MARIPOSA

the *CALOCHORTUS* newletter — ISSN 1543-6934 —

c/o Georgie Robinett, P.O. Box 1993, Brookings, OR 97415-0052 USA

C. amabilis

Time for Subscription Renewals –

This is the last issue of Volume XV (July 2003 through April 2004), and it's time to renew your subscription to ***Mariposa.*** There is no change in the cost, which remains –

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My original intention was to devote this issue to a comprehensive index of all fifteen volumes. However, that proved to be a larger effort than I had anticipated, requiring a total of 10 printed pages, so I decided to make it available separately. If you are interested in having a copy of this comprehensive index, please add –

$2.00 – Domestic	- or -	US$ 4.00 – Foreign

to the subscription price. The index will list all "Species of the Issue," all trip reports and contributed articles, all summaries of other published materials, all letters to the editor, etc., by topic and by author. The index will be mailed out as payment is received.

Study of the Effects of Grazing on *Calochortus greenei*

The February issue of the ***Bulletin of the Native Plant Society of Oregon*** (NPSO) features a report on a new study of the effects of grazing on *Calochortus greenei*. Initiated this past summer by NPSO and the Institute for Applied Ecology (IAE) in Corvallis, OR, together with the Medford, OR, district of the Federal Bureau of Land Management (BLM), the study will count *C. greenei* annually, for at least 10 years, utilizing five pairs of 2X2 meter plots – one fenced and one unfenced in each pair – in three separate locations, for a total of 30 plots. All locations lie within the recently dedicated Cascade-Siskiyou National Monument. (*C. greenei* occurs only in Jackson county, OR, and Siskiyou county, CA, and is listed as endangered in both states.)

The initial survey in 2003 found an average of 21 plants (range 3 to 59) in each of the 30 plots; and concluded that 24% of them were sufficiently undisturbed long enough to produce viable seed. Signs of wildlife/cattle herbivory (consumption) were found on 71% of the plants, and insect herbivory on 36%, on average. Herbivory of flower buds, often total removal, occurred on an average of 18% of the reproductive plants. The study will also compare relative (and changing) proportions of native and exotic species in each plot. In 2003 natives ranged from about 50% at one site, to between 25 and 30% at the other two locations.

Staffing of this study is being provided by student interns. Contributions in support of the study can be made to the Native Plant Society of Oregon, 3927 Shasta View Street, Eugene, OR, 97405-4442, and should be accompanied by a letter stating the purpose of the donation (which will be entirely tax-deductible).

Species of the Issue – *Calochortus nudus*

Background, description(s), and range(s) – Once again, we have a complicated history. The first announcement of the name "*Calochortus nudus*" appeared in an article by Sereno Watson, in the ***Proceedings of the American Academy*** Vol. 14 (1879), p. 263. I have been unable to obtain a copy of Watson's article, but he is quoted in Carl Purdy's 1901 work (cited below) on page 123:

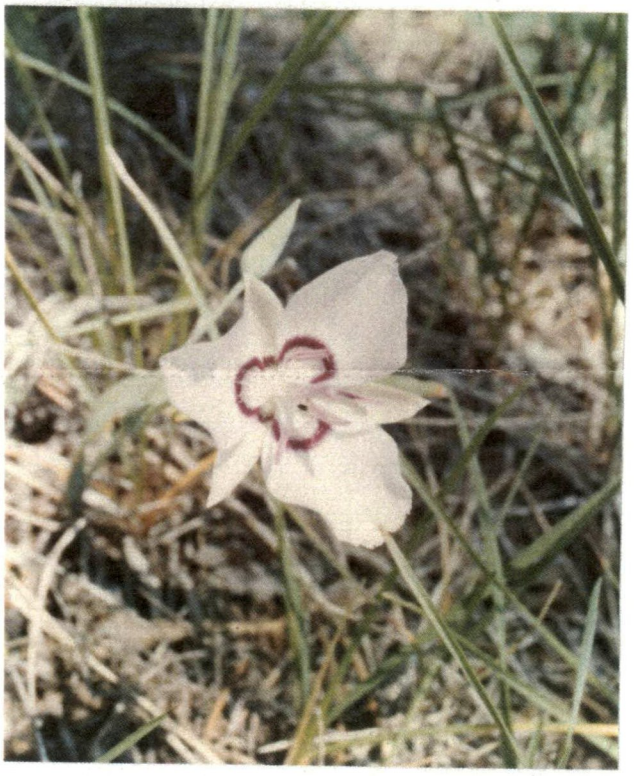
> Low and slender, scape 2 to 4 inches high, with a single leaf 3 to 6 inches long, 3 to 6 lines [a unit of measure commonly used in early botanical writings, equal to one-twelfth of an inch–*Ed.*] wide, light green, of even width for most of length, abruptly acute [pointed–*Ed.*]; flowers one or more, in all specimens examined in an umbel if more than one; sepals narrowly oblong-ovate, acute, shorter than petals; petals greenish white or lilac, greenish at base, obovate, somewhat acute, denticulate above, 5 to 7 lines long, the same in width, entirely nude except for a tuft of two or three short stiff hairs at each extremity of the narrow, closely appressed scale which covers the upper margin of gland; anthers blue, oblong, two-thirds the length of the subulate [narrow, pointed, and more or less flattened, much like an awl–*Ed.*] filaments. ... California (in the Sierra Nevada, Yosemite Valley to Plumas County).

The earliest reference I have is L. H. Bailey, ***The Standard Cyclopedia of Horticulture***, 1900. In a list of *Calochortus* co-authored by Bailey and Carl Purdy, *C. nudus* is described much more briefly as follows: "Low, 2-4 in., delicate: lf. solitary: fls. 1-6, umbellate, small, greenish white or pale lilac, nude except for a tuft of 2 or 3 short hairs at each extremity of scale, denticulate. Calif., in the Sierras" (p. 633). In our discussions with Stan Farwig and Vic Girard, Jim and I always agreed with them, that the descriptions of both Watson and Bailey & Purdy would make it challenging to distinguish *C. nudus* from *C. minimus* (which isn't included Bailey & Purdy's list) – especially given the location both works cite, "in the Sierras".

The following year, Carl Purdy published a separate and more detailed list – "A Revision of the Genus *Calochortus*" (***Proceedings of the California Academy of Sciences***. 3rd Ser. Botany. Vol. II, No. 4). After quoting Watson as above, he adds the following: "On north sides of high mountains in the pine forests of the Sierra Nevada, from Tulare to Plumas counties; in loose dry soils. ... The type as described from Tulare County is white, but there seem to be variations tending to lilac, and in some sections a nude petal. This is the smallest flowered of all the Calochorti." Purdy's 1901 list also does not include *C. minimus*, and the location information given reinforces the sense of confusion as to whether *C. minimus* was the species being described. His phrase, "there seem to be variations tending to lilac, and in some sections a nude petal" does hint at a growing recognition that some difficulty might exist here. Indeed, in this work Purdy introduced a "species novum" – "*Calochortus shastensis*" – as follows:

> Scape low, slender, 4 to 10 inches high, but unusually erect, with a single shining light green radical leaf 3 to 6 inches long, of almost uniform width (3 to 6 lines), but abruptly acute at apex; bracts lanceolate, 6 lines long; sepals long, ovate, acute and acuminate, greenish without, lighter within, purple spotted near the base; petals white or lilac, broadly fan-shaped, somewhat truncated above, denticulate, naked except that some few specimens have a few hairs above the narrow, fringed, ascending scale which divides the gland; anthers linear, obtuse, slightly sagittate [arrow-shaped–*Ed.*]; capsule as in preceding [*C. uniflorus* in Purdy's list] but erect.
>
> Found in open moist meadows in the vicinity of Sissons, California, at the base of Mt. Shasta, and about springy places on the western flank of the mountain.
>
> *C. shastensis* has long been known and collected as *C. nudus*, which it closely resembles in flower but from which it is clearly distinguished by the erect capsule. It is a curious fact that a species linking the small Calochorti of the west lands with the *C. nitidus* section should be found at the very point where the latter terminates its most southern extension. The true *C. nudus*, it will be noted, grows only on dry slopes in the Sierra Nevada, from Plumas County, California, southward.

***Calochortus nudus* –**
(Siskiyou county, CA)



– Photographs by Jim Robinett

Willis Linn Jepson's original ***Manual of the Flowering Plants of California*** (1921/25) again omits any mention of *C. minimus*, and his description of *C. nudus* adheres closely to those of Watson and of Bailey & Purdy. But he offers his own "species novum" announcement, as follows:

> [*C. nudus*] var. *shastensis* Jepson. Stem 4 to 14 inches high, slender, flexuous, more or less erect; basal leaf shorter than, equal to, or longer than the stem; petals white, pale lilac blue or deep lilac, 6 to 10 lines long; capsule elliptic, generally erect, occasionally nodding.—Moist meadows, Sierra Nevada from El Dorado Co. n. to Mt. Shasta; thence sw. to Trinity Co. (pp. 238-39)

Jepson's failure to acknowledge Purdy's prior authorship, instead attributing this "new var." to himself, may be taken as some measure of his ego. He had a reputation for being both self-centered and stubborn – a "don't-confuse-me-with-the-facts" sort of fellow. As I understand it, his defense of not acknowledging Purdy at the time was that Purdy had failed to "properly" announce the plant, which would have required a full description in Latin, and Purdy's monograph did not include this. Of course, neither did Jepson's ***Manual*** !

Next, Leroy Abrams' ***Illustrated Flora of the Pacific States*** (published in four volumes over the period 1923 to 1940) re-recognized Purdy as the original source of "*Calochortus shastensis*" and rather pointedly subsumed Jepson's "*C. nudus shastensis*" into Purdy's plant [Vol. I, 1923, p. 437]. On the other hand, Abrams again attributed *C. nudus* to Sereno Watson and followed the Watson and Bailey & Purdy descriptions closely. He did, however, make a significant change in describing its habitat, to "moist grassy places" (p. 436), as opposed to the "loose, dry soils" and "dry slopes" cited by Purdy. This is important because it seems to be the first recognition that both *C. minimus* and *C. nudus* prefer a moist environment.

At this juncture, given the conflicting names and descriptions of preferred habitat, location, and the plants themselves – not to mention the "hard feelings" apparent among some of the botanists – Marion Ownbey undertook the task of "unraveling the knot," as Vic Girard wrote in his unpublished treatise on *Calochortus*. The solution Ownbey presented in "A Monograph of the Genus *Calochortus*," ***Annals of the Missouri Botanical Garden***, Vol. 27, No. 4 (1940) has been accepted and followed by every subsequent author. Ownbey began with an 1874 description by J. G. Baker of a plant Baker called *C. elegans* var. *subclavatus* (***Proceedings of the Linnean Society of London***. Botany. Vol. 14, p. 305) – described as (I translate roughly from the Latin text) "a small form provided with a paucity of hairs and minutely pitted toward the petal apex" – and used it as the basis for his own "species novum" announcement of *Calochortus minimus* – including the required Latin description as a footnote. On pp. 430-31 he wrote –

> ...Specimens of *C. minimus* were included under *C. nudus* by Watson, but the original description of that species was drawn from specimens collected in Plumas County by Mrs. R. M. Austin. Purdy interpreted the plant here described as *C. nudus*, and proposed the name *C. shastensis* for the more northern species. This interpretation has been followed by later writers, apparently without consulting either Watson's specimens or his original description.
>
> *C. minimus* is the smallest of the *Calochorti*. It is very uniform throughout the range here given [eastern Eldorado county, southward in the Sierra Nevada to Tulare county–*Ed.*], but northward it has hybridized with *C. nudus* to such an extent that it can be said to occur there only as *minimus*-like individuals. Since *C. nudus* is its dominant element, this hybrid population is included under that species, where it is more fully discussed.

In his treatment of *C. nudus*, on pp. 432-34, Ownbey subsumes Watson's *C. nudus*, Purdy's *C. shastensis*, and Jepson's *C. nudus* var. *shastensis*. He distinguishes it from *C. minimus* by a number of attributes – plant height; leaf proportions (*C. nudus* has short, wide leaves, while those of *C. minimus* are quite narrow for their length, much like catsear leaves); petal shape; the number of flowers per stem (from 1 to 6 for *C. nudus*,

from 1 to 10 for *C. minimus*); gland (more or less arched upward for *C. nudus*, but straight for *C. minimus*); and fruit (erect for *C. nudus*, nodding for *C. minimus*). His discussion of *C. nudus* and the *nudus* X *minimus* populations is worth quoting at length, as it does much to explain some of the earlier confusion:

> [The description of *C. nudus*] was drawn from a considerable series of specimens from the vicinity of Mount Shasta, where the species is remarkably uniform. The specimens on which Watson based his original description were collected in Plumas County and are essentially the same. The name, *C. nudus*, however, has been generally associated with... [*C. minimus*], an interpretation which could be justified only by disregarding Watson's description and applying the name to the Yosemite specimens which he cites first, but does not describe.
>
> In the vicinity of Mount Shasta, *C. nudus* is uniform, but south of the Pit River it occurs in pure stands with decreasing frequency as one passes southward. In eastern Eldorado County and southward, only the closely related *C. minimus* occurs. Between the two geographically, there is a bewildering assortment of plants showing independent recombination of the various morphological characters which separate these two species. Such a population can be explained only as the result of long-continued hybridization and probably repeated back-crossing, particularly with *C. nudus*. It should be pointed out, however, that occasional specimens are so close to *C. minimus* that they can be distinguished only by geographical criteria.
>
> From the evidence at hand, it appears that at one time these species were separated by a geographical barrier which allowed evolution to proceed in different directions on either side. As a result there was developed a robust northern race, with larger flowers, rounded petals, taller stems, proportionately shorter and broader leaves, and erect fruits which are acute at both ends. It is fortunate that this race has persisted in a nearly pure state in the Mount Shasta Region, and at numerous stations in the northern Sierra Nevada.
>
> The southern race is smaller in all respects, the petals acute, the stems very short, the basal leaves greatly exceeding the inflorescences, the fruits obtuse and nodding on slender, strongly deflexed pedicels. This race now occupies the southern Sierra Nevada, from eastern Eldorado County southward to Tulare County, in a practically pure condition. The combinations of morphological criteria which separate the southern from the northern race are certainly of specific value. It is only when the intervening population is considered that there is any possibility of another interpretation.
>
> Today the barrier which once separated these two species has disappeared, and they have come together again. Since they were presumably derived from the same stock, the hybrids are fertile and interbreed both among themselves and with both parent species. The result should be a population possessing the characters of both parents, but in different combinations. This is exactly what we find. It is impossible to separate such a population completely into two, or even a dozen, categories, yet the morphological differences between *C. nudus* and *C. minimus* do not permit their inclusion within a single species. Even if such assignment were possible, it would be undesirable, as it would obscure their probable genetic relationships.

In his study of DNA in the *Calochortus* (see ***Mariposa***, Vol. XIV, No. 4; or the longer summary printed separately), Tom Patterson looked at samples of all three plants – *C. nudus, C. minimus,* and *nudus* X *minimus* – all of which "sorted" into his Pacific Northwest clade. In the incomplete run of 74 taxa using chloroplast DNA, *C. minimus* emerged as "sister" (most closely related) to *C. coeruleus*, with *nudus* X *minimus* the next most closely related taxon. *C. nudus* was "sister" to both *C. elegans* and *C. persistens*, a group one step further removed. But "incomplete runs" can distort the results; and none of the three was included in the reduced run of 28 taxa. Patterson later used two sections of nuclear ribosomal DNA to study only the members of Ownbey's Section CALOCHORTUS. Here *C. nudus* appeared as the "sister" to *nudus* X *minimus.* However, regrettably, *C. minimus* had to be eliminated from this analysis, because the two different

sections of DNA yielded conflicting results. In both cases, *C. minimus* seemed to be most closely related to *C. westoni* (a rare catsear from the southern Sierra Nevada), but the relationship of this pairing to other members of Section CALOCHORTUS was widely (one might even say "wildly") divergent.

In his scheme of Sections and subsections, Ownbey grouped *C. nudus, C. minimus,* and *nudus* X *minimus* with *C. umbellatus* and *C. uniflorus*, the species he believed they most resembled morphologically, and called them subsection NUDI. I suspect he would have been very surprised to see any of them associated with *C. coeruleus, C. elegans, C. persistens,* or *C. westoni.* It will probably require further study, perhaps of other portions of *Calochortus* DNA, to clarify these relationships fully.

Field notes – In mid-June 1988, Jim and I found a large population of *C. nudus* along Highway 89, not far north of the Shasta-Siskiyou county border, at about 4000 feet. While we saw other groups later in other places, none of them seemed to flower as consistently from year to year as this one. We visited the area frequently and in other years found it in bloom as early as the end of May, or as late as early July. The location is marked by the highway's entry into the northern edge of a moist mountain meadow, and it traverses the northern border of the meadow for more than a quarter mile. Near the eastern end of the meadow, *C. nudus* blooms along both sides of the highway for at least 100 yards; and in a good year, can be seen extending (behind fencing) south well into the meadow. The plants also extend north just into the edge of the woods; and back in the woods, it is possible to find individual plants nearly a foot tall. Out in the sun, they are typically 4 to 7 inches high, with height and number of flowers seeming to depend on the plant's maturity. Petal colors range from white to lilac, and the petals are marked by a distinctive purple crescent or "∩" mark at the gland. The presence or absence of such a marking became the primary way we distinguished between "pure" *C. nudus*, and the *nudus* X *minimus* further south of here.

Risk – The California Native Plant Society's ***Inventory of Rare and Endangered Plants*** (6th ed., 2001) does not even list *C. nudus* – although curiously, it does list "*C. nudus* var. *shastensis*" – a term discarded by Ownbey more than sixty years earlier – with the comment "Considered but rejected: a hybrid." My reading of Ownbey and earlier authors does not support categorizing it as a "hybrid" but rather as an early misnomer. In any event, *C. nudus* is reasonably common, with cattle and wildlife grazing probably its worst threats.

Cultivation – Though he tried a number of times, Jim was not very successful with *C. nudus*, despite cold stratification of the seeds and plenty of extra water so long as the weather remained cool. We thought our Sonoma county summers might be too hot for it, as we were unable to keep the pot as cool as the soil in its high, moist mountain meadows probably is, even when the air temperature gets quite warm. If seed comes your way, I would recommend cold stratification, then planting in a moderately well draining mix, providing plenty of water in the spring, and trying to keep the pot as cool as possible during the dry summer months.

Request for *Calochortus clavatus* var. *gracilis* locations –

Reader Brad Carter is working on a comprehensive picture book of West Coast bulbs, intending to cover all the species and varieties of *Calochortus*, *Erythronium*, *Fritillaria*, and *Lilium*. He would like to photograph *C. clavatus* var. *gracilis* this spring, and needs suggestions for good, accessible locations in the San Gabriel and/or Santa Susanna Mountains. If you know of any appropriate populations of this uncommon species, please contact him in one of the following ways:

< bradcarter@aol.com > -*or*- (530) 271-5790 (home phone) -*or*- (530) 272-8900 (message phone)

Brad enjoys having company on his photographic forays, so if you are interested in showing him specific populations, or if you'd like to join him on another spring or summer trip, let him know that.