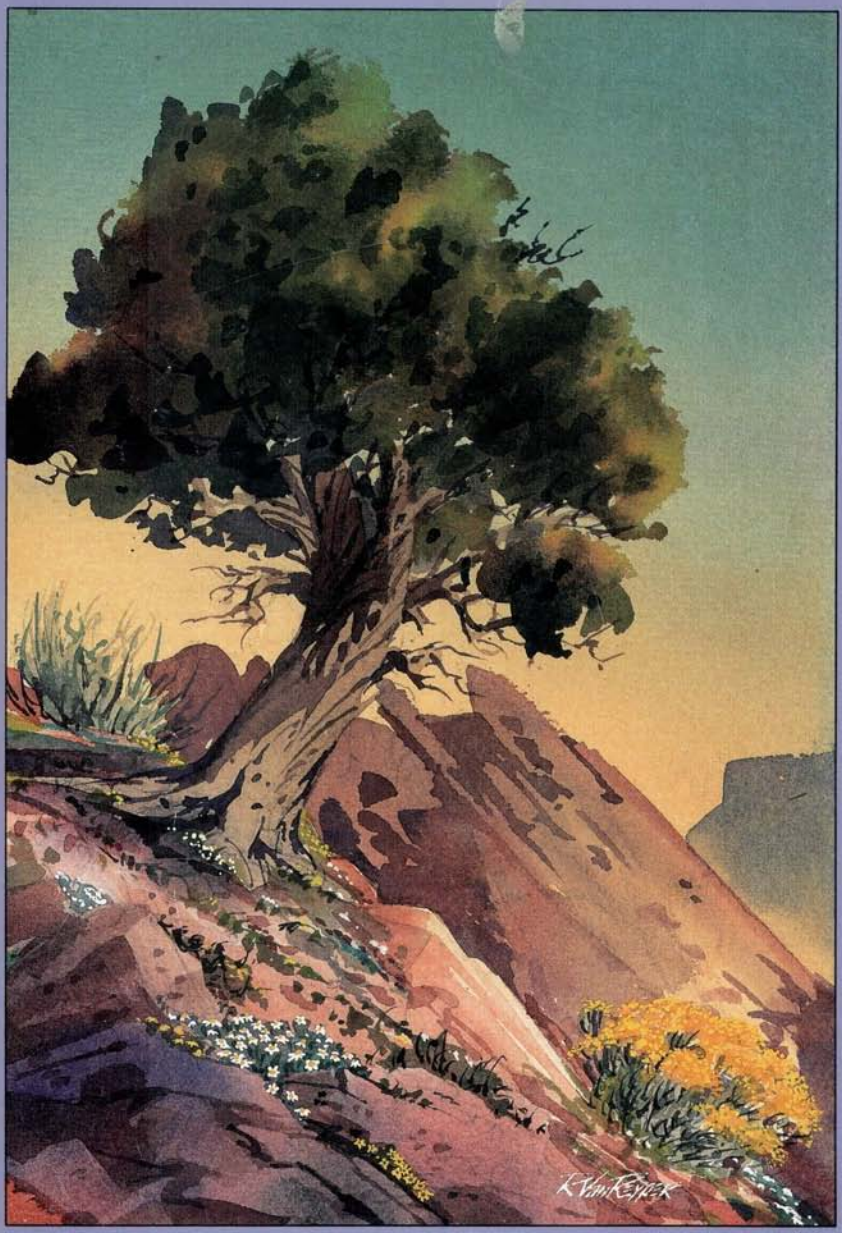
ROCK GARDEN



QUARTERLY

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COVER: *Juniperus osteosperma*
by Dick Van Reyper of Park City, Utah

ROCK GARDEN QUARTERLY

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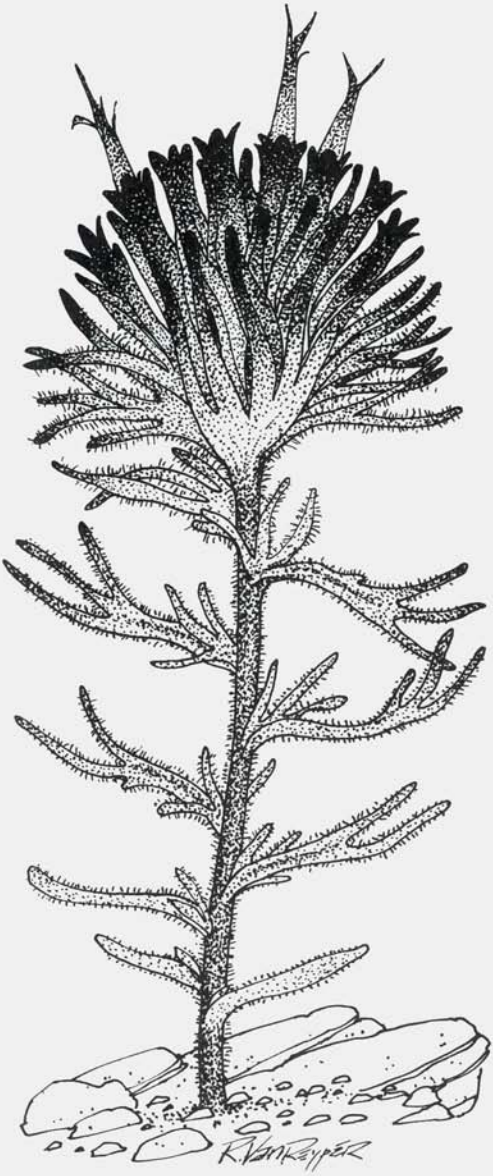
FEATURES

DEPARTMENTS



Castilleja scabrida

THE GENUS *CASTILLEJA* IN UTAH

by David E. Joyner

In *The Legend of the Indian Paintbrush* as retold by Tomie dePaola, a small Indian boy, called Little Gopher, who was unable to physically compete with the larger and stronger boys in his clan, was encouraged by the tribe's shaman to define his own destiny by employing his artistic talents. Inspired by the prophecies of the shaman, the boy contributed to the prosperity of the tribe by illustrating the great hunts and exploits of his people. Although creative in his work, he was unable, however, to fulfill a "dream-vision" that came to him one evening, a vision in which a young Indian maiden said, "Find a buckskin as white as this. Keep it and one day you will paint a picture that is as pure as the colors in the evening sky." Little Gopher found a white buckskin, but using berries, flowers and other items to mix his paints, he could not create the colors of the evening sky. Late one night while resting in his teepee he heard a voice, "Because you have been faithful to the People and true to your gift, you shall find the colors you are seeking. Tomorrow take the white buckskin and go to the place where you watch the sun in the evening. There on the ground you will find what you need." The next evening Little Gopher raced to the top of a nearby hill where, as the voice had predicted, he found small brushes filled with paint. Little Gopher began to paint quickly and surely, using one brush, then another. He had found the colors of the sunset.

He carried his painting down to the circle of the People, leaving the brushes on the hillside. And the next day, when the People awoke, the hill was ablaze with color, for the brushes had taken root in the earth and multiplied into plants of brilliant reds, oranges and yellows."

Form and Function

Indian paintbrushes (*Castilleja*) are highly specialized members of the Scrophulariaceae (Figwort Family), a large family of approximately 220 genera and 3000 species. Included within this taxonomic assemblage are many of our most attractive western wildflowers, such as penstemons (*Penstemon*), monkeyflowers (*Mimulus*) and louseworts (*Pedicularis*). Unlike most members of the Scrophulariaceae, whose flowers provide nectar

guides and a landing pad as enticements to bumblebees, the flowers of Indian paintbrush are small and drab by comparison, having a form more typical of plants pollinated by hummingbirds or long-tongued insects. The greenish or greenish-red petals are fused into a narrow tube (corolla) slit at the distal end. In some paintbrush species the corolla tube extends beyond the bracts, whereas in others, the tube remains obscured. The bracts and sepals provide the brilliant floral colors most people associate with paintbrushes—the crimson so typical of *Castilleja angustifolia* or the reddish-orange of *C. applegatei* (photo, p. 265).

The array of floral colors found among Utah's paintbrushes is surprisingly broad, ranging from fingernail-polish pink to fire-engine red, or from near lemon-yellow to an off-white. Many floral colors can occur within a single population in one geographic location, as exemplified by *C. rhexifolia* in Little Cottonwood Canyon (site of the 1996 Annual NARGS meeting) of the Wasatch Range. Pink and reddish-orange are dominant throughout Grizzly Gulch, a side canyon situated on the northeastern edge of Alta Basin at the top of Little Cottonwood Canyon. Within the Alta and adjacent Albion Basins, rose-red predominates, with an occasional yellow form hidden here or there. Pastels are common along the upper Gad Valley trail, which leads from the crest of Hidden Peak (11,000' end-point for the Snowbird Ski Resort tram) located immediately west of the Albion Basin down through Gad Valley and ultimately to the Snowbird Resort, conference center for the 1996 NARGS Meeting.

The majority of Utah *Castilleja* form clumps, with several stems originating from the same woody root crown; only the single-stemmed *C. exilis* consistently deviates from this pattern. Although all Utah paintbrushes have alternate and sessile leaves, leaf form can vary considerably, even on the same plant. Leaves can be linear, lanceolate, linear-elliptical or lance-ovate. In some species the lower leaves may be entire while the upper leaves are 3- to 5-lobed. In *C. applegatei*, the upper leaves are lobed and have wavy margins, a trait clearly discernible very early in the spring as new buds emerge.

Paintbrush flowers, which are borne on terminal spikes or spike-like racemes, develop cylindrical to ovoid seed capsules. With maturation, the capsules split open, and the seeds are dispersed through wind or animal action. Paintbrush seeds (at least dried seeds) have a very interesting structure: they consist of a brown, almond- to kidney-bean-shaped seed encased within a tortoise-shell-patterned, transparent envelope. Presumably the envelope generates through light refraction the grayish color we associate with paintbrush seeds. The grayish seeds of elephanthead (*Pedicularis groenlandica*, also in the Scrophulariaceae) are similarly structured, except the outer envelope is papillose (resembles "goose bumps") rather than patterned with tortoise-shell patches.

Indian paintbrushes are well-known for their hemiparasitic growth habit. They are not alone in this oddity, for the closely related owl clovers (*Orthocarpus*) and louseworts (*Pedicularis*) also are facultative parasites or hemiparasites. Facultative parasites exploit the water and nutrients confined within the root system of their host but are not obligated to do so in order to survive. The fibrous root system of perennial paintbrushes is woody like a shrub rather than filamentous as one might surmise from

their parasitic habit. The lateral roots form haustoria when coming in contact with a host's roots, entering the root and establishing a connection with water-conducting cells (see Heckard, 1962). Perhaps attachment occurs early in the development (meristemic elongation) of the parasite's new roots, prior to maturation and formation of a woody epidermis, or it may be limited chronologically, predominating during the first year or two of plant growth while the root system is expanding but limited in occurrence thereafter. Regardless of timing, facultative root parasitism probably provides selective advantages to paintbrushes, as suggested by Ronald Taylor in his book *Sagebrush Country*, "through this parasitic association, the paintbrush increases its tolerance to dry conditions and expands its geographical range."

Distribution

Of the more than 200 species of *Castilleja*, fourteen occur within Utah, and six (*C. chromosa, C. exilis, C. linarifolia, C. miniata, C. applegatei,* and *C. rhexifolia*) are common along the Wasatch Front. Five of the 14 have statewide distributions, four are abundant within the state but generally restricted ecologically to montane or desert habitats, and the remaining five are classified as uncommon or rare, their distributions often limited to a single mountain range. Two of these, *C. aquariensis* and both varieties of *C. parvula* (var. *parvula* and var. *revealii*), have federal TES (threatened, endangered, and sensitive) status: *C. aquariensis* (category 1, C1); *C. parvula* var. *revealii* (C2) and *C. parvula* var. *parvula* (C2/3c).

Castilleja aquariensis is a Utah endemic limited in distribution to the Aquarius Plateau, Garfield and Wayne Counties (southcentral Utah). This yellow-flowered perennial occupies "Sagebrush and grass meadow communities adjacent to aspen-subalpine fir on clay-loam soils at about 9,800-11,000' elevation." "Closely resembling taxa in *C. rhexifolia*, but recognized by the linear, appressed-ascending leaves and smaller (6-12" tall), fewer stemmed (1-few) plants. Similar to *C. occidentalis*, which is smaller (3-8" tall) and has decumbent stems." The single specimen of Aquarius paintbrush included within the paintbrush collection at the Garrett Herbarium (Utah Museum of Natural History) was found growing among volcanic rocks on a gentle, north-facing slope of an exposed meadow near the edge of a spruce-fir forest at an elevation of 9,900'.

Castilleja parvula is also endemic to southcentral Utah, with var. *parvula* (Tushar paintbrush) restricted to alpine locales in Beaver, Piute, and Garfield Counties, while var. *revealii* (Reveal paintbrush) occurs at the 7,000-8,500' elevation in Garfield, Iron and Kane Counties. *Castilleja parvula* var. *parvula* frequents "igneous gravels and outcrops between 10,000-12,100' elevation," while var. *revealii* grows among ponderosa pine/bristlecone pine communities on gravelly soils of the Wasatch Limestone Formation. Understandably, the two varieties are similar in appearance, separated taxonomically by habitat, number of persistent stems (*C. parvula* var. *parvula* has several persistent 3.5-8"-long green stems, while var. *revealii* produces one or two purplish stems), and length of the calyx (*C. p.* var. *parvula* =0.5-0.7"; var. *revealii* =0.6-1.3"). The inflorescence of both varieties is crimson to magenta.

Castilleja nana is another perennial species with limited distribution in Utah—alpine meadows in the Deep Creek Range of western Juab and

Tooele Counties. This diminutive paintbrush looks like a pink-topped, 3-5"-tall bottle brush. Each narrow stem supports clustered, dark green, lobed leaves and a tightly compressed, pink inflorescence. Specimens in the Garrett Herbarium were collected from rocky granite ridges in alpine meadows at an elevation of 10,500-12,000'.

Castilleja pulchella (pretty paintbrush) is a short-statured, subalpine or alpine species whose distribution is limited to the Uinta Mountains of northeastern Utah. Goodrich and Neese (1986) describe this paintbrush as small (less than 6" tall) with predominantly yellowish, deeply lobed bracts, lobed leaves, and an inflorescence sometimes tinged with purple. The herbarium specimens look like short-stalked plants with an inordinately robust inflorescence. *Castilleja pulchella* is "fairly common across the crest of the Uinta Mts., tundra of alpine or subalpine rock stripes, fell fields, ridges, and meadows; 10,800-12,500'" and often co-occurs with the equally common *Geum rossii* (Goodrich &Neese, 1986).

The fifth paintbrush with limited distribution in Utah is *C. occidentalis*. This perennial herb grows in alpine meadows in the La Sal Mountains (Grand and San Juan Counties), east of Arches National Park along the Utah-Colorado border. The one specimen in the Garrett Herbarium is approximately 8" tall, with linear-to-elliptic leaves, drab yellowish bracts, and a very large inflorescence. *Castilleja occidentalis* was first reported in Utah in 1911 by P.A. Rydberg and A.O. Garrett.

Although *Castilleja angustifolia, C. applegatei, C. flava,* and *C. rhexifolia* are common in Utah, they prefer either desert or montane habitats. *Castilleja angustifolia* (northwestern paintbrush) is a Great Basin Desert paintbrush found in desert shrub or pinyon-juniper communities at elevations of 4,068-8,460'; it occasionally may occur at subalpine elevations. This perennial paintbrush is 10-15" tall with a robust root system, narrow, light green, deeply lobed leaves, and a pinkish (occasionally violet, purplish, orange, yellow, or whitish) elongated inflorescence. It can be found on rocky foothills growing alongside *Ephedra* spp. (Mormon tea), *Artemisia arbuscula* (low sage), and *Pinus monophylla* (single-leaf pinyon). *Castilleja flava* (yellow paintbrush) is superficially similar in appearance to *Castilleja angustifolia* but has yellow bracts; it also has a robust root system, narrow, lobed leaves, and an elongated inflorescence. Diagnostically, *C. flava* has a "calyx distinctly deeply cleft on [the] side opposite the galea (galea is a hood or helmet-shaped petal)," whereas in *C. angustifolia*, the "calyx clefts [are] more nearly equal" (Shaw 1989). *Castilleja flava* prefers dry sandy or gravelly soil, edaphic traits typical of sagebrush and ponderosa pine (*Pinus ponderosa*) communities at elevations of 5,870-10,000' in the eastern half of the state.

Castilleja rhexifolia (rhexia-leaf paintbrush) and *C. applegatei* (wavyleaf paintbrush) are subalpine to alpine species found in northern Utah along the Bear River, Wasatch, and Uinta Mountain Ranges. Although the geographic distributions of these two perennials overlap, individuals often segregate by stratum. In Little Cottonwood Canyon, for example, *C. applegatei* dominates on the dry, fully exposed, granite outcrops of Albion Basin and on the steeper, south-facing slopes of Grizzly Gulch, while *C. rhexifolia* prefers cooler locations with a deeper organic soil profile, as occurs in gullies, along stream beds, in conifer stands, and in dense herb communities. *Castilleja applegatei,* represented in Utah by var. *viscida* (see Holmgren,

1971), is easily identified by its lobed leaves with "wavy" margins, bright orange or reddish-orange inflorescence, and short stature (under 10"), whereas *C. rhexifolia* has linear leaves, rounded bracts, a taller stature (up to 20"), and shows a variety of floral colors. *Castilleja sulphurea* (photo, p. 265), considered by Albee et al. (1988) to be synonymous with *C. rhexifolia*, also grows in the Albion Basin, but like *C. applegatei*, it prefers the well-drained mineral soils of exposed, rocky sites, such as along the Cecret Trail of Albion Basin. *Castilleja sulphurea* is structurally like *C. rhexifolia* but much smaller in stature (8") and has drab, whitish to greenish-yellow bracts.

The five remaining paintbrushes, *C. chromosa*, *C. linariifolia*, *C. miniata*, *C. scabrida*, and *C. exilis*, have statewide distributions and tend to favor desert over montane habitats. Within this group is our only annual paintbrush, *C. exilis*, a tall (to 24"), thick-stemmed, but shallow-rooted plant that grows in marshes, meadows, or along seeps or springs in salt desert shrub communities. Although western wetland communities are often dominated by moist-soil monocots, such as *Carex nebrascensis* and *Juncus torreyi*, the marsh paintbrush, being a very robust species, competes effectively against the more aggressive, rhizomatous sedges and rushes. *Castilleja exilis* flowers from June through August, and although the inflorescence is very long, up to one-half the total length of the stem, only the bracts of the uppermost flowers show a touch of bright red; bracts surrounding the lower flowers remain green. The lack of color and a typical "weedy" appearance due to its single stem with broad, lanceolate leaves can make *C. exilis* very difficult to identify at a distance if the plant happens to be growing among other similar-shaped, broad-leaved herbs. However, when in flower and viewed at close range, the long, linear bracts extending far beyond the corolla and tipped with fire engine red are diagnostic; no other Utah paintbrush looks like *C. exilis*.

The narrowleaf paintbrush, *C. linariifolia*, is a favorite of mine because of its long, slender leaves. Although leaf width and length can vary significantly in this species according to location, one population in the Holiday Park area (Weber Canyon) on the northwest corner of the Uinta Mountains has leaves so narrow they resemble the filamentous leaves of the submersed sago pondweed, *Potamogeton pectinatus*. In pondweeds and other submersed macrophytes, narrow leaves are an adaptation to reduced levels of light; they also minimize the effects of physical stress due to water movement and optimize leaf surface to volume ratio, thus increasing the efficiency of gas exchange and nutrient absorption. *Castilleja linariifolia*, however, is not a wetland species; in fact, it prefers dry, rocky upland sites, often co-existing with sagebrush. This preference for dry sites can be very dramatic. For example, *C. linariifolia* and *C. miniata* can be found growing side-by-side on a small dry ridge circumscribing one pond in the Holiday Park area, but only *C. miniata* (photo, p. 266) grows within the flood plain of the pond. The range of *Castilleja linariifolia* ends abruptly as the base of the ridge merges into the flood plain, a vertical distance of 3-4'.

Since *C. linariifolia* is a dryland paintbrush and is not exposed to the same physical and physiological stresses affecting submersed pondweeds, why have filamentous leaves? The same question could be asked about other parasitic species within this family (*C. angustifolia*, owl clovers, and louseworts) that also have

slender, filamentous or pinnately dissected leaves. If there is a reduction in total photosynthetic capacity due to reduced leaf mass, compared to what might occur with broader leaves, is the potential loss of energy compensated for by the plant's parasitic habit? Would these species still have filamentous leaves if they were not parasitic, and are *C. linariifolia* and *C. angustifolia* more efficient at extracting nutrients from hosts than are broad-leafed species like *C. rhexifolia*? It would be interesting to determine to what extent environmental factors influence leaf variability in *C. linariifolia* and other parasitic species, and whether leaf shape also responds directly, indirectly, or not at all to the number, proximity, and composition of potential host species. This relationship could be examined under a variety of environmental conditions and with a plethora of potential host species, by investigating *C. linariifolia*, since its range extends from desert shrub to aspen-conifer communities, an elevational gradient of approximately 7,200'.

Castilleja linariifolia, unlike *C. exilis*, is not distinct morphologically and can be easily misidentified, especially in western Utah, where *C. linariifolia* co-occurs and may hybridize with the narrow-leafed *C. angustifolia*. As is the case with *C. flava* and *C. angustifolia*, Shaw (1989) separates *C. linariifolia* from *C. angustifolia* by comparing the sepals: *C. linariifolia* has a "calyx distinctly deeply cleft on side opposite the galea," whereas in *C. angustifolia*, the "calyx clefts [are] more nearly equal." Furthermore, the bright red of *C. linariifolia* is concentrated on the calyx, while in *C. angustifolia* the bracts generate most of the color.

Two of our desert paintbrushes, both with relatively narrow leaves, are *C. chromosa* (desert paintbrush, photo, p. 266) and *C. scabrida* (Eastwood paintbrush, photo, p. 265). These two species are so similar in appearance that many of the pressed specimens at the Garrett Herbarium have been re-identified several times, leaving us to wonder which of the naming authorities is correct. Both paintbrushes also resemble *C. angustifolia*. Goodrich and Neese (1986) segregate *C. scabrida* from *C. chromosa* as follows: *C. scabrida* has a relatively large corolla, the galea is exserted from the calyx, and the stems are somewhat decumbent at the base and lack chlorophyll along the lower scaly portion. *Castilleja chromosa*, on the other hand, has a smaller corolla, the galea is concealed by the calyx, and the erect stems are green throughout. It would be helpful if these two paintbrushes segregated by habitat, but they don't. Eastwood paintbrush is "characteristically in pinyon-juniper communities with sagebrush, occasionally in *Elymus salina*-shadscale or mountain brush communities in sandy soil or sandstone outcrops, or in mixed sand and clay from shale strata; at 5,000-8,200'." *Castilleja chromosa* is "common; widespread; greasewood, shadscale, mixed desert shrub, sagebrush, pinyon-juniper, and mountain brush communities on many substrates; 4,700-8,500'." *Castilleja scabrida* apparently does not occur in the northern portion of the state, so plants seen along the Wasatch, Bear River, and Uinta Mountains are more likely to be *C. chromosa*.

Our last paintbrush is *C. miniata* (scarlet paintbrush, photo, p. 266), a perennial herb of wet or dry sites, found on open slopes, in meadows, or in association with mountain brush, aspen, or spruce-fir communities. Principally montane in distribution, this species can be found throughout the Bear River, Wasatch and Uinta Mountains, the Wasatch Plateau of central Utah, and as far southwest as

the Pine Valley Mountains of Washington County. It also occurs in the western Deep Creek Range, the eastern La Sals, and in the Raft River Mountains in Box Elder County (northwestern Utah). Similar in form and height to *C. rhexifolia*, it can be separated from *C. rhexifolia* by its acute and lobed bracts, which are linear and blunt in *C. rhexifolia*. *Castilleja rhexifolia* also tends to be subalpine to alpine in distribution, while *C. miniata* is typically montane, a distributional pattern particularly apparent along State Route 150 (Kamas-Bald Mountain-Evanston) in the Uintas.

Cultivation

If there was ever an incentive to explore the horticultural requirements of a species, it's having been told "you can't grow that plant, it's impossible!!" For most western rock gardeners, the advice on propagating paintbrushes provided by Linc Foster in *Rock Gardening: A Guide to Growing Alpines and Other Wildflowers in the American Garden* is most fitting: "When seed of any [*Castilleja*] species is available, sow it on a rocky slope, particularly among other existing plants." Unquestionably, living in the appropriate geographic area has definite advantages if you wish to use this method; the best and easiest horticultural strategy for growing paintbrushes in Utah is to put the seed where you want the plants to grow and let Mother Nature do her thing. I have successfully established *C. rhexifolia*, *C. miniata*, *C. linariifolia* and *C. applegatei* in my yard by cold-stratifying seeds over winter, followed in early spring by selectively placing the seeds next to other plants. Sowing seeds randomly throughout the garden in late fall, however, has proven less successful; I assume because the seeds are eaten by overwintering birds or by insects.

Propagation of paintbrushes in 72-well germination trays or in pots is also relatively straightforward and may be the only practical method for rock gardeners living in the Midwest or along the East Coast. Seeds, following cold stratification, readily germinate out-of-doors (March-May) or under artificial light. Seedlings are transplanted in late May, or transfered to small pots where they are held until they can be planted.

If paintbrush seeds are germinated in pots without the use a host plant, the selection and maintenance of a proper planting location plus timing become critical steps in paintbrush propagation. Paintbrush seedlings transplanted in spring or early summer into flower beds supporting an abundance of potential hosts (hence, a virtual web of roots to be tapped) often survive if the bed is kept moist throughout the summer. Allow the bed to dry out or transplant too late in the season and the seedlings usually die, regardless of the availability or composition of host plants. In a dry bed, seedlings either wilt and die within days or linger throughout the summer but show little new growth; these plants rarely if ever survive the winter. Planted in the fall, the seedlings apparently lack sufficient time to develop an adequate root system and amass sufficient reserves to survive the winter. Pick a location where few potential hosts exist and even with sufficient water, the seedlings usually die. I found this was the case even with desert species, such as *C. chromosa*.

One obvious solution for many of the transplantation problems is to germinate paintbrush seeds in pots already supporting a suitable host, and then transplant the two together. And what species are suitable hosts? My paintbrushes co-exist with *Phlox paniculata*, *Artemisia ludoviciana*

(Louisiana sagewort), *Helenium hoopesii* (orange sneezeweed), plus a number of montane and subalpine composites (Asteraceae). Inadvertently, I also found the strawberry clover (*Trifolium fragiferum*) to be a superb host plant, and although most rock gardeners may be reluctant to transplant this aggressive lawn weed into their pristine rock gardens, other more acceptable legumes (Fabaceae) such as *Astragalus, Oxytropis,* or *Hedysarum* may serve equally well. In fact, an association between paintbrushes and legumes is clearly evident in the deserts of the San Rafael Swell of southeastern Utah (Emery County), where *C. scabrida* frequently parasitizes various species of *Astragalus.* Other acceptable host species might include *Artemisia scopulorum* (dwarf sagewort), various short-statured, clump-forming grasses, or even small composites.

During spring of 1995 I coupled several of the more difficult paintbrushes (e.g., *C. nana* and *C. sulfurea*) with *Andropogon scoparius* (little bluestem), a short-statured prairie grass I consider suitable for rock gardens or other natural areas. Time will tell whether the match was appropriate. And with success:

"Scarlet tufts
Are glowing in the green like
flakes of fire;
The wanderers of the prairie
know them well,
And call that brilliant flower the
'painted cup'."
—author unknown

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David Joyner gardens in Salt Lake City, where he tinkers with growing Utah wildflowers.

Red Canyon, Utah

Geology and Plants

by Alyce M. Hreha

There are many scenic areas with alpine plant communities worthy of exploration within a short drive from Salt Lake City, Utah. During the summer months, when July temperatures usually top 100°F, what better relief could we offer visitors than a trip to the mountains? Higher elevations provide visitors with much-welcomed cooler temperatures, great scenery, and an abundance of wildflowers.

One of my favorite botanical areas to observe diminutive species is Red Canyon on the Dixie National Forest in Garfield County atop the Paunsaugunt Plateau of southern Utah. Red Canyon, named for its brightly colored, eroded knolls and scree slopes produced by the weathering and erosion of the red limestone member of the Claron Formation, is bisected by State Highway 12. The Red Canyon badlands are located on the western edge of the Paunsaugunt Plateau, while Bryce Canyon National Park, about ten miles to the southeast, makes up its eastern escarpment.

This region is composed of dry, sparsely vegetated, sloping terrain that forms an intricate system of deeply cut canyons and river valleys separated by high plateaus. A unique and endemic flora is restricted to the Claron Formation. Plant species restricted to unusual or distinct rock substrates and soils are called *edaphic* endemics. Edaphic endemics restricted to calcium-carbonate-rich strata are called calciphiles (limestone lovers). Many of this suite of calciphiles endemic to the Red Canyon area can also be found growing on the Claron Formation at Bryce Canyon National Park and Cedar Breaks National Monument.

Geology

The geological features of the magnificent scenery of this area are the remnants of extensive sediments deposited in a series of ancient Paleocene lakes during 60 million years of weathering and erosion. Sediment accumulation in these oscillating lakes varied as depositional environments and climatic conditions changed. The lakes gradually dried up, and the south-central portion of Utah was fragmented into a series of high, faulted plateaus, then subjected to millions of years of erosion.

The thickness of the Claron Formation varies. At Cedar Breaks, it exceeds

1000', while in the Bryce Canyon area it generally ranges from 500-800'. Variation in color is due to different amounts of iron and manganese present in the beds. Gradation from white to pink to red represents the state of oxidation and the concentration of these metals in each layer; the densely compacted, red, calcareous beds contain the most iron while the porous, white sandy beds contain the least.

Hardness or erodibility of the beds is highly variable and depends on their textural components and limestone (carbonate) content. Very soft beds have more clays and silts present while very resistant beds have a high percentage of limestone and dolomite. Softer beds erode to steep-sided slopes, while harder beds erode to form picturesque limestone spires, pinnacles, breaks, hoodoos, and walls, as well as natural amphitheaters, rock castles, and temples.

Outcrops of these rocks have been called the Badland Cliffs, Pink Cliffs, Sunset Cliffs, and Table Cliffs, all descriptive of landforms outstanding in form or color. These colorful landscapes attract millions of visitors to southern Utah each year.

The formation has been described as having a rapid rate of erosion, largely a function of creep resulting from winter freezing rather than from runoff produced from summer thunderstorms. The limestone rims at Bryce Canyon recede 10"-50" per century, which is considered quite rapid by geological standards. Water in the form of runoff from winter snow melt and heavy summer thunderstorms contributes to streamflow in this area and is the primary agent of erosion to these beds. Slopes are so steep (25-45°) that storm runoff travels rapidly, taking with it any loose material on its downhill course. Control of soil loss and the resultant heavy sedimentation are major soil erosion problems of this badland topography.

Silene petersonii

Soil

Weathering caused by winter freeze-thaw cycles or frost heaving loosens the rock fragments which are then carried downhill by the pelting force of rain during torrential downpours and landslides. As many as 200-300 freeze-thaw cycles per year are common on south-facing slopes where temperature fluctuation is most pronounced. Soil development is limited, resulting in shallower soils and sparser vegetation on south-facing slopes compared to north-facing slopes and relatively flat floodplain sites.

The slope soils in Red Canyon are a mixture of coarse limestone and fine clay particles arranged in alternating vertical bands overlain by gravel, scree,

and talus. Slope soils are generally lacking in organic matter. North-facing slopes and floodplain sites have greater vegetative cover and more visible organic matter than south-facing slopes.

Climate

The average annual precipitation of 18.6" falls primarily in the form of snow from November through March. June is the driest month with less than an inch of precipitation, and August is the wettest month with almost 3" of precipitation from summer thunderstorms. The lowest mean monthly temperatures (22°F) occur in January while the highest mean temperatures (64°F) occur in July. Average highs are 80°F and average lows 40° for July. Red Canyon appears more xeric than these values would indicate, due to high daytime temperatures and the evaporative capacity of the air. Winds are light to moderate in all seasons, and evaporation exceeds annual precipitation. Valleys are generally semi-arid, while plateaus tend to be wetter islands in a sea of semi-aridity.

In general, water availability is decreased on the predominantly dry substrates of the Claron Formation, which have low infiltration and high runoff rates. North-facing slopes are cooler and have more available water than south-facing slopes. Precipitation is unevenly distributed and creates many cycles of alternate wetting and drying. Soils range from spongy when saturated to brick hard when dry, especially on south-facing slopes. Even during the hot summer months when the soil surface appears dry, underlying soil seems to be fairly moist.

Plants

The plant community in in which most of the plants of interest to rock gardeners occur is called the Bryce Canyon breaks community. On north-facing slopes of Red Canyon the breaks community is dominated by coniferous trees from montane zones, such as *Abies concolor, Picea pungens, Pinus flexilis, P. longaeva* and *Psuedotsuga menzeisii,* as well as *Pinus ponderosa* and *Pinus edulis,* both more typical of lower elevation vegetations.

On south-facing slopes trees are almost absent, shrubs are uncommon, and herbaceous vegetation covers less than 10% of the ground. These slopes appear devoid of plants, but closer inspection reveals a variety of mound-forming and rhizomatous species. The forb component is a mixture of common species from nearby vegetation zones and rare calciphiles. This unique assemblage of species differs from understory species found elsewhere in the area.

Some Red Canyon species, such as *Aquilegia scopulorum, Ivesia sabulosa, Eriogonum panguicense, Linum kingii, Monardella odoratissima,* and *Silene petersonii,* inhabit subalpine zones in other parts of their geographic ranges. These are tufted cushion plants or rhizomatous species with characteristics similar to those of alpine species.

There is a different group of species that are endemic to the Claron Limestone; i.e., they occur only on that substrate. These include *Castilleja revealii* var. *parvula, Cryptantha ochroleuca, Eriogonum aretioides, Penstemon bracteatus,* and *Silene petersonii. Silene petersonii* occurs as far distant as the Wasatch Plateau in central Utah, on the same formation. Other species, while occurring primarily on limestone, have also been occasionally found on other geologic substrates. These Red Canyon rarities are all caespitose perennials. Short descriptions follow:

Aquilegia scopulorum

Erect clusters of inflorescences of sky blue flowers arising from dense

rosettes of glabrous leaves originating from a woody caudex. Flowers in early summer.

Cryptantha ochroleuca
Low, caespitose perennial with several short stems of yellow forget-me-not like flowers from dense rosettes of hairy leaves. Flowers in early summer.

Cymopterus minimus
Delicate umbel of yellow flowers with parsley-like leaves arising from subterranean stems. Flowers in early summer.

Lomatium minimum
Umbels of yellow flowers on large caespitose mounds of parsley-like foliage in early summer.

Draba subalpina
Tiny, dark green rosettes of thick leaves, with short stalks of little white flowers in clusters in early spring.

Lesquerella rubicundula (photo, p. 267)
Tiny, grayish-green leaves in rosettes with short stalks of little, bright yellow flowers in clusters in early spring.

Eriogonum aretioides
Tiny mound-forming plants with minuscule, light yellow flowers in early summer.

Eriogonum panguicense
Rosettes to large mounds of lance-shaped, dark green leaves with slender stems and white flower clusters at top in late summer.

Oxytropis jonesii (photo, p. 268)
Rosettes of grayish-green, fuzzy legume leaves with copious, stemless, pink-purple, pea-like flowers in early summer.

Penstemon bracteatus
Dwarf blue-violet beardtongue flowers arising in early summer from glaucous rosettes of spatulate to lanceolate leaves, rhizomatous.

Phlox gladiformis (photo, p. 267)
Large mounds of dark green, needle-shaped leaves with thick clusters of white flowers in early summer.

Silene petersonii
Showy pink-purplish flower clusters on inflorescences arising from creeping rosettes of lance-shaped leaves. Flowers in late summer.

Townsendia montana var. *minima*
Light pink daisies packed into dense grayish green rosettes of lance-shaped leaves. Flowers in early summer.

The relatively barren knolls and scree slopes where these plants grow are unstable, highly eroded, and have shallow, rocky soils. It might be difficult for other plants to become established on these sites because of the apparent high soil temperatures, high evaporation rates, and fluctuating availability of moisture. In contrast to the harsh environment on the slopes, adjacent well-developed floodplain soils support a dense vegetative cover of big sagebrush (*Artemisia tridentata*) and rubber rabbitbrush (*Chrysothamnus nauseosus)* with an understory of common herbs, while the endemics are generally absent.

The endemics appear to be adapted to critical environmental factors such as shallow soils, winter freeze-thaw cycles, summer thunderstorms, high runoff accompanied by low infiltration rates, rapid rates of erosion, unstable or shifting substrates, fluctuating water availability, high evaporation rates, high amounts of solar radiation

and surface albedo—all or any of which might exclude common species.

The species that make up this unique plant community have two different growth forms. Most of the species have rhizomes, while a few species have a vertical caudex. These growth forms are common to plants in alpine communities and serve as adaptations for survival on unstable slopes. The erosion associated with scree slopes in Red Canyon can be compared to the instability associated with talus slopes in alpine regions.

In general, the endemics seem to prefer south- and southwest-facing slopes but are found growing on every possible aspect, except the most northerly exposures, which are usually forested. The occurrence of the endemic species varies with slope inclination. Some species such as *Eriogonum panquicense*, *Lesquerella rubicundula* and *Townsendia montana* var. *minima* appear to tolerate gentle to steep slopes (5-30°) while others such as *Penstemon bracteatus* and *Silene petersonii* appear restricted to steeper slopes (20-30°). Perhaps the latter are more tolerant of slope disturbance and heavy erosion.

Townsendia minima

Major federal land management agencies and conservation organizations in Utah have realized the importance of protecting these rare endemic species for years. Local botanists, especially Dr. Stanley Welsh and his colleagues at Brigham Young University Herbarium in Provo, Utah, have been instrumental in conservation efforts.

Because the distribution of these plants is closely tied to their geologic substrates, habitat destruction would be a major threat to their survival. Elimination of their critical habitat would decrease their abundance and ultimately push their small populations towards extinction. According to Dr. Welsh, plant species from families with the highest percentage of species restriction to unusual edaphic substrates appear to be at the highest risk of extinction. To protect these species, the US Fish and Wildlife Service has proposed listing many as threatened or endangered species.

The geologic substrates that support populations of these endemics in Red Canyon, as well as surrounding areas,

have been located. Populations of these plants and their ecological requirements have been identified and studied. This information is being used by National Park Service (Bryce Canyon National Park and Cedar Breaks National Monument) and US Forest Service (Dixie National Forest) resource managers in the planning of effective management strategies to preserve these species in their habitats on the Claron Limestone.

Utah Natural Heritage Program (Dept. of Natural Resources, State Lands and Forestry Division) botanists are mapping the distributions of these species and studying their habitat requirements. This information will be used to initiate programs to protect them.

An article by Robert Mohlenbrock in *Natural History Magazine* in 1988 featured the unusual endemic flora restricted to the Claron Formation in Red Canyon, Utah. Since 1988, the US Forest Service has set aside two areas: 1) the Red Canyon Research Natural Area, 460 acres near Black Mountain, in cooperation with The Nature Conservancy and 2) the Claron Botanical Area proposed by The Nature Conservancy and the Utah Native Plant Society. Both areas, located on Forest Service land in Red Canyon, will provide protection to the calciphile plant communities. These preserves will also allow researchers to study these plant species and enable the public to observe this rare endemic flora.

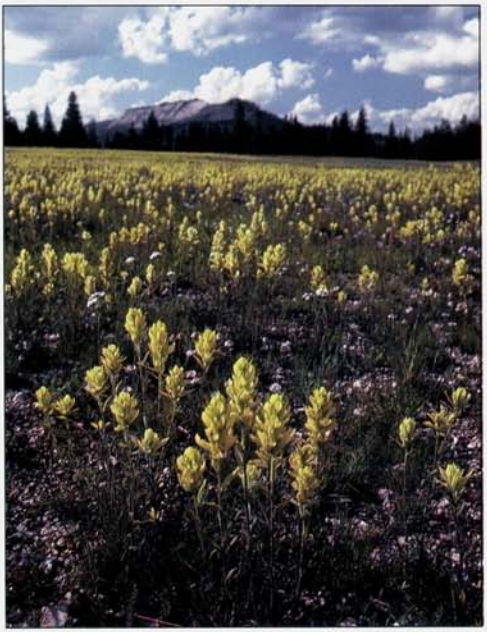
Early collections of some of these endemic species were taken at their type location in Red Canyon by Marcus Jones and Bassett Maguire, two of Utah's botanical pioneers, around the turn of the century. You can experience the excitement these early botanical explorers must have felt when they drove through Red Canyon and discovered these tiny plant species growing in the screes.

A visit to the area to observe these unique species in their native habitat would be rewarding to novice and experienced rock gardener alike. Stop at the Red Canyon Visitors Center on Highway 12 for information on how to reach the Claron Botanical Area, by traveling over a few miles of dirt road off Highway 12. If you have time, you can also visit Cedar Breaks National Monument on the Markagunt Plateau, reached by traveling south on Highway 89 and turning west on Highway 14. Enjoy yourself, the scenery, and the plants. Please remember to take lots of photographs but leave only your footprints on the Claron Limestone. Your cooperation is required to help preserve these unusual species for future generations of rock garden and wildflower enthusiasts.

Drawings by Barbara Soha.

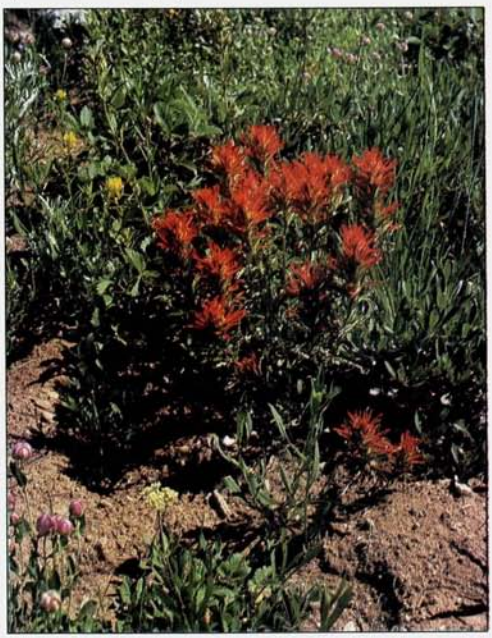
Alyce Hreha studied Red Canyon endemics while working on her doctorate in biogeography at the University of Utah and as a botanical consultant on several rare plant inventories and monitoring projects. She is conservation botanist at Red Butte Garden and Arboretum in Salt Lake City, Utah.

Castilleja scabrida (pp. 255, 256)
photo, Marv Poulson



Castilleja sulphurea (p. 255)
photo, Marv Poulson

Castilleja applegatei (pp. 252-255, 257)
photo, David Joyner



Castilleja applegatei
photo, David Joyner

Castilleja miniata (pp. 253, 255, 256, 257)
photo, Marv Poulson

Castilleja chromosa (pp. 255, 256, 257)
photo, David Joyner

Lesquerella rubicundula (p. 262) photos, Alyce Hreha

Phlox gladiformis (p. 262)

Red Canyon, Garfield County, Utah (pp. 259-264) photos, Alyce Hreha

Oxytropis jonesii (p. 262)

LIMBER PINE ODYSSEY

by Richard Hildreth

First-time visitors to Utah are usually in awe at the proximity of the mountains to major urban areas. Practically within minutes one can transit Salt Lake City at 4,500' elevation, for instance, and "head for the hills." Within 30 minutes of city-center you can breathe fresh mountain air at one of seven major ski areas in the Wasatch Mountains, noted for "the greatest *snow* on earth." In the summer, following a year of ample snow and rain, the wildflowers can be "the greatest *show* on earth." We welcome members of the North American Rock Garden Society to some of our favorite alpine haunts in Utah.

To help set the scene a bit we can picture the major vegetation components as we drive from the bowl of the valley of the Great Salt Lake to our destination, the wildflower meadows, rock outcrops, and mountain tops at Albion Basin and Alta. In 1847 Brigham Young and his band of pioneers set to planting crops and laying out a city. Reportedly there were few, if any, trees on the valley floor. Remember that much of Utah is in the Great Basin with average annual precipitation amounts under 15"—the second driest state in the United States. Only our neighbor Nevada is drier. No doubt boxelder (*Acer negundo*), willow (Salix spp.), and poplars (*Populus fremontii, P. angustifolia*) grew along the banks of the seven creeks that flow out of the Wasatch Range, just as they do today. The open lands are covered by native grasses, forbs, sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus nauseosus*) and bitter brush (*Purschia tridentata*). Farther out in the salt flats the vegetation is considerably different, dominated by greasewood (*Sarcobatus vermiculatus*) and plants of the goosefoot family (Chenopodiaceae). At the mouths of the creeks, near the shoreline of ancient freshwater Lake Bonneville, Gambel oak (*Quercus gambelii*), bigtooth maple (*Acer grandidentatum*), thin leaf alder (*Alnus incana* ssp. *tenuifolia*), boxelder and western water birch (*Betula occidentalis*) thrive as part of the foothill woodland-riparian vegetation type. One of Utah's showiest secrets is the vibrant autumn color display of bigtooth maple along the foothills.

High, snow-covered peaks of Mt. Olympus, Gobblers Knob, and Twin Peaks (11,330' elevation) are clearly

visible from below. Dark green patches and vertical accents betray the presence of various conifer species. It is to this group of plants that our attention will be directed, since they are the signature woody species as we travel from valley basin to alpine treeline. In particular, we will focus on one of my favorite evergreen trees, the limber pine (*Pinus flexilis*).

We will start our odyssey at the mouth of Little Cottonwood Canyon in the southeast corner of Salt Lake Valley, just as we cross the Wasatch Fault. Twelve miles up is Alta and Albion Basin. Scattered Utah junipers (*Juniperus osteosperma)* dot the open slopes here, among outcrops of quartzite. Utah juniper occurs throughout the region at middle elevations (4,800-6,000') usually in association with pinyon pine (*Pinus edulis* in the eastern half of Utah and *P. monophylla* in the western half.) On the north-facing slopes of the canyon at about 6,000' elevation the first specimens of Douglas fir (*Pseudotsuga menziesii* var. *glauca*) are evident, with their curious but tell-tale three-pronged bracts protruding beyond the cone scales. Red Pine Trailhead was named for the abundant Douglas firs that graced these slopes, before pioneer sawyers (who called it red pine) discovered its value as strong construction lumber. Several lumber mills once operated in the various canyons. Growing with the Douglas fir are the first stately specimens of white fir (*Abies concolor)*. Varying in needle color from a clear, glossy, dark green to silvery blue, the white fir is becoming a favorite landscape tree in the valley, although it is not yet as popular as blue spruce (*Picea glauca)*, the state tree of Utah. Young seedlings of white fir will often be seen growing beneath the dappled shade of quaking aspen. Continued growth through the years results in a transition of the vegetation to a white fir-Douglas fir climax, mid-montane forest with groves of aspen (*Populus tremuloides*), Gambel oak, and bigtooth maple surrounding. On the hotter, south-facing slopes at this level, stands of the evergreen curlleaf mountain mahogany (*Cercocarpus ledifolius*) prevail.

In the Snowbird Ski Resort area, the NARGS conference headquarters, at about 8,000', scattered groves of Engelmann spruce (*Picea engelmannii)* and sub-alpine fir (*Abies lasiocarpa*) mingle with aspen and other upper montane, woody vegetation. On exposed ridges and divides the only pine species in the area can be seen, silhouetted against the sky. Older specimens have a characteristic shape with twisted, irregular, spreading branches. This is the limber pine (*Pinus flexilis*), so called because a young branch can literally by tied into a knot without breaking the stem. I remember my father demonstrating this feature to a disbelieving son with a branch from trees near our family cabin in the Snowy Range, west of Laramie, Wyoming. The smell of pitch as the tissues strain is unforgettable. Limber pine has a special kinship for me, as I monitored the growth of young landscape specimens planted near our home in Cheyenne. They were head high to a young lad; some 60 years later these trees are over 50' tall. If you take the tram at Snowbird you will see numerous gnarled limber pine trees on slopes and ridges below.

At timberline along with subalpine fir and Engelmann spruce you may see stunted trees of limber pine, shaped by winds and cold into a characteristic elfin wood or *krummholz*. Single trees have been battered by the elements such that a mature tree, perhaps several hundred years old, will have a trunk no more than 3' high. All its branches

will be spread out in a layer over the ground. The "canopy" seems to flow in the direction of the fierce prevailing wind with branches so dense one can safely lie on top. The windward side of the trunk and main branches may be devoid of viable bark, and the wood beneath bleached by the intense rays of the sun. Trees just below treeline, but still subject to wintry blasts, will have typical flagging of the branches, aligned straight out in the direction of the winds.

If you hike to Cecret (also spelled Secret) Lake above Albion Basin, note the two sentinel limber pines overlooking the lake from high up on the ridges to the southwest.

Let's take a short hike up the Cardiff Trail at Alta. If you will take your eyes off the wonderful assortment of penstemons and other alpines for a moment, you will see a limber pine growing out of a rock outcrop. Donald Culross Peattie in *A Natural History of Western Trees* tells the similar tale of the famous tree on the Lincoln Highway (now Interstate 80) between Cheyenne and Laramie. It is an ancient limber pine growing from the cracks in a large granite boulder right next to the freeway. As Peattie so eloquently describes it, "Limber Pines have a way of growing in dramatic places, taking picturesque attitudes, and getting themselves photographed." (Peattie, 1950). Most people traveling this way from the beginnings of time have memories or photos of "The Old Pine Tree." My favorite specimen in Utah is in a grove overlooking Mary Lake, beyond the ridge to the north in Big Cottonwood Canyon. It is photogenic in all seasons, with strong ascending branches arising from a stout, short trunk. The major roots are grasping a large boulder, exposed, because through the millennia the surrounding soils have eroded away. Who knows its age? It seems timeless. Specimens have been dated nearly 2000 years old; however, not so old as the Great Basin bristlecone pine (*Pinus longaeva*) at almost 5000 years of age (Lanner, 1984).

Limber pine (*Pinus flexilis* James) was named by the naturalist Edwin James (1797-1861) in 1823 in "An Account of an Expedition from Pittsburgh to the Rocky Mountains, Performed in the Years 1819 and '20, under the Command of Major Stephen H. Long" (Welsh, 1993). The natural distribution of limber pine is mainly in British Columbia, Alberta, Montana, Idaho, Wyoming, Colorado, Utah, Nevada, California, and New Mexico, with isolated occurrences in adjacent states (Critchfield, 1966). The related southwestern white pine (*Pinus strobiformis*) occurs mostly south into

Selections of Limber Pine

'Bergman Dwarf'	Growth slow
'Compacta'	Growth slow, conical
'Firmament'	Blue needle selection, resistant to blister rust
'Glenmore'	Needles coarser and longer (to 11.5 cm.), a good silvery blue; growth slow, conical, dense
'Glenmore Dwarf'	Same as 'Glenmore Nana'. A bushy, dwarf form, needles only 3 cm. long.
'Pendula'	Growth rapid, spreading; main trunk and branches drooping; needles as per the species
'Temple'	Growth slow, conical
'Tiny Temple'	Growth very low, spreading; annual growth about 10 cm.; needles short, 6-7 cm. long, 0.7-1.0 mm. wide, dark green outside, gray-blue inside.
'Witch's Broom'	Growth dwarf, compact, dense

Some sources for dwarf conifers are listed in the selected references. Others are listed in the *Journal of the American Conifer Society*, 827 Brooks, Ann Arbor, Michigan 48103-3161.

Mexico, while the similar whitebark pine (*Pinus albicaulis*) overlaps in part of its range to the north. Limber pine occurs in all Utah counties.

Limber pine is a white pine with five needles per fascicle. The needles are up to 3" long, without marginal serrations, dark, glossy green and rigid. The needles are retained for four or five years. The sheath encasing the base of the needles is soon deciduous. The bark of young branches is a light gray color, contrasting with the dark green needles. When planted as a landscape tree, which I certainly encourage, the effect of the dark needles and white bark is striking. The somewhat asymmetric cones are tapered and 4-6" or more in length. Each broad cone scale holds a pair of dark brown to nearly black, wingless pine nuts. The seeds are edible for human consumption and relished by Clark's nutcracker.

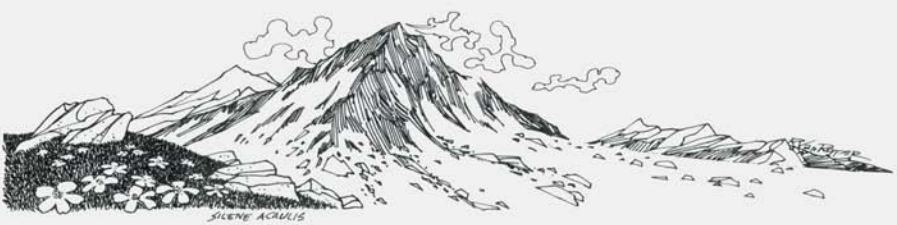
The natural history relating to seed dispersal is a fascinating story of coevolution involving a bird and the life cycle of the limber pine. Clark's nutcracker is related to the common crow. A bold attitude and strident call reveal the kinship. A raucous "craaaah-craaah" interrupts an otherwise peaceful autumn day, echoing along the canyons as the bold bird flits from the top of one pine tree to the next. The upturned branches of the limber pine expose clusters of ripening, straw-colored cones. The nutcracker jabs a powerful, elongated bill between the opening cone scales, extracting the prize within. Seeds of limber pine, like other species with large, nutritious seeds, are wingless, depending on various birds and mammals to disperse their crop. Clark's nutcracker is the principal dispersal agent for limber pine, piñon pines (*P. edulis, P. monophylla, P. cembroides*) and bristlecone pines (*P. aristata, P. longaeva*).

Unlike any other bird the nutcracker has a pouch beneath its tongue, which it systematically fills with pinenuts, one at a time, to a full load of about 100 seeds. It does so in a rather characteristic manner, first grasping and removing the seed, then in a shaky motion it seems to assess whether the seed is sound or not, before pointing its head skyward, allowing the seed to fall into the pouch. With a full load the busy bird flies off to a nearby open ridge or shelf, often near timberline, to disgorge the contents, one seed at a time, as it pokes the seed an inch or more into the soil. Up to a dozen seeds may be deposited in each cache. Somehow, during winter months, with the ground snow-covered, the nutcracker remembers previous caches and uncovers hidden food reserves (Lanner, 1984).

Deposits ignored by the birds and undiscovered by other predators will likely germinate, adding to the forest stand. Often they survive with multiple trunks growing together, seemingly as a single specimen.

Even though the landscape use of nursery-grown, randomly selected limber pine is encouraged and hopefully will spread, it may be that a smaller, or more compact, or slower-growing form will better fit a given situation. In general landscape situations with sufficient space, a specimen, or better yet, a grove of limber pines would be highly desirable and ornamental. However, for rock garden use or for limited space a specimen with a smaller stature may be more suitable.

The appropriate use of evergreens within a rock garden design, or as part of the surrounding or background scene, should be considered as a natural element in the landscape. Certainly there are evergreens in wild, high montane settings where we find and enjoy the treasured jewels of the rock garden. Even at or above timberline one can find dwarf, weather-beaten hummocks of pine, spruce, or fir. Simulating elements of these elfin woods in our own rock gardens seems natural and appropriate. The hunt for rare treasures among dwarf and slow-growing evergreens may be as stimulating, rewarding, and (yes) frustrating as discovering a new alpine flowering plant for the rock garden. The challenge is to create a scene in miniature.



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Drawings by Dick Van Reyper.

Dick Hildreth is a hybrid like many of the plants he has created. He studied botany and horticulture at Wyoming, Ohio State University, and University of California-Davis. He is former Director of the Saratoga Horticultural Foundation in California and past president of the Pacific Horticultural Foundation, publisher of Pacific Horticulture., co-founder of the Utah Native Plant Society and past president of the Utah Association of Nurserymen and Landscape Contractors. He is currently Director of Education for Red Butte Garden and Arboretum at the University of Utah and Adjunct Assistant Professor of Biology.

GARDEN PASSION

THE ENGLISHES' WAY

by Marv Poulson

Beginning with one-half acre of an old wheat field and a heartfelt love for growing things, two green-thumbers with a passion to try the unusual created a garden of beauty, diversity and vigor. John and Mary Jim English nurture a haven, a virtual arboretum and botanical garden, at the edge of the Great Basin Desert. Today at their suburban Salt Lake City, Utah, home of more than 45 years, John and Mary Jim have mature specimens from the intermountain deserts and mountains as well as from a wide range of temperate regions.

On this lot, early Mormon pioneers irrigated crops from a canal; here John started a fruit orchard and vegetable garden. Seasonal planting and harvests yielded fresh produce for family and friends. During development of the garden their three children gathered stones from the remnants of a stream bed. This stimulated an interest in collecting rocks. Later the rocks were blended with rock garden plants. While the family travelled and collected interesting rocks around the state there were many opportunities to see and appreciate the great diversity of Utah's flora. The passing years saw the family grow up and interests in the garden evolve from simple utility to aesthetic diversity. As need for produce waned, interest in native and desert plants took hold.

Both Mary Jim and John studied at the University of Utah where the renowned botanist-naturalist Walter Cottam taught and founded the State Arboretum of Utah. Cottam's passion for trees and horticulture was not lost on the Englishes. As soon as they had the land for their home, tree planting began with a Socrates tree (*Plantanus occidentalis*) that later succumbed to damage from trenching. An Austrian pine (*Pinus nigra*) succeeded the sycamore and now lends elegant character to the front yard.

In many ways, the Englishes were horticultural pioneers; information was scarce when they began. They observed plants in their habitats in the wild and relied on trial and error to grow the plants at home. Planting new things carries some risk. While books on specialty subjects were scarce, plants were even harder to acquire. Information was often gleaned from mail-order catalogues.

In the far end of the yard, where the irrigation water could not flow, a

desert garden took shape. The naturally rocky ground of the old stream bed served as base soil, and John raised the level with several inches of sand. Today the results are impressive, with a collection of *Opuntia* species, *Echinocereus*, *Sclerocactus*, and *Coryphantha* interplanted with yucca, sagebrush, Mormon tea, prickly poppy, and the difficult sego lily, along with dozens of other worthy desert and dryland dwellers. Mary Jim particularly cherishes the tiny members of the desert garden such as *Lewisia*, *Armeria*, *Arenaria*, *Draba*, *Erigeron*, *Penstemon*, and *Lithodora*.

John's interest in trees and the realization that neither he nor Mary Jim really took great pleasure from the harvest any longer pushed the vegetable garden into history; a penchant for iris took over. Hybridizing and showing iris captured the interests of the whole family. Selecting for flower color and form provided much interest and prize-winning exhibition flowers for statewide shows.

As John's collection of trees seldom seen in Utah grew, Mary Jim began delving into ground covers. Local availability was very limited, forcing purchase by mail order. This developed patience and enhanced excitement as the plants grew.

Under the maturing glade these two created in the second driest state in the nation is sheltered a collection of beech, ginkgo, Atlas cedar, flowering crab, dawn redwood, aspen, dogwoods, Japanese maples, dwarf hemlocks, dwarf *Chamaecyparis*, and contorted filberts. Carpets of hardy cyclamen, *Eranthis*, *Veronica*, *Anemone*, *Alchemilla*, *Jeffersonia*, *Hosta*, *Epimedium*, and *Asarum* mingle on the rich forest floor. *Trillium*, *Erythronium*, and *Colchicum* emerge in their seasons to bring scale, texture, color, and exotic interest to the woodland oasis.

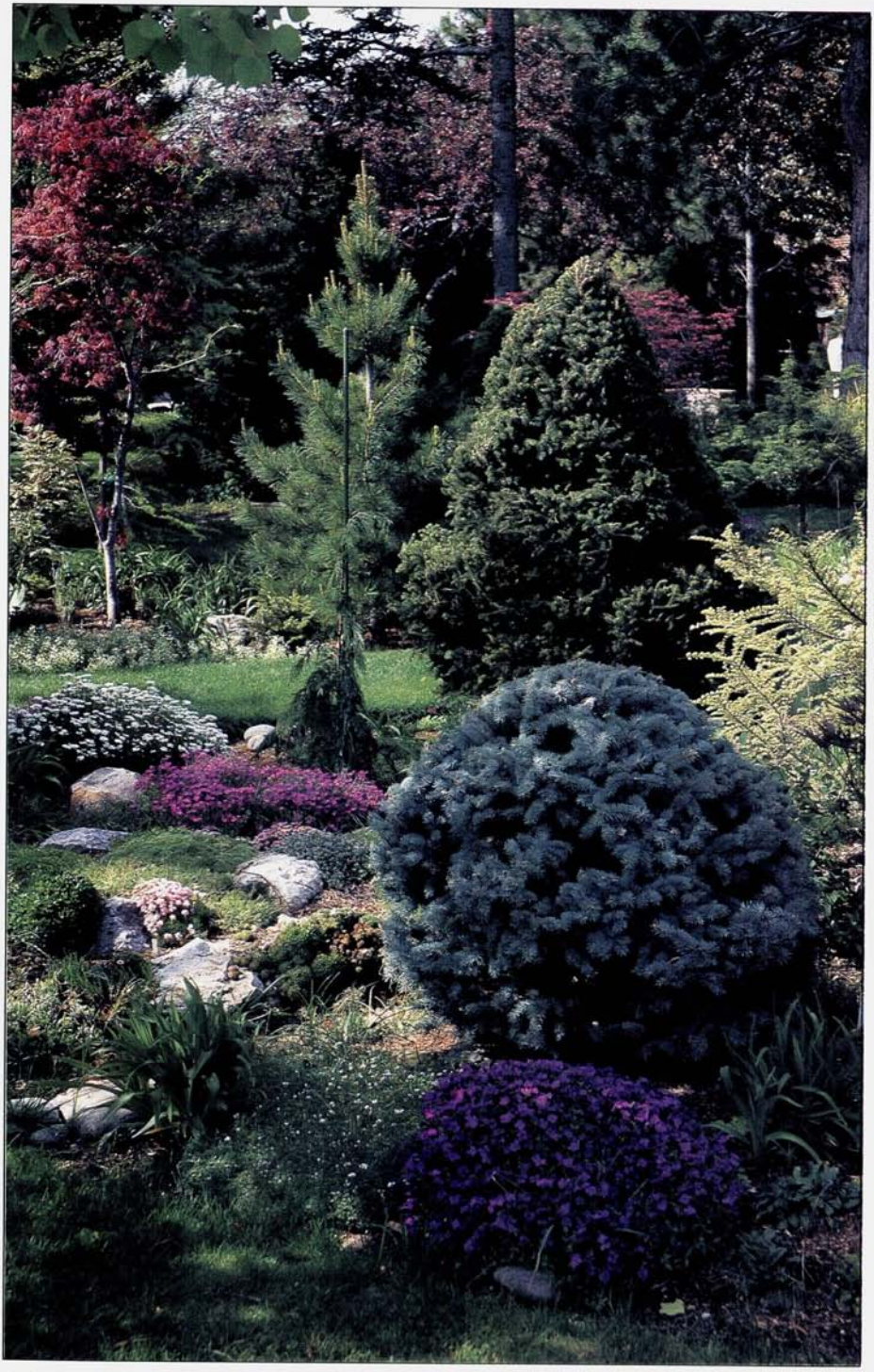
In keeping with the natural diversity represented in the geology of Utah, the Englishes have collected groupings of rock from many formations and locations. These interesting and varied rocks are arranged with complementary alpines and other diminutive plants. Rocks and plants together create an engaging array of texture and color.

To the Englishes, variety is the spice of the garden. Peony, *Anemone nemorosa*, *Meconopsis*, *Papaver orientalis*, and *Delphinium* create vivid displays from spring to autumn, blending stature and color. Daylilies occupy a prominent place in summer and include worthy selections from John's many breeding programs.

Tending a half-acre garden is no small feat. Turf areas of drought tolerant *Zoyzia* provide garden access. Mary Jim dispatches encroaching garden plants, weeds, and spent leaves and flowers with a caring hand. John sees to watering, mulching, and topdressing the beds with compost produced from garden debris. Such diligence and ecological consciousness has spanned decades, long before much was published on the subject.

Mary Jim and John English garden each day with interest, care, and passion. As an admirer of both the people and their garden, I congratulate them and treasure the moments I have enjoyed with them in their oasis in the desert.

Marv Poulson gardens in Salt Lake City.



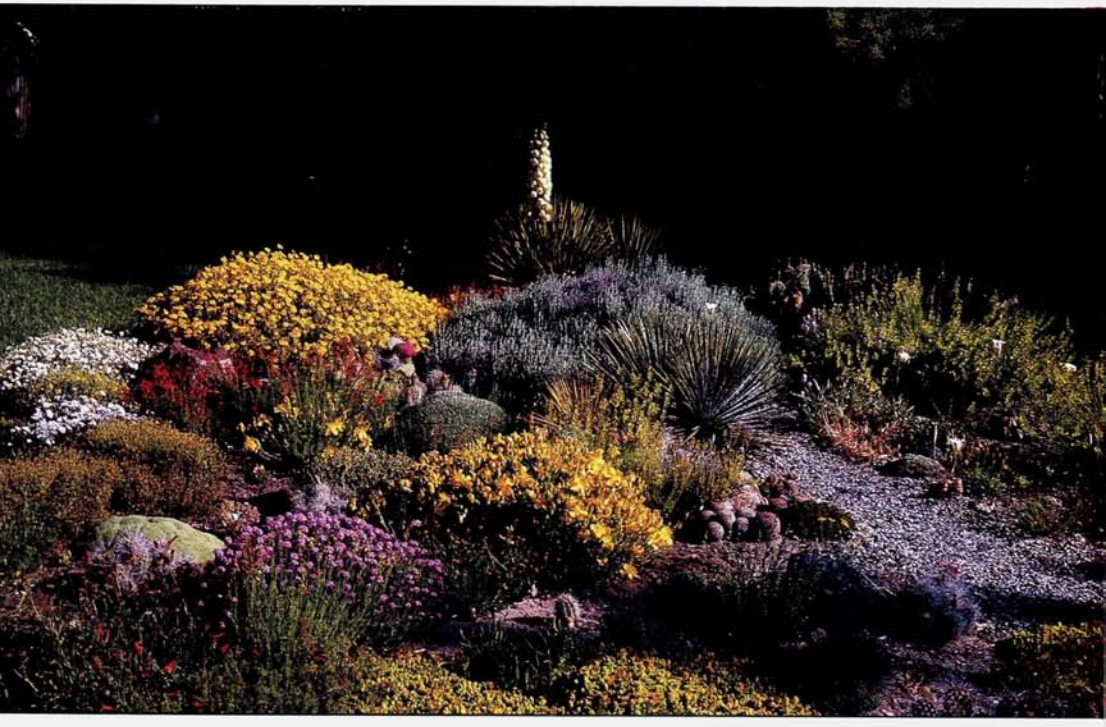
John and Mary Jim English garden (pp. 275-276) photo, John English

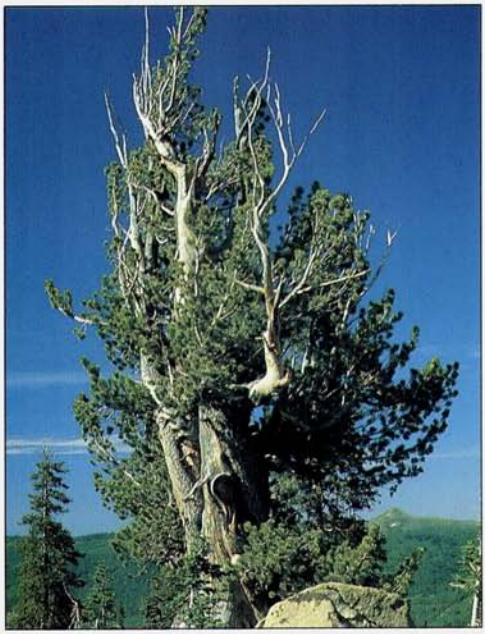
Mules ears (*Wyethia amplexicaulis*) in the dryland garden (pp. 275-276)

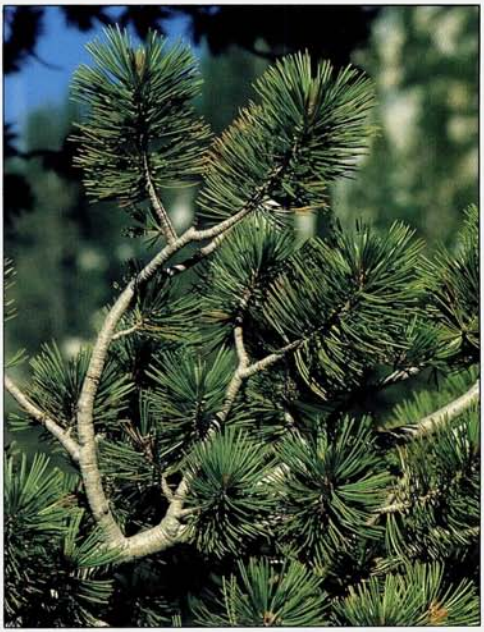
Tulipa pulchella and cholla (*Opuntia)* photos, John English

John and Mary Jim English garden, Salt Lake City, Utah (pp. 275-276)

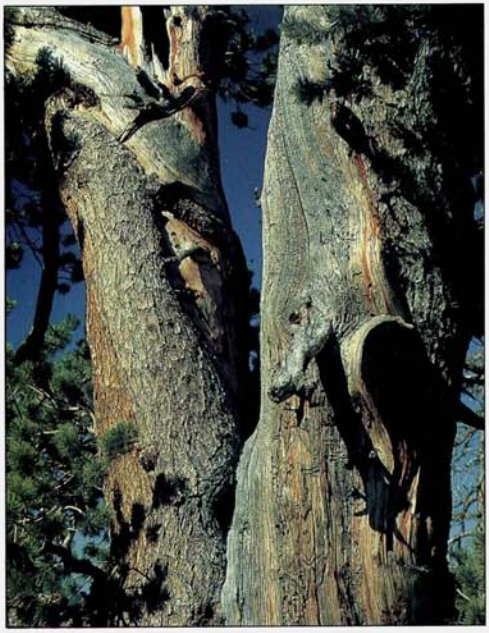
photos, John English

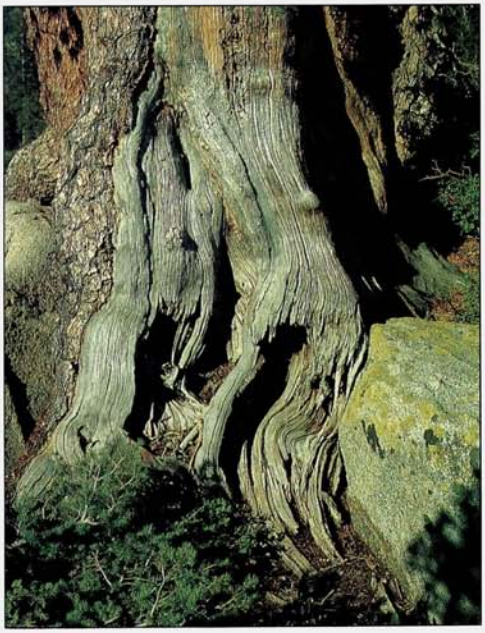






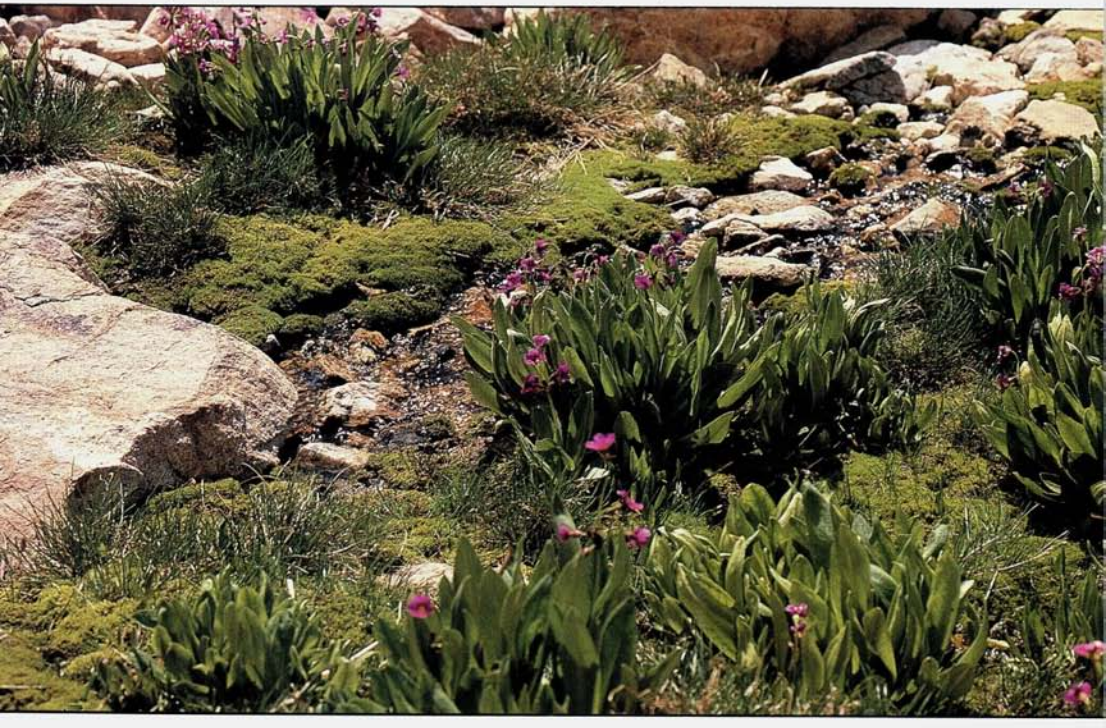
Pinus flexilis at Lake Mary in Big Cottonwood Canyon, Utah (pp. 269-274)
photos, W. R. Hildreth





Stansbury Mountains, Utah (p. 316) photos, William King

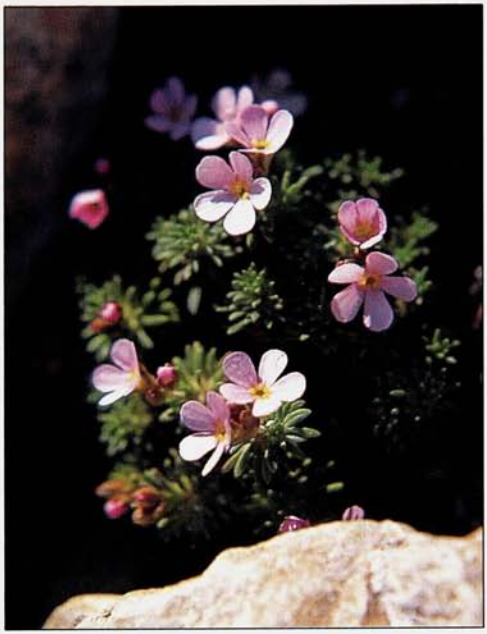
Primula parryi in the Ruby Mountains, Nevada (p. 314)



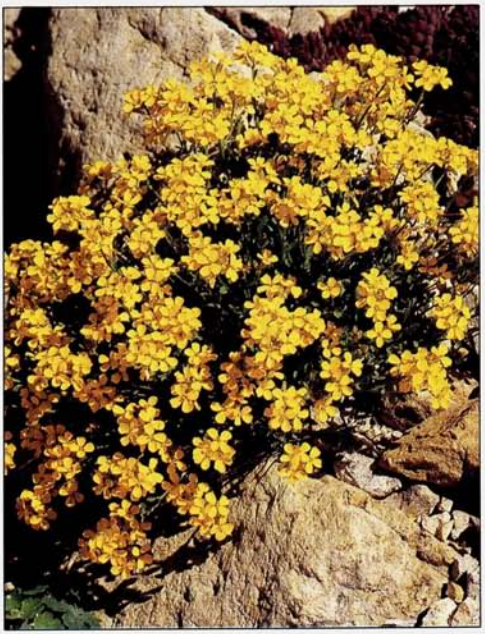
Androsace sempervivioides

Phlox condensata (p. 287)
photos, Dick Van Reyper

Androsace 'Millstream Hybrid'



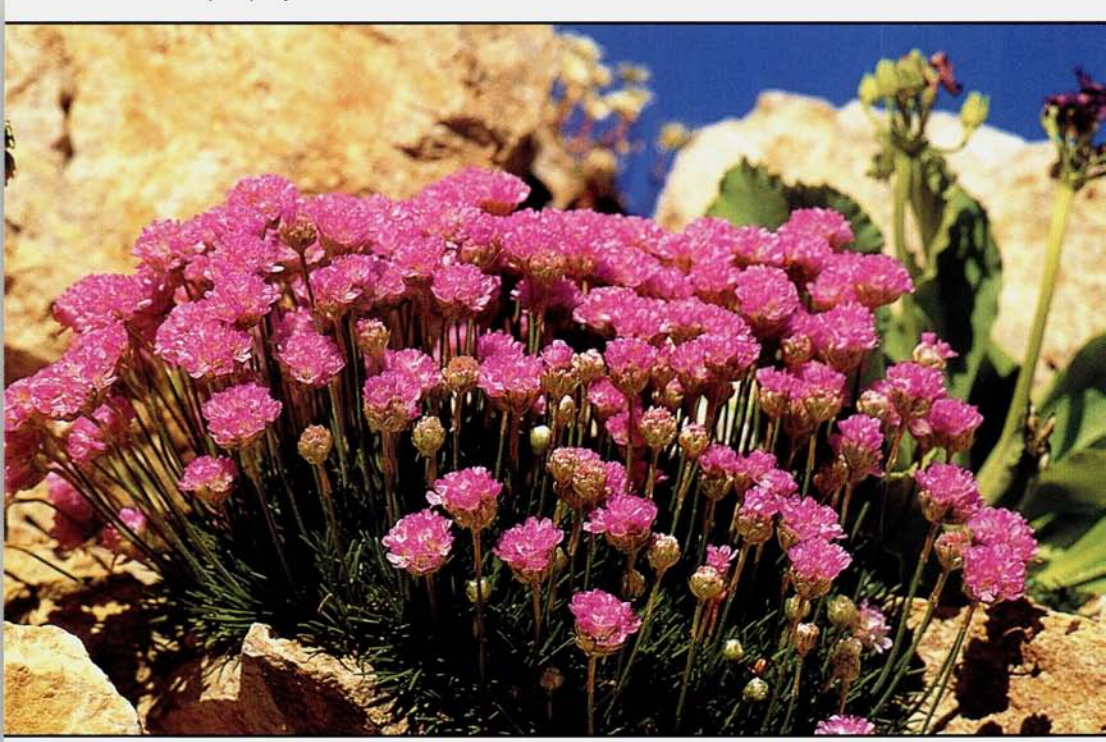
Erysimum kotschyanum



Garden of Dick Van Reyper, Park City, Utah (pp. 285-288)
photos, Dick Van Reyper

Gentiana acaulis (p. 287)

Armeria juniperifolia



A Garden in Park City

by Dick Van Reyper

I have had a 35-year love of the mountains, although I lived most of this time in Minnesota. Eighteen years ago, after meeting Betty Ann (Mech) Addison, seeing her magnificent rock garden at Rice Creek Gardens in Minneapolis, and benefiting from her very extensive knowledge, I was inspired to grow alpines. Five years ago, I decided to live where alpines grow, at 7,400' in the Wasatch Mountains of northern Utah. With a natural limestone outcrop thrusting up on the south side of my house and with many crevices for the smallest of plants, alpines have become my obsession. The clear, dry climate with cool nights and winter snow cover is a definite asset for growing the true high alpines—those mats and buns that were such a challenge in Minnesota.

Our precipitation in Park City comes mostly in winter and spring as snow (350" per year), starting in November and sometimes continuing until early June. Nighttime lows of -25°F are possible but rare. Winter days are normally between 20°-30°F. Winter humidity is low, resulting in very light, fluffy snow with good insulating quality. Summer daytime temperatures are usually 70°-85°F, sometimes reaching above 90°F; because of the low humidity (10-30%) and intense sunlight, shaded areas remain very comfortable. Summer nighttime temperatures generally range between 40°-65°F.

Park City is located in a canyon that continues up to 10,000', which creates thermal air movement (a breeze) on summer days. A slow drift of cool air comes down in the evening. Occasional summer thunderstorms also help the garden, although they normally don't produce more than 1/2" of rain. I frequently water in early morning with a mist nozzle, which doesn't add much ground moisture but keeps the plants happy and smiling. Amazingly, the porous soil of this garden seems to hold moisture longer than the heavy soil of my Minnesota garden. I don't know why.

Most of my plants are at peak bloom mid-May to mid-June. *Iberis saxatilis*, which would get "leggy" and luxuriant at a warm, moist, low elevation site, does not rise more than 2" after having a heavy snow load for months, plus constant low soil temperatures, even at midsummer with high intensity light. Desirable montane species also do well under these conditions.

But in Utah, all your love cannot go to the denizens of the tundra alone. In the broad expanse of the desert, with its variation of plant and rock colors, textures, sizes, and shades, I think there is a visual impact even more elegant than the high peaks. Imagine a scene of red sand and rock forms combined with the variety of greens in plants such as *Artemisia, Chrysothamnus, Datura, Ephedra, Cowania, Atriplex*, the astonishing silver of *Shepherdia* between massive boulders, plus an assortment of browns, tans, yellows, mauve, blue, gray, punctuated by the dark, tortured shapes of ancient *Juniperus osteosperma*. Arranged among these subtle colors and shapes are spots of vivid color from *Encelia* (yellow), *Cassia* (yellow), *Opuntia* (magenta, yellow), *Castilleja* (scarlet), *Salvia dorii* (purple), *Poliminta incana* (purple), and *Penstemon palmeri* (white). Add the sensation of the scent, a fragrance that occurs nowhere else, that burns itself into your memory. Put this against a distant background of blue-violet, snow-covered mountains or the massive red wall of mesa. To quote Robert Service in "Spell of the Yukon," *"It's the beauty that fills me with wonder. It's the stillness that fills me with peace."*

When a person spends some quiet time in the high desert and Great Basin country, especially in spring, there comes a strong desire for some acreage of rock, sand, and brush to indulge the botanical beauties of the "wasteland." I found such a place in my desert garden across my little road, in an area I once considered useless, grown up with rabbitbrush (*Chrysothamnus*), sage (*Artemisia*), *Gilia*, and *Opuntia*. Here elegant dryland species, such as the beautiful *Lewisia rediviva*, species of *Astragalus, Eriogonum, Penstemon, Oenothera*, and other western American plants now relish life at this altitude with "terrible" sand-gravel-clay soil with no added nutrients or organic material. I planted miscellaneous extra alpine seedlings here, too—which are looking increasingly out of place and, sorry to say, should be taken out.

Nevertheless alpines remain way out front in this war between the highlands and the drylands for the heart of this gardener. To get back to my primary addiction, how does one describe to a non-believer—a person who thinks someone growing tiny plants is a little strange—being at 10,000'-14,000' on a perfectly clear, perfectly windless, totally quiet peak with a vista of snowy summits and seeing the intense color on the small, concentrated masses of flowers growing among the rock? My goal was to reproduce this wonderful scene right outside my door—although there are obvious limitations. After 5 years of moving rock and soil and 18 years of learning from mistakes, I am pleased with the progress and results, even though much still needs to be done. With no background in botany, horticulture, or other science, it hasn't been easy, but with interest come knowledge, energy, and pride. I list here some of my favorite plants now in my garden, most of which are not rare or difficult (and not all are alpines), but contribute greatly to the alpine mosaic:

Acantholimon armenum—beautiful, spiny little dome of gray-green with unusual pink flowers.

Androsace pyrenaica—very slow growing, tight mound, but reluctant to produce many flowers after 3 years.

Aquilegia scopulorum—congested, small, blue-green foliage, many pale blue-violet flowers.

Campanula alpestris—4" dwarf with large violet, up-facing bells and narrow, gray-green leaves.

Craspedia uniflora—one of the more unusual composites. Linear gray-green leaves about 5" high with 3/4" bright yellow-orange, tightly packed domes on 10" stems.
Crassula setulosa var. *curta*—tight, small rosettes, and many small, white blossoms, like the diamonds from its South African homeland. Exceptional color in the fall.
Dianthus simulans—tight gray-green, spiny leaf dome with pink flowers.
Draba rigida, D. cappadocica—small buns with many brilliant yellow flowers.
Edraianthus pumilio—linear leafed mat, covered with deep violet flowers.
Eriogonum caespitosum—another neat, silver green mat with bright yellow flowers.
Gentiana acaulis—large trumpets of extraordinary blue that are hard to believe and nice foliage also (photo, p. 284).
Iberis saxatilis—low carpet, profuse, white flowers and dark green foliage.
Leontopodium alpinum—unusual whitish flowers (like a lion's paw).
Lepidium nanum—compact, slow-growing little dome of green.
Lewisia nevadensis—small, fleshy, linear leaves with multiple white flowers.
Lewisia tweedyi—gorgeous, peach-color flowers.
Pellaea atropurpurea—small, blue-green, reliable fern.
Penstemon caespitosus "Claude Barr"—low mat with very small leaves and many blue flowers.
Petrophytum caespitosum—nice, slow-growing, blue-green mat.
Phlox condensata—mat of minute, needle-like leaves with many white flowers and, like *P. hoodii*, a very slow grower (photo, p. 282).
Physaria alpina—nice, light gray rosette, bright yellow flowers.
Rhodohypoxis baurii—numerous, intense magenta flowers on 4"-long, linear foliage; has survived two years in this zone 4 climate in the bog area.
Saxifraga cochlearis, 'Major' and 'Minor'—tight, encrusted mounds, off-white flowers wave in the breeze.
Saxifraga grisebachii—symmetrical rosettes with unusual carmine blossoms.
Saxifraga minutifolia—tight mound of tiny, pale green leaves.
Sempervivum var. 'Plush Carpet'—tiny, bright green balls in the shade, reddish in the sun, that "glue" the rocks together.
Silene acaulis—the great alpine mat with bright pink flowers, symbol of the high mountains.

In the high desert garden
Calylophus lavandulifolius—small, rambling, but non-aggressive plant with many lemon-yellow, 1" flowers all summer over light green, narrow leaves.
Oenothera flava var. *taraxacoides*—beautiful, bright yellow flowers.
Phlox hoodii—tight mat, lots of white flowers.
Yucca harrimaniae—One of my favorite desert species because of its striking symmetry and a true symbol of the desert landscape.

Seed that I have sown in 4" pots and under 5' of snow in March, waiting for spring are: *Primula angustifolia, Claytonia megarhiza, Androsace villosa* var. *arachnoidea, Douglasia montana,* and *Shoshonea pulvinata.* If *two* of these become healthy, mature plants and bloom, I will be elated.

What follows are some comments about how I have attempted to achieve a

"natural, high alpine tundra" look in the rock garden. First, the rocks. Aside from the plants, these are the backbone of the alpine garden. The more rock, the better, and one to three large pieces add scale to make those cushions look even nicer. If you are trying to simulate a high altitude tundra, *fractured* rock, preferably all the same color and from the same site, looks more appropriate than rounded boulder types of various colors. I think it is very important to study the rock formations in nature that you are trying to imitate. Admittedly, I was fortunate to have a lot of rock to begin with, but moving much of the original rocks and bringing in another large quantity of rock plus wheelbarrows of sand, gravel and soil (most through the kitchen and living room and out the side door) presented a challenge. When it comes to moving really BIG rocks, where there's a will there's a way. *Save your back*, plus your fingers, toes, etc. Work very, very slowly and plan carefully. Lots of planks, blocks, a pry bar, short pipes (for rolling), and a two-wheel dolly are very helpful.

One other element that adds immeasurably to the rock garden is water. I decided that to imitate a mountain stream would be expensive and impractical for my small space, and also not artistically believable. My choice was to create, with a drip system made of flexible plastic tube, a simple, concealed "seep" dripping into a very small alpine puddle just below the summit of my rock garden. The very small excess water flowing out of one end creates a moist section on the slope below, making a comfortable home for mossy saxifrages among the tufa. About 5' lower, a second drip outlet keeps water in the lower pool; any excess flows into a small bog area for species that enjoy that environment: *Calluna vulgaris* 'Pyramidalis', *Gentiana verna* var. *angulosa, Andromeda polifolia, Salix nivalis, Betula nana, Rhodohypoxis baurii*, etc. To hold water for these pools, rather than concrete I used bentonite, a water-impervious clay used to seal "leaks" in lakes. It is easy and inexpensive to work with, accommodates plant roots, and can be colored to suit the need, but it needs to be kept wet and sometimes must be patched in the spring—which is very easily done. The water used for this system is not significant and can be easily turned off from a central valve.

Finally, if you haven't participated in the NARGS Seed Exchange, you are missing one of the great pleasures of gardening and some surprises when you get that seed from the Himalayas, Tasmania, or some other exotic location in the world. I also believe that an outstanding rock garden can be created using plants that are not difficult to grow and are easily available.

It's fun to try some of the rare, beautiful, and difficult plants, but for me they must be hardy, outdoor garden plants—no pots allowed (I may make an exception this year with a trough). It is painful sometimes, but I have come to accept failures, as I am only willing to go so far to accommodate even the best species. There are other things in life you know! No?

Dick Van Reyper is a semi-retired, free-lance artist living in Park City, Utah.

Rock Garden Cacti

Native to Utah

by Marv Poulson

The plant kingdom produces fabulous variety, but few members of the realm match cacti in their remarkable array of forms, spectacular flowers, and amazing adaptations for survival. Adaptation marks cacti as tenacious survivors from mountain to desert to tropical climates.

Among Utah's most interesting alpine and desert plants, cacti certainly rank highly. These remarkable succulent plants do populate favorable desert areas with a wide variety of species having growth forms ranging from small shrubs to tiny niche dwellers. Utah has wonderfully rich cactus flora, with many that comfortably fit into the rock garden setting. These plants lend unique interest to the garden so long as the location receives nearly full sun and limited moisture. Soils should be gritty, though not necessarily scree in texture.

Cacti seem rugged and yet create stunning floral displays in nature. These qualities have endeared cacti to the heart of many enthusiasts. Several Utah native cacti adapt well to horticulture and now may be obtained from reputable growers dedicated to protecting natural populations from exploitation. Collecting wild cacti, as any wild-growing plant, is strictly taboo, if not illegal.

Cacti in Utah grow from 9,000' in the central and northern mountains to as low as 2,800'—in a finger of the Mojave Desert in the southwest corner of the state. A broad elevational range is only one aspect of cactus habitat diversity. The complex geology of Utah also provides unique habitats. Some cacti are endemic, found nowhere else in the world, and so very rare that they are listed on the Federal Threatened and Endangered Plant List.

Opuntia —Prickly Pear and Cholla

Of our native cacti, several *Opuntia* species, or prickly pears, make easy-to-grow garden candidates, though only one remains small and compact enough for my rock garden. *Opuntia fragilis*, the fragile prickly pear, performs in a broad range of garden conditions. These cute cacti have bulbous pads with spines that grab and hold fast to anything that might brush by. The pads detach easily from the plant, suggesting the fragile quality that gave it its name. A detached pad may be carried on the fur of an antelope, or on

one's pant cuff, to later fall in a new location to root and grow. Normally, a few yellow flowers will unfurl during early summer, and, like the other *Opuntia* species, open for only a day or two before fading. The flower color on the second day usually darkens before the flower withers.

While we think of *Opuntia* as prickly pears, another section called *Cylindropuntia*, or cholla, comprises a group with cylinder-shaped branches. Only a few of these are hardy enough for cold areas, and the added protection of a solid fence or wall is advised. My favorite of these is *Opuntia ramosissima*, the diamond pencil cholla. This low-sprawling summer bloomer has small, simple, greenish-yellow flowers tucked at the ends of the stems. Long, stiff, white spines poke straight out along the stems, and a pattern of small diamonds gives the plant its common name.

Opuntia whipplei, the plateau cholla, grows at the highest elevation of the upright chollas. Greenish-yellow flowers crown the stems of this shrub-like, green plant. The fruits ripen late to a yellow color and remain fleshy until falling. This and the creeping cholla, *Opuntia pulchella*, are the most cold-hardy of the group. Though I have yet to see the creeping cholla in cultivation, it would, no doubt, make a worthy addition with its curious low habit and enchantingly simple, pink flowers.

Echinocereus Hedgehog Cactus

Commonly called hedgehog cactus, *Echinocereus* forms clumps of stems among the rocks. The strawberry or claret cup cactus (*Echinocereus triglochidiatus* var. *melanacanthus*) represents our most cold-hardy native hedgehog cactus. This low-growing cactus can form tight clusters of more than 200 stems, creating an impressive display of red flowers attractive to migrating hummingbirds. Usually found among weathering rocks, the claret cup cactus grows from low altitudes in southern Utah to the foothills of the mountains. Planted among rocks in well-drained soil, these cacti do well in the rock garden, possibly even in relatively humid climates.

Sclerocactus Devil's Claw Cactus

Commonly called fishhook or devils' claw cactus, *Sclerocactus* is closely related to the generally smaller plains cactus *Pediocactus*. Forming small, single globes or oblong-globe-shaped stems, *Sclerocactus* is popularly referred to as "small barrels." Utah has several exceptional fishhook cacti well suited to the rock garden, though most are rare and not currently being propagated. The most common, largest, and most available is *Sclerocactus parviflorus*. This spiny, single-stemmed cactus may grow to 12" tall and 4-5" in diameter. Flower color varies from soft yellow to brilliant pink or magenta. As with most cacti, young specimens will likely prove most successful in well drained garden situations.

Pediocactus Plains Cactus

Cacti are known for beautiful flowers, and the miniature blossoms of *Pediocactus* are particularly intriguing for their simplicity and delicate coloration. As is common among cacti, the flowers only open in bright sunshine and close soon after clouds or the setting sun bring shade. Such a system assures the greatest opportunity for pollination during periods when pollinators are most likely active. Harsh desert conditions demand that precious plant moisture be conserved at other times of day.

After flowering, a "top-shaped" seed capsule develops from each pollinated flower and soon dries to a hard, brown shell. As the capsule becomes

hard, it splits down one side and around the top. Glossy, tiny black seeds are released and roll to the ground.

The first *Pediocactus* described was discovered in a southern Utah valley. The relatively flat local terrain suggested to the discoverers a "plain." They chose the Greek word "*pedio*," meaning "a plain," for the name of this group of plants. With many more members of this genus of cactus now known, "*pedio*" stretches things a bit. Most *Pediocactus* actually prefer growing on hilly terrain or even open badlands. Such is the way of plant names.

Adaptation to soil extremes is striking for all but one species of *Pediocactus*. Most are restricted to very specific soils in isolated niches of the geologically complex Colorado Plateau. This is why most of these tiny cact1 have such limited habitats and small populations. *Pediocactus* have long been widely sought by collectors. Some rare species now face extinction because of the unscrupulous.

Only one species, *Pediocactus simpsonii* or Simpson's plains cactus, could be considered common in nature, with suitable habitat ranging from the western slopes of the Rocky Mountains into many Great Basin mountain ranges and the Columbia Basin. Simpson's plains cactus adapts to many soil types and exposures, making it particularly well suited to the rock garden. Small, creamy white, yellowish, or pinkish flowers open in early spring.

Neolloydia Pineapple Cactus

This genus of medium sized beehive-shaped or pineapple-like cacti extends north in the Mojave Desert into Utah's southwest corner. Here the prevailing climate contrasts with the rest of the state by being warmer. Our only *Neolloydia* cactus is a species called *N. johnsonii*. It favors rocky limestone outcrops. Johnson's beehive cactus blooms during late April or May with a crown of vivid pink, tightly formed flowers. The spiny stems can easily be seen on open hillsides or silhouetted along low ridges.

In the rock garden, careful place-

ment for favorable exposure should afford this moderately hardy cactus an opportunity to thrive. Attention to providing rocky clay loam with infrequent moisture will suit *Neolloydia johnsonii*, though flowering will be a lucky treat in colder climates.

Coryphantha Pincushion Cactus

Along with *Pediocactus*, the *Coryphantha* cactus are my favorites for the rock garden. Like *Pediocactus*, *Coryphantha* tend to be cold-hardy, compact, and very floriferous. To my eye the flowers are as vivid as those of any plant.

While *Coryphantha vivipara* var. *desertii* (snowball cactus) may not exhibit extreme cold tolerance, this round, silver-spined cactus makes a wonderful addition to a favorable nook. The snowball cactus lends unique stature and texture among the rocks and sports a cluster of light yellowish flowers in early spring.

The hardiest and most widespread of the pincushion cactus, *Coryphantha vivipara* var. *vivipara* ranges from Utah north into southern Canada. Of the spectacular blooming cacti, this species offers the most dependable results in cold climates. The closely related, slightly larger *Coryphantha vivipara* var. *arizonica* also forms tight, low clusters of bubble-like stems producing striking displays of purple-pink to vivid pink or magenta flowers. Though only open for a couple of days, these disproportionately large flowers can almost obscure the plant.

Of all the diminutive, common cacti, *Coryphantha martinsonii* var. *missouriensis* presents beauty and unique interest virtually all year. In nature, these tiny, lumpy-looking cacti favor hiding among grasses on gentle hillsides or the edge of flats. Spring brings softly yellow flowers that can nearly obscure the plant beneath. Later, fruits ripen as round nodules, changing from green to striking red. The bright fruits may linger through winter. These characteristics make Martin's cactus a worthy addition to northern rock gardens.

Several other Utah cacti would make excellent rock garden specimens but, alas, they are so rare or so unsuited to northern climates that successful cultivation would require extraordinary measures such as a cactus house. As for the rare plants, they are either protected under the Endangered Species Act or simply not available from commercial propagators.

Several spectacular hot desert cacti also occur in southern Utah, including the large barrel cactus, *Ferocactus acanthodes* var. *lecontei* and *Echinocactus polycephalus* var. *xeranthemoides*, and the small, barrel-like cactus, *Mammillaria tetrancistra*. While each of these offers unique interest, planting in northern rock gardens would not be successful. Only hot desert gardens or gardens in a cactus house would be suitable for hot desert cacti.

Cacti make fine rock garden candidates. Most hardy species offer long life, easy care, and unique flowers. Soils should be without supplemental fertilizers and reasonably well drained with infrequent watering. Try a few cacti, you will like them.

Drawing by Dick Van Reyper

Nursery-Grown Cacti Sources

Hillview Gardens Products, 5405 W. Metaline Avenue, Kennewick, WA 99336-1422

Intermountain Cactus, 2344 South Redwood Road, Salt Lake City, UT 84119

Cactus by Mueller, 10411 Rosedale Highway, Bakersfield, CA 93312

Desert Nursery, 1301 South Copper, Deming, NM 88030

Schultz Cactus Growers, 1095 Easy Street, Morgan Hill, CA 95037

NEW ZEALAND GARDENS

by Ruby Weinberg

"She'll be right," is a favorite Kiwi expression. And everything *will* be right when you visit New Zealand. After 16 years of dreaming about this magnificent country, my husband and I finally made a trip of five weeks duration. On our second trip, some years later, we could scarcely tear ourselves away after a seven-week sojourn. While driving about enjoying the dramatic and varied scenery, we cultivated many friendships with the Kiwis. All this time, of course, was spent mostly visiting gardens.

Travelers from abroad will not be on the islands very long before they are asked *the* question: "Well, mate, how do you like our country?" After only a few days looking at green, rugged scenery brilliant in bloom, we could answer the question in their own vernacular: "En Zed is bloody marvelous!" Having traveled extensively to see plants and gardens in many parts of the world, my husband and I have no difficulty stating that New Zealand is our favorite destination.

The Kiwis, as New Zealanders call themselves after their native, flightless bird, are dedicated gardeners. Over two-thirds maintain gardens; with the possible exception of their interest in rugby, gardening is their most popular hobby. They grow an enormous diversity of both edible and ornamental plants using treasures from every country on the globe combined with their own unique flora. Of the plants that evolved nowhere else but in New Zealand, 1,800 species are flowering plants. About 600 species are unique New Zealand alpines which should excite the curiosity of many Society members.

In January 1996, international alpine garden enthusiasts will gather together at the Canterbury Horticultural Center in Christchurch, the largest New Zealand city on South Island. There will be seminars and field trips on Southern Hemisphere alpine flora for five full days. Also, six pre- and post- conference tours to several parts of New Zealand are being offered, a few of them simultaneously, giving the visitor opportunities to botanize, observe the native flora, and see a few gardens—at a very reasonable cost.

To all who love high alpines, I urge you to attend this fascinating conference, even though you may live in an

area where growing New Zealand alpines is next to impossible...except, perhaps, in a well ventilated alpine house.

Generally speaking, New Zealand's native plants grow best in the northwestern US, British Columbia, much of the British Isles, and many parts of South Africa. The conditions under which its alpine vegetation is found vary considerably, but they are just about impossible to imitate in my own garden. The same might be said for the indigenous plants of its coastlines, forests, scrublands, etc. Few ardent gardeners accept this nay-saying easily, and over a period of years, I, too, have germinated many New Zealand species in my greenhouse. However, all too typical was *Arthropodium cirratum*, the handsome rengarennga lily, a coastal plant that Kiwi gardeners can grow in their heaviest soils. Under careful culture, I managed to produce mature plants, and these were cherished—by New Jersey insects who found them delicious eating!

Nevertheless, I think of garden wandering as a pleasurable exercise of inquisition rather than acquisition. New Zealand offers much of interest because, from the country's earliest history, the Kiwis imported garden plants and selected, bred, introduced, and developed innovative horticultural techniques to grow them. At least 50% of the land has been classified as steep, 20% as hilly, and 30% rolling or flat. In this undulating landscape are many terraced gardens and planted natural rock outcroppings. Even on the motorways, trailers, creepers, and climbers have been planted in fissures within concrete cribs constructed to hold back the steep grade.

If you cannot attend the conference but are still considering a New Zealand garden trip, many travel organizations offer escorted tours. The best, for any cursory appreciation of the country's gardens and horticulture, are at least three weeks in length. Many coach tours cover great distances, and so stops are necessarily all too brief. Having come so far, European and American garden travelers will appreciate the country much more when they allow enough time and include both North and South Islands. For us, part of New Zealand's charm was experiencing the leisurely pace of life enjoyed by most of its people.

My husband and I found it far more exciting to plan our own garden itinerary, rent a car, and drive ourselves to places that seemed most appealing. We also believe this to be the most economical way to travel. Driving is on the left, not especially a strain on right-side-of-the-road reflexes (as in England) because this is an uncrowded country of only 3.3 million people. Only in a few of the larger cities, such as Auckland and Wellington, did we find anything that might be called traffic.

Planning garden visits in New Zealand is easier than almost any other country, for the Kiwis genuinely enjoy sharing their works of love. There are many books describing outstanding gardens, plant preserves, botanical gardens, etc. Some are available in the US. Most New Zealand book shops carry several with garden descriptions, names, and addresses. If you would like to plan a full garden itinerary in advance, write to David Bateman, Ltd., Publisher, PO Box 100-242, North Shore Mail Center, Auckland 10, New Zealand. He will send you a list of his garden book offerings.

However, those who love to botanize in the mountains would do well to attend the January conference in Christchurch. Alpines seen *in situ* are at their peak from mid-December through February, New Zealand's

summer months. Both our trips were in spring, a long period of cool, breezy weather lasting from mid-September through early December, for on these islands, the growing season unfolds its burgeoning color in long lasting progression. Besides, it is a special thrill to enjoy all this while at home the garden season is closing down to make way for a frigid winter.

A bit about New Zealand's geography: Located between the Tasman Sea and the South Pacific, the islands are 1,300 miles from the continent of Australia. Regrettably, the two countries are all too often confused. Did anyone else hear the New York news commentator recently who mentioned that Australians won the Americas Cup? The Kiwis were the winners, of course! Much of New Zealand's indigenous flora, size, topography, climate, history, and Maori culture of the islands is quite distinct from its distant neighbor, Australia. New Zealand, 1000 miles in length, is about the size in square miles of Colorado, a state it resembles in other ways as well, including alpine terrain. Most areas of the land "down under" are well watered, with many lakes and rivers. No part of the country is more than 80 miles from the sea. Its western coastline is decidedly lush and wetter than the eastern. A spine of volcanic mountains runs through the center of both North and South Islands. Because of this, allow plenty of time for driving; travelers will soon discover the shortest distance between two points is not a New Zealand motorway.

In Auckland, the average warmest days occur in January and reach 75°F (slightly hotter in Northland above Auckland.) The coolest temperatures occur in July when the mercury drops to 48°F. Generally, there is little variation between night and day. Christchurch averages may reach 72°F high in January with a low of 37°F in July. Only two cities on South Island's eastern coast experience occasional snowfall, but of course the country is well known for its snowy mountain ski resorts. Frost occurs rarely on the lowlands of North Island, sometimes on lowland South Island. Even then, it is usually brief. Among gardeners, tree planting continues all winter, a fact that seems incredible to me, a Northeastern American. Another factor is low humidity and a windy atmosphere. I have never seen wash dry as quickly as on a New Zealand clothesline!

Two of New Zealand's three main islands have a great number of interesting private gardens open to the public by appointment with a telephone call or letter, as well as public displays, botanical preserves, and landscaped parks. On our first trip, we concentrated on seeing the best of many gardens featuring wall and rock plantings. On our second visit, we made something of a study of New Zealand's interesting flora, especially as used by the Kiwis in their gardens.

GARDENS AND PRESERVES

'Eden'

Eden on Omana Ave. in a part of Auckland city called Epsom, was developed 30 years ago by the Eden Garden Society for rhododendrons, camellias, dwarf conifers, etc. The five-acre property had been a quarry on the site of an extinct volcano, a site that provides a variety of microclimates for its diverse plantings. It is also a wonderful place to get a first good look at some of the country's most symbolic flora like the floppy-headed cabbage trees (*Cordyline australis*) and the clump-forming flax, *Phormium tenax*. There are many uncommon species here such as the world's smallest fuschia, *Fuschia procumbens*, with delicate flowers, tubular in shape, lacking the usual petals. In great contrast is the shrub called poor knight's lily (*Xeronema callistemon*) with hundreds of stamens clustered together on stalks like red brushes. The plant was only discovered in 1920 on one of New Zealand's smaller islands. A good overview of Eden's plantings may be had by climbing to the top of the garden to look down at the varied plantings set amidst ferny glades, great boulders, subtropical palms, and a waterfall dropping off into a lovely pool.

Auckland Regional Botanical Garden (photo, p. 298)

About a half-hour south of the city on National Highway #1, the Manurewa exit leads to the rolling hillside that is the Auckland Regional Botanical Garden. Opened to the public in 1982, it was only in its infancy during our first trip. Five years later, we found many more developed areas in this garden of 16 acres. Manurewa, as it is often called, is frequently visited by Kiwis who are looking for garden ideas. At the time of our visit, there were 20 different gardens that included many rare magnolias, conifers, perennials, etc. Although it is a very large garden, NARGS members will probably gravitate, as we did, to the rock walls and alcoves where both exotic and native rock plants are displayed. This is a good place to view many species of New Zealand's small evergreen shrubs such as hebes, cultivars of *Leptospermum*, such as the dwarf 'Ruru' and 'Tui', and three species of *Pimelia*, or rice plants, with pink or white flowers. Scree and rock walls here hold such natives as the rock-hugging *Raoulia*. Farmers often mistake these "vegetable sheep" for browsing animals when they are viewed from a distance. Tight mats of the scabweed, *Scleranthus biflorus*, are indigenous ground covers, small of flower but with large interesting seed pods. As part of their rather recent passion for cultivating natives, Kiwi gardeners are learning to use scabweeds on stony, shifting soils.

'Willow Glen'

Ann and Eion Scarrow's garden in Gordonton near Hamilton, about 75 miles south of Auckland, is a marvel of diversity, an all around gardener's garden. Scarrow is one of the country's best known personalities; in fact, he is called "garden guru" because of his many television and radio programs, books, conducted tours, etc. Ann often works together with Eion on projects, especially on their 2.5-acre garden called 'Willow Glen.' On the first of our two visits, I particularly admired their many dwarf conifers, such as the slow-growing *Podocarpus alpinus lawrencii*, *Cupressus macrocarp* 'Greenstead', and *Chamaecyparis lawsoniana* 'Elwood's Pygmy'. When coach visitors arrive, Eion sometimes gives demon-

Main Rock Garden at Christchurch Botanical Garden, New Zealand (pp. 303-304)
photos, Martin Weinberg

Long-time caretaker of rock garden area in Christchurch Botanical Garden

'Alouette', garden of the late Jim LeComte in Ashburton, New Zealand (p. 304)
photos, Martin Weinberg

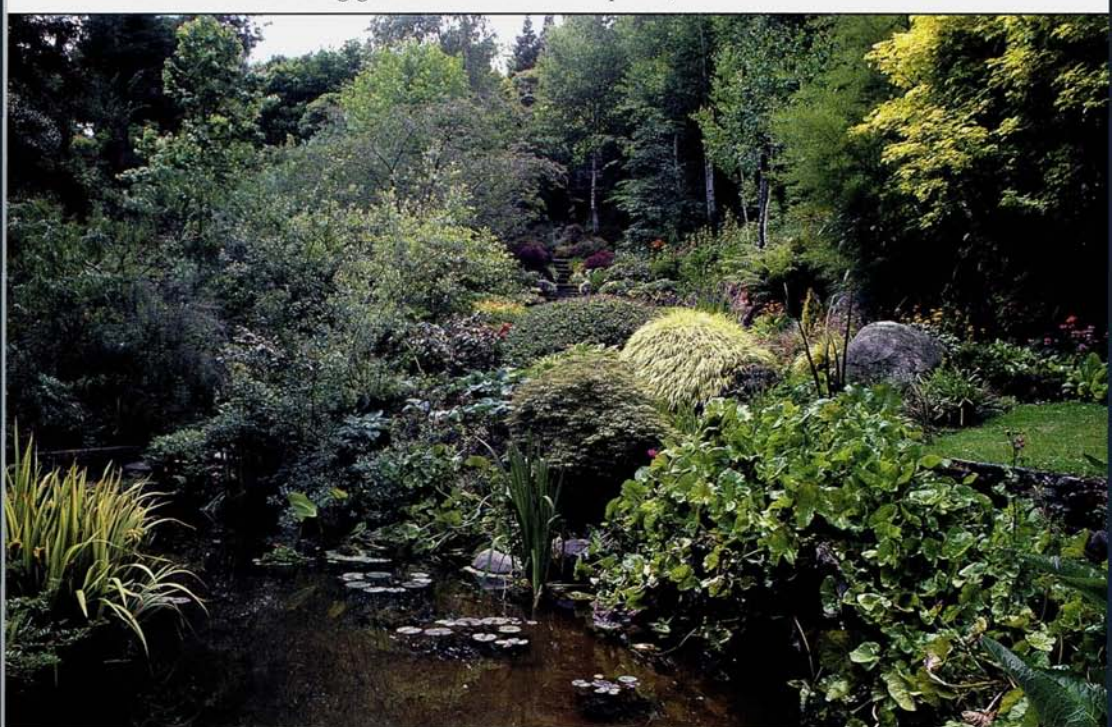
Auckland Botanical Garden; plants include *Raoulia mammillaris, Scleranthus biflorus,* and a prostrate *Pimelia* species from Arthur's Pass (p. 296)

Tupare Garden, a cottage on Mary Lane, bog garden (p. 302)
photos, Martin Weinberg

McConachie's rock planting, includes hebes, dianthus, celmisias, genistas, and verbascums (p. 303)

'Crosshills', the garden of the Robertson's, Otorohanga. Summer house surrounded with spring-flowering rock plants (p. 301) photos, Martin Weinberg

Gordon Collier's bog garden at Titoki Point (p. 303)



strations on pruning or other techniques. Orchards and flowering trees and shrubs, superbly grown perennials, and enormous glass houses, some filled with orchids, are all part of this now-established garden. There are many native plants here also and two unusual Australian perennials that I noted: *Leschenaulta bicolor*, purple flowers stitched in white, and a dwarf form of *Anigozanthus*, the kangaroo paw. We have the Scarrows to thank for clueing us in on where to find other gardens with features that we would most enjoy.

'Crosshills' (photo, p. 300)

On Ellis Road, about 35 miles south of Hamilton just outside the village of Otorohanga, is a superb one-acre development. An English style home and well-designed garden sit in a dreamy valley below its farm. The hillside slopes seemed to be sprinkled, like salt, with sheep, pigs, and cattle. American visitors will probably be surprised that so many farmers in New Zealand use their time and land for creating gardens. Elizabeth and Graham Robertson are among them. They call their 500 acres 'Crosshills' because from its scenic high point the view is of one hill crossing the other. In the valley, Elizabeth has been highly successful in combining the colors of small flowering trees, roses, perennials, and rock plants into a splendid whole. It was not surprising when we learned that she is a floral artist by profession. Every inch of the development is a lesson in color harmony.

The garden itself centers on a wide, semi-circular drive that also serves as its main pathway. The raised beds off the path are edged with dry stone walls called Kio Kio, tumbled graywacke, collected by the family from the hillsides. Kio Kio is a name also used for the area and for a common native fern.

Elizabeth conceived each plot as great drifts of pleasing colors, such as the purple-pink-and-silver garden, another of yellows and blues, an all-white near the house, etc.

One outstanding combination is the perennial morning glory, *Convolvulus mauritanicus* cascading over the rocks with *Lavandula* and the iris-like *Libertia formosa*. Near their summer house is a yellow and white garden with iris, *Sisyrhinchium*, *Iberis*, *Helichrysum* 'Limelight', *Aurinia saxatilis*, *Achillea* 'Moonshine', *Romneya coulteri*, and *Erigeron karvinskianus*. All are perennial in this climate. I admired the *Convolvulus* so much that several years later, I grew one plant from seed and renew it annually with cuttings held over winter in my greenhouse.

Ardent rock plant collectors do not always give thought to striking color combinations, especially when moderate-sized perennials are used with them. This is a garden to give pause and thought.

Les and Lucy Taylor's Garden

Les and Lucy Taylor's two-acre garden on Saxton Road, several miles outside of the city of New Plymouth has a beautiful view of Mt. Taranaki. The main garden is of paths running along rock walls on a downsloping hillside above a gully. The swampy valley below contains a pool, bog plants, and ducks which the Taylors were then enjoying as pets.

Les's horticultural expertise is extensive, and he pointed out to us some of the native plants that he uses in his landscaping: *Astelia*, a genus with strap-like leaves and odd panicles of yellow flowers; *Pratia angulata*, a pretty groundcover,

some with purple, others with white flowers and foliage something like the North American partridge-berry; *Corokia cotoneaster* or the wire-netting bush, a small, twiggy shrub, and another, taller *Corokia* Les uses as a hedge around his upper level swimming pool. Some of the Taylor's walls are of live ponga, logs cut 2-3' in length. Ponga, strictly speaking, is Maori for certain fern species, but it seems as though the word has become an all-inclusive term for these ferns—plants of many practical uses.

Pukeawa

Another private garden, also a Taranaki area nursery, is Pukeawa on Mahoetahi Road in nearby Waitara. Thank goodness a few New Zealand places have English names, my husband and I agreed. All these Maori words were leaving us tongue-tied.

Brent and Barbara Jury, the owners, display a mix of natives and exotics mostly in a massive rock garden. Fat buds of the New Zealand Marlborough daisy, *Pachystegia insignis*, had not yet unfolded when we came upon them in a side garden, but this in no way distracted from the glorious thick, green leaves with margins and central vein etched in white. Combinations of international plants are all over their garden, such as the South African ice plant, *Lampranthus*, with the Peruvian mask flower, *Alonsoa*. Many lovely forms of hebes are also here. Brent Jury told me that the lowest species, called "whipcords," are best suited to South Island gardens.

'Tupare' and 'Hollards' (photo, p. 299)

Two sublimely landscaped Queen Elizabeth II National Trust Gardens are also in this area. One is "Tupare" on Mangorei Road outside New Plymouth; the other is 'Hollards', on Manaia Road in Kaponga. Both are filled with incredibly rare and magnificent ornamentals. Alistair Duncan, Director of Horticulture at Tupare, has botanized in remote areas of China to add to Tupare, a 60-year-old garden. Bernard Hollard, a retired farmer 86 years of age during our visit, had been collecting fine ornamentals for a great part of his life. Alistair also administers this well-labeled collection of native and exotic shrubs.

Pukeiti Rhododendron Preserve

On both our trips, we spent some time at Pukeiti Rhododendron Preserve on Carrington Road. High in the mountains, the preserve is within 900 acres of "bush" where rhododendron (and companion plants) grow superbly. Low and dwarf forms of the genus, however, grow too rapidly in this misty climate. Pukeiti is a good place to observe how large some so-called dwarfs in your rock garden might become. On one of our visits, we came upon a *R. yakusimanum* in full bloom, a huge specimen, the largest in the world, perhaps also the oldest, if I recall correctly. Pukeiti is also an excellent place to study native conifers as well as New Zealand and exotic flowering trees.

Otari Native Plant Preserve

Leaving the Taranaki area is difficult because it has such a variety of public and private gardens, but eventually, we found ourselves at Otari Native Plant Preserve in hilly Wellington, the capital of New Zealand. The entire city surrounds the bay, and much of it is perched high on a hillside which gets its share

of windy blasts. Otari has probably the most outstanding display of indigenous flora in the country. Located on Wilton Road, it was the brain child of Dr. L. Cockayne, a botanist and plant explorer who developed this 500-acre preserve under the Department of Parks. His grave is in the garden.

Raymond Mole, who was then and had been for many years, the preserve's curator, explained to us many interesting facts about some of the natives. Quite a great number bear fruit, and in a good many the fruits are divaricated, i.e., spread apart from each other, nature's way of protecting against occasional frosts. Still others are prickly or sticky, a characteristic that allowed plants to escape predation from moas, the flightless birds that were on these islands before the arrival of the pakeha (white man). There are examples of these characteristics throughout Otari, some displayed in rock gardens. Another memorable feature here is one of the country's largest patches of *Myosotidium hortensia*, the Chatham Island forget-me-not, with handsome broad overlapping leaves and great trusses of blue flowers—not an easy plant to cultivate anywhere, as I understand.

McConachies' Garden (photo, p. 299)

Two other North Island gardens deserve special mention as they are both outstanding, although a little out-of-the-way. One not very well known private property is in the center of North Island in Ohakune. This is an area near ski resorts and very well suited to alpines. On Smith Road live the McConachies. Their plants cascade over rock walls, spill out onto the road, and are embanked on one side of the cobblestone drive. The garden also contains a wide variety of bulbs, many quite rare. Particularly striking here are the three golden pencil pines, *Cupressus sempervirens* 'Swane's Golden', tall, slim sentinels on the lawn just below the house.

Titoki Point Garden (photo, p. 300)

Another, the celebrated Titoki Point garden belonging to Annette and Gordon Collier, is part of their 5,000-acre hillside sheep farm. It is located about 40 miles from Ohakune and is 25 miles north of the small town of Taihape. That is what I would call isolation! Yet, bus loads of visitors make their way each year to this remote location to see the Colliers' unusual garden. It is a gallery of beautifully furnished plant rooms reached by climbing up or down a series of totara (*Podocarpus totara*) steps. Native plants, rock plants, and outstandingly beautiful trees and shrubs are all part of the scene. Above many of the dense plantings are specimens of *Dicksonia fibrosa*, native tree ferns. A bog at the lower level is a study in lush fecundity.

Hagley Park and the Christchurch Botanical Garden (photos, p. 297)

Guidebooks will tell you how best to cross Cook Strait to reach South Island, and eventually, the pretty city of Christchurch on the east coast. One out of every eight acres of the city is devoted to parkland in this city of colorful gardens, and within 75 acres of Hagley Park is the Christchurch Botanical Garden. We meandered along its paths for two days on our first New Zealand trip, savoring the midspring explosion of color from many trees, shrubs, and rock plants.

The park is surrounded on three sides by the Avon River, and it was soil dredged up from the river and its shingles (loose gravel) that helped to create its hillside rock garden. Paths wander up, into, and around the plantings and are defined by large rocks and boulders. We spoke to the chief gardener, who told us that he had been working here, mostly alone, for more than two decades. Sadly, his name is lost to me, for he was greatly to be credited for this meticulously maintained work of art.

The garden was thick with mats of alpines, spring-flowering heaths (*Erica carnea*), small species tulips and iris, and low azaleas. Gray- and silver-leaved dwarf conifers blended well with the plants, and I particularly admired *Rhodohypoxis baurii, Aquilegia flabellata* 'Pumila', and many saxifrages and hypericums. I do not believe that the main rock garden contained many "high alpines;" its most admirable feature was the health and vigor of every plant.

'ALOUETTE' (PHOTO, P. 298)

Our next visit was with James and Jean LeComte at their rock garden nursery, 'Alouette', an hour south of Christchurch in rural Ashburton. Perhaps some of you long-time members of the NARGS remember Jim's 1973-75 series of essays "In Search of *Aciphylla*," written for the Society's bulletin with so much verve and human interest. Besides growing and selling fine alpines, Jim was also a botanizer. His mountain pursuit of *Aciphylla* (a plant genus of 40 species known as speargrass or wild Spaniards) resulted in his discovering an unrecognized species subsequently named *Aciphylla lecomtei* in his honor.

Jim particularly enjoyed the dwarf species of *Aciphylla* for use in rock gardening, but I could not quite share his enthusiasm; *Aciphylla* are noted for their ferocious-appearing, sword-like foliage.

Sadly, this dedicated plantsman died some years ago, and Jean eventually had to sell their property. But how well I remember their raised dry walls overflowing with tiny gems. Of the natives, many forms of *Celmisia* and *Gentiana* were glorious. A plethora of exotic genera were novel to me, such as *Cassiope* and *Pleione*. I particularly enjoyed South Africa's *Rhodohypoxis baurii*, clumps of rose, pink, red, and white star-like blossoms. Jim told us they are very long in bloom. He called them "one of our most useful for rock gardens."

All these diminutive plantings looked like Lilliputians with the giant Mt. Hutt clearly visible in the distance. Hopefully, the nursery's new owners, Sandi and Richard Leith, will be able to restore it to its former glory.

'GLENLEE'

Rock garden devotees from afar will surely want to visit Edith Doyle's 45-year-old garden, 'Glenlee' in rural Ashburton near Mayfield. Doyle, who wrote so ably about alpines on Mt. Hutt in the Winter '95 issue of the *Quarterly*, opens her garden to visitors every Sunday in October and November.

'THIRLSTANE'

Another possible area visit is to 'Thirlstane', the rock garden of Joan and Ian Whillans, about 4 miles south of Mayfield. The couple displays many of their plants in pots and troughs.

Dunedin Botanical Garden

Those who travel farther south to Dunedin and want to see more cultivated New Zealand natives might want to visit the 160-acre Dunedin Botanical Garden at the north end of this city.

Queenstown and The Routeburn Trek

From its earliest days, New Zealand set aside large areas for ten national parks and many state forests and nature preserves. My husband and I wanted to experience the wonder and beauty of this country as first known by pioneers who threaded their way on foot through the formidable mountains. First, we drove to South Island's west coast and the picturesque little resort town of Queenstown. There we joined a tour group called The Routeburn Trek. There are many organized walks throughout the country, some so popular that you might have to sign up as long as a year in advance. Information for escorted treks may be had in the US by telephoning the Mt. Cook Line, 1-800-468-2665. Experienced trekkers who prefer walking unescorted, but well armed with maps, their own supplies, etc., might write to the Department of Conservation, PO Box 10420, Wellington, New Zealand. Better yet, join Southern Alpines '96 on their trips.

A little four-day walk does not adequately describe our adventure. With a leader, two guides, and a small group of stalwart companions, we walked 4,200' above sea level through Mt. Aspiring and Fiordland National Park, covering 25 miles. As in most mountainous countries, peak spring lowland bloom does not always coincide with peak alpine flowering. On our trek, it was far too early for any but a smattering of flowers. Worse, it rained, sleeted, snowed, and was unutterably miserable weatherwise. Yet, through it all, the eerie bush appeared as in an unforgettable dream, and the scenery, crowded and shrouded with sub-tropical *Nothofagus* trees, ferns, mosses, and vines was breathtaking.

If you are in Queenstown, do travel farther to Te Anau and to Milford Sound whose sheltered, mile-deep fiord is one of the world's great wonders. The drive, itself, is lovely, and it was on this road just before entering Homer Tunnel that we found many stands of New Zealand's famous Mount Cook lily, *Ranunculus lyallii*. The magnificent plants were growing in puddles on both sides of the road.

Each time we left New Zealand for our trip home, we felt the true meaning of their Maori folk song, "Po Ataroa": "Now is the hour that we must say good-bye." The warmth and hospitality of each and every Kiwi was above and beyond anything we had ever experienced. Yes, the expression "She'll be right, mate," was certainly true. And you, too, will discover that everything is right about the whole blooming country.

Note: All the private gardens mentioned in this article were being maintained as of 1990. Check their current status when you write or call for an appointment.

Ruby Weinberg is a landscape designer and garden writer. She and her engineer-photographer husband have travelled extensively visiting gardens. When at home, they spend their time on their 6-acre property in rural Tewksbury Township, New Jersey. Their garden of many parts includes a pond, brooks, and a raised-bed rock

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Day Hikes

to Alpine Areas in Utah and Vicinity

by William H. King

Perhaps one of the few things as amazing as growing your own alpine plants from seed to successful flowering is to visit their original environment high in the mountains. You suddenly realize how difficult and demanding an alpine environment truly is, and how different it is from your garden. On July 10—13, 1996, the North American Rock Garden Society will hold its annual meeting in Snowbird, Utah, just a short distance from Salt Lake City. Field trips are planned to the Albion Basin in the Wasatch Range and Bald Mountain in the Uinta Range. This article will briefly review these areas and other day hikes to alpine areas in Utah and neighboring states, as well as tips on successful day hiking and botanizing. Descriptions of these hikes are not meant to be comprehensive, but rather to serve as a resource for selection and a guide for further study.

Usually the perfect time to visit the alpine areas in Utah is from mid-July to mid-August, when the alpine areas are in peak bloom. The exact time of bloom is different each year and depends largely on the amount of accumulated snow pack and on spring and summer temperatures. By late August, many species have set their seed, and the bloom is finished.

An alpine area is usually considered to be above the upper treeline, which in northern Utah is at about 11,000'. The upper treeline is a little higher on south slopes and lower on north. As you ascend, it gets colder, wetter, and there is more ultraviolet radiation. Upper tree limits have been found to have an average daily temperature of 50°F in the warmest month of the year, which is usually July or August (Arno & Hammerly, 1984). This means that the summer daytime high temperatures at the upper treeline might be around 60—70°F, and the nighttime low might be around 40°F but also might be below freezing, even in the summer.

While the treeline may be around 11,000', it is very ragged. Alpine plants compete with pine trees and other species for the ample light they require. Alpine plants can and do grow below the upper treeline in openings between the trees and on rocky slopes where trees are missing. Checking a list of 30 alpine species (Albee et al, 1988), the upper altitude limit in Utah is 12,089', and the low collection point is 8,261'. So, as a rule of thumb, in Utah start looking for

alpine plants in openings above 8,500' in such places as ridge lines, passes, cirques, fell fields, and talus slopes where there is plenty of sun, and the soil is thin.

Because alpine plants grow near the tops of mountains, it is frequently difficult to get to them. I have tried to describe day hikes that can be completed in one day or less with varying degrees of difficulty. My personal limit for a day hike (when I'm in good shape) is about 10 miles round-trip and not much over 3,000' in vertical rise. Most people can hike one-and-a-half to two miles per hour on an improved trail and add an extra half hour for every 1000' of vertical rise. That means that a round trip of 10 miles with 3,000' vertical would take 6.5-8.0 hours hiking time. Also, hiking speed for those doing heavy botanizing may decline to less than one mile per hour, but this is seldom for more than a couple of miles in the peak blooming area. It is important on long day hikes that one start out as early as possible, while the temperatures are still cool and invigorating. During July and August, it is possible to start hiking shortly after 6:00 a.m. and continue as late as 9:00 p.m., which gives you nearly 15 hours of daylight. Remember to allow yourself ample time on top to enjoy the alpine tundra. Your abilities may vary from these, but remember, in most cases you don't have to go all the way to the top of the mountain, or to the end of the trail, to find and enjoy the alpine plants and scenery.

WASATCH MOUNTAINS

Description:

The Wasatch Range, located just east of Salt Lake City, runs north-south and is approximately 160 miles long and 25 miles wide, extending from the Idaho border at the north to Mt. Nebo in the south. Mt. Nebo is the highest summit at 11,928'. The Wasatch Mountains are characterized by recent uplifting, complex folding of the strata and rapid erosion. Most of the higher peaks are composed of intrusive rock, such as the granite found in Little Cottonwood Canyon. Sedimentary rock surrounds many of the higher peaks. Over 30 glaciers carved many of the canyons into the characteristic U shape, and left steep-walled cirques at the heads of the canyons. Moraines were deposited along the edges of the canyons and ends of the glaciers. Precipitation comes mostly in the form of winter snow. Alta and Snowbird average nearly 500" of snow a year. In 1994-95, they both received 700" of snow.

The central Wasatch Range contains 1,139 vascular plant species (Arnow & Hammerly, 1980) and these range from valley-bottom (4,200') through foothill, montane, and subalpine to alpine zones.

There are two hikes we are highly recommending for the Wasatch Mountain Range: Mt. Timpanogos (also known as "Timp," at 11,750') and Albion Basin, each discussed separately below. Another great Wasatch hike is to Lake Blanche (8,920') in Big Cottonwood Canyon, 5-1/2 miles and 2,700 vertical feet, very strenuous. This is perhaps the most photogenic hike in the Wasatch Mountains.

Recommended Wasatch Day Hike #1:

Aspen Grove (6,850') to Emerald Lake (10,370') on Mt. Timpanogos, strenuous, 10.6 miles round-trip. This well-worn trail winds its way up a beautiful

cirque basin past waterfalls and ends for us at Emerald Lake, a small lake created by run-off from the Timpanogos "glacier." For the strong of heart, you may choose to continue to the summit for a total of 16.6 miles round-trip, a very long day. For further description of the Timpanogos area and other hikes, see Kelsey (1989).

Distance:

55 miles from Salt Lake City, 1 hour. Take I-15 south to Orem, heading east on Rd. 52 through Orem to Provo Canyon (US Hwy. 189). Turn on the Alpine Loop Road #92, proceed 6 miles, past Sundance Ski Resort to Aspen Grove. Best area map: Trails Illustrated, Uinta National Forest.

Accommodations:

Many motel and hotel rooms and condominiums are available in the Orem-Provo area. There are no campgrounds in Provo Canyon, but if you continue from Aspen Grove on the Alpine Scenic Loop into American Fork Canyon, you will find many improved campsites.

Government Contact: For the Timpanogos area, contact the Pleasant Grove Ranger District, Uinta National Forest, Box 228, Pleasant Grove, Utah 84062, (801) 785-3563.

Recommended Wasatch Day Hike #2:

Albion Basin Campground (8,800') to Cecret (Secret) Lake (9,220'), easy. One and a half miles round-trip, elevation gain of 420'. This relatively easy hike on a well maintained trail takes you from the Albion campground through breathtaking meadows of wildflowers to a high mountain lake. This is one of the field sites for the NARGS 1996 national convention. An easy extension of the hike around the lake offers many interesting plants. This area is part of the Alta Ski Resort during the winter months. For further information about the hike, see Veranth (1989). For further information about the flora, see Joyner (1993).

Distance:

31 miles from downtown Salt Lake City, a little less than an hour. Take I-15 south to Sandy, then exit onto 90th South, heading east on Rd. 210 to Alta. Best area map: The Wasatch Mountain Club, Hiking the Wasatch.

Accommodations:

There are many hotel rooms at both Alta and Snowbird Ski Resorts, as well as in Sandy and Salt Lake City. There is a campground right at Albion Basin, and additional campsites are located farther down the canyon.

Government Contact: Salt Lake Ranger District, 6944 South 3000 East, Salt Lake City, Utah 84121, (801) 524-5042.

Special Plants To Look For in the Wasatch Range:

Aster kingii var. *kingii, Lesquerella garrettii, Epilobium glaberrimum* var. *fastigiatum, Peltiphyllum peltatum, Erigeron garrettii, Eriogonum brevicaule* var. *wasatchense, E. umbellatum* var. *deserticum*, and *Penstemon humilis* var. *brevifolius.*

UINTA MOUNTAINS

Description:

The Uinta Mountain Range begins 40 miles east of Salt Lake City and continues from there eastward for 150 miles into Colorado, ranging in width from 30 to 40 miles. The largest mountain range in North America that runs on an east-west axis, viewed on a map, it looks like a giant ribcage. King's Peak is the highest summit in Utah at 13,528'. The high central part of the Uintas is composed mostly of quartzite and shale, while the lower edges are predominantly sedimentary rocks. Most of the peaks were heavily glaciated and are flat-top mountains, less rugged looking than the Wasatch or the Tetons. Precipitation in the Uintas is estimated at 40" to 80" per year, mostly in the form of winter snow and summer thunderstorms. There are 1,660 species of vascular plants in the Uinta Mountains (Goodrich & Neese, 1986), of which over 200 are alpine. The alpine portion of the Uintas, above 11,000', is an area of almost 250,000 acres, which is larger than all other alpine areas in Utah combined. However, in 1984, much of the Uintas were declared the "High Uintas Wilderness" area by Congress, which made access to most of the alpine area increasingly difficult. Most of the central backbone of the Uintas is not accessible on a day-hike basis. For example, King's Peak is about a 30-mile round-trip hike and would take most people 3 to 5 days to complete. Wheeled vehicles are not allowed in a wilderness area, but horses and pack animals are permitted. Therefore, we suggest two hikes that are on opposite ends of the Uintas and are relatively easy to access, Leidy Peak (12,028') and Bald Mountain (11,943'), each discussed separately below.

Recommended Uinta Day Hike #1:

Trailhead near Hacking Lake to Leidy Peak, moderate (but route-finding required). Three miles round-trip with an elevation gain of 1,400'. Follow the established trail approximately 1 mile south, choose one of the grass covered ridge lines and route-find to the top of Leidy Peak. Another hike to consider is Marsh Peak (12,240'), just south of Leidy Peak. For further description of Leidy Peak and the High Bollies area see Davis and Veranth (1993) or Kelsey (1986).

Distance:

213 miles from Salt Lake City, 5 hours. Take I-80 east from Salt Lake City about 20 miles to exit 148, follow US 40 southeast to Vernal. From Vernal, turn north on US 191 for 20 miles, then take the paved road 3.3 miles west to the turnoff for the Red Cloud Road Loop FR018. Follow for 12.1 miles to the turnoff for Hacking Lake, FR043, continue 9 miles farther past the lake to the trailhead. The last 20 miles are dirt road, usually passable by car, but check locally for road conditions and directions. Do not attempt to find this location without an area map. Best area map: Trails Illustrated, Flaming Gorge/Eastern Uintas.

Accommodations:

Many motel rooms are available in Vernal. Primitive camping is allowed around Hacking Lake.

Government Contact: For the east end of the Uintas, contact Roosevelt Ranger District, West Highway 40, P.O. Box 338, Roosevelt, Utah 84066, (801) 722-5018.

Recommended Uinta Day Hike #2:

Bald Mountain Upper Meadow (11,500') from the trailhead (10,700'), moderate. Three miles round-trip, elevation gain of about 800'. This moderate hike on a well-worn trail traverses the southern slope of Bald Mountain and goes around the corner through the krummholz into a large, beautiful alpine meadow. This is the other field site for the NARGS 1996 national convention.

Distance:

65 miles from Salt Lake City. Take I-80 east from Salt Lake City about 20 miles to exit 148. Follow US 40 south five miles to the Kamas exit, follow Road 248 until you reach Kamas. From Kamas follow State Road 150 29 miles to the Bald Mountain summit. Best area map: Trails Illustrated, High Uintas Wilderness.

Accommodations:

Many motel, hotel and condominium rooms are available in Park City or back

COMMON ALPINE PLANTS OF UTAH AND VICINITY

	UN	LA	TU	DC	WA	HE	MK	ST	BR	RU	SN	TE
Cymopteris hendersonii	X	X	X	X	X	X		X	X			X
Antennaria alpina	X	X	X		X				X			X
Erigeron compositus	X	X	X	X	X	X	X	X	X			X
Arabis lemmonii	X			X	X	X			X	X		X
Draba crassifolia	X	X	X	X	X	X	X			X		X
Smelowskia calycina	X	X	X		X		X			X		X
Arenaria oblusiloba	X	X	X	X	X		X			X		X
Cerastium beesingianum	X	X	X	X	X	X	X				X	X
Silene acaulis	X	X	X	X	X	X				X	X	X
Carex elynoides	X	X	X	X	X	X	X			X	X	X
Lloydia serotina	X				X				X	X	X	X
Elymus scribneri	X	X	X	X	X	X	X		X		X	X
Phlox pulvinata	X		X	X	X		X	X	X	X	X	X
Polemonium viscosum	X	X	X	X	X					X	X	X
Oxyria digyna	X	X	X	X	X			X	X	X		X
Polygonum viviparum	X	X	X		X		X		X	X	X	X
Cryptogramma chispa	X	X	X		X		X		X	X		X
Lewisia pygmaea	X	X	X	X	X	X	X	X	X	X	X	X
Dodecatheon alpinum	X		X	X	X		X			X	X	
Primula parryi	X	X	X	X	X	X		X	X	X	X	X
Anemone multifida	X	X	X		X		X		X	X		X
Ranunculus eschsholtzii	X	X	X	X	X					X	X	X
Geum rossii	X	X	X	X	X		X	X		X	X	X
Ivesia gordonii	X		X		X			X	X			X
Potentilla diversifolia	X	X	X	X	X		X	X	X	X	X	X
Sibbaldia procumbens	X	X	X	X	X		X			X		X
Salix arctica	X		X		X				X	X		X
Saxifraga debilis	X	X	X		X	X	X	X		X		X
Penstemon whippleanus	X	X	X	X	X	X	X	X	X			X
Veronica wormskjoldii	X	X	X	X	X		X			X		X

UN=Uintas; LA=LaSals; TU=Tushars; DC=Deep Creek; WA=Wasatch; HE=Henry; MK=Markagunt; ST=Stansbury; BR=Bear River; RU=Ruby; SN=Wheeler Peak, Snakes; TE=Tetons

in Salt Lake City. Many campgrounds are scattered along Road 150.

Government Contact: For the western side of the Uinta Mountains, contact the Kamas Ranger District, 50 East Center Street, P.O. Box 68, Kamas, Utah 84036, (801) 783-4338.

Special Plants to Look For in the Uinta Range:

Papaver radicatum, Parrya rydbergii, Penstemon uintahensis, Aster sibiricus, Cardamine oligosperma, Draba crassa, Ranunculus pedatifidus, and *Eriogonum umbellatum* var. *porteri.*

BEAR RIVER RANGE

Description:

The Bear River Range is located 12 miles east of Logan, Utah. The range runs north-south and is approximately 90 miles long and 14 miles wide, with the northern part of the range extending into Idaho. The Bear River Range might be considered by some, in a broader sense, to be an extension of the Wasatch Mountain Range. The tallest peak is Mt. Naomi at 9,980'. The highest summits in the range are limestone; as a consequence, many special plants can be found here. The Bear River Range receives over 450" of snow a year.

Distance:

110 miles from Salt Lake City, 2 hours. Take Interstate 15 north to Brigham City then continue north on US Hwy. 89 22 miles past Logan, go west 8 miles on Forest Road #003 to Tony Grove Lake. Best area map: USGS, Logan, Utah.

Recommended Day Hike:

Tony Grove Lake (8,200') to Mt. Naomi, moderately strenuous. 6 miles round-trip, about an 1,800' vertical rise. This well-traveled trail leads through meadows of subalpine wildflowers and then switchbacks up to the top of Naomi Peak. Another recommended hike is Tony Grove Lake to White Pine Lake, moderate, 7 miles round-trip. This trail leads you up a hill to 8,800' and then back down to White Pine Lake at 8,400'. *Telesonix jamesii* grows on the limestone cliffs above White Pine Lake. For further description of area and other hikes, see Kelsey (1986).

Special Plants To Look For in the Bear River Range:

Draba maguirei, Lesquerella multiceps, Erigeron cronquistii, Musineon lineare, and *Penstemon compactus* (just north of Tony Grove Lake on the rocks).

Accommodations:

Nearest motel rooms are in Logan, but some condominiums are for rent on Bear Lake, which is about 13 miles farther northeast on US Hwy. 89. Campsites are located near Tony Grove Lake, and many others are spread along US Hwy. 89, next to the Logan River.

Government Contact: Logan Ranger District, 860 North 1200 East, Logan, Utah 84321, (801) 753-2772.

HENRY MOUNTAINS

Description:

The Henry Mountains are located 20 miles south of Hanksville, Utah. The range is oval in shape, about 40 miles wide and 70 miles long, and the highest point is Mt. Ellen (11,522'), rising over 6,500 vertical feet from the Colorado Plateau below. The center of the range is of volcanic intrusive origin, while the surrounding area is mostly sedimentary. The Henry Mountains did not have massive glaciers, and as a consequence most of the canyons are V-shaped. The Henry Mountains are significantly drier than other alpine areas in Utah. Hanksville receives only about 6" of precipitation a year, while the upper slopes of Mt. Ellen receive up to 30". Nevertheless, about 700 taxa of vascular plants grow on the mountains (Neese, 1980) and belong to many different plant communities from warm desert to alpine tundra.

Distance:

252 miles from Salt Lake City, 5.5 hours. Take Interstate 15 south to Spanish Fork, then follow US Hwy. 6 to Price and Green River. From Green River, take Interstate 70 9 miles west to Utah #24, heading south to Hanksville. From Hanksville, turn south on 100 east, and follow Sawmill Basin Road (a dirt road that parallels Bull Creek) for 26 miles to reach Bull Creek Pass. This dirt road is rough and a high-clearance vehicle or 4-wheel drive is recommended. Inquire at the Hanksville BLM office for current road conditions. Best area map: Bureau of Land Management, Hanksville, Utah.

Recommended Day Hike:

From Bull Creek Pass (10,485') to the summit of Mt. Ellen, moderately strenuous. Five miles round-trip up the north summit ridge of Mt. Ellen, about a 1,000' vertical rise; follow the visible trail up the ridgeline to the north summit. However, almost all of this is area is an open ridge line with few trees, making navigation easy. Expect to find over 30 species of alpine plants above 11,000'. These include drabas, potentillas, arenarias, *Arabis drummondii, Androsace septentrionalis,* and *Aquilegia caerulea.* From Bull Creek Pass you can also hike the south summit ridge if you have any energy left. If you prefer great scenery from your car at this point, you might try Capitol Reef National Monument or Goblin Valley, both of which are nearby. For further description of the Henry Mountain hikes, see Kelsey (1986) or Kelsey (1990).

Special Plants To Look For in the Henry Mountains:

Eriogonum corymbosum var. *cronquistii* (Bull Mountain area) and *Astragalus henrimontanensis* (ponderosa pine community at the lower elevations of Mt. Ellen).

Accommodations: Some motel rooms are available in Hanksville, but better accommodations are available in Green River. Improved campsites are available at Lonesome Beaver Campground, and there is a commercial campground in Hanksville.

Government Contact: BLM, PO Box 99, Hanksville, Utah 84734, (801) 542-3461.

RUBY MOUNTAINS (PHOTO, P. 314)

Description:

The Ruby Mountain Range is located 20 miles southeast of Elko, Nevada. The range runs north-south and is approximately 100 miles long and 10 miles wide, rising 6,000' from the Great Basin Desert below. The highest peak is Ruby Dome (11,387'). The northern Ruby Range is composed of metamorphic rocks, including gneiss, slate, marble, and quartzite. Most of the major canyons were glaciated, and glacier-formed lakes are abundant. The Rubies are one of the wettest mountain ranges in the Great Basin, receiving over 45" of moisture annually at the high points of the northern part, of which 80% is snow at the upper elevations.

The Rubies contain over 550 species of vascular plants, of which 189 grow up to alpine elevations, making the Ruby Mountains the richest in alpine flora of all the Great Basin ranges. The plant communities of the northern Ruby Mountains are grouped into three major zones: pinyon-juniper, mountain brush, and alpine-subalpine.

Distance:

259 miles from Salt Lake City, about 4.5 hours. Take Interstate 80 west from Salt Lake City to Elko, Nevada, proceed southeast from Elko on Nevada Hwy. 227 for 20 miles to Lamoille Canyon, then go 12 miles up Lamoille Canyon to the trailhead. The best area map: Forest Service, Humboldt National Forest/Ruby Mountain.

Recommended Day Hike:

Lamoille Canyon to Liberty Pass, moderate. Approximately 6 miles round-trip. The well-developed trail begins at 8,400' and goes through meadows and past lakes, climaxing with a fairly steep final mile to Liberty Pass at 10,400'. While passing through the meadow, watch for *Castilleja chromosa, C. miniata, C. linariifolia, Aquilegia formosa, Erigeron asperugineus, E. watsonii* and *Lonicera involucrata.* As the trail climbs out of the meadow onto the rocky slopes, *Primula parryi* is in abundance until just after Lamoille Lake. As the trail gets steeper, the alpine communities begin to appear and offer such species as *Silene acaulis, Phlox pulvinata, Geum rossii, Eriogonum kingii,* and *Potentilla fruticosa.* Those who wish for a more strenuous hike can follow the Ruby Crest Trail another 6 miles round-trip, dropping down off Liberty Pass to Liberty Lake and then back up again to Wines Peak (10,893'). Wines Peak is considered by botanists to be one of the best alpine tundras in the Ruby Mountains. For further description of the hike see Hart (1991) and Grubbs (1991).

Accommodations:

Many hotel rooms are available in Elko, Nevada, and the Thomas Canyon Campground in Lamoille Canyon is top-notch.

Government Contact:

Ruby Mountain Ranger District, 301 South Humboldt, P.O. Box 246, Wells, Nevada 89835, (702) 752-3357.

TUSHAR MOUNTAINS

Description:

The Tushar Mountain Range is located 20 miles east of Beaver in central Utah. The range is 30 miles long by approximately 16 miles wide and runs on an angle from the northwest to the southeast. The highest peak is Mt. Delano (12,169'), about 6,000' above the valley floor. The Tushars were formed from two main periods of volcanic eruption, 22 and 35 million years ago, creating one massive debris pile, much like that of Mt. St. Helens. The mountain range has been subsequently eroded by glaciers, water, and wind, eventually disguising the volcano shape of the mountains. With over 400" of snow each year (Utah snow is usually 8-12% of total precipitation), the Tushars are among the wettest mountains in central Utah. The mountains are populated by *Abies lasiocarpa, Picea engelmannii, Populus tremuloides,* and *Pinus flexilis.* Some of the areas covered by pine trees were heavily logged earlier in this century.

Distance:

230 miles from Salt Lake City, about 4.5 hours. Take Interstate 15 from Salt Lake City to Beaver, Utah. Proceed 20 miles southeast on State Road 153. Best area map: Trails Illustrated, Piute ATV Trails.

Recommended Day Hike:

Mt. Delano (12,169'), moderately strenuous, about 4 miles round-trip and 2,200 vertical feet. Follow State Road 153 to about 2 miles below Elk Meadows Ski Resort. You will find a turn-off to a dirt road marked 123. The road is usually passable by passenger car to Big John Flat, 3.6 miles. Much beyond this point the road is restricted to high clearance vehicles (HCV), which means you must be driving a truck, jeep, or something similar. You can park your car at Big John Flat or just beyond, or if you have an HCV, you can go another 1.2 miles to the Griffith Creek trailhead. From either spot, you can plan an approach up any of several drainages or ridges to Delano Peak; there is no formal trail. Mt. Belknap (12,137') can be approached by continuing on the road for an additional 5.5 miles. Mt. Belknap and Mt. Delano are similar hikes.

Another approach, if you do not want to drive on dirt roads, would be to continue on State Road 153 to the highest parking lot at Elk Meadows Ski Resort, Upper Meadows Lodge. From there, route-find north to Mt. Holly and then to Delano Peak. While this route doesn't involve any more vertical feet to reach the top, it is almost twice as long and requires good route-finding abilities. Bullion Canyon, a former mining area, is located on State Road 123 just before reaching the Belknap Peak trailhead. Proposed as a "research natural area" by The Nature Conservancy, Bullion Canyon boasts a wide selection of subalpine and alpine plants, and this hike may be worthy of a couple hours of exploration. For further information on these hikes, see Biddle (1993), Hall (1991), and Kelsey (1986).

Special Plants to Look For in the Tushars:

Astragalus perianus, A. serpens, Castilleja parvula var. *parvula, Draba sobolifera, Lupinus sericeus* var. *marianus, Gilia pinnatifida, Aster wasatchensis,* and *Townsendia condensata.*

Accommodations:

Many motel rooms are available in Beaver and Cedar City, Utah. Camping sites are available along State Road 153.

Government Contact: Fish Lake National Forest, Beaver District, 190 North 100 East, Beaver, Utah 84713, (801) 438-2436.

STANSBURY MOUNTAINS (PHOTO, P. 281)

Description:

The Stansbury Mountain Range is located 15 miles west of Tooele. The range runs north-south and is approximately 26 miles long by 9 miles wide, rising 6,700' from the desert floor to a height of 11,031' at Deseret Peak. The Stansbury Mountains are a large, eastward-tilted fault block composed of quartzite at the top and sedimentary strata around the base, including limestone on the eastern slopes. The range was heavily glaciated and 17 cirque basins were formed during that period. The valley floor receives about 16" of moisture a year, while the highest parts of the Stansburys receive 55", most of it from winter snow.

The Stansbury Mountains contain almost 600 species of vascular plants, including some 57 varieties that grow at alpine elevations (Taye, 1983). The Stansbury plant communities are very similar to those of other Great Basin ranges, going from desert to pinyon-juniper to subalpine and alpine.

Distance: 55 miles from Salt Lake City, one hour. Take Interstate 80 west to the first Grantsville exit, heading south through Grantsville to South Willow Creek Canyon Road. The last 9-mile-stretch is a narrow dirt road but usually passable by car. Best area map: Alpentech, Stansbury Ski Touring/Hiking.

Recommended Day Hike:

From the trailhead at the end of South Willow Canyon (7,400') to the summit of Deseret Peak, strenuous, 9 miles round-trip, about 3,600 vertical feet. The well-maintained trail will lead you along the eastern ridge line through Mill Fork. Another more moderate hike is to follow the same trail until the trail forks to Willow Canyon Lake. Follow this trail for about 1 mile until it turns westward, but head eastward instead and route-find to the cirque basin below Deseret Peak. For further description of the area and other hikes, see Hall (1991) and Kelsey (1986).

Special Plants To Look For in the Stansbury Mountains:

Arabis holboellii var. *secunda*, *Astragalus kentrophyta* var. *implexus*, *Castilleja applegatei* var. *viscida*, *Eriogonum umbellatum* var. *deserticum*, *Lesquerella occidentalis* var. *cinerascens*, and *Senecio fremontii*.

Accommodations:

Nearest motel rooms are in Tooele, but Salt Lake City is also very close. There are campsites along South Willow Canyon if you prefer to camp.

Government Contact: Salt Lake Ranger District, Wasatch-Cache National Forest, 6944 South 3000 East, Salt Lake City, Utah 84121, (801) 524-5042.

DEEP CREEK MOUNTAINS

Description:

The Deep Creek Mountain Range is located 50 miles south of Wendover, Utah, and parallels the Utah-Nevada border. The range is approximately 30 miles long and 10 miles wide, the highest peak being Ibapah (12,087'). The range rises over 7,500' from the desert below. The center of the range is a beautiful, white granite, the northern end mostly sedimentary rocks, and the southern end predominantly pre-Cambrian quartzite. Most of the major canyons were glaciated, have springs, and are very green.

The desert surrounding the Deep Creeks is dominated by *Artemisia tridentata* and the lower dry forests by pinyon and juniper. The upper, wetter forests are principally coniferous, including *Abies concolor, Pinus englemannii, Abies lasiocarpa,* and *Pinus flexilis.* Annual precipitation at treeline is about 30"-35" a year. Over 600 plant species have been identified in the Deep Creeks (McMillan, 1948), over 80 of these are alpine (Billings, 1978).

Distance:

216 miles from Salt Lake City, about 4.5 hours, including 66 miles of dirt road. Follow Interstate 80 west to Wendover, then take Alternate 93 south towards Ibapah. Turn east 3 miles before Ibapah, follow the Pony Express road to Callao, then south to Granite Canyon. The best area map: USGS 1:100 000, Fish Springs and Wildcat Mountain.

Recommended Day Hike:

Granite Canyon to Granite Pass, strenuous. A 6-to-10-mile round-trip hike (depending on how far you are able to drive up the canyon with your vehicle), about 6 hours. Starting at a trailhead at approximately 6,800', the primitive trail winds up the canyon alongside a majestic creek punctuated by beautiful meadows, climaxing at 10,200' in a wonderful, open fell field. Along the trail you might spot *Habenaria dilatata, Chimaphila umbellata,* and other woodland and riparian species. Near the top, a large series of springs feed the creek, which are surrounded by a giant, marshy meadow of *Dodecatheon alpinum* and perhaps *D. redolens,* as well as *Primula parryi.* The fell field is composed of quarter-size granite pebbles and larger boulders. Between these rocks grow many alpine species, including *Castilleja nana, Phlox pulvinata,* and *Geum triflorum.* Those who wish to go farther can follow the ridge line to the south to Red Mountain (11,588') or to Ibapah Peak; either trip will add a couple of miles and over 1,500' vertical rise to the hike. For further description, see Hart (1991) or Kelsey (1986).

Special Plants to Look For in the Deep Creeks:

Draba kassii, Synthyris pinnatifida var. *laciniata, Hackelia ibapensis, Angelica kingii,* and *Ivesia setosa.*

Accommodations:

The nearest hotel rooms are in Wendover, Nevada. There is a campground just south of Callao at an old CCC site. Primitive camping is allowed in Granite Canyon.

Government Contact: BLM House Range Resource Area, 15 E. 500 North, Fillmore, Utah 84631, (801) 743-6811.

LA SAL MOUNTAINS

Description:

The La Sal Mountains are located in southeastern Utah, 20 miles east of Moab. Twenty-five miles long by 15 miles wide, the La Sals are the second-highest mountain range in Utah, with Mt. Peal 12,721', towering almost 9,000' above the valley floor. The mountains are of volcanic intrusive origin; volcanic action almost penetrated the sedimentary red sandstone but never broke through. In the process, a spectacular mountain range was created, which some might describe as one big talus or scree slope. The La Sal Mountains are surrounded by arid valleys that receive less than 10" of precipitation annually. The alpine areas of the La Sals receive between 15" and 25", and sometimes as much as 30", of annual precipitation. The high mountain elevations can accumulate over 120" of snow per year, which may sound like a lot, but pales in comparison to the northern Utah ranges. The treeline is at about 11,000'-11,500', but many alpine plants grow below this line in glaciated cirque basins. More than 60 species of alpine plants have been identified.

Distance:

270 miles from Salt Lake City, 6 hours. Take Interstate 15 south to Spanish Fork then follow US Hwy. 6 to Green River, head east on Interstate 70 to Crescent Junction and then south on US Hwy. 191 to Moab. From Moab, take the La Sal Mountain Loop Road to the Geyser Pass Road to Geyser Pass, which then splits off to the Dark Canyon Road. The last 12 miles are rough dirt road, which might require a high clearance vehicle; check locally for conditions. An alternative to the Geyser Pass route would be to approach from the south on the Dark Canyon Road. Inquire locally for road conditions and directions. Best area maps: Latitude 40 Degrees, Moab East; and Canyon Country Publications, Hiker's & Cross-Country Skier's Map of the La Sal Mountains.

Recommended Day Hike:

Dark Canyon Basin Trail, strenuous. Three miles round-trip, just over 1,000' vertical rise. No developed trail is available, you must route-find over a talus slope. Hiking on a talus slope is slow-going and can be treacherous. This hike leads you into a beautiful cirque basin with Mt. Peal on the south side and Mt. Mellenthin on the north. This magnificent hanging valley has been designated part of the Mt. Peal Research Natural Area. After visiting the cirque basin, if you must climb to the top of one of the mountains, both Mt. Mellenthin and Haystack Mountain are accessible from Geyser Pass. For further information on hikes in the area, see Knighton (1995) and Kelsey (1986).

Special Plants To Look For in the La Sal Mountains:

Erigeron mancus, E. humilis, E. melanocephalus, E. elatior, Arnica nevadensis, Rudbeckia laciniata, Androsace carinata, Saxifraga bronchialis, Senecio dimorphophyllis var. *intermedius, Besseya alpina,* and *Castilleja occidentalis.*

Accommodations:
Many motel rooms are available in Moab but can fill up easily on weekends. Only primitive campsites are available in the high La Sals, but improved campsites are available in the lower canyons.

Government Contact: Manti-La Sal National Forest, 125 West 200 South, Moab, Utah 84532, (801) 259-7155.

MARKAGUNT PLATEAU

Description:
The Markagunt Plateau is located about 20 miles east of Cedar City, Utah. The plateau is approximately 20 miles wide by 40 miles long, with the entire center of the plateau being over 10,000'. The highest point of Markagunt Plateau is Brian Head Peak (11,315'). It represents volcanic activity that occurred about 30 million years ago. The southern part of the plateau is now Cedar Breaks National Monument, the main attraction of which is a giant, naturally carved amphitheater some 3 miles across and over 2,000' deep. Brian Head Ski Resort, located just to the north, receives 400" of snow a year. Markagunt is an Indian name for "highland of trees."

Distance:
250 miles from Salt Lake City, 4 hours. Take Interstate 15 south to Parowan, then State Road 143 south to Cedar Breaks National Monument. Best area map: Trails Illustrated, Dixie National Forest.

Recommended Day Hike:
Spectra Point (highly exposed; do not pursue the plants over the edge), moderate. Two miles round-trip on an improved trail along the edge of the amphitheater to a lookout point, with a vertical change of 100'. The trail also passes through a stand of ancient bristlecone pine (*Pinus longaeva*). The unique feature of this hike is that you are viewing an inverted treeline and krummholz that descends a short distance into the dry Claron Limestone below the rim of the amphitheater. Many small cushion plants grow on the limestone. This highly unusual circumstance is caused by localized cold temperatures and wind. You may extend this hike an additional 2 miles round-trip to the Ramparts Overlook, but the first part is the most interesting.

An even easier hike is to drive to the Chessman Ridge Overlook (10,467') and walk the 2-mile loop Alpine Pond Trail, on level terrain through a subalpine forest. An easier venture yet is to take the dirt Forest Road #047, which starts about one-half mile to the north of Cedar Breaks National Monument. This 3-mile dirt road takes you to the top of Brian Head Peak through open meadow terrain and affords ample opportunity for stopping to botanize. Also of interest is the area surrounding Navajo Lake (9,028'), just to the south of Cedar Breaks National Monument on Hwy. 14. For further description of the area and other hikes, see Hall (1991).

Special Plants To Look For on the Markagunt Plateau:
Arenaria kingii var. *plateauensis*, *Astragalus limnocharis* var. *limnocharis* (on the

shores of Navajo Lake), *Castilleja parvula* var. *revealii, Cymopterus minimus, Draba subalpina, Eriogonum panguicense* var. *alpestre, Haplopappus zionis,* and *Silene petersonii.*

Accommodations:

The nearest motel rooms are at Brian Head Ski Resort, and many additional rooms are available in Cedar City. There are campsites near the Visitor Center at Cedar Breaks National Monument.

Government Contacts: Cedar City Ranger District, 82 North 100 East, P.O. Box 0627, Cedar City, Utah 84721-0627, (801) 586-4462, and Superintendent, Cedar Breaks National Monument, Box 749, Cedar City, Utah 84720, (801) 586-9451.

TETON RANGE, WYOMING

Description:

The Teton Range, located 5 miles north of Jackson, Wyoming, is approximately 40 miles long and 15 miles wide and parallels the Idaho-Wyoming border. The range runs north-south. The tallest peak is the Grand Teton at 13,770', more than 7,500' higher than the valley floor. The Tetons are one of the youngest mountain ranges in the West and consequently the most rugged. The peaks around the Grand Teton are composed mostly of granites, schist, and gneisses, while the peaks to the south, near Rendezvous Peak, are mostly sedimentary, limestone and dolomite. All of the peaks have been heavily glaciated, and remnants of 12 glaciers are extant. Because of this, there are many high elevation lakes. The Teton Range contains over 1,000 species of plants, of which 216 grow above 9,500' (Spence & Shaw, 1981). Annual precipitation above treeline exceeds 40".

Distance:

262 miles from Salt Lake City, 5 hours. Take Interstate 15 north to Brigham City, then follow US Hwy. 89 through Logan, Utah, to Montpelier, Idaho, and Afton, Wyoming, continuing on to Jackson, Wyoming. Best area map: Earthwalk Press, Grand Teton National Park.

Recommended Day Hike:

Jackson Hole Ski Area Tram (10,450') to Rock Springs Bowl, moderate. 4.2 miles round-trip with a 500' change in elevation. Because of the great elevation change from the valley floor to the top of the mountains and the lack of road access, it is difficult to get into the alpine area on a day-hike basis. Therefore, we are recommending taking the tram from Teton Village to the top of Rendezvous Mountain. This interpretive trail crosses meadows, talus slopes, and an occasional snow patch and enters a small cirque. Flowers you might expect to see along the trail include *Linum lewisii, Phacelia sericea, Castilleja sulphurea, Aquilegia flavescens,* and *Phlox pulvinata.* The trail is marked, and a brochure is available at the trailhead. Contact Jackson Hole Ski Corporation, Box 290, Teton Village, Wyoming 83024, (307) j320
733-2292 for tram prices and operating hours.

Three other recommended day hikes are: Teton Pass to Ski Lake (8,720'), 3 miles round-trip, moderate; Teton Campground (access via Driggs, Idaho) to

Table Mountain (11,106'), 12 miles round-trip, very strenuous; and Jenny Lake to Amphitheater Lake (9,698'), 9.2 miles round-trip, strenuous. For further descriptions of these hikes, see Woods (1993), Carter (1993), and Lawrence (1979).

Special Plants To Look For in the Teton Mountains:

Asplenium trichomanes-ramosum, Eritrichium nanum, Draba crassa, Sagina saginoides, Phyllodoce x *intermedia, Astragalus schultziorum, Eriogonum ovalifolium* var. *ochroleucum, Anemone tetonensis, Potentilla brevifolia, Telesonix jamesii* var. *heucheriformis,* and *Tofieldia glutinosa* var. *montana.*

Accommodations:

Many motel, hotel, and condominium rooms are available at Teton Village and Jackson. Many campsites are available, private and public, in and out of the parks. All accommodations fill up fast, particularly on weekends and holidays; be sure to make advance reservations.

Government Contacts: For the west slope of the Tetons, contact Targhee National Forest, Teton Basin Ranger District, Driggs, Idaho 83422, (208) 354-2431; and for the east slope, contact Jackson Ranger District, Box 1689, Jackson, Wyoming 83001, (307) 733-4755.

WHEELER PEAK, SNAKE RANGE

Description:

The Snake Range is located on the Nevada side of the Utah-Nevada border, 56 miles east of Ely, Nevada, or 90 miles west of Delta, Utah. The range runs north-south, is approximately 50 miles long by 12 miles wide, and is bisected by US Hwy. 6. Wheeler Peak (the second highest mountain in Nevada at 13,063') is located on the northern end of the southern half of the range and was designated Great Basin National Park in 1986. The geologic makeup of the southern end of the Snake Range is a mixture of rock types, including quartzite, shale, limestone, and granite. The Snake Range is drier than the Wasatch or Uinta ranges and receives just under 300" of snow annually above 10,000'. Total precipitation at 6,800' is less than 14" a year. The range has been deeply glaciated, and many cirque basins exist.

Wheeler Peak contains over 400 species of vascular plants, 45 of which are true alpines (Lewis, 1973). The plant communities of the Snake Range are typical of the Great Basin ranges, including sagebrush, pinyon-juniper, mountain brush, aspen-fir, pine, and alpine.

Distance:

263 miles from Salt Lake City, about 5 hours, all paved roads, except where noted. Take Interstate 15 south to Payson, Utah, then southwest on US Hwy. 6 through Delta, Utah, to Baker, Nevada. Best area map: Earthwalk Press, Great Basin National Park.

Recommended Day Hike:

Wheeler Peak campground to Bristlecone Pine Grove and Wheeler Glacier,

moderate. Approximately 6 miles round-trip. The trail begins at 9,950' and ascends through a pine forest to a bristlecone pine interpretive area to the toe of a rock glacier in a cirque under Wheeler Peak's north face at 10,800'. As you enter the bristlecone pine interpretive area, you will find that *Pinus longaeva* and *Pinus flexilis* are mixed together. Much research has been done on the bristlecone pine, and the oldest specimen was cut down and found to be almost 5,000 years old. While walking through this area, watch for *Arabis drummondii, Potentilla glandulosa, Androsace septentrionalis, Phlox pulvinata,* and *Castilleja lapidicola.* Wandering on toward the glacier, you will emerge from the treeline and walk through the moraine. Here you may hope to find *Eriogonum umbellatum, Silene acaulis, Aquilegia scopulorum, Astragalus kentrophyta, A. platytropis*, and *Polemonium viscosum.* The more adventuresome might attempt climbing Wheeler Peak summit, starting from the same trailhead on through the Alpine Lakes Loop. It is about 10 miles round-trip with a vertical rise of over 3,100'. For those who would rather hike in a more remote area of the park, we suggest climbing Mt. Washington (11,658'), which is situated about 5 miles south of Wheeler Peak and must be accessed through Shoshone Campground. Inquire at the gate for directions and road conditions (over 10 miles of dirt road). On Mt. Washington, two beautiful endemics may be viewed, *Primula nevadensis* and *Eriogonum holmgrenii. Primula nevadensis* grows on limestone talus and loam soil under *Pinus longaeva*, the bristlecones near the top of Mt. Washington. *Eriogonum holmgrenii* grows in the grass-forb communities on the ridge line from Mt. Washington to Pyramid Peak, between 10,900' and 11,800'. For further description of these hikes, see Hart (1991), Grubbs (1991) and Kelsey (1988).

Accommodations:

Motel accommodations in Baker are very limited; nearest motel rooms are in either Delta, Utah, or Ely, Nevada. Many improved campgrounds are located within the park.

Government Contact: Great Basin National Park, Baker, Nevada 89311, (702) 234-7331.

HAZARDS OF HIKING IN ALPINE AREAS OF UTAH

The major dangers of hiking in Utah are altitude sickness, lightning, and falling while climbing, but there are other hazards as well. High altitude sickness is a real problem, even to those going just above 10,000', and especially for those who live near sea level or who have had altitude sickness before. It has been described as feeling like a hangover or the flu. The most common symptom is a headache at the back of the head. Other symptoms include nausea, lack of appetite, sleeplessness, and fatigue. In extreme cases it can include edema of the lungs and brain, which can be life-threatening.

The cause of high altitude sickness is the reduction in the amount of oxygen at higher elevations. Your body can adapt to this problem, but it is a gradual process, and people adjust at different rates. If you are coming from a low elevation, it is suggested that you spend several days at 5,000'—8,000' before attempting the hikes recommended here, especially the strenuous or high ones. It is also recommended that you climb high in the day but always sleep at a much lower elevation at night. You should avoid the consumption of alcohol.

If you experience mild altitude sickness, the easiest solution is to descend a few thousand feet. If the symptoms don't immediately improve, or if you have lung or other complications, you should seek medical help at once.

Lightning is a serious threat to the alpine hiker and is the number one cause of weather-related deaths in Utah. Over 100 people are killed by lightning each year in the United States. Most summer thunderstorms occur in the late afternoon or early evening after clouds have developed in the heat of the day. This is a good reason to start your hike early in the day. Keep close track of weather forecasts; if there is a thunderstorm warning for your area, don't even think of hiking that day. If you are already on the mountain, and you see lightning headed your way, get off the ridge line and back to your car, if possible. If not, find a relatively lower area away from tall trees, high objects and water features. Have your group spread out, then squat down with your feet together and your mouth open. Be prepared to give artificial respiration if lightning strikes a member of your party. Fortunately, thunderstorms usually last less than 30 minutes in any one location.

Falling off or falling into something is always a risk when hiking in the mountains. Do not go near the edge of cliffs or precipices. Utah has many old mine shafts that are uncapped; stay away from them. Snow fields can also be very dangerous; stay off them as much as possible. Always ask yourself, "If I fall, where will I end up?" Snow cornices on mountain ridges look interesting, but can also be hazardous. Loose rock and talus can sprain an ankle easily; stay on the trail if there is one.

Controlling your body temperature can be a tricky thing at high elevations. Be sure to take several layers of clothing with you in order to adjust your temperature to the conditions. It is very easy to sunburn at high elevations, so it is best to cover up with clothing, hats, and sunscreen. Always carry more water with you than you need, at least one quart per person, because dehydration can be life-threatening. Many canyons have water sources in them, but water must be filtered or treated, as giardia is a problem in Utah.

Injuries from snakes and animals are quite rare in Utah. Rattlesnakes are seldom seen above 9,000'; it's too cold. Even when encountered, they pose little threat unless you step directly on them. Keep a close eye on the trail, and just go around any you see. Stay away from all other animals you encounter, especially rodents, as many carry diseases. Just admire all wild animals from a distance. Never sleep in a tent with food or anything that is scented (including toothpaste), as it may attract animals.

SUGGESTED EQUIPMENT LIST FOR DAY HIKES

Required: comfortable hiking boots or shoes (that are broken in) with gripping soles and good ankle support; day pack big enough to carry your equipment and food; hat; filled water bottle; lightweight jacket or sweater; rain gear (it frequently rains in the late afternoon); compass and maps; water purification system; first-aid kit; toilet paper or tissues; and personal medication, if required.

Optional: camera and film; walking stick or monopod; hand magnifying lens or loop; pocket knife; small flashlight; suntan lotion and lip balm; insect repellent; small binoculars; notepad, pencil, and small measuring device; sunglasses; plant and field guide books; and snacks.

Equipment for the car: Make sure that your car is in top running condition,

especially your tires, battery, and brakes. Always make sure you carry extra water and food in your car in case you get stranded.

Personal health: Be aware of your own capabilities and limitations; discuss any problems with your doctor. Practice hiking in your own area to get in shape for alpine hiking, but remember, it's always more difficult at high elevations on steep and uneven slopes.

RESOURCES

By far the best flora for all of Utah is the newly revised *A Utah Flora* (Welsh et al., 1993). For those less technically inclined, *Alpine Flower Finder* (Wingate & Yeatts, 1995) works very well for many alpine plants in Utah and is easy to carry. A specific flora, plant list, or thesis exists for nearly every major mountain range or national park in Utah. For those who enjoy color photos, I would highly recommend *Alpine Wildflowers of the Rocky Mountains* (Duft & Moseley, 1989) or *Alpine Wildflowers* (Strickler, 1990). Nearly half of the alpine species pictured in these two books grow in Utah. For the northern and central mountains and valleys, Richard Shaw's new book *Utah Wildflowers* (1995) is excellent. The *Atlas of Vascular Plants of Utah* (Albee et al., 1988) is a very useful book for determining plant distribution and location within Utah. This work summarizes in a graphic way the work of Utah's eight publicly accessible herbaria. The largest collection is at Brigham Young University, while other major holdings are at the University of Utah and Utah State University—the others are within other government agencies. If you would like to see a particular species at an herbarium, always call ahead first, as many have limited hours of operation.

If you would like to find a particular species in the wild, use the *Atlas of Vascular Plants of Utah, A Utah Flora* and other floras for clues. Know what kind of plant and tree communities they grow in. Know the kind of environment and geology they like best, and know when they are most likely to bloom. You will have success finding them if you do your homework and look at the world from the plant's perspective. If the plant grows in the duff, don't be afraid to get down on your hands and knees when you think you are close to finding the plant you're looking for. If you would like to know more about alpine environments in general, see Arno and Hammerley (1984), Zwinger and Willard (1972), and Billings (1974). If you would like to know more about the state of Utah in general, Bill Weir's *Utah Handbook* (1991) is full of interesting facts. The best map for all of the state is DeLorme Mapping's *Utah Atlas and Gazetteer*.

CONSERVATION

Almost all of the hikes described above are on Forest Service or Bureau of Land Management property. Many are in federally designated wilderness areas or are proposed as such. Some are in national parks or monuments. Collection of plant materials in these areas is prohibited or severely limited. Many of the species listed in this article are endemic or locally scarce; some are listed as sensitive, threatened, or endangered. It is a far better plan to leave the plants where you find them, but take lots of pictures for your memories. Also, your presence in alpine areas can have a negative impact on the environment. Remember to be careful where you step, and always haul out all of your trash.

BEFORE YOU GO

Find out as much about the area as you can. Having maps with you is of utmost importance. If you are hiking off-trail, you must have the most detailed maps possible, which are usually USGS 7.5' 1:24,000 scale maps. These are available from federal and state government agencies, as well as some sporting goods stores. However, many of these maps were last updated 20 to 30 years ago, and some of the locations of trails have been changed. Additional trails may have been added. Currently, the condition of Forest Service roads and trails is deteriorating due to budget cuts and resulting lack of maintenance. Make sure you tell someone exactly where you are going and when you will be back.

ALWAYS CHECK LOCALLY

This article was prepared from what were believed to be accurate sources and personal experiences; however, errors do happen and conditions can change. Trails, rivers, snowpacks, and flowers change from week to week. Always check locally before you go.

BE PREPARED

Like the Mormons, who arrived in the Salt Lake Valley in 1847, you must be prepared to handle all situations and emergencies yourself when you are in alpine high country. Take a class or read a book on wilderness first aid. Make sure your equipment is in top shape and you are in good physical condition. Help will always be hours away if you have a problem.

OTHER AREAS

We have discussed only the alpine areas in Utah and nearby. Some areas worthy of exploration were left out. These include the Abajo and Raft River Mountains and the Aquarius and Wasatch Plateaus. Many other alpine areas in adjacent states are worthy of exploration, especially in Wyoming and Colorado; see *Rocky Mountain Alpines* (Williams, ed., 1986).

If you plan your day hikes to alpine areas with as much enthusiasm and dedication as you plan your garden, you will have a very successful and enjoyable outing. We hope to see you at the "Highland/Dryland, Utah Flora '96."

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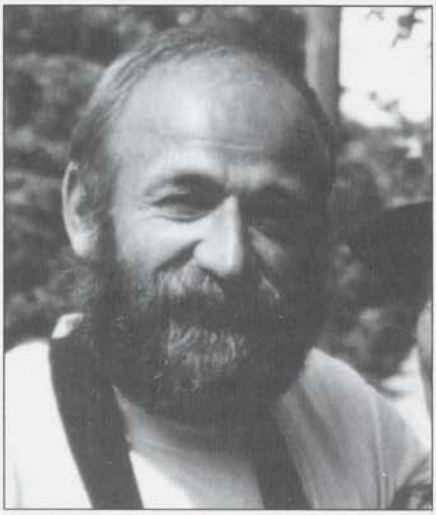
Bill King describes himself as a Salt Lake businessman who spends most of his free time in the mountains and who would just as soon see native plants in their alpine environment as blooming in his own garden.

AWARDS

Marcel LePiniec Award
Josef Halda



Josef Halda has been growing alpine and rock garden plants since he was a boy. He built his first rock garden at age 5. He started traveling to the mountains with his grandfather a few years later and had his own collection of plants in a greenhouse by age 12. In 1960 he started writing to Lawrence Crocker, in Medford, Oregon, partner in Siskiyou Rare Plant Nursery, where his *Daphne arbuscula* 'Vigorous Form' is still grown! He later corresponded with many other Americans and sent seed. At age 16 he went with some older boys to do rock climbing on the mountains of Romania and Bulgaria and spent more time looking at the plants than rock climbing. He continued to combine these two actives until just a few years ago.

Josef's wife, renowned artist Jarmila Haldova, makes his plants familiar to us all with her distinctively beautiful, botanically accurate drawings. She loves the mountains and prepares fine working sketches of the plants in the field. Together they have taken their four boys to many of the mountain ranges in Europe, Central Asia, and Turkey.

In 1967 Josef was the first Czech alpinist and botanist on Ala Dag in Turkey, when his expedition to Afghan Hindukush stopped there to relax in the mountains. He was on a climbing team at the time but went back to collect from the rich flora. He and Jarmila also were the first seed collectors on Karadag and Cilodag in Kurdistan close to Lake Van in 1989. He brought the first *Dionysia* to the Czechs from the Pamir in 1967.

Josef has given botanical names to many plants, including *Campanula blumelii, Cyclamen fatrense, Daphne skipetarum, D. velenovskyi,* x *Jankaemonda vandedemii,* and several more gesneriad hybrids. The following are some of plants that Josef was the first to introduce to our gardens through his continued supply of seed: several *Acantholimon* species, includin: *A. caryophylleum* and *A. diapensioides; Adonis sibirica, A. turkestanica, A. wolgensis; Ajania tibetica; Alajja rhomboidea; Androsace akbaitalensis, A. bisulca* var. *aurata, A. bryomorpha, A. caduca; Biebersteinia odora; Campanula blumelii, C. lehmanniana,* C. *samarkadensis; Chamaerhodos altaica; Chorispora bungeana, C. elegans,* C. *macropoda, C. songorica; Cyclamen fatrense,* C.

parviflorum; Cysticorydalis crassifolia, C. fedtschenkoana; Daphne aurantiaca 'Dwarf', *D. circassica, D. kosanini, D. skipetarum, D. velenovskyi; Dionysia gandzhinae, D. hissarica, D. involucrata, D. tapetodes* 'Seravschan'; *Draba alticola; Dracocephalum altaicum, D. integrifolium, D. paulseni; Gentiana boissieri, G. szechenyi, G. uniflora, G. urnula, G. wardii; Geranium saxatile; Hegemone lilacina, H. micrantha;* several species of *Juno,* including *J. narbutii; Lamium eriocephalum; Onobrychis echidna;* many peonies, including *Paeonia kavachensis* 'Abchan'—dwarf, deep yellow form; species of *Paraquilegia;* many primulas, including *Primula baumgarteniana, P. deorum,* P. *dryadifolia, P. fedtschenkoi, P. iljinskyi, P. minkwitziae, P. turkestanica;* many *Rhododendron* species, including *R. fragrans; Salix berberifolia; Saxifraga alberti, S. asiatica, S. bryomorpha; Solmslaumbachia pulcherrima; Thylacospermum caespitosum;* several *Ungernia* species; and many others from Lesotho, the Drakensberg, and the South American Andes.

Josef has built over 30 rock gardens in the United States and many in Europe. He builds in many styles, but his favorite is the crevice garden, a style he developed as a boy after studying nature.

For the last 35 years Josef has been concentrating on collecting of seed in southern Siberia, central Asia, Manchuria, and the Caucasus—areas that were part of the former USSR. No one else is bringing seed to growers from these areas as there are so many hostilities at present. Josef and Jarmila have also recently collected in all of China, Lesotho, and Patagonia.

Josef has published articles in the *Bulletin of the American Rock Garden Society* on the Caucasus Mountains; Kings Rock in Transylvanian Carpathia, Primulaceae of the Pamir; and plants of Mt. Olympus. He has also published in the *Quarterly Bulletin of the Alpine Garden Society* and the journal of the Scottish Rock Garden Club.

In 1992 Josef published *The Genus* Primula, the first complete monograph on this genus in 50 years. He has written six books about plants in Czechoslovakia, including one on primulas and a monograph on *Daphne.* We can look forward to monographs in English very soon on gentians, daphnes, and androsaces, as well as a large-format book about plants from Central Asia.

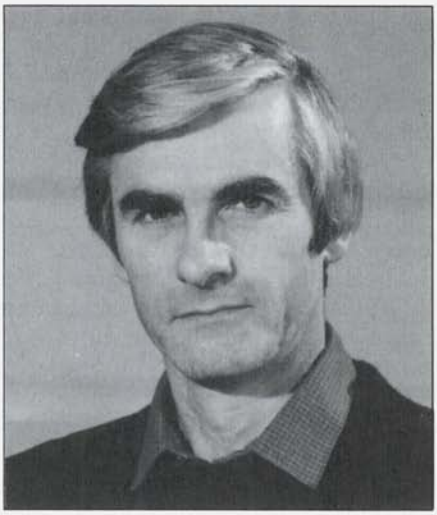
Josef now travels often to NARGS chapters and study weekends to show pictures of the new rare plants he is introducing and to give us all tips on growing.

It will please Josef tremendously to receive this award, first given to his heroes, Lawrence Crocker and Boyd Kline.

—Phyllis Gustafson

Edgar T. Wherry Award
Brian Mathew

The Edgar T. Wherry Award recognizes authors who have made an outstanding contribution to the botanical or horticultural information about native North American plants. Generally, the award recognizes a body of work or a lifetime of literary effort rather than a single work. This year, the committee is honoring an individual who over the years has made an important and lasting contribution: Brian Mathew. Surely all rock gardeners are aware of his important contributions to our knowledge about bulbs, a special interest of his. His surveys of this group as well as works on *Crocus* and *Iris* can be found on the bookshelves of rock gardeners around the world.



In selecting Brian Mathew to receive the Wherry Award, he is being singled out for his book on one of the most desirable and important North American endemic genera from the gardener's perspective, *Lewisia*.

Brian Mathew was a Senior Scientific Officer at the Royal Botanic Gardens, Kew, London, England. In 1986 Mr. Mathew received the Carlton R. Worth Award for his writing about bulbs, a particular specialty of his. At that time Howard Pfeifer wrote in his presentation citation that Mr. Mathew was a rare example of a combination gardener and scientist. "He not only cultivates the plants, but he adds a further dimension to his expertise: He has experienced the bulbs at home in their native habitats. About all these things he has written competently and with great interest."

In the subsequent nine years Brian Matthew has continued his impressive contributions to botanical literature. It is with great pleasure that the committee presents Mr. Mathew with the Edgar T. Wherry Award for 1995.

—James Rugh

Marvin E. Black Award
Norman Singer

If one asks around about who has been a recent dedicated servant to the North American Rock Garden Society, a majority concensus today would be for Norman Singer. To know Norman Singer is to know someone who exudes dedication. To be in attendance at informal gatherings or luncheons with Norman is to immediately realize his chief concerns. Of course Geoffrey Charlesworth takes priority. But his next immediate involvement is the North American Rock Garden Society. Many can attest that he has made a major effort to increase our NARGS's membership, as well as being a general shaker and mover of the Society.

The Marvin E. Black Award appears to have been written with Norman Singer as its model. This newest of awards, created in 1990, is given to those who actively promote the Society. It is given to those who help people discover

the splendor of alpine plants and rock gardening, to somebody who encourages people to reach their potential within our Society, to someone who has exerted great effort to improve and expand the North American Rock Garden Society. It is clear that the Marvin Black Award is completely appropriate to his accomplishments.

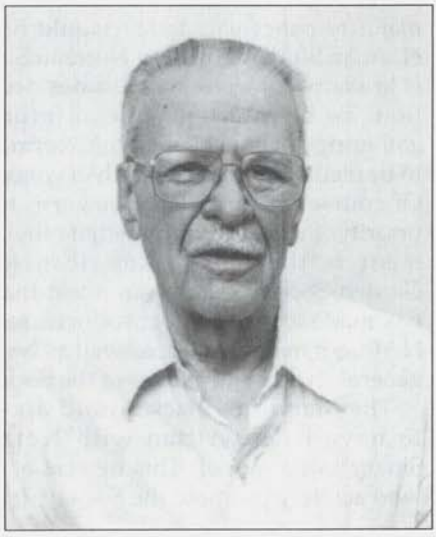
Norman and Geoffrey's yearly plant sale is a grand event dedicated to the distribution of worthy rock garden plants; their garden has always been shared with others. Their frequent dual slide lectures have imparted their gardening experiences and shared their gardening knowledge—even if Norman has not always followed the script! Norman's generosity with plants, plant knowledge, and advice is well-known. But more important than this has been his personal inspiration to many individuals, always to encourage and not to disparage. His support was instrumental in starting several chapters.

Norman provided dynamic leadership at Board meetings as Vice-President and President. As President, his innovative ideas were acted upon, his meetings were timely, efficient, and orderly, so that much was accomplished. Norman did not get his own way on all issues, but dissension was rare. A major accomplishment was to have the revised bylaws passed. As anyone who has worked closely with Norman can acknowleedge, he agonized over decisions of the Presidency, and they can attest to his unflagging efforts.

Norman turned the declining membership of NARGS completely around. His encouragement and sponsorship of the Czechoslovakians and other overseas members is an on-going activity. And we all know of the name change to North American Rock Garden Society, a name which recognizes the expanded role of our Canadian members a change brought about by Norman Singer's verve and drive. The Marvin E. Black Award is consistent with his sterling example of leadership and dedication to our Society.

—Dick Bartlett

Award of Merit
James A. Minogue



Jim Minoque was President of the American Rock Garden Society from 1976 to 1980. He had previously been a member of the Board of Directors between 1974 and 1976. Before becoming president of ARGS, he had been active in many horticultural organizations in the Washington, D.C. area, including serving as chairman of the Potomac Valley Chapter of ARGS.

During his tenure as President, Jim kept the Society on an even keel. He was a conscientious officer, who attended every meeting and concerned himself with all aspects of running the organization. He was a quiet and effective officer, paying

meticulous attention to details. He was also a thoughtful and concerned president as evidenced by his correspondence. Often when he had to send the same letter or notice to everyone on the Board, Jim would also include a separate, personal note to each member. All his correspondence shows this consideration.

He became President during the 1976 Interim International meeting at a time when the Society was growing in size; three new chapters were formed. He kept careful and complete records which were passed on to the next president, Bob Means, who noted that because Jim operated in a calm and efficient manner all his good works were and have been taken for granted.

In 1983 Frank Cabot, preparing to write a history of ARGS, wrote to the former presidents of the Society for comments on their accomplishments while in office. In response to this request, Jim cited his support and encouragement in ARGS acquiring a tax-exempt status, an effort which was finally attained in 1982 by Frank, who was treasurer at that time. Jim felt that the revision of the Brooklyn Botanic Garden *Handbook of Rock Gardening*, written by ARGS members, was another important achievement while he was president.

Possibly even more important to the society than his serving as president, have been Jim's efforts to preserve the history of ARGS. After Bernard Harkness' death Jim travelled to Rochester and retrieved the material Bernard had collected in anticipation of writing the 40-year history of the society. Jim carefully catalogued and filed every document.

Correspondence in the archives between Jim Minogue and Bob Means reveals that in July 1981, after returning from Rochester, Jim offered to take on the duties of Archivist of ARGS. In January 1982 he sent Bob a list of suggestions concerning the archives and the ARGS history. This memo was sent to the Administrative Committee for their comments along with Bob's note: "As far as I am concerned, he is the official archivist of the Society."

Jim continued to maintain the archival files until Frank Cabot agreed to write the ARGS history as part of the 50th Anniversary celebration. In 1983, Jim sent these files to Frank Cabot who wrote: "Bless you for not only being so prompt but for doing such a beautiful job of organizing and filing the material and listing citations so clearly."

The North American Rock Garden Society takes great pleasure in presenting with appreciation and thanks the Award of Merit to James A. Minogue, the Society's first Archivist.

—Marnie Flook

Award of Merit
Marnie Flook

Marnie Flook has had beautiful rock gardens at each of her three homes which she has generously shared with chapter and national members. She joined NARGS in 1962, becoming a charter member of the Delaware Valley Chapter.

Marnie was both Program Chairman, then Chapter Chair, and a Vice President of NARGS. Marnie and I co-chaired the NARGS Annual Meeting in 1977 in Valley Forge, Pennsylvania.

But her biggest contribution is her offer to become Archivist of NARGS. Fortunately, she had the space to store the many, many boxes of papers and memorabilia that arrived—plus having a computer to help organize all this material.

At several points, Marnie has felt overwhelmed by all the material that poured in—cartons and cartons from Frank Cabot in particular. Marnie has arranged for all of the final papers to be stored at the New York Botanic Garden. That is quite an accomplishment and for that single act alone, she deserves the Award of Merit.

Many long hours have been spent indoors going through all this material, when she could have been out in her lovely Maryland garden or on the water in the Flookboat.

—Anita Kistler

BOOKS

Garden Bulbs for the South, by Scott Ogden.1994. Taylor Publishing Company: Dallas. 250 pp. $22.95. ISBN 0-87833-861-6.

You know you have become a "specialist gardener" the day you wander through an entire garden center and can't find a single plant you can justify buying. Judging by the bookshelves of my rock garden friends, their collecting instinct extends to books. But recently I found myself browsing through bookcase after bookcase at a major botanic garden bookstore—coffee table volumes galore with sumptuous cottage gardens and color combinations, tons of general books for novices on herbs, wildflowers, "landscaping"—yes, yes, all very pretty and nice. But where's the meat? And the writing styles all sound the same: Park Avenue muzak. Has everything been said? Is there nothing new under the sun?

And then there's Scott Ogden. Innocent enough with a glowing hot *Tigridia* on the slick cover of muted green and brown bordering, it is wonderfully packaged and put together. Then you open it up: page after page of closeups of wonderful bulbs growing in gardens, in buckets in nature, page after page of crinums, hippeastrums, zillions of zephyranthes. Now *this* is a book worth having.

There are *Narcissus, Iris,* and *Crocus* as well for the terminally temperate--but what sets this book apart is that it is rooted in the lush specificity of an extraordi-

nary talent. Scott has obviously grown every plant in this book, evidently photographed them all—and most importantly imbued the entire project with his enthusiasm and sharp intellect. Unlike commercially packaged prose, Scott speaks rather than cranks out sentences, and you can practically hear the southern musicality in his voice. This isn't just a matter of lyricism but a crisp manner of narrative that gives whole passages of the book expectant tone of a mystery novel: "Nature is remarkably complex at times, and sleuthing among old gardens occasionally turns up a puzzle that takes years to unravel. In April of 1949 Texas plantsman Fred Jones happened upon an odd rain lily growing in a garden in Laredo. The plants had large, turnip-shaped, black-skinned bulbs, strappy, gray leaves like *Z. drummondii*, and funnel-shaped, greenish yellow blooms."

"Jones wondered if these Laredo plants might be hybrids between *Z. drummondii* and the golden *Z. pulchella* that grew in marshes nearby. He set about crossing these two species to test his hypothesis—no mean task since the long-tubed blooms of *Z drummondii* had to be sliced open and de-anthered to prevent self fertilization. Most were maternal (parthenogentic) and resembled one or the other parent, but two were a beautiful primrose color." The story goes on from here, with unexpected twists and more coincidences and surprise resolution.

Meanwhile you are left with an image of Fred Jones delicately dissecting the blossoms of rain lilies almost 50 years ago, wandering through swamps and on the dry hills of Mexico. He is joined by Dr. Thaddeus Howard, John Fairey, Carl Schoenburg, and dozens of other plantsmen until you realize that this is not just a compendium of regional gardening but a monument to an active and little-appreciated tradition of American gardening.

But is it alpine enough? Northern gardeners will yearn for the spidery *Hymenocallis* and probably groan when they see tuberose and the exotic gingers. Just last week I saw *Hedychium* in a yard-wide swath at the Thomas Everett Rock Garden and New York Botanic Garden, and Don Hackenberry has offered a hardy *Hymenocallis* from Appalachian Wildflower Nursery in central Pennsylvania for years and years at a very reasonable price. Do we really know the climatic boundaries of these southerly bulbs? This book helps to illuminate the path to finding out. Of course, you can argue that these are all fodder for cold frames or alpine houses. I would argue that the Madrean Floristic Province of Southwestern America and most of Mexico harbors so many mountains, so many compact, saxatile perennials and bulbs and so many anomalies and mysteries that we can leave our alpine scruples behind for once. Particularly now that these plants has found such an eloquent and scholarly advocate.

—Panayoti Kelaidis

Alpines, the Illustrated Dictionary, by Clive Innes. 1995. Timber Press: Portland. 194 pp.$39.95. ISBN 0-88192-290-0.

Okay, I'll cut to the chase and say I like this book. What a book! This is *definitely* not a standard, traditional or conventional rock garden treatise (you know the kind—how to build a garden with the slanted, sandwich-like rocks and the same old *Androsace-Primula-Saxifrage* bias, as if the Alps were the only mountain range in the world). I would guess that half the plants in this book have never been pictured in any rock garden book in the past. More intriguingly, a large proportion,

possibly up to a fifth, are subtropical at best.. I wonder if the *Huernia kirkii* or *Ferraria* or *Cypella* (or *Petunia* for heaven's sake) could survive this first 8" snowfall that were having here in Denver today on September 20.

The photography is consistent: a few dazzling pictures and a lot of rather routine, but informative, mug shots of potted plants. Many of the plants are immature, and many are not even in bloom. I would have preferred to see one of the several dozen true alpine *Crassula* species of the Drakensberg rather than the unquestionably tender Cape species. The photo of *"Convolvulus lineatus"* on page 48 is a wonderful little stock (I wonder which one?). But quibbles aside, it is refreshing to see so many unknowns, so many recently cultivated plants. I am sure with seedlists sprouting so many unusual plants in recent years, a good photographic book like this can really help put a face to a packet.

For once, rock gardeners in California, Australia or the Riviera will find a few of their favorites included. And best of all, you can practically hear die-hard traditionalists spluttering and cursing in horror as you turn the pages.

—Panayoti Kelaidis

NARGS Coming Events

Winter Study Weekends

Eastern Winter Study Weekend: February 2-4, 1996

Framingham, Massachusetts

Western Winter Study Weekend: March 1-3, 1996

Victoria, British Columbia

Annual Meeting:

July 11-13, 1996

Snowbird, Utah (near Park City)

Interim International Alpine Plant Conference:

January 5-11, 1996

Christchurch, New Zealand

NARGS COMING EVENTS

ANNUAL MEETING

Wednesday-Saturday July 11-12-13-14, 1996
The Snowbird Ski & Summer Resort, Snowbird, Utah
SPEAKERS: Dr. Elizabeth Neese and Marvin Poulsen

This four day conference will be held at Snowbird Resort nestled in the Wasatch Mountains at 8,000 feet surrounded by 11,000 foot plus peaks and only 30 minutes from downtown Salt Lake City. One day of workshops and activities in Little Cottonwood Canyon. Two day-long field trips: Bald Mountain in the high Uinta Mountains and Albion Basin in the Wasatch Range of the Rocky Mountains. Don't miss this opportunity to see alpine plants growing in their natural habitat. There will be a Plant and Book Sale. Look for our brochure in the winter *Bulletin*, registration will be limited.

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