# Differentiating *Mimulus jepsonii* and *M. nanus* in South-Central Oregon: A Problem in Applied Systematics[1]

By Robert J. Meinke

One of plant taxonomy's numerous goals is to provide a serviceable classification that biologists, foresters and other professionals can use to identify accurately species in the course of their work. Most workers rely exclusively on state or regional floristic manuals, such as **Flora of the Pacific Northwest** (Hitchcock and Cronquist 1973), which summarize the species for a given area based on the opinions of numerous taxonomic authorities. Although these extensive references are invaluable, size limitations often make it impossible to include adequately all the natural variation encountered during botanical field studies. This is particularly true if the focus involves rare or unusual taxa.

*Mimulus jepsonii* (Scrophulariaceae), a delicate, annual monkeyflower with purplish-red corollas, provides an example of the problems that can arise in distinguishing rare from more common species. First described by Grant (1924), the species belongs to the *Eunanus* section of the genus, characterized by low-growing annuals with yellow or reddish flowers, often occurring in dry, sandy sites. Peck (1961) reported that *M. jepsonii* occurred only from southern Klamath County (Oregon) to Nevada and California, with the majority of collections from northern California. Because of its apparent rarity, Siddall et al. (1979) recognized *M. jepsonii* as a potentially endangered species for Oregon. Later, it was placed on the Sensitive Species List maintained by Region 6 of the US Forest Service.

*Mimulus jepsonii* ×1

With inclusion on the Forest Service Sensitive Species List, *M. jepsonii* became, in effect, a protected plant on national forest lands in Oregon. Despite this status, little was known about the species outside of the limited information available in the floras (Munz 1959, Peck 1961), and a very outdated taxonomic monograph (Grant 1924). This lack of knowledge eventually became an acute problem, when abundant populations of red-flowered *Mimulus* were found on lands scheduled for timber harvest along the east flank of the southern Cascades Range. Botanists working in the four affected national forests, the Deschutes, Winema, Umpqua and Fremont, began having doubts concerning identification of these populations, despite careful use of available taxonomic keys. Many populations had members with at least some characteristics of *M. jepsonii*. However, many, and perhaps most, also showed a strong affinity to *M. nanus*, another member of the *Eunanus* group that is common and widely distributed east of the Cascades.

Although the morphological split between the two species seemed reasonable on paper (Grant 1924, Munz 1959, Peck 1961), applying the written descriptions and keys to plants in the field proved problematic. Habitat difference could not be used as a means to separate the species either, because virtually no ecological information was available.

Although Peck (1961) implied that *M. jepsonii* did not occur north of southern Klamath County, the Forest Service encountered populations of what seemed to be this taxon as far north as Deschutes County in central Oregon. University taxonomists confirmed this tentative identification, at least for the few collections submitted for determination. However, there were conflicting opinions concerning some specimens, and the identity of most populations remained unsubstantiated. Moreover, additional sites of *M. jepsonii*-like plants were being reported routinely, some of these mixed within populations of what were clearly *M. nanus*.

This investigation attempts to clarify the confusion associated with distinguishing *M. jepsonii* and *M. nanus* in Oregon. The Forest Service needed to know if the two species were distinct and if they could be readily separated in the field. It also needed to be determined whether the taxa actually co-existed in nature, or if this was a misperception based on morphological variation within species. By determining which, if any, of the populations were *M. jepsonii*, an informed decision could be made concerning the need for specific site protection and the overall status of the species in Oregon.

## TAXONOMIC METHODS

### Study Options

Various techniques can help decide if a group of similar populations or specimens represent one or more taxonomic entities. When questions are raised concerning species identification, the first step is to have a specialist evaluate available collections, under the assumption that simple misinterpretations of existing keys and descriptions may be the basis of the problem. If the puzzle persists, an integrated approach may be more productive. For example, it could be important to characterize habitat differences among sites and relate these to plant morphology. Perhaps plants that correspond most to descriptions of *M. jepsonii* associate

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with certain vegetation types or soil conditions. Life history traits could also be important. In other *Mimulus* groups, closely related species differ significantly with respect to breeding systems and germination requirements (Meinke 1983, 1992; Ritland and Ritland 1989). Field or greenhouse studies might reveal comparable distinctions in pollination or seed biology between M. *jepsonii* and M. *nanus*.

Herbarium studies might be augmented with *cytological* investigations, where potential difference in chromosome structure or number could be evaluated. However, chromosomes in *Mimulus* are very small and difficult to compare structurally. Perhaps the most definitive means to evaluate suspected species differences is via molecular studies, using a laboratory technique called *electrophoresis*. Electrophoretic studies of selected enzyme systems, using tissue samples from living plants, could detect biochemical divergence among populations and species. One could even search for chloroplast DNA mutations, a procedure commonly used today in the reconstruction of evolutionary histories and relationships of plants. However, there is no guarantee that chromosome studies or molecular biology would contribute to a practical classification for field use, even if genetic differences among populations were detected. This is because these types of variations, so important from an evolutionary perspective, are seldom correlated with external morphology at the species level.

## A Focus on Morphology

After considering the alternatives, it was determined that an ecological survey combined with a morphological study, using a method known as Principal Component Analysis (PCA), would likely provide the most pragmatic approach to the M. *jepsonii* - M. *nanus* problem. This type of morphological evaluation is often called a *phenetic analysis*. In using PCA, an investigator selects *x* morphological attributes, then measures them on one or more plants from *y* populations. Usually 15-20 traits are measured at a minimum, and typically include floral as well as vegetative features. The investigator selects a range of characters for evaluation, usually including those considered important in the taxonomy of the study group, as identified by previous workers. PCA is useful in species separation studies, because it avoids the need for preconceived assumptions about which populations are thought to represent which taxa. Statistically, the procedure reduces the number of variables in the overall data set by forming linear combinations that explain most of the variability. In general terms, the analysis is designed to identify key morphologic features helpful in distinguishing the species, and will group populations as points on a graph, according to their overall similarity. For M. *jepsonii*-M. *nanus* sites in central Oregon, 20 traits (Table 1) were measured for 65 populations. These occurred from Deschutes to Klamath Counties, and were all sampled in 1991. Five plants were measured per site, and used to calculate a population average for each of the traits in Table 1. Included in the analysis, as a benchmark, was the type collection of M. *jepsonii* from California (Grant 1924). Type collections are important in taxonomy, because they are the specimens upon which the original published description of a species is based. Finally, three living populations of M. *nanus* from Harney County, where M. *jepsonii* was not present, were added for comparison. The PCA program in the software package STATGRAPHICS was employed in the phenetic analyses.

**Table 1.** *List of morphological traits measured from* Mimulus *plants for use in Principal Component Analysis (see discussion in text). Sixty-nine study populations were sampled. An average measurement was derived for each trait (from five samples per population) for use in the analyses.*

**(1)** Length of the longest root. **(2)** Combined length of first two internodes above cotyledons. **(3)** Length of initial stem leaf. **(4)** Width of initial stem leaf. **(5)** Length of upper cauline leaf. **(6)** Width of upper cauline leaf. **(7)** Peduncle length (in fruit). **(8)** Calyx length (in flower). **(9)** Calyx width (in flower). **(10)** Calyx length (in fruit). **(11)** Calyx width (in fruit). **(12)** Overall corolla length. **(13)** Corolla limb length. **(14)** Corolla limb width. **(15)** Corolla tube length. **(16)** Corolla tube width. **(17)** Distribution of hairs on the front of the corolla (on one, or both, corolla lips). **(18)** Length of upper corolla lip. **(19)** Width of upper corolla lip. **(20)** Length of capsule.

Forest Service botanists were concerned that phenology or microhabitat might determine morphology, and that plants identified as M. *jepsonii* might merely be growth forms of M. *nanus* influenced by environment. To address this problem, two separate PCA's were run. The first analysis utilized data measured in the field, using adult, flowering plants selected from each study population in mid to late June. The type collection of M. *jepsonii* (discussed above) was evaluated with this group. The second PCA used equivalent data, but these were recorded from greenhouse-cultivated individuals in late June. The greenhouse plants were raised together at Oregon State University, where they were grown from seedling transplants gathered several weeks earlier from 27 of the original 68 study sites. Transplants were used rather than germination from seed, because of the reported difficulty in getting these species to germinate well in the lab or greenhouse (Ezell 1971). The idea was to determine if plants from a common environment (i.e., the greenhouse) would be more homogeneous than plants from various field locations, presumably more subject to environmentally-induced variation. A trend toward homogeneity in the greenhouse would support the notion that only a single, variable species (presumably M. *nanus*) was represented in the populations selected for study.

Ecological observations of populations were recorded to complement the morphological evaluations described above. General inspections of vegetation and soil were made at each site to check for potential correlations with population differences recognized by morphological analysis. In addition, the pollination biology of selected populations was compared. Insect pollinators were recorded, and seed set measured in the field and greenhouse

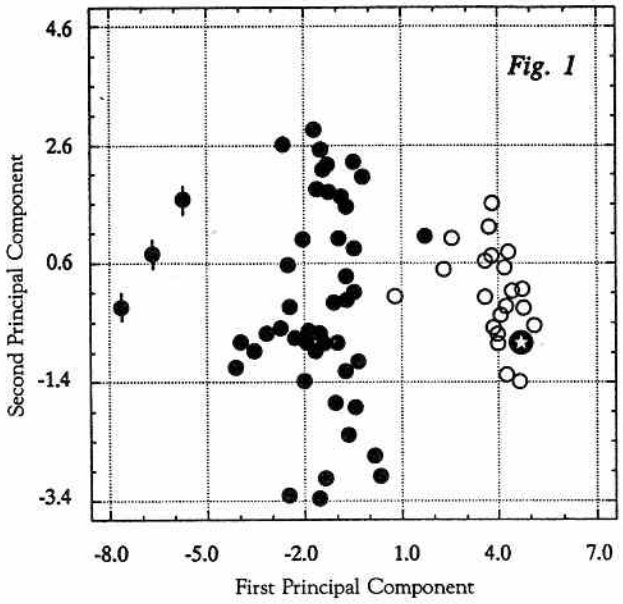
(where pollinators were excluded). Seeds were gathered from populations in each national forest for two germination tests; i.e., (1) a pretreatment of cold storage at 3 °C for two months prior to soaking; and (2) soaking 1-2 days after collection, without a cold treatment.

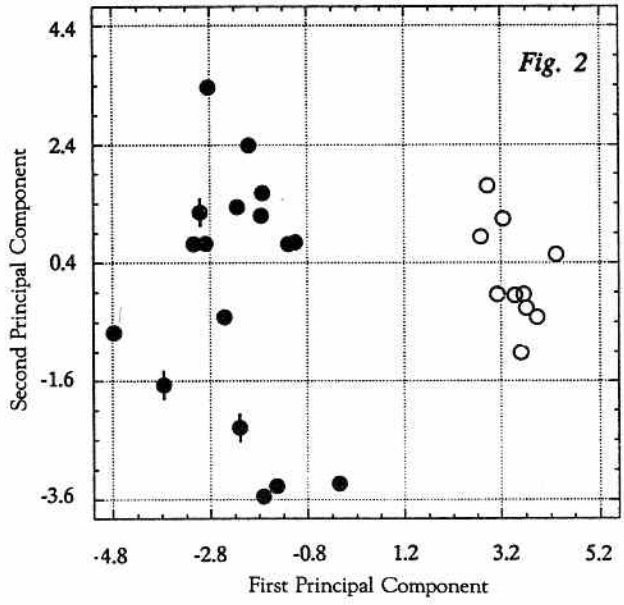
## RESULTS

### Morphological Differences

The PCA diagram (Figs. 1 and 2) clearly indicated that discrete taxonomic entities were present among the sampled populations, based on the traits used in the analyses. The open circles depict populations that generally match published descriptions of M. *jepsonii*. This determination was supported by the close association of these populations with the type collection of M. *jepsonii* (indicated by the star in Fig. 1). The dark circles represent populations that correspond to M. *nanus*, evidently the more variable of the two species, based on data point distribution. Comparison showed that growth in a common greenhouse environment (Fig. 2) did *not* result in convergence among populations, as might be expected if plants identified as M. *jepsonii* were solely the product of environmental modification. In fact, M. *jepsonii* appeared to become even more distinct when grown together with M. *nanus*. It is also interesting that populations of M. *nanus* from the 65 main study sites near the Cascades appeared to be different morphologically from the populations from Harney County, indicated by the three circles on the far left of Fig. 1.

Several characteristics from Table 1 are apparently valuable in distinguishing M. *jepsonii* from M. *nanus*. Three of these; i.e., combined length of the first and second internodes, length of the longest root, and distribution of hairs on the front of the corolla, were identified by PCA as being particularly useful. In M. *jepsonii*, the initial internodes were usually considerably elongated in contrast to M. *nanus*, with flowers and upper leaves often appearing bunched toward the top. If they branched at all, M. *jepsonii* plants tended to do so well above the base, while M. *nanus* plants often branched near the base and became "bushy." In the greenhouse, M.*jepsonii* may branch out more than is typical in the field, but the internode character remains distinctive. The internode trait is not stressed in existing keys, and was first appreciated as diagnostic by David Thompson. a taxonomist in southern California who is interested in *Mimulus*. Roots are rarely of value in identifying differences among annual species, but these taxa are an exception. The intricate, finely branched roots of M. *nanus* ranged from 2-4 times longer than those of M. *jepsonii*, a tendency that re-




**Figs. 1 and 2 (left to right). Results of Principal Component Analyses (PCA) of *Mimulus* populations.** PCA is a multivariate statistical technique that measures likeness among populations, based on selected aspects of plant morphology. (See text for discussion.) The traits used here are listed in Table 1. The symbols in the above diagrams indicate populations, with proximity a direct measure of morphological similarity.

**Fig. 1** — PCA based on measurements taken from plants in the field. The dark circles represent M. *nanus* populations. The three circles on the far left (with vertical hatch marks) are from Harney County, while the 44 circles towards the middle depict the main study populations from central Oregon. Open circles represent M. *jepsonii*, with the star indicating the type collection.

**Fig. 2** — PCA based on measurements taken from greenhouse plants grown from selected field populations. The symbols are the same as described for Fig. 1. Populations of M. *nanus* and M. *jepsonii* become less similar when grown in a homogeneous greenhouse environment, supporting their recognition as separate species.

mained evident even in the greenhouse. However, using this as a field character would require careful excavation. Finally, the differing arrangement of the corolla hairs on the front of the corolla was very specific — in M. *nanus* these were restricted to the extended, lower lip (sometimes called the lower "palate"), while in M. *jepsonii* they were plainly distributed above and below the opening of the corolla. They were whitish in color, and easy to spot with the naked eye, if flowers were fresh. This consistent trait was first recognized by Pennell (1951), but essentially ignored by others. Additional more or less diagnostic features of M. *jepsonii* include narrower leaves, and shorter calyces, corollas and capsules. Table 2 summarizes and quantifies important morphological differences between M. *jepsonii* and M. *nanus*.

**Table 2.** *Summary of morphological differences observed between* Mimulus jepsonii *and* M. nanus *in central Oregon. Quantities represent averages ± one standard error, with the range of the samples listed parenthetically. Five plants were measured per population.*

| Trait | *Mimulus jepsonii* (21 populations) | *Mimulus nanus* (47 populations) |
|---|---|---|
| Length of longest root (cm) | **3.6**±1.1 (0.8- 6.2) | **8.9**±3.6 (2.2-16.5) |
| Length of first two internodes (cm) | **5.4**±2.1 (1.7- 7.2) | **1.8**±0.8 (0.4- 5.6) |
| Length of longest stem leaf (cm) | **1.6**±0.5 (0.9- 2.7) | **2.3**±1.6 (1.4- 4.4) |
| Width of longest stem leaf (cm) | **0.3**±0.1 (0.1- 0.5) | **0.9**±0.6 (0.4- 1.5) |
| Length of flowering calyx (mm) | **4.3**±0.8 (3.4- 5.6) | **7.1**±1.4 (4.6- 8.8) |
| Width of flowering calyx (mm) | **1.5**±0.4 (1.1- 2.1) | **2.2**±0.9 (1.3- 3.3) |
| Length of fruiting calyx (mm) | **5.3**±1.0 (3.9- 6.9) | **8.5**±1.9 (5.9-10.0) |
| Width of fruiting calyx (mm) | **2.2**±0.6 (1.4- 3.1) | **3.5**±1.1 (1.9- 4.1) |
| Corolla length (mm) | **10.2**±1.6 (8.0-13.0) | **18.1**±5.0 (9.1-28.0) |
| Capsule length (mm) | **5.3**±0.9 (4.0- 7.1) | **7.3**±1.3 (5.0- 9.0) |

## Problems with Previous Descriptions

Characters determined by this study to be taxonomically useful were often disregarded in earlier keys, and therein lies much of the problem in appreciating the validity of M. *jepsonii*. Grant (1924) separated the two species by maintaining that the fruiting calyx of M. *nanus* became "distinctly inflated" while that of M. *jepsonii* was "little or not at all inflated." By comparing width/length ratios for both species, from Table 2, we can see that relative calyx dimensions did not change much from flower to fruit (0.35→0.41 for M. *jepsonii*; 0.33→0.41 for M. *nanus*). In any case, calyces of M. *nanus* did not become any broader than those of M.*jepsonii*. In Peck (1961), division between the species was also depicted as absolute. In M. *jepsonii* the corolla was listed as 1 cm. long, while in M. *nanus* it was stated to range from 1.5-2.0 cm. Table 2 shows that corolla length for both species deviated considerably from the range limits imposed by Peck (1961), who also set M. *jepsonii* apart by stating that its leaves were chiefly basal. This feature was virtually never noted among the several thousand M. *jepsonii* plants examined during the study, which generally bore most leaves several cm above the base! Munz (1959) likewise relied on corolla dimensions to separate the two species, allowing for a bit more leeway than Peck (1961) but still not conceding any overlap (9-11 mm vs. 13-20 mm). He also used calyx length as a key character, a feature that worked reasonably well but which, as with the corollas, was subject to enough variation to make it unreliable (Table 2). Holmgren (1984) added a recent twist, indicating that corolla length in M. *nanus* ranged from 1.0-1.5 cm, in complete contrast to Peck's measurements.

## Habitat Considerations

The populations identified as M. *jepsonii* usually occurred in small forest gaps, primarily with vegetation predominated by lodgepole pine *(Pinus contorta)*, or occasionally ponderosa pine *(P. ponderosa)*. *Mimulus nanus* is associated with the same two dominant tree species, but with the habitat preference reversed from that of M. *jepsonii*. Unfortunately, there is enough inconsistency in the distribution of the two species within these forest types to make plant community an unreliable indicator in species identification. *Mimulus nanus* also grows in a variety of scrub and steppe communities, although more commonly to the east of the study area.

A comparison of soil characteristics proved more valuable. Forest Service botanists reported many populations of M. *jepsonii* growing in so-called "popcorn" soil, a reference to the loose, very coarse sand or cobbles that reulted from depositions of pumice and volcanic gravels. In every case, populations identified by the PCA as M. *nanus* grew in this substrate. All populations designated as M. *jepsonii* grew in a heavier soil, containing some pumice but predominantly composed of finer particles that adhere when moist. The difference between the two soils was dramatically illustrated when seedlings and juveniles were transplanted to containers for transport to the greenhouse. The soil around M. *nanus* plants ran between fingers when scooped from the ground, often resulting in the untimely demise of transplants that were unable to tolerate bare roots. It seemed that in the study area, at least, the more substantial root systems of M. *nanus* may be an adaptation providing stability and enhanced moisture uptake in loose, dry soil. Conversely, the substrate supporting M. *jepsonii* populations could literally be sliced with a knife, and entire blocks could

be lifted out intact, much as one might cut a pan of brownies.

## Reproductive Ecology

No significant differences for any aspect of reproduction were observed between M. *jepsonii* and M. *nanus*. On sunny days, populations of M. *jepsonii* and M. *nanus* were freely visited by various potential pollinators. Most common were solitary bees (families *Halictidae* and *Megachilidae*), long-tongued beeflies (family *Bombyliidae*), and several syrphid flies (family *Syrphidae*). The size and behavior of these insects suggested they were capable of pollinating *Mimulus* flowers of both species. Self-pollination is also possible for both species, but is generally inefficient. In the pollinator-free greenhouse, self-pollinating M. *jepsonii* flowers set an average of $13 \pm 10$ seeds per fruit (out of roughtly 300-400 ovules!), while M. *nanus* flowers produced $18 \pm 12$ seeds in each capsule (both $N = 15$). In the field, open-pollinated M. *jepsonii* flowers averaged $146 \pm 43$ seeds per capsule, and M. *nanus* flowers produced a mean of $225 \pm 78$ (both $N = 15$). Germination for both taxa occurred only after seeds were subjected to cold temperature (3 °C) prior to soaking, confirming the earlier report by Ezell (1971). Out of 300 seeds per species, 45 germinated for M. *nanus* and 78 for M. *jepsonii*. These low percentages might be enhanced by providing a longer pretreatment, or by soaking seeds during refrigeration. (They were merely kept damp in this instance.)

# DISCUSSION

## General Conclusions

Most of us have been frustrated by plants that, despite our best effort, cannot be satisfactorily keyed out. Such was the case here, where Forest Service botanists and others encountered local variations in *Mimulus* unaccounted for in available manuals and floras. A statistical evaluation of samples from four national forests confirmed that two monkeyflower species were indeed present. There was remarkably little overlap between the species at the population level, despite the fact that individual specimens did not always conform to the criteria in the existing manuals. Twenty-one M. *jepsonii* populations were identified in this study. All were confined to the Deschutes and Umpqua National Forests and were distributed along the east slope of the Cascades, from central Deschutes County south to Diamond Lake. The south shore picnic area at Diamond Lake was the best place to see showy displays of M. *jepsonii*, which peaked in late June and early July in 1991. This site had fair to good precipitation in March.

Two factors contributed to the difficulty workers had in identifying M. *jepsonii*. First, Forest Service botanists are typically restricted to a limited area of operation, often focusing on a single ranger district or timber sale. Consequently, there was little opportunity to evaluate *Mimulus* populations over a wide enough range to pick up the differences among forests. Second, a great deal of phenotypic plasticity (i.e., variation in plant appearance) occurred within most M. *nanus* populations, increasing the potential for misidentification. This is a common phenomenon for many of our widespread monkeyflowers (Hiesey et al. 1971, Vickery 1978). In large plant populations, especially in cross-pollinating annuals such as *Mimulus*, morphological oddities commonly result from environmental factors or novel genetic expression. Those who have botanized in central Oregon know that M. *nanus* populations can be immense in favorable years. As a result, it is not unexpected to find occasional plants that more or less correspond to published descriptions of other species, particularly M. *jepsonii*. These individuals develop smaller than normal flowers, and may also produce elongate internodes and unusually narrow leaves. Early in the study, it was suspected that some of the Forest Service reports of M. *jepsonii*, principally from Lake and Klamath Counties, probably represented aberrant individuals of M. *nanus* scattered among thousands of "normal" plants. Field work conducted during the study supported this impression. As previously stated, M. *jepsonii* and M. *nanus* were never seen to occur together, a condition possibly due to different substrate preferences.

## Identification

To separate M. *jepsonii* from M. *nanus*, first evaluate distribution of corolla pubescence. The presence of scattered hairs on the lower *and* upper lips always denotes M. *jepsonii*. The remaining characters summarized in Table 2, and the key below, confirm the identification, particularly if corollas are shriveled or absent. As additional evidence, the investigator should take note of the habitat, specifically soil characteristics.

Whenever doubt persists, plant morphology throughout the population should be surveyed before settling on species determination. Examination of a number of individuals in a population should help determine whether a particular variation is consistently represented, or merely a quirk. Infraspecific variability is frequently the basis for problems encountered in keying out plants.

## Further Questions

Is the morphological diversity reported here for M. *jepsonii* and M. *nanus* representative of the two species throughout their ranges? Perhaps not, at least as far as M. *nanus* is concerned. It is evident that populations of this species from Harney County were most similar to each other (Fig. 1), implying that M. *nanus* may consist of distinct geographic races. Regional variation in the species was also observed by Ezell (1971), who suggested in his doctoral dissertation that certain Cascadian M. *nanus* populations should be recognized as a distinct subspecies i.e., subsp. "*cascadensis*"). Ezell (1971) also proposed that M. *jepsonii* be reduced to a subspecies of M. *nanus*. One could argue that Fig. 1 supports this position, because M. *jepsonii* appears to be no more unique than the outlying populations of M. *nanus* from Harney County. However, when M.

*nanus* was grown in the greenhouse, the Harney County plants lost much of this distinction (Fig. 2), suggesting that any "racial" separation between eastern and central Oregon plants is overcome by a common growth environment. *Mimulus jepsonii*, on the other hand, did not lose its identity.

Should M. *jepsonii* be maintained as a distinct species? The answer is an unequivocal "yes," based on what we have learned here. Clearly, it is a separate entity from M. *nanus*, and the morphological relationship between the two taxa is more distant than is traditionally attributed to subspecies or varieties. Of course, it is possible that differences between the species break down outside of Oregon. However, the fact that the type collection of M. *jepsonii* (from the Mt. Lassen area in California) clustered so well with the Oregon populations (in Fig. 1) implies the contrary. Moreover, the separate identities of the species have apparently not come into question in California, although this may be due to their geographic and elevational ranges being more dissimilar farther south.

How should the information gained here influence management of M. *jepsonii?* We now know that in Oregon, at least, the species is less widespread than reported earlier. Nonetheless, M. *jepsonii* is not exactly uncommon, and in some areas it can be locally abundant, particularly where moderate forest disturbance has occurred. As of now, however, there is no firm evidence that the species benefits from disturbance, and further studies are in order. *Mimulus jepsonii* occurs at the northern edge of its range in our area, and it will surely benefit the genetic diversity of the species if Oregon populations are preserved. Besides, Jepson's monkeyflower provides one of the few splashes of spingtime color in an otherwise drab lodgepole pine understory, and perhaps that is justification enough for keeping it around.

M. *jepsonii*

## Key to the Red-flowered Annual *Mimulus* Species of Central Oregon

M. *nanus*

**1** Pedicels from 3-12 mm long, nearly equalling or exceding the calyx; corollas up to about 7 mm long; moist microsites in or near the mountains ..... M. *breweri*

**1′** Pedicels less than 4 mm, always much shorter than the calyx; corollas usually longer than 8 mm; plants widespread, often in low, arid habitats.

**2** Corolla 8-10 (-12) mm long, with hairs above *and* below the corolla orifice; leaves nearly linear to ± oblanceolate; first 2 internodes elongate, up to 7 cm long, plants usually branched well above the base; from near the Cascade Mountains, usually in mesic lodgepole forest, rarely in dry, sandy soil ..... M. *jepsonii*

**2′** Corolla (9-) 12-35 mm long, with hairs limited to the lower palate (lip); leaves oblanceolate to ovate; first internodes not usually much elongated; in a variety of mostly xeric sites, typically in loose, sandy soil.

**3** Major stem leaves (10-) 14-30 mm wide, broadly ovate, acute; flowering calyx 8-15 mm; herbage with a mephitic (skunky) odor ..... M. *cusickii*

**3′** Major stem leaves 4-14 mm wide, oblanceolate, mostly obtuse; flowering calyx 4-9 mm; herbage odorless ..... M. *nanus*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# Some Recent Taxonomic Changes Affecting the Names of Oregon Plant Species

## By Kenton L. Chambers

Books, like people, grow old and eventually need to be retired. The principal floristic manuals covering the flora of Oregon are reaching this venerable state. These include **Manual of the Higher Plants of Oregon** (Peck, 1961), **Illustrated Flora of the Pacific States** (Abrams, 1923, 1944, 1951, 1960), **A California Flora** (Munz and Keck, 1959), **Vascular Plants of the Pacific Northwest** (Hitchcock and Cronquist, 1973). Such works are still extremely useful, their detailed keys, descriptions and illustrations allowing identification and naming of virtually all native and introduced species of the state. As newer books are published, however, like the forthcoming revised version of **Manual of the Flowering Plants of California** (Jepson, 1925), older reference manuals will gradually lose their utility and scientific rigor. They will not represent current knowledge about species names and relationships based on the best and most recent taxonomic research.

The pace of new research in systematics (plant taxonomy, in the broad sense) continues at a high rate in botanical institutions all over the world. Studies by taxonomists in countries as far away as Europe and the Orient have to be examined for new insights about the relationships and classification of Oregon's flora. Botanists who wish to keep abreast of taxonomic research have at least two difficult problems to overcome; first, they must be aware of pertinent publications throughout the vast scientific literature, and second, they must check and evaluate taxonomic conclusions derived from such research. The most criticial publications to Oregon botanists are those which propose significant changes in names and classification of particular Oregon genera. Botanists are almost never forced to adopt new names for familiar plant species; changes are usually optional, based on evaluation of the quality of supporting research and reasonableness of the authors' conclusions. Only if existing plant names are found to be unusable (e.g., "illegitimate") because of particular rules in the International Code of Botanical Nomenclature (ICBN) are we literally forced to abandon them.

The purpose of this article is to list and comment on some proposed changes in the names of Oregon plant species. These changes are the result of recently published taxonomic research. Biologists constantly deal with plant names; however, once we have memorized Latin names for numerous species, it is disconcerting, to say the least, to find other botanists using different names. We ask ourselves, "What goes on here; what's the excuse for changing names?" Perhaps it is a simple difference, such as a letter or two in the spelling of a name. For example, both *Sidalcea malvaeflora* and *Polygonum phytolaccaefolium* bear misspelled species names. Correct are *malviflora* and *phytolaccifolia*, as mandated by a provision in ICBN permitting only the letter "i" as a connecting vowel in compound words of Latin origin. The connector "ae" is not allowed, even though 19th century botanists who originally named these species used it. Likewise, *Pachistima* (Celastraceae) must be spelled *Paxistima* (Chambers, 1992), because the latter name was legitimately published, while the former was not. Other recent changes that we have selected, below, are more significant, representing major differences from the reference manuals listed earlier. No doubt many of the changes will be adopted in the upcoming revised edition of Jepson's manual, as well.

Research leading to rearranging generic relationships is a frequent source of new and unfamiliar plant names. The category of genus is basic and indispensible to nomenclature. By merely speaking the name of a genus (*Rhododendron*, for example), we call to mind a constellation of diagnostic traits — a mental picture, so to speak — by which we recognize a large group of related species. A change in the name of a genus is indeed a major event, which may alter our views of species relationships. Modern systematics research is exposing many past errors in classification, however, and the advance of science cannot be held back simply by nostalgia for familiar plant names.

A good example of correcting past taxonomic errors is the recently-published research by Chuang and Heckard (1991) on the genera *Castilleja* and *Orthocarpus* (Paintbrush and Owl-clover, Scrophulariaceae) and their relatives. The traditional genus *Orthocarpus* is shown to be an artificial assemblage of three evolutionary lines; one line properly belongs within *Castilleja*, another retains the name *Orthocarpus*, and the