

## On the Roof of the Rocky Mountains

The Botanical Legacy of Betty Ford Alpine Gardens,  
Vail's Alpine Treasure

By Sarah Chase Shaw

*On the Roof of the Rocky Mountains* establishes the Gardens as a destination for visitors to Vail, Colorado, a must-see venue, known as much for its beautiful gardens and iconic location as its educational and interpretive exhibits and world-renowned plant collection. The book will also validate the Gardens as a leader in alpine plant ecology and conservation.

With 285 full-color photographs, an artistically-rendered map, and over 22,000 words of text and captions, the global significance of the alpine environment is explained and revealed in detail. Plant and animal species are identified by both scientific and common names.

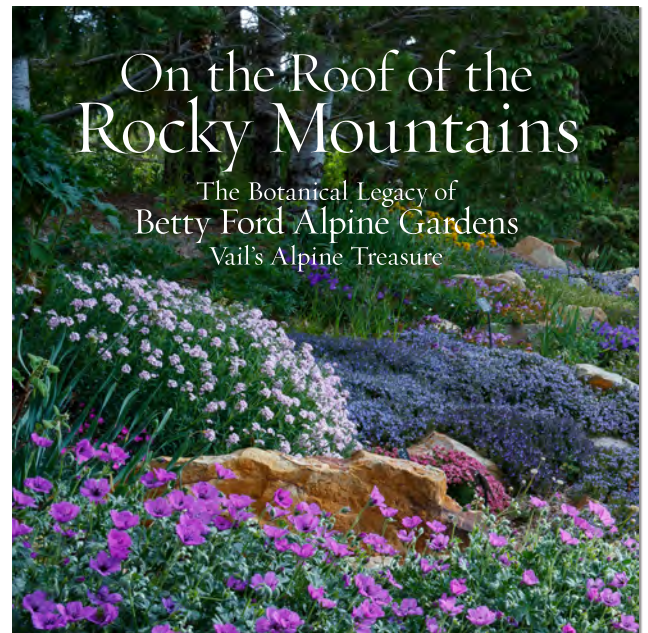
Organized into five chapters, the book opens with *Sowing Seeds*, recounting the history of a community effort to create a public garden in Vail to educate locals and visitors about gardening at 8,200 feet. In *Promote a Deeper Understanding of the Alpine World*, images of alpine and arctic tundra landscapes from around the world illustrate the unique ways in which weather and climate define life above the trees. The magnificence of the Gardens' plant collections is revealed in *Four Seasons in Betty Ford Alpine Gardens*. The Gardens' distinguished collections of alpine plants from around the world come into focus in *Guardians of the Alpine*. And, finally, the Gardens' educational outreach and its role as a leader in plant conservation is clarified in *Vigilance and Vision*.

Sarah Chase Shaw is a freelance writer based in Basalt, Colorado. A landscape architect by training, she specializes in writing about design and lifestyle in the American West. Her work has appeared in national and regional publications, including *Garden Design*, *Western Art & Architecture*, *Planning Magazine*, *Urban Land*, *Vail/Beaver Creek Magazine*, and *Aspen Sojourner*. She is the author of *Garden Legacy: The Residential Gardens of Design Workshop*, and *New Gardens of the American West*. Her most recent book *Living Beneath the Colorado Peaks: The Story of Knapp Ranch* received a Bronze Wrangler Award from the National Cowboy & Western Heritage Museum.

Short essays from noted botanical experts Panayoti Kelaidis, David Inouye, Richard Daley, Peter Raven, and Sara Oldfield accompany the photos and text. The Introduction is written by Nicola Ripley, Executive Director of the Gardens.

*On the Roof of the Rocky Mountains* is a tribute to the world of alpine plants and the important work Betty Ford Alpine Gardens is doing to promote research and conservation of global alpine environments in one of America's premier resort destinations. Named in honor of former First Lady Betty Ford, it is fitting that this world-class botanical garden is located within the Town of Vail's Ford Park, directly across from Vail Mountain, and a short distance from the center of Vail Village.

All Gardens' photography was taken by Vail-based photographers Todd Winslow Pierce and Dominique Taylor. Drone photography was taken by Brandon Huttenlocher. Global alpine imagery was sourced through Minden Pictures.



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## Audiences:

Horticulturalists, botanical garden enthusiasts, high altitude plant researchers, alpine zone scientists, visitors to the Gardens in Vail, and aficionados of outstanding plant photography.

## Interior page examples:

### The Garden's Role in Tourism Development

With the spotlight trained on Vail's vibrant summer season, the viability of a public garden was now a reality and the newly formed Board was granted another opportunity to develop a garden on a piece of land belonging to the Town of Vail. "Demonstrate to the community the educational and economic contributions that a public garden in that location can make," they were told.

Fundraising efforts, led by Helen Fritch and hotelier Sheila Gramshammer with their good friend Betty Ford were successful. However, instead of the straight-forward "landscaping" that the Town had envisioned, Marty Jones built a personal display garden, complete with rocky outcroppings, topographic changes, and even a small recirculating pond to show residents and visitors just how diverse gardens in the Rocky Mountains could be. Aided by Vail's cool temperatures and crisp, clear air, the Mountain Perennial Garden flourished. The Town and the community were delighted, and in July, 1988, Vail Alpine Gardens was officially named Betty Ford Alpine Gardens in honor of the former First Lady and her many contributions to the Vail Valley.

Indeed, with its new name and an enthusiastic public outreach campaign, the Gardens became a household name in Vail, brandishing its reputation amongst tourists and locals alike for promoting stunning floral displays both in its own gardens and throughout the town's quaint pedestrian streets. Suddenly, flower boxes were a mainstay of summer tourism. Store fronts, railings, and walls were adorned with colorful window boxes and flower pots; traffic medians and roundabouts were transformed into colorful ribbons of blooming bouquets.

Sponsors for many years of an annual plant sale, Gardens' board members organized a floral competition, recognizing outstanding gardens and flower displays throughout the Village and the Vail Valley. Helen Fritch and Marty Jones conducted summer wildflower tours and seed exchanges, encouraging locals and visitors alike to learn more about the ecology of Vail and the surrounding mountain environment. They offered horticultural advice as well, promoting native perennials and shrubs that would grow—and maybe even flourish—at 8,000' and above. Their goal was clear, recalls Jones. "We



Accompanied by Helen Fritch (left) and Marty Jones (right), Mrs. Ford cuts the ribbon to celebrate the opening of the Gardens on August 11, 1989 as Denver Botanic Gardens Senior Curator Panayoti Kelaidis looks on. ©BFG Archives

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### A Showcase of Native and Exotic Perennials Found in the Garden

Over 3000 species are featured in the Gardens' diverse collections. The following showcase offers a glimpse of the most common genera, or family groups, that can be seen throughout the Gardens during a typical growing season.

**Aquilegia:** More commonly known as Columbine, every species of *Aquilegia* native to North America can be found in the Gardens' collections. By far the smallest of them all, *Aquilegia jonesii* grows in limestone cliffs from Alberta, Canada, into Montana and Wyoming. **Botanical bit:** Rocky Mountain or Blue columbine (*Aquilegia coerulea*) is the state flower of Colorado and a lovely reminder of summer in the Rocky Mountains.

**Androsace:** With its stemless flowers and a width of only 3", *Androsace hebertica* is the smallest *Androsace* in the Gardens collection. A photograph of this species can be found on page 209. **Botanical bit:** These tiny, fragrant cushion rock-jasmines originated in the Himalayas, spreading throughout Asia to the Alps and Pyrenees in Europe. Some even managed to cross the Bering Sea land bridge into North America over 11,700 years ago.

**Campanula:** The Gardens' collection features approximately 50 species of *Campanula*, or Bellflower, ranging in height from a few inches to a few feet. **Botanical bit:** *Campanula* is Latin for "little bell," a reference to the tubular shape of many of the campanula flowers which appear to have evolved to be exclusively pollinated by bumble bees.

**Dianthus:** Alpine pink, *Dianthus alpinus*, is classified as a calcicole, a plant naturally adapted to grow in the chalky limestone soil found in the northeastern Alps of Austria. **Botanical bit:** Because many of the Gardens' rock garden plants prefer alkaline soil, much of the rock found in the Alpine collections is limestone, which is, by nature a natural soil neutralizer.



*Aconitum columbianum*  
Munkshood

*Aquilegia barnebyi*  
See page 120

*Aquilegia vulgaris*  
Clematiflora

*Aquilegia coerulea*  
See pages 198, 199

*Aquilegia elegantula*

*Aquilegia fabelata* v. *nana*

*Aquilegia jonesii*

*Aquilegia rockii*

*Aquilegia saximontana*  
See page 197

*Aquilegia scopulorum*  
See page 185

*Allium georgii*

*Androsace sempervivoides*

*Androsace villosa*

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The highest flowering plant on Mount Kilimanjaro *Helichrysum*, or everlasting flower, survives in protected areas up to 15,000 feet in elevation. A stiff and dry structure help the everlastings survive the dry conditions and frigid nights. Intricately overlapping petals close tightly at night, further protecting the flowers from cold temperatures and evaporation. ©Stan Gossner/NPL/Alaska Pictures



In the Himalayas, hardy and colorful plants can be found growing as high as 22,000 feet. The blue poppy (*Meconopsis horridula*) is a common sight in these mountain environments. This one grows near Mt. Everest in the Mt. Qomolangma National Park on the Qinghai Tibet Plateau in China. ©Dong Lai/NPL/Alaska Pictures

## Colorado's High Alpine

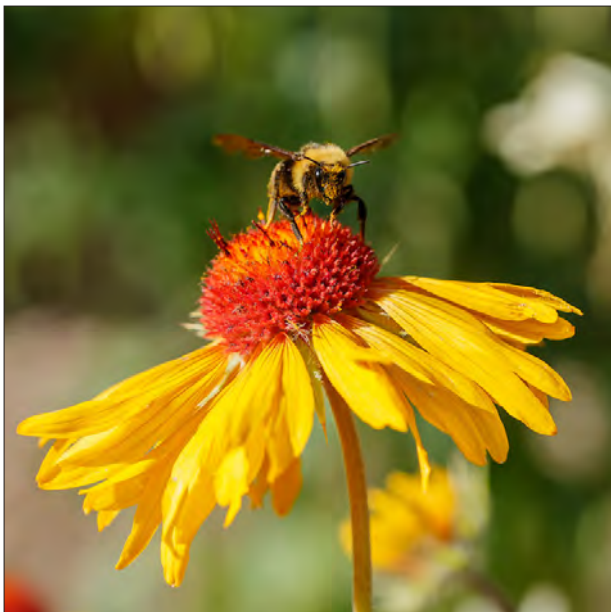
The Southern Rockies is an intercontinental alpine refuge that is part of a larger Northern Hemisphere mountain chain that includes the Central and Northern Rockies, and stretches from British Columbia to New Mexico. Mountains dominate the landscape in the Southern Rockies, a region that lies mostly in Colorado, but extends from the northern edge of the Laramie Mountains in Wyoming, to north-central New Mexico. The Gardens' location in Vail, Colorado, places it in the heart of this geographic region, where millions of years of cross-continental mountain building—known as the Laramide Orogeny—started in the Late Cretaceous period, over 70 million years ago, ending 35 to 55 million years ago.

Most of the mountains that exist today in the Southern Rockies are the result of uplift and glaciation. In the entire Rocky Mountain system, Colorado contains the majority of the highest peaks, ranging in elevation from 11,000 feet to over 14,000 feet. The Sawatch Range, located just south of Vail, contains 15 of the state's 58 "Fourteens" (peaks with an elevation of at least 14,000 feet, or 4270 meters) including Mt. Elbert, the tallest peak in Colorado, at 14,439 feet. Interspersed amongst the more than 300 peaks above 12,000 feet are scenic and ecologically important alpine meadows, fell fields, rock slopes, and tundra.

With 3% of its landmass located in the alpine, Colorado is home to the largest extent of accessible alpine tundra in the contiguous 48 states. Remnants of early mines—decaying log cabins, mine shafts and tailings, and even tools—can be found just at or below treeline throughout Colorado's high country, while roads and trails lead recreationalists deep into fragile environments. Too, Colorado's environmental riches have also attracted multitudes of scientists: more definitive ecological studies have been completed in its tundra environment than any other part of the country.



Treeline in Colorado's Uncompaghe Wilderness is marked by a colorful contrast between the green hues of the dense tufts of grasses and sedges and the rich, red soil. The word "Colorado" is Spanish for "colored red," an apt description for the red sandstone soil of the region. Photo by Jack Bauer



## A Walk Through Betty Ford Alpine Gardens

Vivid color, fluorescent and prismatic at its height, displayed on delicate, minuscule flowers with abundantly diverse and textural growth patterns: these are some of the characteristics that differentiate alpine gardens from all others. Often considered to be the most optically impressive of all botanical displays, they are a source of endlessly fascinating and ever-changing visual delight. Programmed to succeed against all odds regardless of elevation, latitude, geography, or hemisphere, alpine plants across the globe share a common characteristic: they have adapted to harsh climates denoted by frigid temperatures and short growing seasons. Survival of the fittest in an unforgiving environment means alpine plants bloom early, and they bloom quickly.

At 8,200 feet in elevation, Betty Ford Alpine Gardens is the highest public botanical garden in North America. A remarkable and unparalleled collection of over 3,000 species representing alpine environments around the world can be found within the compact five-acre grounds, a naturalized landscape that reflects the native Southern Rocky Mountains ecosystem in which it is located.

Species from Colorado to the Himalayas, and from South Africa to the European Alps, are managed by an internal clock that awakens them as soon as the sun begins to warm the soil, and in some cases, even before the snow melts. From that moment, a race to the finish line begins with each plant given eight to twelve weeks to accomplish what most other plants do in a six-month period: wake up, grow, bloom, produce fruit, seed, and go back to sleep. As a result, there is an ephemeral bloom time, both in the Gardens and in the wild, that extends from early-June to mid-August where waves of brilliant colors cascade over rocks, adorning boggy areas and stream corridors, carpeting the environment with a weekly rotating display of luminance and effervescence.

Pollinators and flowering plants have co-evolved to perform a well-timed dance. Here, a bumblebee's fuzzy body is the perfect carrier as it collects pollen necessary for the plant's reproduction, from a colorful *Gallianthus arvensis* flower. The protein-rich pollen and nectar will be carried back and consumed by the bee's growing colony. ©Gardner Whelan/IFGAC



The Education Center's green roof, visible from the upper deck, provides a natural insulation for the building, keeping the building warm in winter and cool in summer. Set against the west-facing walls of the building, the pollinator garden, shown here and in the photograph on the opposite page, features a variety of pollinator-friendly, non-invasive perennials including bothicks, Market flowers, goldenrod, Lamb's ears, and sagebrush. From the roof deck, views to Vail Mountain are visible through the protective canopy of adjacent conifer trees.

©Tall Windows Photo/EPAG



In September, autumn's fall glory is on display in Ford Park. From the Education Center, views to Golden Peak and Vail Mountain offer visitors a unique perspective of this internationally-known destination resort.

©Tall Windows Photo/EPAG



Trough gardening originated in 1930s England using discarded stone water troughs. Since that time, it has gained popularity, particularly with alpine plant enthusiasts, because of the ease of management and control it provides. The Gardens' collection of more than 40 trough containers remains outside year-round as an example of the convenience and benefits of creating an alpine garden in a small space.

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## ESSAY

### The Fragile Alpine Environment

The 1985 opening of the beautiful Betty Ford Alpine Gardens understandably delighted Mrs. Ford, who loved the mountains around Vail. She and her husband understood immediately that these Gardens would provide a unique setting in which to connect people of all ages with alpine plants and their environments. The institution has done so effectively for more than three decades and will continue to serve well in this capacity far into the future. Situated at a higher elevation than any other botanical garden in North America, Betty Ford Alpine Gardens displays the plants of the higher Rocky Mountains from where they occur nearby, to those that make up the changing communities that range from there up to the tops of the mountains, 5,000 to 6,000 feet above.

The gloriously beautiful Colorado Mountains that we enjoy today attained their present heights mainly during the past 26 million years of earth's history. As they were rising, glaciers were forming in polar regions, with cool temperatures spreading from the Arctic southward. During the most recent glacial period (10,000 to 10,000 years before present), as the mountains were being sculpted into their present forms, northern plants and animals spread far southward, and regional forests retreated for hundreds of miles to the south. As the temperatures warmed over the past 10,000 years and the glaciers retreated, forests migrated back into the region and climbed up the mountains to the current timberline at 11,000 to 12,000 feet in elevation. The tundra and alpine slopes above timberline are remnants of the vegetation that occupied all of the regional lowlands during the preceding cold period, receding up the mountains over the past 10,000 years as temperatures warmed. In these remnants survive plants and animals that form some of the finest scenery that exists anywhere on earth.

As human activities warm the climate beyond any natural limits, they progressively endanger the survival of remaining fragile alpine species. While we struggle to form international agreements that will slow, and eventually even halt these warming activities, they continue unchecked. Those who delight in the plantings at Betty Ford Alpine

Gardens understand what we are losing and are united in an effort to save what we have left. Direct action to save these communities, not only in Colorado but throughout similar regions across the globe, is being promoted actively by the Gardens under the leadership of Executive Director, Nicola Ripley. These activities have inspired the formation of a North American Strategy for Alpine Plant Conservation, which is a blueprint for botanical gardens to work together to protect alpine ecosystems in temperate and northern North America. Even if suitable habitats disappear locally, we need to find ways to save their plants and animals, like the pikas, that otherwise could disappear completely from the region. Learning about them and preserving them is exactly the sort of challenge that Betty Ford would have relished, and she would be glad to know that a garden named for her is doing such a fine job in accomplishing these goals. Please join this important battle by enjoying the Gardens, learning about the plants that it displays so effectively, and supporting its fine efforts in conservation.

—Peter H. Raven, a native of California, has studied plants for most of his life, consistently drawing attention to the need to conserve them. For 39 years, he served as head of the Missouri Botanical Garden, which reaches out globally with its message of research, education, and conservation. Among his many other accomplishments, he authored "The Biology of Plants," which has remained the world's leading textbook in botany for the past half century.

## The Alpines Collection

During the Ice Ages, rapidly advancing ice sheets and mountain glaciers pushed the ancient relatives of what are now recognized as alpine plants out of the way, ultimately forcing them to reestablish their range in a broader swath throughout the mountains of the world. Considered the ultimate opportunists, alpine plants have successfully evolved to occupy a unique ecological niche, maintaining a tenuous foothold in areas above treeline where an inhospitable climate—impenetrable and nutrient-deficient soils, rock and ice, and a short growing season—invites only the toughest plants and animals into its fold.

The Alpines Collection at Betty Ford Alpine Gardens represents a global cross-section of species from arctic tundra and alpine regions, including South Africa, the Western European Alps, the Caucasus Mountains, Central Asia and the Silk Road, the Himalayas, and the Rocky Mountains. What these landscapes have in common is rock, and in the Gardens, as in the wild, alpine plants have achieved a co-dependence with the rocky landscape, looking to it for protection and provision. Plants seek out tiny crevices, sending their roots deep into rocky fissures in search of water, nutrients, and minuscule soil deposits while their prismatic blooms and dwarfed stems branch, spread, mat, and mound, carpeting the sides and the tops of boulders and rock formations.

Specific areas with the Gardens are devoted to geographic collections, however, examples of species from other alpine environments throughout the world can be found in individual gardens as well. In some cases, a species' presence is experimental and random; in others, plants have been introduced as companions to compatible species from other geographic areas. While each geographic collection represents a unique area of the world defined primarily by latitude, hemisphere, adjacency to water, and elevation, the common factors uniting all of these alpine environments are simple: cold temperatures, frigid winds, ice, and snow.



A golden halo of pollen coats the stamens of Utah columbine (*Aquilegia scopulorum*). ©Tad Winkler/Peter D'AG

Following spring. In June, the Alpine Creevice Garden transforms into a magic carpet of effervescent alpine jewels, sparkling under Vail's brilliant blue sky. ©Tad Winkler/Peter D'AG



In August, Gardens' horticultural staff begin their annual specimen and seed collection trips to high-alpine areas in Colorado. Here, Curator of Plant Collections Nick Courtenay cleans soil from the roots of a Moss Gentian (*Gentiana prostrata*), collected on Mt. Evans. After cleaning, the plant is pressed and added to herbaria for future study. ©Christophe Teyssie/D'AG

## Protecting the Future One Seed at a Time

Climate change presents a special challenge for alpine plant species, particularly those categorized as rare and endangered for, unlike animals, plants can't readily move as their habitat is destroyed, making them particularly vulnerable to extinction. Already, warming temperatures are causing quick and dramatic changes in the range and distribution of plants around the world which means that species' conservation has, of necessity, become a major focus of most botanic gardens who hold many living collections and a mass of scientific data about plants.

At Betty Ford Alpine Gardens many of the rare and endangered alpine plant species on display in the Gardens' various collections were planted from seed that was collected in the wild or propagated on site. Visual and botanical treats, the very fact that they are thriving in Vail's cool, alpine climate illustrates the Garden's significant contributions to scientific investigation, species reintroduction, and broader efforts to encourage and support research, conservation, and educational activities.

*In-situ* and *ex-situ* conservation focuses on maintaining species diversity within or away from a plant's natural habitat, respectively. The conservation of certain plants in selected areas outside their natural habitat is known as *ex-situ* conservation, and botanic gardens offer multiple opportunities to do this, while also generating significant scientific data. Another way to gather information about threatened and endangered species is to actively utilize seed banks, which are essentially warehouses of healthy sources of native seed, collected and categorized to preserve genetic information. Seed banking is an efficient form of conservation and preservation intended to allow plants to survive in the face of climate change, natural disaster, disease, and human-caused habitat loss. Both *ex-situ* plant collections and seed banking are critical for present and future reintroduction and restoration of quickly disappearing alpine ecosystems.



Mount Elbert's moonshadow on the Sawatch Range, Colorado. Photo by Jack Eisner

## Trailblazing and Collaboration

The vast North American alpine ecosystem extends from the northern sea-level tundra of Canada and Alaska to the southern mountains of Mexico. Covering areas above 11,000 feet in the central Rocky Mountains of Colorado and the southern Sierra Nevada, it also extends west from the coastal volcanic Cascades to the top of Mt. Washington in New Hampshire. While many regard these vast ecosystems as largely conserved because they are beyond the reach of human disturbance, they are extremely susceptible to climate change.

Given the far-reaching parameters of this ecosystem, then, what should the role of botanic gardens be, particularly those that are positioned to play a unique role in alpine plant conservation? Certainly a national and international spotlight on mountain environments and a sense of urgency due to the evidence of climate change has helped influence public opinion and increased public interest in conserving natural resources. Now, more than ever, is an ideal time to carefully examine the effects that climate change is having on alpine ecosystems. "With some 140 million visitors annually, botanical gardens in the U.S. and Canada host nearly as many people as all professional sporting events combined," says Executive Director Nicola Ripley. "Gardens have an enormous opportunity to advocate on behalf of threatened ecosystems, and a substantial responsibility to influence public opinion in favor of conserving them."

### A Strategy for Alpine Plant Conservation Emerges

The Global Strategy for Plant Conservation (GSPC) was adopted in 2002, its focus to build awareness and a framework for finding solutions to address the threats facing plants and ecosystems worldwide. With 16 targets for plant conservation, the GSPC provides concrete global goals and objectives for plant conservation while also encouraging individual nations to develop their own strategies to support the overall protection effort.

Following the lead of the GSPC, Betty Ford Alpine Gardens created the North American Botanic Garden Strategy for Alpine Plant Conservation (Alpine Strategy) in 2019, the first of its kind to use all available information to provide guidelines for protecting a specific group of plants. As both the author and the leader of the Alpine