eritrichium aretioides

Perhaps the favorite of all alpine flowers is this miniature. The brilliant blue flowers and delicate fragrance makes it unforgettable. White-flowered plants are sometimes found. Borage Family.

Rydbergia

Hymenoxys grandiflora

This sunflower, the showiest and largest alpine flower, is related to a number of desert plants. The common name honors an early Rocky Mountain botanist, Per Axel Rydberg. Although a perennial, requiring several years to mature, the entire plant dies after blooming. Sunflower Family.

Sky pilot

Polemonium viscosum

Sky pilot is the symbol of high altitudes in some mountain regions of the West. The plant usually grows in alpine meadow areas where the surface has been disturbed by gophers. Waterleaf Family.

Alpine wallflower

Erysimum nivale

So untrue to its name, this plant makes an attractive display. It has close relatives in the "parks" of lower altitudes. The blossom emerges first, leaving the less important business of stem growth until later. Mustard Family.

Greenleaf chiming bells

Mertensia viridis

It is not hard to imagine a dainty chime coming from these delicate bells. This is a close relative of the tall chiming bells, or American bluebells, of lower elevations. Borage Family.

Twisted pod draba

Draba streptocarpa

The golden draba adds to the blue-and-yellow phase which marks the mid-summer blooming of the tundra. Several related species are found in the Park; however, most are small and inconspicuous. Mustard Family.

Mountain harebell

Campanula rotundifolia

The nodding, bell-like flowers appear larger than those found at lower elevations, due to the normal sized blossoms on dwarf plants. This is the bluebell of Scotland and it is found throughout the Northern Hemisphere. Bellflower Family.

American bistort

Polygonum bistortoides

In late summer the tundra takes on a polka-dot aspect as these dense spikes of white flowers come into bloom. It is common in most habitats of the alpine tundra, is found below tree line as well. The usually white flowers are sometimes tinged pink. Buckwheat Family.

Viviparous bistort

Polygonum viviparum

A slender relative of the above, this plant has a novel way of reproducing. The flowers never produce seeds. Instead, tiny bulbs are formed on the flower stalk. These fall off during summer and grow a new plant. Buckwheat Family.

Wild candytuft

Thlaspi alpestre

Just as the snow is leaving the ground in late May and early June, these flecks of white appear, making this flower one of the earliest spring flowers, blooming in the foothills in early spring, above tree line in summer. A fine white powder that rubs off covers the leaves, giving the foliage a bluish appearance. Mustard Family.

Birdfoot buttercup

Ranunculus pedatifidus

Found infrequently, this buttercup derives its scientific name from the shape of the narrowly lobed leaves which are similar to that of birds' feet. It is found growing in all northern countries. Buttercup Family.

Alpine anemone

Anemone narcissiflora

The resemblance of the flowers of this plant to those of narcissus is striking, especially since this is a relative of the buttercup and narcissus is related to lilies. This anemone is found also in the European Alps. Buttercup Family.

Pinnate daisy

Erigeron pinnatisectus

Arctic daisies are the most common ones above tree line. Unlike their occurrence at lower elevations, daisies are not common flowers in the alpine tundra. Sunflower Family.

Moss gentian

Gentiana prostrata

Among the tiniest flowering plants of the alpine tundra is this very dwarf gentian. The petals are light-sensitive, closing when shaded by a passing cloud. Gentian Family.

Arctic gentian

Gentiana romanzovii

When the arctic gentian blooms in late August, the tundra is colored shades of bronze and red. Alpine autumn has arrived! (See back cover.) Found throughout the Northern Hemisphere, this gentian is thought by some to be characteristic of the Arctic, thus its name. Gentian Family.

Kings crown

Sedum rosea

One of the easiest flowers to recognize is kings crown. It blooms in July and by September the entire plant often turns a brilliant red. Stonecrop Family.

Alplily

Lloydia serotina

The fragile common alplily is characterized by its narrow leaves. It frequently grows in lines at the base of rocks. It grows in all northern countries. Lily Family.

Yellow paintbrush

Castilleja occidentalis

Paintbrushes, obviously, are not always red. Yellow paintbrush is one of the common flowers found in the alpine regions of the Rocky Mountains. The stems are unbranched, and the plant often grows in large clumps. Figwort Family.

Fairy primrose

Primula angustifolia

Among the earliest bloomers is the striking fairy primrose, made conspicuous by its color and time of blooming. It has many relatives throughout alpine regions of the world. Only 1 to 2 inches high, it is a favorite of flower lovers. Primrose Family.

Alpine androsace

Androsace septentrionalis

Blooming all summer, this tiny primrose-like flower is found in places disturbed by gophers and meadow voles. It grows considerably larger at lower elevations. Primrose Family.

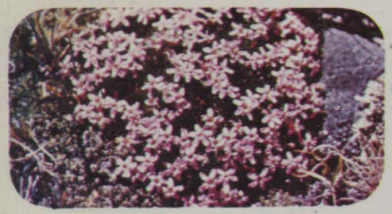
Snowball Saxifrage

Saxifraga rhomboidea

Blooming in April or May at the lower elevations, the snowball saxifrage is seen in summer in the alpine tundra. It is found usually in meadows disturbed by gophers or meadow voles. Saxifrage Family.

FELLFIELDS

Frost activity in the soil leaves many rocks on edge, a unique characteristic of alpine and arctic regions. The popular concept of high mountain regions is an area covered with rocks. This concept fits the fellfield ("fell" means "rock" in Gallic) more than any other community of the alpine. Since strong winds sweep across the fellfields at all times, very little snow covers them in winter. Therefore, plants living in the fellfield must be well adapted to withstand the severe conditions. Adaptation is accomplished by a cushion or mat form of growth. Some of these cushions are known to be several hundreds of years in age.



Moss campion

Silene acaulis

The most characteristic and easy to recognize plant of this community forms these perfect cushions. It grows in fellfields throughout the Northern Hemisphere. An extensive taproot enables it to live where the soils shift constantly. The narrow needle-like leaves give it the appearance of being a moss, hence the name. Pink Family.

Dwarf clover

Trifolium nanum

Dwarf clover has become exceedingly compacted through the process of adapting to the severe environment of the fellfield. The typical clover flower heads have become reduced to a few flowers of exceptionally large size which have practically no stem. This compactness protects the plant from the severe winds. Pea Family.

Alpine clover

Trifolium dasyphyllum

Alpine clover makes the most extensive mats of the tundra, which are very important in holding soil in place against wind and other soil moving forces. This plant retains typical clover flower heads, unlike its close relative, the dwarf clover. Pea Family.

Alpine sandwort

Arenaria obtusiloba

A typical cushion plant of the Rocky Mountains, the sandwort has relatives in the mountains of Europe, but none have developed such outstanding mat forms. Eventually, all mats are invaded by more erect plants, which over the years replace the mats. Thus, plant succession in the tundra goes on. Pink Family.

Rocky Mountain nailwort

Paronychia sessiliflora var. pulvinata

The most compact cushion of the group is formed by nailwort. Notice how bare rock can be invaded by these cushions, which have deep roots with only the cushion growing over the rock. This process ultimately covers rock with vegetation and soil. Pink Family.

Alpine phlox

Phlox pulvinata

In the alpine, this lowland plant has a semi-mat form. In July pale blue or almost white flowers cover the plant. It is one of the less frequently occurring plants of the fellfield. Phlox Family.

Rock willow

Salix anglorum

In slight depressions in the fellfields, where a shallow snow cover may develop in winter, this very tiny willow grows. The shrubby branches are completely prostrate and reduced to the size of string. It is one of the four shrubs of the tundra. Willow Family.

Least lewisia

Lewisia pygmaea

A close cousin to the Montana State flower—the bitter-root. Unlike its cousin, least lewisia bears live succulent leaves while in bloom, which shrivel soon thereafter. The genus was named in honor of Capt. Lewis of the Lewis and Clark Expedition. Purslane Family.

Yellow stonecrop

Sedum lanceolatum

Yellow stonecrop is found abundantly in rocky places throughout the mountains from low to high elevations. Succulent types of plants are common growth forms in dry places like fellfields. Stonecrop Family.

Mountain dryad

Dryas octopetala var. hookeriana

This typical arctic and alpine plant is found throughout the Northern Hemisphere. Having evergreen shiny leaves, a rambling habit, and woody stems the dryad requires high soil nutrient content. Here, it is restricted to soils high in calcium. Rose Family.

The showy seeds of mountain dryad frequently are mistaken for flowers. When ripe, the feathered style on the seeds enables them to be carried a considerable distance by the wind.

Water is one of the primary controlling factors of alpine tundra, as it is everywhere in the world. Certain alpine plants are limited to these moist places, which are sharply delimited and are especially striking in autumn when the rest of the tundra is dry. There is very little free surface water in the alpine, even in these sites. However, pools which develop behind terraces supply these communities with water throughout the growing season.

Nelsons willow

Salix planifolia

Around pools and behind large boulders, there is adequate protection for the growth of this truly shrubby willow. Whenever it grows beyond this protection, it is neatly pruned by the wind. Research indicates that the translucent hairs on the catkins operate like the glass on a greenhouse—allowing the sun to penetrate and warm the catkins by trapping the heat. Willow Family.

White marsh-marigold

Caltha leptosepala

The most characteristic plant of moist areas in the Rocky Mountains is the marsh marigold. Its water-lily-like leaves are very distinctive. Buttercup Family.

Rose crown

Sedum rhodanthum

True to its other name, queen's crown, this stately and lovely flower graces moist areas of the high subalpine and alpine regions of the Rocky Mountains. Stonecrop Family.

Alpine pedicularis

Pedicularis scopulorum

The alpine pedicularis has close relatives in the mountains of Europe. Found only in these moist places on the tundra, it is considered quite rare. Figwort Family.

Koenigia

Koenigia islandica

This is the ONLY truly annual plant that grows in tundra regions of the world. It has very specific demands on its habitat—not too warm (not in excess of 45°), constantly running water, little snow cover, no competition from other plants. Found throughout the Northern Hemisphere, it is always associated with a specific moss. These plants are in full bloom and measure about 1½ inches from the tip of the root to the top of the blossom. Buckwheat Family.

SNOW ACCUMULATION AREAS

The basic control of the pattern of alpine tundra vegetation is snow accumulation. The interaction of wind with the topography causes snow to begin accumulating in certain places in autumn. This snow does not melt out until the following summer, or later. Thus a very short growing season (6-8 weeks) results, to which only a few plants are adapted. However, these areas do afford plants considerable protection from the extreme alpine winters, for temperatures underneath 2½ feet of snow never drop below about 27° F., regardless of extremely low air temperatures above the snow. The plants shown here are indicators of snow accumulation areas.

Snowlily

Erythronium grandiflorum

Snow lily or glacier lily is perhaps the best known of the snow accumulation plants of the Rocky Mountains. As the snow recedes up the mountains, immense fields of this lily appear next to the snow. It is common on the west side of the Park, but very infrequent on the east side. Lily Family.

Sibbaldia

Sibbaldia procumbens

Throughout the Northern Hemisphere, snow accumulation areas are characterized by the presence of Sibbaldia which has flowers with tiny yellow petals and clover-like leaves. Unlike clover, the leaves have two notches in their tips. Rose Family.

Snow buttercup

Ranunculus adoneus

In the Rocky Mountains, this bright, shiny, yellow-petaled flower is synonymous with areas of snow accumulation. It characteristically bursts into bloom within hours after the snow is gone—or even before it is gone. Several seasons of growth form the bud that suddenly bursts into bloom on exposure to the correct temperature. Plants buried under 12 feet of snow have been observed with half-open blossoms. Buttercup Family.

Snowlover
Chionophila jamesii

Snowlovers were first discovered in 1821 on Pikes Peak by Edwin James, a botanist on Major Long's expedition to the Rocky Mountains. Both the common name and the scientific name convey the ecology of this plant. Figwort Family.

Black-headed daisy
Erigeron melanocephalus

Black-headed daisy is commonly found in areas of very late-lying snow, both above and below tree line. Its name might well be more correctly "purple-headed daisy", from the dark purple hairs on the under side of the flower head.

Parry clover
Trifolium parryi

Carpets of this plant, named for one of the early Rocky Mountain botanists, cover extensive areas of shallow snow accumulation. It is the most clover-like of the three clovers found in the alpine. Pea Family.

RUGGED PIONEERS

These are flowers that seldom grow in plant communities, but are found in places where there is no competition for light, water, or nutrients. They have little or no contact with other plants. This usually limits them to talus and scree slopes, rock crevices, or open frost scars.

Big-rooted springbeauty
Claytonia megarhiza

One of the most distinctive of the Rocky Mountain alpine flowers, big-rooted spring beauty has fleshy leaves arranged in perfect rosettes and light pink or white flowers peaking out among the leaves. As the name implies, the root may be over 6 feet long and 1 to 3 inches in diameter. Purslane Family.

Rocky Mountain columbine
Aquilegia saximontana

One of the rarest and most delightful experiences in the alpine tundra is to peer under a large boulder and find this beautiful miniature of the Colorado state flower blooming. Rocky Mountain columbine differs from the Colorado columbine by having short hooked spurs. Buttercup Family.

Alpine mountain-sorrel
Oxyria digyna

Throughout the Northern Hemisphere, alpine sorrel is one of the very first plants to invade gravel areas, especially in the wake of retreating glaciers. Its leaves taste pleasantly acid, resembling rhubarb and sheep sorrel. Buckwheat Family.

Alpine Kittentails

Besseya alpina

These dense spikes of flowers are 2 to 3 inches high, growing from a rosette of thick basal leaves. This plant is restricted to the tundra, although it has close relatives at lower elevations. Figwort Family.

Whiplash saxifrage

Saxifraga flagellaris

True of most pioneers, the whiplash saxifrage has an effective means of vegetative reproduction in the small "whips" like strawberry runners that bear a minute plant at their ends. Therefore, small clusters of rosettes of this plant are characteristically found in gravelly areas. It also grows in all northern countries. Saxifrage Family.

Goldbloom saxifrage

Saxifraga serpyllifolia

The name "saxifrage" means "rock breaker" in Greek, and these plants are frequently found in the cracks of rocks. The leaf rosettes strongly resemble the classical chrysanthemum symbol. The seed pods ripen to a brilliant red. Saxifrage Family.

INDEX

PHOTO ACKNOWLEDGMENTS (listed by pages and numbers)

Robert Barbee–15-1
Norman Bishop–15-3, 17-3, 18-2, 19-2
Margaret and John Douglass–5-2, 20-2, 21-2
Robert Haines–10-2, 24-4
Chester Harris–16-2
Ted and Lois Matthews–9-3, 11-3, 12-3, 14-1, 24-3
Harold and Rhoda Roberts–7-3, 7-4, 10-4, 11-4, 13-2, 15-2, 19-3
Bettie Willard–the remaining 41

*Listed under more than one flower color, since color is variable.