

A Newsletter for the flora of New Mexico, from the Range Science Herbarium and Cooperative Extension Service, College of Agriculture and Home Economics, New Mexico State University.

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A Taxonomic Study of *Philadelphus* (Hydrangeaceae) as It Occurs in New Mexico*

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Abstract

All specimens of *Philadelphus* in the UNM herbarium from New Mexico were examined and measured to evaluate the representation of this genus in the state. Ninety-eight specimens were scored for 31 morphological characters to create a data set which was then used for principal component analysis. These multivariate analyses were combined with a review of the quality of characters used in previous monographs by Rydberg (1905), Hitchcock (1943) and Hu (1956) and an analysis of the geographic variation of character states in New Mexico. Together, these lines suggest that the current number of recognized *Philadelphus* taxa in the state (Martin and Hutchins 1980) is inflated. Examination of *Philadelphus* in the field and in other herbaria is necessary before this work may be considered complete, however, a tentative conclusion is that there are only 4 *Philadelphus* taxa in the state in 2 species: *P. mearnsii*, *P. microphyllus* subsp. *microphyllus*, *P. microphyllus* subsp. *argenteus* and *P. microphyllus* subsp. *argyrocalyx*.

Introduction

Nine species of *Philadelphus* have been reported from New Mexico in the most recent floristic treatment for the state (Martin and Hutchins 1980) with one, *P. microphyllus*, having two recognized varieties. The nomenclature used in the Flora of New Mexico (Martin and Hutchins 1980) and in the latest checklist of New Mexico species (Kartesz 1994) follow the nomenclature and distributional notes in the most recent systematic treatment for the genus as a whole (Hu 1956). Seven of the New Mexico taxa are placed by Hu (1956) in the subgenus *Philadelphus*, section *Microphyllus* (Koehne) Hu: *P. argenteus* Rydb., *P. argyrocalyx* Woot., *P. madrensis* Hemsl., *P. microphyllus* Gray var. *microphyllus*, *P. m.* var. *ovatus* Hu, *P. occidentalis* A. Nels. var. *occidentalis*, and *P. wootonii* Hu. In the subgenus *Deutziodes* Hu, Hu placed three other New Mexico *Philadelphus*: *P. hitchcockianus* Hu and *P. mearnsii* W. H. Evans ex Rydb. (in the section *Pseudoserpyllifolius* Hu) and *P. serpyllifolius* Gray (in the section *Serpyllifolius* Hu). Six of the ten taxa reported to be found in New Mexico by Hu have their type localities in-state, making study of the New Mexico specimens particularly germane to the systematics of these species.

Taxonomic history of *Philadelphus* in New Mexico

The first known xerophytic species of *Philadelphus*, *P. microphyllus*, was described in 1849 by Asa Gray, based on a collection by Fendler from Santa Fe. In the first monograph of the *Philadelphus* of North America, Rydberg (1905) referred to six New Mexico species, all placed in the *Microphylli* group of *Philadelphus*. This included the three previously described species, *P. microphyllus* A. Gray 1849, *P. serpyllifolius* A. Gray 1852 and *P. argyrocalyx* Woot. 1898, as well as three species described by Rydberg (1905) from Southern New Mexico; *P. argenteus* Rydb., *P. mearnsii* W. H. Evans ex. Rydb. and *P. ellipticus* Rydb.

The first Flora of New Mexico (Wooton and Standley 1915) listed only four New Mexico *Philadelphus*: *P. argyrocalyx*, *P. argenteus*, *P. microphyllus* and *P. mearnsii*. Wooton and Standley argued that the type of *P. ellipticus* Rydberg 1905 had an incorrect locality and that the specimen was in all respects identical with the type of the previously described *P. argyrocalyx* Woot. *P. serpyllifolius*, listed by Rydberg (1905) as distributed from "rocky places of Western Texas and New Mexico" was not included in the Flora of Wooton and Standley, nor explicitly synonymized with any of the included species.

* An expanded version of this paper including more detailed results of the analyses, taxa descriptions, distribution maps, materials examined and additional notes on taxon specific characters, biogeography and delimitation is available

(Continued on page 2, *Philadelphus*)



(*Philadelphus*, Continued from page 1)
upon request from the author.

Hitchcock (1943) monographed the xerophytic *Philadelphus* of the southwest and reduced five of the Microphylli group species recognized by Rydberg into subspecies of *P. microphyllus*. This included two species from New Mexico, *P. argyrocalyx* and *P. argenteus*. Nevertheless, disregarding differences in rank, Hitchcock's list of New Mexico species is the same as that of Wooton and Standley (1915). Hitchcock did cite one New Mexico locality for *P. serpyllifolius* in his "material seen" section, but this is for the type which is from "between western Texas and El Paso, New Mexico" (sic). Hitchcock's distribution map for *P. serpyllifolius* (his Fig. 1) shows its range to be entirely within Texas.

Hitchcock (1943) did offer some taxonomic changes affecting the understanding of *Philadelphus* in New Mexico. First, he included two Mexican species, *P. palmeri* Rydb. and *P. madrensis* Hemsl. 1908, in synonymy with the type of *P. argenteus* (*P. microphyllus* subsp. *argenteus* Rydb. (Hitchcock)). Hitchcock also suggests that the *P. asperifolius* Koern 1867 (recognized by Rydberg 1905), another Mexican species, may be synonymous with *P. argenteus*, although in absence of proof of its identity, he simply did not use the name.

Hitchcock described a number of other subspecies of *P. microphyllus*, though none from our area. Interestingly, the distribution of *P. microphyllus* subsp. *occidentalis* (Nels.) Hitchcock (in which Hitchcock included *P. occidentalis* Nels., *P. minutus* Rydb. and *P. nitidus* Nels.) is shown in his Fig. 1 overlapping the far northwest corner of New Mexico. None of the 44 specimens cited under "material seen" for this taxon, however, is from New Mexico.

Hu's comprehensive monograph of the entire *Philadelphus* genus (1956) changes the taxonomy of New Mexico *Philadelphus* more than any revision this century. Hu moved *P. serpyllifolius* and *P. mearnsii* to separate subgenera from the rest of the Microphyllus group, and ranked the latter as one section within the *Philadelphus* subgenus. Within the Microphyllus section, Hu recognized all three Rydberg 1905 species from New Mexico at the specific rank and elevated all of Hitchcock's subspecies of *P. microphyllus* to the specific rank as well. Hu described one new New Mexico species of Microphyllus section *Philadelphus*, *P. wootonii*, which is sympatric with and morphologically similar to the rare endemic *P. argyrocalyx* and two new varieties of *P. microphyllus*, var. *ovatus* from New Mexico and var. *linearis* from Arizona. Hu split *P. minutus* and *P. nitidus* out from *P. occidentalis* and placed them in the taxon *P. occidentalis* var. *minutus*. *P. occidentalis* var. *occidentalis*, which was originally described as a rare species from a single locality in Colorado by its author, was now given a range spanning from California to Texas, including localities in central and southern New Mexico. *P. madrensis* was resurrected out of *P. argenteus* and its range extended from Mexico into New Mexico. Hu also located *P. serpyllifolius* clearly within New Mexico on his distribution map for the section (near Columbus), but as with Hitchcock, his only cited material from New Mexico was the type specimen from "between western Texas and El Paso, New Mexico" (sic). Finally, *P. mearnsii*, which Hitchcock had split into two subspecies, was now split by Hu into four species, two of which, *P. mearnsii* and *P. hitchcockianus* Hu, were said to be found in New Mexico. Hu is thus responsible for swelling the number of New Mexico *Philadelphus* from the four taxa recognized from 1915 - 1956 to the ten taxa now currently accepted.

P. mearnsii was removed from candidacy for the Federal Endangered Species List based on a status report (Spellenberg 1981) that indicated a much broader range in southern New Mexico, Texas and Mexico than previously indicated. This report, despite having mandated sections on taxonomy and nomenclature, did not discuss the relationship between *P. mearnsii* and the closely related or synonymous *P. hitchcockianus*. Furthermore, two of the cited populations for *P. mearnsii* were syntype localities for *P.*

hitchcockianus.

Evaluation of morphological characters in the classification of the genus

A number of characters have been considered taxonomically important by one or more of the three main reviews of *Philadelphus* this century. There has not been agreement among these sources as to which characters are most effective in distinguishing taxa and authors have used characters in their treatments that they admit in other sections to be of suspect value for taxonomic decisions. In the following section, I evaluate a number of the characters stressed by others as taxonomically valuable, concentrating on those of Hu (1956), and discuss my interpretations of which are most useful and reliable.

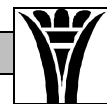
Growth form and stem characters: Plant habit is of limited importance with respect to an herbarium study of the genus since it cannot be directly observed on herbarium specimens. Hu (1956) characterized the sections *Pseudoserpyllifolius* and *Serpyllifolius* as "dwarf shrubs" in his synopsis of characters for subgenera and sections, although elsewhere he specifically downplayed the importance of habit for separating major groups of *Philadelphus*. Hu allowed that habit may be informative for distinguishing taxa up to the rank of species although it was not a key character for New Mexico species in any of the three major treatments (Hu 1956, Hitchcock 1943, nor Rydberg 1905). All three authors included habit in their species descriptions; Hu, for example, included information concerning plant height, growth form (erect, fibrous or calcarate) and branching structure (loose or spinescent). Since it is unclear whether any of these descriptions are based on observations in the field, they may be somewhat suspect with respect to this character.

Hu (1956) discussed four subsets of stem characters: second year's growth, current year's growth, the axillary buds and the adventitious growth. Bark color and exfoliation, he states, are of little taxonomic use due to within-plant variation and the vagaries of sampling shrubs for herbarium specimens. Nevertheless, in Hu's keys, *P. mearnsii* is distinguished from *P. earnestii* in part by differences in bark color and exfoliation. Rydberg (1905) relied on bark characters twice in his key to distinguish New Mexico species. In his system, *P. stramineus* is distinct from *P. microphyllus* because its old stem bark is straw-colored versus gray and a Mexican species, *P. asperifolius*, is distinguished from the rest of the species in the Microphylli group because its second year bark does not exfoliate. Hitchcock (1943) considered the former distinction to be inaccurate and described the latter distinction as "inconclusive."

Hu (1956) employed a number of stem characters and character states in his species descriptions that are not directly comparable across taxa. For several taxa, for example, Hu (1956) gives a condition for a first or second year growth character, but not for both at the same time. In other cases he referred only to qualities of the bark or branchlets without distinguishing first from second year growth. Hu's stem character states are equally confusing. For example, what is the difference between branchlets that are "fibrously striate" and those that are "longitudinally rimulose?" Is there really a difference between the "slowly exfoliating" bark of *P. argenteus* and the "closed, tardily exfoliating" bark of *P. argyrocalyx*?

The presence or absence of axillary buds was taken by Hu (1956) as one of the key characters for delimiting subgenera. In one group, the axillary buds overwinter in nodal pouches at the base of the petioles. In other groups, the axillary buds are supposedly exposed and the remaining petiole base is strongly curved away from the stem. For the New Mexican species, where *P. mearnsii* and *P. hitchcockianus* are the only species from the exposed bud type, these basic distinctions seem to hold, though not exactly as described by

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(*Philadelphus*, Continued from page 2)

Hu. While the second groups' buds are, theoretically, exposed from the nodal pouch, in our forms at least, the bud is still enclosed by one or more protruding scales. Hu also stated that the species with enclosed buds have determinate shoots with no terminal bud and the exposed bud species have indeterminate shoots with a prominent terminal bud. I found no such difference in the New Mexico specimens. In all species examined, the terminal growing-point of a vegetative shoot eventually dies, leaving a short stem protruding from the previous node from which lateral growth continues in the next season; the terminus of fertile short-shoots blossom into one or more flowers.

Leaves: Hu (1956) considered the size and shape of leaves to be of minimal taxonomic importance, a conclusion supported by my study. Leaf shape and size tend to be rather variable among populations within species and to be broadly overlapping between species. Nevertheless, Hu used these characters several times to distinguish New Mexico taxa. *P. mearnsii*, *P. earnestii* and the pair *P. argenteus* and *P. palmeri* are all keyed in part based on leaf shape character. Furthermore one of Hu's new Mexico taxa, *P. microphyllus* var. *ovatus*, is distinguished based primarily on the characters of leaf size and shape. Hitchcock (1943) also used leaf size as an auxiliary character throughout his key and Rydberg (1905) used leaf shape to distinguish some New Mexico species. It is my belief that at least for the New Mexico forms leaf size and shape are of little taxonomic value.

Hu (1956) suggested that the nature and density of indument on the leaf surfaces are rather constant and may be used as important criteria for distinguishing species or even sections and series. Both Rydberg (1905) and Hitchcock (1943) relied strongly on leaf indument in their keys. While some aspects of leaf indument distinguish some of the taxa relatively well, I have found that there is also significant environmental or populational variation differences within species in these characters. This within-species variation may have been under-appreciated in previous treatments.

A second problem with indument involves ambiguous terminology. Hu, following Rydberg and Hitchcock, mixes various terms concerning indument texture and color and trichome shape and orientation inconsistently, such that the same character state (or set of states) is described with different terms for different taxa. Complicating this is the presence in several taxa of more than one trichome type on the same organ. These three problems concerning the character of indument have caused some of the greatest confusion in interpreting *Philadelphus* systematics.

One other leaf character of importance is whether the two surfaces of the leaves are similar (isobilateral) or dissimilar (dorsiventral). The typical leaves of *Philadelphus* are dorsiventral, while *P. mearnsii* and *P. hitchcockianus* leaves are planar with identical surfaces and indument on both sides.

Inflorescence: I observed no significant differences in the inflorescences of New Mexico taxa despite the fact that Hu (1956) places our species in two separate inflorescence types. All taxa in New Mexico have determinate, terminal inflorescences that contain from 1 to 3 flowers. These may be on very short shoots such that the inflorescences appear lateral, though the numerous accompanying leaves distinguishes this as a compressed shoot.

Sepals: Hu indicated that sepal characters are of little taxonomic value, however, sepals of both *P. hitchcockianus* and *P. mearnsii* are deciduous in fruit in contrast with the retained sepals of all other New Mexico taxa. Furthermore, the sepals of these two taxa

are subglabrous and at most somewhat ciliate along the sepal margin, whereas species from the *Microphyllus* group are consistently tomentose or, more accurately, tomentulose, in a 1 to 2 mm border of the inside of the sepals. This seems to be a good distinguishing character. Other sepal characters seem to be either largely invariant or non-informative.

Corolla and petals: Hu (1956) emphasized the taxonomic importance of the appearance of the corolla and the petals in his monograph and several of the species described by Hu (1956) are distinguished by whether the corolla is cruciform, disciform or stellate. The character of corolla shape is taxonomically problematic for several reasons. First, petal shape is rarely preserved well in pressed specimens and determination of corolla shape from intact herbaria specimens requires even more guesswork. Furthermore, flowers that were known to be disciform in the field can appear for all purposes cruciform when pressed (R. Sivinski, *pers. com.*). Finally, my observations suggest that corolla shape is variable within population which are invariant with respect to all other observed characters. Thus, I disagree with Hu's emphasis of this character for taxonomic decisions. Petal characters such as the size, margin and shape are difficult to determine accurately from pressed specimens. Nevertheless, some gross differences in petal size and shape were useful in distinguishing New Mexico taxa.

Stamens: Stamen fusion and number have both been used as important key characters for New Mexico taxa. Rydberg (1905) used stamen number in his key to distinguish the large differences between *P. mearnsii* (15 stamen) and the rest of the New Mexico species (25-60 stamen) described at that point, although he did list specific stamen numbers and fusion states in the descriptions of most species. Hitchcock (1943) emphasized stamen number and fusion characters throughout his key, even though he explicitly recognized that "the stamens are so inconsistent in number that species cannot be distinguished in this manner." Hu considered general patterns of stamen number to be an auxiliary character to distinguish morphologically different and geographically widely separated groups of species. He did not use stamen number to key species and only used stamen fusion as a key character once.

I believe that stamen number and stamen fusion are of little use distinguishing species within the *Microphylli* group. When stamens number above 20, they are extremely difficult to count accurately on herbarium sheets without damaging the specimen. I am suspicious of the published stamen numbers that do not at least give a range of values. Furthermore, final stamen number in all *Philadelphus* is based on expansion from four initial stamen primordia (Andreas Winbauer, *pers. com.*). Variation in the final number is likely to reflect differences in flower size and environmental conditions and is of little primary taxonomic significance. Stamen fusion appears to be variable within plant and within population and I do not believe it is an important taxonomic character. Also, as Hu pointed out, stamen length, though variable, does not make a good character for distinguishing taxa of any rank in this group.

Pistil: Hu believed that the position of the placentas can be used as an auxiliary criterion for the delimitation of subgenera and sections of *Philadelphus*. I found the character to be unreliable. Variability in the ontogenetic development of fruits on herbaria sheets leads to wide variability in the placement of the placenta and the apparent shape of the capsule. Fusion of the stigmas is also a highly variable character and except for the distinction between the *P. mearnsii* group with entirely fused (columnar) stigmas on very

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(*Philadelphus*, Continued from page 3)

short styles and the *Microphyllus* group with variable fusion and longer styles, there is no information in this character for distinguishing New Mexico taxa. Hu (1956) also uses hairs on the disc and style as an important character for distinguishing most New Mexico taxa from a few others and from Mexican species, but I never saw hairs on a style. It was thus of no value distinguishing the specimens at hand in my study.

Capsule: Capsule shape and size is a difficult character to use taxonomically because of strong ontogenetic variability culminating in a destructive splitting of the capsule. The *Microphyllus* group species have capsules that are roughly ellipsoidal at completion, although these are generally closer to obtriangular for most of their development (the portion above the insertion of the sepals appears to expand quite late in development and is present for only a short period before the capsule dehisces). The *Mearnsii* type capsule is more hemispheric in the portion below the sepal insertion and the subsequent expansion of the capsule above this point is not pronounced at final development.

Seeds: Hu (1956) put a surprisingly large amount of emphasis on the character of seeds, specifically the presence and length of the tail. Seeds of *Philadelphus* are minute, ontologically variable in size and character and seldom observed on undisturbed herbarium sheets. I find Hu's characters to be unreliable and extremely impractical for delimiting taxa.

In conclusion, I believe that a more accurate pattern of the taxonomic variability among the New Mexico forms of *Philadelphus* can be achieved by using a smaller set of characters than has been applied by recent monographers. By excluding variable and inconsistent characters from the analysis and by using character state terminology more consistently, one finds fewer natural discontinuities in the New Mexico forms than perceived by Rydberg, Hitchcock or Hu.

Morphological analysis

Methods: Species descriptions for potential New Mexico taxa and their key characters (Hu 1956) were converted to a single table of characters and character states (available from the author) in order to better distinguish the taxa as interpreted in this monographic treatment. Twenty-three specimens from the UNM herbarium collection were then scored for all 84 of these characters, although the character states used varied somewhat from those of Hu when his appeared synonymous or ambiguous. The scores for these specimens were used to give a better basis for new descriptions of the New Mexico taxa and to determine which characters are most useful for distinguishing New Mexico taxa in quantitative analyses. A subset of thirty-one characters were measured or scored (including derived ratios) for each of the 98 New Mexico *Philadelphus* specimens in the UNM herbarium collection. Sixteen of these characters were used in a subsequent principal components analysis of the covariance matrix for 91 specimens using Systat 5.2.1 and the varimax method.

Results and discussion: The PCA results of this analysis are not entirely sensible when the specimen identities as given on the herbarium sheets are taken at face value (Fig. 1). Two distinct clusters are separated along the first axis, the smaller consisting of specimens labeled as *P. mearnsii*, *P. wootonii*, *P. hitchcockianus*, *P. microphyllus* and *Fendlera utahensis* (hereafter the *Mearnsii* group). The second, more spread-out cluster, consists of specimens labeled as *P. microphyllus*, *P. argenteus*, *P. argyrocalyx*, *P. madrensis*, *P. lewisii*, *P. occidentalis*, and *P. serpyllifolius* (hereafter referred to as the *Microphyllus* group). Three characters, axillary bud type (exserted vs. enclosed), leaf face (isobilateral vs. dorsiventral) and inner sepal tomentosity (glabrous or ciliate vs. tomentose) are all perfectly correlated with each other and have factor loadings above 0.9 on the first axis (data not shown). They are thus the primary cause for the distinction between these two groups in this analysis.

The substructuring of the *Mearnsii* group along the second axis follows a strict geographical pattern, with the specimens in the larger, lower cluster all from the Guadalupe Mts. The other specimens are all from the San Andreas Mts., except for the topmost point which is from the type location for *P. mearnsii* near the southeast corner of Luna County. The highest factor loadings along the second axis are for the hypanthium and calyx indument and its density (data not shown). The Guadalupe Mts. specimens have glabrous hypanthia and sepals. All but one of the San Andreas specimens have weakly strigose hypanthia and glabrous sepals, whereas the last two specimens (one from the San Andreas and the other the *P. mearnsii* topotype) have strigose hypanthia and sepals. For the San Andreas Mt. collection, the tomentum was sparse, for the *P. mearnsii* topotype it was at normal density. The character of the hypanthium tomentum was the only trait observed in this study which differed among the 15 specimens of the *Mearnsii* group. The three specimens labeled as *P. wootonii*, the four labeled as *Fendlera utahensis* and the one labeled as *P. microphyllus* are clearly misidentified. If these labels were correct, the specimens would not have even one of the three character states used to distinguish the *Mearnsii* group in this analysis.

The lack of clear substructuring within the *Microphyllus* group suggests that this cluster may represent a single species. Specimens labeled as *P. microphyllus* score low for the second factor (glabrous hypanthia or sparsely strigose), *P. argenteus* specimens are in the middle portion (strigose hypanthia) and *P. argyrocalyx* score higher (densely strigose-villous or villous hypanthia). The specimen labeled as *P. lewisii* was placed squarely in the center of the *P. microphyllus* cluster. This specimen does not have the appropriate leaf or inflorescence characters to be *P. lewisii* or even to be in that subgenus. It is therefore considered to be mislabeled. Most specimens labeled as *P. occidentalis* also overlapped the main *P. microphyllus* cluster precisely. These are likely to be misidentifications as well.

The region along the second axis between the main *P. microphyllus* and *P. argenteus* clusters is filled with variously labeled specimens including a single specimen labeled *P. madrensis* and two labeled *P. serpyllifolius*. True *P. serpyllifolius* has enclosed buds and should cluster much nearer to the *Mearnsii* group than to the *Microphyllus* group. *P. madrensis*, according to its original description, should have leaves that are hispid above and spreading villose below. These character states were not observed in any of the New Mexico specimens including the one labeled as *P. madrensis*. Thus I believe then that these three specimens are misidentified. The *P. occidentalis* labeled specimens are more problematic. The original description of *P. occidentalis* fails to substantiate its distinction from a transition between *P. microphyllus* and what was later described as *P. argenteus*. Without seeing the type of *P. occidentalis* it is impossible to determine the relationship of these three taxa except to say that there is little evidence to suggest that all three exist as distinct entities in New Mexico as exemplified by the forms in this analysis.

Only 5 specimens in the UNM collection were labeled *P. argyrocalyx*, but these all clustered together toward the top of the *Microphyllus* group based on their densely strigose-villous or villous hypanthia and sepals. Another specimen identified only as *Philadelphus* sp. compares well with the description of *P. argyrocalyx* as do the two specimens of *P. microphyllus* and one labeled *P. argenteus* that all cluster toward the top of the *Microphyllus* group. All specimens labeled as *P. wootonii*, a taxon morphologically near to *P. argyrocalyx*, clustered instead in the *Mearnsii* group. These specimens, as suggested before, are all misidentified members of the *Mearnsii* group.

Fig. 2 shows the PCA results for the UNM herbarium specimens corrected for the putative misidentifications previously discussed. The *Mearnsii* group specimens show some geographic distinction in this analysis, but the characters involved (hypanthium and sepal indument) do not seem substantial enough to me to indicate important evolutionary

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(*Philadelphus*, Continued from page 4)

divergence of the populations. With this in mind, I suggest that the prior name, *P. mearnsii*, be applied to all specimens in the group and that *P. hitchcockianus* be considered a taxonomic synonym. There is no evidence in the UNM collection for the existence of *P. serpyllifolius* in New Mexico and its inclusion in our flora appears to be based solely on the confusion of the type locality "between west Texas and El Paso, New Mexico."

The Microphyllus group seems to lack substantial morphological substructuring and may therefore represent a single species with variation among populations primarily in the indument of the hypanthium and calyx. There is no evidence in the UNM herbarium collection for *P. madrensis*. *P. occidentalis* may be synonymous with *P. argenteus* or with a form that is somewhat intermediate between *P. argenteus* and *P. microphyllus* with respect to the hypanthium and calyx tomentum. In either of these cases, *P. occidentalis* would have priority over the name *P. argenteus*, though not at the subspecific rank.

The morphological and geographical variation within the Microphyllus group in New Mexico can be accounted for best by division into three groups which I believe are best given status at the subspecific level. *P. microphyllus* subsp. *microphyllus* pertains to the lower end of the group which includes mostly Northern and Central New Mexican specimens with mostly glabrous hypanthia and sepals, *P. m.* subsp. *argenteus* occupies the middle of the group including the Southern and Central New Mexican specimens with strigose hypanthia and sepals. The *P. microphyllus* in the Sacramento, White and Capitan mountains with particularly dense-villous (lanate) pubescence is subspecies *argyrocalyx*. There is no evidence in our collection for a distinct taxon, morphologically similar to *P. m.* subsp. *argyrocalyx*, called *P. wootonii*.

Table 1 compares several quantitative measurements for the taxa as identified in Fig. 2. There are no significant differences among taxa in the leaf and petal length/width ratios nor in the position of the sepal insertion point relative to the capsule height. Leaf and petal shape are not informative characters for the New Mexico taxa and if there are significant differences in the sepal insertion point, these differences are obscured by the sizable developmental variability in the capsule structure. Several of the measures show significant differences among at least some of the taxa with the trend in these data reflecting the general differences in size of organs (leaves, hypanthium, petals, capsules). *P. mearnsii* is the most diminutive of the New Mexican taxa followed by *P. microphyllus* subsp. *argenteus*, subsp. *microphyllus*, and finally, by the largest *Philadelphus* in New Mexico, subsp. *argyrocalyx*.

Biogeography

If one believes Hu's account of species distributions (Hu 1956), a number of *Philadelphus* are widespread in the U.S. southwest with overlapping distributions. *P. argenteus* and *P. occidentalis*, for example, occur in California, Baja California, Nevada, Colorado, Arizona, Mexico and Texas, oftentimes together. A number of other species appear to be sympatric such as *P. microphyllus* and *P. occidentalis*, *P. argyrocalyx* and *P. wootonii*, *P. madrensis* and *P. microphyllus* or *P. argenteus* and *P. microphyllus* and *P. argenteus*. Mearnsii group species show a similar pattern of long-disjunction and co-occurrence of species.

Hitchcock (1943) suggested a much more orderly distribution of *Philadelphus* taxa in the Southwest. In his scheme, *P. microphyllus* subsp. *argenteus* served as a basal taxon to all other taxa in this region, with the other taxa arranged in various series of morphological evolution from this center. My study supports aspects of both of their studies. Like Hitchcock, I find a much more orderly arrangement of taxa in New Mexico. *P. microphyllus* subsp. *microphyllus* has the largest range in New Mexico, covering most of the north and central

portions of the state. *P. mearnsii* and *P. microphyllus* subsp. *argenteus* have smaller, mostly non-overlapping ranges in the southern end of the state. The range of subsp. *argenteus* in New Mexico is somewhat larger than indicated by Hitchcock, while the range of subsp. *argyrocalyx* is more limited. In this regard, Hu (1956) was somewhat closer to the mark, limiting *argyrocalyx* to Lincoln and Otero counties, although he did not give any New Mexico localities for *argenteus*. Hu (1956) only mapped points for *P. mearnsii* in Grant County, instead of Luna County where it should be. His point for *P. serpyllifolius* should be in Texas.

Key to the *Philadelphus* of New Mexico

- 1 Axillary nodes with scales, buds exposed, leaves isofacial, sepals thin and caducous in fruit, stamen fewer than 20, stigmas columnar. Plant with maple syrup odor. (Subgenus Deutzioides, section Pseudoserpyllifolius).....*P. mearnsii* W.H. Evans ex Rydb.
- 1 Axillary buds in nodal pouches, buds enclosed, leaves with upper and lower surfaces different, sepals thickened and persistent in fruit, stamens > 20, stigmas at least partly divided. Plant (excluding flower) with no particular odor. (Subgenus *Philadelphus*, Section Microphyllus)
 - 2 Hypanthium and sepals glabrous or with scattered trichomes at the base and/or angles.....*P. microphyllus* Gray subsp. *microphyllus*
 - 2 Hypanthium and sepals uniformly pubescent
 - 3 Hypanthium strigose, the straight hairs sparse or dense, widespread in southern part of state.....*P. microphyllus* subsp. *argenteus* (Rydb.) C.L. Hitchc.
 - 3 Hypanthium densely tomentose (lanate), hairs matted into a uniform covering with some protruding longer hairs, S. Lincoln and N. Otero Counties.....*P. microphyllus* subsp. *argyrocalyx* (Woot.) C.L. Hitchc.

Literature Cited

- Hitchcock, C. L. 1943. The xerophyllous species of *Philadelphus* in Southwestern North America. *Madrono* 7:35-56.
- Hu, S. 1956. A monograph of the genus *Philadelphus*. *Journal of the Arnold Arboretum* 37:15-90.
- Martin, W. C. and Hutchins, C. R., 1980. A Flora of New Mexico. J. Cramer, Hirschberg, Germany.
- Rydberg, P. A. 1905. *Philadelphus*. *North American Flora* 22:162-175.
- Spellenberg, R. W. 1981. Status Report on *Philadelphus mearnsii*. Submitted to the Endangered Species Botanist, U.S. Fish and Wildlife Service, Albuquerque, NM.
- Wooton, E. O. and Standley, P. C. 1915. Flora of New Mexico. Contributions from the United States National Herbarium 19:9-794.

(Continued on page 6, *Philadelphus*)



(*Philadelphus*, Continued from page 5)

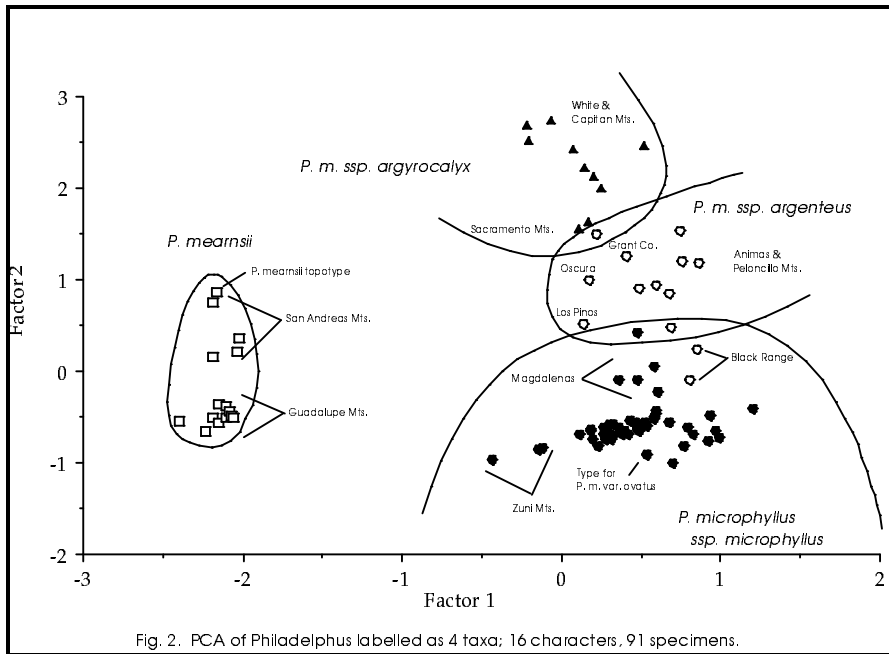
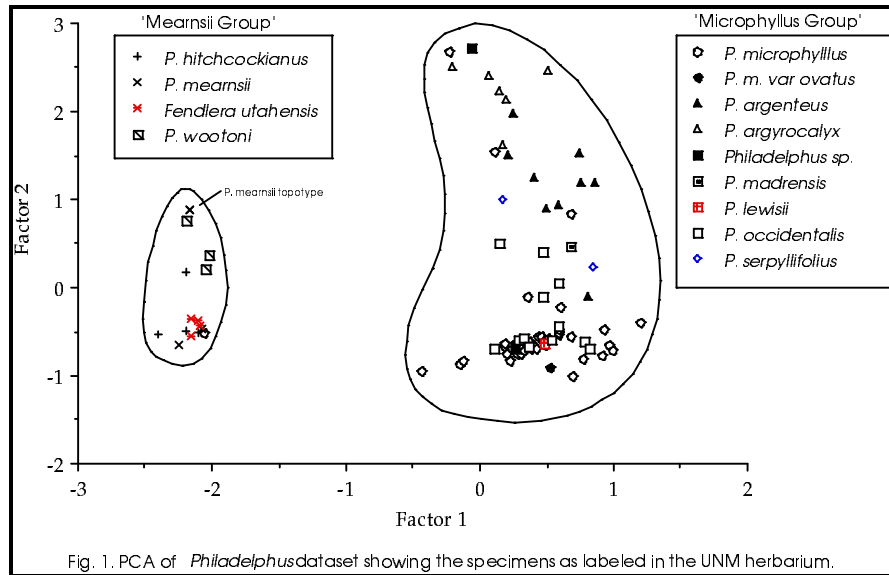
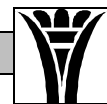


Table 1. A comparison of some of the quantitatively measured characters. Taxa with different letters are significantly different (Tukey-Kramer test, alpha = 0.05).

Character	<i>P. microphyllus</i>			
	argyrocalyx	microphyllus	argenteus	<i>P. mearnsii</i>
LeafLength/Width Ratio	2.0 ± 0.4 ^a	2.3 ± 0.4 ^a	2.2 ± 0.4 ^a	2.3 ± 0.5 ^a
LeafLength (cm)	2.1 ± 0.5 ^a	1.7 ± 0.5 ^{ab}	1.5 ± 0.5 ^{bc}	1.1 ± 0.4 ^c
LeafWidth (cm)	1.1 ± 0.1 ^a	0.8 ± 0.1 ^b	0.7 ± 0.1 ^{bc}	0.5 ± 0.2 ^c
Hypanthium Height (mm)	2.9 ± 0.4 ^a	2.4 ± 0.2 ^a	2.2 ± 0.4 ^a	1.3 ± 0.4 ^b
Petal Length (cm)	1.7 ± 0.2 ^a	1.1 ± 0.1 ^b	1.0 ± 0.4 ^{bc}	0.8 ± 0.1 ^c
Petal Width (cm)	1.2 ± 0.2 ^a	0.7 ± 0.1 ^b	0.8 ± 0.2 ^{ab}	0.4 ± 0.1 ^c
Petal Length/Width Ratio	1.5 ± 0.3 ^a	1.6 ± 0.1 ^a	1.4 ± 0.6 ^a	1.8 ± 0.4 ^a
Capsule Height (mm)	6.8 ± 1.2 ^a	5.9 ± 0.4 ^a	5.4 ± 0.6 ^a	3.8 ± 1.1 ^b
Sepal Position (Sepal/Caps)	0.6 ± 0.4 ^a	0.6 ± 0.4 ^a	0.6 ± 0.6 ^a	0.6 ± 0.4 ^a



New Plant Distribution Records

New records for New Mexico are documented by the county of occurrence and the disposition (herbarium) of a specimen.

— Kelly Allred (MSC Box 3-I, New Mexico State University, Las Cruces, NM.) [Most of these records were included in “A Working Index of New Mexico Vascular Plant Names” by Roalson & Allred (1995 & supplements) as specimen citations, and are compiled here to provide a citable literature report. Names marked with an asterisk (*) are reported for New Mexico for the first time.]

Apiaceae

Bowlesia incana Ruiz & Pavon: Grant Co. (NMC)
Cyclosporum leptophyllum (Pers.) Sprague ex Britt. & Wilson:
 Hidalgo Co. (NMC)
Spermolepis inermis (Nutt. ex DC.) Math. & Const.: Chaves Co.
 (NM Nat. Hist. Inst.)

Apocynaceae

Amsonia tharpü Woodson: Eddy Co. (UNM)

Asclepiadaceae

Asclepias verticillata L.: Doña Ana Co. (UNM)

Asteraceae

Brickellia parvula Gray: Luna Co. (NMC)
 **Erigeron annuus* (L.) Pers.: Lincoln Co. (UNM)
Eriophyllum lanosum Gray: Hidalgo Co. (UTEP)
Grindelia laciniata Rydb.: Sandoval Co. (UNM)
 **Hieracium crepidospermum* Fries.: Lincoln Co. (NMC)
Pectis cylindrica (Fern.) Rydb.: Doña Ana Co. (NMCR); Luna Co.
 (NMC)
Rayjacksonia annua (Rydb.) Hartman & Lane: Socorro Co. (NMC)
Symphotrichum porteri (A. Gray) Nesom: Harding Co. (NMC)
Tetranneuris scaposa (DC.) Greene var. *villosa* (Shinners) Shinners:
 Eddy Co. (UNM)

Boraginaceae

Lappula echinata Gilib.: Otero Co. (NMC)
Pectocarya heterocarpa I.M. Johnston.: Luna Co. (NMC)

Brassicaceae

Brassica napus L.: Sierra Co. (NMCR)
Iberis umbellata L.: San Miguel Co. (NMC), an occasional escape
Lepidium latifolium L.: Guadalupe Co. (NMC)
Lobularia maritima (L.) Desv.: Doña Ana Co. (NMCR)
Matthiola bicornis DC.: Doña Ana Co. (NMC), an occasional escape

Buddlejaceae

Buddleja scordioides H.B.K.: Eddy Co. (NMC)

Caesalpiniaceae

**Gleditsia triacanthos* L.: Doña Ana & Lincoln Cos. (NMCR)

Parkinsonia aculeata L.: Doña Ana Co. (NMC)

Cannabaceae

**Cannabis sativa* L.: Otero Co. [observation] & Doña Ana Co.
 (NMCR)

Caryophyllaceae

Arenaria hookeri Nutt. ex Torr. & Gray: Torrance Co. (UNM)

Cerastium viscosum L.: (UNM), Catron Co. (UNM)

**Dianthus armeria* L.: Mora Co. (NMCR) [weakly adventive]

Chenopodiaceae

Chenopodium cycloides A. Nels.: Roosevelt Co. (NMC) [addendum
 to report in issue 3:6]

Cuscutaceae

Cuscuta appplanata Engelm.: Doña Ana Co. (NMC)

Cuscuta cuspidata Engelm.: Doña Ana Co. (NMC)

Euphorbiaceae

Euphorbia odontadenia Boiss.: Santa Fe Co. (NMC)

Fabaceae

Astragalus crassicaarpus Nutt. var. *paysonii* (Kelso) Barneby: Colfax
 Co. (NMC)

Coronilla varia L.: Union Co. (NMCR)

Trifolium procumbens L.: Los Alamos Co. (UNM)

Gentianaceae

Sabatia angularis (L.) Pursh: Doña Ana Co. (NMCR), weakly
 adventive

Haloragaceae

Myriophyllum aquaticum (Vell.) Verdc.: Doña Ana Co. (NMCR),
 weakly adventive

Lythraceae

Ammannia coccinea Rottb.: Socorro Co. (R. Peterson, NM Nat.
 Hist. Inst.)

Nyctaginaceae

Commicarpus scandens (L.) Standl.: Grant Co. (NMC)

Onagraceae

Oenothera pallida Lindl. subsp. *trichocalyx* (Nutt.) Munz & Klein
 McKinley Co. (UNM)

Polygonaceae

Rumex pulcher L.: San Juan Co. (NMC) [addendum to earlier report
 in issue 7:6]

Rosaceae

**Pyrus communis* L.: Lincoln Co. (NMCR) [persisting around old
 homesteads and orchards and occasionally escaping]

Rubiaceae

Diodia teres Walt. var. *angustata* Gray: Hidalgo Co. (NMC)

Salicaceae

Salix boothii Dorn: Sandoval Co. (Cuba Ranger Dist. Herbarium,
 Santa Fe Nat. For., determined by R. Dorn)

Salviniaceae

Salvinia minima Baker: Doña Ana Co. (NMCR)

Scrophulariaceae

Verbascum virgatum Stokes: Hidalgo Co. (NMC)

Veronica arvensis L.: Lincoln Co. (NMC)

Verbenaceae

Verbena tenuisecta Briq.: Doña Ana Co. (NMC)

Violaceae

Viola rafinesquii Greene: Rio Arriba Co. (NMC)

Alismataceae

Alisma subcordatum Raf.: Rio Arriba Co. (NMC)

Cyperaceae

Cyperus flavicomus Michx.: Hidalgo Co. (NMC)

Cyperus rotundus L.: Doña Ana Co. (NMCR)

Eleocharis geniculata (L.) Roemer & J.A. Schultes: Doña Ana Co.
 (TAES, UTEP)

Scirpus pendulus Muhl.: San Miguel Co. (UNM)

Liliaceae

Calochortus flexuosus Wats.: San Juan Co. (UNM)

Poaceae

Festuca brachyphylla J.A. Schult. ex J.A. & J.H. Schult. subsp.
coloradensis Frederiksen: San Miguel Co. (NMCR)

Festuca calligera Piper: Lincoln Co. (NMCR)

Festuca earlei Rydberg: San Miguel Co. (NMCR)

Festuca trachyphylla (Hackel) Krajina: Rio Arriba Co. (NMCR)

Potamogetonaceae

Potamogeton foliosus Raf. var. *macellus* Fern.: Socorro Co. (NMC)





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Botanical Literature of Interest

Taxonomy and Floristics:

Brummitt, R.K. 1999. **A critique of some recent developments in plant nomenclature.** Syst. Bot. 24(1):108-115.

Columbus, J.T. 1998(1999). **Morphology and leaf blade anatomy suggest a close relationship between *Bouteloua aristidoides* and *B. (Chondrosium) eriopoda* (Gramineae: Chloridoideae).** Syst. Bot. 23(4):467-478. [argues against segregate genera from *Bouteloua*]

Diggs, G.M., Jr., B.L. Lipscomb, & R.J. O'Kennon. 1999. **Shinner's and Mahler's Illustrated Flora of North Central Texas.** Sida, Botanical Miscellany, Botanical Research Institute of Texas, Fort Worth. 1640 pp. [an exceedingly fine flora, though a bit out-of-range for New Mexico]

Schmidt, C. 1999. **Treatment of the genus *Ceanothus* in N. America.** Available online at <http://www.orst.edu/dept/botany/herbarium/projects/ceanothus/index.html>

Simpson, B.B. & B. Miao. 1997. **The circumscription of *Hoffmannseggia* (Fabaceae, Caesalpinioideae, Caesalpinieae) and it allies using morphological and cpDNA restriction site data.** Pl. Syst. Evol. 205:157-178.

Simpson, B.B. 1998. **A revision of *Pomaria* (Fabaceae) in North America.** Lundellia 1:46-71.

[treatment of this segregate from *Caesalpinia*]

Taylor, R.J. 1998. **Desert Wildflowers of North America.** Mountain Press Publishing Co., Missoula, MT 59806.

Tonne, P. & T.K. Lowrey. 1998. **An analysis of taxonomic boundaries between *Erigeron pulcherrimus* and *Erigeron bistiensis*.** Report for Energy, Minerals and Natural Resources Department, State of New Mexico.

Rare, Threatened, and Endangered Plants:

[There are numerous reports and discussions concerning rare New Mexico plants on the New Mexico Rare Plant Technical Council web site: <http://biology.unm.edu/~chelo/nmrptc1.html>]

Journals, Newsletters, Etc.:

Native Plant Society of New Mexico Newsletter. Editor: Tim McKimmie, 1105 Circle Drive, Las Cruces, NM 88005

Oregon Flora Newsletter. Kenton Chambers, Department of Botany & Plant Pathology, Oregon State University, Cordley Hall 2028, Corvallis, OR 97331-2902 email: sundbers@bbc.orst.edu



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