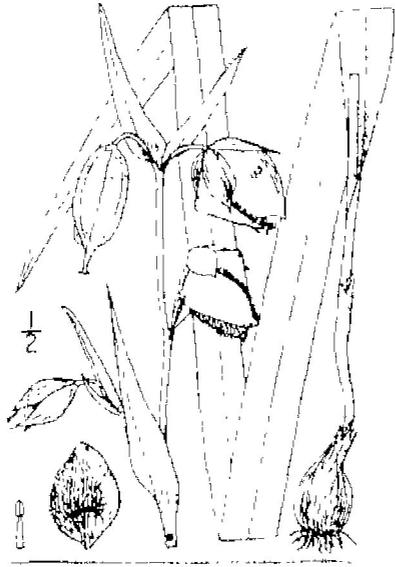


I. SPECIES THIS ISSUE: C. ALBUS

In this issue, we will concentrate on C. Albus. While to some extent this is arbitrary, most botanical classifications begin with the fairy lanterns, and C. Albus was among the first Calochorti discovered. It is also the most widespread of the "globe tulips."

RANGE: From sea level to 2500 ft., entirely in California. In the Sierra Nevada, it grows on the western slopes from Butte Co. in the North to Madera County. On the Coast, it grows from the Bay Area south to San Diego Co.

BOTANY: Ownbey, in his definitive treatment of the genus, divides Calochorti into three sections, and C. Albus is placed in the section Eucalochortus (Ownbey, M., "Monograph of the Genus Calochortus," Annals of the Missouri Botanical Garden, V. 27, #4, 11/40, hereafter "Ownbey"). All the Eucalochortus spp. have 10 haploid number chromosomes, orb- or oblong-shaped seed capsules with three "wings" at equal angles to one another. The "wings" stick out along the entire length of the capsule. Their shape may aid seed dispersal. The capsule also nods, *i. e.*, it does not grow erect, but is bent over. Eucalochorti are subdivided into four subsections. C. Albus is among the "Pulchelli," or the fairy lantern types. This is because this subsection contains spp. all of which have nodding, globose-shaped flowers, although there is some variation in flower shape. Perhaps this globe shape inspired the common names for these spp., including globe tulips, fairy lanterns, "snowdrops," and globe lilies. (Most botanists place Calochortus in the lily family, along with tulips, although there are some classifications which make of Calochortus its own family, distinct from any other.)

1. *Calochortus albus* (Benth) Dougl. White Fairy Lantern. Fig. 1057.

Calochortus albus Benth. Trans. Bot. Soc. 1: 413. *Pl. H. H. S.* 5: 1835.

Calochortus albus Dougl. Benth. Maudsl. & Becc. Bot. 2: 6. 1838.

Calochortus parviflorus Lindl. Bot. Rec. 20: under *pl. 166*. 1834.

Stems: stem, branching, glaucous. Basal leaves lanceolate, acuminate, 3-5 dm, long 10-30 mm, wide. Bracts foliaceous, lanceolate acuminate, 5-15 mm long. Flowers subglobose, nodding on slender pedicels, sepal shorter than the petals, ovate, more or less acuminate, greenish white, outer tinged with reddish purple, petals white, purplish at base, ovate-subobovate, obtuse or acutish, 20-30 mm long, curved and strongly arched, clothed above the gland with long yellowish hairs, gland lunare shallow, with 4 transverse upwardly imbricate scales fringed with close short yellow or white glandular hairs, anthers oblong, mucronate, 4 mm, long, capsule 20-40 mm long, 15-25 mm broad, more or less prominently winged.

Open woods and light slopes of the Upper Sonoran and Transition Zones, Mendocino and Butte Counties, southern through the Coast Ranges, and Sierra Nevada to San Diego County. Type locality: California, exact station not known.

Calochortus albus rubellus Greene. *Glycyrrha* 1: 152. 1847. Distinguished from the typical form by the rose tinged perianth segments. Coast Range, from the Santa Cruz to the Santa Lucia Mountains. California. O. S. G. H. collected at Pacific Grove.

C. Albus, from An Illustrated Flora of the Pacific States, by Leroy Abrams, Ph. D., Stanford Univ. Press, 1923, p. 432.

This edition of Mariposa will be longer than usual in order to introduce key concepts in identifying the species, cite main sources and especially to introduce mixes and a section on the care of seedlings before planting time.

Several letters have inquired about a seed exchange. I may set one up next year for hard-to-get spp., but do not have enough seed at this time to do so. For those of you who are not already aware of sources for Calochortus spp., here are some reliable seed sources (you will have to move quickly!):

1. Robinette Bulb Farm, P.O. Box 1306 Sebastopol, Ca. 95473-1306. Many NO. California spp.
2. Theodore Payne Foundation, 10459 Tuxford St. Sun Valley, Ca. 91352. Many SO. Calif. spp.
3. Southwestern Native Seed, Box 50503 Tucson, Az. 85703. Best source for Northwest, Rocky Mt. and Mexican spp.

C. Albus is differentiated from the other fairy lanterns partly by color, partly by its gland character, and partly by the amount of "hair" on the petal. The gland is a small protuberance at the bottom of Calochorti petals. Using the gland as the mark of species differentiation dates back to Watson. Although its function is not known at this time, according to Dr. Peggy Fiedler of SFSU, it is believed to have something to do with creation of a scent to attract pollinators. The function of the "hairs" or processes on the petals is also unknown.

C. Albus, as its name implies, is white. However, there are many specimens with tinges of pink in the petals, some almost all pink, and one variant (var. "Rubellus") which is rosy to brick red. The Sierra var. of C. Albus differs, in general, in having smaller flowers, of a purer white, a more nearly campanulate shape, and with a less deeply depressed gland (Ownbey). As these are botanically undifferentiated, they are treated as one sp. The gland of C. Albus differentiates it from a close relative, C. Amoenus (Ownbey; Munz, California Flora), in that the membrane covering the gland only covers part of the breadth of the petal, not all of it as in C. Amoenus. It differs in color from the other fairy lanterns, which are yellow; and also differs by virtue of not being conspicuously fringed on the petal edges, unlike the yellow fairy lanterns. It is "hairy" above the gland, but sparsely so.

The bulb (not a corm) of C. Albus is ovoid with a membrane coating. The species varies in height from 2-8 dm. (about 8-32 inches), although Mr. S. Farwig & Mr. V. Girard have described a more diminutive sp. from the coast (Pacific Horticulture, Spring 1981.)

HISTORY: The species was discovered by the great botanical explorer David Douglas, and first described in 1834 (Ownbey, pp. 396-401.) At one time, it was thought to be in the Cyclobothra division (the third section or division of Calochortus) as it has nodding flowers, like many of of the sp. in that

section. However, it has been out of the Cyclobothras since the 1870's, with Baker and Watson's classifications (Ownbey).

GROWING CONDITIONS: C.Albus grows in part to deep shade of the coast and valley oaks, and the yellow or "digger" pines of the lower Sierras. In the wild, it is in USDA zones 9-10, but is hardy to at least zone 7 (0° F) and possibly to zone 6 (-10° F) (Scott, Bulbs, How to Select, Grow and Enjoy, HP Books, p. 74.) It is a winter and spring grower, and dormant from mid-May to October. During this period it receives little or no rain in the wild, although the late M. Schmidt has observed that it is more adaptable to summer water than the Mariposas (Growing California Native Plants, U.C. Press, p. 175.) The clay soils it grows in in the wild retain water long after the rains have ceased, so it may well take more under cultivation.

HORTICULTURE: C.Albus prefers light or part shade, a good and regular supply of water during the growing season (especially in the Spring), and soil enrichment with humus or compost. Clay soils should be modified 50% with sand (2 parts) and thoroughly aged compost or leaf-mold (1 part) (Chickering, Growing Calochortus, Rancho Santa Ana Horticultural Series #1). Up to 50% amendment to 12" deep aids in building well-structured, aerated soil suitable for cultivation. Sandy soils can also be modified with these humusy organic amendments in the same proportion (50%).

The species tolerates coastal fog, and even grows by the coast (Farwig & Girard, op. cit.). I have no reports of how it does in the desert, but it grows in areas of San Diego County which receive fewer than 10" of precipitation/year. Shade is vital in the desert.

In pots, C.Albus should receive a light, friable mix. They adapt well to pots, and can be grown under glass or in a hothouse or alpine house in cold areas by means of pots. They require 8" deep pots to thrive, and shouldn't be crowded. In dry areas one-quarter of the mix should be sand and/or fine gravel; elsewhere, one-third should be sand or gravel.

This adds drainage, a vital element for all Calochorti, indeed all bulbs. The balance of the mix should result in a light and friable medium which retains some water when combined with the sand. It can be either soil-based (2 parts loam to 1 part organic matter) or completely organic. The organic portion should be either finely chopped bark, leaf mold, or aged compost. Commercial potting mixes are all right if they contain no manure or fertilizer, neither of which aid Calochorti. A small amount of lime adjusts pH and provides some nutrients. Potting mix should be diluted with bark.

In both pots and in the ground, the bulbs should be 3-4" deep. They should be kept as dry as possible in the summer. The sp. must be grown from seed, as it produces no offsets (bulbils.) Watering twice a week is sufficient. As damping-off is a major problem with Calochortus seedlings, one can use soil soaks specific to damping-off pathogens or bake the mix at 200° F for 2 hours to eliminate them. Unlike certain other sp., it does not seem to have a mildew (botrytis) problem. Gophers, field mice and rabbits eat the bulbs, so beware of these pests.

As they grow on slopes in the wild (which helps to drain the clay), slopes may be a good landscape situation for the species, especially in wet areas, such as near the Coast. This includes cliffs, ledges or banks. As few flower spp. of any kind adapt well to these problem areas happily, it is useful to discover a species which prefers them. As the sp. prefers dry summers and autumns, a dry border is a suitable position--or better, an entire area kept dry in summer for summer dormant plants. Such an area conserves water as a bonus.

According to A. Wood (Bulbs for your Garden; Houghton Mifflin) 1936) C.Albus is among the more adaptable Western bulbs for Eastern gardens (p. 151.) In the East they prefer a sunnier position than their wild stands would indicate, and are particularly well-suited to rock gardens. Premature autumn growth

and poor drainage are the most formidable problems in the East. The first can be met with heavy mulching, which also throws off the heavy rains. Or, the bulbs can be lifted after flowering and then replanted in late autumn, to prevent premature growth. The latter can be met with greater quantities of sand and/or gravel in the growing medium. We are also warned that the bulbs dislike "alternate freezing and thawing." (We will cover this point below.) According to Taylor (Guide to Bulbs, Houghton-Mifflin), C.Albus will overwinter as far North as Washington, D.C.

II. GOOD NEWS?

Rumor has it that Calochortus Monanthus, considered extinct by the State of California, may yet be alive. Apparently, a rancher east of Yreka, California may have some growing on her property. As yet, this is unconfirmed, and she won't let anyone on her property to see it. But she has agreed to collect seed from the stand and mail it to a grower. Let us hope this sp. is still alive.

III. The Horticultural History of Calochorti--1st Installment.

C. Purdy and L.H. Bailey, Standard Cyclopedia of Horticulture, V.I, pp. 631-5, 1914:

"Nearly every known species is in cultivation to some extent. Some are readily grown, others present considerable horticultural difficulties; but while there are some that probably will always be difficult to cultivate, there are many species--and the number includes the very best--that can be grown successfully by anyone who is willing to give a little special care to them; and there are a few that possess such vigor and hardiness as to be adapted to extensive cultivation.

"All Calochortuses are hardy in the sense of withstanding extreme cold, but they will not endure alternate freezing and thawing nearly so well; and thus there is the paradox of their going safely through severe eastern or European winters and suffering the loss of foliage in mild ones. They should be planted in the fall, and it is better

to plant late, so that leaf growth is delayed until spring. Diverse as are their natural habitats, one soil will answer the needs of all. A light loam, made lighter with sand or sawdust, powdered charcoal, or spent tan-bark, is best. Excellent results have been secured with a mixture of equal parts of a good light loam and spent tan bark, with a little broken charcoal. Wallace, one of the most successful English growers, recommends making a bed sloping to the south, composed of leaf-mold and road grit in equal parts, with a smaller proportion of sharp sand. The idea is to have a light and porous, not too stimulating soil, with perfect drainage. Wallace recommends covering the beds with reeds to throw off the heavy rains. The same end may be attained by such thorough drainage that the rains pass through quickly. In New York, they have been carried through the winter safely under a covering put on before the ground freezes hard. It is well to keep a few leaves about the shoots for a time and to have extra leaves at hand to be used when frost threatens. It is better to lift the bulbs as soon as they ripen, and replant in the fall. Water sparingly at all times. Under suitable conditions they are hardy and tenacious of life, but excessive moisture, either in air or ground, is not to their liking after the flowering season arrives. Theoretically, all Calochortus of [the] Section [Eucalochortus]...should have shade, and all Mariposas...sunshine; but the light shade of a lath-house suits all alike, giving much finer bloom in the mariposas. The flowering season extends over three months, according to species.

"They take well to pot culture with similar soils and treatment. While not to be forced rapidly, they considerably anticipate their out-of-door season. The same treatment can be used in coldframe culture, but they must not be coddled too much."

This seminal article on Calochortus horticulture is interesting in that it fails to distinguish winter (low-elevation California), spring (high-montane, Northwest, and Western) and summer (Mexican) growing spp., despite both authors' familiarity with these three growing conditions. By many accounts, the low elevation California spp. are best germinated in the fall, not the spring or summer; while the other U.S. spp. are best set out in spring, and the Mexican spp. in early summer.

The advice on "alternate freezing and thawing" has become a cliché, but should be taken with a grain of salt. Many spp. of Calochortus endure alternate freezing and thawing in the

wild and still thrive, notably those in the Northwest. Perhaps the real problem is the mucky conditions created during an Eastern thaw, which may rot bulbs from the drier West. (I still haven't figured out what "spent tan-bark" is. Mr. C. Baccus thinks it may be a discard from the leather industry). This article, in a condensed form, is still used in later editions of Bailey's work, up to the 1976 ed. of Hortus (Cornell U.Press), and has never been revised or horticulturally updated.

IV. THREATENED WILD STANDS

C. Pulchellus, another fairy lantern, grows only around Mt. Diablo in Contra Costa County, California, as far as is known. While this sp. is on the CNPS "watch list," as a rare sp., it is threatened by Bay Area development. Specifically, the City of Concord, Ca. has approved a development at the base of Mt. Diablo, "Crystal Ranch," which may involve some of the range of C. Pulchellus. Those members who wish to express their concern over this proposal (and we would urge you to do so) may write:

Roxanne L. Bittman, botanist
Natural Diversity Data Base
Cal. State Dep't of Fish and Game
1416 Ninth St., 12th Fl.
Sacramento, Ca. 95814

V. MIXES:

One that works: (Baccus, 1977) 1 part medium fir bark, 1 part ground forest humus, and 1 part "Cal. mix" (50x50 sand and fir bark, ground, similar to commercial soil amendment).

More humusy than most recommendations, but Mr. Baccus says it works fine. He gets 15-20" rain/year, USDA zone 9.

One that doesn't: (McDonald, 1986) 1 part "gritty soil" (gravelly clay), 1 part sand, rock and charcoal, and 1 part Redwood compost and peat. What I didn't know then was that clay must be virtually pulverized to mix it with the sand properly. I think the various ingredients never got properly mixed. I haven't tried mixing it more thoroughly yet, but I am testing a wide variety of media this autumn for comparison of germination rates.

VI. THE SEEDLING STAGE

The most difficult period for the Calochortus grower is undoubtedly the early seedling stage. Once one is past the first year Calochorti are fairly easy, at least in the West. It is better to start the seedlings in pots or flats and transplant them to the soil after their second year of growth, but they can be started in weed-free soil. Starting the seeds in the ground has a certain advantage, in that the threat of damping-off, a major problem with Calochortus seedlings, is reduced. However, the danger from rodents and other pests is increased.

The seeds should be placed about one-eighth to one-quarter of an inch below the surface. Bottom watering the pots will reduce the danger of the seeds floating about. Some growers place a top dressing of tiny pebbles or bark pieces above the soil line or mix to hold the seeds in place during watering, and keep the moisture more even. As a bonus, the top layer insulates against excessive heat or cold.

In the first months after germination, watering can be tricky. Whether one is growing the plants in pots or soil, the seeds must be kept evenly moist, but not sopping wet. This applies particularly to the desert spp., which are particularly finicky as to water. Too much water encourages damping-off, which can carry off most of the seedlings. This can be controlled by baking the potting medium at 180°F for two hours to kill off the fungi. Soil soaks specific to Rhizoctonia and other damping off pathogens may also be effective.

Too much water can cause rot; too little dessication. During the first year after germination, the desert spp. should be watered about once a week, and the others more frequently, as needed. Watering depends upon the conditions under which plants are grown, average rainfall, media or soil, cloud cover, and temperature. Warmer climates require somewhat more water, cloudier climates somewhat less, and so on. The seedlings should be checked every four to five days for moisture, especially potted ones. It is advisable to let them dry off a bit between waterings to discourage damping-off, and increase aeration, but not more than a week should elapse between waterings. If it rains, of course, no watering is needed.

Enough water should be applied to keep the water table below the roots, and thus prevent salt build-up. Thus enough water

should be applied to flush any salts from the root zone, but no more: a trickle should appear out of the pot's drain holes after watering. In the ground, an inch/week seems a sufficient average for the first year, depending on conditions and spp. Non-desert spp. and adult plants will take more. Some spp. in the wild receive more than two inches/week during the growing season. Yet it should be kept in mind that, for the most part, these are xerophytic plants which don't want to be drowned.

When the seeds germinate a single small stalk will appear which resembles a blade of grass (Calochortus means "beautiful grass"). This will increase in size the first year, but very little. Most of the growth is below, in the bulb. At the end of the first year, a small bulb has formed about three-four inches below the surface. The bulbs do not flower during the first two years. They go dormant for about half the year. The leaf will start to yellow and then turn brown and wither. During this dormant period the bulbs should NOT be watered. They will rot, especially under hot conditions. As this makes them unsuitable for climates with year round rain, growers in such climates must take certain precautions. In wet climates, the bulbs can be dug and stored, but only after they go dormant. Wet climate growers would do better to start the seeds of dry climate spp. in pots and transplant the bulbs after the second year, as it is risky to dig the bulbs during the first year. Some wet climate growers have used raised beds instead, and covered them during dormancy to throw off the rains.

VII. LETTER TO MARIPOSA

I wonder whether the mariposas on bluffs at Point Pinole [E. San Franc. Bay] have survived trampling? I wonder if you know there are mariposas at Lake Alpine in Marin Co. [Ca.]?

--Marjorie Brown

[Sp. may be C. Umbellatus, I am unfamiliar with these stands.--ed.]