

DISCOVERY

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THE GEOLOGY OF WILDFLOWERS

A population of flowers can reveal ancient tales of the landscape dating back millions of years and provide us with lessons in geology, climate, wildlife biology, fire history, and an array of other scientific information. Photo: Karen Withrow

By **BETH PRATT**
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"To really understand what the wild flowers are doing, what the scheme of each one is, besides looking beautiful, is to give one a broader sympathy with both man and Nature and to add a real interest and joy to life which cannot be too widely shared."

Neltje Blanchan,
Wildflowers Worth Knowing, 1917

"The Yellowstone is a wild-flower garden. Wander where you will,

you have the ever-new charm, the finishing touch, the ever-refreshing radiance of the wild flowers."

Enos Mills,
Your National Parks, 1917

What's Inside...

- 50TH ANNIVERSARY OF THE HEBGEN LAKE EARTHQUAKE
- SPACE AVAILABLE IN INSTITUTE SUMMER COURSES
- EXPLORE! MOUNT WASHBURN TRAILS

Nature greets the arrival of spring as enthusiastically as we do, and celebrates with a festival of color. The spectrum of the land rainbow of the wildflower bloom soon banishes the memory of winter's monotone greys and whites. Even Yellowstone's subzero temperatures and blinding snowstorms eventually yield to the pink earthly stars of the spring beauties or the first tentative blue-colored buds of the marsh marigold. As Emerson once remarked, "the earth laughs in flowers," and laughter becomes abundant in Yellowstone as the snowfields retreat and surrender to spring.

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The dazzling beauty of wildflowers elicits our admiration, evokes gratitude toward nature for generously sharing with us her loveliest creations. Many an intrepid mountaineer remembers the joy of discovering the vibrant blue sky pilot nestled among the rocks like a colorful gemstone; a fisherman strolling along a stream bank cannot help but halt in his quest for a trout in order to admire the beaming, sunshine-colored petals of the yellow monkeyflower.

We appreciate wildflowers for their handsomeness; we should also appreciate them as chroniclers of time and place. Beyond their aesthetic value, wildflowers also tell a fascinating story, acting as interpreters of the natural world they inhabit. A population of flowers can reveal ancient tales of the landscape dating back millions of years and provide us with lessons in geology, climate, wildlife biology, fire history, and an array of other scientific information.



The marsh marigold seeks sunshine by extending blue-tinted buds through the melting snowbanks that transform into showy white flowers within 48 hours. Photo: Unknown

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**YELLOWSTONE
ASSOCIATION**

THE MISSION OF THE YELLOWSTONE ASSOCIATION

The Yellowstone Association, in partnership with the National Park Service, fosters the public's understanding, appreciation and enjoyment of Yellowstone National Park and its surrounding ecosystem by funding and providing educational products and services.

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Yellowstone's varied terrain gives birth to a diverse array of wildflowers. Thermal features raise heat-loving children; alpine tundra are the proud parents of hardy, small offspring. As wildlife evolve and adapt in concert with their landscape, so, too, do wildflowers. You would no more expect to observe a sky pilot in a foothill meadow than you would presume to encounter a bison grazing at the top of a 12,000-foot peak. A rose by any other name may smell as sweet, but an evening primrose transported from a dry, open site to a shaded, boggy meadow would not live long enough to transmit its fragrant scent.

Geologic Origins

The epic story of Yellowstone's wildflowers begins not with a tiny, germinating seed, but with the gigantic shifting of the earth's crust over the eons. To discover their geologic ancestors, to determine why the delicate alpine forget-me-not thrives on the slopes of Mount Washburn, or why Ross's bentgrass lives near thermal sites on the Firehole River, one must leave present day and journey back 80 million years to the Cretaceous era.

“Of all the branches of botany there is none whose elucidation demands so much preparatory study or so extensive an acquaintance with plants and their affinities as that of their geographic distribution.”

Sir Joseph Dalton Hooker,
director of Royal Botanic
Gardens, 1865-1885

Yellowstone’s turbulent geologic past shaped a varied landscape, where a series of transformations cumulated in the ecological system that supports the wildflowers we admire today. As Don Despain, author of *Yellowstone Vegetation* states, “Present vegetation is the result of past climatic forces.” His book accordingly divides Yellowstone into five geologic-climatic provinces, characterized by bedrock and soil type and the microclimate of each area. The gradual formation of these provinces occurred over millions of years, and each region’s distinct geologic genetics produces very different plant types, just as the genes of parents contribute to the eye or hair color of their children.

Over 90 million years ago, a visitor to Yellowstone would have gazed upon ocean waters and coastal swamps, felt a sticky humid breeze on their skin, and observed palm and fig trees growing on low hills. Approximately 80 million years ago marked the beginning of a major geologic event that significantly altered Yellowstone’s topography—the Laramide orogeny (orogeny is the Greek term for “mountain generating”). Through a series of geologic pulses throughout the next 30 million years, the Rocky Mountains slowly climbed out of the sea. The coast of the Pacific Ocean retreated to the Oregon-Idaho border, and since no mountains existed between the coast and Yellowstone at that time, the park retained a maritime-like climate.

When the Cascade Range emerged at the edge of the Miocene and Pliocene



The fleshy leaves of the bitterroot sprout excitedly from the ground, followed shortly by delicate rose-pink flowers. Photo: Pam Cahill

and limited the transfer of ocean moisture to the area, tropical species vanished; coniferous forests appeared; and Yellowstone’s climate assumed characteristics similar to modern day: cool-temperate to subarctic. With freezing temperatures possible every month in the year and snow accounting for a large portion of the precipitation, the growing season for most of Yellowstone is brief—June through August. Additionally, the majority of Yellowstone’s terrain derives its moisture source from the melting snowpack and spring precipitation, not from summer rains—another factor shortening the growing season.

As a result, the park’s wildflowers experience a botanical spring fever, knowing the days of plentiful sunshine and water are in short supply. Some of Yellowstone’s wildflowers attest to the truth of the Chinese proverb—“spring is sooner recognized by plants than men.”

Even before winter has fully retreated, the impatient marsh marigold (*Caltha leptosepala*) emerges from hibernation, seeking sunshine by extending its blue-tinted buds through the melting snowbanks, and blossoming into showy white flowers within 48 hours. Montana’s state flower, bitterroot lewisia (*Lewisia rediviva*) also appears anxious for spring. As the snow recedes, the fleshy leaves sprout excitedly from the ground, followed shortly by delicate rose-pink flowers.

Along with geologic uplift, a series of volcanic events built Yellowstone’s foundation with two primary materials: rhyolitic and andesitic. Most of the younger rhyolite bedrock in the central part of the park formed between 2 million and 76,000 years ago, while segments of andesite bedrock in the rest of Yellowstone cooled and hardened 70 to 80 million years ago.

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