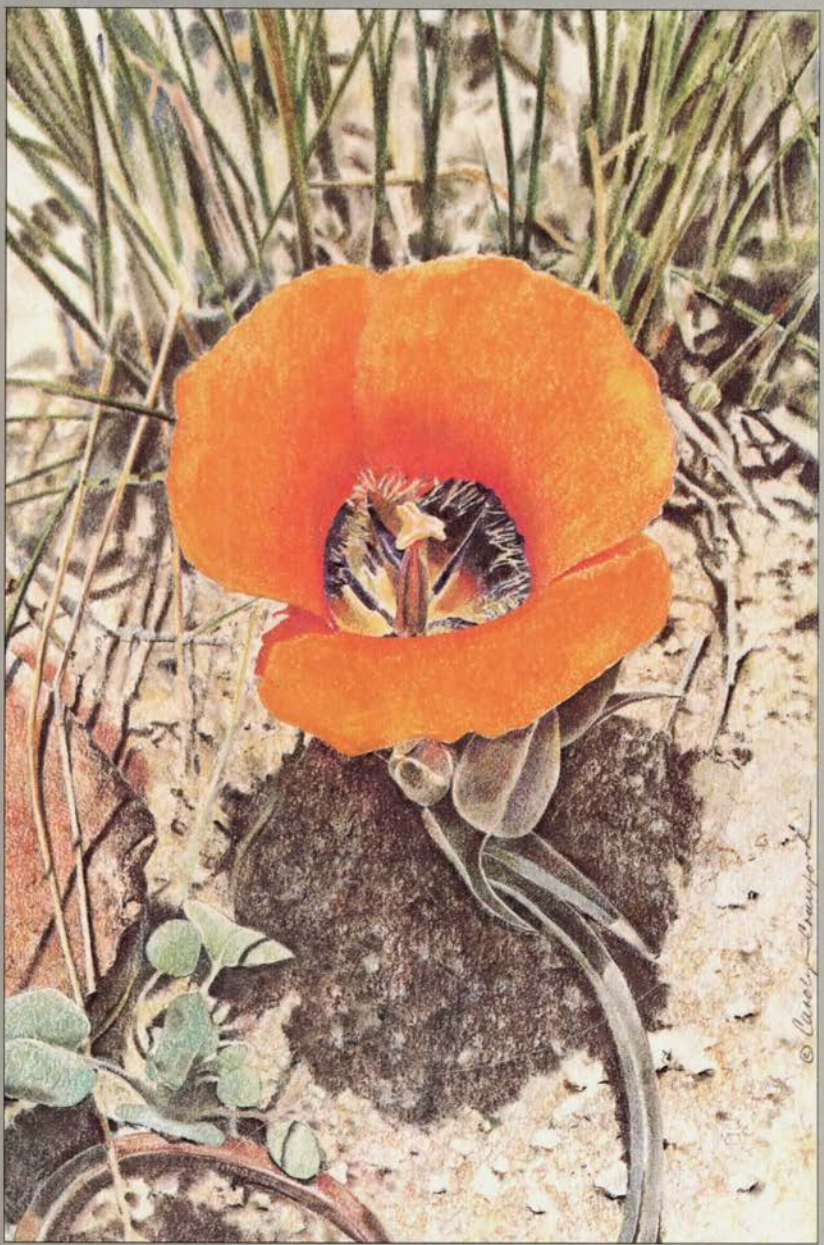

Bulletin of the American Rock Garden Society

Volume 48 Number 1 Winter 1990

Cover: *Calochortus kennedyi*

Our cover is a painting by Carolyn Crawford of Arvada, Colorado.
A photograph by Stan Farwig served as her model.

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American Rock Garden Society

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Contents


©1989 Kristin Jakob
Primula suffrutescens

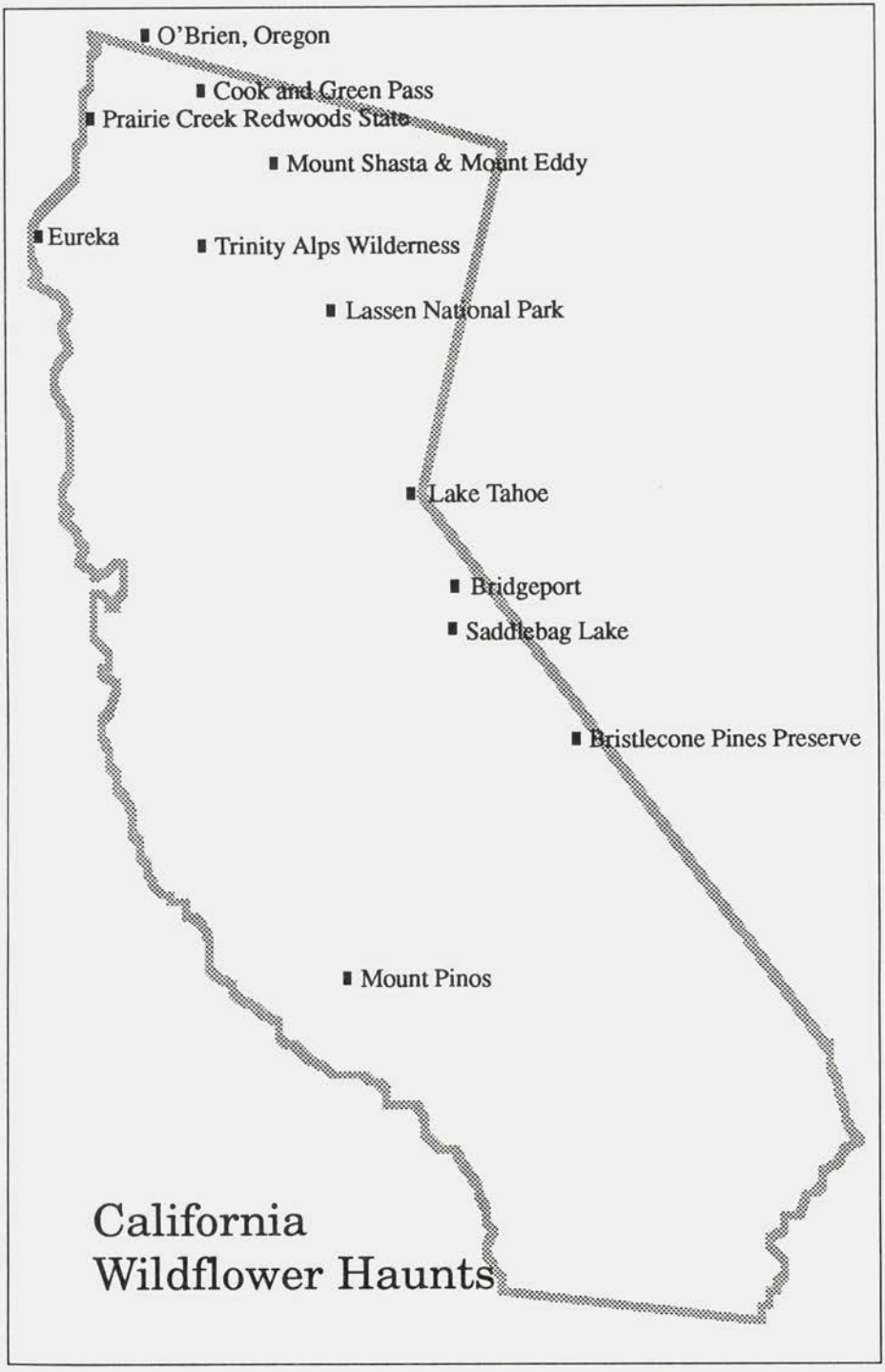
Wildflower Haunts of California

by Wayne Roderick

In California there is so much diversity in climate and topography that it takes nearly a lifetime to see all our interesting plants. For those who have a few weeks to explore there are many places to visit. If you are here in July, it is too late in the year to visit the deserts, to see fields of the annual wild flowers, or flowers of most of our bulbous plants. It is the higher areas of the state that are in full flower at midsummer.

Rock garden people are fortunate that there are still a lot of our plants left in the wild. We never had a Carl Purdy digging these plants by the millions, as happened with the bulbous plants of California. And then there are billions of humans building houses, roads, highways, and bringing ever more acreage into cultivation. Our list of rare and endangered plants is more than 160 pages long. If this is not enough to activate the conscience and discourage the collection of plants from nature in California, consider that we have a long, dry summer. This means that plants must produce a long tap-root to survive the dry period, and this in turn means nearly certain death to any plant dug. So remember, I shall bring the wrath of California down on your head for digging any plant! But California will bless you for taking a little seed. Many of the places I describe here are in plant preserves or wilderness areas. Some of these areas I have personally fought to have set aside, and I will personally hate you, too, if you use this information to exploit them by digging plants.

Highway 395 south from Reno is one of the scenic drives and every road that turns up into the mountains leads up to natural rock gardens. A short ways up Monitor Pass on Highway 89 one can find masses of *Eriogonum wrightii*. This white-leaved mat does not bloom until fall, but what a plant to see! The flowers are not the main attraction, but the foliage is wonderful. On south along Hwy. 395 into Bridgeport Valley there are sheets of *Iris missouriensis* in the meadows, and the


O'Brien, Oregon
Cook and Green Pass
Prairie Creek Redwoods State
Mount Shasta & Mount Eddy
Eureka
Trinity Alps Wilderness
Lassen National Park
Lake Tahoe
Bridgeport
Saddlebag Lake
Bristlecone Pines Preserve
Mount Pinos
California
Wildflower Haunts

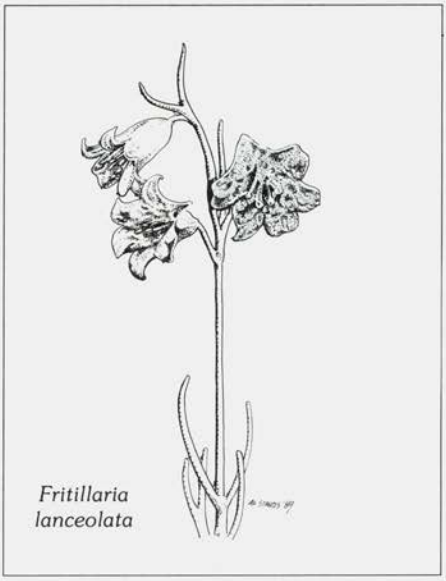
high, snow-covered mountains above can be quite spectacular in June. From Bridgeport south all little roads lead to campgrounds, good fishing and good plant hunting. Just south of Lee Vining the Tioga road takes off to Yosemite and all the many things to see in this park. But just short of Tioga Pass is the road to Saddlebag Lake at 10,000' elevation. Park and walk across the dam, and it's a short walk to the alpine zone. About 200 yards beyond the parking area are masses of *Phyllodoce breweri* with some good color forms. Then there is a glorious meadow of *Aquilegia pubescens* and its hybrids. These are so beautiful that they alone provide enough reason for coming to this location. *Aquilegia pubescens* is white, while the other parent here is *A. formosa,* with red and yellow flowers. In this population the flowers are lovely shades of pink and soft yellows with an occasional pure white. On up the trail are more little lakes, some with golden trout, and then Mount Conness and its glacier. Fine plants abound all the way up.

Still farther south on Hwy. 395 is Bishop, from which lead many interesting roads. But before you explore these, first load up with gas and water and head south to Big Pine and there turn east on Hwy. 168 into the White Mountains and up to Westgard Pass. Then up to the Ancient Bristlecone Pines Preserve. From the time one turns up off the desert floor until White Mountain Road at 7,000' on up until one turns around to come back at perhaps 12,000', there are billions of pictures to take, so make sure you have lots of rolls of film. There are choice rock garden plants everywhere. Mat plants are to be seen at every turn. Eriogonums are perhaps the most common plants. In Grand View campground one drives over or camps on *Phlox covillei*, eriogonums and drabas. The road is paved to the Schulman Grove, but above this on to the Patriarch Grove are the most fantastic plants and scenic areas. There is so much to see, plan to spend two days or more. Most important, remember to spend the mornings up in the high elevations, in areas like the Patriarch Grove, because bad thunderstorms are frequent in the afternoons. Of all the areas to look at dwarf plants I think the best is a little pass about half a mile past the turn-off to the Patriarch Grove. At the road summit at 12,000' on Sheep Mt. is the greatest variety of species. This is a nearly flat area, and plant hunting is fine in nearly every direction. But best is the area west and slightly north of the pass. Here are *Castilleja nana, Eriogonum gracilipes* (see photo, p. 20), a few *E. ovalifolium* (see photo, p. 19), *Townsendia, Phlox, Draba,* and *Potentilla* species, just to name a few.

And then back down to the desert proper. (It is really desert all the way to the top in these mountains.) From the campground on down there are no fewer than four species of *Penstemon*, interesting eriogonums, *Argemone munita* (prickly poppy), and *Mentzelia laevicaulis* (blazing star), all in bloom in July. Growing in shady cracks in the Narrows can be found a *Heuchera* of the *H. rubescens* persuasion. In hot rocky areas on down to the valley are three species of cactus, *Stanleya elata*

(prince's plume), and *Encelia farinosa* (brittle-bush). From Big Pine south on Hwy. 395 the desert is getting darn hot this time of year, but to climb Mount Whitney one must go south to Lone Pine and drive up to Whitney Portal. Climbing up from here you can find *Primula suffrutescens* (see photo, p. 37). At the end of the road are campgrounds that could be full in midsummer. At such elevations there could be frost every night, so make sure to bring warm clothing. About two and a half miles out of Lone Pine toward Mount Whitney is a turn-off up to the right. This road goes into the Alabama Hills, which is where all wild west motion pictures are filmed. In fact the road is called Movie Road, and the sage meadows are Movie Flat. Just south of Lone Pine is the turn-off to Death Valley, a hundred miles away. It can be near hell getting there in July. Once in the Valley you *are* in hell. On July 4, 1989 the temperature at Furnace Creek was 122°F. The National Park Service asks visitors to stay out of the Valley at this season.

If there is time and coolness is desired, I would suggest a trip from Lake Tahoe to Carson City and Reno, then north on Hwy. 395. Go on to Susanville and then west on Hwy. 36 and north on Hwy. 89 to the entrance to Lassen National Park. Lassen Peak is an active volcano. From here north all roads will be scenic. On this drive in moist areas are carpets of *Phyllodoce* and *Kalmia polifolia*, to mention only two good plants. Nearly every parking area along this stretch of road has interesting plants. Then farther north the only questions are how much time the traveler has and which direction to choose—up Mount Shasta or Mount Eddy, to Castle Lake or Cedar Lake, or on to other fabulous spots.



Fritillaria lanceolata

In the middle of the town of Mount Shasta is the road that leads up onto the mountain. There are few good rock garden plants here, but those few are not just good, but great. The road ends at the old ski area, and just short of the end is a parking area off to the right. Park here and walk over the little rise at the end. Veer off to your left into the swale. Here are carpets of *Penstemon davidsonii* by the acre. A few other good plants are phlox, anemones and ferns.

West and over the freeway on the road to Lake Siskiyou (with a good campground) take the road to Castle Lake (with a tiny campground of the finest class, but without water). This is one of the most picturesque of lakes. From the parking lot to the top of the mountain you find one plant after

another of great interest. Several species are rare elsewhere but common here, and there are at least three species counted as rare and endangered by the California Native Plant Society and now listed by the State of California. At the lake follow around to the left and watch for the trail up the hill. When you leave the pavement, there will be *Calyptridium* (*Spraguea*) *umbellatum* (see photo, p. 42), and then at the stream, *Dodecatheon*. The first steps up will lead to *Fritillaria lanceolata* (see photo, p. 44), *Delphinium, Hackelia*, and more. After climbing a ways, more choice plants will be found. Near the top of the climb out in the open areas note the rock outcrops off to the right. This is where you want to be. Between the outcrops are the best color forms of *Lewisia leana* I have ever seen, plus masses of the rare and endangered (and protected) *Erythronium klamathense*. In the rocks are penstemons and small ferns, and on the far side is to be found *Brodiaea modesta*, again an endangered plant. Veer a little to the right of the straight ascent and watch everywhere, and you may find the rare *Dicentra pauciflora* here, there, and everywhere. The extremely rare and highly endangered *Campanula shetleri* is found in a few granite outcrops along the crest of the hill above the faint trail (if you have gotten into the right area and can find the trail). This blooms in late July, but even without flowers the lacework of the leaves in the crevices of the rocks is nice to see. The trail continues on along behind a small hill to a tarn. Here are masses of *Phyllodoce empetriformis* and *Leucothoe davisiae*. On the north side of this little hill where the snows persist until midsummer, there may be quantities of *Erythronium* in bloom. Now take a long look at the magnificent view of Mount Shasta. Then back to the trail and back down to Castle Lake. This walk is only a little more than two miles, but the day is nearly gone, and so back to camp and a nice glass of wine before dinner while we contemplate all the wonderful plants of the day. Going down the road from the lake the next day you will have to stop many times to look at the *Xerophyllum tenax* (bear grass), *Linnaea borealis*, iris, lilies, phantom orchids, and much more.

At the bottom of the hill, turn left up the south fork of the Sacramento River. After three or four miles the road crosses the river. Here watch for moist areas with mats of *Mimulus primuloides* var. *linearifolius*. This is a very free-flowering, easy-to-grow plant that does well in gardens. Generally there are a few ripe seed pods. Ten or twelve miles farther along this road watch for the sign to Cedar Lake. The turn-off to this lake is about a mile short to Gumboot Lake. It is much faster to walk the short mile than to take the car over this "road." There are ten species of conifers along the so-called road. At the lake turn left. There are seven genera of ericaceous plants along the lake's edge, not to say anything about *Gentiana newberryi*, plants of *Darlingtonia* here and there, and *Drosera rotundifolia* making red patches. If there is time and you are a good hiker, follow the "road" to Cliff Lake and try to find the trail up (and I mean up) to Upper Cliff Lake. Here

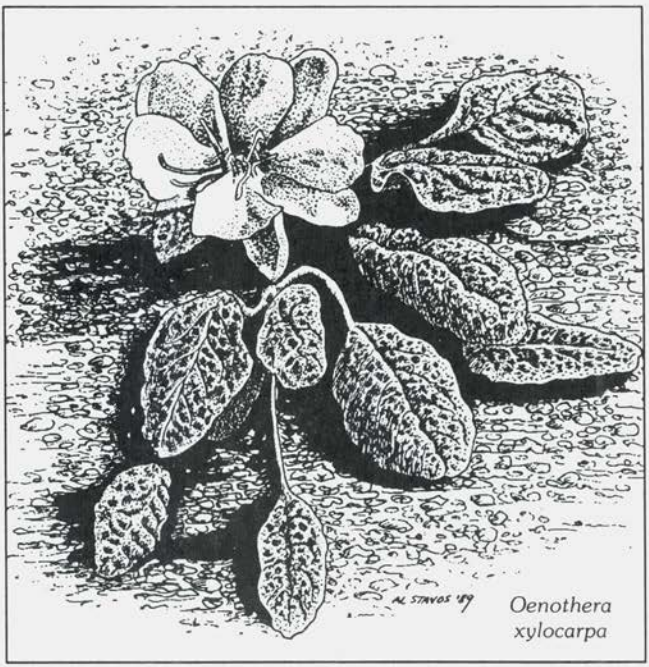
grow two more species of ericaceous plants. There are thousands of plants of *Lewisia leana* here making masses of bright-colored lace. This little lake is privately owned, but the owners are very kind to plant persons as long as they do not dig. After coming back to your car there is time to go on west and up over the top into Mumbo Basin. This is one area where *Lilium washingtonianum* still grows on the dry hillsides. These fragrant white lilies are a sight to see. This species is nearly impossible to grow outside its native range, and these lilies have become rare because of people digging them and bringing them home to die. Down in Mumbo Basin along streams can be found yet more interesting plants, but nothing so spectacular as the combinations at Castle Lake.

Back out to the freeway and on north past the town of Weed. Watch for the off-ramp to Gazelle and Stewart Springs. Take the road to Stewart Springs but do not go through the gates. Instead turn and keep going up. By early July the snow should be gone from the road, so it is passable over the summit. Along this road there are many places to stop and spend time, so plan on not less than a full day. Every moist area and stream has some interesting plants, such as *Darlingtonia, Potentilla fruticosa, Dodecatheon, Adiantum pedatum* var. *aleuticum, Polystichum lemmonii*, lilies, orchids, and on and on. But the best appear at the summit where the Pacific Crest Trail crosses the road. Many choice plants had to be bulldozed to make the road and parking lot. Regardless of where you leave the car, ten steps will have you walking on plants you would love to grow at home. There are brilliant blobs of *Castilleja*, two or three species of penstemons, no fewer than three species of *Eriogonum*, including the rare, tight rosettes of *E. siskiyouense. Anemone multifida* is here, along with *Allium siskiyouense, Fritillaria atropurpurea*, sedums, and more and more, until you are out of film.

The next day come back and continue on down the hill to the switch-back with a parking lot. From here make the climb to Mount Eddy. This is an all-day hike. Going up through the wet meadows there are masses of gentians, *Darlingtonia*, and *Dodecatheon*. It is interesting that at Deadfall Lakes there are not so many plants of interest, but as soon as the trail starts up the south side of the old crater this changes. Here is *Campanula scabrella* in the rock screes, found on this mountain at the southern limit of its range. At the top of this scree is a bewildering community of eriogonums, *Gentiana calycosa*, and some fine specimens of *Pinus balfouriana*, Near the summit of Mount Eddy is *Hulsea nana*, a lovely, short, golden daisy (see photo, p. 41). The eriogonums are mats with heads of flowers —white, pink to nearly red, and some yellowish ones—among other low plants and grasses on a stable scree area. The *Hulsea* grows in gravel with scarcely any other plants. The *Gentiana* grows in moist places and forms mounds up to 2' across covered with dozens of light blue trumpets.

After returning to the car continue down the Trinity River to Hwy. 3. Along the road there has been too

much mining on the river and too much logging on the hillsides, and not many undisturbed areas remain. At Hwy. 3, turn south to Coffee Creek and go up into the Trinity Alps Wilderness or turn north up to Scott Mountain Summit. In the northwest section of the summit is the rare endemic, *Phacelia dalesiana*. This wee phacelia with its white flowers and black anthers was discovered and named only about twenty years ago. In the wet meadows on each side of the campground are many nice plants, including *Calochortus nudus*, in shades of pink. From here the road drops down to Scott River and Scott Valley. There turn right and go to Kangaroo Lake, where there are many interesting plants, or continue on Hwy. 3 through the old mining towns of Callahan and Etna to the edge of Fort Jones. Here turn left and down the Scott River to the Klamath River. From Mount Eddy to the Klamath River you have driven over or around many different mountain ranges all of which are grouped under the Klamath Mountains.

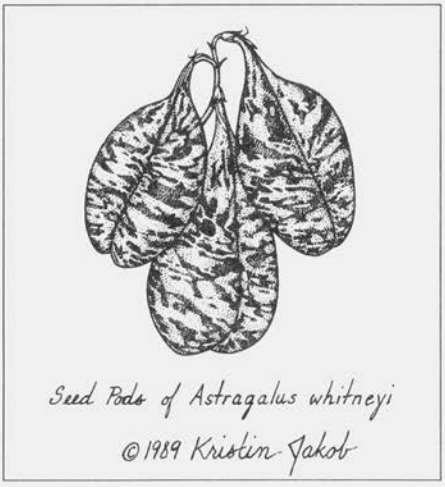


Oenothera xylocarpa

Then turn left to Seiad Valley. At the store at Seiad Valley is the last chance for supplies and gasoline before taking off to Cook and Green Pass in the middle of the Siskiyou Mountains. Just west of the store, cross a bridge and at once find the road up to Cook and Green. This road is paved for about five miles and goes straight ahead. There is a wide side road turning off to the right and crossing the creek—this you do not want. The road you want becomes a rather narrow mountain dirt road which most cars can make with no trouble. At this writing in July, 1989 there is logging of the burned area along the road, and for safety reasons the road is closed to cars Monday through Friday. But the logging should be over and the road open in 1990. Perhaps three-quarters of the way up is Horsetail Falls. The plants found here include the rare *Lilium wigginsii* in all its golden splendor.

Then on to the summit where three roads meet. The Pacific Crest Trail crosses Cook and Green Pass. In the area where you may park your

car, you may find tall *Lilium washingtonianum* plants with as many as 15 large trumpets. The trail east from the pass to Copper Butte leads up to one of the best stands of *Lewisia cotyledon* that I know. Here these plants grow by the thousands. About a quarter of a mile up, this trail comes out among rock outcrops



Seed Pods of Astragalus whitneyi
©1989 Kristin Jakob

splattered with lewisias ranging in flower color from white to nearly red. But look up the slope to the large open area ahead and then climb up. Here are lewisias so thick it is difficult not to step on plants. This hillside generally is at its best late in June but in July there will still be a few flowers. Before the plants are finished blooming, seed is ripe, and by growing a few plants from seed, you may keep your memories of a magnificent sight. On your way back down to the pass note the Brewer's weeping spruce, two kinds of dwarf oaks, the eriogonums, penstemons, and *Eriophyllum*, the odd *Dodecatheon, Calochortus, Fritillaria*, three species of sedums, the dwarf ferns, and *Lewisia leana*. I estimate there are over 500 species of noteworthy plants to be seen in and around the Cook and Green Pass area.

Once back at the car walk a quarter of a mile along the road toward Oregon to see even more species of desirable plants. The most noteworthy here is *Phlox adsurgens* displaying all its variability, with no two plants alike. Other good plants include more penstemons, *Linnaea borealis* in carpets, and a tiny *Rubus* that looks like a strawberry.

At the parking area there is a level trail to the northwest. Follow this to the spring with the best drinking water in all California. Unfortunately, this water may no loger be safe to drink. The only plant you will *not* find along this woodland trail is lewisia, but what a mass of exciting plants! Lilies, anemones, *Pyrola, Arnica, Vancouveria, Mahonia, Chimaphila, Phlox*, lupines, orchids, and then there are the dogwoods.

West of the pass the road very shortly turns into a poor four-wheel-drive trail that ends in about three miles at Lily Pad Lake on one side and Hello Canyon on the other. What wonderful plants can be found here and along the road! The road follows a ridge of serpentine for perhaps a mile and a half and then comes into an area of volcanic soils. Here in the good soil can be seen masses of *Lilium washingtonianum* var. *purpurascens* and *Xerophyllum tenax*. In rock outcrops here the lewisias are on the yellow side. A short ways on should be a big snow bank, and around any snow bank is *Erythronium grandiflorum* var. *pallidum*. At the end of the "good" road look down

into Hello Canyon and see what was once a road that now ends at a large limestone outcrop. There are seven genera of ferns here with four species of *Polystichum*. At the very end of the road in among the large rocks grow large mats of *Epilobium obcordatum* var. *siskiyouense* (in some books listed under *E. o.* var. *laxum*. See photo, p. 42) and *Veronica copelandii*. If these two plants are at their prime, it is well worth the long hike to see them.

Returning to the car, should you still have energy and time, follow the Pacific Crest Trail to the west. Along this trail was once a fine clump of *Cypripedium montanum*, the lady slipper orchid; but after I showed them to a group, the plants were dug, so now I tell no one where to see any of these orchids. There is a carpet of pipsissewa under the trees near the parking area. I have not even mentioned all the interesting conifers or the rare dwarf Sadler oak, but time keeps us moving to see more.

Back down to Seiad Valley and farther down the Klamath River to Happy Camp, turn north up over the Siskiyou Mountains to O'Brien, Oregon. Just over the summit are to be found the finest mats of *Phlox adsurgens* I have ever seen. There is so much to see plan on three hours for this short drive of about 30 miles. On arriving at Hwy. 199 at O'Brien, cross over and take the road alongside the store, which will become the Patrick's Creek Road back into California. When the paving ends start to slow down, as soon many interesting plants will appear. Along this 20- to 25-mile stretch of road each month from early spring until fall brings new combinations of good plants into bloom. By mid-June the *Erythronium, Trillium rivale, Phlox speciosa, Darlingtonia, Dicentra oregana*, and *Vancouveria chrysantha* have finished blooming, but there remain many beautiful species. Not less than three species of lilies can be found where the bridge crosses Whisky Creek. An odd lily of the *L. pardalinum* type (see photo, p. 44), as well as *Narthecium californicum*, which should be in full bloom in July, are both here. At the summit, which is also the state line, keep left as the right fork becomes nearly impassible. But first stop at the summit and spend some time as there are several good plants to be found in the serpentine scree areas. Here are *Lewisia oppositifolia, Epilobium rigidum, Erigeron*, and sedums. On down the road grows *Lilium bolanderi* in bright red. From time to time, one can also see a plant or two of *L. kelloggii* (see photo, p. 44). About three-quarters of the way down the main road turns left, but keep to the right for about half a mile. This is the Old Gasquet Toll Road. After crossing the bridge, go on to a small stream and stop at a large parking area, which is never used except by crazy plant people. A few paces up this stream look for *Lilium vollmeri*. From here the road becomes rather poor, so it is best to turn around, return to the left fork, and continue on down to Highway 199. About 10 or 15 miles down Hwy. 199 one comes to the first redwood forests.

Farther on is Hwy. 101, the Redwood Highway, and turns southwards towards home. South of Klamath River is Prairie Creek

Redwoods State Park. Here ask where to find Davison Road to see Fern Canyon. This is not much of a canyon, but what a sight to see! The 30' to 50' walls are covered with five-finger ferns. This is the typical subspecies of *Adiantum pedatum* and not the variety *aleuticum*. There is no place like this in all the rest of the world.

On south, in Eureka, is the Carson Mansion (closed to the public) just a short block or two off the highway on the north side of town. This Victorian house was built of redwood by the first redwood baron. One can not believe that wood can be used in so many ways—scrolls, rosettes, pillars, fans, arches, and any other wood form one can think of. On south the countryside becomes hot and dry and has very little for the rock gardener, and so on to San Francisco.

There are many other interesting places to see, but at other times of the year. Visit Death Valley in late March or early April. Go at the same time for the Joshua Tree or Anzo-Borrego parks. All the desert can be a carpet of color at this time of year if the rains have been good. The Mother Lode area, where gold was mined in 1849, is great in the spring, say from Grass Valley to Mariposa (be sure to go to Columbia, a town restored back to the gold days). From mid-May to about mid-June *Calochortus kennedyi* is in bloom in the Mount Pinos area where the color is in the wildest flame red (see photo, p. 39, cover painting). You will have to brave the heat of the San Joaquin Valley down Interstate Hwy. 5 to the small town of Gorman and there turn west through Frazier Park and on to Lake of the Woods. Beyond Lake of the Woods the road climbs up a side valley, and where the road forks, keep left up onto Mount Pinos and watch closely for spots of the bright red of *Calochortus kennedyi* and the white of *C. venustus* (see photo, p. 39). At the end of the pavement at the ski area there is a bad dirt road onto the top of the mountain where one can find natural rock gardens filled with many wonderful rock plants.

I have left out so many good places that some people will think there is something wrong with me, but most visitors will have less than a month's time, and exploring all the places mentioned here will keep them going for much longer. Yes, if you have years to play, there are still the Mt. Hamilton Range, the San Benito Range, the Warner Mountains, the High North Coast Ranges and on south to San Diego County, all filled with wonderful and intriguing plants.

Wayne Roderick began his horticultural career with his first plot of ground at age 5, progressing to operating his own nursery for 14 years, heading the University of California at Berkeley Botanic Gardens' California section for 16 years, and serving as director of Tilden Regional Parks Botanic Garden for 7 years, before retiring to a full-time career as ambassador of western petaloid monocots and dean of California horticulture.

Drawings by Al Stavos.
Map by D.D. Hall.

Lewisias of the Sierra Nevada

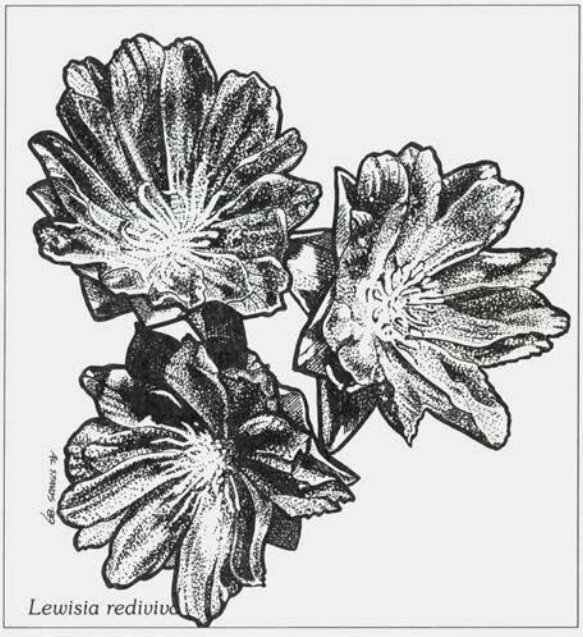
by B. LeRoy Davidson

The Elliott horticultural monograph of the genus *Lewisia* paid California and the Sierra Nevada a nice compliment in referring to Yosemite as "the home of the *Lewisia,*" since of the total of maybe 25 taxa in the genus no less than six are to be found within those boundaries and a seventh just outside. While this is a numerically accurate summary, it scarcely reflects well in view of the fact that not one of the seven is to be numbered among the great beauties of the clan, and some are of botanical interest only, though in mass array in the wild each has its own individuality and certain wan charm.

About a dozen taxa are to be found within the greater Sierran Floristic Province, which includes the foothills as well as the towering peaks of that great mountain chain lying eastward of the Central Valley Floristic Province, from Plumas County south to Kern County, or from Lassen Peak to where the Sierra peters out into the transverse Tehachapi Range—where Southern California is said to commence.

Included in the Sierran flora are lewisias of all the sections of the genus, as recently ranked by Mathew, except for Section Strophiolum (=*L. tweedyi*). Within Section Erocallis, its sole member, the little carpeting *L. triphylla*, occurs widely in spring-wet woodland as elsewhere in a variety of exposures and elevations, particularly in the snowbed habitat where it often behaves as a whey-plant, within a few brief weeks of its appearance gone for the season. A wee thing, whitish or faintly blush and pretty enough *en masse*, it is easily overlooked, being both precocious and diminutive.

The vast uptilted block of the Sierras is some 400 miles in length and from 50 to 80 miles in width, principally a granitic mass but with certain other materials such as basalt and serpentine, and the northern segment is over-burdened with a dark metamorphic mantle that frequently resembles pudding stone. During the five major periods of the Ice Age the major part of the Sierra was at one



Lewisia rediviva

time or another deeply buried, only the highest of its spires escaping as nunataks projecting out of the ice, thus preserving at least a portion of the plant life.

These valley glaciers were not so cold as their polar counterparts. Some were as enormous as that which gouged out Lake Chelan trench in Washington State to the north, well over a mile in depth. The largest Sierran glacier appears to have occupied the gorge of the present Tuolumne River, at least 60 miles in length. Precipitation throughout the West is dominated by the so-called Aleutian Low, with cyclonic storms spun off eastward from the Pacific. Most of the moisture comes in cooler months, and summers may be very parched, though both precipitation and temperature are most variable from place to place. Snow drifts may last most of the summer or all of it, and there are small valley glaciers remaining in many places as well. The weather gods are whimsically independent; within recent memory following on several drought years and consequent water rationing, over 12 wet inches of rain fell on one coastal point within a 32-hour period; on the mountains, snowfall was proportionately heavy.

The Section Rediviva is represented, of course, by the bitterroot, *L. rediviva* (see photo, p. 17), particularly in the smaller, depauperate phase that passes as var. *minor*, but apparently more a conditional than a genetic phase. This has much the look of the typical Montana bitterroot except for being paler, whitish or ivory to pinkish. In the Sierra it is a foothill dweller. By far smaller and most distinct in its far fewer petals and pair of enormously exaggerated, wing-like sepals cupping the exquisite whitish or lilac or mauve flowers is *L. disepala* (see photo, p. 18), seen on the granite screes in the vicinity of Yosemite Valley—but only by hikers who come early while the snow is still patched about on the slopes; it manages thus the effect somehow of a carpet of crocuses.

Sierran taxa of the Section

Pygmaea are about half a dozen, some obviously quite distinct, others not at all so. With Californian botanists it has been traditional to consider *L. pygmaea* and *L. nevadensis* as a pair of similar species, although outside the state, particularly to the north, they are not so easily separable. The former is supposedly marked by sepals rounded and glandular-serrulate, while in the other they tend to be more sharply acute and quite entire. Margaret Williams has noted, too, that blossoms of the latter are sub-regular or out-of-round, quite oval in outline. Dr. William Weber maintains that in western Colorado these two are recognizable both morphologically and ecologically, *L. pygmaea* in open, stony alpine meadowlands with *L.*


Lewisia cotyledon

nevadensis less frequent and lower, on the plateaulands. He feels, as did Rydberg, that the bitterroot is the only proper *Lewisia*, and refers other taxa to Howell's genus, *Oreobroma*, supposedly merged into the genus *Lewisia* as long ago as 1897!

Within the high cirques and adjacent nunatak plateaus of the Sierra the tundra supports the tiny, bright pink candy-striped *L. sierrae*, with sepals almost, if not quite, entire. Adjacent to this and particularly on the unglaciated plateaus, the variant called *L. pygmaea* var. *glandulosa* is equally a tiny one, with flowers rose-red, or veined or white, the purple-stalked glands on the sepals particularly noticeable. Similar developments in some other high places in lewisia-land have been described in the past and then submerged by later opinion.

Lewisia longipetala is said by its oblong pink petals and purple-stalked glands to be one of the most individual of the Section Pygmaea. This occurs in the north-central Sierra at considerable heights, often with two or three other members of this wet-loving aggregate of taxa, and they can then present some problems of identity. Stebbins, however, has maintained that regardless they all remain constant, with no interbreeding in his experience. Of the Sierran *Lewisia pygmaea* relatives, *L. kelloggii* is most individual, a compact plant with lanceolate or spatulate leaves at least as neat as the perfection of *L. brachycalyx*, which does occur in California but only to the south of the Sierra. The former is known also to Idaho in occasional disjunct colonies, and both are white, or, on occasion, pink.

And then, of course, there are the supposedly evergreen species of the Section Cotyledon. *Lewisia cotyledon* itself does not occur in the Sierra although it does come near as *L. cotyledon* var. *howellii* found between Shasta and Lassen in the

McCloud and Pitt River canyons. Within a high and remote basin in Fresno County in the central Sierra exists an oddly disjunct colony of the quill-built rosettes that typify *L. leana*, otherwise of the Klamath Floristic Province, its flowers reminiscent of those of the northern *L. columbiana*, appropriately named, as it comes from the Columbia River drainage almost exclusively. Rather nearby from a mapper's viewpoint Elliott's seventh species, *L. congdonii*, holds forth in infrequent but extensive colonies at high elevations adjacent to Yosemite. This has flowers very similar to the last, and is curiously deciduous by flowering time, the large fleshy leaves on distinct petioles going to a bright chamois yellow as they fail to function and collapse, the oddball in this otherwise evergreen company. Farther still to the north in the Sierra in a few remote canyons is found *L. cantelovii* and the similar *L. serrata*, both with flowers remarkably like those of *L. columbiana* and rosettes of plane foliage that are rather leathery and intricately cut and toothed to form plants of great attraction. In *L. serrata* the leaves are even toothier—teeth on teeth frequently.

Though brief, these notes might prove an aid to quick identification of any member of the genus *Lewisia* encountered within the Sierra Nevada. A hand glass will be a great aid to enjoying the intricacies and delicacies of them and to noting how nearly alike they are as members of their genus—quite aside from some obvious distinctions that separate them one from another.

Roy Davidson began gardening in the semi-arid Palouse prairie of the Snake River country of eastern Washington, moving to Seattle where his Bellevue garden now contains a famous collection of western native plants and aristocratic exotics. Roy has been a regular contributor to the ARGS bulletin for many years as well as a mainstay of penstemon and iris societies. He is completing a monograph on *Lewisia* for Timber Press.

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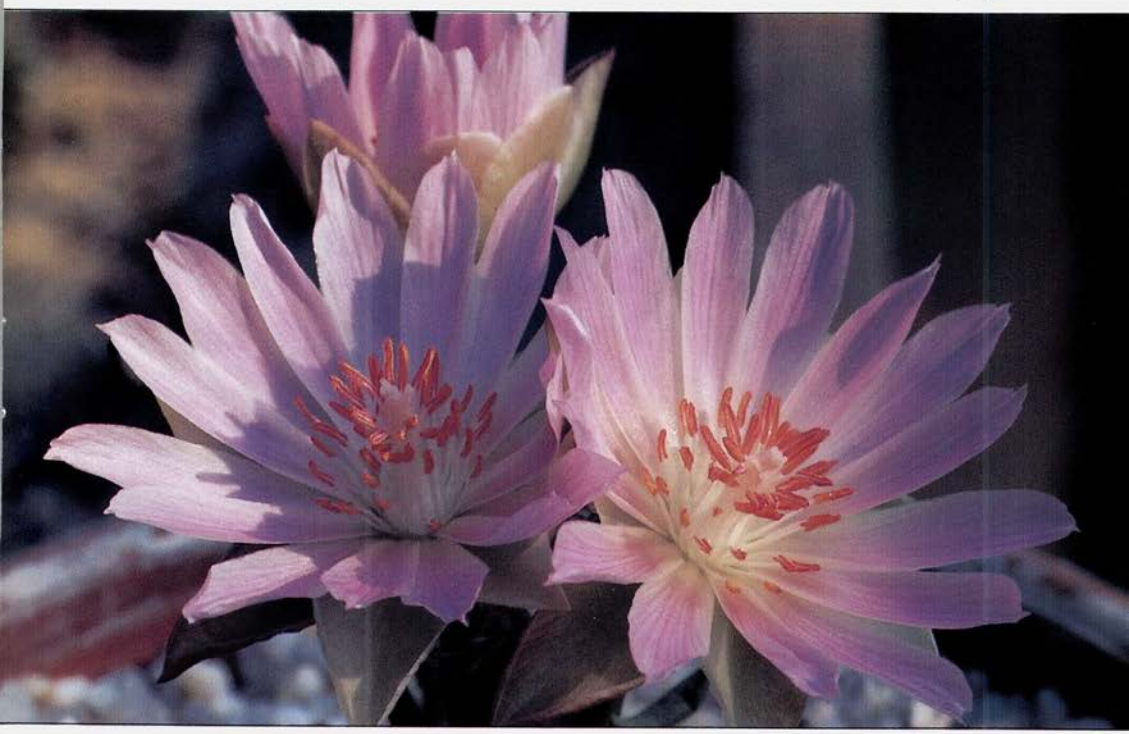
Lewisia cotyledon, in cultivation (see pp. 47, 48) Joel Spingarn

Lewisia rediviva (see pp. 14, 47) Joel Spingarn

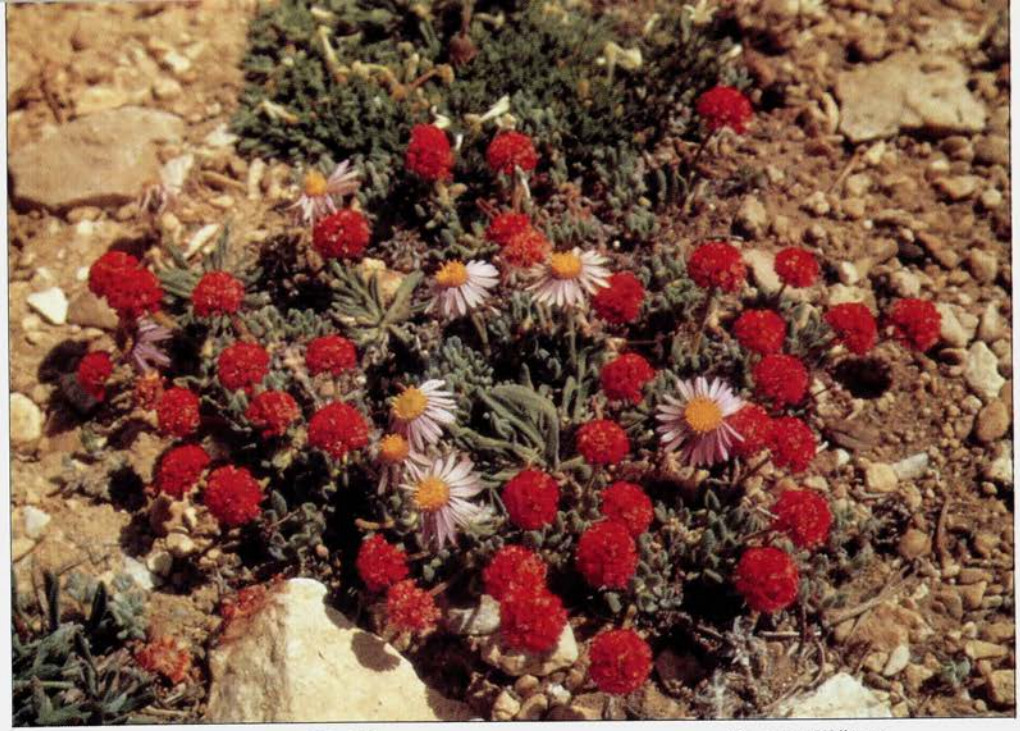


Lewisia stebbinsii (see p. 49) Sean Hogan

Lewisia disepala (see p. 14) Sean Hogan

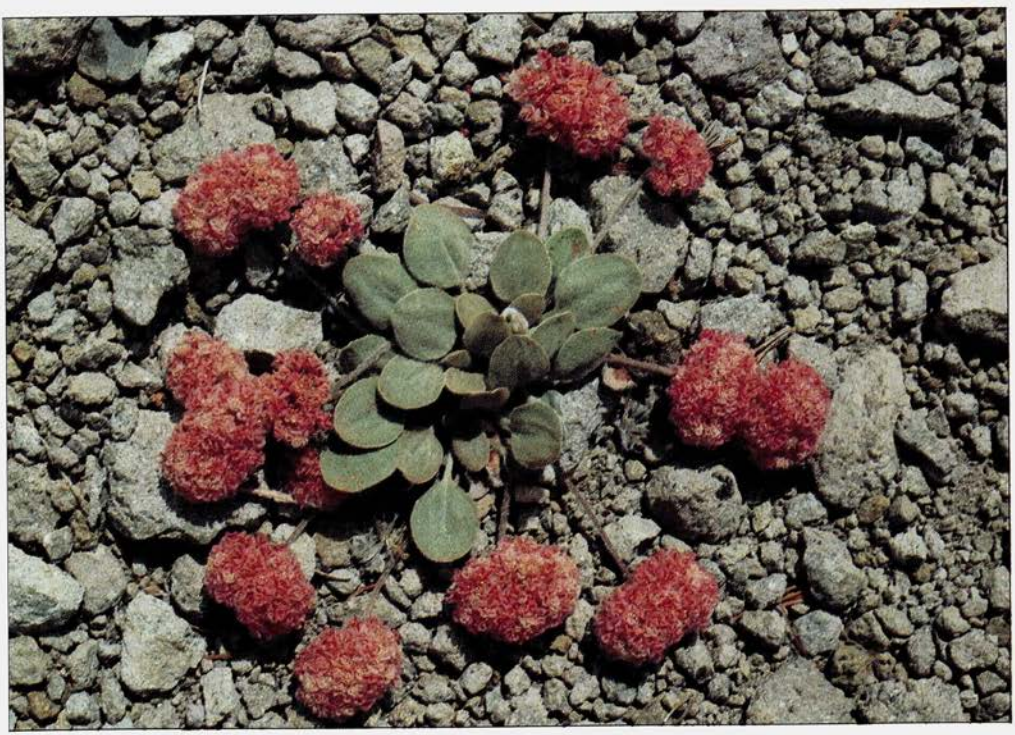
Eriogonum incanum (see p. 22) Wallace Wood

Eriogonum ovalifolium (see pp. 4, 22) Margaret Williams



Eriogonum gracilipes (see pp. 4, 22, 23) Margaret Williams

Eriogonum lobbii (see p. 23) Ted Kipping



Eriogonums to Grow and Treasure

by Margaret Williams

Eriogonums are plants for discriminating gardeners. If you can provide a sunny situation with sharp drainage, there is no reason they will not flourish for you and provide you with years of pleasure. Plants grown well are worthy of a place of honor in any garden.

For those of you who have not had the opportunity to look at plants in the dry areas of the West, or who do not have a "dry garden," the buckwheats (*Eriogonum*) may not be very exciting. But if woolly, silvery foliage, interesting texture, and subtle coloring appeal to you, buckwheats will be the ultimate. You will want to caress the foliage, feel the hardness of the cushions, and possess them for your own.

If you have only seen pot-grown plants, which bear no resemblance to the plants in the wild, then you must come and view eriogonums in their natural habitats. One good place to do this is in the Sierra Nevada, although in the West there are many other places, at varying elevations, where these plants grow superbly. Often they grow in rocky places, usually in full sun, and fully exposed to the wind. If you are able to see them in their natural settings, you will surely develop an appreciation of their sturdy but subtle beauty.

The genus *Eriogonum*, in the Polygonaceae, has nearly 250 species of annual or perennial herbs or subshrubs. Most of these grow in arid regions in the western United States. André Michaux, a French botanist who named *Eriogonum tomentosum*, the earliest species to be described (1803), took the name from *erion*, meaning wool, and *gonu*, meaning knee or joint. This buckwheat is a tall, leafy, herbaceous plant, which is hairy at the nodes (joints). It is found from South Carolina to Florida.

Buckwheats are also known commercially. The cushions of *E. thymoides* and *E. wrightii* have been harvested to make the pads on "Ming trees," which used to be very popular. Many of these were sent to Hawaii.

Bees gather nectar from buckwheat plants and make honey of excellent quality.

There are 115 species of *Eriogonum* in California and 74 in Nevada. In addition, there are many varieties. It would be impossible to discuss all of these, so this article is confined to a few dwarf, perennial species that are found in the Sierra Nevada. These are excellent rock garden plants that are coveted by many gardeners. For anyone who lives in a dry climate, growing them should pose very few problems.

Most people are acquainted with the sulfur buckwheat, *E. umbellatum* and its many varieties, because they are very showy and are so widely distributed along roadsides. There are some dwarf, prostrate varieties, but these grow large in the garden.

I am especially charmed by the less conspicuous, dwarf, cushion-type buckwheats. Most of these are quite hairy or even woolly. Many, such as *E. caespitosum*, *E. wrightii* var. *subscaposum*, and many varieties of *E. ovalifolium* are easy in the garden. Which plants do I covet the most? They are *E. gracilipes*, *E. rosense*, *E. incanum* (see photo, p. 19), and *E. lobbii*, ones that are difficult for me to grow, of course. Why the difficulty? Partly because rarely have I gotten seed, and then it did not germinate well.

The leaves of the buckwheats are one of their distinctive characteristics. Often the upper surface of the leaf is different from the underside; one side may be quite woolly, and the other may be smooth. Generally, the plants are quite silvery or gray. Of the ones mentioned above, *E. caespitosum* and *E. wrightii* have the smallest leaves. Usually they are quite narrow; those of *E. caespitosum* are silvery, while those of *E. wrightii* are grayish.

Eriogonum ovalifolium (see photo, p. 19) is misnamed, as its leaves generally are more round than oval. Many varieties of this species are most attractive. Some make cushions up to 2' across. Most impressive is *E. o.* var. *eximium*, which can form a mound up to 8" high when it is growing in a place where wind blows granitic sand. The gray, almost round leaves grow up through the sand, making the mound taller each year. It has large clusters of cream-colored flowers with a pink midrib, on stems up to 3" long. These flowers become buff-colored as they age. Seed is slow-ripening, and not all the seeds mature. At high elevations, the leaves are short-stemmed, and the flowers of var. *nivale* are almost stemless. On a mountain top, cushions of tightly clustered leaves dotted with tiny clusters of cream flowers that age red are entrancing. A pair of tweezers helps to pick seeds, but being there at the right time is most crucial and a matter of luck. Unfortunately, in the garden plants tend to be looser and the flower stems longer, but even so they are very attractive.

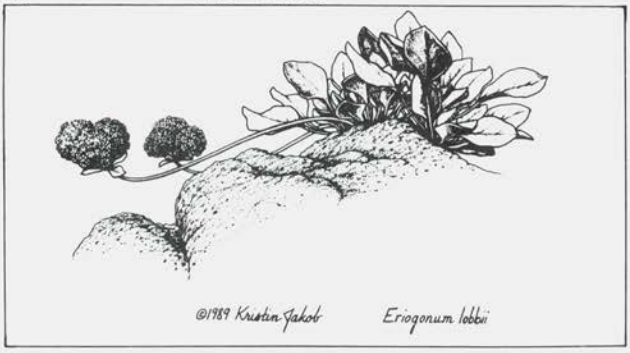
The flowers of *E. caespitosum*, *E. gracilipes* (see photo, p. 20), and *E. rosense* are in clusters borne on stems between 3" and 4" tall. The flowers of *E. gracilipes* are cream; those of the others are yellow. All of them age in varying shades of pink to dark red and even maroon. The leaves of the latter two are oval. *Eriogonum caespitosum* leaves form

larger, tight mats. The leaves of the other two form compact cushions, usually less than 8" across.

Eriogonum lobbii has larger leaves than any of the above (see photo, p. 20). They are ovate to almost round, up to 2" wide, and form a low cluster up to 16" in diameter. The cream-colored flowers are in large flattened heads nearly 2" in diameter, on stems up to 8" long. In late summer, as the seeds ripen, its flowers turn a captivating raspberry color. To me, this is the handsomest of them all.

Buckwheat flowers individually are small, the calyx is six-parted and petal-like. There are no petals. Usually many flowers are clustered at the end of a bare stem to make a small head, often ball-like. *Eriogonum wrightii* is one of the exceptions: small clusters of flowers are scattered along its stems. The perianths of these are variously white, ochroleucous, or yellow, often tinged or striped with pink, rose, or purple. As the flowers age, they often change to very deep, rich colors.

Most of these dwarf buckwheats bloom from May through August. The exception is *E. wrightii*, which begins to bloom in August. It takes at least a month and sometimes longer for the seed to ripen. Sometimes the flowers remain on the plants even after they have dried and the seeds are ripe. This gives a long season for the plants to be attractive. In severe climates, buckwheats will lose their leaves in winter. However, here in the Reno, Nevada area, for example, leaves usually remain on the plants over winter.



Rarely do we see young plants in the wild. Mature plants have such extensive root systems that it would be almost impossible to transplant them. For these reasons, and further ethical ones, collecting wild plants is not a reasonable means of obtaining these species. Sometimes cuttings placed in perlite in a mist bench will strike if taken early in the year. So far, seed propagation is the most practical and promising method for bringing these plants into the garden.

All my seeds are planted in late winter in a mixture of sandy soil, peat, and perlite (about equal proportions), with the addition of some bone meal and some trace elements. Each kind of seed is planted in a separate 4" plastic pot in early spring. The seeds are covered lightly with fine sand and/or pumice. The pots are placed outdoors and are watered as needed unless we have rain or one of our rare snows. During this time, it usually freezes at night, and daytime temperatures may be in the 60°F range. This alternate freezing and thawing satisfies any requirements the seeds may have for cold stratification. About the end of April, the pots are

moved to a heated greenhouse and are placed in a mist bench with a heating cable underneath them. When the seeds germinate, the pots are removed from the mist, but kept in the greenhouse until the weather moderates. Before I had access to a greenhouse, I followed the routine described above, except all of this had to be done outside. The germination was not as good as it is now. Seedlings grow slowly. I sometimes water them with a weak solution of Peter's. I usually do not transplant the seedlings until the following spring. However, if I am in a hurry, I transplant the seedlings the first summer, but put them under mist for a couple of weeks until they seem established. When I transplant the seedlings, I add some bone meal or slow-release fertilizer, Osmocote (14-14-14).

When the pots are taken out of the greenhouse, they are put in full sun and are watered with sprinklers every morning for 5 to 15 minutes, depending on the weather. By the middle of November, usually I am able to reduce the water considerably, but even in winter, care must be taken that pots do not dry out.

My chief problems are with poor germination and losing plants by transplanting too soon. You may wonder if I overwater, but with perfect drainage and almost zero humidity outdoors, there is no problem. Of course, there is more humidity in the greenhouse, but because it is heated, plants are watered daily there also.

Of course, obtaining seed is also a problem. Plants in the wild produce more abundant and better seed than those in pots. Many desirable plants grow near us, but to be there at the right time to find ripe seed is another hurdle to cross. Gathering the seed is a pleasant chore except on hot days!

Nothing is more disappointing to a buckwheat lover than to receive a packet containing only chaff from the Seed Exchange. This is not necessary, since it is easy enough for a seed collector to rub some of the collected seeds in the palm of one hand with finger tips from the other. If the seed is mature, the chaff will be easily loosened, and you will feel the sharp-pointed end of the seed. Blow off the chaff, and the three-angled seed, shaped like a little vase, will be revealed. Examine the seed to be sure there are no worm holes. If you have lots of seed, try placing it in a dish of water. Wormy seed will float. Discard it and dry the rest of the seed immediately. Store the seed in paper bags in a cool place.

Many eriogonums may be difficult for the casual observer to tell apart. However, with a good key, their differences are easy to sort out. James L. Reveal, University of Maryland, wrote an annotated key to the eriogonums of Nevada in *Great Basin Naturalist* Vol. 45:493-519, 1985. He is also revising the treatment of this genus in California for *The Jepson Manual: Vascular Plants of California,* which is due for publication in 1992.

Margaret Williams is an acknowledged authority on Great Basin botany and horticulture. She is the guiding spirit of the Northern Nevada Native Plant Society. She edits their newsletter and spearheads their seed exchange. To join or subscribe, write: NNNPS, PO Box 8965, Reno, NV 89507. Margaret gardens in Sparks, Nevada.

Calochortus: Why not try them?

by Boyd Kline

Why not grow *Calochortus* as well as tulips or daffodils? In dry country you won't have to worry about watering in the summer, as you would have to water other bulbs. The traditional bulbs only appear in the early spring but *Calochortus* bloom later, giving you marvelous color for months after other bulbs are gone. Here in Medford, Oregon, they start to bloom in late April or May and different species continue all the way to August. If you have a collection you will have bloom all summer long.

I grow *Calochortus* in the open ground of my garden, 150 miles inland from the Pacific Ocean. Here we have no summer rains, or at most scattered showers which pass quickly and never saturate the ground. I grow many species from seed. I leave the new seedlings in the seed pot for two summers.The pots of newly germinated seed are sunk to the rim in sand and are kept thoroughly shaded their first summer, so that they don't get completely baked. *Calochortus* send up only one thin leaf the first year. As the summer goes on the tiny plants keel over and go dormant and you think you've lost them. Don't worry. Just give the pots complete drainage, shade them well, and don't water them much. I water seedlings slightly all year so they don't dry out completely.

Calochortus don't like pots, so after the plants have gone dormant late in their second season I plant them out in the garden. Or right after the new leaves appear in March or April I line them out in a row in a seed bed. They remain there until they bloom. When the first flowers appear I place a marker next to each plant to mark the spot. After they go dormant I transplant them to their permanent position in the garden.

Perhaps the most common reason given for not growing *Calochortus* is the length of time from seed to flowering plant. For most species it takes five to seven years to reach blooming size. A few bloom in three years. In my experience few of these plants increase much vegetatively in cultiva-

tion. *Calochortus luteus* and *C. venustus* are the most vigorous in this respect, while most other species remain as solitary plants.

Fully mature plants do not require any shade. We have hot summers and we grow them in full sun. During the growing season *Calochortus* can take just about as much water as you can give them, but as soon as the flower buds begin to show color it is very important not to water any more. Let them dry out completely. I used to grow *Calochortus* in pure sand with good success, but then we had several summers with long periods of 100°F weather, and they seemed to suffer. Now I grow them in a mixture of sand and loam with a lot of red serpentine soil added. Serpentine is a metamorphic rock, very common in the coastal ranges of Oregon and California, which has a high concentration of magnesium and other metals. Many plants find serpentine quite toxic, but most all *Calochortus* love it..

I ensure perfect drainage by layering a mixture of 4" to 5" of soil mix over 6" of pure sand. The bulbs are usually planted about 3" deep in the soil. I like to mulch the bed with conifer needles to keep the soil somewhat cooler and retain a little moisture in the summer months. I have a lot of deodar cedar trees nearby, which shed a lot of needles.

Where do *Calochortus* grow in nature? Many species grow on serpentine ridges: Many species grow in grasslands or sagebrush, with few other flowering plants in evidence.

I grow about 30 kinds of *Calochortus*. Here are some of the species with which I have had success. Each one of them seems to have an internal clock that times a different period of bloom. .

Cat's Ears

In this group of species the inner surface of the petal is covered with a coat of fine hairs, and so they are commonly referred to as cat's ears. These species are relatively easy to grow, and would be good for beginners to try.

C. tolmiei is one of the first to bloom. The flower is usually pale lavender in color, although in different areas there are many different shades. On the coast it is a deep purple. This species is closely related to *C. coeruleus* (see photo, p. 39). In the mountains *C. coeruleus* is usually a pale lavender and very hairy. Both species grow in rocky areas among grasses. I have not had as much success with *C. coeruleus*.

C. elegans is a tiny species that grows at 6,000' to 7,000' in well-drained but heavy soil. The flowers vary from mountain top to mountain top. In the Siskiyou Mountains they tend to be pale lavender. In the Cascades I've found them in deep purple, the flower on 2" stems and the leaf 8" long.

C. monophyllus is called the little yellow cat's ear, and is one of the first to bloom. I have found populations where the plants were only 3" tall, but I have also found plants as tall as 8" or 9". This species usually occurs in shady places, under pine and fir trees. It is found in California as far north as Mt. Lassen. The soil of its native habitat is rather heavy, but drains well. This species blooms in Medford the second week in May.

C. subalpinus is a nice, high-alti-

tude species I've seen at McKenzie Pass outside of Bend, Oregon, at about 5,000'. It grows in forest duff and very loamy soils. It is rather low-blooming, reaching only 8" or so. The flower is a soft, creamy white with a few markings inside. This species is supposed to bloom in August, but I went over to collect seed in September this year and found it still in flower.

C. coxii is a very short species from 6" to 10" tall, sometimes called upright cat's ear. The blossom is a creamy white color with very beautiful purplish markings in the throat. A Mr. Cox from Canyonville first found it, and thought it an unusual form of *C. tolmiei,* blooming very late. The botanists he consulted at the university thought that it was unremarkable, but later it was studied and published as a new species by Frank Callahan, an Oregon seedsman.

Globe Tulips or Fairy Lanterns

This group of *Calochortus* is utterly different from cat's ears. There are only five taxa in this section. They have pendulous blooms that hang down like Chinese lanterns, while the other species have flowers held upright like tulips. The entire group blooms early in the *Calochortus* season, starting in May most years. I grow all of these in the open, and they all seem to like serpentine. This group does most of its growing in the wet winter season of the Mediterranean climate, and for that reason perhaps these species seem to be more difficult to grow in areas where winters are severe. Some may be cold tender, too.

C. amabilis is one of the so-called Chinese lanterns, with yellow, round balls of bloom. It is usually found on yellow clay soils in deep grass along the back roads of California. It can be anywhere from 8" to 14" tall.

C. amoenus is similar, but usually a creamy white, although there is also a red form.

C. albus is a pure white species distinguished by the shape of the gland.

C. pulchellus has much larger flowers, twice the size of *C. amabilis.* The blossoms are a beautiful greenish yellow rather than just yellow.

Other *Calochortus*

C. clavatus is a very late-blooming species, often flowering in August. It has upright, cup-shaped, deep yellow flowers with purple outer shading, and clavate, or club-shaped, hairs. Some have quite deep purple shading. I have never seen this species in the wild, but have grown it from seed.

C. bruneaunis (see photo, p. 38) superficially resembles *Calochortus nuttallii* from farther east, but it has a number of consistent, minor differences in structure, and a consistently different chromosome count.

C. eurycarpus is from Montana and Idaho south to Nevada. It grows 12" to 18" tall. Its native habitat is heavy soil in meadows. It usually has pointed petals and blossoms a pale, silver white with dark markings at the base of the petals. It's a rather late bloomer, lasting into late July.

C. greenei grows on the tops of the Siskiyou Mountains and on the other side of the Klamath Basin. It occurs over an area of about 20 square miles. The flowers are a beautiful, reddish-lavender or sometimes purple colo;, the plants are from 10" to 16" tall. It grows in a peculiar

black, adobe clay. The bulb can be 12" or more deep. I grow this species in ordinary soils. It has a wide leaf and is a rather late bloomer, especially in the wild, beginning to flower in mid-July.

C. gunnisonii grows and blooms nicely, but doesn't increase much. I've never seen it in the wild, but it grows well in cultivation if you let it dry out. My form is a greenish white, not particularly colorful. It blooms in July and August.

C. howellii grows at lower elevations than many other species, 1,300' to 2,000', in various heavy soils, usually yellowish-brown clays. The bulb is not very deep. In the areas where it grows the ground often cracks during the dry summers. The flower is silver white with a black center. It blooms in late June or early July in the garden.

C. kennedyi (see photo, p. 39) is regarded by many as the most beautiful mariposa tulip. It grows primarily in the desert areas of Arizona and southern California. I used to think that the bright yellow *C. k. var. munzii* grew in geographically distinct populations until I saw a large population where yellow flowers were mixed in with vermilion-orange ones. Until last year I assumed that *C. kennedyi* was quite tender, but a pot full of seedlings came through last winter's 5°F unscathed. This *Calochortus* blooms from late April to June, depending on altitude.

C. leichtlinii is another high altitude species from 8" to 12" tall. It grows at 5,000' to 6,000' on high plateaus from Modoc Co., California south to Lake Tahoe. It tends to grow in rocky meadows where the soil is a pumice sand that dries out quickly. In nature it blooms as late as August, and seed ripens only in September, but in the garden it blooms the second week of July. It responds to the same cultural treatment as the other species.

C. luteus is one of the elite species, an upright, golden yellow mariposa that grows a foot or so tall—however deep the grass is. I know it from the California ranges around Clear Lake. It is relatively early in the garden, blooming as soon as the first of June. In the wild it may bloom the first of May.

C. macrocarpus is the giant of the genus. It needs to be staked in the garden, since it has a huge flower that makes the long stem flop over. The beautiful lavender to purple flowers have a prominent green stripe down the center of the outside of each petal. Its very narrow sepals stand out straight from the base of the flower like a clown collar. It blooms in July.

C. nudus grows on flat sites where there's lots of moisture. In the high mountains it can be found in valleys, often near bogs. Its flowers are brilliant lavender on stems anywhere from 3" to 9" tall. It is completely hairless. This is found near Mt. Shasta south to El Dorado Co., California.

C. nuttallii I've never seen in the wild. It usually blooms a creamy white and has pointed petals. It is one of the most widespread species, occurring from California to Nebraska and from Canada practically to Mexico.

C. n. var. *aureus* is a form from southern Utah and northern Arizona, sometimes classed as a species in its

own right. It has flowers of a pure, deep golden yellow.

C. persistens (see photo, p. 39) is a rarity that only grows near Yreka. The flower is such a gorgeous pink. I have to admit that it looks better in the wild than it does in captivity. In the wild it is only 6" to 8" tall, but in the garden it can be a foot tall and the flowers are a paler pink. It usually blooms mid-July.

C. plummerae is a late-blooming species, comes in lavender, and is rather tall. It grows in the mountains of southern California.

C. tiburonensis I grew from seed and it bloomed one year. It hasn't bloomed in the four or five years since. I hope it will bloom this coming year. It is the only species that doesn't bloom every year for me. I think it may not like the cold winters of Medford, so I cover my beds now to protect this and other tender species. The small, yellow-green flowers have many fine hairs. It comes from the Tiburon Peninsula. It blooms in June.

C. umpquaensis is found near Roseburg. The Forest Service stated that it was a form of *C. howellii*, but *C. howellii* has upright seed pods, and this has pendant seed pods. The flower resembles *C. howellii*, but is much larger. The color is silver white with a very black center. Frank Callahan has found three locations now in addition to the original site, so the species is not nearly as rare as was once supposed. It is found on serpentine ridges on the east side of the coast range.

C. uniflorus grows at 1,500' altitude, and is very much like *C. nudus*, although the plant grows only 3" to 4" tall, the leaf to 8" long.

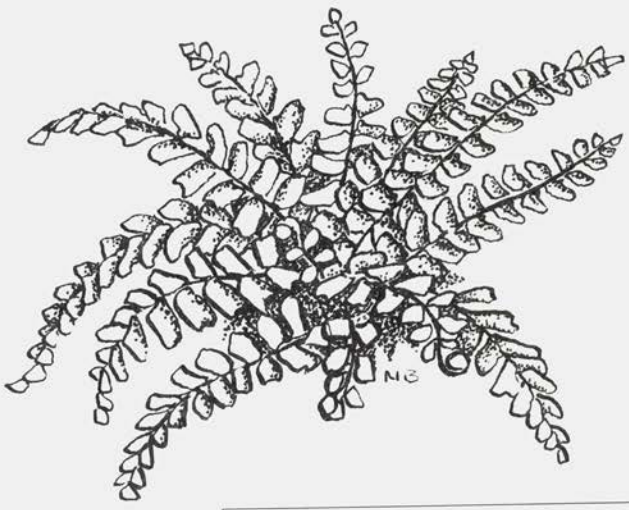
C. venustus (see photo, p. 39) blooms a week or two before *C. vestae*. It seems most common between 3,000' and 5000', growing in grassland. This is unquestionably the most variable mariposa. It has a tremendous variety of colors that attract everybody, especially the crushed-strawberry reds and the purple reds. There are yellowish forms and creamy whites as well, each flower with markings that differ tremendously. It grows in sandy soils in the Sierra Nevada and the coast range.

C. vestae (see photo, p. 38) is like a late-blooming *C. venustus*, resembling that species strongly, although the flowers are a more uniform white, with beautiful, deep reddish-purple markings . It begins to flower in June, but can start as late as July, and I've even seen it in bloom in August.

Growing lilies has long been my main horticultural hobby. I am also very interested in fritillaries, and from these two groups I have learned patience, and no longer mind waiting years for bloom. I have always admired the *Calochortus* and as I tried them over the years I have found that they are not so difficult as their reputation might have you think. I just kept trying them and found I could succeed. Perhaps you will, too. They are certainly a beautiful part of the western flora and very worthy plants to grow in the garden.

Boyd Kline was one of the original owners of Siskiyou Rare Plant Nursery. A *Calochortus* society has just been formed. For information, write, *Mariposa*, H.P. McDonald, Editor, 260 Alden Road., Hayward, CA 94541.

Asplenium trichomanes



Polypodium californicum

California Rock Ferns

by Margery Edgren

When hiking through the coastal areas, foothills, and mountain slopes of California, one encounters many small attractive ferns. They occur in an abundance of shapes, sizes, colors, and textures that make them a stimulating source of contemplation and pleasure. The backs of the fronds are particularly interesting and sometimes quite beautiful. The spore cases are formed in an endless variety of distinctive patterns in dark brown or black, standing out sharply against the smooth green of the fronds.

Pityrogramma triangularis has soft golden powder covering the reverse of the leaves, in delightful contrast to the dark green of the upper surface. This striking feature has earned it the common name of goldback fern. *Pityrogramma viscosa*, or silverback fern, sometimes considered just a form of *P. triangularis*, has sparkling white powder that is equally attractive. In nature, fronds of this genus curl up and die back during the dry summer season, but with water in the garden they remain green throughout the year. Another little fern, widespread from areas near the coast to the Sierras, grows in thick tufts, with new growth a rich green and fronds deeply cut in lacy patterns. Later, near the end of the dry summer, its color changes to gray green. This one has several common names, such as Indian's dream and Oregon cliff brake, and seems to have greatly puzzled taxonomists. Over the years they have assigned it to several different genera and changed the species epithet as well. At present, it is known as *Aspidotis densa*. Quite similar in appearance is *Aspidotis californica*. Indeed, they may easily be confused without close inspection of key characteristics involving distribution of the sporangia and the shape of the false indusium. Both species can be used for similar garden effects.

My first glimpse of *Cheilanthes gracillima* was with hikers near Cook and Green Pass in the Siskiyou Mountains. As we settled ourselves among the rocks for a picnic lunch,

we glanced up at the cliff above us and there, absolutely filling the crevices that crisscrossed the face, were masses of the little ferns, spilling out in sprays of soft green. The bead-like segments of their deeply dissected pinnules produce richly textured fronds, making the plant ideal for distinctive accents in the garden (as well as for this large display in nature).

One can see *Cryptogramma acrostichoides* while hiking at Squaw Valley, where it springs in clumps from pockets of soil between the rocks. The sterile fronds have crenate, rounded pinnules producing shapes resembling parsley, hence its common name of parsley fern. It has completely separate fronds for the production of spores, in pleasing contrast to its vegetative foliage, and is particularly appealing when these fronds are present.

Pellaea bridgesii is a small mountain fern of exposed cliffs and rocky slopes, occurring from 6,000' to 10,000' in the Sierra Nevada. It has handsome fronds with short, linear blades and broadly oval pinnae of gorgeous blue-green hue. Their smooth edges are curled under, forming false indusia that cover the spore cases. Tufted in habit and difficult in cultivation, it is a particularly choice fern for narrow crevices and a true gem for the rock garden.

The fronds of *Polypodium californicum* are relatively small in size and once pinnately divided with smooth edges. The resulting broadly scalloped outline provides a bold contrast for dainty shade plants. New growth is a bright green that darkens with age. It is most attractive in confined areas such as chinks or niches where the elongating rhizome is crowded to mass the fronds in clumps, or in a crevice, where it must run along a distinctive line. In the wild it is summer deciduous, but in the garden it can be encouraged to extend its growing season somewhat with occasional summer water. New fronds appear quite early in the fall.

Athyrium alpestre var. *americanum* (*A. distentifolium* var. *americanum*) has much the same upright, feathery fronds in delicate shades of light green as the more widely known lady fern, but its small size and less invasive nature make it a charming companion for many rock garden plants. Its lacy, oblong blades are often less than 12" long with a maximum range to about 23". It grows in moist habitats from 6,000' to 10,000' throughout the Sierra Nevada, frequently among granite rocks.

The range of *Asplenium trichomanes* barely dips into northern California at its southern limit along the coast. Reliably small and clumping in nature, this fern is perfect for an accent in a shady trough or terrarium, where it thrives in the moist atmosphere. Distinctive spore patterns on the backs of the fronds add to its overall appeal.

Dainty *Adiantum jordanii*, the California maidenhair, with its delicate, low-growing fronds, is another fine plant for the shade garden. Found in moist canyons at low altitudes, it is common in Marin County on shaded, rocky slopes or in open woods. Its gracefully arching leaves are similar to other taller maidenhairs but have shorter leafstalks, and its well-spaced, rounded pinnules give an

airy, casual appearance compared to the refined and elegant *A. pedatum* or the full, lush fronds of *A. capillus-veneris*. It is particularly useful on shady banks and walls. Summer deciduous in its native habitat, it has proved somewhat difficult in cultivation, but a worthwhile challenge to dedicated gardeners.

Surely these ferns would grace many a rock garden if only they were available to us. However, I have not described these desirable ferns to promptly imply they are unobtainable. You can grow them from spores yourself more easily than you may suppose. Watch for the spores in the ARGS seed exchange lists. They do appear occasionally, and as the demand increases, so will the supply. Spores are readily available at the proper time. Collectors need to be alert to the likelihood that gardeners are willing to grow them, and here is an easy method.

Forget about sterilizing pans and spores and media. At the local garden center, find some plastic saucers made to set under potted plants. Slip one into a Ziploc® bag, and you have an individual greenhouse to take your fern from spore to sporophyte. A 5" saucer and Ziploc® sandwich bag fit well together. Next, fill the saucer halfway to the rim with a mixture of 4 or 5 parts perlite to 1 part milled sphagnum. The moss is a finely chopped, dried product of fresh sphagnum sold in small bags and should not be confused with sphagnum peat products used everywhere for soil amendment. Moisten this mixture with a solution of hydroponic fertilizer specially formulated for raising plants in liquid solution without soil. Bare roots are bathed in such a solution without danger of burning, and it has proved equally safe for fern spore pans. Hydroponic fertilizer is not commonly available in garden centers, but several brands can be obtained through mail order catalogs. I use Chem Gro, NPK 10-8-22, sold by Hydro Gardens, Inc., PO Box 9707, Colorado Springs, CO 80932. Other equivalent solutions may also be available. Drain the sphagnum mixture on clean newspaper before filling the saucer. Press the medium firmly into the bottom so that it forms a smooth, tightly locked base on which to spread the layer of spores. It is essential to leave the medium damp but not wet. Excess moisture may be drained off as you press the medium into the saucer.

Again, forget about trying to sow powdery spores evenly. This is another mission impossible. Instead, put a heaping teaspoonful of very fine vermiculite into a small plastic cup and moisten with hydroponic fertilizer. Then add the fern spores and mix thoroughly. Next, spread the vermiculite evenly over the medium in the saucer and a good distribution of spores will result. Press firmly to make good contact with the medium below. The tiny spores will not be crushed.

Subdued, reliable light from fluorescent tubes is an excellent source of illumination for spore pans. Either place them around the edges of other plants that require more intense light, or keep them about 12" to18" away from the tubes. Sources of soft natural light can also be used.

The spores germinate in a few days to a couple of weeks, although

this can only be seen through a dissecting microscope or lens. They develop rapidly at around 70°F with continuous fluorescent light. (Combining a warm white with a cool white tube gives an excellent spectrum of light without investing in expensive plant growth tubes. Even cool white alone is reasonably good.) The single most important factor in producing

Pityrogramma triangularis

good healthy spore pans is moisture control. Using too much moisture is far worse than letting the pan become slightly dry. Overwhelming contamination with algae, fungi, and mosses results from keeping the pan too wet. To reduce moisture, it is far safer to open the bag frequently and wipe off the moisture condensed on the plastic than to leave the pan open to the air to dry off. How easy it is to forget and allow it to dry up completely! When necessary, a little more moisture can be added by gently misting the medium with a spray bottle.

Prothallia resembling little liverworts grow first. When mature, they produce gametes, and at this stage a thin film of water on the prothallia is necessary for fertilization to take place. A light misting of the pan should suffice. Tiny sporophytes start appearing on the prothallia after about two or three months, depending on growing conditions and species. They soon stick up above the mat of prothallia and will grow into the ferns you want for the garden. They may be pricked out while tiny or moved out in clumps later by those who prefer working with reasonably large plantlets that require less attention after transplanting. A mixture of sphagnum peat, vermiculite and some sand or pea gravel makes a good potting medium for the young sporophytes. Perlite may be added for species needing fast drainage. Continue to use the hydroponic nutrients or a dilute solution of liquid fertilizer. Continuous light will promote fast growth, and a plastic cover keeps humidity high without excessive misting. Open the cover occasionally or provide for some circulation of air.

Attractive young plants can be produced in twelve to eighteen months. Propagators wait longer than that for many choice alpines, especially for those that take three years to germinate! When the time comes to plant these young ferns in the garden, you can fill many niches, thus multiplying your chances of success many times over buying a single plant.

Margery Edgren specializes in growing alpines in pots. She has gardened in the Midwest and Northeast as well as in her current home, Woodside, California. She is noted for her skill in growing recalcitrant plants, using lights and refrigeration to bloom them on command. She is currently president of the Western Chapter of ARGS.

Drawings by Nancy Baron.

Plant Gems of the Golden State

by John Andrews

Among rock gardeners California is probably best known for its monocots, yet its flora contains many other very choice rock gardening subjects. These appeal to the beginner and experienced grower alike. Several included in this list will be familiar, while others may be new to most rock gardeners. Many of these plants are from the arid environment of the Great Basin, others from the highest mountain ranges of the state.

Starting with the genus *Astragalus*, there is one delightful species that extends along the eastern edge of California and on into the Great Basin. *Astragalus purshii* var. *tinctus* has a wide range, and within it there are many expressions of the plant, but the best you might encounter have short stems and form silvery-silken mounds. Near the base of these are borne large pink and violet flowers. The blossoms are then followed by silky pods like a rabbit's foot, with beaks as sharp as a rabbit's toenail. These plants inhabit rocky, semi-barren sagebrush plains and put on a brake-screeching display in April. Continuing this generic theme of silky, silver foliage and fuzzy pods, but with flowers as crimson as any *Zauschneria*, is *Astragalus coccineus* (see photo, p. 40) of the Inyo-White Mountains. I have not seen it anywhere in large numbers, and so it remains a cherished experience to stumble upon any individual of the scattered plants. Its habit of growing in low-rainfall, exposed, sunny positions on the edge of the Mohave Desert might suggest that this plant would be ungrowable in more hospitable climatic regimes, but try it in the bulb frame or planted out in a well-drained, sunny position late in the spring where it has protection from late frosts. Some plants actually grow very near desert springs, and the roots must go down to some moisture. They may tolerate considerably more water than nature offers them in their native habitat.

Few alpine campanulas can rival the extreme expressions of the genus in California. Usually on exposed

rocky slopes or fell fields from Mt. Eddy northward into the Cascades grows *Campanula scabrella*. It has canescent gray tuffets of leaves on the ends of buried stems that reach up through shifting rocks and form small mats in more stable situations. These mats are topped in season with gray-blue gems on minute stems. This is the perfect alpine if grown hard in full sun, but it becomes a little lankier in sheltered plantings. On the shady sides of cliffs and cracks in the Mt. Shasta area is another species, *Campanula shetleri*. Gray-blue bells sit on short stems over mounds of puberulent, green, dentate leaves often packed tightly into rock crevices. Some plants try to mimic dionysias by growing upside down under rock ledges. This is a plant for moister conditions. The best-looking, tight-foliaged individuals are on the edge of exposure to the sun, peeking out from under a ledge or around a rock, still in the shade but where they get a lot of indirect light.

Two potentially frustrating pan plants for the alpine house are *Dicentra uniflora* and *D. pauciflora*. These are plants that disappear in the summer when the rocky, gravelly, vernally wet areas where they grow become dry. *Dicentra uniflora* appears like a longhorn steer's head with long outer petal tips; the petals of *D. pauciflora* are shorter. Flowers are pinkish with darker outer petals. Leaves of *D. uniflora* are a little more substantial, and the dissections are rounded. *Dicentra pauciflora* grows in areas with slightly more humus and has the most beautiful pink or whitish flowers over extremely dissected, pointed foliage. It may be the easier of the two in cultivation, having a whitish cluster of tuberous roots that is easier to keep track of.

The California species of *Epilobium* are probably well known but deserve to be mentioned again. *Epilobium rigidum* and *E. obcordatum* var. *siskiyouense* (see photo, p. 42) both have glaucous foliage and large, soft- to bright-pink flowers, displayed beautifully in nature against the gray-blue, raw serpentine rocks of their native homes. *Epilobium obcordatum* prefers an alpine, exposed rocky field, while *E. rigidum* will occur at lower elevations in dry run-off channels. Good seed is difficult to get with the vagaries of the Californian dry season in which it blooms. Plants are easy to grow and look best planted around bases of rock. *Epilobium obcordatum* is difficult in pots, but small plants are possible. *Epilobium obcordatum* ssp. *obcordatum* wants to make mats, while *E. o.* ssp. *siskiyouense* is supposed to be more clumping. However, it also seems to run, though not as much.

The name *Hesperochiron* can occasionally be seen on seed lists, and yet this genus is little known. These flowers occur in large displays usually growing with *Viola beckwithii*, which association should have made them a little better known. These perennials of the Hydrophyllaceae, or waterleaf family, are summer dormant. A slightly larger plant than *H. pumilus*, *Hesperochiron californicus* has crystalline white to pinkish, more funnel-form flowers on rosettes of canescent leaves, and grows in slightly wetter, sandier situations. *Hesperochiron pumilus* is more a clay lover, with pink to purple

Trail to Winnemucca Lake

Ted Kipping

Primula suffrutescens (see pp. 5, 46)

Ted Kipping

Calochortus bruneaunis (see p. 27) Stan Farwig

Calochortus vestae (see p. 29) Boyd Kline

Calochortus coeruleus Stan Farwig
(see p. 26)

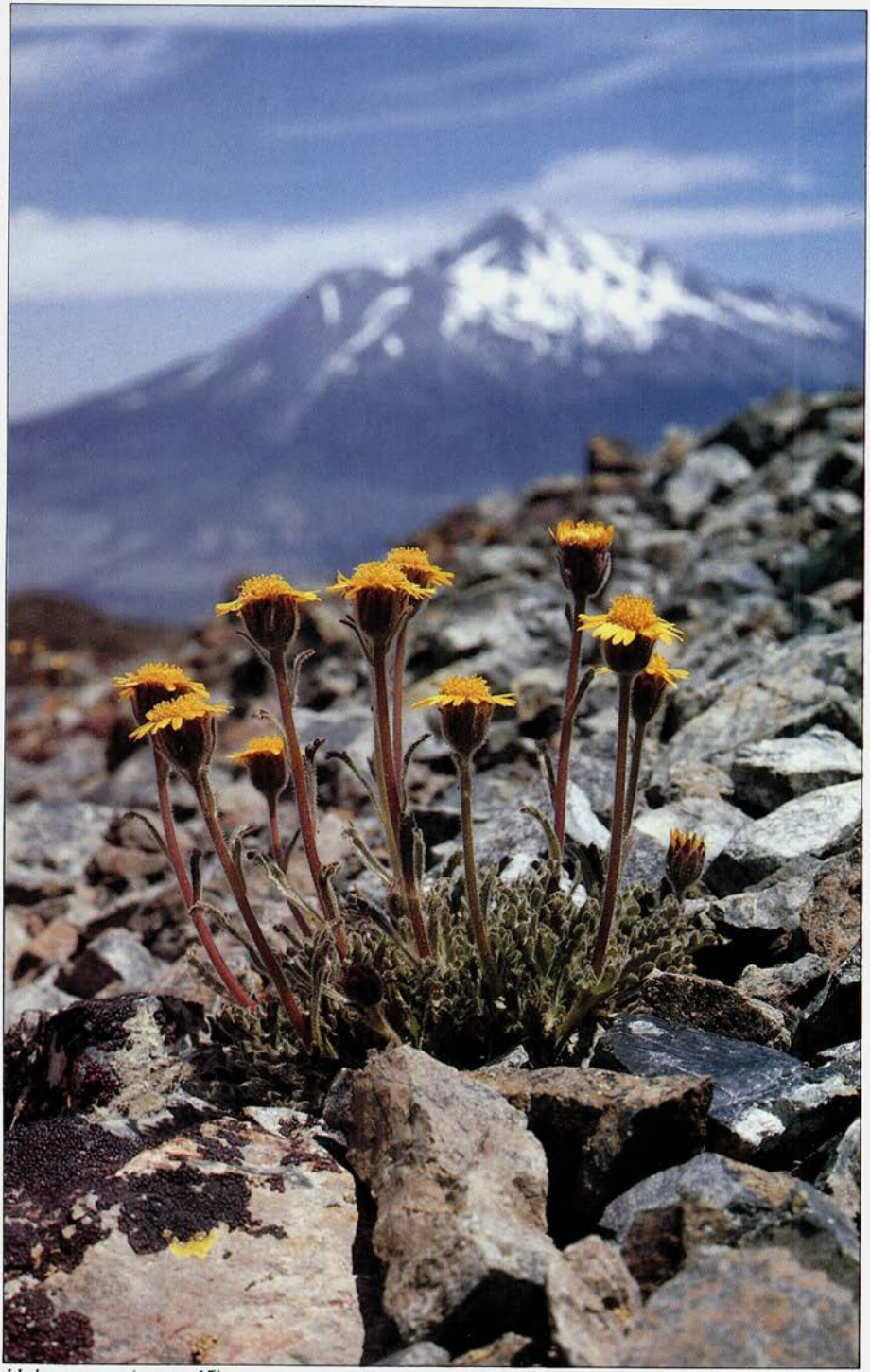
Calochortus kennedyi Stan Farwig
(see p. 28)

Calochortus persistens Boyd Kline
(see pp. 28, 29)

Calochortus venustus Stan Farwig
(see p. 29)

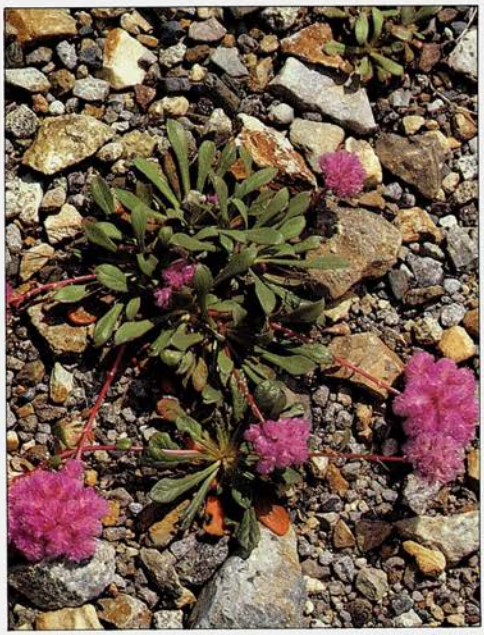
Astragalus coccineus (see p. 35) Boyd Kline

Silene hookeri var. *bolanderi* (see p. 46) Boyd Kline

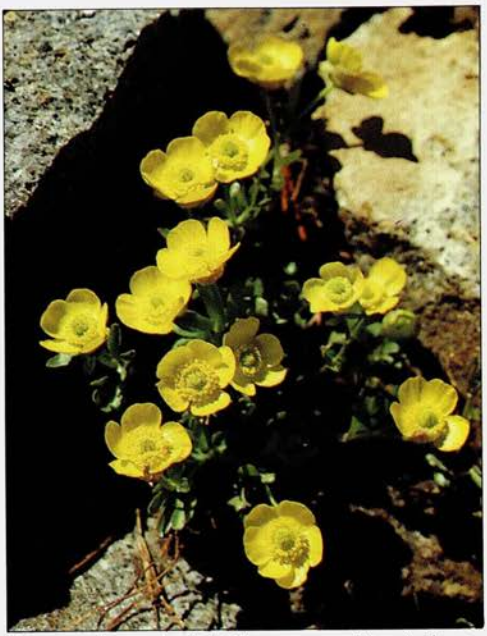


Hulsea nana (see p. 45)

John Andrews



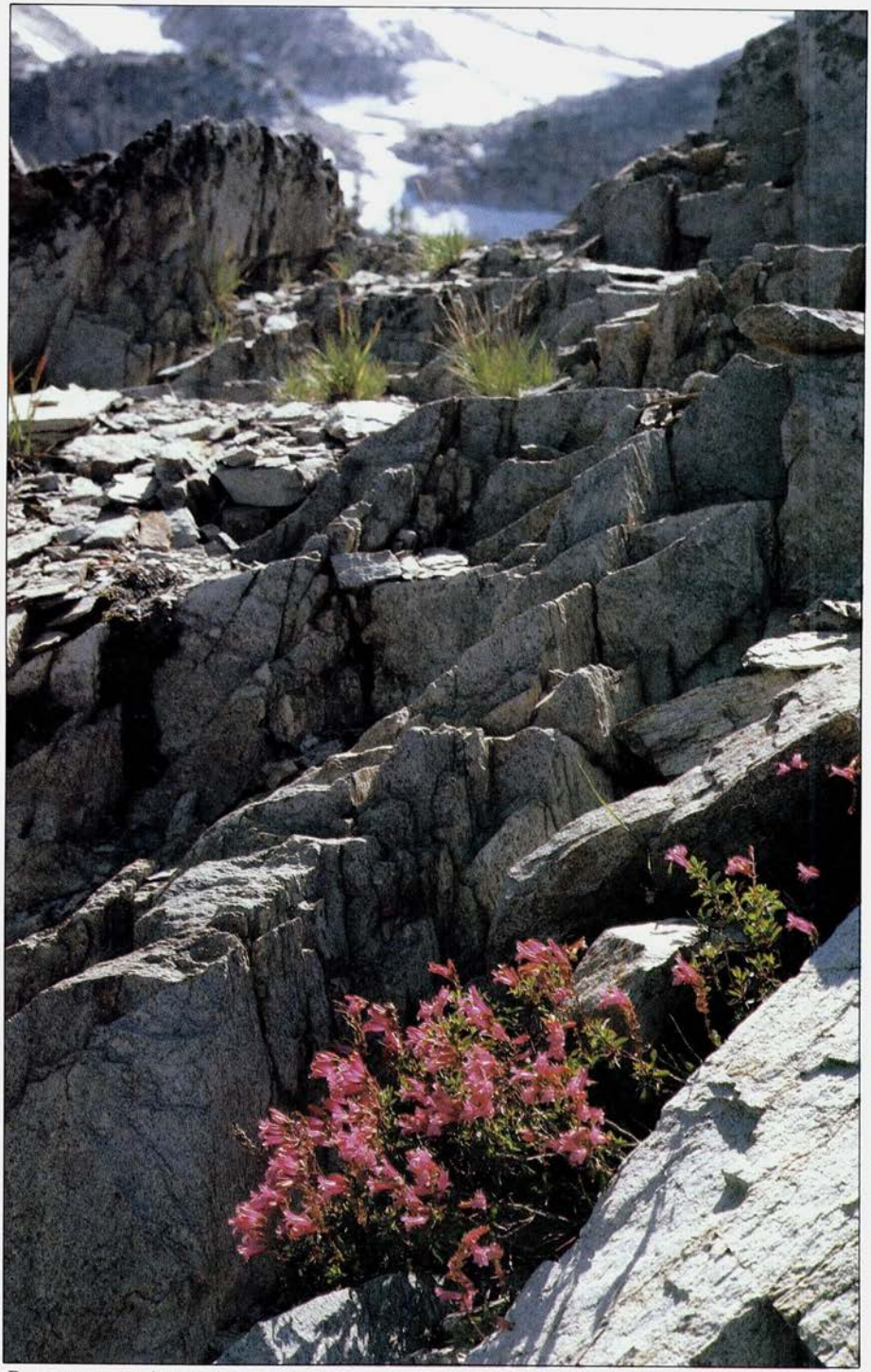
Spraguea umbellata John Andrews
(see p. 5)



Ranunculus eschscholtzii John Andrews
(see p. 45)

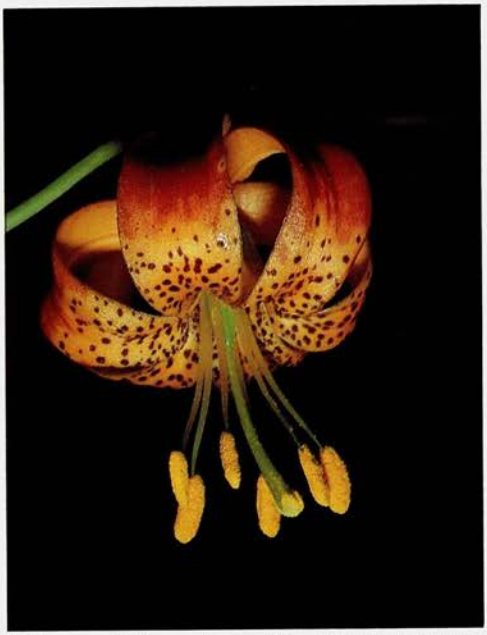
Penstemon speciosus
ssp. *kennedyi* (see p. 46) John Andrews

Epilobium obcordatum (see p. 36) Ted Kipping



Penstemon newberryi (see p. 43) Ted Kipping

Fritillaria lanceolata William Jennings



Lilium pardalinum (see p. 9) William Jennings

Lilium kelloggii (see p. 10) Boyd Kline

Fritillaria planiflora Boyd Kline

veins pencilling the flattened, cup-shaped flowers of the smaller plants. Both are inhabitants of the sagebrush plains and ridges, vernally very moist and always in full sun except for the favored shelter of an occasional *Artemisia*. These should be very good bulb frame items.

To come up with clumps of foliage covered with spider webs and topped with regal sunflowers that battle the ridgetop winds, take up the challenge of the genus *Hulsea*. *Hulsea nana* (see photo, p. 41) is the shortest at less than 6" high, like *Campanula scabrella* growing on Mt. Eddy and to the north. The rosettes are fantastic in themselves, being glandular and usually white woolly, and densely packed on the branching caudex. *Hulsea algida* is a slightly larger plant on screes from Mt. Rose and on north through the arid ranges on the east side of the Sierra Nevada into eastern Oregon and Idaho.

Ivesias are a little short of perfect alpines, usually with a few ferny, *Potentilla*-like leaves and small yellow flowers. Not so my recent find of *Ivesia lycopodioides*. This one makes clumps of finely dissected, glandular leaves no more than three inches tall, topped with an equally short stem of a few yellow flowers, these the largest of the genus. In appearance without flowers this plant could be a large clubmoss. It comes from the windswept ridges of the central Sierra Nevada.

Growing throughout much of the Sierra Nevada is *Lupinus breweri*, making mats of silken-foliaged, silver plants with heads of blue and white flowers. These bloom over a long period of time if given occasional water. Jim Archibald has said that if others have suggested that the West is continuously carpeted with *Phlox hoodii*, then he may claim that Mt. Rose is woven together by the mats of *Lupinus breweri*.

Growing in barren areas of the Sierra is the beautiful *Oenothera xylocarpa*. From its minutely pubescent, lyre-shaped, spotted leaves to its huge, soft yellow, vespid flowers that age to salmon, it is stunning. Another species, with finely dissected foliage and cup-shaped flowers, growing on vernally moist plains, is *O. tanacetifolia*. It can be found sometimes in communities with *Hesperochiron californicus*.

Usually growing close to *Polemonium pulcherrimum* you may find *Ranunculus eschscholtzii* var. *oxynotus* (see photo, p. 42), forming large clumps of foliage topped with bright, waxy yellow buttercups. The flowering follows the snow melt along the ridge tops. Green seed is the optimum means of propagating this plant.

California has some spectacular penstemons also. *Penstemon newberryi* ssp. *sonomensis* grows on a few rocky ridge tops in a few counties of the Coast Ranges, making mats of small, dark green leaves topped with stems of the most intense, dark red bloom punctuated with the fuzzy white dots of the anthers. These plants are usually in the more north-facing crevices. The typical *P. newberryi* (see photo, p. 43) is a more common shade of red and forms a taller clump up to several feet high. This comes from the northern and central Sierra. *Penstemon purpusii* grows on more exposed

serpentine ridges, with a prostrate rosette or two of leaves and many large blue and violet flowers. The leaves are an attractive feature in themselves, being slightly folded, pubescent, and glaucous. A species that I've never seen in flower, which must be stunning, is *P. tracyi* of the Trinity Alps area. It makes mounds of bright green leaves, leathery red on the reverse, topped with a large ball of small, long-tubed white or pinkish flowers. As a bonus it is also very floriferous. It sits upon hot volcanic rocks, in the crevices, usually with an eastern exposure to escape the worst of the summer heat. Finally, for masses of floral display, few penstemons could match *P. speciosus* and the form representing the extreme of its dwarf development, *P. s.* ssp. *kennedyi* (see photo, p. 42). This grows in a wide area of the West in barren or disturbed sites, such as road cuts. It has huge blue flowers.

Silene hookeri is a stunning plant usually of barren, rocky areas. It sends up stems from a buried crown, and these increase in number with age. These have grayish leaves topped with white, pink or violet flowers. The flowers approach a full inch in diameter in the subspecies *bolanderi* (see photo, p. 40). This subspecies grows in heavy, rocky serpentine clays and is usually the most dwarf in full sun.

California has only one primula, *Primula suffrutescens* (see photo, p. 37). It makes large mats of rooting stems with green leaves, dentate on the tips and topped with glandular stems bearing many glowing magenta pink flowers. These have an extremely exotic, far-eastern fragrance. The mats usually occur below peaks with north to northeast exposures along drainages. The smaller plants of the Trinity Alps actually grow in glacial melt water. The Sierran plants get melt water under the boulder rubble on which they grow. I've never been successful with this plant, but I still try, and rumors are that Ingwersen's of England grows fine plants.

Finally the violets. These are classic plants and should be tried whenever possible. *Viola beckwithii* from the sagebrush plains, growing in wet areas that dry out in the summer, has bluish lower petals with purple petals above, all over finely palmately dissected, glaucous foliage. This is from the eastern side of California. From the northwest corner of the state and on into Oregon is *Viola hallii*. I prefer *V. hallii* myself, with its lower petals in white or cream and the upper reddish-purple. The leaves have a few palmate dissections. Both plants can be quite sizable and floriferous in nature, inhabiting similar areas of rocky, vernally moist, summer-dry ridges and flats. These are a challenge for the most dedicated grower, requiring a period of summer dormancy during which they must not get wet and yet must not dry out completely.

This in no way summarizes all the worthy plants that might be encountered in California and brought into cultivation. Here I only suggest a few possibilities and offer them up as challenges to the alpine grower.

John Andrews specializes in choice alpines. He lives and gardens in Berkeley, California. In July he will sell some of these and other little known natives at the annual meeting in Lake Tahoe in July 1990.

Lewisias, Wild and Cultivated

by Sean Hogan

The first modern record of lewisia cultivation is of *Lewisia rediviva*. The plant was collected in Montana on the return trip of the Lewis and Clark 1804-1806 expedition. Several years later, a Philadelphia botanist by the name of Pursh removed the dried plant from the press as he prepared to describe it and noticed life remaining in the succulent root. A few days after it was planted, the rice-grain-like leaves appeared. The cultural requirements were not known, and it soon died. The brief reappearance of leaves resulted in the specific epithet *rediviva*., meaning coming back to life. Because Lewis was the first to collect specimens of the genus, it was named for him.

The beautiful rosettes of *Lewisia cotyledon* (see photo, p. 17) first appeared in cultivation from the remote regions of the Siskiyou country nearly a hundred years after this first collection of *L. rediviva*. Other species also made short appearances in pots, but it wasn't until the late 1920s that catalogs began to offer enough to make the most easily propagated species, and unfortunately also the most easily collected, relatively available in the US and Britain. The few species to be widely distributed became instant favorites among rock gardeners and succulent collectors.

Even now some of the choicest species are rare in cultivation. This is not due to just another of Murphy's laws that the most beautiful members of the genus are the most frustrating to grow. Successful cultivation of lewisias can be rather complex because of the great variation in climate and substrate of the natural habitats in which they grow, but with a basic feel for the native ecology and a few reliable horticultural techniques, any one of the species can be grown to perfection.

Little literature on cultivation of the genus appeared even after its horticultural popularization in the 1920s and 1930s. The catalogues from the early nurserymen and collectors in southwestern Oregon and

northern California offered some tips but were often vague. Most nurseries were in lewisia country, or close enough that they felt no need to explain their own conditions. More writing has come about recently, beginning with Roy Elliott's monograph in 1966. Works soon to come should clarify taxonomic problems of the genus, so I will concentrate here on a few observations concerning dos, don'ts and whys of lewisia culture.

Lewisias fall loosely into three groups: Cotyledon, Pygmaea and Rediviva, each named for a typical member of that section of the genus. All have in common their need for winter and spring moisture with immediate drying to facilitate summer dormancy. They vary, however, in the timing of dormancy, tolerance for exposure to drying wind and sun, and in their preferred soil type. Let's look first at the conditions under which these plants grow in nature.

The Cotyledon group is the largest and is confined to areas most affected by Pacific moisture. Although the need for summer drought can't be overlooked, the growth period can be extended to span most of the summer if temperatures are cool (below 25°C) and the plants are not allowed to become completely dry. *Lewisia columbiana* and its varieties *rupicola* and *wallowensis* are possibly the most adaptable to moister conditions, as they grow from the coastal mountains of British Columbia to Oregon, east to the Montana-Idaho divide. *Lewisia cotyledon,* of northwestern California and southwestern Oregon, is one of the parents of most horticultural crosses. Its varieties *fimbriata*, *howellii* and *purdyi* are the easiest to grow, while varieties *heckneri* and *cotyledon* itself are more susceptible to rot. They all grow on very rocky ridge tops that often catch the fog or on steep cliffs near flowing water. *Lewisia cotyledon* var. *heckneri*, among others, often grows in horizontal cracks in metamorphosed shale and folds its leaves out and down over its crown, shading the easily baked center and guiding water away with the help of upward pointing teeth. Even with these adaptations a single summer rain can kill the plants in the wild. *Lewisia leana* is another ridge-top plant often growing and hybridizing with *L. cotyledon*.

Lewisia cantelovii and the similar *L. serrata*, as well as *L. congdonii*, are Sierran foothills plants. They are most often found growing on steep north-facing cliffs dripping with water from October through April. *Lewisia congdonii* is the only deciduous member of the Cotyledon group. Until recently, many botanists assumed it was evergreen and were frustrated by their inability to find it during the summer months. It can hold its leaves most of the summer if given cool, moist conditions, but never does so in nature. As with most of its kin, a fine line exists between the well pampered plant and the compost pile.

Lewisia tweedyi, from central Washington to extreme southern British Columbia, has long been considered the most temperamental species of the genus. The first instinct of growers, when the plant seems to be in trouble, is to decrease the water. A closer look at the conditions of central Washington dictates different

treatment. Although summers are dry, the various soils derived from sandstone, granite, basalt, or volcanic ash are deep and well drained, but with moisture often just under the surface. The plants' crowns usually face downhill, avoiding sitting water, but the constant availability of some moisture ensures healthy roots on these fast-growing, naturally short-lived beauties. Damp but not saturated conditions in winter are preferred, with as little fluctuation in soil moisture as possible. Early dry spells will send the plants into premature dormancy, promoting the chance of rot with subsequent moisture.

The Pygmaea section occupies the high country, often growing above timberline. Frozen below a deep layer of snow for up to ten months a year, they are the true alpines of the genus. *Lewisia pygmaea* is the most widespread of all lewisias, extending from the McKinley Range in southern Alaska to northern Mexico. The entire Pygmaea group is summer-deciduous and summer-dormant and inhabits areas that are vernally wet. Plants such as *L. kelloggii, L. triphylla, L. sierrae, L. pygmaea* and its varieties,and to a lesser extent *L. nevadensis* and *L. stebbinsii* (see photo, p. 18), often emerge from snow banks on the downhill side and sit in running water for most of their growth period. At the highest elevations this might not be until the end of August when frost has already begun. Lower, the plants might emerge as early as April or May and become dormant at spring's end, remaining so until moisture returns in the fall. Careful attention should be given to the timing of dormancy in cultivation. Plants from different areas in the wild, even plants of the same species, can begin dormancy weeks apart.

Lewisia oppositifolia is a low-elevation exception to this group of alpine plants, growing in the Illinois Valley just north of the California-Oregon border. It grows as low as 300 m in eroded serpentine. It emerges about the beginning of November, after the first rains and cool weather. *Lewisia brachycalyx*, although a high-elevation plant from the Southwest, will also emerge in the late fall and grow through the entire winter whenever the temperature is above freezing. Watering can generally begin early in the fall, with the first green shoot being the "go" sign.

The final group consists of *L. rediviva* and two obscure plants that are barely known. *Lewisia rediviva* (see photo, p. 17) inhabits a vast area from southern British Columbia to southern California and east to the Rockies, and it is variable in flower color and form. The plants in the rain shadow of the Sierra Nevada and Cascades exist in areas that may receive less than 15 cm of precipitation annually. In contrast, some of the higher California serpentine substrate populations, are soaked by more than 100 cm. All are adapted to areas where the first frost, or the first diurnal temperatures averaging below 10° C, coincide with the first rains. Even in habitat, hot weather after the beginning of cool season growth can rot the plants.

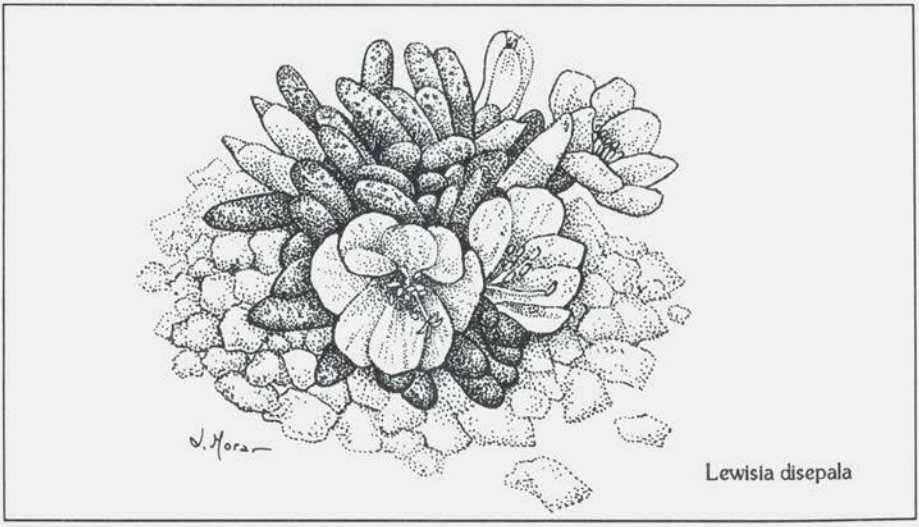
The other two members of the group, *L. disepala* and *L. maguirei,*

also adhere to a similar regime. They are montane and adapted to thundershowers. *Lewisia maguirei* is a limestone endemic of central Nevada. It looks much like *L. rediviva* but has up to three flowers per stem, as opposed to one. It hangs on to gently sloping scree at 1,950 m to 2,400 m. *Lewisia disepala* (see photo, p. 18) turns the tops of several granitic domes in the southern Sierra Nevada pink in April and May as the snow recedes. At one low-elevation site at about 1,200 m, these little jewels are the first of the spring flowers in early March. They blossom happily, sitting soaked with water in shallow pans in the granite. By May this colony must be found by feeling for the dormant crowns under the fine gravel. In cultivation they can remain nearly evergreen. As they are shallow rooted, they should be in shade when they're allowed to go dry, to avoid loss of soil humidity.

Pot culture is not something from the 1960s but rather a way many people must grow their plants. There are as many philosophies on how to grow in containers as there are people who grow. Lewisias, like so many other tricky plants, respond to certain methods of treatment that at first might seem complicated but are actually rather simple. Each revelation results from the loss of many plants, and with each new disaster even the most hard-won theories of cultivation are subject to change.

Constant fall to spring moisture is essential for proper growth, as all lewisias are cool-season growers. Moisture might be given beginning mid-winter for members of the Pygmaea group that are frozen under snow in nature, and therefore remain dry most of the cold season, as well as for other species that grow in areas twhere temperatures drop below -14°C regularly. Most species of lewisias prefer to be wet almost the entire season of active growth. Although succulent they need not dry out between waterings. As the warmth of late spring induces them into dormancy, the water must be turned off for all but the most vigorous members of the Cotyledon group. The soil should dry but should not bake. Adequate soil humidity can be maintained by keeping direct sun off the pots and giving the general area an ever-so-slight splash of moisture every few days.

Cool temperatures combined with bright light are perfect for lewisias but something few growers can achieve in cultivation. Plants grown with too much shade will lose compactness and red tones in the leaves. Flowering will be reduced as well. On the Pacific slope, where winter sun is never strong, lewisias benefit from full exposure between the fall and spring equinoces, and prefer a cover of 40% shade during the summer months. As most species are not growing by then, even more shade won't hurt. In the open rock garden, where the mass of the soil keeps temperature and moisture levels more constant than can be achieved in a pot, even the more sun-sensitive plants such as *L. cantelovii* can take a lot of light. Placement on an open, north exposure or on the north side of a rock is best. For most lewisias, too much water during the winter growth period is scarcely possible. Any combination of ample moisture, too much



Lewisia disepala

shade, and too heavy feeding can produce either the robust, overly plump plants that some term cabbages, or leggy, spindly plants. These are both easily rotted because of bloated leaves and stems. The ensuing dormancy is often fatal. Especially in summer heat, full sun can overheat the center of the rosette. If any moisture is present, the plant becomes more susceptible to the invasion of soil-borne fungi. In general, lack of water simply reduces the size of the leaves and slows the growth. Only in spring can drought cause the loss of the season's flowers or seriously damage the plant..

Soil mix and potting are always subjects for friendly argument. It is important to provide a situation where excess water is drained away, but some moisture is held. Lewisias do need good drainage, but every time they dry when they shouldn't, the roots die back. Then the plants have to be brought back out of dormancy, expending energy on new roots, and setting back growth. The second principle is the use of nearly all mineral soil to the exclusion of all but 10% to 15% well-rotted organics. Most commercial organic mixes use raw wood products that are often dyed to appear rotted. These might be fine for begonias, but the toxins released by fungi and other factors are often more than lewisias can handle. Any root dieback is a perfect place for rot to enter. The best potting mixes for lewisias consist of about 40% coarse grit, such as 1/4" crushed stone, pumice, or expanded shale; 25% builder's sand; 25% lava fines or decomposed granite; and the rest a well-rotted compost. The soil should be very gritty on the surface, becoming denser toward the bottom of the pot. The addition of some clay aggregates or a couple of crystals of soil polymer can help with moisture retention. The object is to have the constant moisture necessary for vigorous growth but yet to keep it away from the plant's crown. Narrow deep

pots are preferred, as they drain more rapidly than shallow, wide pots but retain necessary moisture near the bottom, remaining cooler. Several light, cool-season feedings are also beneficial.

Finally, when a flourishing assortment of these plants once thought so difficult to grow has been achieved, the instinct to share with a friend will hopefully come. Better yet, increasing the number of these plants in cultivation will lead to a reduction of pressure on wild populations. Cuttings are easy once the plants are large enough. Most members of the Cotyledon group form offsets, and these can be removed and rooted easily. Spring is the most logical time for this propagation technique, as the warmer soil induces quick root formation, and lower humidity allows both surfaces of the cut to dry quickly. A little sulfur or fungicide is good insurance against rot. Root cuttings can work, too, especially with the Rediviva group. By severing a large root near the caudex and lifting the cut end above the soil, new rosettes will often form in time at the cut end.

For plants that remain as single rosettes, seed is the obvious solution. A cold stratification of at least 30 days is preferred, but seeds in nature can germinate their first autumn. Storage in the refrigerator will lengthen the viability of lewisia seed. Seeds sown in the fall have the longest growth period and therefore the best success. The seed should be placed on the soil surface with a light covering, and the soil should then be soaked and chilled. My method involves putting the flat of freshly sown seed on the roof of the car outside on chilly November evenings and allowing the soil to freeze. This does have a few dangers, such as forgetting the seed when leaving for work the next morning! Any cold area outside will do. If the car is in a garage or no November frost occurs in your area, lewisias sprout very well in the refrigerator at a couple of degrees above freezing. Because no one really knows if the light in that refrigerator really does stay on, it is best to remove the seed within a week or so of germination to a cool, light spot. With most species it is possible to have flowering plants in one season with a little pampering. Even growing from seed can be a tricky method of propagation in some species of the Pygmaea group, such as *L. kelloggii*. Germination is sparse and may take two or three seasons.

Lewisias have had a fairly short history of cultivation, and there is a lot to learn. They might not become the next supermarket primroses, but they'll be seen in a lot more nurseries and gardens in the future.

Sean Hogan is curator of the New World Desert, the African, and the Australian sections of the University of California-Berkeley Botanic Garden in Strawberry Canyon. He has done extensive field studies of *Lewisia*

Pacific Coast Iris

by Lewis and Adele Lawyer

Nature lovers who like to explore the wilderness areas of the three Pacific Coast states are familiar with the little wild irises that dot the landscape so beautifully in the spring. Officially known as the series *Californicae*, but more commonly referred to as the Pacific Coast Iris (PCI), the Pacific Coast natives (PCN), or the Pacificas, they are being increasingly used as landscape and rock garden subjects.

All types of iris have been a mainstay of artists throughout the ages. Their tripartite flowers were often depicted on silk by Chinese and Japanese artists, and they were the basis of the *fleur-de-lis* used widely in design and heraldry. We think the dainty Pacifica iris lend themselves particularly well to decorative use, both in the garden and in art forms, much more so than the stately, tall bearded types.

In the wild these species are distributed along the coast and in the Coast Ranges from the southern part of western Washington to near Santa Barbara in California, and as far inland as the western slopes of the Cascades in Oregon and Washington and the Sierra Nevada of California. An isolated population of one subspecies is scattered through the San Bernardino Range in Southern California.

David Douglas is given credit for first discovering the Pacific Coast iris, *Iris douglasiana*, named for him rather than by him. Several years later, in 1825, he also discovered *I. tenax*, which he brought back to English gardens and described. Of course, native Americans had known of the existence of these plants for hundreds of years before Douglas "discovered" them. In fact, it was because these peoples were using the tough fibers of the iris leaves for netting that Douglas chose his specific epithet from the Latin, *tenax*, meaning cohesive or tough.

Iris tenax is the only species of these iris native to Washington. It also occurs in Oregon, and there is a subspecies in Del Norte County, Cali-

fornia. Because this plant is deciduous and grows poorly in warmer areas, it has not been used to any great extent as a parent in hybrids. In the colder areas where it is well-adapted, however, its well-proportioned flowers and wide range of color make it a very desirable garden plant, and it is being used in special breeding projects to introduce frost resistance.

Three species have been used extensively in breeding for garden adaptation: *Iris douglasiana, I. innominata*, and *I. munzii. Iris bracteata* has been used to a lesser extent, especially by Dr. Lee Lenz at the Rancho Santa Ana Botanic Garden in California, and *I. fernaldii* has been incorporated into some of the Ghio lines.

Of the *Californicae* species, *I. douglasiana* has the widest range geographically, its native populations extending for almost 700 miles along the coast from Coos County, Oregon, to Santa Barbara County in California. It has, on the other hand, a very narrow territory ecologically, always growing within the influence of, if not within sight of, the Pacific Ocean. Despite its narrow ecological confines, however, *I. douglasiana* is one of the most widely adaptable of all the species and is somewhere in the background of nearly every named introduction. As a species or a garden hybrid, it is a strong grower and in its native habitat covers large areas with its thickly matted clumps.

Iris innominata was discovered by Mrs. John R. Leach of Portland in 1928 and was described by L. F. Henderson two years later. The flowers of this species are principally yellow to yellow-orange, but both violet and orchid flowers occur occasionally in Oregon, and its color is exclusively violet to purple in its California range. Many of the *I. innominata* plants found in nature are so beautiful that efforts by breeders to improve them are an exercise in redundancy. Nevertheless, the species has been widely used in hybridizing by Marjorie Brummitt and others in England and by most of the hybridiz-

ers in the United States. *Iris innominata*, like *I. douglasiana,* forms clumps, but these are compact and discrete, in balance with their narrow, grass-like foliage and dainty proportions and distinctly less aggressive than *I. douglasiana.*

Iris munzii was known and collected as early as the late 1800s, but it was not until 1938 that R. C. Foster described it as a species. It is known only from the Sierra foothills in Tulare County, California, where it is associated with oaks, woodland plants, and especially with poison oak, *Rhus (Toxicodendron) diversiloba*. In nature it is the tallest and largest-flowered of the series. Flower color ranges from a near-white, pale blue-violet to a darker violet, often with a bright blue streak down the midrib of the falls, which, in contrast to the violet background, appears turquoise in color. The overall effect of this pattern is striking. While many faults accompany *I. munzii* as a parent, its claim to fame lies in this pure blue streak, which is being exploited by hybridizers to enhance flower color. To this end it has been widely used in breeding, especially by Dr. Lenz , and to a lesser extent by other hybridizers, including the late Thornton Abell of Santa Monica and Joe Ghio of Santa Cruz. Our own hybridizing program, a search for "true blue," is almost exclusively *munzii*-derived.

Others of the eleven species and five subspecies enumerated in the Lenz publication, *A Revision of the Pacific Coast Iris,* have not been widely hybridized. They are lovely to look at and admire in the wild but, because they seem unwilling to adapt to cultivation, have not proven to be desirable parents for garden subjects. As a matter of fact, even the most docile of the species are not easily grown in environments differing greatly from their native habitat. When we look at the entire series *Californicae,* however, we find a great range of ecological adaptability, from *Iris douglasiana* on the salt-sprayed cliffs along the Pacific Ocean to *Iris hartwegii* at 6,800' elevation in the Sierras; from *Iris tenax* in the snow and cold of Washington to *Iris munzii* just above the orange groves of Porterville; and from both *Iris innominata* and *Iris douglasiana* on the western slopes of the coast mountains of Oregon and California, with rainfall in the 100"-per-year category, to *Iris macrosiphon* in Tehama County, California in areas with 20" or less of precipitation.

With the possibilities of this adaptability in mind, the Society for Pacific Coast Native Iris (SPCNI) is sponsoring a comprehensive breeding project involving interspecific hybrids to obtain frost tolerance, heat tolerance, or whatever tolerance is necessary to allow these beauties to grow and thrive in areas outside the three western coast states. Seed of selected species and hybrids has been sent to breeders in the continental United States, Hawaii, Canada, England, and France. It is hoped that through an exchange of germ plasm we can develop a more universally adapted plant.

Each of the five most widely used species has contributed its part to our modern garden clones. *Iris innominata* has given us its petite plant size and its nicely shaped, sometimes

ruffled flowers on 6" to 12" stems. *Iris douglasiana*, in addition to its sturdy and aggressive plant growth, has helped upgrade the single-flower stalks of *I. innominata* by imparting its ability to produce three flowers per spathe, and it has also transmitted its ability to produce branching flower stalks. *Iris munzii* has added to this its genetic capacity to produce four flowers per spathe; in fact, one of our *munzii-douglasiana* hybrids has produced 18 flowers on a single stalk. We are also crossing our *munzii*-derived selections with *Iris innominata* selections to attain a more petite plant size. The 36" flower stalks we have measured on some of the *munzii* hybrids might look quite out of place in any but the very largest rock garden. The other two species, *Iris bracteata* and *I. fernaldii,* have contributed mostly to the genetic diversity of flower color.

Although the influence of the pure species is obvious, few of our present-day hybridizers are using them in their current breeding. In fact, of the 84 named clones registered and introduced during the past three years, none of the parental crosses involves a pure species. One of the 84, however, is a collected wild clone of *I. tenax*.

Hybridizing for garden type Pacificas was started in England by William R. Dykes (pre-1923) and Amos Perry (1923-1938). All of their introductions were interspecific crosses, mostly involving *Iris douglasiana* and *I. innominata*. The first hybridizer of record in the United States was Fred DeForest of Oregon, who, starting in 1939, registered and named five selected clones of *Iris douglasiana,* five of *Iris macrosiphon,* and three crosses involving his *Iris douglasiana* clones. During this same period, Carl Starker of Oregon registered and named three clones of *Iris douglasiana*, all of which were collected. The most famous of these, 'Agnes James', was actually collected by someone else and was introduced by Starker's nursery.

We have not been able to find any precise dates, but it was about this time that the famous "PCI seed exchange" took place. Sparked by the enthusiasm of Sydney B. Mitchell of Berkeley, California, seed from the Fred DeForest *I. douglasiana* lines, combined with the legendary "quart of seed" from the collection of Mathew Riddle of Portland, Oregon, landed on the doorstep of Sydney Mitchell. Mitchell, who was at that time chairman of the American Iris Society Species Group, added seed from other sources, including his own plantings, and sent it to potential breeders worldwide. Among the recipients were Jean Stevens of New

Zealand and Fred Danks of Australia. Eventually, through further seed exchange, this germ plasm was introduced into every PCN breeding project of note, including those of Marjorie Brummitt of England, Don Hargraves of Australia, all the southern California breeders noted in the following paragraph, and even such modern-day breeders as Joe Ghio.

The golden years of the Southern California hybridizers started in 1940 with Eric Nies, Marion Walker, Lee Lenz, Richard Luhrsen, George Stambach, August Phillips, and Jack McCaskill playing prominent roles. For almost thirty years these breeders dominated the US introductions, most of which traced back in some way to *Iris douglasiana*, the species that seemed to be most amenable in their climate. During this period there were, of course, other hybridizers, such as H. S. Fothergill and Marjorie Brummitt of England, who were contributing to the growing list of named cultivars. The thing that these early breeders had in common was that, since there was little hybrid material from which to choose, they were all dependent on pure species in their crosses.

In 1970, Joe Ghio of Santa Cruz started his long series of introductions. A year later he was joined by Bob Hubley of Riverside and Roy Davidson and Jean Witt of Seattle. Of these four, only Roy Davidson and Jean Witt relied to any extent on pure species. Joe Ghio, of course, started with species seed from re-selected Mitchell lines, added some lines he personally selected in the mountains above Santa Cruz, and later used pollen collected from *Iris munzii* in

the Sierra Nevada. On the whole, however, Ghio and the multitude of hybridizers of modern PCI introductions rely almost entirely on named cultivars, already tailored by themselves or others. We use the word "tailored" instead of "improved" because each hybridizer has his own goals and ideals, and each may be quite different from the others. Like it or not, there is little incentive for today's hybridizers to go back to the species when most of the hard work of combining several desirable characteristics into one plant has already been done. A cultivar without the undesirable traits of its ancestors can easily be found by modern breeders.

Similarly, gardeners who live in an area where Pacificas are relatively easy to grow usually depend upon named cultivars obtained by mail-order from one or more of the nurseries specializing in this group. This is, of course, the only alternative for anyone who wants to grow a specific hybrid. For those who want to know whether this group of iris would thrive in their garden, however, seed is the cheapest and most dependable way to start.

Flowers of the modern, named

garden clones are so varied in shape, texture, size, color, and pattern that they defy description. Petals can be as narrow as a half inch, or so wide that you can't see between them. They can be ruffled or tailored, and variously marked or beautifully patterned with lines or signals, or they can be a solid hue with no markings at all. All colors except fire-engine red and all shades from near-black to white have been developed. Bloom-stalk height ranges from 6" to 36", and growth habits vary from sparse to a thickly matted clump within two or three years from planting. Leaves can be grass-like and as narrow as one-eighth inch or sword-like and up to 1" in width. For this reason, while plants from seed of a given species of PCI may be very similar or even identical, seedlings from open-pollinated garden cultivars will give you all the combinations of color, shape, size, and pattern that you could desire. In fact, no two will be alike, and you will have an instant mixed garden from which to choose a few favorites. Or you may leave it untouched.

Seed of both species and garden clones is available through the Seed Distribution Chairman of the SPCNI. Seed of garden clones is also available from some of the breeders. If planted in the fall, many or most seedlings will bloom by the second spring, one-and-a-half years after planting. For those interested in hybridizing, therefore, no garden flower excels the iris as a subject. In contrast to most perennials, for example, daffodils, where you must wait seven years for first bloom, a PCI cross made in the spring will bloom the second year. The only difficulty is deciding to discard any of the recombinations that result.

Seeds are usually planted in cans or pots in a mixture of garden soil and peat moss. After planting, they should be kept moist at all times and will emerge in about two months. If kept growing actively, they can be transplanted into the garden when 4" to 6" tall with little or no loss. If you plan to choose or select plants, they can be planted 6" apart in rows 1' apart. As garden subjects, they should be 12" to 18" apart. As clones get older, transplanting becomes more difficult. When moved, these iris must be actively growing and have new, white roots, which usually appear in the fall and early spring. They must be kept moist and planted as soon as possible after they are dug.

Pacific Coast native iris grow best in a well-drained, slightly acid soil, pH around 6.5. We incorporate Canadian peat in our soil before planting, but a good organic compost would also be suitable. Summer watering may pose a problem since in their native habitat most species receive little summer rainfall. Given these minimum conditions, however, Pacifica iris make ideal rock garden subjects, since they are ideally proportioned for display against rocky and low-growing foliar backdrops. As landscape subjects, you can find a flower color to harmonize with almost any surroundings and a plant size to fit any space. They prefer speckled shade or morning sun and, once established, naturalize as clumps requiring a minimum of care.

Color Photos of Iris

Specific information on the native iris pictured is given below. From this you can get an idea of the range of plant sizes and types available or being developed.

Photo on Page 61

'Sierra Dell', introduced by the Lawyers in 1988, has four to nine flowers per 25" stalk and leaves up to 1/2" in width. A three-year-old clump, 18" across, produced 171 blooms on 28 bloom stalks.

Photos on Page 62

'Ami Royale', introduced by Luhrsen in 1957, has one or two flowers per 8" stalk and grass-like leaves 1/4" in width. A four-year-old clump 8" across produced 49 flowers on its 34 flower stalks.

'Banbury Gem', introduced by Brummitt in 1972, has two flowers per 12" stalk. It produces a loose clump, but is quite floriferous.

'Native State', introduced by Ghio in 1980, has two to three flowers per 8" to 10" stalk.

'Small Town', introduced by Ghio in 1987, has one or two flowers per 8" to 12" stalk. A three-year-old clump, 10" across, produced 36 flowers on 23 stalks. Leaves are 1/4" wide by 10" long.

'Wildman', introduced by Ghio in 1988, has two flowers per 10" stalk and leaves 1/3" wide by 13" long. As a two-year-old clump, 6" across, it produced eight flowers on four stalks.

XP108A is a cross between two Lawyer *munzii*-derived hybrids. As a two-year-old clump it produced 24 flowers on six 23" bloom stalks. It is being used for hybridizing because of its flower type, but will not be introduced because of an undesirable growth habit.

Photos on Page 63

'Brancaforte', introduced by Ghio in 1971, has two flowers per 10" to 14" stalk.

Iris innominata, from China Flat. We have no data on this specific plant, but from other clones of the same species, you would expect it to have one or rarely two flowers per 7" to 10" stalk, to make a clump about 8" across, and to have up to 40 bloom stalks by the fourth year.

Adele and Lewis Lawyer currently edit the quarterly *Almanac of the Pacific Coast Iris Section of the American Iris Society*. They are coordinating an international scheme to increase the horticultural range of Pacificas by facilitating exchange of germ plasm of plants growing in diverse habitats and extreme climates. They live and garden in Oakland, California.

Drawings.by Carolly Hauksdottir, p. 54; Lewis Lawyer, p. 56; Al Stavos; p.57.

Suppliers of Pacific Coast Iris

There are sources of potted plants at nurseries, through botanic gardens, and, in the West, through native plant societies. The major suppliers of mail-order plants are listed below:

Aitkens Salmon Creek Garden, 608 NW 119th Street, Vancouver, WA 98685. Catalog $1.00. Lists mostly Ghio varieties and color-indexed selected seedlings.

Bay View Gardens, 1201 Bay Street, Santa Cruz, CA 95060.
Catalog $1.00. Owned by Joe Ghio who has introduced and named more Pacifica cultivars than any other breeder. His catalog lists all of his recent introductions plus one or two from other sources. Seed and selected unnamed seedlings are also available.

Cooper's Garden, 212 W. Country Road C, Roseville, MN 55113.
Catalog 25¢ stamp. *Iris tenax* and related seedlings.

Deming Iris Garden, 4122 Deming Road, Everson, WA 98247.
Catalog $1.00. PCN seedlings listed.

Genotypes Unlimited, 418-A Cayuga Street, Salinas, CA 93901.
Lists Ghio and other introductions plus genotypes suitable for breeding. Seed also available. List on request.

Laurie's Garden, 41886 McKenzie Highway, Springfield, OR 97478.
Catalog, 25¢ stamp. Species, seedlings, and seed suitable for colder climates.

Longview Iris Gardens, 12407 Fremont Street, Yucaipa, CA 92399.
Catalog on request; lists named cultivars available in gallon cans which can be picked up at the nursery. This is the only listing of the Lenz *I. munzii* introductions we could find.

Maxim's Greenwood Gardens, 2157 Sonoma Street, Redding, CA 96001.
List on request. Many PCI cultivars.

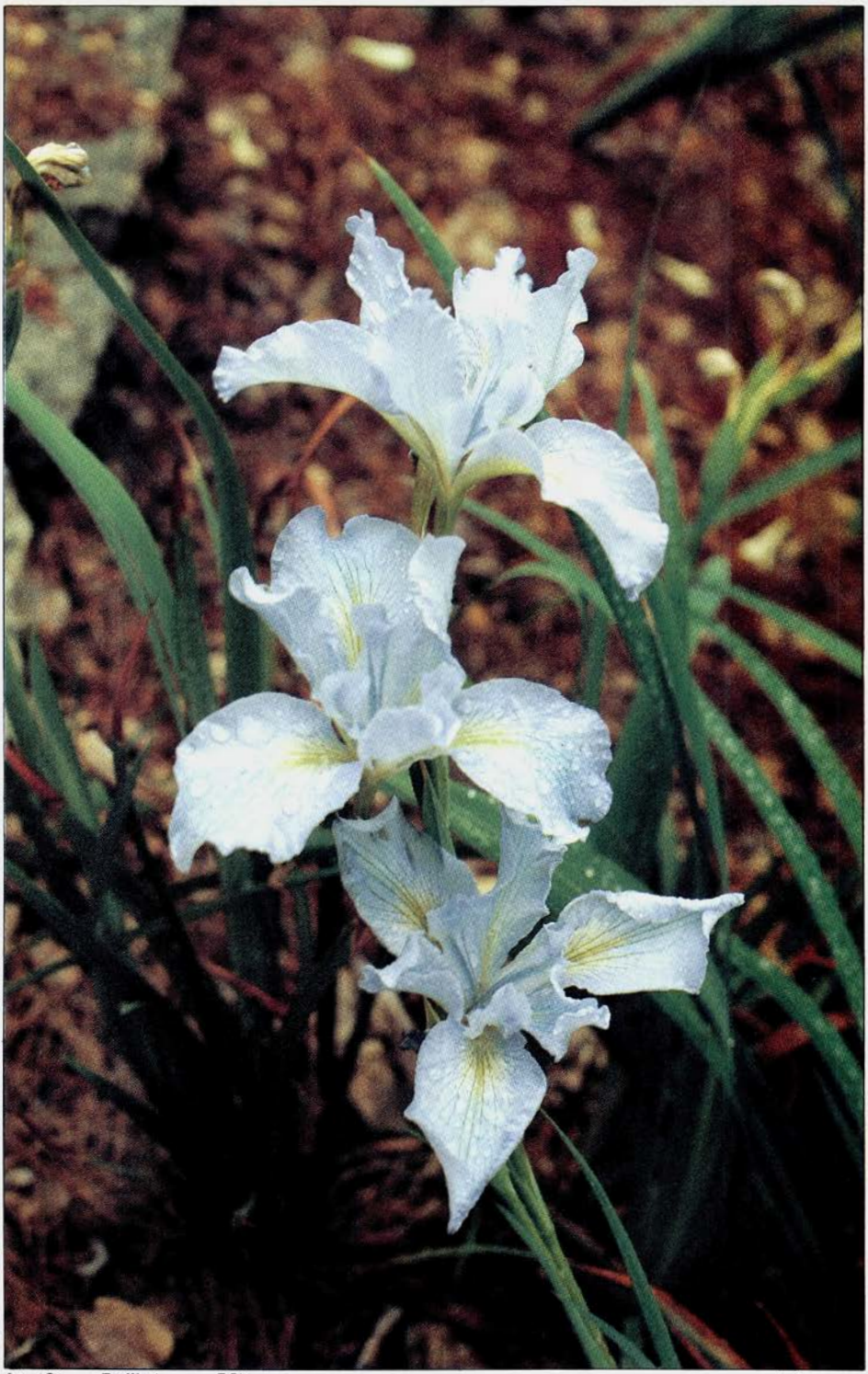
Portable Acres, 4036 Trinity Drive, Santa Rosa, CA 95405.
Catalog $1.00; lists introductions of many breeders past and present, including those of Brummitt, Ghio, Lawyer, Meek, and Wood. Also species.

Siskiyou Rare Plant Nursery, 2825 Cummings Road, Medford, OR 97501.
Catalog $2.00. *Iris innominata* mixed seedlings and yellow to gold forms.

Soc. for Pacific Coast Native Iris, 4333 Oak Hill Road, Oakland, CA 94605. Bulletin subscription $4.00 annually. Seed of most PCN species and open-pollinated garden varieties.

Yerba Buena Nursery, 19500 Skyline Boulevard, Woodside, CA 94062.
List on request. *Iris douglasiana, I. macrosiphon,* Pacific Coast hybrid seedlings.

Jean Witt, 16516-25th NE, Seattle, WA 98155.
Not commercial, but sells hard-to-find cultivars and spp. on an individual basis.



Iris 'Sierra Dell' (see p. 59) L. Lawyer

Iris 'Native State' (see p. 59) L. Lawyer

Iris 'Banbury Gem' (see p. 59) L. Lawyer

Iris, Lawyer hybrid XP 108A (see p. 59) L. Lawyer

Iris 'Small Town' (see p. 59) L. Lawyer

Iris 'Wild Man' (see p. 59) L. Lawyer

Iris 'Ami Royale' (see p. 59) L. Lawyer

Iris 'Brancaforte' (see p. 59) L. Lawyer

Iris innominata, China Flat (see p. 59) L. Lawyer

Diplacus grandiflorus (see p. 65) Ted Kipping

Diplacus, Verity Hybrids (see p. 65) David Verity

Diplacus for Rock Gardens

by David Verity
University of California, Los Angeles

Diplacus is a genus of about a dozen species and varieties that are native to California, northern Baja California, southwestern Oregon, and some of the offshore islands. Known as bush monkeyflower or sticky monkeyflower (for the usually glutinous leaves), they are closely related to *Mimulus*, but differ in being woody and also in a few botanical technicalities. As seen in the wild, these 1' to 3' subshrubs often attract attention by their abundant orange to red or yellow flowers, creating an urge for many to bring them into the garden. Most of the species respond well to cultivation, at least for a few years; however, unless adequate drainage is provided along with careful attention to prevent overwatering during the summer, the plants will tend to be short lived. Where soil conditions are right, occasional deep waterings will prolong the bloom well past midsummer.

In the western foothills of the central Sierra Nevada range is found *D. grandiflorus* (*Mimulus bifidus*), a dense, spreading species often hanging from rock outcroppings and roadcuts. Its pale buff to nearly white flowers are up to 4 cm across, the largest of the genus, and justly give this species the common name of azalea-flowered diplacus. In early summer it makes spectacular displays along the road into Yosemite. In southern California *D. longiflorus*, a more upright shrub with smaller but darker orange flowers, is impressive in many hillside areas. Its interesting variety *rutilus*, with deep velvety red flowers, is common in a few localities. The subspecies *calycinus*, reaching elevations of 7,500' in various mountains of southern California, should be of special interest to rock gardeners because of its lower, more compact form and presumed hardiness. Its flowers are usually pale yellow in color with deep orange nectar guides. *Diplacus aurantiacus* has smaller, deep orange flowers, and forms from along the north coast and into adjacent Oregon should tolerate more summer water than most. This species has been cultivated in England for many years. *Diplacus puniceus* and *D. parviflorus* are closely related to each other and have bright red flowers that are similar in form to those of *D. aurantiacus*. The former is from chaparral areas of San Diego County and Baja California, while the latter comes from the offshore islands. Finally, *D. clevelandii*, from chaparral openings in Orange and San Diego Counties, is less woody and is quite different from the rest. It is more difficult to cultivate but is outstanding for its golden yellow flowers.

All species and varieties of *Diplacus* are capable of hybridizing and in some areas extensive blending can be found. Under these circumstances, outstanding individuals are often seen. When collections are brought together in cultivation, numerous combinations that could not occur in the wild are possible, and when carefully controlled crosses are made over several generations, as I

did at UCLA a few years ago, the results can be very impressive. Compact plants with large flowers in colors of red, orange, yellow, white, pink and violet or combinations of these were produced. These plants can be readily grown from cuttings, and many of the selections were released to nurseries and botanical gardens. Some California nurseries that carry them are the Theodore Payne Foundation in Sun Valley, the Tree of Life Nursery in San Juan Capistrano and the Yerba Buena Nursery in Woodside. The work is now being continued at UC Riverside, and hopefully rock gardeners can look forward to some exciting new releases within a few years.

Books

Identifying California Alpines

by Wilma Follette
Sausalito, California

So, you are coming to California and you want to call all those lovely plants you will meet by name—and certainly have proper identifications on the zillion slides you will take. Well, be of good cheer for literature on California's plants abounds.

You must realize that you will be viewing one of the world's richest and most varied floras. The California flora includes more than 5000 native species plus another 1000 or so introduced ones. Furthermore, the California Floristic Province, which excludes the deserts, has a 47.8% endemism rate, i.e., almost half our plants grow nowhere else.

Let's say you are a rank amateur or you only care about the common names, or at most, the genera. There are many local or regional illustrated guides or pamphlets available, for instance, the four small University of California Press books that were authored by Phillip Munz and illustrated by line drawings and color photographs. They cover the wildflowers of the desert, the Sierra Nevada, the coast, and cismontane California respectively.

There is also a Nature Study Guild series of small, simple pictographic keys (called "Finders") to the wildflowers of the Sierra Nevada and the Redwood Region along with others on the ferns, the trees, and the fleshy fruits of the Pacific Coast.

One of the best resources for the entire Pacific Coast for any level of interest or ability is Niehaus and Ripper's *Field Guide to Pacific States Wildflowers* in the Peterson Field Guide Series. Arranged by color, form and detail, almost 1500 plants are illustrated by line drawings and given both common and scientific names.

If you are an educated amateur or professional botanist, for you the trea-

sure-trove is rich indeed. The bible of the state's flora is Munz and Keck's *California Flora and Supplement* put out by the University of California. However, Jepson's original 1925 *Manual of the Flowering Plants of California* is in the process of being revised and brought up-to-date, and will be generously illustrated and include garden uses. Planned to be of service to all levels of users, it is scheduled to appear in late 1992.

The plants of the Sierra Nevada, where the 1990 ARGS annual conference will be held, are readily accessible through several publications. The small, pocket-sized *A Sierra Nevada Flora* by Weeden is a highly useful and recommended botanical key to the flora above the foothill elevations in the 200-mile Sierran range that is our eastern border. The Tahoe Basin itself is well-covered by Gladys Smith's *Flora of the Tahoe Basin and Neighboring Areas*. Though not a key, it lists locations and interesting lore plus an excellent introduction to the geography, plant communities, and historical botanists of her study area. (Use Weeden for a key.) Julie Carville's new *Lingering in Tahoe's Wild Gardens* is a fascinating compendium of Tahoe walks, plants, birds, animals, insects, Indian lore, philosophy and conservation concerns.

Three small U.C. Press paperbacks that cover the trees, the shrubs and the wildflowers of the Sierra Nevada are well-illustrated guides to those plant groups. The last two have simple botanical keys.

Additionally, there is a profusion of guide books and floras on local California areas and counties and parks. For these, consult book outlets that specialize in nature publications in the location you are visiting.

Perhaps you are a photographer who will be carrying a heavy bag of lenses and gear in addition to your awkward tripod and that not-so-light camera. Frankly, the best arrangement for you is a spouse or companion who will carry the books, take the notes, and spend the time identifying the plant —while you are endlessly focusing, changing lenses, locating the most sincere plant in the colony at the best angle, and waiting for the wind to die down. Lacking such an assistant, Niehaus' *Pacific States Wildflowers* is of minimum size and weight and maximum ease and speed of identification. However, since it covers all the Pacific states, the exact species name for the plant you are focused on may not be forthcoming.

An additional, easy, and pleasant way to learn the flora of an area is to join a field trip. The California Native Plant Society (909 Twelfth St., Suite 116, Sacramento, CA 95814), with its 27 chapters state-wide, has free field trips year 'round to which the public is invited. The Society also publishes a quarterly bulletin, *Fremontia*, on all aspects of native plants, along with large, beautifully illustrated posters on Spring Wildflowers, Wildflowers of the Desert, Wildflowers of the Sierra Nevada, and Shrubs of the Coast Ranges. For specific information on California's native plants, Marjorie Schmidt's *Growing California Native Plants* is excellent.

Finally, welcome to our treasure house. Don't let the abundance overwhelm you. Get a book and/or a knowledgeable guide, and enjoy! The more you know, the more you'll see.

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ARGS Coming Events

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Annual Meeting: **Lake Tahoe: The Sierra Nevada**
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Covers many plants available in English nurseries. Focus on those that can be grown in the open garden. Intended for beginners but covers some more difficult species. Alphabetical listing of genera, 32 color photos, 49 drawings, 278 pp., publ. Timber Press.

The Rock Garden and its Plants from Grotto to Alpine House*
by Graham Stuart Thomas.....$26.00
History and exposition of rock gardening. Covers many types of gardens, with information on suitable plants and shrubs. Watercolors by author. 32 color photos, 200 b/w, 256 pp., publ. Sagapress and Timber Press.

Modern Miniature Daffodil Species and Hybrids*
by James Wells.....$26.00
Presents information on both indoor and outdoor culture. Describes many species as well as hybrids recently introduced. 106 color photos, 170 pp., publ. Timber Press.

Alpine Wildflowers of the Rocky Mountains,
by Dr. B. Willard and M. Smithson.....$3.50
Introduction to alpines most often encountered by tourists. Good color photos. Brief information on various alpine ecosystems. 40 pp., publ. Rocky Mountain Nature Association.

***Rare Plants of Colorado,* by Colorado Native Plant Society**....$6.00
Written to increase awareness and understanding of endangered and threatened species and their habitats. Discusses both natural and human factors contributing to rarity. Covers more than 90 plants. Beautifully illustrated, all color, 74 pp., publ. with Rocky Mountain Nature Association.

Campanulas*, by Peter Lewis and Margaret Lynch**.....$22.00
Much needed book on campanulas describes more than 300 species, not all for the rock garden. Color photos, 165 pp., publ. with Hardy Plant Society.

***The Genus* Dionysia*, by Christopher Grey-Wilson**.....$43.00
A very fine work on the genus, cultivation and propagation included. Many line drawings and color photos. 172 pp., publ. Alpine Garden Society.

Additional Books

*Rock Gardening Through the Year**, by Foerster $21.00
*Flora of the Pacific Northwest**, by Hitchcock et al., 1987 ed. 36.00
*Iris**, by Kohlein 27.00
*The Genus Cyclamen**, by Christopher Grey-Wilson 22.00
*Aroids**, by Brown 31.00
*The Smaller Bulbs**, by Brian Mathew 34.00
Kalmia: *The Laurel Book II**, by Jaynes 21.00
Wildflowers of the Western Cascades, by Ross and Chambers 15.00
Vascular Plants of Wyoming, by Robert Dorn 15.00
Vascular Plants of Montana, by Robert Dorn 9.00
*Utah Flora**, ed. Stanley Welsh et al. 36.00
*Orchids of the Western Great Lakes Region**, by Fred Case 26.00
*Wild Flowers of Northern Carolina**, by Justice and Bell 28.00
*Encyclopedia of Ferns**, by Jones 35.00
*The Opinionated Gardener**, by Geoffrey Charlesworth 14.00
*Flora of the Great Plains**, publ. University Press of Kansas 36.00
*Rocky Mountain Alpines**, publ. Alpines '86 Int'l. Conference 30.00
Rock Gardening, by H. Lincoln Foster 18.00
Manual of Alpine Plants, by Will Ingwersen, reprint edition 15.00
The Bernard Harkness Seedlist Handbook, by Harkness et al. 23.00
A Synoptic Guide to the Genus Primula*, by Fenderson 36.00
*Sucessful Southern Gardening**, by Sandra Ladendorf 18.00
*A Plantsman's Guide to Primulas**, by P. Swindells 16.00
*Clematis**, by Barry Fretwell 19.00
*Clematis**, by Lloyd & Bennett, revis. 1989 ed. 26.00
Genus Pleione*, by Cribb & Butterfield 25.00
*A Manual of Saxifrages**, by Webb & Gornall 40.00
*Hellebores**, by Brian Mathew 50.00

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Wisconsin-Illinois	Douglas Macdonald, 1214 Grant Street, Evanston, IL 60201

Editorial Staff

Editor	Gwen Kelaidis (303) 322-1410
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