

ROCK GARDEN *Quarterly*



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COVER: *Castilleja* species and Native American petroglyph, eastern Oregon. Painting by Carol McLaughlin Kortnik, Joseph, Oregon (see "About the Artist," p. 64).

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ROCK GARDEN

Quarterly

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Contents

Unknown Colorado: Secret Treasures of a Higher State, PANAYOTI KELAIDIS	3
An Alpine Inspiration: The Betty Ford Alpine Gardens, NICOLA RIPLEY	10
New Plants for Colorado Rock Gardens, BILL ADAMS	13
Eriogonums for Year-Round Beauty, REBECCA DAY-SKOWRON	15
Colorado Cacti in Habitat and Garden, ROD HAENNI	18
Colorado's Campanulas, ANDREW PIERCE	20
Dwarf Conifers from the Rocky Mountains, CLARK COE	22
Dealing with Drought in Colorado, KIRK FIESELER	25
New Ideas for Rock Gardening at Utrecht, WIERT NIEUMAN	28
The Whittemore Garden in the Southern Appalachians, BOBBY J. WARD	31
PRACTICUM: Growing Penstemons from Seed, VIRGINIA MAFFITT	53
FORUM: Castillejas in Cultivation	56
BOOKS	
Nicholls, <i>Alpine Plants of North America</i> , rev. by CHRISTINE EBRAHIMI	58
Grissell, <i>Insects and Gardens</i> , rev. by MICHAEL K. YOUNG	59
A Colorado Plant-Hunter's Bookshelf, comp. by LORAIN YEATTS	61
NARGS Coming Events	65

SPECIAL ISSUE: Colorado, Host of the 2003 NARGS Annual Meeting

Each year, fortunate members of the North American Rock Garden Society plan to attend the Society's Annual General Meeting. Most eagerly anticipated are the annual meetings that take place in the continent's scenic mountains, like last year's in Alaska. Thanks to the Rocky Mountain chapter, one of the largest in both membership and geographic coverage, this coming summer we will convene in the Rockies and enjoy field trips on subalpine and high alpine trails. (See the Coming Events announcement in this issue for information on registering for the meeting.)

Colorado is home to a remarkably varied array of floral communities, ranging from semi-arid desert to alpine tundra where we will see some of the same plants that grow at lower elevations in Alaska. In addition, Colorado rock gardeners have spent the past several decades working with both native and exotic plants in a climate that is both demanding and, paradoxically, benign for many species.

Pre-conference events offer an opportunity to visit the famed Denver Botanic Gardens and newer Hudson Gardens, followed by a tour of Vail's Betty Ford Alpine Gardens. Curators from all three—Panayoti Kelaidis, Andrew Pierce, and Nicola Ripley—have contributed articles to this issue. Contributors Kirk Fieseler and Bill Adams will be among the skilled growers at the ever-popular plant sale. For those who can't get enough hiking in during the three days of the meeting proper (July 10–13), a post-conference field trip is also offered.

In this issue you'll find out about Colorado's climate and environment, its innovative gardens, and some of its lesser-known plant treasures. At the end of the "Books" section is a reference list for those who want to do more serious homework before summer arrives.

Many thanks to the authors who made this issue possible, and especially to Panayoti Kelaidis, Marcia Tatroe, and Loraine Yeatts for coordinating the contributions and providing supplementary photographs.

Unknown Colorado: Secret Treasures of a Higher State

Panayoti Kelaidis

I live in the densest urban corridor of the Intermountain West, and yet an hour in almost any direction can take me to untrammelled wilderness. I've spent the bulk of a half-century studying, planting, and building rock gardens, yet from my front window, on a clear day, I can gaze at the spine of the Continental Divide stretching for nearly 200 miles, rarely dropping below 12,000 feet (3692 m)—all pristine rock garden on a monumental scale. I have amassed a considerable horticultural library, and yet the plants that grow wild at the fringes of my garden, or in many of the mountains I can view, are absent, overlooked, or essentially nonexistent in horticultural literature. There are hundreds of mountain ranges and prairies throughout the West that few rock gardeners have visited, and fewer still have praised. Colorado contains the lion's share of high peaks in the West, yet everyone wants to go to the Bighorns in Wyoming. I like to go there, too; I sometimes wonder if the operative principle of life isn't paradox and contradiction.

If you have been on Mount Evans and Pikes Peak and therefore think you know Colorado, think again. Each passing year, I find more and more wonders in my back yard, and a floral bounty that equals anything I have seen in the Himalayas, the Drakensberg, the Andes, or the Alps. One must time a visit to Namaqualand or the Mediterranean carefully, lest the window of bloom be closed, but an unparalleled pageant of color unfurls every year in Colorado, from April in the Western desert to a crescendo in July on the tundra, August lush in the sub-alpine meadows, into late September when color peaks on the Great Plains.

Southern Colorado: A land apart

Possibly the most poorly known areas in Colorado are the southern counties, the farthest from the Front Range corridor and harkening to the Southwest. This region contains some of the most dramatic contrasts in North America. The San Juan Mountains are the largest mountain mass in Colorado, with thousands of peaks above treeline in an area the size of Connecticut. Summer rainfall

here can be torrential, and winter snows accumulate to great depths, making this one of the wettest mountain ranges in the interior United States (yearly precipitation over 100 inches/250 cm has been recorded in a few spots here). Within view of the snowy peaks lie some of the hottest and driest deserts in North America, where annual rainfall of less than 5 inches (12.5 cm) is not uncommon, and summer temperatures soar to nearly 115°F (46°C).

One of the commonest plants above treeline everywhere in the San Juans, and also in the Sangre de Cristo Mountains, resembles the “old man of the mountain” (*Hymenoxys grandiflora*) found elsewhere in Colorado. Look a bit closer, however, and you notice that *Hymenoxys brandegei* has more than one flower per stem. In addition, the flowering stem usually produces a basal offshoot that will bloom another year. Those who have grown *H. grandiflora* often wish it would live to bloom again. Their wish is granted: *H. brandegei* is accommodating and permanent in trough or well-drained scree.

On one remote steep meadow near Silverton, friends once invited us to examine a race of *Aconitum* that grew little more than 8 inches (20 cm) tall. The deep violet flowers were similar to *Aconitum columbianum*, but only ankle-high. The local botanists disparaged this find as a mere variant of the widespread species, but it's one that rock gardeners would love to grow.

What other anomalies do these vast mountains hide? I once found a wet cliff laced with Steller's parsley fern (*Cryptogramma stelleri*), a boreal fern far south of its other known occurrences. It had been found a few other times in Colorado, but this subarctic species, most abundant a thousand or more miles to the north, appears to grow at its lushest in the southernmost mountains in Colorado, almost within sight of New Mexico.

Not far away is the locus classicus for one of America's loveliest phloxes, *Phlox caryophylla* (photo, p. 37). Not only do the leaves resemble a dianthus (as the species name suggests), but the flowers too suggest a compact pink, and the fragrance has a whiff of carnation. Although it is known from many spots, the lush-est colonies we have ever found are in vacant lots in the pleasant but burgeoning town of Pagosa Springs.

Another specialty of southwestern Colorado is *Townsendia glabella* (photo, p. 36), the Western Slope cousin of *Townsendia hookeri* of the Great Plains. The foliage of *T. glabella* is smooth and almost succulent. The flowers often have a tinge of lavender. The principal difference we have noted is that the cushions of *T. glabella* can get quite large—up to a foot (30 cm) across in nature. In the garden, it doesn't tolerate conditions as dry as the eastern Plains species does, but good drainage is a must.

Western slope: Plateau and biodiversity

The transition from plains to mountain on the eastern face of the Colorado Rockies is a clean crisp line you can draw from border to border; the Western slope, by contrast, is a jigsaw puzzle of plateaus, desert, massive canyons, and

“sky islands” or isolated mesas. The biodiversity of western Colorado is consequently an order of magnitude larger than that of the eastern region. New species are being discovered all the time, and many unexplored corners remain.

Under duress, I would have to say that the Uinta Basin has been our happiest hunting ground. Straddling the Colorado/Utah border, this vast gentle bowl contains a lion’s share of rare endemic penstemons and other special plants of the Southern Rockies. Even familiar plants, like the Sego lily (*Calochortus nuttallii*), take on special qualities: usually pure white, in part of the San Rafael Swell pink forms are common, but in the Uinta Basin practically all the flowers are deep rose-red, often contrasting starkly with bright orange substrates. In some years—not necessarily wet ones—this dazzling bulb blooms in the millions.

Yucca species grow all the way to Canada on the Great Plains, but some of the most northerly yuccas and claret-cup cacti grow in Brown’s Park, a vast wild-flower garden centered on Dinosaur National Monument and the junction of the Yampa and Green rivers. The yucca at the western end of the Uinta Basin forms silvery blue rosettes and has been called *Yucca sterilis* because it seems not to produce seed most years. It is quite compact in nature, and a stunning garden plant. Even smaller and more desirable is one found around Flaming Gorge: tiny *Yucca harrimaniae* (photo, p. 37). I have had bloom stalks under a foot (30 cm) tall. A 20-year-old specimen at Denver Botanic Gardens has formed a trunk and is growing upward now, like a dollhouse Joshua tree (*Yucca brevifolia*).

Brown’s Park is one of America’s largest uninhabited regions (10,000 square miles with no permanent ranch or habitation), and it is practically encrusted with cushion plants and other floral treasures. The Uinta Basin flora lists 43 species of *Astragalus* alone, 30 species of *Penstemon*, and more than 20 of *Eriogonum*. Some, like *Astragalus spatulatus* (photo, p. 35), are found over a much wider range in Wyoming, Utah, and Colorado. In Brown’s Park, however, this species occurs not only in the typical bright pink phase but also in a strangely alluring straw-yellow with brown stripes. *Astragalus detritalis* occurs nowhere else, one of the showiest compact and growable milkvetches.

Some botanists have lumped *Penstemon acaulis* and *Penstemon yampaensis*, which are superficially similar, but at their type localities both represent quite distinct miniature gems, the smallest in the genus. Once thought to be very rare, *P. yampaensis* has now been found in vast numbers over a huge region; however, I believe *P. acaulis* to be quite rare and shrinking because of the rapid expansion of wheat farming in southern Wyoming. Neither is likely to become a common garden plant any time soon. *Penstemon yampaensis* can often be found growing alongside a silver-leaved cushion that for a few weeks in May or June is obscured by white or pale pink daisy heads: this is *Erigeron consimilis*, a slightly larger cousin of *E. compactus* from the Great Basin, with even whiter foliage. It has proven slightly easier to grow, too, and is particularly wonderful in troughs.

Another Western slope endemic is *Psilostrophe bakeri* (photo, p. 36), the showiest of this outstanding genus of Western daisies. The basal rosette is fluffy

with silky hairs, beautiful in its own right. In the garden it produces a dome under a foot (30 cm) high, covered with papery golden flowers; under the right conditions it can bloom from late spring to autumn frost. Locally it is called “paperflower” because the flowers are everlasting and rustle in the wind. A welter of psilostrophes can be found across the Chihuahuan and Sonoran deserts, most of them quite large with much smaller flowers. The largest-flowered and most compact is endemic to the Grand Valley of Colorado and Utah, and is perennial to boot. Alas, it is unknown in commerce.

For many visitors, the most alluring plants may be some of the commonest. The tiny rock paintbrush, *Castilleja scabrida*, can occur by the thousand in slick-rock habitat throughout the Uinta Basin and through much of the Great Basin and Colorado Plateau. We have been delighted to discover that it thrives in trough gardens in Denver (photo, p. 35), where one particular specimen chooses to be in peak bloom whenever the Rocky Mountain Chapter stages a spring plant sale. Needless to say, we find ourselves hefting the heavy trough to the sale year after year to show it off.

The *Intermountain Flora* declares that the Canyonlands portion of the Colorado Plateau contains the highest concentration of endemic plants in the United States. At first, the stark landscape, seemingly designed by a celestial landscape architect cousin of Salvador Dalí, is empty. But through the year, especially after good rains, the barren landscape blooms with an astonishing range of choice plants.

On the sheer red canyon walls, water can seep out, and a rich suite of endemics has evolved on what are called “hanging gardens.” In one canyon on the slopes of the Uncompaghere, Paul Maslin and I first stumbled on *Mimulus eastwoodiae*, a new record for the state. We were thrilled to find this in Colorado, where Alice Eastwood began her illustrious botanical career in the 1860s as a teacher at Denver’s East High School, just a few blocks from today’s Denver Botanic Gardens. This tiny cousin of *Mimulus cardinalis* has evolved to grow upside down on the wet surface of sheer rock. Whereas the more familiar cardinal monkeyflower grows several feet tall and wide, Miss Eastwood’s namesake rises barely an inch or two (2–5 cm) off the ground. It usually grows alongside the sticky-leaved, variably colored *Aquilegia micrantha*, and *Epipactis gigantea* is often not far away.

Not far above in pine woodlands, there are often large expanses of shrubby growth that closely resemble Californian chaparral. Several manzanitas occur here. The tall *Arctostaphylos patula* is found from Colorado to the western face of the Sierra Nevada and Cascades. Rock gardeners are more taken, however, with a compact, spreading manzanita similar to the *Arctostaphylos nevadensis* found at high elevations in California. Some botanists believe the compact plant in Colorado represents a hybrid between *A. patula* and *A. uva-ursi*, since both are often found growing nearby. Whatever its origins, *Arctostaphylos coloradoensis*, as it is now known, is a magnificent groundcover in Denver. We boast a colony of a few plants that now covers almost 100 square feet (c. 9 square meters) (obviously, it’s not for the small garden), requiring no supplemental water or any sort

of care beyond occasional hard shearing by nursery friends, who have probably kept the plant from swallowing half of our garden. It begins to bloom in late January most years for us, but it has yet to produce the wonderful fruits one sees in nature.

Alpine: The summit experience

If the state of Colorado would annex the higher portions of the Uinta Mountains of Utah, extend the state line to include the Medicine Bow of Wyoming, and realign the Sangre de Cristo mountains so they fall entirely north of the state line, then the bulk of the alpine flora of the Southern Rockies would become Colorado endemics. Alas, we are a generous state: we have shared small populations of *Erigeron pinnatisectus*, *E. melanocephalus*, *Gentianopsis barbellata*, *Papaver klunense*, *Primula angustifolia*, *Rhodiola rhodantha* (photo, p. 34), *Ranunculus adoneus*, *Senecio holmii*, and a hundred other treasures that otherwise are overwhelmingly concentrated within the boundaries of our state.

One of the least known of our shared treasures is *Delphinium alpestre* (photo, p. 34). This most congested and stunningly blue of North American larkspurs is found on a handful of peaks in central and southern Colorado, barely escaping along the spine of the Sangres into New Mexico. This dazzling alpine has suffered the insults of Reginald Farrer and even Graham Nicholls, who declare it “dull” (the herbarium specimens are unprepossessing, perhaps). A greater insult was inflicted on our dumpling by a regional botanist, who lumped it with *Delphinium ramosum*, a subalpine giant with a similar geographic range. Let us pass over this injustice in silence. As if in compensation, *D. alpestre* is a delight in cultivation, blooming for weeks and even months on end and living for years in a crevice garden.

The daisies of the Rockies are legion, and most are superlatively showy and adaptable to gardens. (I always chuckle when I remember that Tony Hall, the guru of Kew, suggested that the Rockies be renamed “the Daisy Chain” because of the abundance of Asteraceae here.) One of the commonest alpine daisies is *Erigeron leiomerus*, which spreads slowly at the root to make an extensive mat, with vivid bright blue daisies from spring through much of summer. *Erigeron simplex* (photo, p. 36) makes a denser clump. It has lived for years in both a crevice garden and a trough. Its 5-inch (12.5-cm) stems are topped with bright lavender or violet heads, showy for weeks on end. Both plants are virtually unknown in gardens outside Colorado—though perhaps not for long.

Oxytropis podocarpa (photo, p. 37) is an alpine pea with a fascinating distribution. In Colorado it can be extremely common in the Leadville Limestone areas of the Mosquito and Collegiate ranges. It reappears in the Northern Rockies of Canada, where it survived the last Ice Age on nunataks (unglaciated mountain summits). It is hard to decide if this brilliantly colored pea is showier in bright purple-blue blossom or when the flowers transform into masses of fruit the size and color of large purple grapes. Although I have managed to grow most

of the western *Astragalus* and *Oxytropis* species in containers or dry screes, this one has eluded me so far.

Troughs have proven to be the only place we can get the dazzling western alpine “sky pilots” to persist in cultivation. Many confuse the widespread *Polemonium viscosum*, with dark blue-purple flowers that are usually quite one-sided, with the smaller, paler blue, nearly spherical flowers of *Polemonium confertum*. The latter generally grows on very rocky ground, often stark talus slopes, whereas *P. viscosum* prefers turfey meadows, particularly if they have been cultivated recently by pocket gophers.

Great Plains and foothills: Graceful grasslands

The Great Plains often look to me like a vast sea of grass. If so, it is an anomalous sea, full of canyons, buttes, and corrugations. Here the rain falls mainly in summer, from May to August, and the flowering season is likewise protracted, with no violent spring rush as in the mostly winter-rainfall Great Basin. In fact, the Great Plains are never more showy than in late summer, when *Senecio longilobus*, *Aster bigelowii*, and *Mentzelia nudicaulis* paint the landscape with brush strokes of yellow, lavender, and glowing ivory.

Not all the treasures of the Great Plains are so showy: *Bolophyta tetraeuris* has special meaning for me because it grows almost entirely in barren rock outcrops around Pueblo, Colorado, one of my favorite places in the state. It was discovered by Rupert Barneby and Dwight Ripley, two of the most significant figures in twentieth-century rock gardening. This tiny cushion composite, related to *Guayule* and *Parthenium*, attains a noble end: the tiny gray flowers do not detract from the cushion form itself. It is painstakingly slow to grow from seed and does best in a xeric garden—obviously not a plant for the masses.

Near *Bolophyta* you are apt to find the gnarled shrub of *Frankeniania jamesii*, another plant not likely to appear at Wal-Mart in the foreseeable future. *Frankeniania* makes a bonsai-like mound of tiny, nearly evergreen foliage, usually under 12 inches (30 cm) in height and not much wider, except in specimens that may be centuries old. The dense mounds produce a sprinkling of pale pink stars for weeks on end in early summer. I treasure this strange plant not only because it is a wonderful specimen in the dry garden, but also because it must represent some link across ancient seas: its nearest relatives are mostly subtropical coastal waifs of different habit.

Lesquerella ovalifolia, another among the dozens of choice Arkansas River Valley endemics, grows with the previous two plants. It features trim rosettes, vivid yellow flowers, and bubble-like seedpods. But the tiniest and choicest of all lesquerellas has to be *Lesquerella alpina* (photo, p. 36), a huddled dome only an inch (2.5 cm) or so tall, eventually spreading 5–6 inches (12–15 cm) across; that is what our oldest specimens have attained in almost 20 years of growth. This universal plant of dryland bunneries all over Wyoming comes as far south as the Pawnee Buttes in northern Colorado. It reappears on the limestone sum-

mits of some of the highest peaks of central Colorado, and as a distinct subspecies in the piñon-juniper forests of Brown's Park. I know—it looks like a draba. So what? Some of us like drabas!

Another universal Wyoming steppe plant that sneaks into a few northern Colorado counties is *Sphaeromeria capitata* (*Tanacetum capitatum*) (photo, p. 34). This produces a woody, filigree mat of artemisia-like foliage and yellow lollipop flowers that are decorative through the summer. The plant has an uncanny resemblance to *Artemisia glacialis*, that challenging waif from the Alps. This most vigorous member of its genus is, by contrast, easily grown in well-drained, sunny scree or xeriscape in Colorado.

Just as yellow and congested but even less familiar is *Aletes humilis*, a very local umbellifer found on a few rugged hilltops in Boulder and Larimer counties. It is extremely similar in growth form and habit to *Shoshonea pulvinata* and a bevy of *Musineon* species that occur on outcrops across the Great Plains. All of these pulvinate umbellifers have intensely aromatic foliage, acid-yellow flowers, and fascinating swollen seedpods, appealing in their own right. They are very slow to grow from seed, extremely long-lived and drought-tolerant, and essentially absent from cultivation.

Cacti are discussed elsewhere in this issue, but I have to single out my favorite of the family: *Pediocactus simpsonii* var. *minor* is not a rare plant in Colorado; I have seen high mountain parklands studded for miles with thousands of baseball-, softball-, or nearly soccer-ball-sized mounds of this irresistible mountain plant, which usually has flowers of soft pink or pearly white. I have seen yellow flowers on plants in Brown's Park, but the loveliest form has the misfortune to grow on the Great Plains, at the foot of the Rockies between Boulder and central Jefferson County; that is, it is growing in the heart of the Denver urban corridor. This is the tiny snowball cactus, with pure white spines and flowers of the purest cerise, with a heavenly scent. Fortunately, several colonies persist on preserves, and it is well established in private gardens, so this most beautiful of native cacti should endure at least as long as there are rock gardeners to propagate it, and parks where it can hide.

Here, then, are a few of the treasures that I have sought out or stumbled upon as I explore the Colorado hills and plains. And they are just the beginning.

Panayoti Kelaidis is Curator of Plant Collections at the Denver Botanic Gardens and a longtime NARGS activist and contributor to the *Rock Garden Quarterly*. He and his wife, Gwen Kelaidis, also maintain a notable rock garden at their home in Denver and lecture frequently to garden groups.

An Alpine Inspiration: The Betty Ford Alpine Gardens

Nicola Ripley, Vail, Colorado

What makes a great rock garden? Is it great design, great plants, great rock, or a great location? All these garden elements are found in abundance at the Betty Ford Alpine Gardens in Vail, Colorado (photos, pp. 38–39).

Situated in the heart of the Southern Rocky Mountains, just west of the Continental Divide, Vail's narrow valley at 8200 feet (2485 meters) is surrounded by mountain peaks rising to around 13,000 feet (c. 4000 meters). The north-facing mountain slopes are cloaked in dense lodgepole pine (*Pinus contorta* subsp. *murrayana*) forest, and the higher slopes with Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*), with the tree line at approximately 11,000 feet (c. 3300 meters). Aspens (*Populus* spp.) and sagebrush (*Artemisia* spp.) dominate the south-facing slopes, which are bathed in strong sunlight most of the year. Most of the precipitation falls as snow in winter, with 4 feet (1.3 m) typically covering the garden from November through early April. Summers are dry, with warm days and cool nights—a climate in which most alpines thrive. Within this high mountain valley lies a masterpiece: the Betty Ford Alpine Gardens.

This small botanic garden was begun in 1987 by a group of volunteers eager to demonstrate to local newcomers that a great diversity of plants could be grown at this elevation. From the small demonstration rock garden, enthusiasm grew, and the Mountain Perennial Garden quickly followed. This sunken garden of perennial borders is based on an English theme, using hardy perennials and many plants from mountain regions around the world. These include Himalayan lilies (*Lilium* spp.) and “poppies” (*Meconopsis* spp.), the species peonies *Paeonia anomala* and *P. obovata* from Asian mountains, and showy plants from the Alps such as *Campanula thyrsoides* and *Eryngium alpinum*. Shadier corners are home to an array of primroses: *Primula chionantha*, *P. sikkimensis*, *P. poissonii*, *P. sieboldii*, and many others.

Diverging from the traditional, the adjacent Mountain Meditation Garden is a re-created alpine meadow around a tranquil lake, where Indian paintbrush (*Castilleja* spp.) grows with death camas (*Zigadenus elegans*) and golden aster (*Haplopappus acaulis*), with white arctic gentian (*Gentiana algida*) in wetter spots.

Of most interest to NARGS members will be the Alpine Rock Garden. In a spectacular natural amphitheater surrounded by high mountain peaks, this garden is one to activate the senses and excite the plant-lover. Dedicated in 2000, it displays the variety and beauty of the Rocky Mountain flora, especially high-elevation plants of the alpine and subalpine communities. About 1200 tons of rock were brought in to build the various sections. Because all this rock came from Colorado sources, the garden has a true sense of place, with native trees and shrubs interconnecting all the communities seamlessly. One large granite formation was transplanted piece by piece from local forest land near Buena Vista and reconstructed on site. By numbering the boulders and using detailed photographs, the builders were able to replace the boulders exactly as they had been found.

The site has a natural vertical drop of more than 40 feet (13 m), so Marty Jones designed the garden as a series of steep rock cliffs, with an accessible pathway winding up through the cliffs and steep stone steps cutting the loops like an enormous game of Snakes and Ladders. Through the center of the garden, a mountain stream rushes dramatically under a series of log bridges into a clear pool.

The garden is generally divided between south-facing dryland communities and west-facing moist subalpine and alpine areas, and within this into numerous specialized smaller gardens. A Colorado fen garden surrounding the base pool is home to native plants from wet, peaty soils, with many sedges (*Carex* spp.), interplanted with native orchids (*Platanthera dilatata*), cottongrass (*Eriophorum altaicum*, *E. spissum*), gentians (*Gentiana parryi*, *G. algida*), and blue-eyed grass (*Sisyrinchium angustifolium*, *S. idahoense*).

In the large dryland garden are plants of the high sagebrush plateaus, including many species of *Astragalus*, *Eriogonum*, *Lupinus*, and *Penstemon*. The west-facing subalpine walls are more shaded and are home to plants such as *Linnaea borealis*, the delicate twinflower, *Telesonix jamesii*, and many shrubby penstemons such as *Penstemon rupicola*, *P. fruticosus*, and others in the *P. davidsonii* group. The lower section of the wall is home to plants of the local alpine tundra, including *Polemonium viscosum*, *Penstemon hallii*, *Phlox condensata*, *Hymenoxys grandiflora*, *H. acaulis*, and the alpine poppy *Papaver kluanense* (rare in the state and to be seen on the Hoosier Pass field trips).

Saxifraga species from around the world are dramatically displayed in their own garden. Silver saxifrages, including the magnificent *Saxifraga longifolia*, and beautiful specimens of *S. valdensis* emerge from crevices in the wall. There are more than 100 different taxa documented in our database, with gems in the Kabschia group such as *S. × elisabethae* 'Icicle', *S. × boydilacina* 'Moon Beam', *S. × edithae* 'Bridget', and *S. × irvingii* 'Jenkinsiae' on display.

At the top of the garden, rock plants from around the world are grown in a crevice setting reminiscent of Czech-inspired construction. *Asperula pontica* sprawls next to very floriferous forms of *Lewisia tweedyi*, taking advantage of shady clefts between rocks. Tight buns of *Draba polytricha*, *D. rigida*, and *D. bryoides* dot the garden amid the array of flowers from about 20 different *Campan-*

ula species. Fresh from a recent expedition to the Andes, partially funded by a NARGS grant, plants such as *Calceolaria arachnoidea* with its white, hairy leaves and purple pocket flowers grow in the open along with *Calceolaria hypericina*, *Oxalis exigua*, and *Loasa filicifolia*. Exotic-looking *zauschnerias* (*Epilobium canum*) from Arizona and California color the ground.

Alpines in the rock garden peak in June, when drabas and saxifrages are at their best, blooming alongside mats of *Gentiana verna*. They are followed by pentstemons in midsummer, and later by *Campanula* species such as *C. troegerae*, *C. formanekiana*, and *C. versicolor*. The final show of the season comes from the bed of fall-blooming gentians. White forms of *G. sino-ornata* and vivid blue *G. farreri* bloom just in time for the first snowfall in October, and, unfortunately, they rarely get a chance to set seed.

Progress continued during 2002 with a new Children's Garden that is part of a large limestone complex. This limestone scenery is reminiscent of the nearby Mosquito Mountain Range and was inspired by the special plants of Hoosier Ridge and the Big Horn Mountains in Wyoming. The Children's Garden re-creates a hike in local mountains, displaying native plants of the damp cottonwood forests and the aspen woodlands up to the barren alpine tundra. Aspens only 3 feet (1 m) tall, dwarfed by the harsh elements, feature in the timberline zone; above that, the limestone screes are studded with familiar alpine favorites such as *Claytonia megarhiza*, *Arenaria obtusiloba*, *Eriogonum flavum*, pretty pink *Primula angustifolia*, and tight mats of *Trifolium nanum*.

Nicola Ripley is Director of Horticulture at the Betty Ford Alpine Gardens. With a master's degree in ecology, specializing in alpine plants and environments, she brings an English gardener's eye and a scientist's urge to collect and document these remarkable gardens. She will speak on ecological inspiration in rock gardening at the 2003 NARGS Annual Meeting.

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New Plants for Colorado Rock Gardens

Bill Adams

As the owner of Sunscapes Rare Plant Nursery in Pueblo, Colorado, I'm continually searching for new and exciting rock garden plants for my own garden and those of my customers. Over the years, I've found that the best way to find new plants is to grow them from seed. As winter approaches and the seed lists appear in my mailbox, I read through them exhaustively, looking for interesting plants that will endure heat, cold, wind, drought, and alkaline soils.

Experience tells me that I'll have a few successes from the seeds I order, together with many failures. If you're not familiar with the plant, you're at the mercy of the description—often better than the plant. Climate and growing conditions are also subject to some guesswork; often I've found that some plants from seemingly compatible areas do not want to grow in mine, and, conversely, some from apparently less ideal regions are perfectly happy with their new home. It's these surprises, both good and bad, that make prospecting for new plants so interesting.

Many of the experimental plants I propagate are planted out in my rock garden for testing. There, unfortunately, a significant number disappear, obviously unsuited to eastern Colorado. Others persist for a while but are not really happy and never develop as they would in their native habitats. A few, however, prove to be exceptional performers. I'd like to share several of those with you.

In fall of 1995, I received seed of *Salvia dorrii* (photo, p. 40) from my good friend and plant guru, Panayoti Kelaidis. This subshrub is a common inhabitant of the high plains of the western United States but has been used sparingly in horticulture. It has been claimed that this is the "purple sage" referred to in the Zane Grey title and the Western band, *Riders of the Purple Sage*; fame aside, it is an excellent performer in low-water landscapes. This beauty quickly develops into a specimen 12 inches high and 15 inches wide (30 by 38 cm), with stout woody branches covered with silver green rounded leaves. The evergreen foliage is slightly resinous and intensely aromatic. Spikes of small blue flowers enclosed in showy purple-blue bracts begin to appear in mid-May; flowering continues through June, with the dried bracts providing interest through much of the summer. Propagation is easy from cold-stratified seed, but I have found that

garden-collected seed, although plentiful, contains a large percentage of infertile material. The plant is cold-hardy enough as long as it has a reasonably dry, sunny, well-drained site. Since discovering *S. dorrii*, I've planted it often, and it never fails to impress me with its beauty and durability.

Following that success, I began to search for other shrubby salvias. I soon obtained seed of *Salvia pachyphylla* (photo, p. 40), a denizen of a region unfamiliar to me: the mountains of southern California. I had concerns about its hardiness, but I knew I always learned something about how to germinate the seed, even if the resulting plants were unsuccessful in the garden. In fact, I couldn't have been more pleased with the result: *S. pachyphylla* has been one of the most spectacular salvias I've encountered. Much like *S. dorrii*, it is woody, with the same silvery green, aromatic foliage, but the entire plant is twice as large. The blue flowers are surrounded by large, very attractive rosy purple bracts that are the most decorative part of the inflorescence. The color in the bracts persists for a very long time, extending the "flowering" season through summer and into late October. The dried bracts, together with a continuing succession of new flowers, provide a spectacular display, and the foliage offers interest through winter and spring. Seed is plentifully set and easily germinated without stratification; again, however, my garden seed displays limited fertility. Though not as cold-hardy as *S. dorrii*, this species survives our winters. It does not require xeric conditions and actually performs better if given additional moisture during the growing season. To my knowledge, *S. pachyphylla* is rare in cultivation outside California, and I enthusiastically recommend that you try it.

Over the years, I have had great success growing plants from the northern Mediterranean and Central Asia, since the plant habitats in that part of the world resemble those of eastern Colorado. A few years ago, I acquired seed of *Pelargonium endlicherianum* (photo, p. 41), a unique "geranium" that grows up to high elevations (7500 feet/2300 m) in the Taurus Mountains of eastern Turkey. The seed germinates sporadically but reasonably well when scarified before sowing. The young seedlings quickly form a basal caudex (swollen stem) that looks like a light green marble. As the plant matures, the caudex develops into a water-conserving organ that helps the plant survive periods of drought. The attractive rounded leaves form a dome from which emerge numerous 8-inch (20-cm) stems bearing large brilliant pink flowers. Flowering begins in late June and continues through July. My garden plants have produced limited quantities of fertile seed. Although drought-tolerant, *P. endlicherianum* does not seem to be particularly moisture-sensitive; plants require moderate moisture to perform at their best and to keep from going dormant. Cold-hardiness is not a problem: I've overwintered plants outside, unprotected in small pots, without loss. This is a winner for the rock garden.

I take great satisfaction in discovering and developing these new introductions and in sharing them with others.

Bill Adams is the proprietor of Sunscapes Rare Plant Nursery in Pueblo, Colorado (see the advertising section of this issue for details).

Eriogonums for Year-Round Beauty

Rebecca Day-Skowron

My appreciation for the richly diverse genus *Eriogonum* grows year by year. These are mainly dryland natives of western North America, commonly called Sulfur Buckwheat or Wild Buckwheat because of their triangular seeds. Eriogonums have been stellar performers in Colorado's 2002 summer of drought and extreme heat. The name *Eriogonum*, from Greek, means 'woolly knees', referring to the hair on the nodes of some species. Observing these plants in their full glory in the wild has inspired me to grow many fine forms in my gardens, where I created a feature called the "Badlands" to provide habitat for them. They thrive in their new home, constructed of sandy soil excavated from my greenhouse site, limestone rocks, and subsoil. Many eriogonum seedlings planted here at the height of our hottest summer have become decent specimens in this infrequently watered garden. Eriogonums grow much in character in this bed, retaining the size and form of their wild ancestors. I am reminded of some of my favorite places as I enjoy them in my garden; I also gain a little window into places I have not visited by growing species collected as seed by others.

I have observed many beautiful forms of *Eriogonum ovalifolium* in a variety of habitats. In Wyoming, a large form, *E. ovalifolium* var. *ochroleucum*, grows on the high plains chalk bluffs among *Penstemon paysoniorum*, *Ivesia gordonii*, and *Lomatium nuttallianum*. *E. ovalifolium* var. *purpureum*, an alpine form with glowing pink heads, intermingles with the reddish-flowered *Eriogonum caespitosum*, *Lewisia rediviva*, and *Phlox hoodii* in the rocky road cuts along South Pass. At Steens Mountain in south central Oregon, we observed three different varieties plus a hybrid growing in the scoria scree of this unique volcanic fault-block mountain. *Eriogonum ovalifolium* var. *depressum* (photo, p. 42) is a gorgeous silver mat surrounded by white globe-shaped blooms that age to bright pink, on prostrate stems. *E. ovalifolium* var. *ovalifolium* has yellow capitate heads over silver mats, stunning against the dark volcanic scoria. Its hybrid with *E. strictum* var. *anserinum* is similar, but with branching yellow flower stems.

Eriogonum caespitosum (photo, p. 42) forms large buns covered with short stems of yellow to red floral balls. In Idaho, we climbed a steep, rough road to a

level rock field full of dense polsters studded with scarlet pompoms—a choice form of *Eriogonum caespitosum*—looking like lollypop land.

A common sulfur buckwheat of the high plains is *Eriogonum flavum*. Slightly more robust than the previous two, it is a fine rock garden plant with dense, pretty yellow flower clusters. *E. flavum* var. *flavum* features yellow capitate heads that age to dark red, with green lanceolate leaves. There is an alpine form of this species, *E. flavum* var. *xanthum* (photo, p. 42), with smaller flower heads tucked into tight mats of relatively small silvery leaves. While many of the alpine struggled somewhat from the drought, the eriogonums were at their best.

One of the most variable species is *Eriogonum umbellatum*. An especially nice, dwarf mat form from Steens Mountain is *E. umbellatum* var. *dichrocephalum*, referred to as *E. umbellatum* var. *hausknechtii* in some sources. A showy, larger form (10–12 inches/25–30 cm) can be found near Bogus Basin, Idaho: *E. umbellatum* var. *umbellatum* has bright yellow umbels that color the steep roadsides of scree. There are many other excellent varieties that should be grown, all slightly different, and all tough performers.

In an avalanche chute of volcanic scree on the Oregon-Idaho border, I happened across *Eriogonum compositum*. This architectural plant has a sturdy stalk supporting a large umbel of yellow bloom. The triangular basal leaves were curled back from the drought, exposing their snowy tomentose backs. At 20 inches (50 cm), this is the largest eriogonum I grew.

Eriogonum allenii is native not to the Western drylands but to the shale barrens of West Virginia and Virginia. I had been growing it for several years in my xeric bed before I was informed of its origins. It is finally established, but it would probably benefit from a site with more moisture. In autumn, the large, felt-backed leaves turn a stunning red.

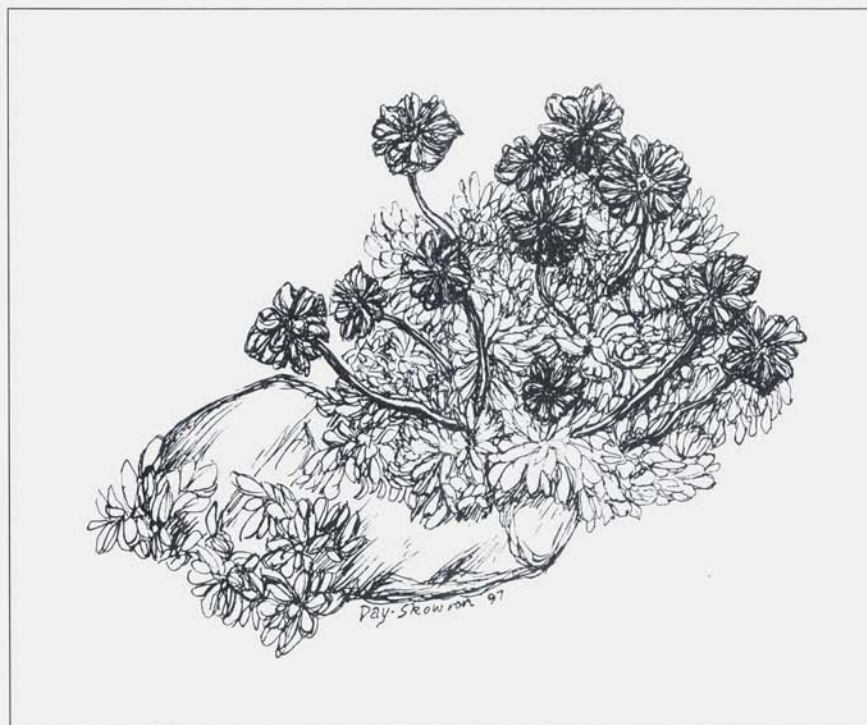
A couple of eriogonums are creating some confusion in cultivation. *Eriogonum kennedyi* and *E. wrightii* var. *subscaposum* form nearly identical mats of tiny silver leaves. According to the eriogonum expert, James Reveal of the University of Maryland, “In general, the inflorescence of *Eriogonum kennedyi* is always capitate while that of *E. wrightii* var. *subscaposum* is elongated and branched.” Both are excellent rock garden plants, requiring slightly more moisture than most others of the genus. I have a beautiful thriving swarm of the two, perhaps approximating how they grow in their home on Mount Pinos in the Sierra Nevada. This is in my low-water Badlands, but in heavy, fine-particled soil that retains moisture.

Three extremely choice dwarf eriogonums are found in rocky, fine mineral soils. They are difficult to please in cultivation but worth every effort. *Eriogonum tumulosum* has hard green buns studded with cream flower clusters. *E. shockleyi* forms sage-green mats with dense creamy umbels held just above the leaves. Both dwell in sagebrush-juniper scrublands of Utah. *Eriogonum acaule* (photo, p. 42) is found in the high, dry plain barrens of Wyoming, where it mingles with *Phlox bryoides* and *Astragalus simplicifolius* amid wind-polished rocks, one of the most fabulous natural bunneries I know. *E. acaule* forms perfect buns of tiny silvery fingers and produces sessile yellow flower clusters that age to rust.

Eriogonums are tolerant of a variety of climates, given full sun and good drainage. A gardening friend in Michigan has had great success with the genus, especially *Eriogonum ovalifolium* varieties. Some colonies have spread to a couple of feet in diameter. He feels a sand bed is essential in his more humid climate.

Easily grown from seed given outdoor treatment, eriogonums enjoy harsh climatic conditions and thrive while other plants struggle or die. In the present drought cycle, they should play a more significant role in our gardens. Unique blossoms and attractive evergreen or gray foliage provide year-round interest. I have photographed many eriogonums in the wild and in my gardens and posted them on an Internet picture gallery at <http://www.rmrp.com>.

Rebecca Day-Skowron and her husband, Bob, own Rocky Mountain Rare Plants (see this issue's advertising section), a premier source of wild-collected seed of the American West as well as of many exotic alpine plants that she grows in her superbly designed private garden, which will be open to attendees at the 2003 Annual Meeting. Rebecca is also an accomplished photographer and botanical artist.



Eriogonum caespitosum, Idaho. Drawing by Rebecca Day-Skowron.

Colorado Cacti in Habitat and Garden

Rod Haenni

A number of cacti native to Colorado are genetically able to survive temperatures down to -20°F (-29°C) without consistent snow cover. Most of these Colorado natives can be grown in temperate regions around the world in the same soil and light conditions as the sun-loving alpine plants typically cultivated in rock gardens and troughs. *Pediocactus simpsonii* grows at least as high as 10,000 feet (3077 m) in Colorado, as close as any North American cactus gets to true alpine conditions. *Echinocereus triglochidiatus* is found above 8000 feet (2461 m), and all the remaining species discussed below occur above 6000 feet (1846 m).

Colorado's subalpine climate is characterized by hot days (frequently above $90^{\circ}\text{F}/32^{\circ}\text{C}$) and cool nights ($50\text{--}60^{\circ}\text{F}/10\text{--}15^{\circ}\text{C}$) during summer, and by mild days ($30\text{--}50^{\circ}\text{F}/-1\text{ to }+10^{\circ}\text{C}$) and cold nights ($-20\text{ to }+20^{\circ}\text{F}/-29\text{ to }-7^{\circ}\text{C}$) during winter. Winter and summer, sunlight is abundant and moisture is slight (6–15 inches/15–45 cm of precipitation annually). Relative humidity is frequently below 30%. These climatic conditions cannot be duplicated in the Midwestern and eastern United States or in most of Europe, but several species of Colorado cacti can tolerate a wide range of higher moisture/humidity regimes if they have adequate light and excellent aeration around their roots. The sunniest and driest portions of a temperate rock garden, or troughs situated in full sun, provide near-ideal conditions for the cacti described below:

Echinocereus fendleri var. *fendleri* is uncommon in the state, found in isolated populations in south central and southwestern Colorado. The large (to 3 inches/8 cm diameter) purple flower is unique among Colorado cacti. Plants begin blooming when 3 inches/8 cm tall and may eventually offset and form clusters of several stems.

Echinocereus triglochidiatus var. *triglochidiatus* (photo, p. 45) is sparsely spined and bears spectacular deep red or red-orange flowers throughout May. Plants grow slowly into clusters 8 inches high by 18 inches wide (20 by 45 cm), but individual stems 6 inches (15 cm) high are mature and will bloom every year. This is the longest blooming of all of the hardy cacti, with individual flowers remaining open for as long as seven days. This cactus is commonly confused

with *Echinocereus coccineus* var. *coccineus*, which is more heavily spined and has orange-red dioecious flowers, frequently with sterile stamens. *E. triglochidiatus* var. *mojavensis* f. *inermis* is a striking spineless form that grows intermixed with normally spined plants in extreme western Colorado and into Utah.

Echinocereus viridiflorus* var. *viridiflorus (photo, p. 45) grows by the millions up and down the Front Range throughout Colorado into New Mexico, north into Wyoming and east into Kansas and Nebraska. Individual stems produce 1-inch (2.5-cm) yellow-green to traffic-light green flowers from late April through May. Tiny (1-inch/2.5-cm) stems are mature, and occasional clumps 8 inches (20 cm) tall by 12 inches (30 cm) wide are known from eastern Colorado.

Escobaria missouriensis* var. *missouriensis favors rocky areas along the Front Range and in widely separated locations in western Colorado. Plants offset readily and have soft white spines that leave much of the plant body in full view. Its flowers are brown-and-yellow and not spectacular, but the red fruits are persistent and showy for over six months, with the previous year's fruits alongside the current year's flowers. Flowering is in early to mid May; mature plants are 2–6 inches (5–15 cm) across and lie almost flush with the ground.

Escobaria vivipara* var. *vivipara is common throughout the uncultivated areas of Colorado's eastern plains and is also found in Denver's Front Range and scattered in the canyons and valleys in the southern and western parts of the state. Mature plants range in size from a golf ball to 6 by 8 inches (15 by 20 cm) and frequently form clusters up to 18 inches (45 cm) across. Spination can be white, brown, red, or a combination of these, and flowers are typically pale to deep pink and an inch (2.5 cm) across. Individual plants can have several flowers open at once and bloom throughout May and early June. The flowers last only a day or two, producing green fruit that ripens in September or October.

Pediocactus simpsonii* var. *simpsonii (photos, p. 45) is found at higher elevations to 10,000 feet (3077 m) all through Colorado and adjoining states. Spination can be gray, white, brown, or red; the 1-inch (2.5-cm) flowers come in shades of pink, flesh-pink, and white, and rarely cerise. Typical mature plants are 2 inches tall by 3–4 inches wide (c. 5 by 10 cm), but some reach 8 by 6 inches (20 by 15 cm) and can form clusters a foot (30 cm) across. This is one of the first hardy cacti to bloom each year, usually beginning in early April.

Of course, this brief list does not begin to explore all of the diversity present in Colorado cacti—notably, I have not discussed any of the *Opuntia* species—but it does present a few cacti with horticultural appeal combined with wide tolerance for a variety of climatic conditions. These cacti will also cohabit gracefully with other Western natives, such as penstemons, erigerons, and oenotheras.

Rod Haenni of Littleton, Colorado, maintains a large collection of approximately 300 species and varieties of hardy cacti, including almost all of the North American and South American species that can survive winter temperatures to –20°F. His collection also includes numerous cold-tolerant agaves, yuccas, nolinias, mesembs, sedums and sempervivums, as well as more traditional rock garden plants grown in several different rock gardens. Visitors are welcome anytime.

Colorado's Campanulas

Andrew Pierce

With only three species, Colorado isn't very well endowed with "harebells" compared to southeastern Europe, whence come a great number of the more than 250 species which we admire in rock gardens and at plant shows. However much they lack in variety, Rocky Mountain campanulas are ubiquitous and lovely in nature, offering color a bit later in the summer than many wildflowers, and one of the three species is quite adaptable in cultivation.

Campanula rotundifolia is common throughout boreal and alpine regions in much of the Northern Hemisphere. It grows at many elevations in Colorado, from the foothills almost to the top of the state's 54 "fourteeners" (mountains over 14,000 feet/4300 m). Few plants have so many common names: harebell, Scotch harebell, bluebells of Scotland, and the more fanciful lady's or witch's thimbles. Generally the pendent flowers range from light to deeper blue, even purple at higher elevations. In another manifestation of environmental variation, the plants at lower elevations have wiry stems up to 18 inches (45 cm), with several flowers per stalk, but in the high mountains they have much larger individual flowers on 4–6-inch (10–15-cm) stems.

The botanists have their day here, and from time to time there have been "splitters" such as Edward Lee Greene, who named a dozen or more subspecies. We can see the relationship of our taller forms to *C. rotundifolia* subsp. *groenlandica* from Greenland, but such differences are so minor that they are generally lumped together as *C. rotundifolia*. The species name, 'round-leaved', may appear to be a misnomer, but indeed a plant's first cluster of leaves are almost round, though they wither early so that this is not always obvious.

In the wild, Colorado's *C. rotundifolia* generally prefers sunny, rocky locations among broken granite or gneiss. They can be crevice plants. If they are growing in woodland, they will find sites with good drainage but will be less robust than in the open.

The plant is quite widely cultivated, including the white form, 'Alba', examples of which are occasionally seen in the wild. The variety 'Olympica' was introduced in 1931 by Will Ingwersen of England from the Olympic Mountains in Washington state (not Mount Olympus in Greece) and is still widely grown today.

Campanula uniflora, the alpine harebell, offers a sharp contrast. This diminutive plant is a native of open grassy areas in the subalpine and alpine zones. Also a circumpolar species, it is often missed by hikers because it is so tiny—just a couple of inches high, with solitary tilted flowers one-third inch (1 cm) long that barely open. It is the darkest blue of our three campanulas, often approaching violet, and blooms later into August. Carolus Linnaeus, who was familiar with it in his own country, originally named *C. uniflora*. It is difficult to find and photograph; I do not know of its being cultivated.

Campanula parryi (photo, p. 43) rounds out our trio. This plant is more restricted in its distribution, found mostly in the Rocky Mountain states rather than being circumpolar. It was collected by the botanist Christopher Parry on his many trips to Colorado during 1862–1876, when he had a cabin on Grizzly Gulch a few miles south of Clear Creek. Many of his specimens were sent to Asa Gray in New York, who named the plant after Parry. Growing between 7000 and 11,000 feet (2150–3385 m), it has a scattered distribution and requires a moister situation than does *C. rotundifolia*. *C. parryi* is often found as solitary plants in wetter grassy areas, but it can also form clumps in damp gravel. On one of the field trips at the coming NARGS Annual Meeting, we will see large clumps right by the trail that obviously relish the runoff.

The rather upright, open flowers of *C. parryi* are widely bowl-shaped, blue to lavender, 0.5 inch (1.3 cm) across, and carried singly on stems 4–7 inches (10–18 cm) high. The flowering period is July through August, and the individual flowers are long-lasting. The most attractive of our three species, it is not widely cultivated at this time. Panayoti Kelaidis says it is easy from seed or cuttings, but others call it difficult. We should take up the challenge and bring our best-looking campanula into rock gardens.

Andrew Pierce of Evergreen, Colorado, is Gardens Director at Hudson Gardens and Event Center. He has worked in horticulture for over 45 years, trained in England at Kew Gardens, and for the past 25 years in the Rockies. He has served two terms as chairman of the Rocky Mountain NARGS chapter.

Dwarf Conifers from the Rocky Mountains

Clark Coe

Dwarf conifers make an important contribution to the rock garden with their year-round evergreen presence, while providing a rich variety of shapes, foliage textures, and colors. Their character suggests their use as accents, anchors, or backdrops for the flowering plants.

Gardeners in the Rocky Mountain and Intermountain West often purchase dwarf conifers that have been grown in Pacific Northwest nurseries. Although many of these conifers can adapt to our region, a significant number are not suited to our climate. This has limited our choices.

Thus, great news for gardeners in our region, and other rock gardeners as well, is the work of Jerry Morris. Jerry is a retired landscape contractor from Lakewood, Colorado, who has become an expert consultant on native Rocky Mountain trees and shrubs, his true love. Over the years, in his free time he would head for the mountains. He is a modern mountain man, a consummate outdoorsman in all seasons and extraordinarily observant. Since youth he has hunted wild game to feed his family, and his hunting skills have served him well as a plant-hunter. He says, "The more you look, the more you see!"

In the 1950s, Jerry learned that an unusual dense-needed growth of small twigs he found on a ponderosa pine was a natural genetic mutation called a "witches' broom," and that cuttings from it could be grafted to normal rootstock to create dwarf conifers that would retain the character of the witch's broom. This opened a whole new world for him. From that time, he was on the lookout for witches' brooms and eventually discovered hundreds of them on spruces, firs, pines, and other trees. Jerry has recorded the locations of a great many brooms with horticultural promise and has named and taken cuttings from several hundred brooms for grafting. The photograph on p. 44 shows an unusually perfect little broom on the trunk of a bristlecone pine (*Pinus aristata*), which Jerry discovered and named 'Cheery'.

Upon retirement, Jerry was asked to be a consultant to the Alpine Botanical Garden, a private arboretum being developed for native Rocky Mountain trees and other plants on more than 100 acres (40 hectares) at the owner's mountain home near Aspen. In 1994, he was retained to devote half his time to advising the

arboretum and searching the Rocky Mountains for special trees and plants for the arboretum. Jerry has engaged all his talents in this search, traveling untold miles in the West. He favors the back roads and hikes promising mountain locations for countless hours. Along the way, he has discovered a host of new witches' brooms, as well as other plant material for his own use as well as for the arboretum.

Jerry is active in the American Conifer Society and is an internationally recognized pioneer in the introduction of Rocky Mountain dwarf conifers to horticulture. More than twenty of his cultivars now grace a berm at Denver Botanic Gardens, and another thirty are in Vail's new Alpine Rock Garden at Betty Ford Alpine Gardens.

Although Jerry has a greenhouse and an experimental garden plot, he doesn't have the time to propagate in quantity and to distribute his discoveries. Therefore, he has arranged with Stanley & Sons Nursery in Oregon to propagate and market his plants to wholesale customers. The latest availability list shows more than a hundred of Jerry's cultivars from nine Rocky Mountain species, and Stanley is growing and testing more than a hundred others that are not yet available.

Rock gardeners will now be asking how they can obtain these plants, still rarely available in garden centers. Fortunately, there will soon be a way. Stanley and five other nurseries operate a website, <www.aestheticgardens.com>, established five years ago to make their special plants available to retail customers. It lists the plants available with descriptions and some photographs, and an order can be placed through the website. Jerry Morris's Rocky Mountain dwarf conifer collection will be available by spring 2003.

A description of some of Jerry Morris cultivars in my garden or at Denver Botanic Gardens (DBG) follows.

Abies concolor '**Charmin' Chub**' (white fir; photo, p. 44) is a perky miniature globe with silvery blue foliage from Cucharas Pass in the Sangre de Cristo Mountains southwest of Walsenburg, Colorado. Propagated from a large broom with tight upward-pointing branches and named for Justin 'Chub' Harper of the American Conifer Society, it can be seen at DBG.

Abies lasiocarpa '**ShaLynn**' (subalpine fir) is a miniature globe with soft blue foliage, from the north slope of Mount Evans west of Denver.

Picea pungens '**J. James**' (Colorado spruce) is a dense globe of deep blue foliage, from Rifle Gap north of Rifle, Colorado; growing at DBG.

Pinus aristata '**BeaverDam**' seedling is a dwarf bristlecone pine. Some conifer brooms bear cones, and Morris grew seedlings from this broom from the north slope of Mount Evans west of Denver, selecting this compact globe of strong green foliage with silvery undersides.

Pinus aristata '**Fairplay**' (bristlecone pine) is a dense upright miniature with deep olive-green foliage, from north of Fairplay in South Park, Colorado; growing at DBG.

Pinus flexilis '**Damfino**' (limber pine; photo, p. 44) is a compact upright with dark green foliage, from Damfino Creek in North Park, Colorado, near the Wyoming border. (Presumably, one early fur trapper said to another, "What's the name of this creek?" and the response was, "Damn if I know!")

Pseudotsuga menziesii 'Pretty Doug' (Douglas fir) is a sprightly compact upright with bright green foliage, from a dwarf seedling tree growing underneath a tree with a broom in it at Six Mile Gap in North Park, Colorado.

Pseudotsuga menziesii 'Vail' (Douglas fir) is a stately, narrow upright with soft blue-green foliage, from west of Vail, Colorado; growing at DBG.

Selecting a planting site with the right measure of sun, shade, and wind, as well as soil and water characteristics, is very important for the success of these plants. In my experience, once dwarf conifers are established, too much water can cause the plants to grow too fast and lose their compact growth habit. These cultural requirements are well described in Clark West's article "Conifers in the Rock Garden" in the *Rock Garden Quarterly*, Summer 1997 (volume 55, no. 3).

Clark Coe, a longtime Denver gardener, began rock gardening in 1988. He has a strong interest in alpine and saxatile plants, and also conifers and broadleaf evergreens, from climates around the world that are similar to that of Colorado.

Dealing with Drought in Colorado

Kirk Fieseler

The year 2002 has seen records broken for high temperatures, drought, and forest fires in Colorado. As I write in October, we have had a total of 7.31 inches (18.28 cm) of precipitation at our nursery in semi-arid Fort Collins, where we average about twice that. Add two preceding dry years, and we are now entering a drought period that, judging by tree-ring evidence, has not been equaled since the 1600s. Next year could spell ruin for many in the nursery business, unless there is enough snow in the mountains to refill our reservoirs. Not only has the lack of precipitation (we don't really distinguish rain, sleet, and snow on the plains; if it's wet we'll take it, and we call it "precipitation") been disappointing; we baked this summer, with day after day at 90°F (32°C) or higher. The hot, dry weather took a toll on my attitude toward gardening and on my work ethic—a hammock in the shade was my main interest in the afternoons—but I did notice, between naps, that some of my rock garden plants thrived through this hot weather. Below I discuss certain genera and species that performed well for us this past year. Note that all our rock garden plantings are irrigated, however, with 10–12 inches (25–30 cm) of extra water over the growing season.

We grow a number of species of *Asperula*. Karen Lehrer, my partner, has developed a devotion to them, and thanks to her, I'm able to present the following species. *Asperula nitida* always surprises me; it looks fragile and mosslike, but it really stands up to the heat and drought. We have it planted on the southeast side of our rock garden, and now in fall it's still covered with pink flowers over delicate bright green foliage. Other vigorous asperulas that have done well this year in our display garden include *A. pontica* (photo, p. 43), *A. boissieri*, and *A. gussonii*.

Here in the West we have many gray-foliaged plants, with the genus *Artemisia* contributing its fair share. The one that has caught my eye, however, is a low creeper from Armenia, *A. caucasica* subsp. *caucasica*. It gets only about an inch (2.5 cm) tall and grows vigorously, forming shimmering gray mats 10 inches (25 cm) wide in one year.

I'm a sucker for just about any *Clematis*, especially the shrubby types. My favorites include *C. hirsutissima*, *C. columbiana* var. *tenuiloba*, *C. integrifolia*, and *C.*

scottii. This year, *C. texensis* has climbed through my daphne and into my heart. Bright red blooms adorn this weakly climbing plant. Its small Chinese-lantern blooms remind me of Christmas lights twinkling in the woody shrubs it laces through. It's hard to find the true species because it has been crossed with other species to produce rather similar named hybrids.

I've never grown many evening primroses (Onagraceae) before this year, but that will change in the future because of *Calylophus hartwegii*. This plant, similar to the better-known *Oenothera* species, has bloomed all spring, summer, and fall. Even if it didn't have 3-inch (7.5-cm) clear yellow flowers, opening morning and evening, I would plant it for its ornate flower buds, greenish yellow speckled with rusty red. They remind me of elongated, camouflaged eggs. This plant gets about 12 inches (30 cm) tall and has a loose, spreading habit.

Gladiolus have never interested me because of their lack of cold-tolerance. A good friend of mine grew glads, and I always admired his devotion to them; he dug, stored, and replanted his patch every year. My attitude has changed now, thanks to Panayoti Kelaidis and his promotion of *G. saundersii*. He gave me some plants five or six years ago, and they have proven winter-hardy. They have wonderful salmon-red flowers with white markings and are very drought-tolerant too.

We grow a lot of **penstemons** here in the West, and most do very well if we don't pamper them with too much fertilizer or water. I like the slower-growing types that don't get big and smother their neighbors. The following two, one native to the Pacific Northwest and the other to Colorado's western slope, have long names, woody growth, and evergreen leaves. *Penstemon davidsonii* subsp. *menziesii* 'Microphyllus' (photo, p. 43) is a slow creeper with large blue-violet trumpet flowers. It has been long-lived and quite vigorous for us. Its low habit protects it in the winter months, when frequent winds and alternating temperatures freeze-dry other shrubby penstemons from the Northwest. *Penstemon linarioides* subsp. *coloradoensis* has thin, grayish leaves, perfect for uniting different colorful plants in the garden around it. Its flowers are a good blue, but it's the gray foliage that really stands out even in the winter months. It is long-lived and has a tight growth habit as well.

Primulas are another group of plants I've always enjoyed growing, but this drought has been brutal for many species. Our native *Primula angustifolia* has failed to set seed the past two years owing to the lack of moisture. In my garden, *P. rusbyi* (photo, p. 43) has performed beyond all expectation, with many rose-violet blooms in spring and late summer. This species is native to New Mexico and grows in seeps, so as long as it gets a little extra moisture, it can take high temperatures and low humidity. Another surprisingly heat-tolerant species is *P. hirsuta*; my plants are well established and grow among north-facing rocks. This is a low-growing species with a deep root system well suited to withstanding short periods of drought.

Many true alpine can struggle when grown outside their native habitat. Is it the soil, the lower altitude, the heat, or any of a myriad other factors? A heat-tolerant alpine that has done well in my garden for the past few years is *Silene*

acaulis. It has bright evergreen, flowing pads of hard foliage that I find most attractive as it slowly grows over the rock mulch. It's one of those plants you just have to reach down and pet to appreciate. The white-flowered selection *Silene acaulis* 'Alba' has been more vigorous here than the typical form; it covers the ground quickly and stands up to full sun and heat.

The last two species I want to highlight are both western natives. Both are low-growing groundcovers that thrive in full sun and heavy clay soil, with very little water. Both are in the Asteraceae family and have grayish foliage. *Heterotheca jonesii* bears cute little yellow daisylike flowers; *Sphaeromeria capitata* (photo, p. 34) also produces yellow flowers, but these form a small ball-shaped inflorescence just above the foliage. *Sphaeromeria* is very long-lived and develops a woody stem, much like its larger cousin *Artemisia tridentata* (western sage).

We rock gardeners in Colorado are looking forward to hosting the big event in Breckenridge in summer 2003. I hope Mother Nature cooperates and blesses us with some snow this winter, but experience with the drought-tolerant plants described in this article and others in this issue shows that we will have interesting gardens to greet visitors even if she doesn't.

Kirk Fieseler is a horticulture instructor at Front Range Community College in Fort Collins. He also co-owns Laporte Avenue Nursery (see the advertising section of this issue) with Karen Lehrer. His main interest is the growing, selection, propagation, and marketing of new plant introductions with rock garden potential.

New Ideas for Rock Gardening at Utrecht

Wiert Nieuman

The rock garden at the Botanic Garden in Utrecht is the largest public rock garden in the Netherlands. Besides the outdoor rock garden, it includes a small alpine house, a nursery producing plants for the rock garden and the systematic garden (a feature of botanic gardens where plants are displayed according to family and genus), some peat terraces, and a feature called the *Hochstaudeinflur*, a German term for the nutrient-loving and larger-growing perennials of alpine meadows and forest clearings in valleys.

The rock garden was built between 1963 and 1975 on the site of an old fortress. It covers about 4,000 square meters and rises to an elevation of 12 meters (38 feet). The garden is divided into European, Asian, and American sections. There is also a scree with a collection of sun- and drought-loving plants from all continents. Because there are no mountains in the Netherlands, the stones for the rock garden were transported from Belgium, 250–300 kilometers away.

Early Ideas

In the early 1980s, I read in the *Bulletin of the Alpine Garden Society* about hypertufa troughs. That was the beginning of a collection of troughs and of another kind of rock gardening. At that time we didn't have an alpine house, but in the troughs we could cultivate plants that could not grow in the open garden.

In 1982, we drilled holes in some chalky stones and planted them with saxifages. As I write in May 2002, these plants are still alive, never having been replanted. They include *Saxifraga scardica*, *S. × apiculata* 'Alba', *S. burseriana*, and some self-sown seedlings of *S. longifolia*. They are exposed to full sun, and in spring and early summer part of the new growth is sometimes sunburnt; nevertheless, every year the plants flower very well and are admired by thousands of visitors.

By 1988, our collection of hypertufa troughs had grown to twenty, and we were looking for another challenge. We found it when we acquired some glazed red terracotta sewer pipes 20 cm (8 inches) in diameter. With a diamond saw,

we sawed the pipes in half lengthwise. Then we planted these pieces with various rock plants, including sedums, sempervivums, dianthus, and saxifrages. Around the same time, we got some old pig troughs made of the same material as the sewer pipes. We combined the two in a pleasing sculptural arrangement at the entrance of the garden. The troughs are now filled with all kind of rock plants, from very easy to difficult to cultivate.

In 1991, we built a rectangular raised bed, at that time a totally new gardening idea in the Netherlands. We used old dark gray rooftiles, salvaged when houses in an old part of the city of Utrecht were retiled. Dutch roof tiles are not flat but have a wavy shape. We broke the rooftiles lengthwise into two pieces, and from this material and some old paving stones, we built a raised bed about 10 meters (30 feet) long. The center of the bed is filled with rubble from the roof tiles, stones, and sandy soil. The top is covered with various kinds of stones so that visitors can get ideas about what stones are useful for rock gardens. Not only the top is planted; the sides are constructed so that there are many places for a variety of rock plants. This idea works: many people admire the bed, and most think that it is built from natural stone. In 2000, we renewed this bed entirely, and now there are three beds, two of which can be covered in winter with plastic against rain.

Using old sewer pipes, pig troughs, and roof tiles was the beginning of our interest in using old materials in a new way, a technique we can call “recycled rock gardening.”

The eyecatchers

In 1995–1996, we used recycled pavers to build three spheres (photos, p. 46) ranging in height from about 1.5 to 2 meters (50–70 inches). In the Netherlands, sidewalks are mostly made from concrete pavers about 30 × 30 cm square (about 1 foot square) and 4 or 5 cm (about 2 inches) thick.

Here is our method: In the middle of the building site, set a metal pipe with a diameter of about 5 cm (2 inches). Along this pipe, to the top of the sphere, run a water hose with a sprinkler head at the end. The metal pipe acts as a fixed point for building the sphere. On the ground around the pipe, we lay a circle of broken paving stones, so that most of the space between the outside and the pipe is filled with stone. Over this layer we spread a thin layer of ordinary sandy garden soil, so that all the holes between the stones are filled. Then follows the next layer of stones, about 2 cm (1 inch) wider in diameter than the first. It is easy to achieve the right form by using a measuring tape. It is necessary to set every layer closely with broken paving stones, and to fill the holes completely with sandy soil.

The lower half of the sphere need not be perfectly shaped; in fact, it is more of a lumpy inverted cone, but this isn't apparent once the construction is completed. To make the upper half regular in shape, we make a plywood cut-out form in the shape of a quarter-circle with a radius equal to that of the planned sphere. Once the sphere has reached half its intended height, after setting each

layer of stones we place this cut-out pattern so that one end of the arc is against the pipe, and the other against the widest, central stone layer. We move it around the circle, pushing in any stones that protrude beyond the edge of the pattern at that level. As we work up layer by layer, this helps us form a fairly perfect half-sphere. It is necessary to work accurately and to use a mason's stone-cutting tool to shape the broken paving stones.

When the sphere is complete, we can start planting. At first, we used easily grown rock plants like *Sedum pachyclados*, *Armeria*, *Sempervivum* species and cultivars and campanulas. With an old knife or screwdriver, we can dig out a planting space between the adjacent outer paving stones. First we fill this space with soil, and then set in the plants. Finally, we push the dislocated paving stones back into place.

At this time, we have three spheres of different heights. We have stopped planting them with very easy growers; now we use plants like *Haberlea rhodopensis* on the shaded sides, *Leontopodium alpinum* subsp. *nivale*, *Daphne arbuscula*, *Veronica aphylla*, *Primula marginata*, *Primula auricula*, and *Draba* and *Saxifraga* species. In the future, we will try slow-growing shrubs, *Dianthus*, *Saponaria*, and other subjects. I also planted seven or eight *Dionysia aretioides* on the lower part of the spheres; one plant has flowered very well and is now 20 cm (8 inches) in diameter. Two of these spheres are shown in the photo on p. 46, with close-ups of *D. aretioides* and *Primula marginata* flowering in them.

Wiert Nieuman is manager at the Botanic Garden in Utrecht. He writes for garden magazines in the Netherlands and has written books on rock gardening, rock plants, general gardening, and conservatory plants. He was formerly chairman of the NRW (the Dutch Rock Garden Society) and now is editor of *Folium Alpinum*, the quarterly bulletin of that Society.

The Whittemore Garden in the Southern Appalachians

Bobby J. Ward

Ev and Bruce Whittemore's garden (photos, pp. 47, 48) lies in a bucolic, hilly setting near apple farms, folk and classical music festivals, breathtaking vistas, and waterfalls near Penrose in western North Carolina, on the edge of the Southern Appalachian Mountains and near Pisgah National Forest. Neighboring streams flow into the French Broad River and beyond to the Mississippi and the Gulf of Mexico. The Whittemores call their three-acre property "Fort Knox" because "that's where all the money is," Ev says, as she recalls the time and money the two have spent in developing the garden since spring 1997. I have visited the garden twice in the past three years, witnessing its continued expansion and evolution. You cannot visit there without admiring Ev's and Bruce's indefatigable stamina.

Moving from Massachusetts

Ev's introduction to the world of rock garden plants occurred years ago when she noticed the bright blue flowers of a gentian at a nursery in the Berkshires of western Massachusetts, where they were living at the time. Ev purchased the gentian and planted it, and it promptly died. As she began to understand rock plants and their drainage and soil requirements, she became determined to make them survive, and this determination grew into an obsession. She was turned on full throttle to the world of rock and alpine gardening, and she has remained smitten and crazed.

Twenty years ago, Ev and Bruce migrated from Massachusetts to their first North Carolina property, also in Penrose, seven miles away from Fort Knox. That first move took them from a colder climate and longer winter (USDA Zone 5) to milder USDA Zone 7a, where Ev didn't have to sit inside waiting for spring to begin. Now she could garden outdoors more months of the year. She drove down to North Carolina and bunked in a garden shed on the site as she developed the garden, while Bruce stayed and worked a while in Massachusetts. The first North Carolina home was called "Fort Courage" for their indomitable

desire to move to the South. That property, on four acres, contained natural stone formations and the dramatic backdrop of a solid granite wall. Fort Courage was one of the prime garden sites to tour at the NARGS annual meeting in May 1994, hosted by Ev and the Southern Appalachian Chapter. I remember the dianthus patio behind the house, the native plants, the rhododendrons and heaths, and *Meconopsis* gleaming along a trail at the edge of a woods. Fort Courage became the focal point of NARGS meetings, area garden tours, and drop-in visitors.

Ev and Bruce sold Fort Courage in the fall of 1996, perhaps because of the steep slopes and walkways they had to traverse daily, or the pestiferous chiggers that swarmed each summer in the woods. Ev feigns naïveté, saying she thought she was giving up a tough garden for one that would require less work and energy. While he felled holly trees and other timber and developed the new site, Bruce's only admonition to Ev was that there would be no lawn. In spring 1997, before their modular house was constructed, Ev had already been to the local Penrose quarry and ordered rock for delivery in 63-, 45-, and 23-ton lots. She built the garden while Bruce did woodwork for the house. By the time the county authorities approved house occupancy in June, the garden was well under way, and Fort Knox had been christened. Today the property encompasses a collection of several gardens, some of which I describe below.

The Woodland Rock Garden

At the approach to the Whittemore property, at an elevation of 2500 feet (800 m), there is a 125-foot-long (40-m) woodland rock garden bordering the driveway on the left, or south, side. In the spring it's vibrant with various species and cultivars of *Primula*. It is also rich in native plants such as *Galax aphylla*, the late-winter bloomer *Epigaea repens* (trailing arbutus), *Dicentra eximia* (bleeding heart), trilliums, and several species of ferns and orchids, including the pink lady slipper *Cypripedium acaule*. Here Ev also is trying a few epimediums. By fall, most of the plants in the woodland rock garden are dormant, and the dominant feature becomes the floppy red seed heads of luxuriant *Arisaema sikokianum*. Ev covers the woodland rock garden with ramie netting for a few months at the end of the summer to help prevent leaves, primarily pine needles, from falling into the rock crevices, where the needles are difficult to remove. She removes the netting by early January, when all the needles have fallen and before spring growth begins; she also watches that birds don't get tangled in the netting.

The woodland rock garden has a simple wood-and-rope bridge spanning a streambed that is dry most of the year. Nearby is a large concrete block trough, now covered with hypertufa painted black, intended originally as a holding bed for small conifers. The conifers grew so well that they have now become permanent residents.



Caltha leptosepala beside a snowmelt stream in Colorado. (photo, Loraine Yeatts)



Sphaeromeria capitata (left; p. 9), was photographed on the Laramie Plains. *Rhodiola rhodantha* (right; p. 7) is a plant of moist alpine places. (photos, Panayoti Kelaidis)

Delphinium alpestre (p. 7) grows on a few mountain peaks.





A trough made and planted by Gwen Kelaidis features red *Castilleja scabrida* (pp. 6, 57) with yellow *Lesquerella alpina* and *Hymenoxys lapidicola*. (photos, Kelaidis)

Astragalus spatulatus (p. 5), one of the many showy pea family members of the Rockies.

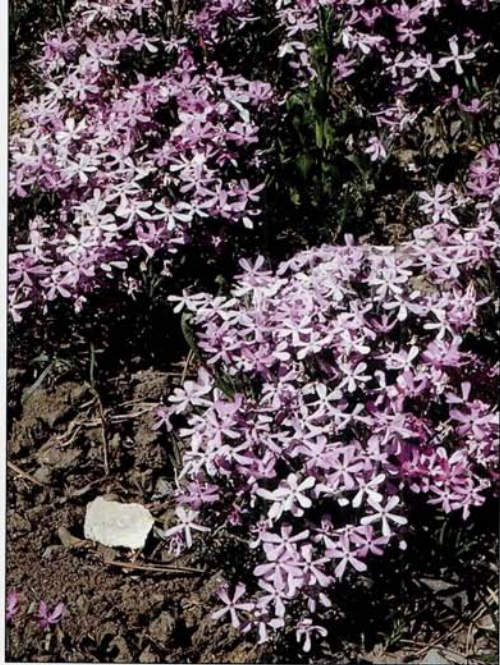




Lesquerella alpina (left; p. 8) represents an important genus of Rocky Mountain crucifers. The “paperflower,” *Psilostrophe bakeri* (right, p. 5) is endemic to the Western Slope. (photos, Kelaidis)

Townsendia glabella (left) and *Erigeron simplex* (right) are two reasons why the Rockies could be called the “Daisy Chain” (p. 7).





Left, *Phlox caryophylla* (p. 4) at Pagosa Springs, Colorado; right, *Yucca harrimanniae* (p. 5), a cold-hardy species small enough for the larger rock garden. (photos, Kelaidis)

Oxytropis podocarpa (p. 7) occurs disjunctly in Colorado and in the Northern Rockies of Canada.





Two sections of the Betty Ford Alpine Gardens in Vail (p. 10): above, the dry section of the Alpine Rock Garden; below, the Mountain Perennial Garden. (photos, Nicola Ripley)





Above, two naturalistic scenes in the Betty Ford Alpine Gardens (p. 10): a cascade framed by weathered wood, and a massive boulder feature. (photos, Nicola Ripley)

Below, *Penstemon procerus* 'Kristal', a white form, in the Betty Ford Alpine Gardens.





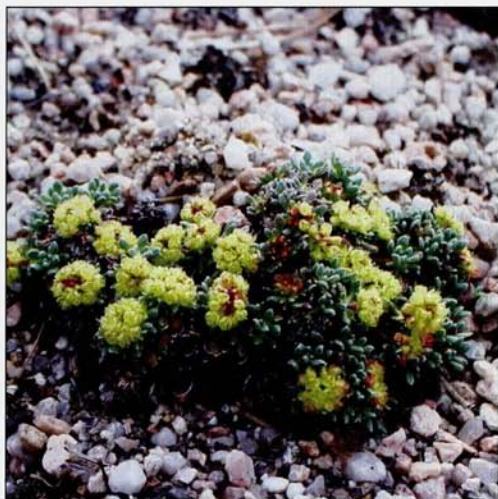
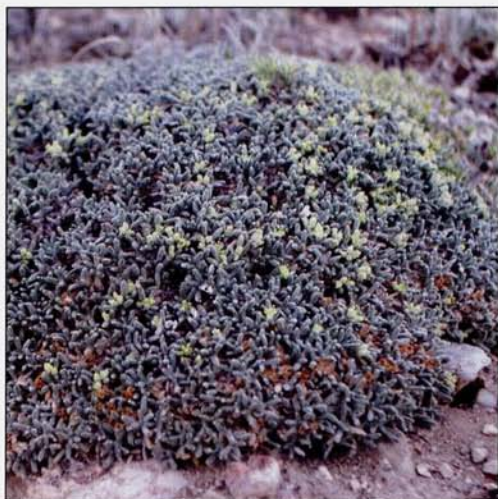
Salvia dorrii (above) and *Salvia pachyphylla* (below; pp. 13–14) are two shrubby species that succeed in a semi-arid garden. (photos, Bill Adams)





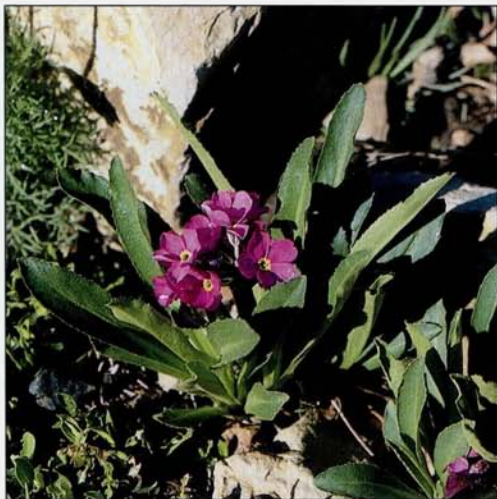
Pelargonium endlicherianum (above), a hardy species from Turkey, is becoming popular in American rock gardens (p. 14; photo, Kirk Fieseler) *Eritrichium howardii* (below left) has not defeated the skilled gardeners at the Denver Botanic Garden. *Zauschneria garrettii* (below right; p. 12), now referred to *Epilobium canum*, blazes in the Betty Ford Alpine Garden.





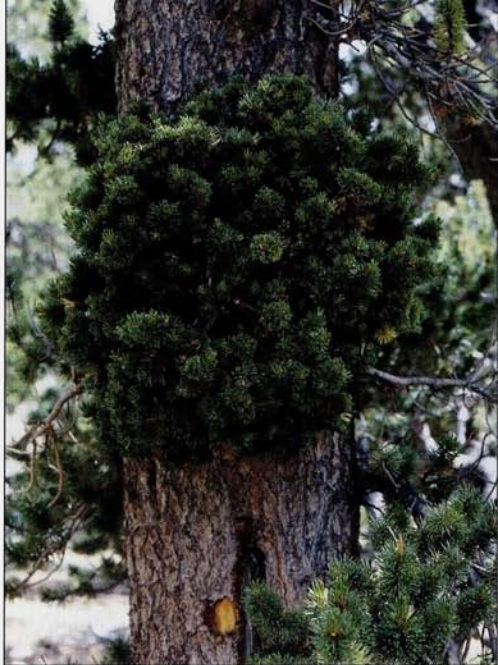
Four species of *Eriogonum* (p. 15) grown at Rocky Mountain Rare Plants: above left, *Eriogonum caespitosum*; above right, *Eriogonum flavum* var. *xanthum*; below left, *Eriogonum ovalifolium* var. *depressum*; below right, *Eriogonum acaule*. (photos, Rebecca Day-Skowron)





Turkish *Asperula pontica* (above left; p. 25), Rocky Mountain native *Primula rusbyi* (above right; p. 26), and Pacific Northwest selection *Penstemon davidsonii* subsp. *menziesii* 'Microphyllus' (below left; p. 26) withstand Colorado's drought years with a little supplementary water. (photos, Kirk Fieseler)
Campanula parryi (below right; p. 21) from the Rockies is a good candidate for rock gardens. (photo, Loraine Yeatts)





Three dwarf conifers selected in the Rocky Mountains by Jerry Morris (p. 22): above left, *Pinus aristata* with the original witch's broom from which 'Cheery' was propagated; above right, *Pinus flexilis* 'Damfino'; below, *Abies concolor* 'Charmin' Chub'. (photos, Clark Coe)





Rocky Mountain hardy cacti suited to the rock garden (p. 18): above left, a selection of *Pediocactus simpsonii* from Utah; above right, *Pediocactus simpsonii* 'Snowball'; below left, *Echinocereus viridiflorus* (photos, Panayoti Kelaidis); below right, *Echinocereus triglochidiatus* in the wild (photo, Randy Tatroe).





Spherical crevice constructions at the Utrecht Botanical Garden (p. 29) support choice specimens of *Primula marginata* (below left) and *Dionysia aretioides* (below right). (photos, Wiert Nieuman)





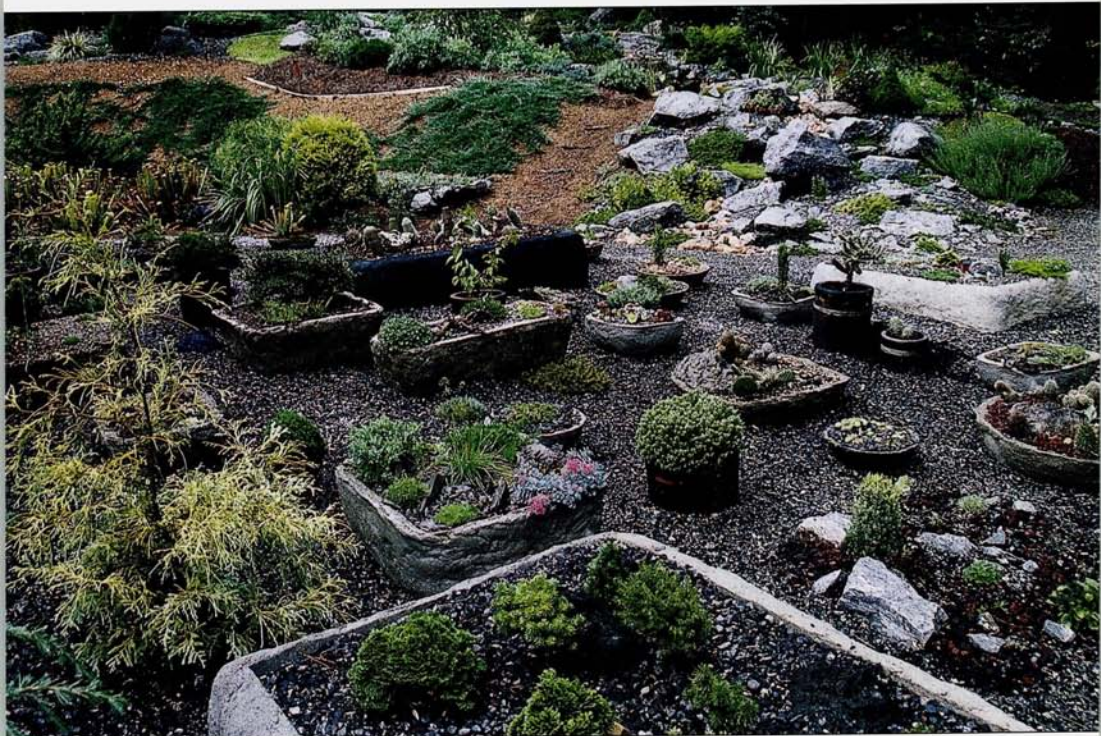
A recently planted cactus garden in front of one of the Whittemore hoop houses can be protected from rainfall (p. 31). (photo, Ev Whittemore)

Ev Whittemore has planted even the rooftop of one of her greenhouses with alpins.
(photo, Bobby Ward)





Specialized plantings in the Whittemore garden range from a bog devoted to *Sarracenia*, Louisiana irises, and primulas (above) to a large collection of troughs. (photos, E. Whittemore, B. Ward)



Alpine Houses

There are two alpine houses. The hill garden alpine house, behind the house on the west side of the property, contains various *helichrysums*, South African *Rhodohypoxis baurii*, dwarf daphnes, *Gypsophila aretioides* (it also grows in the garden), forms of *Aquilegia jonesii*, *Daphne jasminea*, western eriogonums, *Primula allionii* from the Maritime Alps, and *Tecophilaea cyanocrocus*, the rare blue Chilean bulb. There are also nonhardy cyclamens and *Lewisia tweedyi*. All plants in the greenhouse are set in the ground, not in pots or on raised shelves or benches, because Ev is afraid she might overwater potted plants.

The second of the two alpine houses is a “working greenhouse” and contains ground beds of seedlings, plunge pots, seed pots, and enough room for Cinq, the white poodle, to run though. Seedlings germinated under lights in the garage are moved here until they are ready for the garden. In 2001, Ev and Bruce made a hypertufa wall for this alpine house (described in the Summer 2002 issue of this journal); she has now festooned it with *Asplenium* and other ferns, *Gypsophila nana*, *Iberis rigida*, *Androsace* ‘Millstream’, and many more plants. From a distance, this is an odd-looking feature at the end of the alpine house, but it is more fully appreciated upon close inspection when the myriad plants reveal themselves.

Ev doesn’t mind tackling irresistible but difficult plants such as *Campanula zoysii*, *Jankaea heldreichii*, and *Physoplexis comosa*. She grows *Calceolaria uniflora* from southern Patagonia and various species of *Meconopsis*, such as *M. rudis* and *M. lancifolia*. Her favorite is *M. paniculata* from the Himalayas “for the lovely winter appearance in color and form of the foliage,” she says.

In the alpine house, Ev also endeavors to grow New Zealand plants, including the evergreen *Raoulia* × *loganii* (now called × *Leucoraoulia loganii*), *Raoulia* × *petrimia* ‘Margaret Pringle’, and dwarf evergreen *Clematis marmoraria*—all acquired from Rick Lupp of Mt. Tahoma Nursery.

The Trough Garden

On the north side of the house, Ev has 46 troughs (at the moment), mostly made of hypertufa, which are dedicated to almost everything in the temperate plant kingdom: bulbs, cacti, conifers, dwarf shrubs, carnivorous plants, ferns, herbaceous alpiners, and more. Here you will find troughs of *Saxifraga*, *Orostachys*, and *Sedum* growing a few feet away from troughs with conifers, shrubs, pitcher plants (*Sarracenia*), dryland western U.S. species, *Campanula*, and much more. You walk among this collection of troughs feeling as if you are admiring the showcases at Tiffany’s, so numerous are the genera and species on display. Ev says she provides no cover to the troughs during winter, though allowing limited protection from the infrequent snowfalls and from wind-blown leaves. As a rule, when the troughs are being made, she has already decided what will go into them. If bog plants such as *Drosera* (sundew) and *Sarracenia* are intended, the troughs will have no drainage holes and will be lined with plastic. If cacti or succulents are

going to take up residence in the troughs, they will have good-sized drainage holes and a mix with plenty of sand. For dwarf conifers and shrubs, the hole will be large enough to encourage roots to grow out of the trough and into the soil beneath it, necessitating permanent placement in the trough garden. There are even bottomless troughs near the bog for plantings of *Cassiope*, *Soldanella*, and *Primula rosea*, which appreciate added moisture. In 2000, Ev purchased seven upright chimney-liner (flue) tiles for the trough garden, sprayed them lightly with black paint, and planted them. She figures she has made at least 100 troughs altogether; some have been given away, some sold to benefit her NARGS chapter and garden tours, and others donated to support local Earth Day events, environmental activities, and the library.

Dryland Plants and the “Mini-Mountain”

Behind the house, under a plastic cover, is an area devoted to dryland plants, primarily from the American West. Because of its proximity to the house, Ev can monitor this special collection closely to be sure that the plants do not get overheated or wet on days when the cover is removed. This collection includes *Epilobium*, *Townsendia jonesii*, *Arenaria erinacea*, *Hymenoxys*, several species of *Eriogonum*, *Penstemon*, *Draba*, *Phlox*, and *Lesquerella tumulosa*—most of which were started from seed.

Adjacent to the dryland area is a hypertufa “mini-mountain” rising out of a bottomless box approximately 3 by 5 feet (1 by 1.7 m) made of preservative-treated lumber with side drainage holes. Among the gems here are *Dianthus microlepis* var. *degenii*, several forms of *Silene acaulis*, *Arabis androsacea*, *Campanula raineri*, and *C. betulifolia*. It is also crammed with *Erinus alpinus*, *Androsace villosa*, *Draba ventosa*, *Gypsophila bungeana*, *Veronica minuta* var. *minuta*, *Arenaria aggregata* subsp. *erinacea*, and probably more. The plants fit so nicely and are so well in scale that you expect to see a narrow-gauge track with a model locomotive and cars tooling around this orogenic formation.

Crevice Gardens

Also behind the house on the west side of the property are upper and lower crevice gardens, with an artificial 70-foot (22-m) stream that courses into the pond below. Tucked among the rocks are dianthus, dwarf irises, dwarf daphnes, and numerous other delightful plants. On an autumn visit, you will see a blaze of *Stachys coccinea*, a magnet for the last of the season’s ruby-throated hummingbirds. The stachys are sited next to the crevice garden, where Ev can admire these nectar-feeding visitors from the house without disturbing them.

The Dianthus Patio

One of the *pièces de résistance* is the 80-foot-long (26-m) patio in front of the house. It is “mulched” with gray stone and planted with varieties of dianthus, attracting attention even when they are not in full bloom. Below the dianthus patio, lavender (*Lavandula*) and heaths (*Erica*) grow on a 45° sloping bank that drops to the east and downward to its natural fall along the county road and onto an 185-foot-long (60-m) border of the property. Ev and Bruce prepared this site with mattocks, leaving only an understory of native dogwoods and blueberries and the canopy of large trees. Beneath this high shade they have planted native rhododendrons, ferns, and dwarf conifers.

Other gardens

Walking around the property, you are treated to visual delights at every turn—and admonished not to step on “anything green.” You will notice there is no shortage of additional troughs; you will find at least 50 more scattered around the Whittemore property, tucked here and there. There’s a small “barnyard” of hens-and-chicks (*Sempervivum*) with a pink pig (no plastic flamingoes for Ev), an alpine village, and a waterlily pond stocked with minnows, tadpoles, and salamanders. Near the pond is a bog garden with tall pitcher plants, sundews, *Andromeda polifolia*, *Vaccinium macrocarpon* ‘Hamilton’, and *Sphagnum*. The woodland area near the wet bog supports moisture-loving plants such as *Soldanella*, *Cassiope*, and *Phyllodoce*.

At the edge of the woods behind the house, you can see *Cyclamen hederifolium* growing on rotting stumps where a bit of topsoil has been added. There is a small vegetable garden here as well. From the vantage point on this rise behind the house, you can gaze over to the rooftop garden, an extension of the alpine greenhouse, where Ev is growing various species of *Dianthus*, *Pulsatilla*, *Gentiana*, *Draba*, *Sempervivum*, and *Phlox subulata* (but no roof iris). The rooftop garden seems to be Ev’s declaration that she will garden on every square foot of the property. Bruce seems well suited to the challenge of constructing such features.

A garden of hardy cacti and other succulents grows outside the working greenhouse. Here Ev prepared a bed using lean creek sand and topsoil, then added a top-dressing of fine sand she brought back from New Mexico. However, discovering that the sand spattered a lot during heavy rains, she covered the sand with Chat 78, a commercial-grade local gravel up to one-quarter inch in diameter. “The cacti probably like it better now,” she says. The cactus garden includes western U.S. prickly pears, *Opuntia basilaris* and a pink-flowering form of *O. polycantha*; a half-dozen or so species of *Echinocereus*; the Arizona barrel cactus, *Ferocactus wislizenii*; and the pincushion cactus, *Escobaria*. Here Ev has also planted the hardy century plants, *Agave parryi* var. *huachacensis* and *A. harvardiana*, from the American Southwest and Mexico.

There are other pocket gardens on the Whittemore property: “dry” streams, plantings of annuals, a north-side woodland garden, and a shrub and clematis garden—all creating further interest for visitors at all seasons. There is color in the garden much of the year. On a late winter visit to Fort Knox, you will see numerous spring harbingers around the property, including *Crocus*, *Helleborus*, *Galanthus*, the dwarf *Iris danfordiae*, *Hepatica americana*, *Phlox stolonifera* and *P. subulata*, *Draba*, *Androsace*, and *Daphne*, all gleaming in the crisp, sunny air.

Many of the plants that Ev grows begin as seeds from the exchanges of various plant societies (she was seed director for NARGS in the early 1980s), commercial seed suppliers such as Ron Ratko (Northwest Native Seed) and Phyllis Gustafson (Rogue House Seeds), and seedsmen in eastern Europe, primarily the Czech Republic. She has made her own collecting trips to Colorado, Wyoming (the Big Horns), Montana, and New Mexico, and has visited nurseries as far away as Minnesota.

Fort Knox’s growth and development results from a partnership between this “24/7” couple. Ev’s ambition seems to be to grow as many interesting plants as she can find, relying on Bruce, the engineer, carpenter, plumber, and electrician, to provide the outline and structure for the garden. “He understands leverage,” Ev says, certainly a skill that comes in handy when moving mountains of rock at Fort Knox.

Bobby J. Ward lives and gardens in Raleigh, North Carolina. He is a botanist, the author of *A Contemplation Upon Flowers* (Timber Press, 1999), and the current president of NARGS.

Growing Penstemons from Seed

Virginia Maffitt

Penstemon seeds are a wonderful creation; equipped to survive the harshest winters locked in nearly impervious seed coats. Because this characteristic can make it difficult to germinate penstemon seeds for garden use, here are some general directions to improve your success rate.

Use clean plastic pots deeper than they are wide. A sterile mix of 60% vermiculite and 40% perlite seems to be the best medium because it doesn't act as a host for moss, bacteria, and fungi in a pot that may sit outdoors for a year or two. (Where ground horticultural pumice is available, growers often use that instead of perlite.) A layer of grit on the bottom of the pot keeps the medium in and lets water drain. Notch the label near the base and stick it through a drain hole.

Seeds can also be sown in flats with small individual cells. Plant one seed per cell, and as soon as the second ("true") leaves appear, you can pop the new plant right into the next size of pot. With careful labeling, you can use a 100-cell flat for about 20 plants each of five species. To label securely, slice through one cell and push through a half-label. Any label sticking out of a pot is certain to be knocked loose!

If using larger pots, sprinkle the seed sparsely over the medium. Ten husky plants with intact roots are better than 30 spindly ones. A light covering of oyster shell (available from feed stores) adds a bit of alkalinity and provides a dry surface for plants to grow on. The seeds generally need light to germinate, so barely cover them. If you like to keep track of how various species grow, in addition to the plant name, note on the label the date sown, approximate number of seeds, seed source and wild origin, stratification time, color, and other points of interest.

Germination can take from one month to one year or more. Cold stratification is usually necessary, but this requirement varies widely for the 280+ species of penstemons. This means a period during which the temperature is less than 40°F (5°C) each night, in a moist environment. A rule of thumb seems to be that the farther north and the higher the plant originates, the longer its germination period. Count on 12 weeks for Canadian and northern Rocky Mountain species; Pacific Northwest species typically take 8–12 weeks. California, Arizona,

New Mexico, and Mexican desert varieties generally don't need any cold period and germinate the quickest. Germination can take place weeks, months, or years after the cold stratification period. Some species also need a period of warmth followed by more cold time.

Cold stratification is best done outdoors. Try to plant seeds in the fall, set the pots out, and let nature take its course. Provide some security for the flats from animals, windstorms, and children—screening to prevent animal excavation, shelving near a building, or a simple hoop house over a weed barrier on the ground. Usually slugs and snails don't bother the young seedlings, but bait protection is advisable.

By February, when most seed exchange orders arrive, it's almost too late to count on a 12-week stratification time outdoors in the Pacific Northwest, where I garden, though 8 weeks may still be possible. The refrigerator can do the job, but doesn't seem to work as well, perhaps because the temperature doesn't vary and there is no light. I use it anyway by late February for plants needing a 12-week chill. In a plastic sandwich bag, put several tablespoons of pumice and one of perlite. Moisten slightly, add the seed, and shake a bit. Put the label inside and twist-tie the bag shut. If you have space, you can refrigerate seed pots in a sealed plastic bag. Check for germination after the first month and then every few weeks. Seeds that actually germinate in the refrigerator are very delicate, so handle them gently.

I obtained very good germination results last year by simply soaking the seed before planting in drugstore-variety hydrogen peroxide for 15 minutes. Pour it through a fine sieve and plant. Large, woody seeds benefit from rubbing on a rough surface until you see dust coming loose, then soaking in peroxide. Don't dump any unsprouted pots for at least two years—some seed coats are really tough. Stored penstemon seeds will germinate at least up to five years old, and possibly older. Some growers think germination of older seed is better.

However you sprout the seedlings, the best choice for potting up is a container 2 inches square by 3 1/4 inches high (about 5 by 8 cm), sometimes called a "rose pot." Even though the seedling is tiny, its roots need the depth. Penstemons with the first true leaves can have 4-inch-long (10-cm) roots that dig deep fast, seeking moisture and stability. Plant the tiny seedlings as soon as you can handle them, as the vermiculite/perlite mix has no nutrients. They do well in a mix of nearly pure pumice with 25% garden compost or soilless mix for nutrients. Fine sharp grit with small amounts of perlite and compost also works well. A few days in the shade and a dilute liquid fertilizer will help avert transplanting shock. Give all the seedlings afternoon shade through the first summer, but more fertilizer is rarely required. It promotes soft growth that is subject to fungus die-off.

A few species, such as *Penstemon serrulatus*, *richardsonii*, and *ovatus*, and some Southeast U.S. species, may bloom by their second summer, but most need to mature longer. When the weather cools in the fall, first-year plants are ready to go into your rock garden or trough. Most penstemons are adapted to being frozen or snow-covered all winter. In very rainy winters, Rocky Mountain and

Southwest desert plants survive better if covered by a rigid plastic "roof" held overhead on stakes.

Be sure to plant garden penstemons on a slope. A gravel or sand bed underlaid with rock (or even concrete chunks) will keep them living longer. Most species need full sun for most of the day, though a few, such as *P. serrulatus* and *P. confertus*, appreciate afternoon shade or the north side of a rock outcrop to keep their handsome foliage green. Bright winter sun at high elevations such as Denver can scorch evergreen penstemons. Research the species you have grown to decide on the conditions that best mimic their home terrain.

The Santa Barbara Botanic Garden (1212 Mission Canyon Road, Santa Barbara, CA 93105) has published a marvelous paperback, *Seed Propagation of Native California Plants*, priced at \$14. It lists most California natives, including penstemons, with germination techniques and times. The Alplains seed catalog (see this issue's advertising section) offers cold stratification techniques and suggested times for each of their many penstemons. Jim Swayne on his website <jas@bmi.net> has a germination methodology list for most species, including garden zone, habit, color, habitat and much more. It is painstakingly detailed, and I keep it nearby as I sow.

A final word of advice: when your plants bloom, key them out to be sure you are growing what you thought you planted. (I've received *P. serrulatus* at least six times under other names.) Good growing!

Ginny Maffitt of Sherwood, Oregon, is a retired teacher and is active in both the American Penstemon Society and in NARGS, currently serving as chairperson of the Columbia-Willamette Chapter. She and husband John enjoy traveling and photographing penstemons in the wild, and currently grow more than 100 species.

Castillejas in Cultivation

compiled by the editor

This issue's cover features a genus that always attracts the attention of visitors to western North America but that is rarely seen in rock gardens. *Castilleja* (Scrophulariaceae) species come in a range of colors, including cream, yellow, and purple, but the showiest are bright red and orange. They are believed to be "hemi-parasites" that depend in part on root association with host plants, particularly grasses and composites, but also clovers (*Trifolium* spp.) and shrubby penstemons. In the Spring 1996 *Rock Garden Quarterly* (vol. 54, no. 2), Ken Sherman described his techniques for transplanting castillejas and growing them from cuttings, and he theorized that at least some species could be grown without a host if supplied with sufficient fresh water, particularly in a soil mix rich in ground pumice.

Those wishing to grow castillejas from seed may benefit from the following excerpt from Jim Borland's article "Changing your propagation paradigms" (*American Nurseryman*, Mar. 1, 1996, pp. 24–29), supplied by Paige Woodward, who operates a nursery in British Columbia:

The first "secret" of growing paintbrushes includes realizing that their seed is surrounded by a reticulated network of dry material that inhibits water from ever getting to the seed. Simply rubbing between the thumb and palm rids the seed of this coating. Additionally, while some species must first be moist-chilled for a period of time before sowing, others germinate without difficulty. . . . Seedlings are tiny and usually subject to damp-off problems. Again, sanitation is the key to surmounting this. . . . Copious light (24 hours if possible) and a regime of heavy fertilization with each watering will get the seedlings to the transplant stage with no problems. They can then be transplanted singly or in pairs, since there is some evidence that they will parasitize each other, each benefiting from the experience.

Note, however, that Ken Sherman's article recommends little or no fertilizer.

Diana Capen of Rye, Colorado, writes: "I've never had trouble germinating *Castilleja integra* in the greenhouse in February, but I did lose too many of them

when transplanting. Jeff Ottersburg, owner of the nursery Wild Things, had pretty good success by letting the potting soil dry out almost completely before moving the seedlings out of the flats. That never worked for me, so I started sowing them directly into plug flats with 128 cells. I broadcast the seed over the flat, trying not to get too many in each cell. They germinate just as well this way, and in six weeks or so they move without any problem. Most cells end up with two or three seedlings each, and maybe they derive some comfort from that proximity. Jeff has now also started direct-sowing them, but into larger cells. He is growing them in gallons and selling them in full bloom. When he transplants them into the gallon pots, he adds blue grama grass to the pot. *C. integra* can bloom the first year from seed sown in January or February."

Bob Nold of Denver has a small lawn of blue grama grass, which is native to the high plains, and has established *C. integra* (a species with pale yellow flowers) in it. He calls the grass "an ideal host for castillejas, if not for visitors, who tend not to notice the castillejas unless they're in bloom, and the plants get trampled." Bob started his plants in pots before adding them to the grassy area.

Loren Russell recalls: "Florence Free's rock garden in Seattle's Montlake district featured a slope made into a scree garden with the addition of some inches of decomposed granite. Among its smaller plants were numerous *Castilleja miniata* and *C. levisecta*, the latter a very rare Puget Sound native. She had introduced both species years earlier by rubbing seed into established mats of *Raoulia* spp. She had apparently tried other low mat-forming hosts but preferred the raoulia because the castilleja seedlings would not be shaded out. In areas where raoulia are not hardy, it's likely that other mat-forming composites like *antennarias* would be efficient nurse crops for castillejas sown in situ."

The photo of *Castilleja scabrida* on p. 35, taken in the Kelaidis garden in Denver, shows how spectacular a well-grown specimen can be. Also in cultivation in Denver, reports Panayoti Kelaidis, are *C. chromosa* and *C. integra*; the latter produced hundreds of plants along a pathway at the Denver Botanic Gardens.

Seed of *Castilleja* species is often available from collectors' lists and sometimes appears in seed exchanges. Most species are probably quite cold-hardy, and a flourishing plant with multiple flowering stems would be a triumph in any rock garden.

Books

Alpine Plants of North America: An Encyclopedia of Mountain Flowers from the Rockies to Alaska, by Graham Nicholls. Timber Press, 2002. ISBN 0-88192-548-9. 344 pp., 495 color photos, maps. Hardcover, \$49.95 (available at discount from NARGS Book Service).

Reviewed by CHRISTINE EBRAHIMI, Columbia City, Oregon

The title alone will pique your interest. If it isn't enticing enough, though, all you have to do is look at the author's name, and you'll surely pick this book up. As a grower of alpenes for 40 years, and especially of North American alpenes since 1982, the distinguished Graham Nicholls has traveled extensively throughout North America and is well versed in its alpine flora, despite residing near Bath, England. As icing on the cake, Nicholls has collaborated with the extremely knowledgeable Rick Lupp (proprietor of Mt. Tahoma Nursery), who is listed as Consulting Editor, creating an unbeatable partnership. Together, they have combined in one book a remarkable wealth of information gleaned from numerous years of collecting, growing, and observing alpine plants in North America.

Why would anyone in his right mind devote himself to such an overwhelming task, covering such a huge region and its alpine flora? Apparently it needed to be done—and leave it to a Brit to do it! In the relatively short span of five years, Nicholls has managed to accomplish this huge undertaking.

Aware of the magnitude of his task, Nicholls has limited his scope a bit, first by excluding nonflowering plants and bulbs (well covered in *Bulbs of North America*). Then, geographically, he has limited himself by excluding the low-elevation eastern mountains (which are mostly tundra floral extensions), thus enabling him to concentrate on the vast mountain regions of western North America. However, Nicholls made his task more difficult by expanding his definition of alpine from those "true alpine" plants that grow only above treeline in mountainous alpine and subalpine zones, to embrace "horticultural alpenes." The latter he defines as small plants from various elevations that are frequently grown in rock gardens. They tend to grow in harsh "alpine-like" conditions of low precipitation, poor soils or high snow cover.

Nicholls's introduction is an excellent overview of the alpine habitats of North America, including the Rockies, Great Basin, Pacific Northwest mountains, and Alaska. The regions are then divided into defined sections with helpful information on temperatures, elevation ranges, precipitation, and soil types.

The bulk of the pages are devoted to the plant encyclopedia, with alphabetical listing of 54 genera of alpine plants found in North America. Although this does not cover all alpine species found here, it easily includes the majority of interesting and well-known genera. There are particularly good reviews of several large genera: *Astragalus*, *Draba*, *Eriogonum*, *Gentiana*, *Penstemon* (my personal favorite), and *Phlox*. Plant descriptions of individual species and varieties follow, with comments on where and how they grow. Also noted are good cultivars of the species and useful information on propagation methods and cultivation. There are numerous helpful growing hints in addition to many colorful anecdotes from the author, making this book not only useful but also fun to read. Toward the end of the book, you will find an excellent review of the cultivation of alpenes (including soil mixtures), a list of alpine plant distributions by state, and a source list.

The two most impressive aspects of this book for me were the remarkable color photos and the exceedingly helpful information about the species' native habitats. Every person who has picked up my copy to glance through has commented on the pictures. Nearly 500 excellent photos of individual species and habitats are found throughout this book. Additionally, as a botanist and a grower of alpenes myself, I concur with the author that to grow almost any alpine successfully, it is important to understand how the species grows in its native habitat. Too few alpine books cover this aspect, which can prove the key to success or failure when growing these little gems. Nicholls has done a very good job of providing useful information about each species native environment.

As Nicholls states in his preface, "This is a book intended for plant hunting enthusiasts, growers, and anyone else interested in North American alpenes." In this goal he has wholeheartedly succeeded. This is a book that will grace the shelves of all growers and lovers of alpine plants. There are more than a few botanists, like myself, who will also find this book to be a very useful overview of alpine flora. We who love alpenes should be grateful to Nicholls and Lupp for collaborating to provide such a useful book, and in so doing, saving many of us much time and energy searching out this valuable information ourselves.

Insects and Gardens: In Pursuit of a Garden Ecology by Eric Grissell, with photographs by Carl Goodpasture. Portland, Oregon: Timber Press, 2001. ISBN 0-88192-504-7. 345 pp. Hardcover, \$29.95.

Reviewed by MICHAEL K. YOUNG, Missoula, Montana

It is a rare gardener who doesn't panic at the sight of an infestation of aphids. Rarer still is the gardener who realizes that nearly all of those aphids are female

because aphids are largely parthenogenic (produce eggs without fertilization). They undergo simple metamorphosis from egg to nymph to adult without an intervening stage as a pupa, and are members of the order Hemiptera (true bugs—most recent treatments place aphids in a separate order, Homoptera). Meeting them with chemical attack or biological control via “beneficial” insects is probably unnecessary and definitely has ramifications beyond the simple reduction of aphids, which could respond by producing a winged generation, or, more interestingly, a generation including males. Such is the information available in *Insects and Gardens* by Eric Grissell.

Grissell is an entomologist, and in Part I of this book he leads the reader on a broad tour of insect taxonomy, biology, and diversity, particularly as these apply to gardens and the gardener. This includes defining what insects are—generally small, six-legged, nonfurry beasts, many of which can fly—and what are not insects but are often lumped with them, such as spiders, ticks, pill bugs, or millipedes. Another characteristic typifies insects: abundance. There are between 3 and 30 million species; their collective biomass is perhaps 27 billion tons, and they comprise about 1 quintillion individuals, give or take a few trillion. This abundance provides a basis for much evolutionary novelty. For example, whereas many insects lay eggs (perhaps as many as several million over a decade by a single female in one ant species), some give birth to live young (and in some species, these young consume their mother), and others lay single eggs that then divide to produce as many as a thousand young.

Other than a coterie of butterfly enthusiasts, we gardeners are likely to acknowledge insects under two circumstances: if they eat our plants or sample us. Fortunately for most gardeners, the majority of these insects are not interested in devastating precious daphnes or ravaging the lettuce, but in engaging in the larger ecological theater in which our gardens exist, the subject of Part II. Their interactions with plants are largely benign and often essential: How often have you wished to collect the seeds of some garden plant that consistently failed to produce any because of the lack of an appropriate pollinator? Their interactions with one another reaffirm that nature is red in tooth, claw, and mandible. For example, there are a host of primary parasitoids, such as parasitic wasps, that lay one or more eggs in their prey, which are often those insects gardeners consider pests. But there are also secondary parasitoids that lay eggs in primary parasitoids. And then there are tertiary parasitoids that lay eggs in the bodies of secondary parasitoids, as well as untold numbers of larvae and adults piercing, crushing, and chewing everything else. Amidst this carnage are a legion of insects that consume dead bodies, body parts, decaying plant materials, and yes, living plants—but without their services, gardens would quickly resemble piles of skeletons and litter, lending new meaning to the phrase “raised bed.”

Grissell repeatedly notes this sort of complexity in an effort to make us aware of the amazing diversity in our gardens, he also offers it as a plea for a conservative approach to treating garden problems. The author gently admonishes us that a little knowledge is a dangerous thing, because we often act as though we can do just one thing, such as using a chemical to remove a garden pest. But the

cascading web of interactions among insects, plants, and their environment ensures that we largely have no idea of the probable outcome of our actions. As an alternative, in Part III Grissell suggests that we focus on what he terms "realistic gardening": working with ecological processes rather than against them (as if we stood much chance against biological activities founded on 3 billion years of practice), enhancing the diversity of our gardens rather than simplifying them. He implores us to resist the urge to impose order on the garden, especially to control insects, and he gives specific tips for creating gardens that are sufficiently diverse to achieve a balance among insects preying on plants and those preying on plant-eating insects.

This book is written more as an appreciation than a textbook, crafted with humor and patience. It contains enough detail to arouse one's curiosity, but not so much that it overwhelms. The photographs by Carl Goodpasture are superb, often wonderfully illustrating points in the text or simply demonstrating the astonishing beauty of insects. A modest bibliography gives more information on ecologically realistic gardening, though those wishing to know more about identifying or understanding insect ecology will have to go elsewhere. This book will not teach you much about rock gardening, but it will make you aware that a garden is much more than an assortment of plants.

A Colorado Plant-Hunter's Bookshelf

Compiled by LORRAINE YEATTS, Golden, Colorado

- Colorado Native Plant Society. 1997. *Rare plants of Colorado*. Estes Park: Rocky Mountain Nature Association; and Helena, Mont.: Falcon Press. 106 pp. Excellent photos and descriptions; plants arranged by habitat.
- Colorado Rare Plant Technical Committee. 1997. *Colorado rare plant field guide*. Prepared for US BLM, USFS, and F&WS by Colorado Natural Heritage Program. Photos, drawings, descriptions, range maps; master rare plant list.
- Beidleman, Linda H., Richard G. Beidleman, and Beatrice E. Willard. 2000. *Plants of Rocky Mountain National Park*. Helena, Mont.: Rocky Mountain Nature Association and Falcon Press. 266 pp. A complete revision of Ruth Nelson's manual (1979). Comprehensive for Rocky Mountain National Park; technical key; good photos; plates and text separated.
- Chronic, Halka. 1980. *Roadside geology of Colorado*. Missoula, Mont.: Mountain Press. A good overview, especially for the roads covered.
- Duft, Joseph F., and Robert K. Mosley. 1989. *Alpine wildflowers of the Rocky Mountains*. Missoula, Mont.: Mountain Press. 200 pp. Plants arranged by family; good photos; plates and text separated.
- Ermick, John C. 1995. *Rocky Mountain National Park natural history handbook*. Niwot, Colo.: Robert Rinehart with Rocky Mountain Nature Association. 158 pp. Excellent photos; enjoyable reading; geology, natural history and ecosystem information applies generally.

- Emerick, John C., and Cornelia F. Matal. 1992. *From grassland to glacier: The natural history of Colorado*. Boulder: Johnson Books. A very good ecological review.
- Ewan, Joseph. 1950. *Rocky Mountain naturalists*. Denver: University of Denver Press.
- Guennel, G. K. 1995. *Guide to Colorado wildflowers*. 2 vols. Englewood, Colo.: Westcliff. 352 pp. Plants arranged by flower color; botanical names, synonyms, family names, common names used for each plant; photos and drawings by author.
- Irwin, Pamela. 1999. *Colorado's best wildflower hikes, vol. 1: The high country*. Englewood, Colo.: Westcliff. Good hiking info and photos; primarily uses common names.
- Kershaw, Linda, Andy MacKinnon, and Jim Pojar. 1998. *Plants of the Rocky Mountains*. Edmonton, Alta.: Lone Pine. Small photos accompany each plant; keys to families and some genera; arranged by vegetation type and family; well done.
- Nelson, Ruth Ashton. 1979. *Handbook of Rocky Mountain plants*. 3rd ed. Estes Park, Colo.: Skyland. 331 pp. Keys relatively easy for beginners; perceptive plant descriptions.
- Robertson, Leigh. 1999. *Southern Rocky Mountain wildflowers*. Helena, Mont.: Falcon Press. 162 pp. Guide to common wildflowers, shrubs and trees by flower color; good photos; botanical and common names, synonyms; good bibliography.
- Scott, Richard W. 1995. *The alpine flora of the Rocky Mountains, vol. 1: The Middle Rockies*. Salt Lake City: University of Utah Press. 901 pp. First in a projected series, this volume covers Montana, Wyoming, and Utah. Line drawings and distribution maps for each species.
- Weber, William A., and Ronald C. Wittmann. 1992. *Catalog of the Colorado flora: A biodiversity baseline*. Boulder: University Press of Colorado. 215 pp.
- Weber, William A., and Ronald C. Wittmann. 2001. *Colorado flora: Eastern slope*. Boulder: University Press of Colorado. 521 pp.
- Weber, William A., and Ronald C. Wittmann. 2001. *Colorado flora: Western slope*. Boulder: University Press of Colorado. 488 pp. Comprehensive; technical keys in field guide-size edition.
- Williams, Jean, ed. 1986. *Rocky Mountain alpines: Choice rock garden plants of the Rocky Mountains in the wild and in the garden*. Portland, Ore.: Timber Press. A collective volume prepared for the 1986 Interim International Rock Garden Conference in Boulder, under the auspices of ARGS and the Denver Botanic Gardens.
- Wingate, Janet L. 1990. *Rocky Mountain flower finder: A guide to wildflowers found below tree line in the Rocky Mountains*. Berkeley, Calif.: Nature Study Guild. 125 pp. Simple pocket-size illustrated key.
- Wingate, Janet L., and Loraine Yeatts. 1995. *Alpine flower finder: The key to wildflowers found above timberline in the Rocky Mountains*. Boulder: Roberts Rinehart. 130 pp. Simple pocket-size illustrated key.

- Zwinger, A. H., and B. Willard. 1972. *Land above the trees: A guide to American alpine tundra*. New York: Harper & Row. 487 pp. Organized by ecosystem or topic, eloquently written; excellent illustrations; comprehensive alpine plant list with color, bloom time, distribution; common names emphasized; specific plant info somewhat difficult to find.
- (CD) 2001. *Plants of Colorado interactive keys and color photos, including all known vascular plants, both native and naturalized*. Distributed by New York Botanical Garden Press. <nybgpress@nybg.org>

Websites

- <www.coloradoalpineplants.org> A searchable database of about 200 illustrated alpine species; L. Yeatts photos.
- <www.swcoloradowildflowers.com> A searchable database of plants of Four Corners region; some common alpine included, with descriptions and interesting facts.
- <www.rmnp.com> Rebecca Day Skowron's Rocky Mountain Rare Plants photo gallery; searchable database of excellent photos.

About this year's cover artist

Carol McLaughlin Kortnik is a watercolor artist living in Joseph, Oregon—the gateway to the Wallowa Mountains, site of this year's NARGS expedition. She and her husband own Aspen Grove Gallery, where she displays her original paintings, bronzes, and limited edition prints. She also exhibits at Valley Bronze in Cannon Beach, Oregon, and at Everett Gallery in Spokane, Washington. She travels to numerous shows in the Northwest and California to show her work and has participated in the prestigious Leigh Yawkey Woodson Birds in Art Show. In 1997 and 1998, both *US Art* and *Inform Art* magazines interviewed her as an artist specializing in painting Native American petroglyph sites. She was chosen as this year's cover artist because her work combines two great themes of our journal: the natural history of North America and beautiful stone.

For more information about Carol's work, contact Aspen Grove Gallery, P. O. Box 189, Joseph, Oregon 97846; phone 541-432-9555.



NARGS COMING EVENTS

Eastern Winter Study Weekend: "Lost in the Woods" (the shady rock garden), Jan. 24–26, 2003, Ann Arbor, Michigan. Host: Great Lakes Chapter. Contact: Michael Kaericher, 8171 Brookville Rd., Plymouth, MI 48170 <mkaericher@alum.mit.edu>

Western Winter Study Weekend: "Treasures of the Plant Hunters," Feb. 28–Mar. 2, 2003, Vancouver, British Columbia. Host: Alpine Garden Club of British Columbia. Contact: Moya Drummond, 3307 W. 6th Ave., Vancouver, BC V6R 1T2 <moyadrummond@shaw.ca>

2003 NARGS Annual Meeting: "Rush to the Rockies" at Beaver Run Resort, Breckenridge, Colorado, July 8–13, 2003, hosted by the Rocky Mountain Chapter. Contact: Mary Komodore, 25298 Foothills Dr. N., Golden, CO 80401, tel. 303-526-1054



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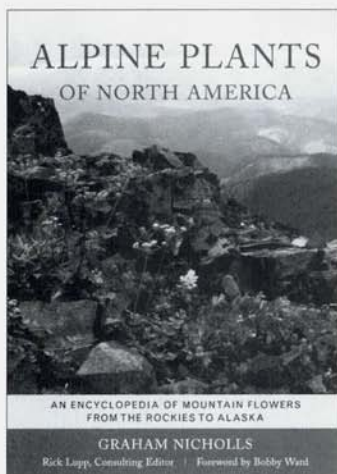
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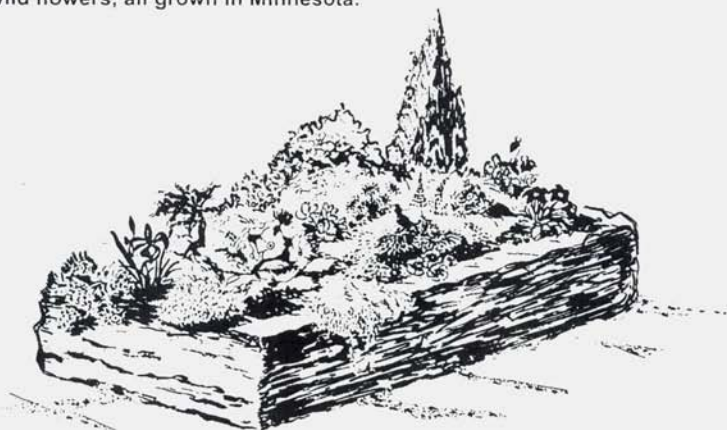
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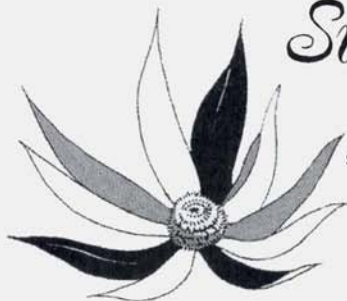
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