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A COMPARATIVE STUDY OF THE ALLIUM FALCIFOLIUM ALLIANCE

By

LOUIS VINCENT MINGRONE

A thesis submitted in partial fulfillment of the
requirements for the degree of

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1968

To the Resident Instructional Staff:

The members of the Committee appointed to examine the thesis of LOUIS VINCENT MINGRONE find it satisfactory and recommend that it be accepted.

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| | |
|-------|--|
| CAS | California Academy of Science Herbarium |
| DS | Dudley Herbarium of Stanford University |
| GH | Gray Herbarium of Harvard University |
| MO | Missouri Botanical Garden Herbarium |
| NY | New York Botanical Garden Herbarium |
| ORE | University of Oregon Herbarium |
| OSC | Oregon State University Herbarium |
| POM | Pomona College Herbarium |
| UC | University of California Herbarium, Berkeley |
| US | United States National Herbarium |
| WILLU | Willamette University Herbarium |
| WS | Washington State University Herbarium |
| WTU | University of Washington Herbarium |

A COMPARATIVE STUDY OF THE ALLIUM FALCIFOLIUM ALLIANCE

ABSTRACT

by Louis Vincent Mingrone, Ph.D.
Washington State University, 1968

Chairman: Marion Ownbey

The taxa of the Allium falcifolium alliance were examined morphologically, chromosomally, and by two-dimensional descending paper chromatography.

Based on morphologic evidence obtained from herbarium specimens, and field and garden studies, of the 57 names proposed for the taxa of the alliance, a total of 31 are considered to represent valid taxa in this treatment. The remainder have been reduced to synonymy.

The chromosome base number is seven throughout the alliance. Diploidy ($2n=14$), tetraploidy ($2n=28$), and hexaploidy ($2n=42$) occur, but only one taxon is known to include all of these ploidy levels, and most include only one or, at the most, two.

Chromatograms representative of the taxa of the alliance revealed a total of 96 different spots. With the exception of the anthocyanins which appeared pink or rose, the spots were not visible in daylight. The colors of these components in ultraviolet light included yellow, various shades of blue, and purple. The anthocyanins and flavonoid (purple) spots appeared consistently within populations and taxa in which they occurred. Other spots were either sporadic, or completely consistent within the alliance. Few compounds were found to be species-specific but patterns were.

From the cumulative evidence obtained from the different approaches, supported by general resemblance within the alliance, it can be concluded that the Allium falcifolium alliance is a distinctive and homogeneous assemblage of interrelated species and varieties.

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INTRODUCTION

The genus Allium is usually placed in the family Liliaceae, although Hutchinson (1926), on the basis of inflorescence type, moved it from the Liliaceae to the Amaryllidaceae. This transfer has been accepted by some morphologists (Cheadle, 1942), and is supported by pollen studies (Maia, 1941); its adoption may gain support with gradual dissipation of what may well be a natural prejudice to change (Lawrence, 1951).

Allium is a genus of about 500 species (Stearn, 1946) predominantly of Northern hemisphere distribution. In North America, the genus is represented by about 70 species (Ownbey and Aase, 1955). A great number of specific names have been proposed in the genus because of its size and wide distribution. Many systematists have worked with its species, but few monographic studies have been made, most of which were based on material inadequate for a comprehensive account.

Species of the genus are commonly known as chives, garlic, leek, onion, or shallot and are valued for their economic and ornamental uses.

Historical Account

The literature dealing with North American species of the genus Allium generally has been scant and superficial. Although both Don (1837) and Regel (1875) treated the American species known to them, comparatively little attention was given to the extent of the representation of the genus in this hemisphere (Ownbey and Aase, 1955).

The only definitive treatment of the North American species is that of Watson (1879). The material available to Watson of even the commonest species

was totally inadequate. However, this work as a whole is sound, and most of the 46 species which he recognized for North America, north of Mexico, are valid today (Ownbey and Aase, 1955).

Following Watson, many new species were proposed and old ones misinterpreted, which added confusion as to the number and delimitation of the species indigenous to North America. Most of these studies were concerned with the genus as represented in limited areas, and were presented without benefit of either a detailed study of species of adjacent areas or a consideration of the identity of their types. The work of Jones (1902) is such an account. Although Jones's field knowledge of the genus was extensive, he paid little attention to the mechanics of nomenclature, and of all the treatments of Allium this is perhaps the most confused.

At the other extreme is the treatment of Abrams (1923) in which 45 species are recognized for the three Pacific Coast States. Abrams recognized as species a few morphological variants which do not appear to deserve that status, but otherwise a minimum of confusion exists in his delimitation of the species and the names which he applied to them (Ownbey and Aase, 1955).

Recently Ownbey has studied the North American species, and three significant papers based on these investigations have appeared. These treat the genus Allium as it occurs in the states Arizona (Ownbey, 1947), Idaho (Ownbey, 1950a), and Texas (Ownbey, 1950b). Ownbey has grouped the species of the New World into nine well-defined species alliances. The first comprehensive cytotoxic survey of one of these alliances, that of Allium canadense, was presented by Ownbey and Aase (1955). Recently, a study of the composition of the volatile substances of the alliances has been made (Saghir et al., 1966).

Jones and Mann (1963) make a valuable contribution to the systematics of cultivated alliums.

The Allium falcifolium alliance consisting of 31 taxa is the largest of the alliances proposed by Ownbey. A previous study within this alliance has been presented by Ownbey (1948) on the identity and delimitation of the widespread and variable species, A. tolmiei. However, up to this time no definitive study of the entire A. falcifolium alliance has appeared. The present treatment comprises a comprehensive survey of the taxonomic, cytotaxonomic, and chromatographic nature of this alliance.

Geographic Distribution

The Allium falcifolium alliance is confined to Western North America, more specifically to the Pacific Northwest extending south to California and Nevada, and north to Vancouver Island. The easternmost extension of the alliance is in western Wyoming and adjacent southern Montana, south to northwestern Colorado. Many of the species of the alliance are restricted in distribution as exemplified by A. jacintense found only in Riverside County, California; A. tolmiei var. persimile only in Adams County, Idaho; and A. yosemitense only in Mariposa County, California. There are few species that are restricted to single states, and one, A. robinsonii, which is limited to the valley of the Columbia River. The most restricted taxon is the single population of A. douglasii var. constrictum known only from Steamboat Rock, Grant County, Washington.

In addition to the broad outline given above, more specific information concerning ranges and habitats is given for each of the various taxa in the taxonomic treatment.

Morphologic and Taxonomic Criteria

Members of the Allium falcifolium alliance have a uniform morphology, although major groups are readily distinguishable. The first of these groups

includes those taxa with terete scapes, generally concave-convex linear leaves, and mostly persistent scapes and leaves at maturity. The second group is characterized by flattened or at least compressed scapes, flat commonly falcate leaves, and mostly deciduous scapes and leaves at maturity. Subordinate groups within these major groups are often difficult to delimit because of the morphologic characters held in common.

The taxa of the alliance are herbaceous perennials, arising from an underground bulb generally with two basal leaves and an inflorescence which is umbelliform in nature. This false umbel in Allium has been shown to consist of a number of monochasial cymes with shortened internodes (Rendle, 1956). Mann (1959) has illustrated the possible development of this type of inflorescence.

The characters listed below were useful in the delimitation of specific categories as well as intraspecific ones.

Bulb

Ovoid bulbs are characteristic of all the species, except A. crenulatum and A. pleianthum in which distinctly oblique bulbs are found. The bulbs generally are paired within the old bulb coats, and the adjacent walls of the newly formed bulbs are flattened. A. crenulatum and A. pleianthum bulbs reform by one or two lateral offshoots, outside the old bulb coats, and the parent bulb disappears by anthesis. Another variation in the general pattern is that found in A. madidum, which produces a cluster of easily detached bulblets at one side of the base.

The bulb coats of this alliance are not characterized by greatly thickened reticulations, and the cellular detail sometimes evident is the result of thickened cell walls of the remnants of the inner epidermis. The

outer bulb coats range in color from white, pink, reddish, yellow, brown, gray to black. The inner coats are generally white, yellow, pink to reddish.

Leaves

The leaves are basal and there are generally two. However in a few species, populations have been found with either one or two leaves (A. crenulatum, A. cratericola, and A. parvum), and there are species which consistently have only a single leaf (A. hoffmanii, A. burlewii, and A. obtusum). Size of the leaves varies from those shorter than the scape, those as long as the scape, and those greatly exceeding the scape in length. The shape of the leaves ranges from concave-convex and linear to flat and falcate.

Scape

The solitary scape ranges from terete, compressed, to strongly flattened and winged. The height of the scape varies from just a few cm (3-5) to 4 dm.

Inflorescence

The bracts of the inflorescence are generally lanceolate to ovate, and range from obtuse, to acute, to long acuminate. The bracts number from two to five, with most taxa having two.

The number of flowers, of the inflorescence, varies with taxa having few (5-15) to those having many (50+).

Flowers

The pedicels are shorter, about as long as, longer than, or greatly exceeding the length of the perianth. The perianth segments vary from 5-15 mm long and the shape is also variable, being linear-lanceolate, lanceolate, linear-oblong, oblong-lanceolate, ovate or elliptic, and range from obtuse,

to acute, to acuminate. The color of the perianth is white, pink, reddish, or purple, with the midribs being inconspicuous to conspicuously green, pink, or rose. The perianth is persistent at maturity, either erect or spreading, and is either thin and papery or slightly thickened.

Stamens

The stamens are variable in length from well included to exserted. The anther position is dorsifixed and often versatile, with dehiscence by longitudinal slits. The color of the anthers varies from yellow, or gray-blue, to purple. The filaments are dilated below and confluent at the base, and often adnate to the perianth segments.

Ovary

The ovary is trilocular with axile placentation. Crests of the ovary are not highly developed within this alliance, and in many species these structures are absent. A number of species, however, do possess some sort of processes on the ovary. In those species that do possess crests, the number of processes is either three or six.

The style may be included or exserted, and the stigma may be pointed or capitate. If capitate, the stigma may be entire, obscurely 3-lobed, or 3-lobed.

Fruit

The fruit of the alliance is a trilocular, loculicidally dehiscent capsule, with one or two seeds in each locule. The crests may or may not persist following anthesis.

Seeds

The seeds are dull or shiny black in color, and the alveoli are not pustuliferous. Seed dispersal is of the tumbling disseminule type (Daubenmire,

1964). This type of dispersal is readily demonstrated in those species in which the scape is deciduous at maturity. The species of the persistent scape type may also be classified in this dissemination pattern, in that the pedicels of individual flowers break off and whole flowers are rolled along before the wind, and seeds are knocked out of the capsule from time to time.

TAXONOMIC STUDIES

Materials and Methods

Herbarium Studies

After a preliminary investigation had been made, and a general understanding as to the limits of the alliance obtained, collections of the members of the Allium falcifolium alliance were assembled from most of the larger American herbaria. Using standard monographic techniques (Ownbey and Aase, 1955), these specimens were sorted geographically by states and counties and under each county the collections were arranged alphabetically by collectors. This brought together mass collections now widely dispersed among different herbaria, and permitted detailed comparisons of specimens collected by the same collector at the same time and place, and those collected at a different time or place or by a different collector. An appreciation of the kind and degree of variation shown from place to place and from year to year was obtained from this comparison.

With this extensive material available, the problems of nomenclature within the alliance were better understood. Many of the proposed and existing names were based on specimens that varied only slightly from a known and accepted species. Therefore, many of these proposed names have been reduced to synonymy. However, new and undescribed taxa were discovered and named in conformity with the International Code of Botanical Nomenclature (Lanjouw, 1966).

The study of nomenclatural types was secondary to the study of the variation that exists within the species of the alliance. Only after basic correlations had been made were the type specimens considered any more than additional records.

Field and Garden Studies

Along with the morphologic and geographic studies based on herbarium material, an attempt was made to study living material from as many localities as possible. This was accomplished by numerous collecting trips with Dr. Marion Ownbey through Idaho, Oregon, and Washington, and one trip to California, accompanied by Dale W. McNeal. This resulted in the collecting of most of the taxa of the alliance from one or more localities, which were then brought back to Pullman, Washington, and grown in the experimental garden and greenhouse. Of the 31 taxa included in the Allium falcifolium alliance, all but five species (A. burlewii, A. cratericola, A. jacintense, and A. yosemitense) have been collected and are growing in Pullman. The difficulties in collecting the missing species involved the great distance from Pullman as well as inappropriate and inadequate time available to collect them.

In this manner a living collection of the taxa was brought together under more or less uniform conditions. This enabled elimination of variation due to varying environmental factors. Another reason for the study of living plants is that many characteristics are not perfectly displayed on herbarium specimens. Garden studies also permit continued observation of a plant throughout its life cycle.

By minimizing the effect of variation in the environment, garden studies permit an evaluation of this effect, which is in turn of wide applicability in the interpretation of variation within and between wild populations (Ownbey and Aase, 1955). When grown in the garden at Pullman, not only were

the species and varieties clearly distinct, but even races of the same taxon from different localities were usually distinguishable. Individuals from a single locality, under garden conditions, may become very uniform, whereas distinctions between populations from well-separated localities in general tended to become enhanced because of the minimization of varying environmental factors. Studies of this type have resulted in a better understanding of the identity and delimitation of species within the alliance. One such example is that of Allium tolmiei (Ownbey, 1948).

Results and Discussion

From the information gathered by means of herbarium and field and garden studies, a complete picture of the correlated morphologic characters revealed relationships among the taxa of the alliance. In the alliance there appeared to be two major groups which included species and varieties very closely related to each other. One of these groups included those taxa that had terete scapes, generally concave-convex, linear leaves, and mostly persistent scapes and leaves at maturity. The other included those taxa that had flattened or at least compressed scapes, flat, commonly falcate leaves, and usually deciduous scapes and leaves at maturity. Within each of the major groups there appeared to be a further subdivision into smaller subordinate groups, based on overall morphological characters and geographic patterns that the taxa held in common. These smaller subordinate groups have also been shown to be similar on the basis of the composition of their volatile constituents (Saghir et al., 1966). Although these groupings were easily noted, there exist many interspecific morphologic connections between the small subordinate groups of each major group as well as between the major groups. It was therefore decided that from the morphologic evidence available, though subgroups were distinguishable, no special designation of them would be needed because the

overall picture indicated that the whole alliance consists of a closely related group of taxa.

The alliance, therefore, is to be considered a distinctive and homogeneous assemblage of inter and intrarelated species and varieties. Of the 57 proposed names for the taxa of the alliance, a total of 31 existing and new designations are considered valid in this treatment and the remainder have been reduced to synonymy.

CHROMOSOMAL STUDIES

Materials and Methods

The chromosome numbers are known from the unpublished work of Dr. Hannah C. Aase, with the exception of a few populations counted in connection with the present report (Table 1). Chromosome numbers from as many localities (Table 1) as possible were determined for all of the taxa except A. jacintense, material of which was not obtained.

Although chromosome numbers for several North American species of Allium have been reported (Darlington and Janaki-Ammal, 1945; Darlington and Wylie, 1956), no report seems to have been made for the taxa of the Allium falcifolium alliance, except for counts by Dr. H. C. Aase on the California species (Munz, 1959) and A. tolmiei and varieties (Ownbey, 1950a).

Chromosome counts were usually made in the metaphase and anaphase stages of the first meiotic division of the pollen mother cells. Frequently, counts were also made in root-tip cells (Ownbey and Aase, 1955).

The aceto-carmine smear technique, with various modifications, was used throughout. The somatic chromosomes of Allium are long and comparatively crowded within the cell, and appear especially so at the higher levels of ploidy. To facilitate counting, the chromosomes were shortened by pretreatment of the excised root tips in colchicine solution before fixation in acetic-alcohol. Hydrochloric-alcohol was employed to favor tissue maceration (Ownbey and Aase, 1955).

The few counts that were made during the present study employed the aceto-carmine smear technique after previous fixation in Carnoy's Fluid.

TABLE 1.--Chromosome numbers in the Allium falcifolium alliance

| Taxon | Culture Number | Chromosome Number | | Source |
|---------------------|----------------|-------------------|----|---|
| | | n | 2n | |
| <u>A. aaseae</u> | 540 | 7 | | Idaho. Ada Co.: low hills just n.w. of Boise, Apr. 9, 1947, <u>Ownbey & Ward 3095</u> |
| | 1212* | 7 | | Idaho. Gem Co.: 5 mi. s.e. of Emmett, top of Freezeout Hill, June 18, 1966, <u>Ownbey & Mingrone</u> |
| | 360 | 7 | | Idaho. Gem Co.: 5 mi. s.e. of Emmett, top of Freezeout Hill, June 12, 1946, <u>Ownbey & Ownbey 2765</u> |
| <u>A. anceps</u> | 793 | 7 | | California. Lassen Co.: 16.5 mi. w. of Madeline, May 19, 1950, <u>Balls 14782</u> |
| | 365 | 7 | | Nevada. Washoe Co.: 2.5 mi. s.e. of Tahoe function, near bottom of grade to Virginia City, June 18, 1946, <u>Ownbey & Ownbey 2920</u> |
| | 367 | 7 | | Nevada. Washoe Co.: just n.w. of University of Nevada Campus, Reno, June 19, 1946, <u>Ownbey & Ownbey 2923 (with Billings)</u> |
| | 1127 | | 14 | Oregon. Harney Co.: 52 mi. s.e. of Burns, May 28, 1959, <u>Cronquist 8297</u> |
| | 361 | 7 | | Oregon. Malheur Co.: 25.5 mi. n. of McDermitt, Nevada, June 13, 1946, <u>Ownbey & Ownbey 2781</u> |
| <u>A. brandegei</u> | 816 | 7 | | Idaho. Adams Co.: 21 mi. n.w. of Council on road to Cuprum, June 28, 1950, <u>Ownbey 3283</u> |
| | 548 | 7 | | Idaho. Adams Co.: 4 mi. s. of Council, Apr. 13, 1947, <u>Ownbey & Ward 3118</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|---------------------|----------------|-------------------|----|---|
| | | n | 2n | |
| <u>A. brandegei</u> | 542 | 7 | | Idaho. Blaine Co.: 9 mi. n.e. of Carey, Apr. 10, 1947, <u>Ownbey & Ward 3101</u> |
| | 249 | 7 | | Idaho. Camas Co.: 5 mi. n.e. of Fairfield, June 6, 1944, <u>Hitchcock & Muhlick 8759</u> |
| | 250 | 7 | | Idaho. Elmore Co.: ca. 16 mi. n. of Mountain Home, June 3, 1944, <u>Hitchcock & Muhlick 8660</u> |
| | 248 | 7 | | Idaho. Valley Co.: 2 mi. w. of McCall, May 30, 1944, <u>Hitchcock & Muhlick 8519</u> |
| | 254 | 7 | | Idaho. Valley Co.: Bear Valley, 35 mi. n. of Lowman, July 8, 1944, <u>Hitchcock & Muhlick 9717</u> |
| | 629A | 7 | | Montana. Park Co.: ca. 4 mi. e. of Cooke City, July 7, 1949, <u>Witt 1190</u> |
| | 809 | 7 | | Utah. Cache Co.: 18 mi. n.e. of Logan, June 26, 1950, <u>Ownbey & Holmgren 3263</u> |
| | 944 | | 14 | Utah. Summit Co.: 2.5 mi. n. of Trial Lake, Unita Mts., 1952, <u>Preece, Murdock & McKnight 2153</u> |
| | 822 | 7 | | Utah. Utah Co.: Timpangos Mt., near Provo, June 14, 1950, <u>Biddulph & Biddulph 1</u> |
| <u>A. burlewii</u> | 398 | 7 | | California. San Bernadino Co.: s.w. of Stockton Flat, San Gabriel Mts., July 5, 1946, <u>Ownbey & Ownbey 2979</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|-----------------------|----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. burlewii</u> | 401 | 7 | | California. Ventura Co.: just above Chuckupate Forest Camp, Frazier Mt., July 6, 1946, <u>Ownbey & Ownbey 2984</u> |
| <u>A. cratericola</u> | 853 | | 28 | California. Butte Co.: on the summit of Table Mt., Mar. 19, 1951, <u>Hoffman 3771</u> |
| | 1037 | | 14 | California. Trinity Co.: near Peanut, May 18, 1954, <u>Barnaby 11554</u> |
| <u>A. crenulatum</u> | 930 | | 14 | Oregon. Benton Co.: 1 mi. below summit of Marys Peak, Coast Range, June 19, 1952, <u>Ownbey & Preece 3305</u> |
| | 931 | | 14 | Oregon. Benton Co.: at summit of Marys Peak, Coast Range, June 19, 1952, <u>Ownbey & Preece 3306</u> |
| | 926 | | 14 | Oregon. Clatsop Co.: Saddle Mt., June 22, 1952, <u>Howell 28431</u> |
| | 927 | | 14 | Oregon. Lane Co.: summit of Coburg Hills, near Eugene, May 25, 1951, <u>Detling 6853</u> |
| | 933 | | 14 | Oregon. Lane Co.: summit of Bohemia Mt., Calapooya Mts., June 22, 1952, <u>Ownbey & Preece 3310</u> |
| | 597 | 7 | | Washington. Chelan Co.: Cascade Creek Pass, Wenatchee Mts., July 20, 1948, <u>Ward & Sheldon 736</u> |
| | 63 | 7 | | Washington. Clallam Co.: above Idaho Camp, Hurricane Ridge, Olympia National Park, July 23, 1940, <u>Aase</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|--|----------------|-------------------|----|---|
| | | n | 2n | |
| <u>A. crenulatum</u> | 1004 | | 14 | Washington. Clallam Co.: Hurricane Ridge, Olympia Mts., Aug., 1953, <u>Detling</u> |
| | 860 | 7 | 14 | Washington. Clallam Co.: trail between Hurricane Ridge and Mt. Angeles, Aug. 12, 1951, <u>Kruckeberg</u> |
| | 268 | 7 | | Washington. Kittitas Co.: e. of Upper Naneum Meadow, on road from Mt. Lillian to Mission Peak, Wenatchee Mts., Aug., 1944, <u>Weber & Schultz</u> |
| <u>A. douglasii</u> var. <u>columbianum</u> | 84 | 7 | | Idaho. Clearwater Co.: n. side of Clearwater Canyon, just above bridge at Peak, May 4, 1941, <u>Ownbey & Aase 2385</u> |
| | 661 | 7 | | Idaho. Clearwater Co.: near top of Clearwater Canyon, w. of Ahsahka, May 8, 1949, <u>Ownbey 3176</u> |
| | 246 | 7 | | Idaho. Idaho Co.: 1 mi. s. of Kamiah, May 28, 1944, <u>Hitchcock & Muhlick 8449</u> |
| | 97 | 7 | | Idaho. Idaho Co.: 2 mi. e. of Cottonwood, June 1, 1941, <u>Ownbey & Aase 2394</u> |
| | 632 | 7 | | Idaho. Latah Co.: 2 mi. s. of Troy, May, 1949, <u>Aase</u> |
| | 278 | 7 | | Idaho. Latah Co.: 3 mi. n.w. of Kendrick, Apr. 29, 1945, <u>Ownbey 2747</u> |
| | 415 | 7 | | Idaho. Latah Co.: 1.5 mi. w. of Troy, July 28, 1946, <u>Ownbey & Ownbey 3076</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|--|----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. douglasii</u> var. <u>columbianum</u> | 462 | 7 | | Idaho. Nez Perce Co.: 1/4 mi. n. of junction of Highways 95 and 195, at top of Lewiston Grade, Sept. 1, 1946, <u>Ownbey 3091</u> |
| | 1000 | | 14 | Montana. Sanders Co.: near Hot Springs, July, 1953, <u>Diettert</u> |
| | 27 | 7 | | Washington. Lincoln Co.: s. shore of Spokane R., 5 mi. above its mouth, May 21, 1940, <u>Rogers 497</u> |
| | 197 | 7 | | Washington. Spokane Co.: 2 mi. n. of Spangle, June 21, 1942, <u>Ownbey & Aase 2538</u> |
| | 799 | 7 | | Washington. Spokane Co.: Turnbull Wildlife Refuge, Cheney, June 15, 1950, <u>Scheffer</u> |
| <u>A. douglasii</u> var. <u>constrictum</u> | 1175* | 7 | | Washington. Grant Co.: bench below top of Steamboat Rock, May 19, 1966, <u>Ownbey & Mingrone 3421</u> |
| <u>A. douglasii</u> var. <u>douglasii</u> | 797 | 7 | | Oregon. Umatilla Co.: ca. 20 mi. s.e. of Pendleton, near top of Cabbage Hill, June 12, 1950, <u>Cronquist 6576</u> |
| | 22 | 7 | | Washington. Whitman Co.: 2 mi. e. of Pullman, prior to 1939, <u>Aase</u> |
| | 82 | 7 | | Washington. Whitman Co.: ca. 6 mi. w. of Pullman, along Union Flat Creek, Apr. 20, 1941, <u>Ownbey & Aase</u> |
| | 194 | 7 | | Washington. Whitman Co.: 1 mi. n. of Colton, June 14, 1942, <u>Ownbey & Aase</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|---|----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. douglasii</u> var. <u>nevi</u> | 68 | 7 | | Washington. Klickitat Co.: 13 mi. n.w. of Goldendale, Aug. 27, 1940, <u>Ownbey 2346</u> |
| | 176 | 7 | | Washington. Yakima Co.: 13 mi. s.w. of Ellensburg, along Umtanum Creek, Apr. 24, 1942, <u>Ownbey & Weber 2530</u> |
| <u>A. falcifolium</u> | 994 | 7 | 14 | California. Colusa Co.: 0.6 mi. e. of Colusa-Lake Co. line, above Lakeport-Williams Highway, May 3, 1953, <u>Henry</u> |
| | 259 | 7 | | California. Glenn Co.: summit n. of Black Butte, July 13, 1944, <u>Howell 19751</u> |
| | 883 | | 14 | California. Glenn Co.: 3 mi. s. of Telephone Forest Camp, and ca. 47 mi. n.w. of Willows, along Willows-Covelo Road, Sept. 19, 1951, <u>Ward & Ward 1077</u> |
| | 680 | 7 | | California. Humboldt Co.: between Le Perron Flat and Whiteys Peak, Klamath National Forest, June 13, 1949, <u>Whittaker</u> |
| | 860 | | 14 | California. Lake Co.: 2.1 mi. s. of Lakeport, May 2, 1951, <u>Hoffman 3776</u> |
| | 383 | 7 | | California. Lake Co.: 2.8 mi. n. of Middleton, June 27, 1946, <u>Ownbey & Ownbey 2952</u> |
| | 731 | 7 | | California. Mendocino or Tehama Co.: Anthony Peak, July 10, 1949, <u>Hoffman 2895</u> |
| | 564 | 7 | | California. Siskiyou Co.: Scott Mt., 5 mi. s.e. of Callahan, May, 1947, <u>Constance & Mason</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|-----------------------|----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. falcifolium</u> | 113 | 7 | | California. Siskiyou Co.: s.w. of McKinley Mt., w. of Yreka, June 22, 1941, <u>Ownbey & Brown 2427</u> |
| | 939 | | 14 | California. Siskiyou Co.: ridge road to Deadwood Lookout, mts., w. of Yreka, June 25, 1952, <u>Ownbey & Preece 3342</u> |
| | 835 | 7 | | California. Tehama Co.: 0.4 mi. from Ball Rock, w. Tehama Co., July 1, 1950, <u>Hoffman 3237</u> |
| | 834 | 7 | | California. Tehama Co.: near Yolla Bolly Guard Station, Yolla Bolly Mts., July 5, 1950, <u>Hoffman 3232</u> |
| | 724 | 7 | | California. Trinity Co.: Blue Ridge, Lassic Group, July 13, 1949, <u>Hoffman 2883</u> |
| | 837 | | 14 | California. Trinity Co.: 1.1 mi. n. of White Rock Guard Station, July 3, 1950, <u>Hoffman 3249</u> |
| | 838 | 7 | | California. Trinity Co.: summit of gap between North Yolla Bolly Peak and Black Rock Peak, July 4, 1950, <u>Hoffman 3447</u> |
| | 184 | 7 | | Oregon. Josephine Co.: 3 mi. w. of Selma, above Illinois R., May 18, 1942, <u>Constance & Rollins 2978</u> |
| | 185 | 7 | | Oregon. Josephine Co.: 6 mi. below Galice, 1942, <u>Constance & Rollins</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|-----------------------|----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. falcifolium</u> | 836 | 7 | | Oregon. Josephine Co.: 5.4 mi. e. of the junction of Takilma-Holland Road with the Waldo-O'Brien Road, on the road to Happy Camp, July 15, 1950, <u>Hoffman 3247</u> |
| | 61 | 7 | | Oregon. Josephine Co.: 3 mi. s.w. of O'Brien Post-Office, July 9, 1940, <u>Ownbey</u> |
| | 937 | | 14 | Oregon. Josephine Co.: dry serpentine hill near Waldo, June 24, 1952, <u>Ownbey & Preece 3332</u> |
| | 193 | 7 | | Oregon. Josephine Co.: Illinois Valley, near Selma, June 5, 1942, <u>Small</u> |
| | 701 | 7 | | Oregon. Josephine Co.: serpentine, Waldo Hill, Aug. 31, 1949, <u>Whittaker</u> |
| <u>A. fibrillum</u> | 96 | 7 | | Idaho. Lewis Co.: 5 mi. e. of Forest, May 25, 1941, <u>Ownbey & Aase</u> |
| | 93 | 7 | | Idaho. Nez Perce Co.: summit just n. of Lake Waha, Craig Mts., May 25, 1941, <u>Ownbey & Aase 2388</u> |
| | 94 | 7 | | Idaho. Nez Perce Co.: 9 mi. beyond Waha on road to Salmon R. rim, Craig Mts., May 25, 1941, <u>Ownbey, Aase, & Weber 2390</u> |
| | 463 | 7 | | Idaho. Shoshone Co.: ridge e. of Little Baldy Lookout, July, 1946, <u>Witt 1022A</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|---------------------|----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. fibrillum</u> | 216 | 7 | | Idaho. Washington Co.: 21 mi. n.w. of Council, near head of Hornet Creek, Cuddy Mts., July 5, 1942, <u>Ownbey & Aase 2576</u> |
| | 668 | 7 | | Oregon. Union Co.: Horseshoe Prairie, Blue Mts., Umatilla National Forest, June 10, 1949, <u>Cooke & Cooke</u> |
| | 71 | 7 | | Oregon. Wallowa Co.: 13 mi. above Imnaha on Hat Point Road, Sept. 6, 1940, <u>Ownbey 2374</u> |
| | 200 | 7 | | Oregon. Wallowa Co.: 20 mi. n. of Enterprise, June 30, 1942, <u>Ownbey & Aase 2550</u> |
| | 206 | 7 | | Oregon. Wallowa Co.: ca. 0.5 mi. beyond summit of grade from Chico Guard Station to Billy Meadows, July 1, 1942, <u>Ownbey & Aase 2560</u> |
| | 207 | 7 | | Oregon. Wallowa Co.: 3 mi. n. of Red Hill Lookout, July 1, 1942, <u>Ownbey & Aase 2562</u> |
| | 73 | 7 | | Washington. Asotin Co.: upper end of Cloverland Road, Blue Mts., Sept. 7, 1940, <u>Aase</u> |
| | 104 | 7 | | Washington. Asotin Co.: 1 mi. s. of Anatone, June 8, 1941, <u>Ownbey & Aase</u> |
| | 698 | 7 | | Washington. Columbia Co.: near Godman Spring, Blue Mts., Sept., 1949, <u>English</u> |
| | 74 | 7 | | Washington. Garfield Co.: near Mt. Misery, Blue Mts., Sept. 7, 1940, <u>Aase</u> |

TABLE 1.--Continued

| Taxon | Culture Numbers | Chromosome Number | | Source |
|---------------------|-----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. fibrillum</u> | 75 | 7 | | Washington. Garfield Co.: near Mt. Misery, Blue Mts., Sept. 7, 1940, <u>Aase</u> |
| | 556 | 7 | | Washington. Garfield Co.: 12 mi. s. of Pomeroy, summit of Abel's Ridge, May 9, 1947, <u>Daubenmire</u> |
| | 557 | 7 | | Washington. Garfield Co.: 12 mi. s. of Pomeroy, on Abel's Ridge, May 9, 1947, <u>Daubenmire</u> |
| <u>A. hoffmanii</u> | 692 | 7 | | California. Shasta Co.: 1.8 mi. w. of Regan Meadow Camp Ground, July 19, 1949, <u>Hoffman 2886</u> |
| | 841 | 7 | | California. Tehama-Trinity Co.: at junction of Wildwood and Regan Meadow roads, on line between Tehama and Trinity Cos., July 2, 1950, <u>Hoffman 3238</u> |
| | 729 | 7 | | California. Trinity Co.: Blue Ridge Lassic Group, July 13, 1949, <u>Hoffman 2893</u> |
| | 725 | 7 | | California. Trinity Co.: Perry Salt-Log Serpentine Mt. Lassic Group, July 17, 1949, <u>Hoffman 2884</u> |
| | 691 | 7 | | California. Trinity-Humbolt Cos.: Mt. Lassic, headwaters of Little and Big Van Duzen R., Trinity-Humbolt Co. line, July 14, 1949, <u>Hoffman 2890</u> |
| <u>A. lemmonii</u> | 330 | 7 | | California. Lassen Co.: Grass Valley, s.w. of Blacks Mt. Experimental Forest, Oct., 1945, <u>Robbins</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|--------------------|----------------|-------------------|----|---|
| | | n | 2n | |
| <u>A. lemmonii</u> | 795 | 7 | | California. Modoc Co.: on way from Alturas to Klamath Falls, opposite trail leading to Hackmore, May 15, 1950, <u>Balls 14698</u> |
| | 374 | 7 | | California. Sierra Co.: 10 mi. s.e. of Sierraville, along Little Truckee R., June 22, 1946, <u>Ownbey & Ownbey 2931</u> |
| | 815 | 7 | | Idaho. Owyhee Co.: 38 mi. s.w. of Rogerson, w. of Three Creek Post Office, June 27, 1950, <u>Ownbey 3271</u> |
| | 814 | 7 | | Idaho. Twin Falls Co.: 23 mi. s.w. of Rogerson, 1.0 mi. n.e. of House Creek, June 27, 1950, <u>Ownbey 3270</u> |
| | 1122 | | 14 | Oregon. Malheur Co.: 3 mi. s.w. of Harper, May 2, 1959, <u>Cronquist 8169</u> |
| <u>A. macrum</u> | 297 | 7 | | Oregon. Crook Co.: s. of Buck Hollow Creek, Ochoco National Forest, July 2, 1945, <u>Weber 2959</u> |
| | 755 | 7 | | Oregon. Gilliam Co.: 9 mi. s. of Condon, May 12, 1950, <u>Cronquist 6296</u> |
| | 189 | 7 | | Oregon. Klamath Co.: Green Springs Highway beyond Keno, May 23, 1942, <u>Small</u> |
| | 779 | 7 | | Oregon. Umatilla Co.: 24 mi. s.w. of Pendleton, May 11, 1950, <u>Cronquist 6284</u> |
| | 780 | 7 | | Oregon. Wheeler Co.: along John Day R. just s. of Seince Creek, between Fossil and Mitchell, May 12, 1950, <u>Cronquist 6306</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|-------------------|----------------|-------------------|----|---|
| | | n | 2n | |
| <u>A. macrum</u> | 174 | 7 | | Washington. Kittitas Co.: 8 mi. s.w. of Ellensburg on old Yakima road, Apr. 24, 1942, <u>Ownbey & Weber 2528</u> |
| | 180 | 7 | | Washington. Klickitat Co.: 4 mi. s.e. of Bickleton, Apr. 25, 1942, <u>Ownbey & Weber 2534</u> |
| | 242 | 7 | | Washington. Walla Walla Co.: s.w. of Touchet, Apr. 7, 1944, <u>Weber, Weber, & Booth</u> |
| | 80 | 7 | | Washington. Whitman Co.: at summit of Snake R.-Little Almota Creek Divide, Apr. 20, 1941, <u>Ownbey & Aase 2378</u> |
| <u>A. madidum</u> | 36 | 21 | | Idaho. Adams Co.: 3 mi. w. of McCall, June 27, 1940, <u>Aase & Ownbey</u> |
| | 358 | 21 | | Idaho. Adams Co.: 4 mi. w. of New Meadows, June 11, 1946, <u>Ownbey & Ownbey 2756</u> |
| | 319 | 14 | | Oregon. Grant Co.: wet meadow, Malheur National Forest, Aug. 3, 1945, <u>Weber 3112</u> |
| | 284 | 14 | | Oregon. Umatilla Co.: on ridge top, along Bear Wallow road, June 8, 1945, <u>Weber 2885</u> |
| | 801 | 14 | | Oregon. Wheeler Co.: ca. 18 mi. n.e. of Spray, June 21, 1950, <u>Cronquist 6639</u> |
| | 290 | 14 | | Oregon. Wheeler Co.: directly n. of Pisgah Lookout, June 28, 1945, <u>Weber 2948</u> |
| | 298 | 14 | | Oregon. Wheeler Co.: Squaw Meadow Creek, Ochoco National Forest, July 3, 1945, <u>Weber 2962</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|-------------------|----------------|-------------------|----|---|
| | | n | 2n | |
| <u>A. obtusum</u> | 857 | | 14 | California. Butte Co.: on road from Magalia to Lovelock at Mosquito Creek on ridge before reaching Little Butte Creek, May 1, 1951, <u>Hoffman 3773</u> |
| | 688 | 7 | | California. Tulane Co.: Siberian Pass Creek, Sierra Nevada, July 25, 1949, <u>Munz 14209</u> |
| | 391 | 7 | | California. Tuolumne Co.: on ridge w. of Strawberry Lake, June 30, 1946, <u>Ownbey & Ownbey 2936</u> |
| | 392 | 7 | | California. Tuolumne Co.: s.w. of Strawberry Lake, June 30, 1946, <u>Ownbey & Ownbey 2964</u> |
| <u>A. parvum</u> | 945 | | 14 | California. Siskiyou Co.: summit Gazelle Mt., Apr. 27, 1952, <u>Parker</u> |
| | 359 | 7 | | Idaho. Washington Co.: summit 5.5 mi. s.w. of Midvale, June 12, 1946, <u>Ownbey & Ownbey 2760</u> |
| | 547 | 7 | | Idaho. Washington Co.: 6 mi. s.w. of Midvale, Apr. 13, 1947, <u>Ownbey & Ward 3115</u> |
| | 1119 | | 14 | Oregon. Harney Co.: 30 mi. s. of Juntura, Apr. 23, 1959, <u>Cronquist 8143</u> |
| | 1133 | | 14 | Oregon. Harney Co.: top of the Trout Creek Mts., July 9, 1959, <u>Cronquist</u> |
| | 190 | 7 | | Oregon. Klamath Co.: at Pelican City, May 25, 1942, <u>Small</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|------------------|----------------|-------------------|----|---|
| | | n | 2n | |
| <u>A. parvum</u> | 1121 | | 14 | Oregon. Malheur Co.: 2 mi. e. of Juntura, Apr. 27, 1959, <u>Cronquist 8151</u> |
| | 979 | | 14 | Oregon. Wheeler Co.: 10 mi. n.w. of Mitchell, on s.w. side of Sulton Mt., Apr. 30, 1953, <u>Cronquist 6911</u> |
| | 362 | 7 | | Nevada. Humboldt Co.: 14 mi. s. of McDermitt on Highway 95 and 14 mi. e., s. of Buckokin Mt., Santa Rosa Mts., June 13, 1946, <u>Ownbey & Ownbey 2791</u> |
| | 334 | 7 | | Nevada. Mineral Co.: slope n. of Cat Creek, Warsuk Range, July 9, 1945, <u>Alexander & Kellogg 4421</u> |
| | 335 | 7 | | Nevada. Mineral Co.: below summit, Mt. Grant, Wassuk Range, July 13, 1945, <u>Alexander & Kellogg 4421A</u> |
| | 295 | 7 | | Nevada. Nye Co.: Cherry Creek, Quinn Canyon Range, June 8, 1945, <u>Maguire & Holmgren 25347</u> |
| | 366 | 7 | | Nevada. Storey Co.: 6 mi. n.w. of Virginia City, just e. of Washoe Co. line, June 18, 1946, <u>Ownbey & Ownbey 2922</u> |
| | 368 | 7 | | Nevada. Washoe Co.: 6 mi. n.w. of University of Nevada Campus, Reno, June 20, 1946, <u>Ownbey & Ownbey 2924</u> |
| | 369 | 7 | | Nevada. Washoe Co.: 4 mi. n.w. of University of Nevada Campus, Reno, June 20, 1946, <u>Ownbey & Ownbey 2926</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|----------------------|----------------|-------------------|----|---|
| | | n | 2n | |
| <u>A. platycaule</u> | 331 | 7 | | California. Lassen Co.: mountain slope immediately s. of McKenzie Meadow and ca. 1 mi. w. of Coopervale Ranger Station, along Susanville-Westwood highway, Sept. 24, 1945, <u>Robbins</u> |
| | 43 | 7 | | California. Modoc Co.: Cedar Pass to Cedar Peak, Warner Mts., e. of Alturas, July 1, 1940, <u>Aase & Ownbey</u> |
| | 796 | 7 | | California. Modoc Co.: 2.5 mi. off Highway 299 from Canby to Aden, May 18, 1950, <u>Balls 14743</u> |
| | 1128 | | 14 | California. Modoc Co.: at Cedarville Pass, Warner Mts., between Cedarville and Alturas, June 20, 1959, <u>Cronquist & Holmgren 8523</u> |
| | 48 | 7 | | California. Modoc Co.: near summit of Cedar Peak, Warner Mts., July 1, 1940, <u>Meyer & Biddulph</u> |
| | 47 | 7 | | California. Modoc Co.: Cedar Pass to Cedar Peak, Warner Mts., July 1, 1940, <u>Ownbey & Meyer 2145</u> |
| | 238 | 7 | | California. Nevada Co.: w. side of Donner Pass, near Norden, July 15, 1943, <u>Howell 18377</u> |
| | 239 | 7 | | California. Nevada Co.: Castle Peak, July 20, 1943, <u>Howell 18608</u> |
| | 237 | 7 | | California. Placer Co.: between Donner Pass and Mt. Lincoln, July 21, 1943, <u>Howell 18653</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|----------------------|----------------|-------------------|----|---|
| | | n | 2n | |
| <u>A. pleianthum</u> | 756 | 14 | | Oregon. Wheeler Co.: 3 mi. n.e. of Clarno, May 6, 1950, <u>Cronquist 6263</u> |
| <u>A. punctum</u> | 1125 | | 14 | Oregon. Harney Co.: along the e. front of Steens Mts., 1.0 mi. s. of Alvord Creek, 100 mi. s.e. of Burns, May 20, 1959, <u>Cronquist 8257</u> |
| | 1126 | | 14 | Oregon. Harney Co.: n.e. slope overlooking Alvord Creek, 100 mi. s.e. of Burns, May 22, 1959, <u>Cronquist 8271</u> |
| | 1124 | | 14 | Oregon. Lake Co.: 20 mi. s.s.w. of Wagontire, between Gray's Butte and the n. end of Alkali Lake, May 14, 1959, <u>Cronquist 8237</u> |
| <u>A. robinsonii</u> | 182 | 7 | | Oregon. Sherman Co.: banks of Columbia R. just below confluence of John Day R., Apr. 26, 1942, <u>Ownbey & Weber 2536</u> |
| | 1164* | 7 | | Washington. Franklin Co.: 10 mi. n.w. of Pasco, along Columbia R., Apr. 11, 1965, <u>Morehouse</u> |
| | 769 | 7 | | Washington. Grant Co.: 2 mi. above Beverly, e. side of Columbia R., May 7, 1950, <u>Witt & Witt</u> |
| | 177 | 7 | | Washington. Yakima Co.: banks of Columbia R. at Priests Rapids, Apr. 25, 1942, <u>Ownbey & Weber 2631</u> |
| <u>A. scilloides</u> | 666 | 7 | | Washington. Douglas Co.: near the summit of Badger Mt., May 31, 1949, <u>English</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|----------------------|----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. scilloides</u> | 170 | 7 | | Washington. Grant Co.: ca. 1.0 mi. n. of Park Lake, at top of coulee wall, Apr. 24, 1942, <u>Ownbey & Weber 2522</u> |
| | 175 | 7 | | Washington. Kittitas Co.: 10 mi. s.w. of Ellensburg on old Yakima road, Apr. 24, 1942, <u>Ownbey & Weber 2529</u> |
| | 181 | 7 | | Washington. Klickitat Co.: 4 mi. s.e. of Bickleton, Apr. 25, 1942, <u>Ownbey & Weber 2535</u> |
| <u>A. simillimum</u> | 544 | 7 | | Idaho. Blaine Co.: 3 mi. s.w. of Hailey, Apr. 11, 1947, <u>Ownbey & Ward 3103</u> |
| | 251 | 7 | | Idaho. Boise Co.: ca. 6 mi. s. of Lowman on Lowman-Boise road, June 1, 1944, <u>Hitchcock & Muhlick 8621</u> |
| | 543 | 7 | | Idaho. Butte Co.: just n. of w. entrance to Craters of the Moon National Monument, Apr. 10, 1947, <u>Ownbey & Ward 3102</u> |
| | 252 | 7 | | Idaho. Camas Co.: 11 mi. n. of Soldier, 1944, <u>Hitchcock</u> |
| | 257 | 7 | | Idaho. Custer Co.: 3 mi. s.w. of Stanley Lake, June 6, 1944, <u>Hitchcock & Muhlick 9640</u> |
| | 253 | 7 | | Idaho. Elmore Co.: on top of s. side of Dog Mt., head of Dog Creek of the Basic River, ca. 4 mi. n. of Pine, June 5, 1944, <u>Hitchcock & Muhlick 8738</u> |
| | 545 | 7 | | Idaho. Elmore Co.: 7 mi. e. of Dixie, Apr. 11, 1947, <u>Ownbey & Ward 3106</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|------------------------|----------------|-------------------|----|---|
| | | n | 2n | |
| <u>A. simillimum</u> | 221 | 7 | | Idaho. Idaho Co.: 2 mi. n. of Secesh Summit, 7.5 mi. s.w. of Bergdorf, July 6, 1942, <u>Ownbey & Aase 2581</u> |
| | 256 | 7 | | Idaho. Lemhi Co.: 8-mile Creek, 12 mi. s.w. of Leadore, Lemhi Mts., June 24, 1944, <u>Hitchcock & Muhlick 9243</u> |
| | 255 | 7 | | Idaho. Lemhi Co.: 1.0 mi. s.w. of Taylor Mt., 4 mi. n.e. of Morgan Creek Summit, June 30, 1944, <u>Hitchcock & Muhlick 9411</u> |
| | 220 | 7 | | Idaho. Valley Co.: 0.5 mi. below Brundage Lookout, w. of Payette Lake, July 5, 1942, <u>Ownbey & Aase 2580</u> |
| <u>A. siskiyouense</u> | 843 | 7 | | California. Del Norte Co.: summit Happy Camp-Waldo road, July 15, 1950, <u>Hoffman 3244</u> |
| | 845 | 7 | | California. Siskiyou Co.: South Fork Road to Baldy Mt. Lookout, 2.4 mi. from the lookout, July 12, 1950, <u>Hoffman 3235</u> |
| | 867 | | 14 | California. Siskiyou Co.: summit above Packers Valley, between the headwaters of Grider Valley Creek and Bear Valley, n.w. of Turk Lake, in the Marble Mts., July 16, 1951, <u>Hoffman 3793</u> |
| | 59 | 7 | | California. Siskiyou Co.: summit of Siskiyou Mts. between Happy Camp and O'Brien, Oregon, July 8, 1940, <u>Aase & Ownbey</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|---|----------------|-------------------|----|---|
| | | n | 2n | |
| <u>A. siskiyouense</u> | 798 | 7 | | Oregon. Jackson Co.: on Dead Indian Road to Lake O' the Woods, June 14, 1950, <u>Kruckeberg 1787</u> |
| | 50 | 7 | | Oregon. Jackson Co.: near summit of Siskiyou Mts., 5 mi. n. of the California line, July 3, 1940, <u>Ownbey 2169</u> |
| | 938 | | 14 | Oregon. Jackson Co.: s. slope of Siskiyou Mts. near the California line, June 25, 1952, <u>Ownbey & Preece 3336</u> |
| | 191 | 7 | | Oregon. Jackson Co.: Jenny Creek, Green Springs Highway, May 25, 1942, <u>Small</u> |
| | 821 | | 14 | Oregon. Jackson Co.: Little Red Mt., on ridge connecting with Dutchman Peak, Siskiyou Mts., July 14, 1950, <u>Whittaker 279</u> |
| <u>A. tolmiei</u> var. <u>persimile</u> | 817 | 21 | | Idaho. Adams Co.: 25 mi. n.w. of Council on road to Cuprum, June 28, 1950, <u>Ownbey 3284</u> |
| | 218 | 21 | | Idaho. Adams Co.: 3 mi. n. of Hornet Creek Ranger Station, Cuddy Mts., July 5, 1942, <u>Ownbey & Aase 2578</u> |
| | 1200* | 21 | | Idaho. Adams Co.: 20 mi. n.w. of Fruitvale on road to Cuprum, June 18, 1966, <u>Ownbey & Mingrone 3451</u> |
| <u>A. tolmiei</u> var. <u>platyphyllum</u> | 31 | | 14 | Idaho. Idaho Co.: a few mi. s. of Grangeville, June 25, 1940, <u>Aase</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|---|----------------|-------------------|----|---|
| | | n | 2n | |
| <u>A. tolmiei</u> var. <u>platyphyllum</u> | 247 | 14 | | Idaho. Idaho Co.: 6 mi. s. of Grangeville, May 29, 1944, <u>Hitchcock & Muhlick 6842 & 6843</u> |
| | 1136 | | 28 | Idaho. Idaho Co.: 1 mi. above mouth of White Bird Creek, May 2, 1959, <u>Ownbey</u> |
| | 99 | 14 | | Idaho. Idaho Co.: 4 mi. s.w. of Grangeville, June 1, 1941, <u>Ownbey & Aase 2398</u> |
| | 100 | 14 | | Idaho. Idaho Co.: 2 mi. down Whitebird Grade, above Salmon R., June 1, 1941, <u>Ownbey & Aase 2399</u> |
| | 209 | 14 | | Oregon. Union Co.: 7 mi. e. of Elgin, July 2, 1942, <u>Ownbey & Aase 2565</u> |
| | 633 | 14 | | Oregon. Wallowa Co.: 6 mi. s.w. of Paradise, Apr. 18, 1949, <u>Ownbey 3171</u> |
| | 201 | 14 | | Oregon. Wallowa Co.: above Chico Guard Station, ca. half-way up, July 1, 1942, <u>Ownbey & Aase 2556</u> |
| | 202 | 14 | | Oregon. Wallowa Co.: above Chico Guard Station, ca. half-way up, July 1, 1942, <u>Ownbey & Aase 2556</u> |
| | 203 | 14 | | Oregon. Wallowa Co.: at top of grade from Chico Guard Station to Billy Meadows, July 1, 1942, <u>Ownbey & Aase 2557</u> |
| <u>A. tolmiei</u> var. <u>tolmiei</u> | 794 | 7 | | California. Lassen Co.: Ash Creek, in Public Camp off road from Adin to Madeline, May 18, 1950, <u>Balls 14767</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|--|----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. tolmiei</u> var. <u>tolmiei</u> | 985 | | 14 | California. Modoc Co.: Jess Valley, e. of Likely, May 14, 1953, <u>Weber</u> |
| | 818 | 7 | | Idaho. Adams Co.: 7 mi. e. of bridge below Homestead, Oregon, June 29, 1950, <u>Ownbey 3289</u> |
| | 549 | 7 | | Idaho. Adams Co.: along Little Salmon R., 10 mi. s. of Pollock, Apr. 13, 1947, <u>Ownbey & Ward 3119</u> |
| | 33 | 7 | | Idaho. Idaho Co.: near Hibbs Cow Camp, Seven Devils Mts., June 26, 1940, <u>Aase</u> |
| | 34 | 7 | | Idaho. Idaho Co.: near Heaven's Gate, Seven Devils Mts., June 27, 1940, <u>Aase</u> |
| | 95 | 7 | | Idaho. Nez Perce Co.: slopes overlooking Salmon R. Canyon, Craig Mts., May 25, 1941, <u>Ownbey & Aase 2391</u> |
| | 1134 | | 14 | Idaho. Owyhee Co.: ca. 5 mi. n.e. of Oregon State line, n. of Jordan Valley, June, 1959, <u>Cronquist</u> |
| | 546 | 7 | | Idaho. Washington Co.: 1 mi. w. of Eaton, Apr. 12, 1947, <u>Ownbey & Ward 3114</u> |
| | 213 | 7 | | Oregon. Baker Co.: 5 mi. w. of Hereford, July 3, 1942, <u>Ownbey & Aase 2572</u> |
| | 215 | 7 | | Oregon. Baker Co.: 3 mi. s.e. of Unity, July 4, 1942, <u>Ownbey & Aase 2574</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|--|----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. tolmiei</u> var. <u>tolmiei</u> | 786 | 7 | | Oregon. Grant Co.: just s. of Meadow Creek Pass, 6 mi. s.w. of Dale, May 19, 1950, <u>Cronquist 6375</u> |
| | 788 | 7 | | Oregon. Grant Co.: 6 mi. n. of Mt. Vernon, May 21, 1950, <u>Cronquist 6395</u> |
| | 884 | | 14 | Oregon. Grant Co.: 30 mi. n. of Burns, Aug. 1, 1951, <u>Goodwin</u> |
| | 106 | 7 | | Oregon. Grant Co.: 9 mi. n. of Long Creek, June 16, 1941, <u>Ownbey & Brown 2410</u> |
| | 317 | 7 | | Oregon. Grant Co.: Belshaw Meadows, Malheur National Forest, July 26, 1945, <u>Weber 3103</u> |
| | 318 | 7 | | Oregon. Grant Co.: s. side of Fox Valley, Old Ryan Ranch, Malheur National Forest, July 26, 1945, <u>Weber 3104</u> |
| | 323 | 7 | | Oregon. Grant Co.: summit of Prairie Hill, Malheur National Forest, Aug. 11, 1945, <u>Weber 3235</u> |
| | 1120 | | 14 | Oregon. Harney Co.: a scant mile w. of the Middle Fork of the Malheur R., 17 mi. w. of Juntura, Apr. 26, 1959, <u>Cronquist 8146</u> |
| | 1123 | | 14 | Oregon. Harney Co.: 11 mi. n.w. of Drewsey, May 5, 1959, <u>Cronquist 8185</u> |
| | 1131 | | 14 | Oregon. Harney Co.: Steens Mts., just w. of the crest, July 15, 1959, <u>Cronquist 8700</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|--|----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. tolmiei</u> var. <u>tolmiei</u> | 107 | 7 | | Oregon. Harney Co.: 4 mi. w. on Gravel Ridge road, 18 mi. n. of Burns, June 17, 1941, <u>Ownbey & Brown 2412</u> |
| | 940 | | 14 | Oregon. Harney Co.: 35 mi. s.w. of Burns, June 27, 1952, <u>Ownbey & Preece 3359</u> |
| | 299 | 7 | | Oregon. Harney Co.: 0.5 mi. n. of Allison Ranger Station Snow Mt. Ranger District, Ochoco National Forest, July 5, 1945, <u>Weber 2971</u> |
| | 579 | 7 | | Oregon. Jefferson Co.: near Crooked River bridge on Dalles-California highway, May 3, 1947, <u>Peck 24139</u> |
| | 109 | 7 | | Oregon. Lake Co.: at mile post 41, S. 10, T. 355, R. 17E, June 18, 1941, <u>Ownbey & Brown 2414</u> |
| | 628 | 7 | | Oregon. Lake Co.: Quartz Mt., June 29, 1948, <u>Peck 25462</u> |
| | 781 | 7 | | Oregon. Morrow Co.: 18 mi. s.w. of Heppner, May 14, 1950, <u>Cronquist 6343</u> |
| | 787 | 7 | | Oregon. Umatilla Co.: 5 mi. n. of Ukiah, May 19, 1950, <u>Cronquist 6363</u> |
| | 105 | 7 | | Oregon. Umatilla Co.: 6 mi. n. of Ukiah, June 16, 1941, <u>Ownbey & Brown 2408</u> |
| | 286 | 7 | | Oregon. Umatilla Co.: 6 mi. n. of Ukiah Junction, June 1, 1945, <u>Weber 2877</u> |
| | 287 | 7 | | Oregon. Umatilla Co.: 3 mi. n.e. of Lehman Spring, June 4, 1945, <u>Weber 2893</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|--|----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. tolmiei</u> var. <u>tolmiei</u> | 210 | 7 | | Oregon. Union Co.: 13 mi. n. of North Powder, w. of Union, July 2, 1942, <u>Ownbey & Aase 2568</u> |
| | 204 | 7 | | Oregon. Wallowa Co.: at top of grade from Chico Guard Station toward Billy Meadows, July 1, 1942, <u>Ownbey & Aase 2558</u> |
| | 289 | 7 | | Oregon. Wheeler Co.: 5.5 mi. e. of Pisgah Lookout, June 28, 1945, <u>Weber 2947</u> |
| | 292 | 7 | | Oregon. Wheeler Co.: on e. side of Younger Spring, June 28, 1945, <u>Weber 2952</u> |
| | 293 | 7 | | Oregon. Wheeler Co.: S. 20, T. 13S., R. 23E., June 28, 1945, <u>Weber 2954</u> |
| | 656 | 7 | | Washington. Asotin Co.: overlooking Grande Ronde R., just above Rattlesnake Creek, s.w. of Anatone, Apr. 24, 1949, <u>Cronquist 5728</u> |
| | 102 | 7 | | Washington. Asotin Co.: on prairie, 1 mi. n. of Anatone, June 8, 1941, <u>Ownbey & Aase 2403</u> |
| | 103 | 7 | | Washington. Asotin Co.: 7 mi. s. of Anatone, June 8, 1941, <u>Ownbey & Aase 2404</u> |
| | 199 | 7 | | Washington. Asotin Co.: just s. of Big Butte, Blue Mts., June 29, 1942, <u>Ownbey & Aase 2544</u> |

TABLE 1.--Continued

| Taxon | Culture Number | Chromosome Number | | Source |
|--|----------------|-------------------|----|--|
| | | n | 2n | |
| <u>A. tolmiei</u> var. <u>tolmiei</u> | 551 | 7 | | Washington. Asotin Co.: along Grande Ronde R., just above mouth of Rattlesnake Creek, Apr. 27, 1947, <u>Ownbey & Aase 3123</u> |
| | 1166* | 7 | | Washington. Asotin Co.: along Grande Ronde R., at bottom of Rattlesnake Grade, May 16, 1965, <u>Mingrone 7</u> |
| | 634 | 7 | | Washington. Columbia Co.: Abel's Ridge, s. of Pomeroy, Blue Mts., Apr. 16, 1949, <u>Buechner</u> |
| | 555 | 7 | | Washington. Garfield Co.: Abel's Ridge, 12 mi. s. of Pomeroy, May 9, 1947, <u>Daubenmire</u> |
| | 83 | 7 | | Washington. Whitman Co.: bank of Snake R., just below Truax, Apr. 27, 1941, <u>Ownbey & Aase 2380</u> |
| <u>A. tribracteatum</u> | 991 | | 14 | California. Tuolumne Co.: between Long Barn and Pinecrest, May 23, 1953, <u>Howell 29006</u> |
| | 392 | 7 | | California. Tuolumne Co.: s.w. of Strawberry Lake, June 30, 1946, <u>Ownbey & Ownbey 2964</u> |
| <u>A. yosemitense</u> | 890 | | 14 | California. Mariposa Co.: 0.5 mi. n. of Signal Peak Lookout, Chowchilla Mt., June 17, 1951, <u>Quick</u> |

*Collections counted during the present investigation.

Results and Discussion

The chromosome base number is seven throughout the alliance (Table 1). Within the alliance diploidy ($2n=14$), tetraploidy ($2n=28$), and hexaploidy ($2n=42$) occur. Only one taxon in the alliance is known to include all of the above ploidy levels (A. tolmiei, Table 1), and most include only one or at the most two.

The value of chromosome numbers in the interpretation of species has been demonstrated in many recent taxonomic studies, and some workers, for instance Löve (1951), have gone as far as to advocate the classification of all polyploid types as distinct species. However, chromosome number is of greatest importance when it reinforces evidence from other independent approaches, and is of minimal value when it does not (Ownbey and Aase, 1955).

Polyploid races have arisen within several evolutionary lines in Allium, yet there is no indication that this mechanism has been of any great significance in the evolutionary development of the genus. As with other isolating mechanisms, it is not the initiation of a barrier to interbreeding which is important from the standpoint of classification, but the evolutionary divergence which it permits (Ownbey and Aase, 1955).

CHROMATOGRAPHIC STUDIES

Materials and Methods

Collections were made of species and varieties from the experimental garden (Table 2) when the plants were in full flower. These were pressed and dried in the usual manner, and prior to weighing of samples for analysis, material that was not completely dry, especially the fleshy bulbs, was dried overnight in an oven at about 50 C. Specimens that were collected in the field, at the proper stage of development, were also used as chromatographic material. In this manner not only was material from the garden available, but also material from the field, which provided a comparative representation of those particular taxa.

The material available provided 26 taxa for investigation and in each of these, flowers, scape, leaves, and bulb were analyzed together. After a preliminary investigation, it was found that analysis of the plant parts run separately versus the parts run together resulted in no significant diagnostic substances being lost or gained. Therefore, it was decided to run the parts together.

More than one population was examined in many of the taxa; in the case of A. tolmiei var. tolmiei, 20 were studied. Up to five chromatograms were made from each population.

For each sample, 0.16 g of dried material (0.04 g of each plant part) cut into very small pieces was placed in a shell vial to which 1.5 ml of the extracting solvent, 1.0% hydrochloric acid in methanol (v/v), was added. This amount of extracting solvent was sufficient to cover the dried material.

TABLE 2.--Sources of chromatographic material of the
Allium falcifolium alliance

| Taxon | Culture Number | Source |
|--|----------------|--|
| <u>A. aaseae</u> | 1212 | Idaho. Gem Co.: 5 mi. s.e. of Emmett, top of Freezeout Hill, June 18, 1966, <u>Ownbey & Mingrone</u> |
| <u>A. anceps</u> | 1245 | Oregon. Malheur Co.: 25.5 mi. n. of McDermitt, Nevada, June 15, 1967, <u>Mingrone & McNeal 101</u> |
| <u>A. brandegei</u> | 1197 | Idaho. Adams Co.: 2 mi. w. of McCall, and 1.5 mi. n. of McCall-New Meadows highway, June 17, 1966, <u>Ownbey & Mingrone 3449</u> |
| | 1198 | Idaho. Adams Co.: 11 mi. n.w. of Fruitvale, along Grouse Creek, June 18, 1966, <u>Ownbey & Mingrone</u> |
| <u>A. crenulatum</u> | 1241 | Oregon. Clatsop Co.: summit of Saddle Mt., June 11, 1967, <u>Mingrone & McNeal 97</u> |
| | | Oregon. Linn Co.: Monument Peak, June 24, 1967, <u>Marttala</u> |
| <u>A. douglasii</u> var. <u>columbianum</u> | 1213 | Idaho. Idaho Co.: 2 mi. s.e. of Cottonwood, June 17, 1966, <u>Ownbey & Mingrone</u> |
| | 1162 | Idaho. Latah Co.: 3 mi. n.w. of Kendrick, May 1, 1965, <u>Mingrone 3</u> |
| | 1172 | Idaho. Latah Co.: 3/4 mi. s.e. of Troy, May 2, 1965, <u>Mingrone 14</u> |
| | 1163 | Idaho. Nez Perce Co.: 21 mi. s.e. of Pullman, Washington, top of Lewiston Grade, May 16, 1965, <u>Mingrone 4</u> |
| | 1169 | Washington. Spokane Co.: 2.5 mi. n. of Spangle, May 19, 1966, <u>Ownbey & Mingrone</u> |
| <u>A. douglasii</u> var. <u>constrictum</u> | 1175 | Washington. Grant Co.: top of Steamboat Rock, May 19, 1966, <u>Ownbey & Mingrone 3421</u> |
| <u>A. douglasii</u> var. <u>douglasii</u> | 1238 | Oregon. Grant Co.: 3 mi. e. of Hamilton, and 8.8 mi. w. of Long Creek, June 5, 1967, <u>Ownbey & Mingrone 3500</u> |
| | 1239 | Oregon. Grant Co.: 5.6 mi. e. of Hamilton, and 6.2 mi. w. of Long Creek, June 5, 1967, <u>Ownbey & Mingrone 3501</u> |

TABLE 2.--Continued

| Taxon | Culture Number | Source |
|--|----------------|---|
| <u>A. douglasii</u> var. <u>douglasii</u> | 1192 | Oregon. Umatilla Co.: 14 mi. s.e. of Pendleton, May 22, 1966, <u>Ownbey & Mingrone 3444</u> |
| | 1160 | Washington. Whitman Co.: 2 mi. s.w. of Colton, head of Steptoe Canyon, May 28, 1965, <u>Ownbey & Mingrone</u> |
| | 1161 | Washington. Whitman Co.: 7 mi. w. of Pullman, on Union Flat Creek road, May 28, 1965, <u>Ownbey & Mingrone</u> |
| | 1168 | Washington. Whitman Co.: 1.0 mi. n.w. of Colton, May 16, 1965, <u>Mingrone 9</u> |
| <u>A. douglasii</u> var. <u>nevi</u> | 1156 | Oregon. Wasco Co.: 4.4 mi. s. of Bear Springs, n. boundary of Warm Springs Indian Reservation, June 8, 1963, <u>French 2251</u> |
| | 1157 | Oregon. Wasco Co.: 4.4 mi. s. of Bear Springs, n. boundary of Warm Springs Indian Reservation, June 8, 1963, <u>French 2252</u> |
| | 1177 | Washington. Kittitas Co.: 16 mi. n.w. of Ellensburg, May 20, 1966, <u>Ownbey & Mingrone 3430</u> |
| | 1183 | Washington. Klickitat Co.: 7.6 mi. n. of Goldendale, May 21, 1966, <u>Ownbey & Mingrone 3436</u> |
| | 1181 | Washington. Yakima Co.: 14 mi. s.w. of Ellensburg, May 21, 1966, <u>Ownbey & Mingrone 3434</u> |
| | 1182 | Washington. Yakima Co.: 16 mi. s.w. of Ellensburg, Umtanum Ridge, May 21, 1966, <u>Ownbey & Mingrone 3435</u> |
| <u>A. falcifolium</u> | 1242 | California. Trinity Co.: 14.5 mi. n.e. of Forest Glen, toward Peanut, June 12, 1967, <u>Mingrone & McNeal 98</u> |
| | 1233 | Oregon. Josephine Co.: 5 mi. w. of Kirby, Tennessee Mt., Tennessee Pass, June 3, 1967, <u>Ownbey & Mingrone 3492</u> |
| | 1234 | Oregon. Josephine Co.: 4.4 mi. s.w. of O'Brien, June 3, 1967, <u>Ownbey & Mingrone 3494</u> |

TABLE 2.--Continued

| Taxon | Culture Number | Source |
|---------------------|----------------|--|
| <u>A. fibrillum</u> | | Oregon. Union Co.: Wallowa Mts., ca. 3 mi. on Eagle Creek Trail from Boulder Park Resort, June 15, 1967, <u>Marttala</u> |
| | 1210 | Oregon. Wallowa Co.: 30 mi. n. of Enterprise, rim of Joseph Creek Canyon, June 20, 1966, <u>Ownbey & Mingrone 3464</u> |
| | 1165 | Washington. Asotin Co.: ca. 8 mi. s.w. of Anatone, Fields Spring State Park, along trail to lookout, May 16, 1965, <u>Mingrone 6</u> |
| | 1173 | Washington. Asotin Co.: summit of Big Butte Lookout, May 16, 1966, <u>Mingrone 15</u> |
| <u>A. lemmonii</u> | | California. Alpine Co.: 0.5 mi. w. of Monitor Pass, July 10, 1963, <u>Howell 39728</u> |
| | | California. Alpine Co.: ca. 7 mi. from E. Carson R., near Monitor Pass Road, July 9, 1958, <u>Howitt 49</u> |
| | | California. Plumas Co.: Sierra Valley near Beckwourth, June 18, 1962, <u>Howell 37767</u> |
| | | California. Sierra Co.: Sierra Valley between Sierraville and Loyalton, May 14, 1954, <u>Howell & Barneby 29548</u> |
| | 1217 | Oregon. Baker Co.: ca. 2 mi. s.e. of Baker, May 31, 1967, <u>Ownbey & Mingrone 3471</u> |
| | 1221 | Oregon. Harney Co.: 15 mi. w. of Juntura, June 1, 1967, <u>Ownbey & Mingrone 3477</u> |
| | 1222 | Oregon. Harney Co.: 20 mi. w. of Juntura, June 1, 1967, <u>Ownbey & Mingrone 3479</u> |
| | 1122 | Oregon. Malheur Co.: 3 mi. s.w. of Harper, May 2, 1959, <u>Cronquist 8169</u> |
| | 1220 | Oregon. Malheur Co.: Directly s. of Harper Junction, June 1, 1967, <u>Ownbey & Mingrone 3476</u> |
| <u>A. macrum</u> | 1230 | Oregon. Klamath Co.: 3 mi. w. of Keno, June 2, 1967, <u>Ownbey & Mingrone 3487</u> |

TABLE 2.--Continued

| Taxon | Culture Number | Source |
|-------------------|----------------|--|
| <u>A. macrum</u> | 1191 | Oregon. Wheeler Co.: 2.3 mi. n.e. of Service Creek, May 22, 1966, <u>Ownbey & Mingrone</u> |
| | 1178 | Washington. Kittitas Co.: 7 mi. s.w. of Ellensburg, May 21, 1966, <u>Ownbey & Mingrone 3431</u> |
| | 1184 | Washington. Kittitas Co.: 8 mi. s.w. of Ellensburg, May 21, 1966, <u>Ownbey & Mingrone</u> |
| | 1170 | Washington. Whitman Co.: 11 mi. s.w. of Pullman, Little Almota Creek Divide above Davis Bar on the Snake R., May 28, 1965, <u>Ownbey & Mingrone</u> ; May 6, 1966, <u>Mingrone & Fahselt</u> |
| <u>A. madidum</u> | 1196 | Idaho. Adams Co.: 2 mi. w. of McCall, and 1.5 mi. n. of McCall-New Meadows highway, June 17, 1966, <u>Ownbey & Mingrone 3448</u> |
| | 1188 | Oregon. Morrow Co.: 37.6 mi. s. of Heppner, May 22, 1966, <u>Ownbey & Mingrone 3441</u> |
| | 1190 | Oregon. Morrow Co.: 38.6 mi. s. of Heppner, May 22, 1966, <u>Ownbey & Mingrone 3443</u> |
| | 1207 | Oregon. Union Co.: 32 mi. s.w. of La Grande and 8 mi. n.e. of Lehman Springs Junction, June 20, 1966, <u>Ownbey & Mingrone 3461</u> |
| <u>A. obtusum</u> | 1244 | California. Amador Co.: 22 mi. e. of Pine Grove, June 15, 1967, <u>Mingrone & McNeal 100</u> |
| <u>A. parvum</u> | | California. Plumas Co.: 2 mi. e. of Blairsdan, May 14, 1954, <u>Howell & Barneby 29557</u> |
| | 1211 | Idaho. Washington Co.: 5 mi. s.w. of Midvale, summit of Midvale Hill, June 18, 1966, <u>Ownbey & Mingrone</u> |
| | 1218 | Idaho. Washington Co.: 5 mi. s.w. of Midvale, summit of Midvale Hill, June 1, 1967, <u>Ownbey & Mingrone 3472</u> |
| | 1224 | Oregon. Harney Co.: ca. 20 mi. w. of Juntura, on Stinking Water Mt. access road, June 1, 1967, <u>Ownbey & Mingrone 3480</u> |

TABLE 2.--Continued

| Taxon | Culture Number | Source |
|----------------------|----------------|--|
| <u>A. parvum</u> | 1229 | Oregon. Lake Co.: 15 mi. w. of Lakeview, June 2, 1967, <u>Ownbey & Mingrone 3486</u> |
| <u>A. platycaule</u> | | California. Mono Co.: Diamond Peak, June 16, 1961, <u>Hardham 7467</u> |
| | 1227 | Oregon. Lake Co.: n. end of Lakeview, June 2, 1967, <u>Ownbey & Mingrone 3484</u> |
| | 1228 | Oregon. Lake Co.: 14 mi. w. of Lakeview, June 2, 1967, <u>Ownbey & Mingrone 3485</u> |
| <u>A. pleianthum</u> | 1186 | Oregon. Wheeler Co.: 1.5 mi. e. of Clarno, May 22, 1966, <u>Ownbey & Mingrone 3439</u> |
| | 1236 | Oregon. Wheeler Co.: 6.5 mi. w. of Mitchell, June 5, 1967, <u>Ownbey & Mingrone 3496</u> |
| <u>A. punctum</u> | 1125 | Oregon. Harney Co.: 1.0 mi. s. of Alvord Creek and 100 mi. s.e. of Burns, along the e. front of Steens Mts., May 22, 1959, <u>Cronquist 8257</u> |
| | 1126 | Oregon. Harney Co.: on n.e. slope overlooking Alvord Creek, a little over 1.0 mi. above Alvord Ranch, 100 mi. s.e. of Burns, May 22, 1959, <u>Cronquist 8271</u> |
| | 1226 | Oregon. Harney Co.: 0.5 mi. s. of Wagontire, June 1, 1967, <u>Ownbey & Mingrone 3482</u> |
| | 1124 | Oregon. Lake Co.: 20 mi. s.s.w. of Wagontire between Gray's Butte and the n. end of Alkali Lake, May 14, 1959, <u>Cronquist 8237</u> |
| <u>A. robinsonii</u> | 1164 | Washington. Franklin Co.: 10 mi. n.w. of Pasco, along Columbia R., Apr. 11, 1965, <u>Morehouse</u> |
| | 1171 | Washington. Grant Co.: ca. 1.0 mi. s. of Vantage Bridge, between highway and Columbia R., Apr. 4, 1966, <u>Ownbey</u> |
| <u>A. scilloides</u> | 1176 | Washington. Grant Co.: Dry Falls State Park, May 19, 1966, <u>Ownbey & Mingrone</u> |

TABLE 2.--Continued

| Taxon | Culture Number | Source |
|---|----------------|---|
| <u>A. scilloides</u> | 1179 | Washington. Kittitas Co.: 9. mi. s.w. of Ellensburg, May 21, 1966, <u>Ownbey & Mingrone 3432</u> |
| | 1180 | Washington. Kittitas Co.: 10 mi. s.w. of Ellensburg, May 21, 1966, <u>Ownbey & Mingrone 3433</u> |
| <u>A. simillimum</u> | 1195 | Idaho. Adams Co.: 0.5 mi. below summit of Brundage Mt., June 17, 1966, <u>Ownbey & Mingrone 3447</u> |
| <u>A. siskiyouense</u> | 1231 | Oregon. Jackson Co.: 0.1 mi. e. of Pinehurst, June 2, 1967, <u>Ownbey & Mingrone 3488</u> |
| | 1232 | Oregon. Jackson Co.: 1.0 mi. s. of the summit of Siskiyou Mt., June 2, 1967, <u>Ownbey & Mingrone 3491</u> |
| <u>A. tolmiei</u> var. <u>persimile</u> | 1199 | Idaho. Adams Co.: 17 mi. n.w. of Fruitvale on road to Bear, June 18, 1966, <u>Ownbey & Mingrone 3450</u> |
| | 1200 | Idaho. Adams. Co.: 20 mi. n.w. of Fruitvale on road to Cuprum, June 18, 1966, <u>Ownbey & Mingrone 3451</u> |
| | 1201 | Idaho. Adams Co.: 2.6 mi. n. of Hornet Creek Ranger Station, Cuddy Mts., June 18, 1966, <u>Ownbey & Mingrone 3452</u> |
| <u>A. tolmiei</u> var. <u>platyphyllum</u> | 1135 | Idaho. Idaho Co.: 1.0 mi. above the mouth of White Bird Creek, s. facing slope along the Salmon River, May 2, 1959, <u>Ownbey</u> |
| | 1194 | Idaho. Idaho Co.: 6 mi. s.w. of Grangeville, June 17, 1966, <u>Ownbey & Mingrone 3446</u> |
| | 1208 | Oregon. Union Co.: 6 mi. e. of Elgin, June 20, 1966, <u>Ownbey & Mingrone 3462</u> |
| | 1209 | Oregon. Union Co.: 7 mi. e. of Elgin, June 20, 1966, <u>Ownbey & Mingrone 3463</u> |
| | 1193 | Oregon. Wallowa Co.: 30 mi. n. of Enterprise, on rim of Joseph Creek Canyon, May 22, 1966, <u>Ownbey & Mingrone 3445</u> |

TABLE 2.--Continued

| Taxon | Culture Number | Source |
|---|----------------|--|
| <u>A. tolmiei</u> var. <u>platyphyllum</u> | 1216 | Oregon. Wallowa Co.: 5 mi. w. of Minam, May 31, 1967, <u>Ownbey & Mingrone 3469</u> |
| <u>A. tolmiei</u> var. <u>tolmiei</u> | 1214 | Idaho. Adams Co.: 10 mi. s. of Pollock, June 17, 1966, <u>Ownbey & Mingrone</u> |
| | 1134 | Idaho. Owyhee Co.: 5 mi. n.e. of Oregon State Line, n. of Jordan Valley, June, 1959, <u>Cronquist</u> |
| | 1202 | Oregon. Baker Co.: 2 mi. s.e. of Unity, 39 mi. n.w. of Brogan, June 19, 1966, <u>Ownbey & Mingrone 3453</u> |
| | 1203 | Oregon. Grant Co.: 22 mi. n.e. of Prairie City, just w. of Blue Mt. Pass, June 19, 1966, <u>Ownbey & Mingrone 3454</u> |
| | 1204 | Oregon. Grant Co.: 17 mi. n. of Mt. Vernon, June 20, 1966, <u>Ownbey & Mingrone 3458</u> |
| | 1205 | Oregon. Grant Co.: 9 mi. n. of Long Creek, near summit of Ritter Butte, June 20, 1966, <u>Ownbey & Mingrone 3459</u> |
| | 1240 | Oregon. Grant Co.: 5.6 mi. e. of Hamilton and 6.2 mi. n.w. of Long Creek, June 5, 1967, <u>Ownbey & Mingrone 3502</u> |
| | 1120 | Oregon. Harney Co.: 17 mi. w. of Juntura, on the road to Burns, April 26, 1959, <u>Cronquist 8146</u> |
| | 1123 | Oregon. Harney Co.: 11 mi. n.w. of Drewsey, May 5, 1959, <u>Cronquist 8185</u> |
| | 1222 | Oregon. Harney Co.: 19 mi. w. of Juntura, June 1, 1967, <u>Ownbey & Mingrone 3478</u> |
| | 1225 | Oregon. Harney Co.: Stinking Water Mt. access road, June 1, 1967, <u>Ownbey & Mingrone 3481</u> |
| | 1189 | Oregon. Morrow Co.: 37.6 mi. s. of Heppner, May 22, 1966, <u>Ownbey & Mingrone 3442</u> |
| | 1206 | Oregon. Umatilla Co.: 5 mi. e. of Lehman Springs Junction, June 20, 1966, <u>Ownbey & Mingrone 3460</u> |

TABLE 2.--Continued

| Taxon | Culture Number | Source |
|--|----------------|--|
| <u>A. tolmiei</u> var. <u>tolmiei</u> | 1185 | Oregon. Wheeler Co.: 5 mi. n. of Fossil, May 22, 1966, <u>Ownbey & Mingrone 3438</u> |
| | 1187 | Oregon. Wheeler Co.: 6 mi. w. of Fossil, May 22, 1966, <u>Ownbey & Mingrone 3440</u> |
| | 1235 | Oregon. Wheeler Co.: 10 mi. s.w. of Mitchell, June 5, 1967, <u>Ownbey & Mingrone 3495</u> |
| | 1237 | Oregon. Wheeler Co.: 3 mi. n.e. of Mitchell, June 5, 1967, <u>Ownbey & Mingrone 3497</u> |
| | 1174 | Washington. Asotin Co.: 0.5 mi. below Big Butte Lookout, May 15, 1966, <u>Ownbey & Mingrone</u> |
| | 1166 | Washington. Asotin Co.: along Grande Ronde R., at the bottom of Rattlesnake Grade, May 16, 1965, <u>Mingrone 7</u> |
| | 1167 | Washington. Asotin Co.: 2 mi. s. of Anatone, May 16, 1965, <u>Mingrone 8</u> |
| <u>A. tribracteatum</u> | 1243 | California. Tuolumne Co.: 4 mi. e. of Long Barn, June 15, 1967, <u>Mingrone & McNeal 99</u> |

Extraction was allowed to continue for 24 hrs at about 4 C. The extract was then drawn off with a pipette pulled from soft glass tubing, and 0.5 ml of fluid applied to one corner of Whatman 3MM chromatographic paper in a spot about 2.5 cm in diameter.

The chromatograms were developed by the descending method in two directions. The first direction was 26 hr in t-butanol:acetic acid:water (3:1:1 v/v) and the second was 4.5 hr in acetic acid:water (15:85 v/v) (Alston and Turner, 1962). After drying, the chromatograms were examined and marked under various conditions including visible and long wave ultraviolet light with and without ammonia vapor (Table 3).

Spots on the chromatograms of different taxa were tentatively considered to represent the same compound on the basis of their appearance under the above conditions and by comparison of their R_f values in the two solvent systems. Each spot was given a number for identification and quantitatively estimated by visual comparison, the most intense spot having a value of 3 and the least intense a value of 1 (Tables 4, 5, 6).

Results and Discussion

Chromatograms representative of 26 taxa of the alliance revealed a total of 96 different spots. Most of the spots were not visible in daylight, exceptions being the anthocyanins which appeared pink or rose. Under ultraviolet light, the chromatographic components were yellow, various shades of blue, and purple. Those that appeared purple in ultraviolet light and changed to yellow, yellow-green, or green, with ammonia vapor tentatively were considered to be flavonoids on these bases alone. The characteristics of the individual spots under various light conditions with and without ammonia vapor are presented in Table 3. The spots that appeared purple or dark in ultraviolet

TABLE 3.--Characteristics of chromatographic components
in the Allium falcifolium alliance^a

| Spot Number | | No Reagent Visible Light | No Reagent Ultraviolet Light | Ammonia Vapor Ultraviolet Light |
|-------------|------|-----------------------------|---------------------------------|------------------------------------|
| Dark | D- 1 | -- | pu | y, y.g, g |
| | D- 2 | -- | pu | y, y.g, g |
| | D- 3 | -- | pu | y.g, g |
| | D- 4 | -- | pu | g |
| | D- 5 | -- | pu | -, y.g, g |
| | D- 6 | -- | pu | y.g, g |
| | D- 7 | -- | pu | y.g, g |
| | D- 8 | -- | pu | -, y.g, g |
| | D- 9 | -- | pu | -, y.g, g |
| | D-10 | -- | pu | -, y.g, g |
| | D-11 | -- | pu | y, y.g |
| | D-12 | -- | pu | y, y.g, g |
| | D-13 | -- | pu | y, y.g, g |
| | D-14 | -- | pu | y.g, g |
| | D-15 | -- | pu | -, y, y.g |
| | D-16 | -- | pu | -, y, y.g, g |
| | D-17 | -- | pu | y, y.g, g |
| | D-18 | -- | pu | -, y.g, g |
| | D-19 | -- | pu | y, y.g, g |
| | D-20 | -- | pu | y.g, g |
| | D-21 | -- | pu | y.g, g |
| | D-22 | -- | pu | y, y.g |
| | D-23 | -- | pu | y, y.g, g |
| | D-24 | -- | pu | g |
| | D-25 | -- | pu | y, y.g, g |
| | D-26 | -- | pu | y, y.g |
| | D-27 | -- | pu | y.g, g |
| | D-28 | -- | pu | y, y.g |
| | D-29 | -- | pu | y.g, g |
| | D-30 | -- | pu | -, g |
| | D-31 | -- | pu | y, y.g, g |
| | D-32 | -- | pu | y.g, g |
| | D-33 | -- | pu | y.g, g |
| | D-34 | -- | pu | y, y.g, g |
| | D-35 | -- | pu | g |
| | D-36 | -- | pu | -, g |
| | D-37 | -- | pu | y.g, g |
| | D-38 | -- | pu | y.g |
| | D-39 | -- | pu | y.g |
| | D-40 | -- | pu | y.g |
| | D-41 | -- | pu | g |
| Anthocyanin | A- 1 | p, r | r | d |
| | A- 2 | r | m | d |
| | A- 3 | r | m | d |
| | A- 4 | p, r | r | d |
| | A- 5 | p | r | d |

TABLE 3.--Continued

| Spot Number | | No Reagent Visible Light | No Reagent Ultraviolet Light | Ammonia Vapor Ultraviolet Light | |
|-------------|--------|-----------------------------|---------------------------------|------------------------------------|---|
| Anthocyanin | A- 6 | p, r | r | d | |
| | A- 7 | p, r | r | d | |
| | A- 8 | p, m | m | d | |
| | A- 9 | p, m | r, m | d | |
| | A-10 | p, m | r, m | d | |
| | A-11 | p, m | r, m | d | |
| | A-12 | m | m | d | |
| | A-13 | p | r | d | |
| | A-14 | p | r | d | |
| | Yellow | Y- 1 | -- | y | t |
| | | Y- 2 | -- | y | t |
| | | Y- 3 | -- | y | t |
| | | Y- 4 | -- | y | t |
| | | Y- 5 | -- | y | t |
| Y- 6 | | -- | y | t | |
| Y- 7 | | -- | y | y | |
| Y- 8 | | -- | y | t | |
| Y- 9 | | -- | y | -- | |
| Y-10 | | -- | y | t | |
| Y-11 | | -- | y | t | |
| Y-12 | | -- | y | t | |
| Y-13 | | -- | y | t | |
| Y-14 | | -- | y | t | |
| Y-15 | | -- | y | t | |
| Y-16 | | -- | y | t | |
| Blue | B- 1 | -- | b | -- | |
| | B- 2 | -- | b | -- | |
| | B- 3 | -- | b | -- | |
| | B- 4 | -- | b | d.b | |
| | B- 5 | -- | b | l.b | |
| | B- 6 | -- | b | -, l.b, b.g | |
| | B- 7 | -- | b | bt.b | |
| | B- 8 | -- | b | b.g | |
| | B- 9 | -- | b | -- | |
| | B-10 | -- | b | -- | |
| | B-11 | -- | b | bt.b | |
| | B-12 | -- | b | -- | |
| | B-13 | -- | b | l.b, b.g | |
| | B-14 | -- | b | -- | |
| | B-15 | -- | b | -, l.b | |
| | B-16 | -- | b | -, b | |
| | B-17 | -- | b | -- | |
| | B-18 | -- | b | -- | |
| | B-19 | -- | b | -- | |
| | B-20 | -- | b | -- | |

TABLE 3.--Continued

| Spot Number | | No Reagent Visible Light | No Reagent Ultraviolet Light | Ammonia Vapor Ultraviolet Light |
|-------------|------|-----------------------------|---------------------------------|------------------------------------|
| Blue | B-21 | -- | b | -- |
| | B-22 | -- | b | -- |
| | B-23 | -- | b | -- |
| | B-24 | -- | b | -- |
| | B-25 | -- | b | -- |

^aAbbreviations: b--blue, bt--bright, d--dark, g--green, l--light, m--magenta, p--pink, pu--purple, r--rose, t--tan, y--yellow, hyphen--no reaction.

TABLE 4.--Intensity and distribution of the dark absorbing components
in the Allium falcifolium alliance taxa

| Allium falcifolium Alliance Taxa | Dark Spot Numbers | | | | | | | | | | | | | | | | | |
|---|-------------------|----------------|-----------------|-----------------|-----------------|-----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| <u>A. douglasii</u> var. <u>douglasii</u> | 1 | | 3 | 2 | 1 | 1 | 1 | | 1 | 1 | 1 | 2 | 3 | 3 | 2 | | | 3 |
| <u>A. douglasii</u> var. <u>columbianum</u> | 1 | | 2 | 2 | 3 | 2 | | 1 | 2 | 2 | | | 3 | | 1 | 1 | 1 | 3 |
| <u>A. douglasii</u> var. <u>constrictum</u> | 1 | 3 | 3 | 3 | 2 | 1 | | 2 | 2 | 1 | 3 | | 3 | 2 | 1 | 1 | 2 | 1 |
| <u>A. douglasii</u> var. <u>nevii</u> | | | | 1 | 3 | 3 | | | 1 | 1 | 3 | | | 3 | | | | |
| <u>A. macrum</u> | 2 | 2 | 1 | | 2 | 2 | | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 2 | 2 | | |
| <u>A. fibrillum</u> | | | | | 3 | 3 | 3 | | 3 | | 3 | 3 | 3 | 2 | | 1 | | 1 |
| <u>A. madidum</u> (Oregon) | | | | | 2 | 3 | | | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 |
| <u>A. madidum</u> (Idaho) | | | | | 2 | 3 | | 2 | 1 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 1 |
| <u>A. brandegei</u> | | | 2 | 1 | 3 | 3 | | | 1 | 1 | 3 | | 3 | 3 | 2 | 2 | 3 | 2 |
| <u>A. simillimum</u> | | | | | 2 | 3 | | | | | 2 | | 2 | | 3 | 2 | | |
| <u>A. aaseae</u> | 2 | 2 | 2 | 2 | 2 | 2 | | | | | 2 | | 2 | | 3 | 3 | 2 | 3 |
| <u>A. anceps</u> | | | | | 3 | 3 | | | | | 2 | | 2 | | | 2 | | |
| <u>A. lemmonii</u> (California) | 3 | 3 | 3 | 3 | 3 | 2 | | 3 | 2 | 1 | 3 | | 3 | 3 | | | 3 | 2 |
| <u>A. lemmonii</u> (All Others) | 3 | 3 | 3 | 3 | 3 | 2 | | 3 | 2 | 1 | 3 | | 3 | 3 | | | 3 | 2 |
| <u>A. punctum</u> | | | | | 3 | 2 | | | | 2 | 2 | 2 | 2 | 3 | | 2 | | 1 |
| <u>A. pleianthum</u> | | | | 1 | 3 | 3 | | | 1 | 1 | 2 | 2 | 3 | 3 | | 2 | | |
| <u>A. tolmiei</u> var. <u>tolmiei</u> | | | | | 2 | 2 | | | 1 | 1 | 3 | 2 | 2 | 2 | 1 | 1 | | 1 |
| <u>A. tolmiei</u> var. <u>platyphyllum</u> | 1 | | 1 | 1 | 3 | 3 | 2 | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| <u>A. tolmiei</u> var. <u>persimile</u> | 2 | | 2 | 2 | 3 | 3 | | 1 | | | 3 | 2 | 2 | 1 | 2 | 2 | | 2 |
| <u>A. scilloides</u> (Dry Falls) | 3 | | 2 | | 1 | 1 | | 1 | 1 | 1 | | | 2 | | 2 | 2 | 3 | |
| <u>A. scilloides</u> (All Others) | 3 | | 2 | | 1 | 1 | | 1 | 1 | 1 | | | 2 | | 2 | 2 | 3 | |
| <u>A. parvum</u> | 3 | | 2 | 2 | 1 | 2 | | | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | | 1 |
| <u>A. robinsonii</u> | | | | | 3 | 2 | | | | | 2 | 2 | 3 | 3 | 3 | 3 | | 1 |
| <u>A. crenulatum</u> | | | | | 3 | 3 | | | 1 | | 2 | 2 | 3 | 3 | 2 | | | 2 |
| <u>A. falcifolium</u> (Peanut) | | | | | 2 | 1 | | | 3 | 3 | | | 2 | 1 | | | | 3 |
| <u>A. falcifolium</u> (All Others) | 3 | 3 | 3 | 3 | 2 | 2 | | 2 | | | 2 | 2 | 2 | 2 | 2 | | | 2 |
| <u>A. siskiyouense</u> | 2 | 3 | 2 | 1 | 3 | 3 | | 1 | 1 | 1 | 2 | 2 | 2 | | | 2 | 2 | 2 |
| <u>A. platycaule</u> | 2 | | 2 | 2 | 3 | 2 | | 1 | | | 2 | 2 | 2 | 2 | | | | 2 |
| <u>A. obtusum</u> | | | | | 2 | 3 | | | | | 2 | 2 | 2 | 2 | 3 | 3 | | 1 |
| <u>A. tribracteatum</u> | | | | | 3 | 2 | | 2 | | | 2 | 2 | 2 | 3 | 2 | | | 1 |
| Occurrence Spots/Alliance | $\frac{15}{30}$ | $\frac{7}{30}$ | $\frac{16}{30}$ | $\frac{15}{30}$ | $\frac{28}{30}$ | $\frac{30}{30}$ | $\frac{3}{30}$ | $\frac{14}{30}$ | $\frac{19}{30}$ | $\frac{17}{30}$ | $\frac{25}{30}$ | $\frac{16}{30}$ | $\frac{26}{30}$ | $\frac{24}{30}$ | $\frac{15}{30}$ | $\frac{24}{30}$ | $\frac{11}{30}$ | $\frac{22}{30}$ |

TABLE 4.--Continued

| Dark Spot Numbers | | | | | | | | | | | | | | | | | | | | | Total | | |
|-------------------|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------------------|
| 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | Spots/ Species |
| | | | | | | | | | | | | | | | | | | | | | | 1 | 15 |
| | | | | | | | | | | | | | | | | | | | | | | | 13 |
| | | | | | | | | | | | | | | | | | | | | | | | 16 |
| | | | | | | | | | | | | | | | | | | | | | | | 11 |
| | | | | | | | | | | | | | | | | | | | | | | | 22 |
| | | | | | | | | | | | | | | | | | | | | | | | 14 |
| | | | | | | | | | | | | | | | | | | | | | | | 16 |
| | | | | | | | | | | | | | | | | | | | | | | | 18 |
| | | | | | | | | | | | | | | | | | | | | | | | 16 |
| | | | | | | | | | | | | | | | | | | | | | | | 8 |
| | | | | | | | | | | | | | | | | | | | | | | | 14 |
| | | | | | | | | | | | | | | | | | | | | | | | 12 |
| | | | | | | | | | | | | | | | | | | | | | | | 24 |
| | | | | | | | | | | | | | | | | | | | | | | | 22 |
| | | | | | | | | | | | | | | | | | | | | | | | 12 |
| | | | | | | | | | | | | | | | | | | | | | | | 12 |
| | | | | | | | | | | | | | | | | | | | | | | | 14 |
| | | | | | | | | | | | | | | | | | | | | | | | 16 |
| | | | | | | | | | | | | | | | | | | | | | | | 19 |
| | | | | | | | | | | | | | | | | | | | | | | | 13 |
| | | | | | | | | | | | | | | | | | | | | | | | 16 |
| | | | | | | | | | | | | | | | | | | | | | | | 21 |
| | | | | | | | | | | | | | | | | | | | | | | | 10 |
| | | | | | | | | | | | | | | | | | | | | | | | 12 |
| | | | | | | | | | | | | | | | | | | | | | | | 9 |
| | | | | | | | | | | | | | | | | | | | | | | | 16 |
| | | | | | | | | | | | | | | | | | | | | | | | 18 |
| | | | | | | | | | | | | | | | | | | | | | | | 18 |
| | | | | | | | | | | | | | | | | | | | | | | | 9 |
| | | | | | | | | | | | | | | | | | | | | | | | 12 |
| $\frac{6}{30}$ | $\frac{25}{30}$ | $\frac{11}{30}$ | $\frac{5}{30}$ | $\frac{4}{30}$ | $\frac{1}{30}$ | $\frac{5}{30}$ | $\frac{3}{30}$ | $\frac{8}{30}$ | $\frac{7}{30}$ | $\frac{4}{30}$ | $\frac{6}{30}$ | $\frac{5}{30}$ | $\frac{3}{30}$ | $\frac{3}{30}$ | $\frac{9}{30}$ | $\frac{2}{30}$ | $\frac{3}{30}$ | $\frac{3}{30}$ | $\frac{1}{30}$ | $\frac{2}{30}$ | $\frac{2}{30}$ | $\frac{4}{30}$ | |

TABLE 5.--Intensity and distribution of the anthocyanin and yellow fluorescing components in the Allium falcifolium alliance taxa

| Allium falcifolium Alliance | Anthocyanin Spot Numbers | | | | | | | | | | | | | | Total | |
|--|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|-------|-------------------|
| | Taxa | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | Spots/ Species |
| <u>A. douglasii</u> var. <u>douglasii</u> | 1 | 2 | 2 | | | 2 | | 2 | | 2 | 2 | | | | | 7 |
| <u>A. douglasii</u> var. <u>columbianum</u> | 1 | 2 | 1 | | | 2 | | 2 | 2 | 2 | | | | | | 7 |
| <u>A. douglasii</u> var. <u>constrictum</u> | 1 | 2 | 2 | | | 2 | | 2 | | | | | | | | 5 |
| <u>A. douglasii</u> var. <u>neveii</u> | 1 | 2 | 2 | | | 2 | | 2 | 2 | 1 | | | | | | 7 |
| <u>A. macrum</u> | 1 | 2 | 1 | 1 | 1 | 2 | | 2 | 1 | 1 | 1 | | | | | 10 |
| <u>A. fibrillum</u> | 2 | 2 | 2 | 4 | 1 | 2 | | 2 | 1 | 1 | | | | 1 | | 10 |
| <u>A. madidum</u> (Oregon) | 1 | 1 | 1 | 1 | | 1 | | 1 | 1 | 1 | 1 | | | | | 9 |
| <u>A. madidum</u> (Idaho) | 1 | 1 | 1 | 1 | | 1 | | 1 | 1 | 1 | 1 | | | | | 9 |
| <u>A. brandegei</u> | 1 | 1 | 2 | | 1 | | | 1 | | | | | | | | 5 |
| <u>A. simillimum</u> | 2 | 2 | 2 | 2 | 1 | | | | | | | | | | | 5 |
| <u>A. aaseae</u> | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | | | | | 11 |
| <u>A. anceps</u> | 1 | 2 | 2 | 1 | 1 | | | | | | | | | | 1 | 6 |
| <u>A. lemmonii</u> (California) | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | | | | | 10 |
| <u>A. lemmonii</u> (All Others) | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | | | | | 10 |
| <u>A. punctum</u> | 2 | 2 | 2 | 2 | 1 | 1 | | 1 | 1 | | | | | | | 8 |
| <u>A. pleianthum</u> | 1 | 1 | 1 | 1 | | 1 | | 2 | 1 | 1 | | | | | | 8 |
| <u>A. tolmiei</u> var. <u>tolmiei</u> | 2 | 2 | 2 | 2 | 1 | 1 | | 2 | 2 | 1 | 1 | | | 1 | | 11 |
| <u>A. tolmiei</u> var. <u>platyphyllum</u> | 1 | 2 | 2 | 1 | 1 | 2 | | 2 | 2 | | 2 | | | 1 | | 10 |
| <u>A. tolmiei</u> var. <u>persimile</u> | | | | | | 1 | | 2 | 1 | | | | | | | 3 |
| <u>A. scilloides</u> (Dry Falls) | 1 | 1 | 2 | 1 | | 2 | | 2 | 2 | | | | | | | 7 |
| <u>A. scilloides</u> (All Others) | 1 | 1 | 2 | 1 | | 2 | | 2 | 2 | | | | | | | 7 |
| <u>A. parvum</u> | 2 | 2 | 2 | 1 | | 1 | | 1 | 1 | | | | | | | 7 |
| <u>A. robinsonii</u> | 2 | 2 | 2 | 2 | 1 | 1 | | 2 | 1 | | | | | | | 8 |
| <u>A. crenulatum</u> | 2 | 2 | 2 | 2 | | 1 | | 2 | 1 | 1 | 1 | | | | | 9 |
| <u>A. falcifolium</u> (Peanut) | 2 | 1 | 1 | 1 | | 3 | 2 | | 1 | | 1 | 3 | | | | 9 |
| <u>A. falcifolium</u> (All Others) | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | | | | | 11 |
| <u>A. siskiyouense</u> | 2 | 2 | 2 | 2 | | 2 | 1 | 2 | 2 | 2 | 2 | | | | | 10 |
| <u>A. platycaule</u> | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | | | | | 11 |
| <u>A. obtusum</u> | 1 | 2 | 2 | 2 | 2 | | | | | | | | | | | 5 |
| <u>A. tribracteatum</u> | 2 | 2 | 2 | 1 | | | | | | | | | | 1 | | 5 |
| Occurrence Spots/Alliance | $\frac{29}{30}$ | $\frac{29}{30}$ | $\frac{29}{30}$ | $\frac{24}{30}$ | $\frac{15}{30}$ | $\frac{25}{30}$ | $\frac{7}{30}$ | $\frac{25}{30}$ | $\frac{23}{30}$ | $\frac{16}{30}$ | $\frac{12}{30}$ | $\frac{1}{30}$ | $\frac{4}{30}$ | $\frac{1}{30}$ | | |

TABLE 5.--Continued

| Yellow Spot Numbers | | | | | | | | | | | | | | | | Total |
|---------------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | Spots/ Species |
| 1 | 1 | 1 | 1 | 2 | | | | 1 | | | | | | | | 6 |
| 1 | 1 | | 1 | 1 | | | | 1 | | | | | | | | 5 |
| 1 | 2 | 2 | 2 | 2 | | 1 | | 1 | | | | | | | | 7 |
| | 1 | 1 | 1 | 1 | | | | 1 | | | | | | | | 5 |
| | 1 | 1 | | 1 | 1 | | | 1 | | | | | 1 | | 1 | 7 |
| 1 | 1 | 1 | 1 | 1 | | | | 1 | | | | | | 1 | | 7 |
| 1 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | | | | | | | | 9 |
| 1 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | | | | | | | | 9 |
| | 1 | 1 | | 1 | | | | 1 | | | | | | | | 4 |
| 1 | 1 | 1 | | 1 | 1 | 1 | | 1 | | | | | | | | 7 |
| | 1 | | | 1 | | | | 1 | | | | | | | | 3 |
| 1 | 2 | 1 | 1 | 1 | | | | 1 | | | | | | | | 6 |
| | 1 | | | 2 | | | | 1 | | | | | | | | 3 |
| | 1 | | | 2 | | | | 1 | | | | | | | | 3 |
| 2 | 2 | 1 | 1 | 2 | | | | 1 | | | | | 2 | 1 | | 8 |
| 2 | 2 | 2 | 2 | 2 | 1 | | | 1 | | | | | | | | 7 |
| 1 | 1 | 2 | 2 | 2 | | | 1 | 1 | | | | | | | | 7 |
| 1 | 2 | 1 | | 2 | 1 | | | 1 | | | | | | | | 6 |
| | 1 | | 1 | 2 | | | | 1 | | | | | | | | 4 |
| | 1 | | | 2 | 1 | | | 1 | | | | | | | | 4 |
| | 1 | | | 2 | 1 | | | 1 | | | | | | | | 4 |
| | 1 | | | 1 | 1 | | | 1 | | | | | | | | 4 |
| 1 | 2 | | 1 | 2 | 1 | | | 1 | 1 | 1 | | | | | | 8 |
| 2 | 2 | 2 | 2 | | | | | 1 | | | 1 | | 1 | | | 6 |
| 1 | 1 | | | 2 | | | | 1 | | | | | | | | 4 |
| | 1 | | | 2 | 1 | | | 1 | | | | | | | | 4 |
| | 1 | | | 1 | 1 | | | 1 | | | | | | | | 4 |
| | 2 | 1 | 1 | 2 | | | | 1 | | | | | | | | 5 |
| 1 | 1 | 2 | | 1 | 2 | | | 1 | | | | 1 | | | | 7 |
| 1 | 1 | | | 1 | | | | 1 | | | | | | | | 4 |
| $\frac{17}{30}$ | $\frac{30}{30}$ | $\frac{17}{30}$ | $\frac{15}{30}$ | $\frac{29}{30}$ | $\frac{13}{30}$ | $\frac{4}{30}$ | $\frac{2}{30}$ | $\frac{30}{30}$ | $\frac{1}{30}$ | $\frac{1}{30}$ | $\frac{1}{30}$ | $\frac{1}{30}$ | $\frac{2}{30}$ | $\frac{2}{30}$ | $\frac{1}{30}$ | |

TABLE 6.--Intensity and distribution of the blue fluorescing components in the Allium falcifolium alliance taxa

| <u>Allium falcifolium</u> Alliance | Blue Spot Numbers | | | | | | | | | | | |
|---|-------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|-----------------|-----------------|
| | Taxa | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| <u>A. douglasii</u> var. <u>douglasii</u> | 1 | 1 | | 1 | 1 | | | 2 | 2 | 1 | 1 | 1 |
| <u>A. douglasii</u> var. <u>columbianum</u> | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | | 1 |
| <u>A. douglasii</u> var. <u>constrictum</u> | 1 | 1 | | 1 | 1 | 2 | 2 | 2 | 2 | 1 | | 1 |
| <u>A. douglasii</u> var. <u>nevi</u> | 1 | 1 | | 2 | 1 | | 2 | 2 | 2 | | | 1 |
| <u>A. macrum</u> | 1 | 1 | 1 | 2 | 1 | | 1 | 1 | 1 | | | 1 |
| <u>A. fibrillum</u> | 1 | 1 | | 1 | 2 | 1 | 2 | 2 | 2 | | | 1 |
| <u>A. madidum</u> (Oregon) | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 |
| <u>A. madidum</u> (Idaho) | | | | | | | | | | | | |
| <u>A. brandegei</u> | 2 | 1 | | 1 | 1 | 1 | 2 | 2 | 2 | | | 1 |
| <u>A. simillimum</u> | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 |
| <u>A. aaseae</u> | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 |
| <u>A. anceps</u> | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 |
| <u>A. lemmonii</u> (California) | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | | | 1 |
| <u>A. lemmonii</u> (All Others) | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | | | 1 |
| <u>A. punctum</u> | 1 | | | 1 | 1 | | 1 | 1 | 1 | | | 1 |
| <u>A. pleianthum</u> | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | | | 1 |
| <u>A. tolmiei</u> var. <u>tolmiei</u> | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 |
| <u>A. tolmiei</u> var. <u>platyphyllum</u> | 1 | 1 | | 1 | 1 | 1 | 2 | 2 | 2 | | | 1 |
| <u>A. tolmiei</u> var. <u>persimile</u> | 1 | 1 | | 1 | 1 | 2 | 2 | 2 | 2 | | | 1 |
| <u>A. scilloides</u> (Dry Falls) | 2 | 1 | 2 | 1 | 1 | | 1 | 1 | 1 | | | 1 |
| <u>A. scilloides</u> (All Others) | 2 | 1 | 2 | 1 | 1 | | 1 | 1 | 1 | | 1 | 1 |
| <u>A. parvum</u> | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 |
| <u>A. robinsonii</u> | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 |
| <u>A. crenulatum</u> | 1 | 1 | | 1 | 2 | 1 | 1 | 1 | 1 | | | 1 |
| <u>A. falcifolium</u> (Peanut) | 2 | 1 | | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 |
| <u>A. falcifolium</u> (All Others) | 2 | 1 | | 1 | 1 | 2 | 2 | 2 | 2 | 1 | | 1 |
| <u>A. siskiyouense</u> | 1 | | 1 | 1 | 1 | 1 | 2 | 2 | 2 | | | 1 |
| <u>A. platycaule</u> | 1 | 1 | | 1 | | 1 | 1 | 1 | 1 | 1 | | 1 |
| <u>A. obtusum</u> | 1 | | 1 | 1 | 1 | | 1 | 1 | 1 | | | 1 |
| <u>A. tribracteatum</u> | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | | | 1 |
| Occurrence Spots/Alliance | $\frac{30}{30}$ | $\frac{26}{30}$ | $\frac{12}{30}$ | $\frac{30}{30}$ | $\frac{29}{30}$ | $\frac{22}{30}$ | $\frac{30}{30}$ | $\frac{30}{30}$ | $\frac{6}{30}$ | $\frac{3}{30}$ | $\frac{19}{30}$ | $\frac{19}{30}$ |

TABLE 6.--Continued

| Blue Spot Numbers | | | | | | | | | | | | | Total | |
|-------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------|
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | Spots/Species |
| | | | | | | | | | | | | | | 12 |
| 2 | 1 | 1 | | | | | | | | | | | | 12 |
| 1 | 1 | | | | | | | | | | | | | 11 |
| | | | | | | | | | | | 1 | 1 | | 9 |
| 1 | | 1 | | | | | | | | | | | | 10 |
| | 1 | | | 1 | | | | | | | | | | 9 |
| | | | | 1 | | | | | | 1 | | | | 9 |
| | | | | | | | | | | | | | | 9 |
| | | | | | 7 | | | | | | | | | 9 |
| | | | | | | | | | 1 | | | | | 8 |
| 1 | | | | | | | | | | | | | | 9 |
| | | | | | | | | | | 1 | | | | 9 |
| | | | | | | | | | | | | | | 9 |
| | | | | | | | | | | | | | | 9 |
| | | | | | | | | | | | | | | 5 |
| | | | | | | | | | | | | | | 9 |
| | | | | | | | | | | | | | | 9 |
| 1 | | | | | | | | | | | | | | 9 |
| 1 | | | | | | | | | | 1 | | | | 10 |
| | | | | | | | | | | | | | | 8 |
| | | | | | | | | | | | | | | 7 |
| | | | | | | | | | | | | | | 8 |
| | | | | | | | | | | | | | | 8 |
| | 1 | | | | | | | | | | | | | 7 |
| 1 | | | 1 | | | | | | | | | | | 10 |
| | | | | | | | | | | | | | 1 | 9 |
| | | | | 1 | | | | | | | | | | 10 |
| 1 | 1 | | | | | | | | | | | | | 10 |
| 1 | | | | | 1 | | | 1 | | | | | | 11 |
| | | | | | | | | | | | | | | 7 |
| | | | 1 | | | | | | | | | | | 13 |
| | 1 | | 1 | | | 1 | 1 | | | 1 | 1 | | | |
| $\frac{8}{30}$ | $\frac{7}{30}$ | $\frac{2}{30}$ | $\frac{3}{30}$ | $\frac{4}{30}$ | $\frac{2}{30}$ | $\frac{1}{30}$ | $\frac{1}{30}$ | $\frac{1}{30}$ | $\frac{3}{30}$ | $\frac{3}{30}$ | $\frac{1}{30}$ | $\frac{1}{30}$ | $\frac{1}{30}$ | |

light were highly consistent in their appearance within the same taxon and often among related taxa.

The chromatograms of each population of a taxon, as in the case of A. tolmiei var. tolmiei with five chromatograms each of 20 populations, revealed the same dark spots. This indicates that populations are very homogeneous for these flavonoids. The flavonoid spots are illustrated in Fig. 1 as a composite chromatogram representative of the alliance. The flavonoid intensities were also relatively constant (Table 4).

The appearance of spots of other colors, with the exception of the anthocyanins, was not consistent within taxa or among taxa or they were of general occurrence within the alliance. The intensities of these spots were also variable as is seen in Table 5 for the yellow components and Table 6 for the various blue spots. Tables 5 and 6 are based on composite chromatograms of each taxon, and any spot (yellow or blue), no matter how infrequent, is listed for that particular taxon. Since these spots seem to lack taxonomic significance, no further consideration will be given to them. In other genera they have been found not to be significant.

There are nine commonly occurring anthocyanins (1, 2, 3, 4, 5, 6, 8, 9, 10), with sporadic additional spots (7, 11, 12, 13, 14) appearing variously within the alliance (Table 5). There appear to be no really separable groupings; however, the consistency of the complex indicates a general overall relationship in the synthesis of these anthocyanins within the alliance. The anthocyanin spots are illustrated in Fig. 2 as a composite chromatogram representative of the alliance.

The purple or dark spots have been shown to be of taxonomic importance by other authors. Many of these authors have been able to show definite patterns of species-specific components (Alston and Turner, 1962, 1963; Fahselt

Fig. 1.--Composite chromatogram of the flavonoid
components (excluding anthocyanins) of the
Allium falcifolium alliance

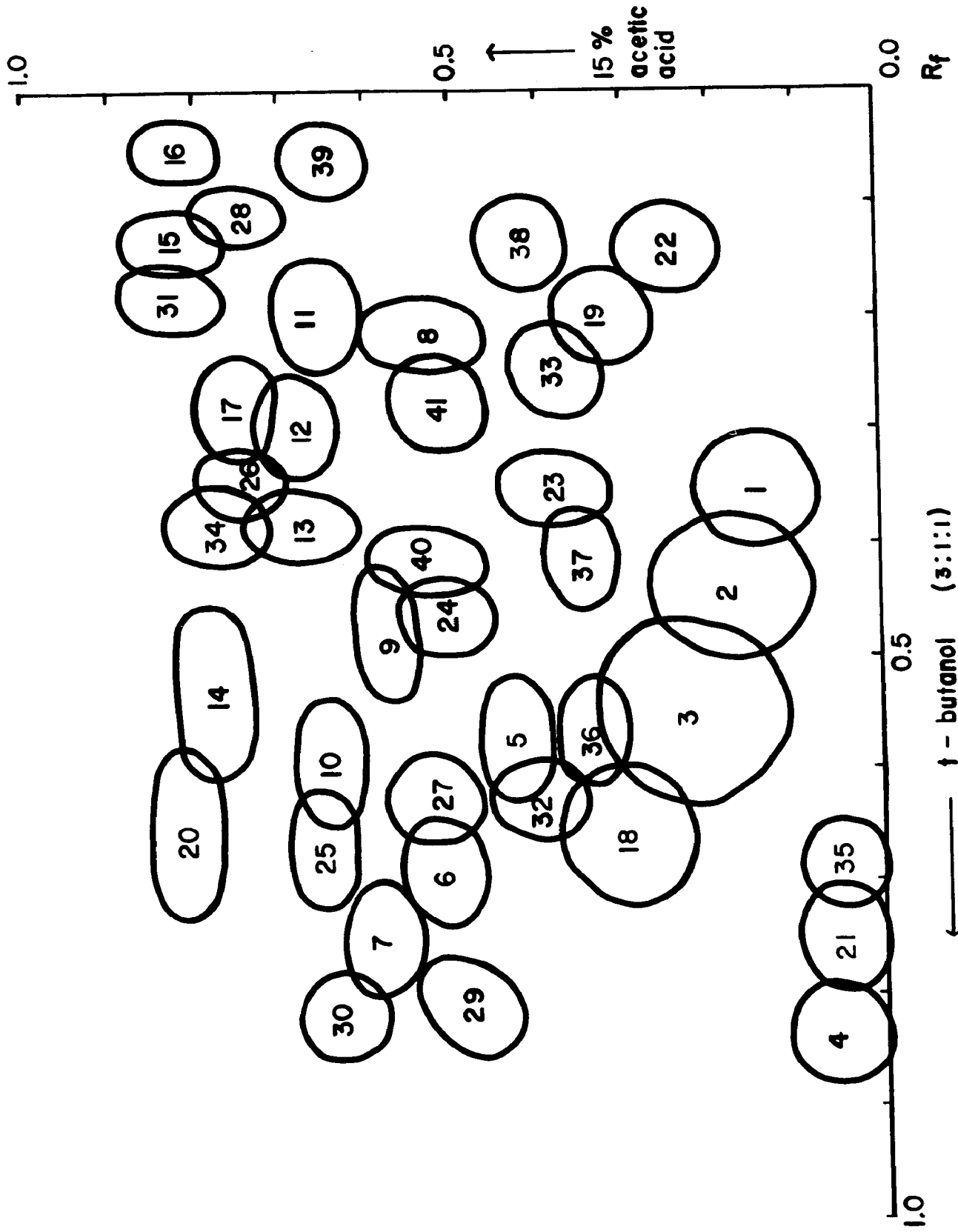


Fig. 1

Fig. 2.--Composite chromatogram of the anthocyanin
components of the Allium falcifolium alliance

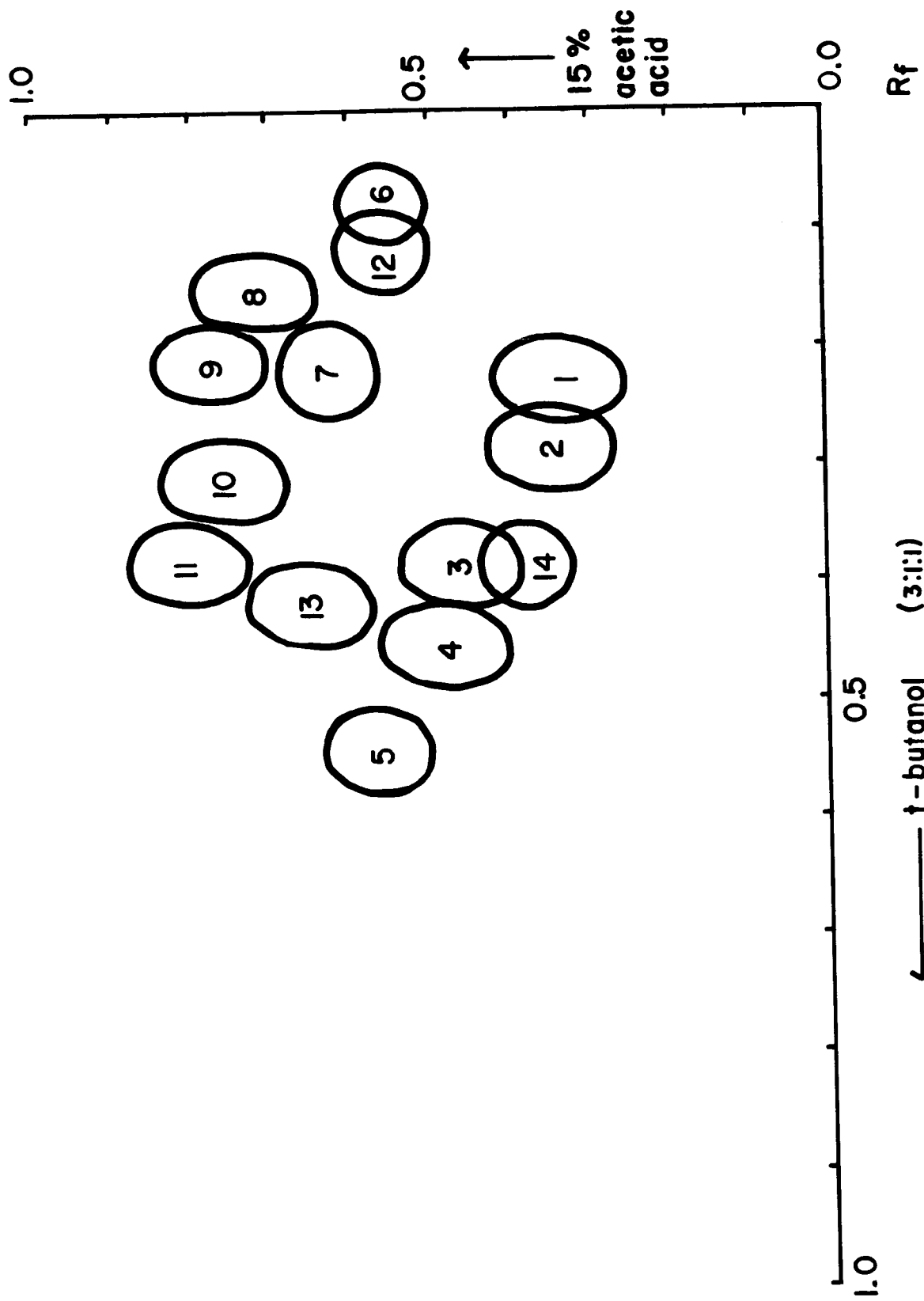


Fig. 2

and Ownbey, 1968); however, in the A. falcifolium alliance this has not been possible. In this way the alliance appears similar to the Tragopogon dubius-porrifolius-pratensis complex (Brehm and Ownbey, 1965), in which each species has a characteristic pattern which is distinct from that of other species only on quantitative, distributional, and combinational aspects.

As can be seen from Table 4, only a few spots (24, 35, 38, 39, and 40) are species-specific, whereas each taxon has a characteristic pattern which is distinct from that of other taxa of the alliance. Table 7 attempts to determine if these flavonoid (dark) spots exhibited patterns in support of the morphological grouping of taxa. The number of spots in one taxon in common with spots of a second taxon was added to the number of spots of the second taxon in common with the first one. This total was divided by the sum of the spots in each taxon taken separately, and multiplied by 100 to give a percentage index of the resemblance (RI) of the two taxa. It was found, however, that this resemblance index based on chromatographic characteristics, on the whole, did not show a strong correlation with the morphological grouping. This would seem to indicate that other relationships are possible.

Such a relationship can be demonstrated with A. tolmiei var. tolmiei (Table 7). Within its own group, its closest affinity lies with A. crenulatum at 77% and A. robinsonii at 75%. This figure is only 67% with the other varieties of A. tolmiei, but with a species in another group, A. punctum, it is 85%. Comparing A. tolmiei var. tolmiei with A. madidum or A. brandegei in a different major group, we find a relationship of 80% or 81%. Many examples of this type can be drawn from the data of Table 7.

However, it should be noted that in a few cases, a close correlation with morphology can in fact be shown. The group that contains A. douglasii and its varieties as well as A. macrum is a good example. In this group,

TABLE 7.--Resemblance index percentages of the taxa
of the Allium falcifolium alliance

| Taxa | <u>A. douglasii</u> var. <u>douglasii</u> | <u>A. douglasii</u> var. <u>columbianum</u> | <u>A. douglasii</u> var. <u>constrictum</u> | <u>A. douglasii</u> var. <u>nevillei</u> | <u>A. macrum</u> | <u>A. fibrillum</u> | <u>A. madidum</u> (Oregon) | <u>A. madidum</u> (Idaho) | <u>A. brandegei</u> | <u>A. simillimum</u> | <u>A. aaseae</u> |
|---|---|---|---|--|------------------|---------------------|----------------------------|---------------------------|---------------------|----------------------|------------------|
| <u>A. douglasii</u> var. <u>douglasii</u> | 100 | | | | | | | | | | |
| <u>A. douglasii</u> var. <u>columbianum</u> | 71 | 100 | | | | | | | | | |
| <u>A. douglasii</u> var. <u>constrictum</u> | 77 | 90 | 100 | | | | | | | | |
| <u>A. douglasii</u> var. <u>nevillei</u> | 54 | 50 | 59 | 100 | | | | | | | |
| <u>A. macrum</u> | 59 | 57 | 68 | 49 | 100 | | | | | | |
| <u>A. fibrillum</u> | 62 | 44 | 53 | 64 | 50 | 100 | | | | | |
| <u>A. madidum</u> (Oregon) | 65 | 62 | 69 | 67 | 63 | 73 | 100 | | | | |
| <u>A. madidum</u> (Idaho) | 61 | 65 | 71 | 62 | 65 | 75 | 94 | 100 | | | |
| <u>A. brandegei</u> | 71 | 76 | 81 | 74 | 58 | 60 | 75 | 75 | 100 | | |
| <u>A. simillimum</u> | 43 | 48 | 50 | 63 | 47 | 64 | 67 | 62 | 58 | 100 | |
| <u>A. aaseae</u> | 62 | 74 | 80 | 48 | 61 | 50 | 60 | 56 | 73 | 64 | 100 |
| <u>A. anceps</u> | 37 | 32 | 36 | 61 | 35 | 62 | 57 | 60 | 50 | 70 | 46 |
| <u>A. lemmonii</u> (California) | 56 | 61 | 70 | 51 | 70 | 42 | 50 | 52 | 65 | 31 | 63 |
| <u>A. lemmonii</u> (All Others) | 59 | 63 | 74 | 55 | 64 | 44 | 53 | 55 | 68 | 33 | 67 |
| <u>A. punctum</u> | 52 | 40 | 50 | 52 | 47 | 85 | 64 | 67 | 64 | 60 | 54 |
| <u>A. pleianthum</u> | 67 | 56 | 64 | 78 | 59 | 77 | 71 | 67 | 71 | 60 | 54 |
| <u>A. tolmiei</u> var. <u>tolmiei</u> | 69 | 59 | 67 | 64 | 61 | 79 | 80 | 81 | 80 | 64 | 57 |
| <u>A. tolmiei</u> var. <u>platyphyllum</u> | 77 | 62 | 69 | 59 | 63 | 67 | 63 | 59 | 76 | 58 | 73 |
| <u>A. tolmiei</u> var. <u>persimile</u> | 65 | 63 | 69 | 47 | 68 | 61 | 57 | 70 | 63 | 52 | 73 |
| <u>A. scilloides</u> (Dry Falls) | 50 | 77 | 69 | 42 | 57 | 30 | 48 | 52 | 62 | 38 | 59 |
| <u>A. scilloides</u> (All Others) | 45 | 69 | 63 | 37 | 68 | 27 | 44 | 47 | 56 | 33 | 53 |
| <u>A. parvum</u> | 72 | 59 | 65 | 56 | 65 | 57 | 59 | 56 | 65 | 41 | 63 |
| <u>A. robinsonii</u> | 48 | 35 | 46 | 57 | 50 | 75 | 62 | 64 | 54 | 56 | 50 |
| <u>A. crenulatum</u> | 59 | 48 | 57 | 70 | 53 | 77 | 79 | 73 | 71 | 60 | 54 |
| <u>A. falcifolium</u> (Peanut) | 50 | 46 | 48 | 70 | 45 | 61 | 64 | 59 | 56 | 59 | 35 |
| <u>A. falcifolium</u> (All Others) | 52 | 48 | 56 | 37 | 68 | 40 | 38 | 41 | 44 | 25 | 60 |
| <u>A. siskiyouense</u> | 67 | 58 | 71 | 55 | 70 | 56 | 53 | 61 | 59 | 31 | 63 |
| <u>A. platycaule</u> | 55 | 65 | 71 | 48 | 60 | 50 | 59 | 61 | 71 | 46 | 75 |
| <u>A. obtusum</u> | 58 | 55 | 64 | 60 | 52 | 70 | 72 | 67 | 72 | 82 | 70 |
| <u>A. tribracteatum</u> | 59 | 48 | 57 | 52 | 53 | 69 | 64 | 67 | 57 | 60 | 54 |

similarity is high morphologically as well as chromatographically. The relationship of the varieties douglasii, columbianum, and constrictum ranges from 71% to 90%, whereas with variety nevi, the highest relationship with another variety is only 59%. Its highest relationship within the alliance is 78% with A. pleianthum, a species in a different major group. A. macrum is similar in that its highest relationship percentage of 70 is not within its group but with A. lemmonii, again a species of a different major group. The two taxa that deviate most chromatographically, also diverge the most morphologically. A. douglasii var. nevi is the extreme of A. douglasii, and although A. macrum shares major morphologic characters with A. douglasii, it still is quite a distinct species.

The individuals of A. madidum from Oregon and Idaho respectively are morphologically similar and cannot be separated by any visible characters. They differ, however, in chromosome number, being hexaploid ($n=21$), in populations from Idaho and tetraploid ($n=14$) in the Oregon populations. The chromatographic data on the Idaho populations studied, moreover, shows two additional spots (8 and 27) that the Oregon populations did not have, all other spots being in common. The relationship index (Table 7), therefore, shows a very high similarity of 94%.

In early investigations of the alliance, it was noted that the population of A. scilloides found at Dry Falls, Grant County, Washington, was slightly different from other populations of the same species. It was felt, however, that this difference did not warrant separating it in any manner. From the chromatographic information (Table 4), it can be seen that the Dry Falls population lacks three components (19, 22, and 23) that the other populations of the species contain, while the other spots of the taxa are in common. The relationship index (Table 7) shows a high similarity of 90%.

A population of A. falcifolium collected near Peanut, Trinity County, California, was notably different from the typical examples of that species. The data provided by chromatographic analysis (Table 4) shows the Peanut population has only four spots (5, 6, 14, and 20) in common with the other populations of A. falcifolium and five spots (9, 10, 13, 28, and 31) that are different. The other populations of the species have 12 spots (1, 2, 3, 4, 8, 12, 18, 19, 21, 23, 25, and 33) different from those of the Peanut population. This great difference in numbers of spots results in a resemblance index percentage (Table 7) of only 32.

In A. lemmonii, all populations of the species appeared quite similar and within the limits of the variability of the species, but from the data obtained chromatographically (Table 4), it was found that populations from California possessed two additional spots (22 and 23) which were not present in populations from southeastern Oregon. With only a two-spot difference, the relationship index (Table 7) shows a similarity of 96%.

These isolated cases have provided additional information that for the most part substantiates some of the morphologic evidence accumulated. The data from A. madidum is quite easily acceptable, even though the two different ploidy levels are not separable morphologically. Within A. tolmiei, on the other hand, the diploid, tetraploid, and hexaploid (Table 1) populations are distinguishable morphologically (Taxonomic Treatment) as well as chromatographically (Table 4).

The A. scilloides and A. falcifolium cases provide additional data on populations that are only slightly different morphologically. For A. scilloides, the problem could involve isolation and divergence of the Dry Falls population from other populations of this species.

A. falcifolium from Peanut, on the other hand, represents a population that is barely distinguishable morphologically but strikingly different

chromatographically. An interpretation of this situation is difficult with the amount of information available, and for the present only the existence of this interesting population and its deviation from typical A. falcifolium is noted.

The A. lemmonii data provide still another type of problem. Though not separable morphologically, as scilloides and falcifolium, nor cytologically as madidum, the populations of this species in Oregon could represent a distinct chemical race.

The consistency of the flavonoids and anthocyanins may be considered an indicator of relationship of the taxa of the alliance. The chromatographic characteristics of the taxa, although not showing a strong correlation with the morphological grouping, indicate an overall affinity within the alliance.

TAXONOMIC TREATMENT

Key to the Species of the Allium falcifolium Alliance

1. Scapes terete or nearly so; leaves linear to broad and falcate, shorter, as long as, or longer than the scape; both scape and leaves usually persistent at maturity.
 2. Stamens equaling the perianth segments in length or exerted.
 3. Leaves shorter than to equaling the scape in length
 1. A. douglasii
 3. Leaves much longer than the short scape 2. A. macrum
 2. Stamens 1/2 to 3/4 the length of the perianth segments.
 4. Larger bulbs with a cluster of bulblets to one side at the base 3. A. madidum
 4. Bulbs without basal bulblets (rarely with 1 or 2).
 5. Leaves usually twice the length of the scape; pedicels shorter than the perianth segments; perianth segments serrulate; cellular reticulations of the bulb coats obscure.
 6. Perianth segments white with green midribs; ovary crested 4. A. simillimum
 6. Perianth segments deep pink; ovary crestless 5. A. aaseae
 5. Leaves less than twice the length of the scape; pedicels longer than the perianth segments; perianth segments entire; cellular reticulations of the bulb coats evident.
 7. Reticulations of the bulb coats very fine, narrow and much contorted, appearing as wavy lines 6. A. fibrillum
 7. Reticulations of the bulb coats isodiametric or transversely elongate 7. A. brandegei
 1. Scapes flattened or at least somewhat compressed; leaves flat, linear or broader, falcate, generally longer than the scape; both scape and leaves deciduous at maturity.

8. Leaves paired.
9. Perianth segments linear, linear-lanceolate, or linear-oblong, more than 3 times as long as wide.
10. Perianth segments with long acuminate involute tips; stamens exerted; leaves 8 to 15 mm broad 8. A. platycaule
10. Perianth segments without long acuminate involute tips, margins scarious; stamens included; leaves mostly less than 5 mm broad.
11. Bulb coats yellow and thick, with thick transversely rectangular reticulations 9. A. anceps
11. Bulb coats black and thin, with no definite reticulations 10. A. yosemitense
9. Perianth segments lanceolate, oblong, or ovate, less than 3 times as long as wide.
12. Perianth segments lanceolate or lance-ovate, tips involute, acute or acuminate.
13. Flowers 9 to 15 mm long; perianth segments attenuate, often undulate and serrulate-denticulate; leaves 6 to 8 mm broad 11. A. falcifolium
13. Flowers 6 to 10 mm long, perianth segments acute or acuminate, entire; leaves less than 6 mm broad.
14. Stamens about as long as the perianth segments; leaves barely exceeding the scape 12. A. lemmonii
14. Stamens 1/2 to 3/4 as long as the perianth segments; leaves up to twice as long as the scape.
15. Scape flattened, 2-edged and winged, wings entire (sometimes obscurely crenulate); perianth segments lanceolate, acute, entire, involute at the tip; filaments smooth 13. A. tolmiei
15. Scape flattened, 2-edged and winged, wings serrulate to papillose; perianth segments elliptic-lanceolate, obtuse, often denticulate, not involute at the tip; filaments papillose 14. A. siskiyouense
12. Perianth segments oblong-lanceolate or oblong, tips not involute, obtuse.
16. Bulbs oblique at the base.

17. Leaves 1.5 to 4 mm broad, twice as long as the scape; wings of the scape crenulately roughened; pedicels about equaling the perianth segments in length; perianth segments nearly erect . . . 15. A. crenulatum
17. Leaves 5 to 7 mm broad, longer than the scape but less than twice its length, wings of the scape serrulate to slightly denticulate; pedicels 2 to 3 times as long as the perianth segments; perianth widely spreading . . . 16. A. pleianthum
16. Bulbs ovoid, symmetrical at the base.
18. Bulb coats without evident reticulations.
19. Leaves 2 to 4 mm broad, 2 or 3 times as long as the scape; pedicels about as long as the perianth segments; perianth segments linear-lanceolate or oblong, sub-acute or obtuse 17. A. parvum
19. Leaves 5 to 6 mm broad, slightly longer than the scape; pedicels about twice as long as the perianth segments; perianth segments conspicuously lance-oblong, obtuse 18. A. jacintense
18. Bulb coats with evident reticulations.
20. Scape compressed but not winged; perianth segments lanceolate, oblong-lanceolate or oblong, acute or obtuse.
21. Bulb coats distinctly reticulate with transversely elongate meshes . . . 19. A. punctum
21. Bulb coats with very fine oblong reticulations.
22. Bracts of the inflorescence acuminate with tail like tips; ovary distinctly 3-crested, the crests closely surrounding the style 20. A. cratericola
22. Bracts of the inflorescence ovate, abruptly acuminate; ovary crestless or obscurely 3-crested, if crested, crests not closely surrounding the style 21. A. tribracteatum
20. Scape compressed and winged; perianth segments broadly lanceolate, elliptic-oblong, or broadly elliptic, obtuse.

23. Perianth segments broadly elliptic, obtuse, becoming broadly lanceolate, acute, strongly keeled and closely investing the fruit 22. A. scilloides
23. Perianth segments oblong, obtuse, not becoming strongly keeled and not closely investing the fruit 23. A. robinsonii
8. Leaf solitary.
24. Stamens as long as the perianth segments or exserted.
25. Pedicels longer than the perianth segments; filaments strongly papillose 24. A. hoffmanii
25. Pedicels shorter than the perianth segments; filaments smooth 25. A. burlewii
24. Stamens included.
26. Bulbs oblique at the base 15. A. crenulatum
26. Bulbs ovoid, symmetrical at the base.
27. Bulb coats with evident reticulations .
28. Perianth segments 5 to 8 mm long; stamens 1/2 to 2/3 the length of the perianth segments; capsules crested with 6 short, acute processes 26. A. obtusum
28. Perianth segments 10 to 14 mm long; stamens 3/4 the length of the perianth segments; capsules crested with 3 short, blunt processes 20. A. cratericola
27. Bulb coats without evident reticulations 17. A. parvum
1. A. douglasii Hooker

Key to the Varieties of Allium douglasii

1. Leaves 1/2 as long as the scape, flat and sometimes falcate 1a. A. douglasii var. douglasii
1. Leaves 3/4 to equaling the scape in length, linear, concave-convex.
2. Leaves about 3/4 the length of the scape; scape enlarged below the inflorescence; bulb coats without evident reticulations.

3. Scape thickest just below the inflorescence
 1b. A. douglasii var. columbianum
3. Scape distinctly constricted just below the inflorescence
 1c. A. douglasii var. constrictum
2. Leaves about as long as the scape; scape slightly or not at all
 enlarged below the inflorescence; bulb coats with compressed hexagonal
 reticulations ld. A. douglasii var. nevii

1a. Allium douglasii Hooker var. douglasii

Allium douglasii Hooker, Fl. Bor. Am. 2:184, t. 197. 1839. Type (K), collected by Douglas, "On the low hills common, rare near the coast," verified by M. Ownbey. A second specimen is labeled, "Subalpine hill near Kettle Falls on the Blue Mountains, 1826." Both collections probably come from the Blue Mts., near Walla Walla, Wash.

Allium hendersoni Robinson & Seaton in Bot. Gaz. 18:237. 1893. Based on: L. F. Henderson 2482, collected near Pullman, Wash., June, 1892, the first specimen cited. Lectotype (GH) and isotype (WTU) studied.

Bulb ovoid, coats white, sometimes pink, mostly without cellular reticulations; leaves 2 per scape, channeled, broad, flat, glaucous and falcate, 2 to 15 mm broad, much shorter than the scape, reddish toward the base, usually persistent at maturity; scape 1 to 4 (usually 2 to 3) dm tall, terete, stout and striate-grooved, longer than the leaves, persistent at maturity; bracts of the inflorescence 3, ovate, acute, papery; umbel 25-50 or more-flowered, pedicels 2 to 3 times the length of the perianth; perianth segments 6 to 10 (usually 7 to 8) mm long, narrowly lanceolate, acuminate, entire, widely spreading, light pink to purple, with prominent green midribs; stamens as long or longer than the perianth segments, anthers gray-blue, filaments united into a ring and to the perianth segments at the base; ovary with a groove on the back of each lobe and crested with 6 pink ridges, style exerted, stigma capitate; capsule crestless; seeds black, shining, alveoli not pustuliferous.

n=7.

Illustrations.--Hooker, Fl. Bor. Amer. t. 197. 1840. Abrams, Ill. Fl. Pac. States 1:387. 1923.

Distribution.--Winter wet shallow soils on rock outcrops, southeastern Washington in Whitman and Walla Walla Cos., south to northeastern Oregon in Umatilla Co., south to central Oregon in Grant and Wheeler Cos. (Fig. 3).

OREGON. GRANT CO.: summit 3 mi. e. of Hamilton and 8.8 mi. w. of Long Creek, June 5, 1967, Ownbey & Mingrone 3500 (WS); 5.6 mi. e. of Hamilton and 6.2 mi. n.w. of Long Creek, June 5, 1967, Ownbey & Mingrone 3501 (WS); 4 mi. n.w. of Long Creek, 4200 ft. alt., T. 9S., R. 29E., S. 26, May 20, 1954, Steward & Smith 6735 (NY, OSC, WS). UMATILLA CO.: Cottonwood Canyon, 8 mi. s.e. of Walla Walla, Wash., May 24, 1942, Booth (WS); near top of Cabbage Hill, nearly 20 mi. s.e. of Pendleton, 3,500 ft. alt., June 12, 1950, Cronquist 6576 (NY, ORE, OSC, POM, UC, US, WS, WTU); Emigrant Hill, e. of Pendleton, Blue Mts., May 21, 1930, Hamblen (WS); ca. 12 mi. s.e. of Freewater, on road to Elgin, May 26, 1957, Hitchcock & Muhlick 20980 (DS, WS, WTU); 4 mi. e. of Pendleton, July 1, 1933, Peck 17440 (DS, NY, WILLU, WTU). WHEELER CO.: on a high hill or mountain near Fossil, June 3, 1925, Henderson 5399 (CAS, DS, GH, MO, ORE).

WASHINGTON. WALLA WALLA CO.: Walla Walla R., 15 mi. e. of city, June, 1903, Cusick 3026 (ORE, POM); Waitsburg, May 15, 1897, Horner R465B480 (GH); Blue Mts., July, 1896, Piper (WS). WHITMAN CO.: 2 mi. s. of Pullman, prior to 1939, Aase, grown at Pullman (WS); along Union Flat Creek, w. of Pullman, May 6, 1952, Aase, grown at Pullman (WS); road to Wawawai, Colfax, 2000 ft. alt., May 9, 1936, Baer 35 (UC); Experimental Range, just e. of Pullman, May 10, 1949, Baker 5880 (NY, OSC, WS); just e. of Pullman, May 22, 1951, Baker 7480 (OSC); 12 mi. n.e. of Wawawai, May 23, 1951, Baker 7482 (OSC, WS); Union Flat, June 13, 1896, Elmer 216 (MO, NY, UC, US, WS); near Pullman, 1 mi. on Moscow road, June 1, 1928, English 394 (MO, WS); Union Flat, June 9-23, 1894, Henderson (US); Union Flat, 6 mi. s. of Pullman, June 4, 1892, Lake & Hull 621 (GH, WS, WTU); 1.0 mi. n.w. of Colton, May 16, 1965, Mingrone 9, grown at

Fig. 3.--Distribution of some taxa of the Allium falcifolium alliance.

A. brandegei Δ , A. burlewii \blacktriangle , A. douglasii var. columbianum \circ ,
A. douglasii var. constrictum \star , A. douglasii var. douglasii \bullet ,
A. douglasii var. nevii \blackstar , A. hoffmanii \square , and A. parvum \dagger .

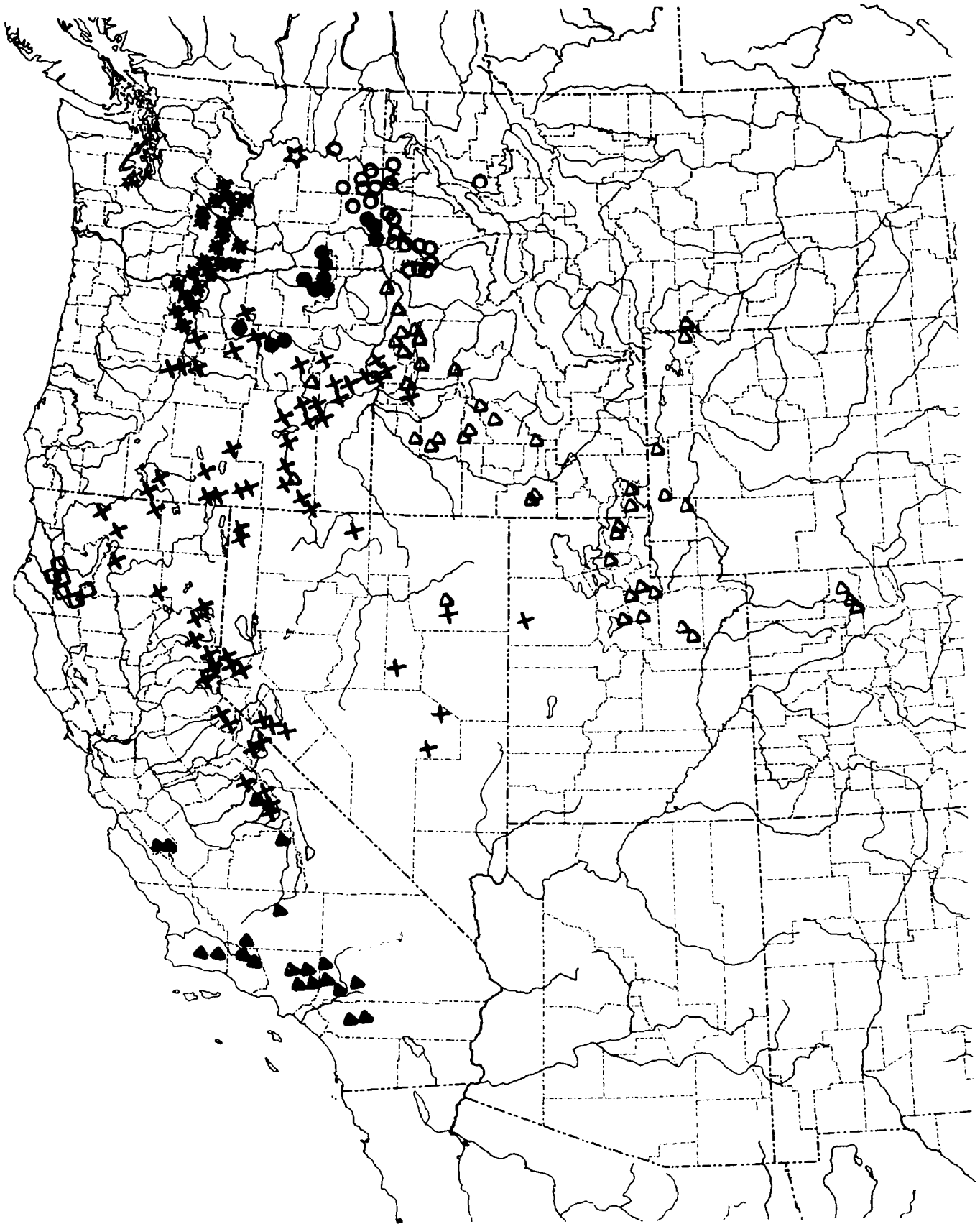


Fig. 3

Pullman (WS); along Union Flat Creek, ca. 6 mi. w. of Pullman, Apr. 20, 1941, Ownbey & Aase, grown at Pullman (WS); 1 mi. n. of Colton, June 14, 1942, Ownbey & Aase, grown at Pullman (WS); on s. hillside, 2 mi. e. of Pullman, June 14, 1944, Ownbey, grown at Pullman (WS); top of Steptoe Canyon, 2 mi. s.w. of Colton, May 28, 1965, Ownbey & Mingrone (WS); 7 mi. w. of Pullman, on Union Flat Creek road, May 28, 1965, Ownbey & Mingrone (WS); Union Flat near Pullman, June 9, 1894, Piper 1870 (DS, GH, NY, ORE, POM, US, WS, WTU); 1 mi. above Almota, Snake R. Canyon, May 22, 1936, Peterson 90 (WTU); Union Flat, w. of Pullman, Apr. 11, 1923, St. John & Pickett 6505 (WS); in canyon, 2 mi. n.w. of Indian, Apr. 21, 1923, St. John 7628 (GH, MO, UC, WS); Steptoe Canyon, Snake R., May 20, 1923, St. John & Warren 3406 (WS); Union Flat, 6 mi. w. of Pullman, May 27, 1923, St. John 6096 (DS, GH, MO, NY, ORE, POM, UC, WS).

1b. Allium douglasii var. columbianum Ownbey & Mingrone

Allium douglasii var. columbianum Ownbey & Mingrone, in Hitchcock et al., Vasc. Pl. Pac. N.W. 1:(in press). Type, Ownbey & Aase 2538 (WS), from low rocky prairie, 2 mi. n. of Spangle, Spokane Co., Wash., studied.

Bulb ovoid, coats white or sometimes pink, without cellular reticulations; leaves 2 per scape, concave-convex, channeled, linear, 2 to 8 mm broad, 3/4 or more the length of the scape, reddish toward the base, usually persistent at maturity; scape 1 to 4 (usually 2 to 3) dm tall, terete, stout and striate-grooved, much enlarged below the inflorescence, slightly longer to 1/4 longer than the leaves, persistent at maturity; bracts of the inflorescence 3, ovate, acute, papery; umbel 25- to 50 or more-flowered; pedicels 2 or more times the length of the perianth; perianth segments 6 to 10 (usually 7 to 8) mm long, narrowly lanceolate, acuminate, entire, widely spreading, light pink to purple, with prominent green midribs; stamens as long or longer than the perianth, anthers gray-blue, filaments united into a ring and to the perianth segments at the base; ovary with a groove on the back of each lobe, and crested with

6 ridges, style exerted, stigma capitate; capsule crestless; seeds black, shining, alveoli not pustuliferous. $n=7$.

Distribution.--Winter wet shallow soils on rock outcrops, or wet meadows, northeastern Washington, east and south in adjacent northwestern Idaho, east to Hot Springs, Sanders Co., Montana (Fig. 3).

IDAHO. CLEARWATER CO.: Greer, at top of grade, May 30, 1937, Christ 7489 (NY); n. side of Clearwater Canyon, just above the bridge at Peck, May 4, 1941, Ownbey & Aase 2385, grown at Pullman (WS); near top of Clearwater Canyon, w. of Ahsahka, May 8, 1949, Ownbey 3176, grown at Pullman (WS); n. side of the Clearwater R. opposite Peck, May 3, 1941, Weber 2116 (WS). IDAHO CO.: Stites, May 30, 1938, Christ 10100 (NY); along Middle Fork Clearwater R., 2 mi. e. of Kooskia, June 3, 1949, Christ & Christ 18245 (NY); 1 mi. n. of Cottonwood, June 19, 1946, Daubenmire 46233 (WS); near Cottonwood, June 24, 1894, Henderson 2724 (GH); 1 mi. s. of Kamiah, May 28, 1944, Hitchcock & Muhlick 8449 (CAS, DS, GH, MO, NY, US, WS, WTU); 2 mi. e. of Cottonwood, June 1, 1941, Ownbey & Aase 2394 (WS); 2 mi. s.e. of Cottonwood, June 17, 1966, Ownbey & Mingrone, grown at Pullman (WS); North Fork Clearwater R., 2 mi. n. of Stites, 1,500 ft. alt., June 15, 1951, Ripley & Barneby 10752 (CAS, WS). KOOTENAI CO.: 5 mi. n. of Worley, Rockford Road, June 18, 1960, Baker 15942 (WTU); Signal Point near Post Falls, above Spokane R., May 30, 1939, Christ 10249 (NY). LATAH CO.: 2 mi. s. of Troy, May, 1949, Aase, grown at Pullman (WS); Potlatch, June 16, 1911, Beattie 4042 (WS); top of canyon above road (Rt. 99), 3 mi. n.w. of Kendrick, May 1, 1965, Mingrone 3 (WS); 3/4 mi. s.e. of Troy on Rt. 99, May 2, 1965, Mingrone 14 (WS); at top of grade, 3 mi. n.w. of Kendrick, Apr. 29, 1945, Ownbey 2747, grown at Pullman (WS); 1.5 mi. w. of Troy, July 28, 1946, Ownbey & Ownbey 3076, grown at Pullman (WS). NEZ PERCE CO.: Cameron, July, 1933, Gail & Long 13889 (NY); Valley of Big Potlatch R., June 9, 1892, Sandberg,

MacDougal, & Heller 355 (CAS, DS, NY, US); Junction of Rts. 195 and 95, 21 mi. s.e. of Pullman toward Lewiston, May 16, 1965, Mingrone 4 (WS); ca. 1/4 mi. n. of junction of Highway 95 and 195 at top of Lewiston Grade, Sept. 1, 1946, Ownbey 3091, grown at Pullman (WS).

MONTANA. SANDERS CO.: near Hot Springs, July, 1953, Diettert, grown at Pullman (WS).

WASHINGTON. LINCOLN CO.: Sprague, 1892, Henderson (WTU); Sprague, May, 1892, Henderson 2479 (GH); Spokane R., 5 mi. above its mouth, below 1,290 ft. alt., May 21, 1940, Rogers 497, grown at Pullman (DS, GH, MO, NY, POM, UC, US, WS, WTU); near Sprague, 550 m. alt., June 11, 1893, Sandberg & Leiberg 205 (CAS, GH, MO, NY, ORE, UC, US, WS). SPOKANE CO.: Spangle, June 15, 1929, Benson 1641 (POM); Spokane, June 2, 1892, Henderson 2481 (WS, WTU); Spokane, June, 1890, Leiberg (MO, ORE); Rockford, 700 m. alt., Leiberg 1001 (DS, GH, MO, NY, POM, UC, US); Spokane, May 30, 1932, Milburge 399 (US, WTU); Down River Drive, Spokane, May 10, 1934, Milburge 884 (WTU); 2 mi. n. of Spangle, June 21, 1942, Ownbey & Aase 2538 (WS); 2.5 mi. n. of Spangle on Rt. 195, May 19, 1966, Ownbey & Mingrone (WS); near Spangle, June 25, 1899, Piper 3036 (GH, WS); on Turnbull Wildlife Refuge, Cheney, June 15, 1950, Scheffer, grown at Pullman (WS); Bonnie Lake, May 30, 1923, St. John, Pickett, & Warren 3212 (POM, WS, WTU); Hangman's (Latah) Creek, May 13, 1889, Suksdorf (WS); n. of Spangle, June 29, July 26, 1915, Suksdorf 8697 (CAS, DS, GH, MO, NY, UC, US, WS, WTU). STEVENS CO.: bank of Spokane R., 6 mi. above its confluence with the Columbia R., May 27, 1939, Sharsmith 4024 (CAS, DS, GH, NY, UC, US, WS, WTU). WHITMAN CO.: head of Rock Lake, May 28-30, 1904, Beattie & Lawrence 2345 (UC, WS); 2 mi. n. of Rosalia, June 16, 1953, Daubenmire 5395 (WS).

1c. Allium douglasii var. constrictum Mingrone & Ownbey

Allium douglasii var. constrictum Mingrone & Ownbey, in Hitchcock et al., Vasc. Pl. Pac. N.W. 1:(in press). Type, Ownbey & Mingrone 3421 (WS), from rocky bench below south summit of Steamboat Rock, upper Grand Coulee, Grant Co., Wash., May 19, 1966, studied.

Bulb ovoid, coats brownish to white, with no reticulations; leaves 2 per scape, concave-convex, channeled, linear, 1 to 3 mm broad, 3/4 as long as the scape or longer, reddish or purple at the base, persistent at maturity; scape 15 to 20 cm tall, terete, striate, much enlarged apically but distinctly constricted just below the inflorescence, persistent at maturity; bracts of the inflorescence 3, ovate, acute, papery; umbel 15- to 30 or more-flowered; pedicels longer than the perianth; perianth segments 7 to 8 mm long, narrowly lanceolate, acuminate, entire, widely spreading, light pink to rose, with prominent green or reddish midribs; stamens exserted, anthers gray-blue, filaments dilated below and united into a ring and to the perianth segments at the base; ovary with a groove on the back of each lobe, and obscurely, if at all, crested, style exserted, stigma capitate, entire; capsule crestless, seeds black, shining, alveoli not pustuliferous. $\underline{n}=7$.

Distribution.--Rocky sandy soil, known only from the top of Steamboat Rock, Grant Co., Washington (Fig. 3).

WASHINGTON. GRANT CO.: abundant but restricted to bench below top of Steamboat Rock, summit s. of trail, May 19, 1966, Ownbey & Mingrone 3421 (WS).

1d. Allium douglasii var. nevi (S. Watson) Ownbey & Mingrone

Allium nevi S. Watson in Proc. Am. Acad. 14:231. 1879. Allium douglasii var. nevi Ownbey & Mingrone in Hitchcock et al., Vasc. Pl. Pac. N.W. 1:(in press). Type (GH), collected by Rev. R. D. Nevius in 1873 at Hood River, Oregon, studied.

Bulb ovoid, coats white or reddish, thin, with compressed transversely oblong hexagonal reticulations; leaves 2 per scape, narrowly linear, flat or channeled, obscurely glaucous, reddish-purple at the base, 2 to 3 mm broad,

about equaling or a little shorter than the scape, usually persistent at maturity; scape 15 to 20 cm tall, slender, terete or somewhat flattened and 2-edged, slightly if at all enlarged at the apex, persistent at maturity; bracts of the inflorescence 2, ovate, acute; umbel 10- to 20-flowered; pedicels slightly longer than the perianth, slender; perianth segments 6 to 8 mm long, lanceolate, acuminate, entire, mostly rose-colored; stamens as long or slightly longer than the perianth segments, anthers gray-blue, filaments united into a narrow ring below; ovary distinctly crested with 6 low ridges, style exerted, stigma capitate; capsule crestless; seeds black, shining, alveoli not pustuliferous.

n=7.

Illustration.--Abrams, Ill. Fl. Pac. States 1:391. 1923, as A. nevi.

Distribution.--Heavy rocky soils, wet meadows, or along streams, central Washington east of the Cascades, south to northcentral Oregon (Fig. 3).

OREGON. HOOD RIVER CO.: Hood R., Barrett (ORE); Hood R., May 3, 1886, Drake & Dickson 763 (NY); Hood R., May 3, 1886, Henderson (ORE); Hood R., May 23, 1886, Henderson 960 (DS, OSC); Hood R., May 30, 1886, Henderson 114 (GH); Hood R., May 20, 1924, Henderson 511 of 1924 (MO); Hood R., May 17, 1927, Peck 14892 (MO, WTU). WASCO CO.: 4.4 mi. s. of Bear Springs, on road to Beaver Creek; just inside posted n. boundary of Warm Springs Indian Reservation, June 8, 1963, French 2251, 2252 (WS); Mosier, May 13, 1923, Gorman 6133 (ORE); near The Dalles, June, 1882, Howell (DS); Kingsley, June, 1881, Howell (DS, ORE, OSC, NY, UC, WS); 10 mi. n. of Wipinitia, May 29, 1933, Peck 17384 (DS, NY, WTU); 5 mi. n. of Tygh Valley, June 4, 1950, Peck 26189 (WILLU); 10 mi. w. of Maupin, June 5, 1950, Peck 26216 (CAS, WILLU); 5 mi. w. of The Dalles, May 13, 1928, Thompson 4222 (DS, GH, MO, POM); summit of old road between Moiser and The Dalles, May 27, 1928, Thompson 4335 (DS, MO, US); near Rowena, Apr. 14, 1934, Thompson 10382 (DS, MO, POM, US, WTU).

WASHINGTON. KITTITAS CO.: Wenatchee Mts., 5,300 ft. alt., July 1, 1903, Cotton 1284 (US, WS); Wenatchee Mts., July, 1897, Elmer 458 (POM, WS); North Fork Teanaway Creek, 3 mi. n. of junction with West Fork, June 12, 1948, Hitchcock 17200 (DS, MO, NY, OSC, POM, UC, US, WS, WTU); Table Mt. area, 1/2 mi. e. of Lion Rock Lookout road on Liberty-Wenatchee Forest Service Road (Liberty--Beehive), July 1, 1952, Kruckeberg 3013 (NY, OSC, POM, UC, WS, WTU); on the high ridges of Table Mt., July 8, 1933, McGee 1014 (CAS); along Rt. 131, 16 mi. n.w. of Ellensburg, May 20, 1966, Ownbey & Mingrone 3430 (WS); Summit meadows, Colockum Pass, 5,250 ft. alt., June 21, 1936, Smith 1217 (DS, WS); near Rattlesnake Hills, Ellensburg, May 21, 1932, Thompson 8310 (CAS, DS, GH, NY, UC, US, WTU); Table Mt., 5,000 ft. alt., Aug. 9, 1933, Thompson 9765 (NY, POM, WTU); near Virden, June 8, 1935, Thompson 11616 (CAS, DS, GH, MO, NY, POM, UC, US, WTU); Bald Mt., Snoqualmie National Forest, 6,000 ft. alt., June 22, 1940, Thompson 14755 (GH, MO, NY, US, WS, WTU). KLINKITAT CO.: Swale Creek, half way between Goldendale and Centerville, May 6, 1931, Applegate 6791 (DS, UC); s. of Satus Pass, May 13, 1949, Dana (OSC); near Satus Peak, T. 9N., R. 16E., S. 32, 3,500 ft. alt., June 9, 1932, Heidenreich 182 (WS); Klickitat R., June 25, 1899 (1900), Flett 1116 (WS); 7 mi. s. of Bickleton, Apr. 26, 1941, Gleason 371 (WS); Klickitat, June, 1879, Howell (GH, MO); Bickleton, June 29, 1930, Jones 25177 (POM); 13 mi. n.w. of Goldendale, Aug. 27, 1940, Ownbey 2346, grown at Pullman (WS); 7.6 mi. n. of Goldendale on Rt. 97, May 21, 1966, Ownbey & Mingrone 3436 (WS). YAKIMA CO.: North Fork of Ahtanum Creek, Ahtanum Watershed, 3,500-6,000 ft. alt., June 7, 1936, Bernath 61F (WS); Yakima region of Cascade Mts., June, 1882, Brandege 14216 (MO); North Fork Ahtanum R., 1892, Henderson (WTU); Upper Nachez R., June 15, 1892, Henderson (WS); Upper Wenas R., June 17, 1892, Henderson (WS); North Fork Ahtanum R., Aug. 3, 1892, Henderson 2480 (GH, WS); no locality, June, 1892, Henderson 2481 (GH); Cimcoe

Mts., July, 1880, Howell (NY, ORE, US); Cimcoe Mts., June, 1881, Howell 8035 (WTU); 2 mi. w. of Wiley City in the Wenas Valley, Apr. 7, 1936, Neale 6 (DS); along Umtanum Creek, 14 mi. s.w. of Ellensburg, May 21, 1966, Ownbey & Mingrone 3434 (WS); 16 mi. s.w. of Ellensburg, Umtanum Ridge, May 21, 1966, Ownbey & Mingrone 3435 (WS); along Umtanum Creek, 13 mi. s.w. of Ellensburg on old Yakima road, Apr. 24, 1942, Ownbey & Weber 2530, grown at Pullman (WS); Falcon Valley, June 24, 1882, Suksdorf (NY); Falcon Valley, June 5 and 28, 1883, Suksdorf (DS, GH, NY, UC, US); Pitman's Ranch near Bickleton, June 6, 1884, Suksdorf (WS); on Thackley's Farm, Falcon Valley, June 11, 1909, Suksdorf 6606 (NY, UC, WS, WTU); near Wood's place, Falcon Valley, May 30, 1912, Suksdorf 7499 (WS, WTU); near Bickleton, 3,500 ft. alt., May 25, 1935, Thompson 11525 (CAS, DS, GH, MO, NY, POM, UC, US, WS, WTU); Cleman Mt., 4,000 ft. alt., May 27, 1940, Thompson 14596 (CAS, DS, GH, MO, NY, POM, UC, US, WS, WTU); near top of ridge, s. of Tieton R., June 19, 1932, Warren 1806 (WTU).

2. Allium macrum S. Watson

Allium macrum S. Watson in Proc. Am. Acad. 14:233. 1879. Type, Cusick 40 (GH), on rocky hills, Union Co., Oregon, in 1877, studied.

Allium equicaeleste St. John in Proc. Biol. Soc. Wash. 44:31. 1931. Type, St. John, Jones, Moore, & Warren 9787 (WS), rocky ground, 1,600 ft. alt., Sixprong Creek, T. 5N., R. 21E., Klickitat Co., Wash., Apr. 12, 1929, and isotypes (GH, US), studied.

Bulb globose to ovate, inner coats white, outer brownish, membranous, without reticulations; leaves 2 per scape, narrowly linear, flat or channeled, 2 to 3 mm broad, greatly exceeding the short scape, usually persistent at maturity; scape 2 to 5 cm tall, terete or nearly so, striate-grooved, persistent at maturity; bracts of the inflorescence 2, abruptly acute; umbel 10- to 20-flowered; pedicels about twice as long as the perianth, slender, spreading; perianth segments 5 to 7 mm long, narrowly lanceolate, acuminate, white or pinkish, with prominent red midribs; stamens equaling the perianth segments in

length or exserted, anthers gray-purple, filaments united into a ring and adnate to the perianth segments at the base; ovary lobes bordered above by a thick obtuse ridge, style exserted, stigma capitate; capsule crestless but prominently grooved; seeds black, dull, alveoli not pustuliferous. $n=7$.

Illustration.--Abrams, Ill. Fl. Pac. States 1:395. 1923.

Distribution.--Barren rocky soil, central Washington to Walla Walla, Columbia, and Whitman Cos., south to northcentral Oregon and again near Keno, Klamath Co., Oregon (Fig. 4).

OREGON. CROOK CO.: s. of Buck Hollow Creek, 4,600 ft. alt., T. 15S., R. 22E., S. 1, Ochoco National Forest, July 2, 1945, Weber 2959, grown at Pullman (WS). GILLIAM CO.: 9 mi. s. of Condon, T. 5S., R. 21E., May 12, 1950, Cronquist 6296 (NY, ORE, OSC, POM, UC, US, WS, WTU); Condon, Apr. 29, 1938, Freese (WS); 0.5 mi. s.e. of Geo. White Ranch, ca. 9 mi. n.w. of Lonerock, above and to the w. of East Fork, May 29, 1955, Hitchcock 20492 (NY, WS, WTU). GRANT CO.: above the John Day R., just n. of Picture Gorge, 8 mi. n.w. of Dayville, 2,600 ft. alt., T. 12S., R. 26E., S. 18, May 29, 1953, Cronquist 7046 (GH, NY, UC, WS, WTU); hill tops near Prairie City, Apr. 23, 1925, Henderson 5108 (CAS, DS, GH, MO, ORE); opposite Humphrey's Ranch, the other side of the river, Apr. 30, 1925, Henderson 5109 (CAS, DS, GH, MO, ORE). KLAMATH CO.: Klamath Falls, May, 1941, Krause (WILLU); 3 mi. w. of Keno, June 2, 1967, Ownbey & Mingrone 3487 (WS); Keno, May 26, 1948, Peck 24946 (OSC, UC, WILLU, WS); Green Springs Highway beyond Keno, May 23, 1942, Small, grown at Pullman (WS); 4 mi. w. of Keno, along Highway 66, 4,200 ft. alt., May 2, 1954, Steward & Steward 6694 (NY, POM, WS, WTU). MORROW CO.: near Rhea Creek, 605 m. alt., May 12, 1894, Leiberg 62 (GH, NY, UC, US); no location, Apr. 16, 1903, Lunell 62 (GH); on the summits of the foothills of the Blue Mts., Apr. 17, 1903, Lunell (DS). UMATILLA CO.: 24 mi. s.w. of Pendleton, T. 1S., R. 31E., May 11,

Fig. 4.--Distribution of some taxa of the Allium falcifolium alliance.

A. anceps ● , A. macrum ○ , A. madidum ▲ , A. obtusum ▴ ,

A. siskiyouense ✦ , A. tolmiei var. persimile ☆ ,

and A. tolmiei var. platyphyllum ✦ .

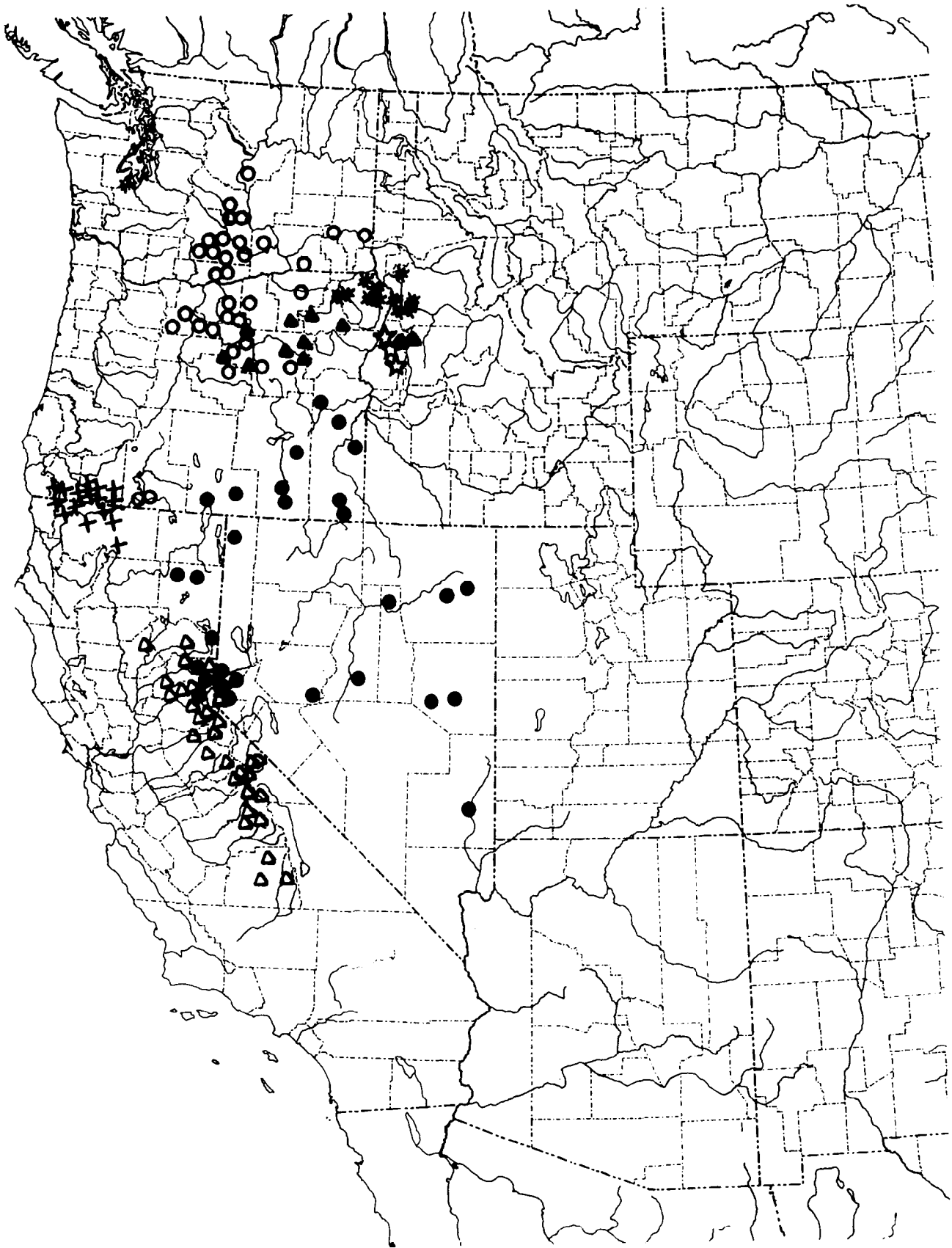


Fig. 4

1950, Cronquist 6284 (NY, ORE, OSC, POM, UC, WS, WTU). UNION CO.: no location, 1880, Cusick 40 (NY, US). WASCO CO.: along Highway near Kent, at the head of Buck Hollow, May 18, 1938, Baker 804 (OSC, WTU); ca. 10 mi. n.w. of Warm Springs on Highway 26, May 9, 1957, Calder, Saville, & Taylor 20698 (WS); 3 mi. w. of Shaniko, 3,500 ft. alt., T. 7S., R. 16E., May 5, 1953, Cronquist 6935 (CAS, DS, NY, OSC, POM, UC, WS, WTU); near Shaniko, May 5, 1928, Gale 99 (DS, MO, POM, US, WTU); 8 mi. s. of Maupin, June 8, 1950, Peck 26247 (WILLU). WHEELER CO.: along the John Day R., just s. of Service Creek, between Fossil and Mitchell, 1,700 ft. alt., T. 9S., R. 23E., May 12, 1950, Cronquist 6306 (NY, ORE, OSC, POM, UC, WS, WTU); above the John Day R., 4 mi. s.e. of Spray, 2,000 ft. alt., T. 9S., R. 25E., May 13, 1950, Cronquist 6320 (WS, WTU); 2.3 mi. n.e. of Service Creek, May 22, 1966, Ownbey & Mingrone (WS); near Spray, Apr. 17, 1935, Thompson 11344 (CAS, DS, GH, MO, NY, POM, UC, US, WS, WTU).

WASHINGTON. BENTON CO.: e. end Rattlesnake Hills, Apr. 22, 1958, Daubenmire 5817 (WS). DOUGLAS CO.: e. edge of Douglas, May 20, 1957, Daubenmire 5790 (WS). KITTITAS CO.: "Saddle Mt.," e. of Ellensburg, 2,500 ft. alt., T. 18N., R. 20E., May 9, 1955, Moomaw (WS); 7 mi. s.w. of Ellensburg, May 21, 1966, Ownbey & Mingrone 3431 (WS); 8 mi. s.w. of Ellensburg, May 21, 1966, Ownbey & Mingrone, grown at Pullman (WS); 8 mi. s.w. of Ellensburg on old road to Yakima, Apr. 24, 1942, Ownbey & Weber 2528, grown at Pullman (WS). KLICKITAT CO.: 1 mi. w. of Cleveland, May 13, 1963, Daubenmire 63147 (WS); Bickleton, May, 1882, Howell & Howell (GH); 4 mi. s.e. of Bickleton, Apr. 25, 1942, Ownbey & Weber 2534, grown at Pullman (WS); 2 mi. s. of Bickleton enroute to Rattlesnake Hills from top of Roosevelt grade, Apr. 6, 1934, Pickett, McMurray, & Dillon 1468 (WS, WTU). WALLA WALLA CO.: Touchet, Apr. 7, 1944, Booth (WS); s.e. of Touchet, Apr. 7, 1944, Weber, Weber, & Booth, grown at Pullman (WS). WHITMAN CO.: Riparia, Henderson (GH); s. slope of summit of Snake R., Little

Almota Creek Divide where the road crosses, Apr. 20, 1941, Ownbey & Aase 2378 (WS); 11 mi. s.w. of Pullman, Little Almota Creek above Davis Bar on the Snake R., May 28, 1965, Ownbey & Mingrone, May 6, 1966, Mingrone & Fahselt 11 (WS). YAKIMA CO.: Yakima Region, Washington Territory, Northern Transcontinental Survey, 1882, Brandege (UC); Rattlesnake Mts., May 6, 1901, Cotton 345 (US, WS); Yakima Indian Reservation, 2,500 ft. alt., T. 7N., R. 17E., S. 14, Apr. 27, 1932, Heidenreich 88 (WS); hills s. of White Swan, Mar. 24, 1942, Hoover 5615 (WTU); Cimcoe Mts., Wash. Terr., July, 1880, Howell (MO); at head of Glade Creek, 6 mi. n.e. of Bickleton, Apr. 25, 1952, Ownbey & Weber 2533 (WS); n. of Sunnyside, 2,400 ft. alt., T. 11N., R. 23E., S. 3, Apr. 15, 1956, Moomaw (WS); near Wenas, Apr. 15, 1940, Thompson 14489 (GH, MO, NY, US, WS, WTU); Medicine Valley, 10 mi. s.w. White Swan, Apr. 7, 1933, Warren 1911 (WTU); 5 mi. w. of Yakima, Cowiche Ridge, Apr. 23, 1933, Warren 1948 (WTU).

3. Allium madidum S. Watson

Allium madidum S. Watson in Proc. Am. Acad. 14:228. 1879. Type, Cusick 382 (GH), in swales on high ground, Union Co., Oregon, May-June, 1877, studied.

Bulb globose to ovoid, bulbiferous to one side at the base, outer coats brownish, inner coats white to pink, coats usually without reticulations, but these when present of the contorted type; leaves 2 per scape, narrowly linear, flat or channeled, 1 to 4 mm broad, about equaling the scape in length, reddish toward the base, persistent at maturity; scape 1 to 2 dm tall, terete or nearly so, sometimes ridged, persistent at maturity; bracts of inflorescence 2, ovate, acuminate; umbel 10- to 20-flowered; pedicels usually less than twice as long as the perianth; perianth segments 6 to 10 mm long, lanceolate, obtuse to acuminate, entire, becoming involute at the tip, white with prominent green or pink midribs; stamens 3/4 as long as the perianth segments, anthers yellow or purple, filaments dilated below and united into a narrow ring at the base;

ovary not crested or obscurely 3-crested, style included, stigma capitate, entire or slightly lobed; capsule crestless; seeds black, dull, alveoli not pustuliferous. $n=21$ (Idaho), $n=14$ (Oregon).

Illustration.--Abrams, Ill. Fl. Pac. States 1:394. 1923.

Distribution.--Low ground, along seasonal water courses, mountains of northeastern Oregon, Grant, Umatilla, Union, and Wheeler Cos., and Adams and Idaho Cos., Idaho (Fig. 4).

IDAHO. ADAMS CO.: 3 mi. w. of McCall, June 27, 1940, Aase & Ownbey, grown at Pullman (NY, WS); 2 mi. w. of McCall, and 1.5 mi. n. of McCall-New Meadow highway, on road to Brundage Mt. lookout, June 17, 1966, Ownbey & Mingrone 3448 (WS); 4 mi. w. of New Meadows, June 11, 1946, Ownbey & Ownbey 2756, grown at Pullman (NY, WS); 5 mi. w. of New Meadows, June 11, 1946, Ownbey & Ownbey 2756a, grown at Pullman (WS); 5 mi. s. of Meadows, June 9, 1936, Rollins 1142 (GH, MO, NY). VALLEY CO.: Bear Flat, Payette Lakes, McCall, July 4, 1952, Baker 9094 (OSC, WS).

OREGON. GRANT CO.: ca. 7 mi. s.w. of Anthony Lake, along road to Granite, July 17, 1952, Hitchcock 19718 (CAS, DS, NY, OSC, POM, UC, WS, WTU); e. of Austin, 4,600 ft. alt., June 5, 1945, Ripley & Barneby 6597 (CAS, WS); Malheur National Forest, 5,500 ft. alt., T. 11S., R. 31E., S. 21, n.w. 1/4, n.w. 1/4, Aug. 3, 1945, Weber 3112, grown at Pullman (WS). UMATILLA CO.: along Bear Wallow road, T. 4S., R. 33E., S. 21, June 8, 1945, Weber 2885, grown at Pullman (WS). UNION CO.: Hog (Craig) Mt., s. of Union, June 10, 1912, Cusick 3726 (OSC, WS, WTU). WHEELER CO.: ca. 18 mi. n.e. of Spray, 4,000 ft. alt., T. 7S., R. 25E., June 21, 1950, Cronquist 6639 (NY, ORE, OSC, POM, UC, US, WS, WTU); 1 mi. s.e. of Spanish Peak, 6,500 ft. alt., Ochoco Mts., s.w. of Dayville, T. 13S., R. 25E., S. 31, July 21, 1953, Cronquist 7561 (GH, NY, WILLU, WS, WTU); n. of Pisgah Lookout, 6,200 ft. alt., T. 13S., R. 21E., S. 8, June 28,

1945, Weber 2948, grown at Pullman (WS); banks of Squaw Meadow Creek, and flat n. of bridge over Squaw Meadow Creek, Ochoco National Forest, T. 14S., R. 25E., S. 14, July 3, 1945, Weber 2962, grown at Pullman (WS).

4. Allium simillimum Henderson

Allium simillimum Henderson in Bull. Torrey Bot. Club 27:355. 1900. Type, Henderson 3100 (US), Secesh Peak, Idaho, Alt. 8,000 ft., July 2, 1895 and photograph of type (POM, WS), studied. Secesh Peak is probably the present Squaw Meadow Lookout on the line between Idaho and Valley Counties in S. 28, T. 22N., R. 42E.

Bulb ovoid, outer coats brownish, with more or less distinct cellular isodiametric to transversely elongate reticulations, inner coats white to pink; leaves 2 per scape, linear, channeled, 1 to 2 mm broad, 2 to 3 times as long as the scape, deciduous at maturity; scape 1 to 5 cm tall, slightly flattened, not or very narrowly winged, deciduous at maturity; bracts of the inflorescence 2, ovate, obtuse or acute; umbel 5- to 12-flowered, pedicels much shorter than the perianth; perianth segments 5 to 9 mm long, oblong to lanceolate, obtuse to acuminate, obscurely to distinctly denticulate-serrulate, not involute at the tip, white with green midribs; stamens 1/2 to 2/3 as long as the perianth segments, anthers yellow or purple, filaments dilated below and united into a ring at the base; ovary crested with 3 low processes, style included, stigma capitate, entire; capsule crested; seeds black, dull or shining, alveoli not pustuliferous. $n=7$.

Distribution.--Coarse sandy soils of granitic, calcareous or basaltic origin, mountains of central and southwestern Idaho (Fig. 5).

IDAHO. ADAMS CO.: 1 mi. s. of Goose Lake, July 8, 1954, Baker 11697 (OSC); 0.5 mi. from summit of Brundage Mt., June 17, 1966, Ownbey & Mingrone 3447 (WS). BLAINE CO.: ca. 18 mi. n. of Ketchum, at cirque lake at head of Boulder Creek, July 2, 1948, Christ & Christ 17604 (NY); near Sawtooth, July 9 & 10, 1896, Evermann 535 (US); near Sawtooth, July 22-24, 1896, Evermann 621

Fig. 5.--Distribution of some taxa of the Allium falcifolium alliance.

A. aaseae ✱ , A. crenulatum ● , A. falcifolium ○ , A. jacintense ☆ ,
A. scilloides ▲ , A. simillimum ▲ , A. tolmiei var. tolmiei □ ,
 and A. tribracteatum ■ .

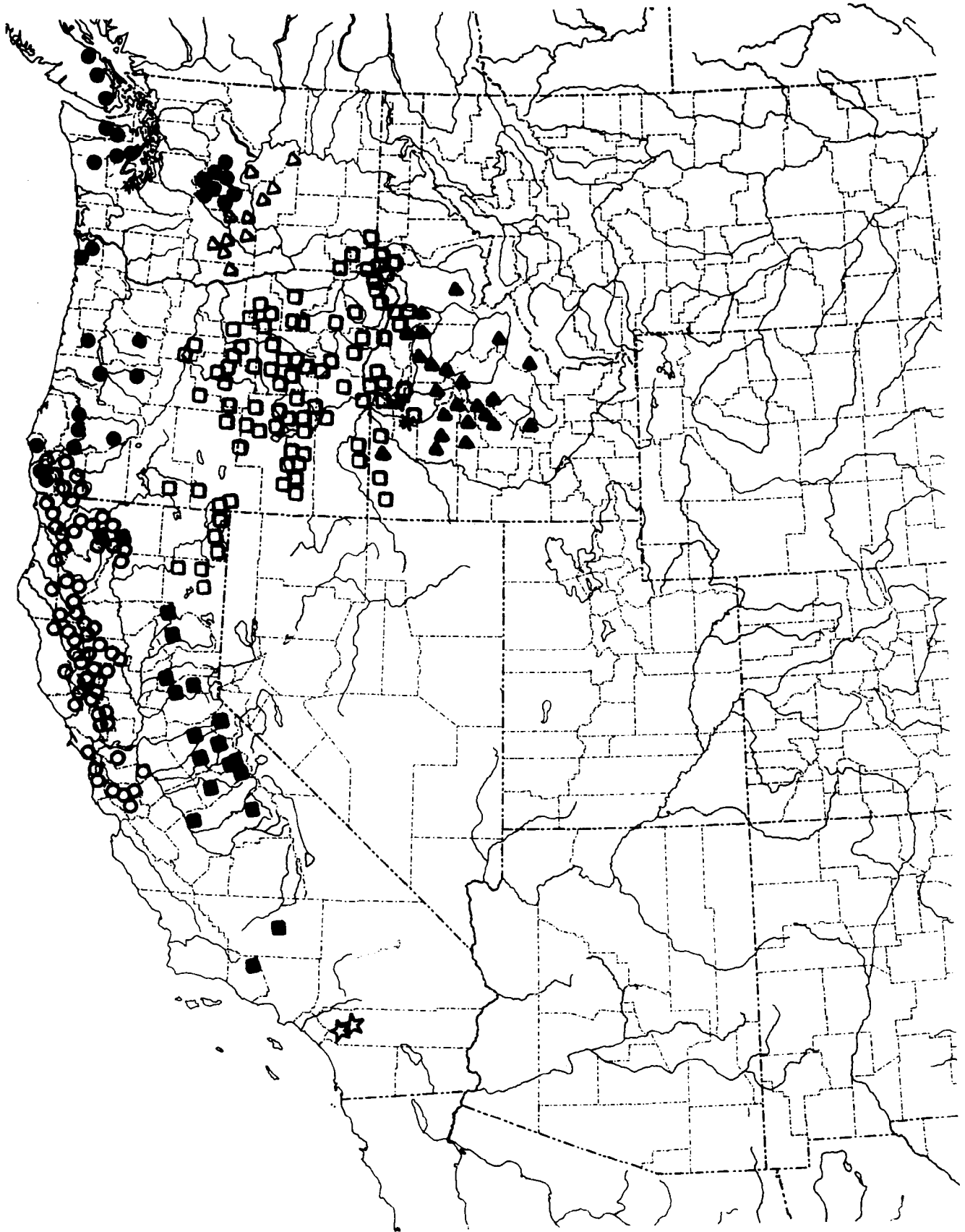


Fig. 5

(additional data, "west shore of Altus Lake, 2130-2190 m. alt."--from sheet of *Calochortus nitidus* (No. 628) in Field Museum, collected same locality and dates) (US); 3 mi. s.w. of Hailey, Apr. 11, 1947, Ownbey & Ward 3103, grown at Pullman (WS). BOISE CO.: along Trail Creek, June 12, 1947, Christ & Christ 16784 (NY); 6 mi. s. of Lowman on Idaho City road, ca. 6,000 ft. alt., June 1, 1944, Hitchcock & Muhlick 8621 (CAS, DS, MO, NY, UC, WS, WTU). BUTTE CO.: just n. of w. entrance to Craters of the Moon National Monument, Apr. 10, 1947, Ownbey & Ward 3102, grown at Pullman (WS). CAMAS CO.: Dollarhide Summit, Smoky Mts., 28 mi. w. of Ketchum, 8,719 ft. alt., June 30, 1948, Christ & Christ 17545 (NY); Crouch Summit, ca. 9 mi. n. of Soldier, 7,000 ft. alt., June 6, 1944, Hitchcock & Muhlick 8764 (CAS, DS, MO, NY, UC, WS, WTU). CUSTER CO.: s.w. of Stanley Lake, ca. 8,000 ft. alt., June 6, 1944, Hitchcock & Muhlick 9640 (CAS, DS, MO, NY, UC, US, WS, WTU); on w. side of Ryan Peak, Boulder Mts., Sawtooth National Forest, ca. 11,000 ft. alt., Aug. 1, 1944, Hitchcock & Muhlick 10595 (CAS, DS, MO, NY, WS, WTU); 3 mi. s.w. of Stanley Lake, 8,000 ft. alt., Summer, 1944, Hitchcock (9640?), grown at Pullman (WS); Josephus Lakes, 9,000 ft. alt., Aug. 3, 1916, Macbride & Payson 3554 (MO, NY, US). ELMORE CO.: Trinity Mt., w. of Rocky Bar, July 14, 1944, Christ 14438 (NY); summit of Dog Mt., ca. 4 mi. n. of Pine, Boise National Forest, ca. 8,300 ft. alt., June 5, 1944, Hitchcock & Muhlick 8738 (CAS, DS, MO, NY, UC, US, WS, WTU); on top of s. side of Dog Mt., head of Dog Creek of the Boise R., ca. 4 mi. n. of Pine, June 5, 1944, Hitchcock & Muhlick 9717, grown at Pullman (WS); Sawtooth Primitive Area, headwaters of Middle Fork Boise R., above Atlanta, above Middle Spangle Lake, July 19, 1944, Hitchcock & Muhlick 10156 (CAS, DS, MO, NY, US, WS, WTU); Flint Creek, Atlanta district, Boise National Forest, 7,000 ft. alt., June 29, 1942, MacFadden 25464 (CAS); 7 mi. e. of Dixie, Apr. 11, 1947, Ownbey & Ward 3106, grown at Pullman (WS). IDAHO CO.:

3 mi. e. of Burgdorf, May 29, 1940, Christ 11017 (NY); Indian Hill, T. 31N., R. 10E., June 23, 1941, Davis 3483 (CAS); 500 yds. s.w. of lookout tower, Indian Hill, above Meadow Creek and Selway R., drainage, Nez Perce National Forest, 6,000 ft. alt., July 7, 1959, Kruckeberg 4107 (NY, WTU); ca. half-way up s. side of the peak 2 mi. n. of Secesh Summit, 7.5 mi. s.w. of Burgdorf, July 6, 1942, Ownbey & Aase 2581 (WS). LEMHI CO.: near head of Eight Mile Creek, ca. 12 mi. s.w. of Leadore, June 24, 1944, Hitchcock & Muhlick 9243 (CAS, DS, GH, MO, NY, US, WS, WTU); gravelly slope, ca. 1 mi. s.w. of Taylor Mt., ca. 30 mi. n. of Challis, June 30, 1944, Hitchcock & Muhlick 9411 (CAS, DS, MO, NY, UC, WS, WTU); 1 mi. s.w. of Taylor Mt., 4 mi. n.e. of Morgan Creek summit, 9,000 ft. alt., Summer, 1944, Hitchcock, grown at Pullman (WS); Eight Mile Creek, 12 mi. s.e. of Leadore, Lemhi Mts., Summer, 1944, Hitchcock (9243?) (WS). OWYHEE CO.: Silver City, 7,000 ft. alt., June 28, 1911, Macbride 996 (DS, GH, MO, NY, POM, UC, US); Silver City, May 25, 1933, Train 94 (US). VALLEY CO.: Elk Summit, w. of Big Creek P. O., July 21, 1944, Christ & Ward 14561 (NY); Elk Summit, 9,000 ft. alt., T. 21N., R. 8E., July 7, 1940, Davis 2655 (CAS); ca. 10 mi. s. of Landmark, June 27, 1946, Hitchcock & Muhlick 14083 (CAS, DS, MO, NY, UC, WS, WTU); near Elk Creek Ranger Station, 15 mi. w. of Cape Horn, June 27, 1946, Hitchcock & Muhlick 14101 (CAS, DS, MO, NY, POM, UC, WS, WTU); at Poker Meadows Forest Camp, Bear Valley, Boise National Forest, 6,500 ft. alt., July 13, 1957, Kruckeberg 4160 (WTU); 0.5 mi. below Brundage Lookout, w. of Payette Lake, July 5, 1942, Ownbey & Aase 2580 (WS).

5. Allium aaseae Ownbey

Allium aaseae Ownbey in Res. Stud. St. Coll. Wash. 18:19. 1950. Type, Ownbey & Ward 3095 (WS), from low hills directly back of Collister schoolhouse, just n.w. of Boise, Idaho, Apr. 7, 1947, and isotypes (NY, WS), studied.

Bulb ovoid, outer coats brownish with or without obscure cellular reticulations, inner bulb coats white, pink or red; leaves 2 per scape, linear,

channeled, concave-convex, 1 to 4 mm broad, entire or denticulate, 2 or more times longer than the scape, green at anthesis, deciduous at maturity; scape 1 to 5 cm long, slightly flattened, with or without narrow sometimes crenulate-denticulate wings, deciduous at maturity; bracts of the inflorescence 2 or 3, ovate, obtuse to acuminate; umbel 5- to 10-flowered; pedicels much shorter than the perianth; perianth segments 6 to 9 mm long, oblong to lanceolate, obtuse to acuminate, obscurely to distinctly serrulate-denticulate, not involute at the tip, becoming cup-shaped at maturity, pink fading to white with dark pink midribs; stamens 1/2 to 3/4 as long as the perianth, anthers yellow or purple, filaments dilated below and united into a ring at the base; ovary crestless, style included, stigma capitate, entire; capsule crestless, seeds black, shining, alveoli not pustuliferous. $n=7$.

Distribution.--Coarse sandy soil and gravelly river benches, known only from Freezeout Hill in the vicinity of Emmett, Gem Co., Idaho, and near Boise, Ada Co., Idaho (Fig. 5).

IDAHO. ADA CO.: Boise, Idaho, Cleburn (POM); Boise City, Idaho, June, 1881, Wilcox (GH). GEM CO.: s. slope of Freezeout Hill, near Emmett, Apr. 11, 1951, Aller 1173 (WS); ca. 5 mi. s. of Emmett, at top of Freezeout Hill, June 18, 1966, Ownbey & Mingrone, grown at Pullman (WS); top of Freezeout Hill, 5 mi. s.e. of Emmett, Apr. 12, 1947, Ownbey & Ward 3110 (WS).

6. Allium fibrillum M. E. Jones

Allium fibrillum Jones ex Abrams, Ill. Fl. Pac. States 1:393. 1923; Jones in Contrib. West. Bot. 10:24. 1902, nomen prov. Type, Jones 6601 (POM), from Cuddy Mts., alt. 6,000 ft., Washington Co., Idaho, July 2, 1899, and isotypes (CAS, DS, MO, NY, US, WS), studied.

Allium collinum Douglas ex S. Watson in Am. Acad. Arts and Sci. Proc. 14:228. 1879. Type (K), collected by Douglas, abundant on the Blue Mts., 1826, not seen. Fragment (GH) and photographs of the type (GH, NY, POM, US, WS), studied.

Bulb nearly spherical, outer coats brownish with characteristic reticulations, which are very fine, narrow and much contorted appearing as wavy lines, inner coats white to pink; leaves 2 per scape, linear and channeled, 1 to 3 mm broad, about as long or slightly longer than the scape, reddish toward the base, usually persistent at maturity; scape 3 to 15 cm tall, terete or slightly flattened but not winged or very narrowly so, persistent at maturity; bracts of the inflorescence 2, ovate, acuminate; umbel 10- to 20-flowered; pedicels about as long as to nearly twice as long as the perianth, perianth segments 5 to 8 mm long, lanceolate, obtuse to acuminate, entire, somewhat involute at the tips, white with prominent greenish or pink midribs; stamens $2/3$ to $3/4$ as long as the perianth segments, anthers yellow or purple, filaments dilated below and united into a ring at the base; ovary obscurely crested with 3 low processes or crestless, style included, stigma capitate, entire; capsule crestless, seeds black, dull or shining, alveoli not pustuliferous. $n=7$.

Illustration.--Abrams, Ill. Fl. Pac. States 1:393. 1923.

Distribution.--Barren soils or meadows and prairies, mountains of northern Idaho and western Montana, the Blue Mts., and adjacent areas of southeastern Washington, northeastern Oregon, and adjacent areas of northwestern Idaho (Fig. 6).

IDAHO. BENEWAH CO.: St. Mary's R., 930 m. alt., June 26, 1894, Leiberg 1067 (DS, GH, MO, NY, ORE, POM, UC, US). LATAH CO.: Collins, in stream (creek) bed at "Warrens," July 25, 1898, Piper 2894 (GH, NY, WS). CLEARWATER CO.: at top of Greer, Idaho grade, May 30, 1937, Christ 7427 (NY). IDAHO CO.: Camp Howard, July 4, 1907, Aldrich 13922 (NY); 12 mi. s. of Grangeville, ca. 2 mi. down the Whitebird grade, May 28, 1938, Beinke 459 (WTU); Westlake, May 31, 1937, Christ 7608 (NY); Joseph, May 21, 1939, Christ 10208 (NY); on road between Joseph and Boles, T. 29N., R. 1W., S. 16, July 2, 1950, Jones 159 (NY,

Fig. 6.--Distribution of some taxa of the Allium falcifolium alliance.
A. cratericola ● , A. fibrillum ○ , A. lemmonii ▲ , A. platycaule † ,
A. pleianthum ■ , A. punctum △ , A. robinsonii □ ,
and A. yosemitense ✧ .

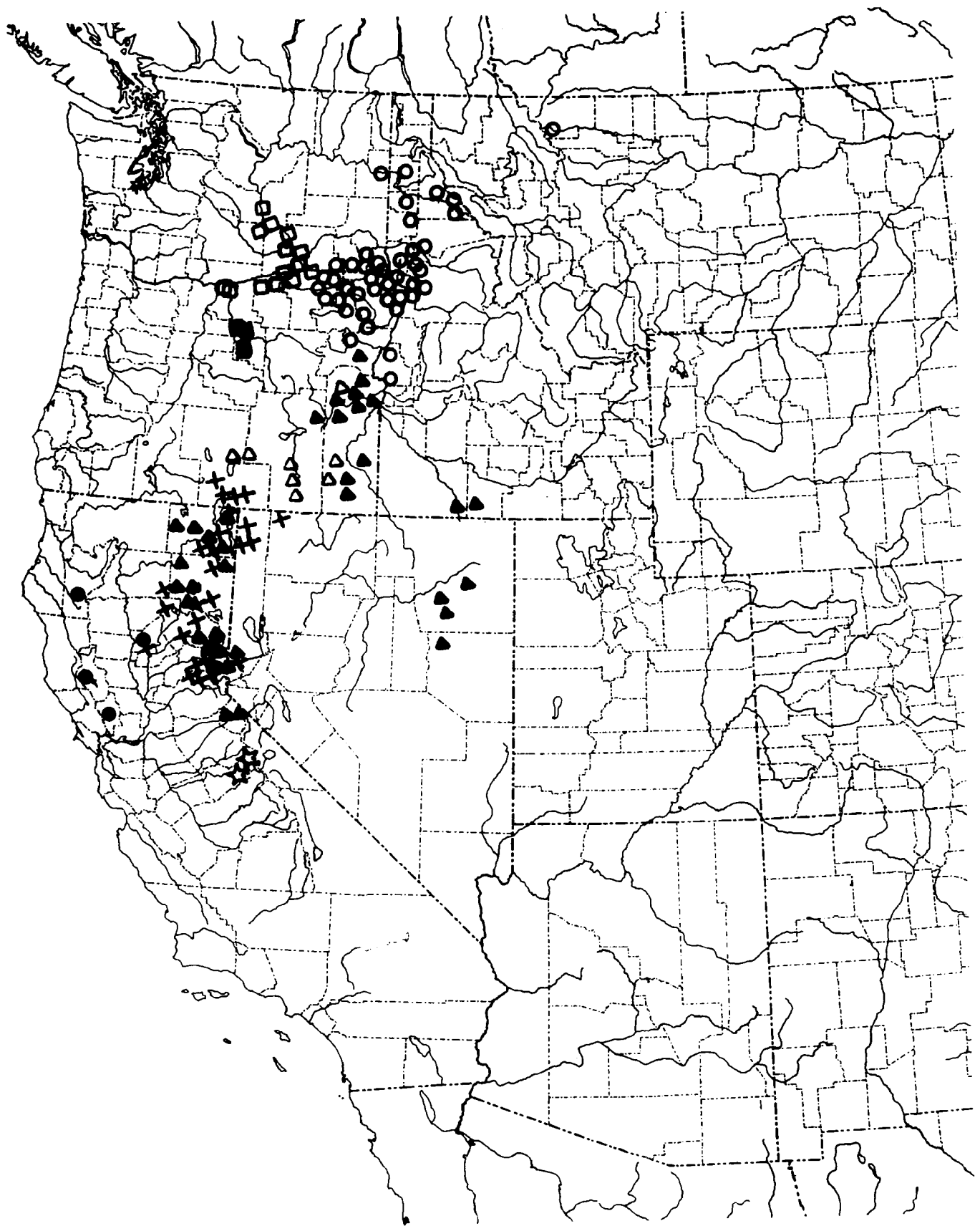


Fig. 6

POM, US, WS, WTU). KOOTENAI CO.: Coeur d'Alene, Mar. 12, 1934, Christ 3631 (NY); Coeur d'Alene, May 18, 1932, Rust 1299 (US). LEWIS CO.: 5 mi. e. of Forest, May 25, 1941, Ownbey & Aase 2393 (WS); Craigmont, 1932, Rowntree (CAS). NEZ PERCE CO.: 3 mi. s. of Culdesac, May 27, 1950, Baker 6653 (OSC, WS); above Lake Waha, May 17, 1952, Baker 8899 (OSC, WS); Culdesac, May 13, 1934, Christ 4075 (NY); 6 mi. n.w. of Reubens, June 5, 1949, Christ & Christ 18301 (NY); about Lake Waha, 2,000-3,500 ft. alt., June 27, 1896, Heller & Heller 3329 (MO, NY, UC, US); Craig Mts., June 23 & 24, 1894, Henderson 2725 (GH, US, WS); just n. of Lake Waha, Craig Mts., May 25, 1941, Ownbey & Aase 2388, grown at Pullman (WS); Craig Mts., 9 mi. beyond Waha, on road to Salmon R. Canyon, May 25, 1941, Ownbey, Aase, & Weber 2390 (WS); 5 mi. e. of Culdesac, May 14, 1932, Warren (GH, NY, UC, US, WS); summit of Craig Mts., 8 mi. s. of Lake Waha, May 25, 1941, Weber 2177 (WS, WTU); just n. of Lake Waha, Craig Mts., May 25, 1941, Weber 2206 (WS, WTU). SHOSHONE CO.: Grizzly Peak, top of Grizzly Mt., July 24, 1959, Daubenmire 59200 (WS); near Stevens Peak, 1,780 m. alt., Leiberg 1462 (MO, NY, ORE, POM, UC, US); Siwash Peak, Avery Ranger Station District, St. Joe National Forest, T. 45N., R. 6E., 5,829 ft. alt., June 17, 1939, Moore 428 (UC, WS); along the water trail from Little Baldy Lookout, T. 50N., R. 5E., S. 9, June 30, 1946, Witt 1022 (DS, NY, POM, UC, WS, WTU); ridge e. of Little Baldy Lookout, T. 50N., R. 5E., S. 9, s.w. 1/4, July, 1946, Witt 1022A, grown at Pullman (WS). WASHINGTON CO.: w. of Monroe Creek, near Weiser, May 14, 1938, Christ 9360 (NY); head of Hornet Creek, 21 mi. n.w. of Council, Cuddy Mts., July 5, 1942, Ownbey & Aase 2576 (WS).

MONTANA. GLACIER CO.: Upper Marias Pass, Rocky Mts., Aug. 3, 1883, Canby 320 (GH, NY, US); vicinity of summit, Marias Pass, 1,580 m. alt., July 19, 1954, Harvey 5867 (WS); s. side of Cuthank Pass, June 19, 1926, Raup (GH); Marias Pass, 5,200 ft. alt., June 26, 1951, Ripley & Barneby 10963 (CAS).

OREGON. BAKER CO.: no location, 6-7,000 ft. alt., Cusick 954-858 (GH); Eagle Creek, June 5, 1939, Gustafson (OSC); top of East Ridge, 5,600 ft. alt., T. 6S., R. 44E., S. 34, June 24, 1957, Head 996 (OSC); top of South Ridge overlooking Gold King Creek, 6,350 ft. alt., T. 6S., R. 44E., S. 19, July 2, 1957, Head 1110 (OSC, WS); on top of ridge, Cornucopia Mine, above Cornucopia, 8,500 ft. alt., June 25, 1935, Jones 6734 (US); Baker City, June 11, 1902, Jones (POM). MALHEUR CO.: no location, May 25, 1940, Gilkey (OSC). UMATILLA CO.: Toll Gate, 4,500 ft. alt., June 23, 1936, Bolt 792 (UC); 10 mi. e. of Weston, May 17, 1942, Booth (WS); just n. of Emigrant Springs State Park picnic area, ca. 22 mi. s.e. of Pendleton, T. 1N., R. 35E., June 12, 1950, Cronquist 6570 (NY, ORE, OSC, POM, UC, WS, WTU); Meacham (road to "The Breaks"), 3,900 ft. alt., T. 1S., R. 35E., June 5, 1955, Detling 7712 (ORE); Meacham (road to "The Breaks"), 4,000 ft. alt., T. 1S., R. 35E., June 5, 1955, Detling 7714 (ORE); Blue Mts., May 22, 1936, Freese (WS); ca. 20 mi. s.e. of Freewater on road to Elgin, May 26, 1957, Hitchcock & Muhlick 20982 (DS, WS, WTU); 18 mi. e. of Pendleton, on road to Meacham, w. boundary of Emigrant Springs State Park, 3,500 ft. alt., June 21, 1935, Keck & Clausen 3598 (DS); Bennett Peak, 4,500 ft. alt., Blue Mts., May 23, 1936, Maxon 87 (CAS); 8 mi. e. of Weston, July 10, 1944, Peck 22226 (NY, WILLU); near Langdon Lake, July 12, 1944, Peck 22266 (UC, WILLU); 14 mi. e. of Weston, T. 4N., R. 38E., S. 31, June 25, 1949, Pyeatt 22 (WS); summit of Blue Mts., between Pendleton and LaGrande, June 17, 1928, Thompson 4888 (DS, MO, POM, WTU); near Bear Wallow Guard Station, May 23, 1941, Winn (OSC); Blue Mts., June, 1939, Zivney 200 (OSC). UNION CO.: on Horseshoe Prairie, Blue Mts., Umatilla National Forest, near Oregon Route 204, T. 3N., R. 38E., S. 26, s.w. 1/4, June 10, 1949, Cooke & Cooke, grown at Pullman (WS); "Hog'em," June, 1880, Cusick 848 (GH); no location, 1881, Cusick 985 (GH); s.e. of Five Points, May 11, 1949, Hefty 7 (OSC); Cove, May 3, 1938, Javette (OSC);

near Bone Springs, Wenaha National Forest, 5,000 ± ft. alt., Aug. 2, 1916, Lawrence WF193 (OSC); rest area near Eagle Creek, ca. 3 mi. up main Eagle Creek Trail from Boulder Park Resort, elev. ca. 5,900 ft., Wallowa Mts., July 15, 1967, Marttala (WS); near summit, Blue Mts. Tollgate Road, May 31, 1939, Muenschler & Muenschler 15764 (GH, NY). WALLOWA CO.: 2 mi. e. of Flora, May 27, 1949, Baker 6035 (NY, WS); ca. 22 mi. n. of Enterprise, May 27, 1949, Baker 6048 (NY, OSC, WS); ca. 17 mi. n. of Enterprise, May 27, 1949, Baker 6068 (WS); Blue Mts., at Flora Junction, June 2, 1950, Baker 6759 (NY, OSC, WS); at Flora Junction, 36 mi. n. of Enterprise, June 1, 1951, Baker 7663 (OSC, WS); e. fork of Peavine Creek, Imnaha National Forest, May 29, 1907, Coville 2352 (US); stony swales of Paradise, 4,000 ft. alt., June 18, 1900, Cusick 2413 (GH, MO, NY, POM, UC, US, WS); Bet. Zumwalt and Billy Creek Meadows, July 18, 1948, Gilkey 19 (OSC); 13.2 mi. s. of Oregon-Washington boundary on Oregon Highway 3, June 2, 1963, Gillett & Taylor 11016 (WS); between 10-mile post and Saddle Creek View Point on Hat Point road, July 2, 1952, Howell 28567 (CAS, POM, WILLU, WS); near Bald Knob, 6,250 ft. alt., June 25, 1907, Jardine 46 (US); at Billy Meadows, 5,000 ft. alt., May 15, 1908, Jardine 194 (US); at Billy Meadows, 5,000 ft. alt., June 22, 1908, Jardine 290 (US); Sacajawea Camp, 0.5 mi. below Hat Point, July 25, 1950, Kruckeberg 2463 (NY, POM, UC, WS, WTU); just below Bonny Lakes, 8,500 ft. alt., July 23, 1952, Kruckeberg 3137 (OSC, POM, WS, WTU); 13 mi. above Imnaha on Hat Point Road, Sept. 6, 1940, Ownbey 2374, grown at Pullman (WS); 20 mi. n. of Enterprise, date (?), Ownbey & Aase 2550, grown at Pullman (WS); no location, July 1, 1942, Ownbey & Aase 2560, grown at Pullman (WS); 3 mi. n. of Red Hill Lookout, July 1, 1942, Ownbey & Aase 2562, grown at Pullman (WS); 30 mi. n. of Enterprise on Rt. 3, on rim of Joseph Creek Canyon, just n. of Joseph Canyon lookout, June 20, 1966, Ownbey & Mingrone 3464 (WS); ridge 28 mi. n. of Enterprise, June 23, 1934, Peck 18225 (DS, WILLU); near

Buckhorn Springs, June 29, 1934, Peck 18318 (DS, WILLU); Bald Knob, n. slope, June 25, 1907, Sampson & Pearson 66 (US); Cattle Camp at head of Horse Creek, 5,400 ft. alt., June 24, 1897, Sheldon 8364 (NY, US); above Joseph Creek, June 1, 1933, Sprague (OSC).

WASHINGTON. ASOTIN CO: upper end of Cloverland Road, Blue Mts., Sept. 7, 1940, Aase, grown at Pullman (WS); 4 mi. from Anatone, 3,300 ft. alt., May 8, 1936, Downen 53 (UC); Wenatchee Guard Station, 20 mi. s.w. of Asotin, T. 8N., R. 43E., S. 35, June 10, 1959, Hitchcock & Muhlick 21824 (NY, UC, WS, WTU); Blue Mts., June, 1928, Jones 1932 (WS); along trail to lookout, Fields Spring State Park, ca. 8 mi. s.w. of Anatone, May 16, 1965, Mingrone 6 (WS); summit of Big Butte lookout, May 16, 1966, Mingrone 15 (WS); 1 mi. s. of Anatone, June 8, 1941, Ownbey & Aase 2405 (WS); summit of Big Butte, 6 mi. w. of Anatone, 4,500 ft. alt., May 30, 1928, St. John & Palmer 9597 (UC, WS).

COLUMBIA CO.: Tallow Flat, Wenaha Forest Reserve, T. 9N., R. 40E., June 24, 1913, Darlington 172 (WS); near Godman Spring, Blue Mts., Sept. 1949, English, grown at Pullman (WS); Godman Springs, Blue Mts., 5,740 ft. alt., Constance, Clarke, Stoats, & VanVleet 1215 (MO, WS); Blue Mts., May 8, 1897, Horner R190B478 (GH); Blue Mts., June 11, 1897, Horner R193B477 (GH); west slope of ridge, 3 mi. below Griffin Fork of the South Touchet R., May 17, 1936, Jones 58 (WTU); summit of Blue Mts., July 15, 1896, Piper 2325 (NY, WS); Wolf Fork of Touchet R., May 30, 1925, St. John, Davison, & Schiebe 6932 (MO, NY, UC, WS); Stayawhile Springs, 5,500 ft. alt., T. 7N., R. 40E., July 6, 1927, St. John & Smith 8342 (WS).

GARFIELD CO.: near Mt. Misery, Blue Mts., Sept. 7, 1940, Aase, grown at Pullman (WS); near Stentz Spring, Clearwater Ranger Station, T. 9N., R. 42E., Umatilla National Forest, 4,000 ft. alt., June 13, 1936, Constance & Clements 1725 (DS, GH, MO, US, WS, WTU); summit of Abel's Ridge, 12 mi. s. of Pomeroy, May 9, 1947, Daubenmire, grown at Pullman (WS); ca. 15 mi.

s. of Pomeroy in Blue Mts., May 25, 1944, Hitchcock & Muhlick 8291 (CAS, DS, HG, MO, NY, UC, US, WS, WTU); in the Blue Mts., s.w. of Pomeroy, May 18, 1936, Meyer 300 (MO, POM, WS, WTU); above the Tucannon R., between Clearwater Ranger Station and Mt. Misery, T. 8N., R. 42E., S. 15, Blue Mts., 5,000 ft. alt., June 6, 1938, Peters 354 (DS, GH, UC, WS). SPOKANE CO.: near the top of Mica Peak, July 10, 1916, Suksdorf 8833 (CAS, DS, GH, MO, NY, UC, US, WS, WTU). WALLA WALLA CO.: high ridges of the Blue Mts., July 15, 1896, Piper 2325 (GH, ORE, POM).

7. Allium brandegei S. Watson

Allium brandegei S. Watson in Proc. Am. Acad. 17:380. 1882. Type (GH), collected by T. S. Brandege, Elk Mts., Colorado, July, 1881, and isotypes (MO, UC), studied.

Allium tribracteatum var. diehlii M. E. Jones in Contrib. West. Bot. 10:18. 1902; Allium diehlii Jones in Contrib. West. Bot. 10:86. 1902. Type, Jones 6590 (POM), Altus. Parley's Canon, alt. 8,000 ft., Utah, May 31, 1898, and isotypes (CAS, DS, MO, NY, UC, US, WS), studied.

Allium minimum M. E. Jones in Contrib. West. Bot. 10:19, fig. 36. 1902. Type, Jones 6595 (POM), Cuddy Mts., alt. 6,000 ft., Washington Co., Idaho, July 2, 1899, and isotypes (CAS, DS, GH, WS), studied.

Bulb ovoid, outer coats brownish, with usually distinct isodiametric or transversely elongate cellular reticulations, inner coats red or white; leaves 2 per scape, narrowly linear, channeled, 1 to 3 mm broad, entire, longer than the scape, persistent at maturity; scape 3 to 10 cm tall, slender, slightly flattened but not winged, persistent at maturity; bracts of the inflorescence 2, ovate, acuminate; umbel 8- to 15- flowered; pedicels usually less than twice as long as the perianth; perianth segments 5 to 8 mm long, lanceolate, obtuse to acuminate, entire, becoming involute at the tip, white with prominent green to red midribs; stamens 2/3 to 3/4 as long as the perianth segments, anthers yellow, filaments dilated below and united into a ring at the base; ovary not crested or obscurely crested, style included, stigma

capitate, entire; capsule crestless; seeds black, shining, alveoli not pustuliferous. $n=7$.

Illustration.--Watson, Bot. King Exped. 38. 1871, as A. tribracteatum.

Distribution.--Sandy rocky soil, mountains of western Colorado and Wyoming to Montana, across northern Utah to Elko Co., Nevada, north to south and southcentral Idaho, and to Wallowa Co. in northeastern Oregon (Fig. 3).

COLORADO. GUNNISON CO.: vicinity of Mt. Carbon, 3,270 m. alt., June 19, 1910, Eggleston 5699 (GH, US). ROUTT CO.: Rabbit Ear Range, July 18, 1903, Goodding 1591 (GH, MO, NY, US); Steamboat Springs, June 16, 1903, Osterhout 2792 (NY); 3 mi. n.w. of Steamboat Springs, 6,800 ft. alt., June 6, 1951, Ripley & Barneby 10593 (CAS); ca. 28 mi. n. of Steamboat Springs, July 19, 1951, 8,000 ft. alt., Weber 6838 (CAS, WS, WTU); 1 mi. n. of center of Steamboat Springs, May 9, 1952, Weber 7329 (WS, WTU).

IDAHO. ADA CO.: 4 mi. n.w. of old site of Mayfield, May 2, 1948, Christ & Christ 17349 (NY). ADAMS CO.: Fruitvale, May 12, 1938, Christ 9188 (NY); 6 mi. w. of New Meadows, on divide between Weiser and Salmon R., May 12, 1938, Christ 9244 (NY); near summit between New Meadows and McCall, May 12, 1939, Cronquist 1197 (NY); summit along highway, 4 mi. w. of McCall, T. 18N., R. 3E., May 10, 1940, Davis 1911 (CAS); 2 mi. w. of McCall, and 1.5 mi. n. of McCall-New Meadows highway on road to Brundage Mt. Lookout, June 17, 1966, Ownbey & Mingrone 3449 (WS); along Grouse Creek, 11 mi. n.w. of Fruitvale, June 18, 1966, Ownbey & Mingrone (WS); along watercourse, 4 mi. s. of Council, Apr. 13, 1947, Ownbey & Ward 3118, grown at Pullman (WS); 21 mi. n.w. of Council on road to Cuprum, June 28, 1950, Ownbey 3283, grown at Pullman (WS). BEAR LAKE CO.: ca 10 mi. w. of Bloomington, T. 14S., R. 42E., S. 30, 9,300 ft. alt., July 18, 1952, Baker 9363 (OSC, WS); 15 mi. w. of Montpelier, on Strawberry Canyon road, June 29, 1943, Christ 14176 (NY); 13 mi. w. of Bloomington

Lake in the Bear River Range, July 9, 1949, Christ & Christ 18685 (NY); Copenhagen Basin, June 16, 1959, 8,200 ft. alt., Cottam, Anderson, Rowland, & Ream 15521 (DS); Meadow Creek R.S., June 26, 1938, Davis 381 (WS). BLAINE CO.: 11 mi. e. of Carey, May 8, 1937, Christ & Ward 7090 (NY); 12 mi. n.w. of Ketchum, 6,500 ft. alt., June 20, 1941, Cronquist 2544 (GH, MO); Alturas Lake, 7,100 ft. alt., June 21, 1941, Cronquist 2595 (GH, MO); 1 mi. above Ketchum, R. 18E., T. 4N., May 31, 1941, Davis 3095 (CAS); 9 mi. n.e. of Carey, Apr. 10, 1947, Ownbey & Ward 3101, grown at Pullman (WS); Ketchum, May 13, 1941, Wood (POM). CAMAS CO.: Hill City, May 7, 1937, Christ & Ward 7052 (NY); 5 mi. n.e. of Fairfield, June 6, 1944, Hitchcock & Muhlick 8759 (CAS, DS, GH, MO, NY, WS, WTU). CASSIA CO.: Mt. Harrison, July 14, 1939, Davis 1342 (CAS); 1 mi. s. of divide between Mt. Independence and Mt. Harrison along road between Elba and Oakley, June 16, 1958, Kruckeberg 4439 (NY, WS, WTU). ELMORE CO.: head of Slater Creek, May 2, 1937, Christ & Ward 6917 (NY); 2 mi. w. of Bennett, May 7, 1937, Christ & Ward 7035 (NY); ca. 16 mi. n. of Mountain Home, on road to Dixie, June 3, 1944, Hitchcock & Muhlick 8660 (CAS, DS, GH, MO, NY, US, WS, WTU). GEM CO.: 2 mi. s. of Ola, along Squaw Creek, May 3, 1948, Christ & Christ 17356 (NY). IDAHO CO.: Seven Devils Mts., Seven Devils Camp, July 21, 1954, Baker 12052 (OSC); Lily Pad Lake, July 15, 1941, Christ 12711 (NY); Hibbs Cow Camp, Ownbey & Meyer 2085 (WS); Hibbs Cow Camp, June 13-30, 1937, 7,800 ft. alt., Packard 317 (UC, WS). VALLEY CO.: Bear Valley, July 23, 1932, 6,395 ft. alt., Christ 1815 (NY, US); 5 mi. n. of Cascade, T 14N., R. 3E., May 10, 1940, Davis 1908 (CAS, UC, WS); 2 mi. w. of McCall, May 30, 1944, Hitchcock & Muhlick 8519 (CAS, DS, GH, MO, NY, UC, WS, WTU); Bear Valley, July 8, 1944, Hitchcock & Muhlick 9717 (CAS, DS, GH, MO, NY, UC, US, WS, WTU); Bear Valley, 35 mi. n. of Lowman, Summer, 1944, Hitchcock (WS).

MONTANA. PARK CO.: between the dam and the old sawmill site at the falls of the Clarks Fork of the Yellowstone R., ca. 4 mi. e. of Cooke City, June 28, 1948, Witt 1190 (CAS, NY, WS, WTU); July 3, 1949, Witt 1701 (CAS, NY, POM, WS, WTU); July 7, 1949, Witt (WS).

NEVADA. ELKO CO.: Thomas Canyon camp grounds, Lamoille Canyon, June 15, 1951, Holmgren 1120 (MO, UC, WS); between the loop in Lamoille Canyon and Lamoille Lake on the Harrison-Lamoille trail, July 22, 1943, 9,300 ft alt., Maguire & Holmgren 22148 (MO, NY, UC, WTU).

OREGON. HARNEY CO.: 11 mi. e. of Frenchglen, on way to Fish Lake, w. slopes of the Steen's Mts., June 14, 1946, Maguire & Holmgren 26445 (WS).
WALLOWA CO.: summit of Imnaha-Snake Divide, 23 mi. above Imnaha, July 10, 1933, Peck 17551 (DS, NY, WILLU), July 11, 1933, Peck 17594 (DS, NY). GRANT CO.: head of Otis Creek, s. Blue Mts., June 18, 1897, Cusick 1642 (DS, GH, MO, ORE, POM, UC, US, WS).

WYOMING. LINCOLN CO.: upper LaBarge Creek, 10,300 ft. alt., June 13, 1916, Barneby 13197 (CAS, NY); headwaters of the Hoback R., 9,000 ft. alt., July 11, 1933, Williams 1254 (CAS, MO, OSC); LaBarge, May 31, 1894, Stevenson 137 (US). YELLOWSTONE NATIONAL PARK: Druid Peak, July 12, 1899, Nelson & Nelson 5794 (DS, GH, MO, NY, POM, US); on mountain side, Aug. 19, 1893, Rose 233 (US); along Slough Creek, July, 1885, Tweedy 498 (NY, US).

UTAH. CACHE CO.: e. of Mt. Logan, May 20, 1934, 8,000 ft. alt., Maguire 13188 (GH, UC); vicinity of Tony Grove Lake, July 3, 1936, Maguire 13942 (NY, WTU); Logan Canyon, 5 mi. above Ricks Springs, May 23, 1939, 6,500 ft. alt., Maguire 16691 (GH, NY, WTU); vicinity of Tony Grove Lake, June 27, 1942, Maguire 21548 (NY, WTU); Logan Canyon, Logan, May 23, 1939, Muenschler & Maguire 15458 (NY, MO, WTU); across from Tony Grove Forestry Camp, Logan Canyon, Bear River Range, 18 mi. n.e. of Logan, Apr. 26, 1951, Ownbey &

Holmgren 3263, grown at Pullman (WS); Tony Grove Lake on Mt. Naomi, 28 mi. e. of Logan, June 23, 1947, 8,800 ft. alt., Parker & McClintock 6926 (CAS, MO, NY, POM, UC, US, WS); n. of Tony Grove Lake, 25 mi. up Logan Canyon, July 12, 1938, Snell 21726 (WS); n. end of Tony Grove Lake, July 2, 1953, Tillett & Crockett 187 (NY, UC, WS, WTU). DUCHESNE CO.: Big Cottonwood Canon, below Silver Lake, June 29, 1905, Rydberg & Carlton 6500 (US); Antelope Canon, June, 1868, Watson 1187 (NY). SUMMIT CO.: Bald Mt., near Mirror Lake, July 26, 1957, 10,500 ft. alt., Beaman & Stone 14765 (WS); Parley's Canyon, May 28, 1908, Clemens (DS, GH, MO); near Gogorza, May 16, 1937, 6,325 ft. alt., Garrett 7420 (WS); Uinta Mts., near Holiday Park, June 19, 1947, Garrett & Milner 9509 (WS); Upper Provo River, 3 mi. s. of Trial Lake, Uinta Mts., June 6, 1946, Harrison 11012 (UC, US); Parley's Park, Altus, May 14, 1901, Jones (POM); near Long Lake, 2-1/2 mi. n. of Trial Lake, Uinta Mts., 1952, Preece, Murdock, & McKnight 2153, grown at Pullman (WS); Parley's Canon, Wasatch Mts., June 8, 1901, 5,000 ft. alt., Stokes (DS, NY); June 10, 1901, 8,000 ft. alt., Stokes (UC); Parley's Park, June, 1869, Watson 1187 (GH, US). UTAH CO.: at summit between North Fork and American Fork on Timpanogos Mt., near Provo, June 14, 1950, Biddulph & Biddulph 1 (NY, POM, UC, WS, WTU); American Fork Canyon, May 30, 1942, Garrett 8451 (WS); Diamond Fork Canyon, June 8, 1934, 7,000 ft. alt., Harrison 7560 (MO). WASATCH CO.: along Daniels Creek, 16 mi. s.e. of Heber, T. 1 or 2 S., R. 12W., June 9, 1961, 7,500 ft. alt., Cronquist & Holmgren 9223 (NY, POM, UC, WS, WTU). WEBER CO.: Summit Little Bear R. Canyon, May 13, 1934, Maguire & Maguire 13187 (WS).

8. Allium platycaule S. Watson

Allium platycaule S. Watson in Proc. Am. Acad. 14:234. 1879. Lectotype (GH), collected by J. G. Lemmon in Sierra Valley, Sierra Co., California, in 1873, studied.

Bulb ovate, outer coats gray or brown, inner coats white, both without reticulations; leaves 2 per scape, flat, thick, broad and strongly falcate, 8-15 mm broad, longer than the scape, deciduous at maturity; scape 17 to 13 cm tall, stout, strongly compressed and winged, deciduous at maturity; bracts of the inflorescence 3 to 5, acuminate; umbel 30- to 50 or more-flowered; pedicels twice as long as the perianth; perianth segments 8 to 15 mm long, lanceolate, very narrow, with long-acuminate, infolded tips, rose colored with conspicuous dark midribs; stamens exserted, anthers yellow or purple, filaments somewhat dilated at the base; ovary crestless, style exserted, stigma acute, entire; capsule crestless; seeds black, dull or shining, alveoli not pustuliferous. $n=7$.

Illustrations.--Bot. Mag. 102, t. 6227. 1876, as A. anceps. Abrams, Ill. Fl. Pac. States 1:388. 1923.

Distribution.--Rocky sandy soil, northern Sierra Nevada to Lassen and Modoc Cos., California and adjacent areas of northwestern Nevada, and in Lake Co., Oregon (Fig. 6).

CALIFORNIA. BUTTE CO.: Summit, June 20, 1897, Austin 1197 (US); Jonesville, w. of the summit, July 16, 1932, Copeland (UC); summit of the Sierra Nevada above Jonesville, 7,000 ft. alt., June 16, 1915, Heller 12024 (CAS, DS, GH, MO, NY, OSC, UC, US, WTU). LASSEN CO.: 16.5 mi. w. of Madeline on road from Adin, 5,500 ft. alt., May 19, 1950, Balls 14782 (POM); Susanville, July 2, 1892, Brandege (UC); top of divide, 8 mi. s.w. of Susanville, 6,400 ft. alt., June 1, 1934, Grinnell (UC); top of Diamond Mt., Susanville, Perkins Ranch, 7,300 ft. alt., June 28, 1897, Jones (MO, POM, US); mt. slope immediately s. of McKenzie Meadow, ca. 1 mi. w. of Coopervale R.S., along Susanville-Westwood Highway, 6,000 ft. alt., T. 29N., R. 10E., S. 30, Sept. 24, 1945, Robbins, grown at Pullman (WS); Fredonyer Pass, 5,500 ft. alt., June 14, 1943,

Ripley & Barneby 5733 (CAS, WS). MODOC CO.: Cedar Pass to Cedar Peak, Warner Mts., e. of Alturas, July 1, 1940, Aase & Ownbey, grown at Pullman (WS); summit of the Warner Mts., at s. base of Warren Peak, Aug. 1, 1923, Applegate 8060 (DS, POM); high mts., Warner range, July, 1898, Austin & Bruce 2227 (DS, UC); above Lake City, 5,000 ft. alt., June 9, 1936, Babcock & Stebbins, Jr. 1798 (UC); Cedar Creek Canyon, ca. 3 mi. w. of Cedarville, in the Warner Mts., 5,000-5,500 ft. alt., June 9, 1936, Babcock & Stebbins, Jr. 1823 (UC); ca. 200 ft. above and s. of Cedar Pass, Warner Mts., 6,500 ft. alt., June 18, 1952, Bacigalupi, Heckard, Sanderson, & Bacigalupi 3747 (UC); above Upper Rush Creek Public Camp, 2.5 mi. off Highway 299, May 18, 1950, Balls 17241 (POM); above Upper Rush Creek Public Camp, 2.5 mi. off Highway 299 from Canby to Adin, 5,000 ft. alt., May 18, 1950, Balls 14743 (WS); e. of Alturas, June 1, 1940, Cantelow 3897 (CAS); 9.8 mi. w. of Cedarville, Modoc National Forest, May 29, 1956, Chisaki 865 (UC, WS, WTU); at Cedarville Pass, Warner Mts., between Cedarville and Alturas, 6,400 ft. alt., T. 43N., R. 15E., S. 28, June 20, 1959, Cronquist & Holmgren 8523, grown at Pullman (NY, UC, WS, WTU); w. side of Cedar Pass, June 13, 1940, Eastwood & Howell 8187 (CAS); Alturas, 1,450 m. alt., June 17, 1911, Eggleston 7778 (US); Cedar Pass Summit, Warner Mts., 6,350 ft. alt., June 16, 1938, Grinnell & Grinnell 1111 (UC); at Cedar Pass, 6,350 ft. alt., June 25, 1941, Heller 16207 (MO, NY, UC, WTU); 15 mi. n.e. of Alturas, 5,300 ft. alt., May 27, 1940, Hitchcock 6667 (DS, MO, NY, POM, UC, WS, WTU); s. side of road, Cedar Pass, 6 mi. e. of junction of highways 395 and 8A, 5,000 ft. alt., July 14, 1955, Hoffman 4106 (UC); Parker Creek, Warner Mts., 5,200 ft. alt., June 11, 1934, Howell 11920 (CAS, POM); Buck Creek, w. slope of Warner Range, Summer, 1930, Kelly 70 (CAS); near Ft. Bidwell, Apr.-May, 1903, Manning 59 (UC, US); Lake City, Apr. 29, 1914, Manning (UC); Likeley, June, 1920, Manning (UC); near summit of Cedar Peak, Warner Mts., July 1, 1940,

Meyer & Biddulph, grown at Pullman (WS); on n. slope, Cedar Peak, Warner Mts., July 1, 1940, Ownbey & Meyer 2145, grown at Pullman (WS); Parker Creek, Warner Mts., 5,200 ft. alt., June 12, 1929, Payne 3 (CAS, UC); n.w. of Alturas, 4,500 ft. alt., May 31, 1944, Ripley & Barneby 5994 (CAS); just n. of Cedar Pass, ca. 6,200 ft. alt., June 22, 1944, Sharsmith 4484 (UC, US, WS, WTU); Deep Creek, near Cedarville, 5,100-6,000 ft. alt., June 8, 1919, Smith 1123 (UC); Bowman ranch, Warner Mts., 6,000 ft. alt., July 10, 1917, Steffen 74 (UC); above Thomas Creek, 6.1 mi. e. of California State Highway 299, on Cedar Pass road, June 12, 1961, Wiggins & Wiggins 16398 (DS); Rush Creek Camp, 4,700 ft. alt., T. 40N., R. 9E., S. 24, May 30, 1933, Wilson 33 (UC); Rush Creek, 4,700 ft. alt., May 30, 1933, Wilson 93 (UC). MONO CO.: Diamond Peak, 7,500 ft. alt., June 16, 1961, Hardham 7467 (CAS, POM). NEVADA CO.: w. side of Donner Pass near Norden, ca. 7,000 ft., July 15, 1943, Howell 18377 (CAS, WS); Castle Peak, July 20, 1943, Howell 18608, grown at Pullman (CAS, WS); Soda Springs, 9,000 ft. alt., July 28, 1881, Jones 2569 (GH, MO, POM, US); s.--face of Boreal Ridge, 7,500 ft., June 27, 1950, Raven 2427D (POM). PLACER CO.: Summit, C. P. R. R., June, 1898, Eastwood (WS); near Squaw Peak, July, 1894, Fox (UC); 0.5 mi. w. of Lake Van Norden, 7,500 ft. alt., June 22, 1934, French 458 (UC, POM); between Donner Pass and Mt. Lincoln, July 21, 1943, Howell 18653, grown at Pullman (CAS, WS); Emigrant Gap, June 27, 1882, Jones (POM); Cisco, Sierra Nevada Mts., June, 1870, Kellogg (DS); above Truckee R., June 2, 1885, Sonne 307 (DS); near Truckee R., July, 1887, Sonne (UC). PLUMAS CO.: no location, no date, Austin (NY); ridge n. of Red Rock, n. of Engelmine, June 16, 1961, Dempster 1466 (UC, WS); Rock Creek, 4,000 ft. alt., T. 24N., R. 9E., S. 30, May 29, 1938, Haddock 13 (UC); Red Clover Creek, 5,500 ft. alt., July, 1903, Hall & Babcock 4458 (UC); near Quincy, T. 24N., R. 9E., S. 33-34, June 12, 1940, Hansen (OSC); ridge e. of Red Clover valley, July 4, 1907,

Heller & Kennedy 8723 (CAS, DS, MO, NY, US); 1.7 mi. n. of Beckwourth Butte, 5,200 ft. alt., T. 22N., R. 14E., S. 5, May 24, 1935, Sawyer 36 (UC); Bear Ridge, near Taylor, 7,200 ft. alt., July 2, 1955, Weatherby 1568 (CAS, DS, NY, POM, UC). SHASTA CO.: Lassens Peak, Aug., 1896, Austin 444 (UC); Lassens Peak, Aug., 1896, Bruce 444 (US). SIERRA CO.: no location, 187?, Lemmon (NY); Gibsonville, no date, McQuerten (NY). TEHAMA CO.: on Butt Mt., 4-6,000 ft. alt., July 14, 1920, Copeland 108 (DS).

NEVADA. HUMBOLDT CO.: Charles Sheldon Refuge, 6,500 ft. alt., July 15, 1936, Fuller 79 (NY). WASHOE CO.: canyon 11 mi. e. of Eagleville (Calif.), 6,600 ft. alt., June 4, 1946, Alexander & Kellogg 4650 (UC, WS); along Highway 8A, 1.1 mi. from the California-Nevada state line, e. of Surprise Valley, May 29, 1956, Chisaki & Tavares 870 (UC, WS, WTU); vicinity of Reno, 1,350, 1,500 m. alt., July 18, 1913, Hitchcock 517 (US); Reno, 4,500 ft. alt., May 27, 1903, Jones (GH, POM); 7 mi. s.w. of Vya, 6,000 ft. alt., June 1, 1944, Ripley & Barneby 6011 (CAS, WS); "The Junipers" Mt. range on e. border of Long Valley, 12 mi. n.e. of Vya, 6,000 ft. alt., May 31, 1939, Train 2946 (NY, POM, UC, WTU).

OREGON. LAKE CO.: hills e. of Lakeview, May 26, 1902, Applegate 3057 (DS); e. slope of Crane Mt., Warner Mts., July 7, 1932, Applegate 7490 (DS); w.-facing slope of hill just e. of Lake City, June 10, 1936, Babcock & Stebbins 1862 (UC); Bullard canon, Lakeview, 1,540 m. alt., June 12, 1911, Eggleston 6915 (US); Paisley, 4,500 ft. alt., May 1, 1914, Elden 9 (OSC); summit of Crane Creek Mt., Fremont National Forest, 8,400 ft. alt., June 18, 1919, Ferris & Duthie 270 (DS); on hill back of Lupens (?), e. of Lakeview, 1931, Loveless 200 (ORE); w.-facing slope, at n. end of Lakeview, June 2, 1967, Ownbey & Mingrone 3484 (WS); low knoll, 14 mi. w. of Lakeview, June 2, 1967, Ownbey & Mingrone 3485 (WS); Lakeview, June 27, 1927, Peck 15258 (MO);

Lakeview, June 27, 1927, Peck 15258a (DS); near summit of Crane Mt., 12 mi. s.e. of Lakeview, 2,500 m. alt., July 11, 1927, Peck 15592 (WTU); 10 mi. s. of Lakeview, June 28, 1937, Peck 19604 (WILLU); near Chandler Park, June 3, 1948, Peck 205074a (UC, WILLU); Adel, 3,000-4,500 ft. alt., May 11, 1940, Willits 241 (DS).

9. Allium anceps Kellogg

Allium anceps Kellogg in Proc. Calif. Acad. 2:109, fig. 32. 1863. Type (CAS), collected by A. A. Veatch at Washoe, Nevada, studied.

Bulb broadly ovoid, bulb coats thick and yellow, with thick cellular reticulations; leaves 2 per scape, slightly convex, striate, margins scabrous, somewhat falcate, 4 to 6 mm broad, twice as long as the scape, deciduous at maturity; scape 10 to 15 cm tall, flattened with scaberulous translucent margins, deciduous at maturity; bracts of the inflorescence 2, ovate, acute; umbel 15- to 25-flowered; pedicels 3 or more times as long as the perianth; perianth segments 6 to 8 mm long, linear-lanceolate, acute, margins scarious, pinkish with diffuse green midribs; stamens as long as the perianth segments or a little shorter, anthers light yellow to almost white, filaments dilated below; ovary with 6-parted crest, style 1/2 the length of the stamens, stigma pointed, entire; capsule crested; seeds black, dull, alveoli not pustuliferous. $\underline{n}=7$.

Illustrations.--Proc. Calif. Acad. 2:110. 1863. Watson, Bot. King Exped. t. 36. 1871. Abrams, Ill. Fl. Pac. States 1:386. 1923.

Distribution.--Heavy barren soils, flats and slopes, Nevada to north-eastern California north to Lake, Harney and Malheur Cos., Oregon (Fig. 4).

CALIFORNIA. LASSEN CO.: 16.5 mi. w. of Madeline, Hwy. from Adin to Madeline, May 19, 1950, Balls 14782, grown at Pullman (WS); Madeline Plains, June, 1898, Bruce 2280 (NY, UC); s. of Constantia, 4,750 ft. alt., May 29, 1944, Ripley & Barneby 5949 (WS). NEVADA CO.: Prosser Creek, near Truckee,

May 30, 1887, Sonne 411 (UC). PLACER CO.: Sierra Valley, s. side, Tahoe Forest, 5,500 ft. alt., June 2, 1927, Smith 2070 (UC); road to Tahoe, June, 1889, Sonne 307 (MO). SIERRA CO.: no location, 1875, Lemmon 265 (GH, MO, NY); Little Truckee R., July, 1891, Sonne 411 (MO).

NEVADA. CHURCHILL CO.: summit between Buffalo Canyon and Ione Valley, June 7, 1949, Mills & Beach C-84 (UC, WS). ELKO CO.: Victory Highway, Emigrant Pass, June 10, 1933, Eastwood & Howell 217 (CAS, NY); Victory Highway between Wells and Wendover, June 11, 1933, Eastwood & Howell 316 (CAS, NY); near Cave Creek Post Office, Ruby Valley, May 22, 1928, Mason 4702 (CAS, WS). EUREKA CO.: Palisade, June 14, 1882, Jones (POM). LANDER CO.: Reese R. valley, 6 mi. n.w. of Austin, 5,900 ft. alt., May 22, 1944, Ripley & Barneby 5923 (CAS, WS). LINCOLN CO.: near Panaca, May 18, 1901, Bailey, Colville, & Funston 1972 (US). ORMSBY CO.: near Carson City, 1865, Anderson 23 (GH, UC); Empire City, May 19, 1882, Jones 4095 (CAS, DS, NY, POM, UC, US); June 20, 1889, Jones (NY). STORY CO.: near Virginia City, 1863-64, Bloomer (GH, US). WASHOE CO.: Reno, 4,560 ft. alt., Apr. 24, 1901, Cowgill (DS, NY, UC, US); Reno, w. of University, Apr. 27, 1901, Cowgill (MO, UC); University Heights, Reno, 4,550 ft. alt., May 6, 1909, Heller 9597 (DS, GH, NY, US); Reno, Apr. 15, 1890, Hillman (POM); near bottom of grade to Virginia City, 2.5 mi. s.e. of Tahoe, June 18, 1946, Ownbey & Ownbey 2920 (WS); just n.w. of U. of Nevada campus, Reno, June 19, 1946, Ownbey & Ownbey 2923 (WS); Washoe Valley near Steamboat Springs, 5,200 ft. alt., Apr. 27, 1941, Pedro (UC); Verdi, May, 1890, Sonne 10 (GH); 9 mi. n. of Poeville, n.w. of Reno, 5,200 ft. alt., June 7, 1938, Tillotson 121 (POM, UC); Long Valley, 5 mi. n.e. of Vya, on road to wild life refuge, 5,600 ft. alt., May 31, 1939, Train 2943 (NY, UC, WTU); Big Canyon, 15 mi. e. of Vya, "The Junipers" Mt. range, e. border of Long Valley, May 31, 1939, Train 2950 (POM); 4 mi. n. of Reno, junction of Pyramid Lake

Highway and Sparks road, 5,000 ft. alt., Apr. 24, 1940, Train 3495 (NY); 1 mi. s. of Spanish Spring, Spanish Springs Valley, May 1, 1940, Train 3573 (UC); Steamboat Springs, May, 1868, Watson 1186 (GH, NY, US); just n. of Geiger L.O. between Reno and Virginia City, 5,400 ft. alt., May 20, 1953, Weber & Rose 8416 (WTU). WHITE PINE CO.: U.S. 50, 33 mi. w. of Ely, June 13, 1964, Holmgren & Reveal 922 (WS); n. end White Pine Mts., w. Little Antelope Summit, 4,900 ft. alt., May 24, 1941, Ripley & Barneby 3591 (CAS); 6,600 ft. alt., June 14, 1944, Ripley & Barneby 6263 (CAS, WS).

OREGON. HARNEY CO.: 52 mi. s.e. of Burns, T. 27S., R. 35E., about S. 26, 4,000 ft. alt., May 28, 1959, Cronquist 8297 (NY, WS, WTU); 12-15 mi. from Frenchglen, Blitzen R., May 20, 1927, Henderson 8812 (CAS, ORE); Steins' Mts. pass, above Anderson Valley, June 6, 1927, Henderson 8819 (CAS, ORE); 3 mi. s. of Frenchglen, June 14, 1948, Peck 25202 (WILLU). LAKE CO.: Hart Mt., 4,800 ft. alt., June 11, 1937, Leach (WILLU); Antelope Res. Hdg., June 12, 1948, Peck 25200 (UC, WILLU); w. of Lakeview, June 2, 1944, Ripley & Barneby 6044 (CAS). MALHEUR CO.: no location, June 11, 1901, Cusick 2559 (GH, UC, US); near Beulah and Agency Valley, May 11, 1927, Henderson 8817 (CAS); near Harper Ranch, 800 m. alt., May 22, 1896, Leiberg 2097 (GH, UC, US); Barren Valley, 1,275 m. alt., June 2, 1896, Leiberg 2196 (GH, UC); 25.5 mi. n. of McDermitt, Nevada on highway 95, June 15, 1967, Mingrone & McNeal 101 (WS); 25.5 mi. n. of McDermitt, June 13, 1946, Ownbey & Ownbey 2781, grown at Pullman (WS); 15 mi. s. of Sheaville, May 5, 1940, Peck 20582 (CAS, OSC, UC, WILLU); 15 mi. n. of McDermitt, June 4, 1943, Peck 21718 (UC, WILLU); Blue Mt. Pass, 25 mi. n. of McDermitt, June 6, 1943, Peck 21756 (WILLU).

10. Allium yosemitense Eastwood

Allium yosemitense Eastwood in Leaflet West. Bot. 1:132. 1934. Type (CAS), collected by Mrs. Enid Michaels, at the head of Bridal Veil Falls, Yosemite Valley, Calif., June, 1922, studied.

Bulb ovoid, outer coats thin and black, inner coats white, both without definite reticulations; leaves 2 per scape, linear, thick, flat, 2 to 5 mm broad, much longer than the scape, deciduous at maturity; scape 5 to 10 cm tall, reddish, somewhat compressed, deciduous at maturity; bracts of the inflorescence 2 or usually 3, ovate, acuminate; umbel 15- to 30 or more-flowered; pedicels twice as long as the perianth; perianth segments 9 to 10 mm long, linear-oblong, acute, white to pale rose with darker midribs, stamens about as long as the perianth segments, anthers yellow, filaments dilated at the base; ovary crested with 6 obtuse processes, style exerted, stigma capitate, somewhat 3-lobed; capsule crested with 3 or 6 obtuse processes; seeds black, dull, alveoli not pustuliferous. $n=7$.

Distribution.--Heavy rocky soil, known only from the Chowchilla Mts., and Yosemite National Park, Mariposa Co., California (Fig. 6).

CALIFORNIA. MARIPOSA CO.: Chowchilla Mt., 7,000 ft. alt., June, 1951, Harris (CAS); 0.5 mi. n. of Signal Peak Lookout, ca. 6,900-7,000 ft. alt., Chowchilla Mt., June 17, 1951, Quick 51-75 (CAS); Chowchilla Mt., June 20, 1952, Quick 52-48 (CAS).

11. Allium falcifolium Hooker & Arnott

Allium falcifolium Hooker & Arnott, Bot. Beechey's Voy. 400. 1841. Type (K?), collected by Douglas in California, not seen.

Allium breweri S. Watson in Proc. Am. Acad. 14:233. 1879. Type, Brewer 1060 (GH), summit of Mt. Diablo, California, May 7, 1862, and isotypes (CAS, MO, UC, US, WS), studied. Allium falcifolium var. breweri M. E. Jones, Contrib. West. Bot. 10:83, 1902.

Bulb ovoid, outer coats brownish or reddish, inner coats white, both without reticulations; leaves 2 per scape, thick, flat and strongly falcate, 6 to 8 mm broad, much longer than the scape, deciduous at maturity; scape 5 to 10 cm tall, strongly flattened and winged, deciduous at maturity; bracts of the inflorescence 2, lanceolate, mostly long acuminate; umbel 10- to 30-flowered;

pedicels almost to fully as long as the perianth; perianth segments 9 to 15 mm long, lanceolate, long acuminate, inrolled, often serrulate with minute glands, rose-colored to purple, with thickened midribs; stamens 1/2 as long as the perianth segments, anthers yellow, filaments dilated at the base, ovary crested with 3 broad processes, style included, stigma capitate, entire; capsule crested; seeds black, dull, alveoli not pustuliferous. $\bar{n}=7$.

Illustrations.--Watson, Bot. King Exped. t. 36. 1871. Jepson, Fl. Calif. 6:272. 1922. Jepson, Man. Fl. Pl. Calif. 222. 1923. Jepson, Ibid., as A. breweri. Abrams, Ill. Fl. Pac. States 1:385. 1923. Abrams, Ibid., as A. breweri.

Distribution.--Heavy rocky soil, often on serpentine outcrops, Coast Range from Josephine Co., Oregon south through northwestern California to Santa Clara Co. (Fig. 5).

CALIFORNIA. ALAMEDA CO.: Oak Hills (Skyline Blvd.), May 7, 1937, Covel 595 (CAS). COLUSA CO.: Dry Creek near Stonyford, Apr. 23, 1926, Ferris 6570 (DS, POM); Snow Mt., June, 1884, Rattan (DS); slope w. and above junction of Middle and North Forks of Stony Creek, ca. 6 mi. w. of Stonyford, T. 17N., R. 7W., Apr. 16, 1950, Robbins 3332 (WS); exposed slope above Dark Hollow Creek (a tributary of Middle Fork Stony Creek), on s. flank of Snow Mt. E., at lower edge of cirque between Snow Mt. W. and Snow Mt. E., 6,500-6,600 ft. alt., July 25, 1956, Robbins & Heckard 3717 (UC, WS). CONTRA COSTA CO.: Summit, Mt. Diablo, May 25, 1921, Abrams 2038 (DS); Summit, Mt. Diablo, May 25, 1921, Abrams 8038 (DS, POM, WTU); s.e. slope of Mt. Diablo, T. 1S., R. 1E., S. 6, 3,250 ft. alt., May 8, 1936, Belshaw 2067 (UC); Summit, Mt. Diablo, June 14, 1930, Bowerman 333 (UC); Mt. Diablo, Eagle Point, talus slope at summit, Apr. 16, 1932, Bowerman 1347 (UC); Mt. Diablo, May 30, 1896, Congdon (NY, UC); Summit, Mt. Diablo, May 17, 1936, Covel 126 (CAS); Mt. Diablo, May 30, 1915,

Eastwood 4531 (CAS, GH, UC, US); n. slope of Meridian Peak, Mt. Diablo, May 13, 1950, Grant & Grant 8898 (POM); summit of Eagle Peak Mt. Diablo Group, Apr. 16, 1949, Hoffman 2974, grown at Pullman (WS); ridge e. of Deer Flat, Mt. Diablo, Apr. 6, 1941, Howell 16179 (CAS); Mt. Diablo, May 22, 1921, Jepson 9212 (UC); summit, Mt. Diablo, 1894, Michener & Bioletti (NY); Mt. Diablo, summit, May 16, 1935, Rose 35164 (MO, NY, POM); Summit, Mt. Diablo, ca. 3,900 ft. alt., May 15, 1941, Rose 41237 (GH, MO, UC). DEL NORTE CO.: along the old Gasquet-O'Brien Toll Road, 10.1 mi. n.e. of Patrick Creek Road, 3,050 ft. alt., June 9, 1962, Breedlove 3197 (DS, WS); Red Mts., 1860-67, June, 1866, Bolander 6554 (GH, UC, US); Oregon Mt., July 2, 1936, Eastwood & Howell 3743 (CAS); near Red Mt., June 21, 1937, Eastwood & Howell 4612 (CAS); Red. Mt., June 21, 1937, Eastwood & Howell 4661 (CAS, GH); Gordon Mt., 4,000 ft. alt., June 28, 1930, Kildale 9873 (DS); Gordon Mt., on road to Big Flat, w. Siskiyou Mts., 3,800 ft. alt., June 24, 1952, Munz 17724 (POM, NY); near Cedar Springs between Gordon Mt. and French Hill, Siskiyou Mts., 3,500 ft. alt., June 26, 1952, Munz 17784 (POM); near Gasquet, mt. slopes, n. side of Middle Fork of Smith R., on Old Gasquet Toll Road, 1,400 ft. alt., June 1, 1935, Parks & Tracy 11230 (UC); State Line n. of Monumental, at head of Shelley Creek, California side, 3,100 ft. alt., June 13, 1936, Parks & Tracy 11384 (UC); Happy Camp Road, May 12, 1934, Rowntree (CAS); Gasquet, June 1, 1935, Rowntree (CAS); Elk Valley, at the extreme head of Blue Creek, July 19, 1950, Tracy 19119 (POM, UC, WTU); at the State Line n. of Monumental, June 15, 1951, Tracy 19427 (POM, UC, WTU); Old Road-Gasquet to Monumental, 0.5 mi. above Ten Mile Creek, 1,500 ft. alt., June 17, 1937, Wolf 2863 (NY, POM, WS). GLENN CO.: Sheetiron Mt., Mendocine National Forest, 6,400 ft. alt., June 26, 1950, Eighme 50 (OSC); between Mud Flat and Bennet Spring on the Newville-Covelo road, ca. 2,200 ft. alt., June 3, 1915, Heller 11925 (CAS, DS, GH, MO, NY, OSC, UC, US); near Valley View Ranger

Station, 4,550 ft. alt., June 29, 1948, Hoffman 2494 (UC, WS); summit ridge n. of Black Butte, July 13, 1944, Howell 19751 (CAS, WS); Noel Springs Camp, on road to Sheetiron Mt., Mendocino National Forest, ca. 5,000 ft. alt., June 21, 1953, Sharsmith 4321 (UC, WS, WTU). HUMBOLDT CO.: on boundary between Humboldt and Trinity Cos., 600 ft., July 17, 1902, Jepson 2069 (UC); Horse Mt., 4,000 ft. alt., June 2, 1926, Kildale 2143 (DS); Horse Mt., 4,000 ft. alt., June 9, 1926, Kildale 2150 (DS); Horse Mt., July 18, 1937, Kildale 15132 (POM); Orleans Mt., ca. 5,500 ft. alt., Aug. 4, 1948, Pollard (CAS); Grouse Mt., June 1, 1937, Purdy (CAS); between Mad R., and Pilot Creek, June, 1883, Rattan (GH, UC); Buck Mt., near the summit, 5,000 ft. alt., June 17, 1913, Tracy 4164 (UC, US); Horse Mt., ca. 5,000 ft. alt., June 20, 1926, Tracy 7612 (UC); Grouse Mt., at "Cold Springs," 4,700 ft. alt., July 23, 1930, Tracy 9131 (UC, WTU); Horse Mt., 4,700 ft. alt., July 11, 1933, Tracy 12658 (UC); Grouse Mt., 5,000 ft. alt., July 25, 1933, Tracy 12891, 12892 (UC); between LePerron Flat and Whiteys Peak, Salmon Mts., T. 10N., R. 6E., 6,000 ft. alt., June 13, 1949, Whittaker (WS). LAKE CO.: 4-5 mi. e. of Hough Springs, May 7, 1928, Abrams 12564 (NY); Pine Grove, n. slope of Cobb Mt., Mar. 8, 1934, Applegate 8882 (DS); 6 mi. n. of Middletown, June 13, 1948, Bacigalupi 2877 (DS); close to summit of Hull Mt., 6,950 ft. alt., June 24, 1954, Bacigalupi & Robbins 4598 (UC); 1 mi. s. of Lakeport, Apr. 25, 1932, Baker 5999 (POM); 1 mi. s. of Lakeport, Mar. 27, 1940, Baker 9512 (POM); summit of Rocky Hill, 2 mi. s. of Lakeport, Mayacamas Mt. Range, Clear Lake R., 1,700 ft. alt., Apr. 30, 1928, Benson 143 (POM, WTU); toward Lower Lake, Middletown, 1,500 ft. alt., Benson 2017 (GH); Kelsey Creek, 2,500 ft. alt., May 22, 1932, Benson (POM); Lakeport, Mar. 16, 1934, Benson (DS); Siegler Springs, Apr. 29, 1923, Blankinship (CAS, POM); 3 mi. e. of Middletown, Mar. 21, 1931, Constance 126 (WTU); Mirabel Mine, May 15, 1938, Eastwood & Howell 5525 (CAS); on trail to Mt. Sanhedrin, May 25,

1925, Eastwood 12965 (CAS); Milk Ranch, Snow Mt., Mendocino National Forest, 6,400 ft. alt., June 18, 1950, Eighme 18 (OSC); between Hough's Springs and Leesville, May 18, 1937, Foster 270 (GH); Lakeport, May 10, 1929, Hitchborn 121 (DS); Hunting Creek, Mar. 20, 1947, Hoffman 870 (WS); summit of Goat Mt., June 20, 1947, Hoffman 1673 (WS); 11 mi. e. of Hough Springs, Bartlett Springs-Leesville road, 1,750 ft. alt., May 15, 1949, Hoffman 2807, grown at Pullman (WS); Bartlett Mt., near summit of road from Bartlett Springs to Clear Lake, May 16, 1949, Hoffman 2810, grown at Pullman (WS); 2.1 mi. s. of Lakeport, May 2, 1951, Hoffman 3776, grown at Pullman (WS); Goat Mt., 6,000 ft. alt., June 26, 1956, Hoffman 4260 (UC); midway between Middletown and Patten's, Mar. 28, 1926, Howell 1773 (CAS); Pinnacle Rock, Bartlett Mt., June 20, 1945, Howell 21100 (CAS); on Middletown grade, May 5, 1891, Jepson (UC); Middletown grade, beyond Mt. St. Helena, May 5, 1893, Jepson (UC); Middletown grade, near Lake Co. line, May 5, 1893, Jepson (UC); Keleeyville, Apr. 1, 1931, Jussel (CAS); Jordan Park, Cobb Mt., Apr. 29, 1933, Jussel (CAS); ca. 2 mi. n. of Middletown on road to Lower Lake, Apr. 24, 1938, Mathias 1332 (UC); West Peak Ridge, Snow Mt., 6,900 ft. alt., July 25, 1956, Munz 22314 (POM); 2.8 mi. n. of Middletown, June 27, 1946, Ownbey & Ownbey 2952 (WS); 3.3 mi. n. of Middletown, Apr. 3, 1926, Peirson & Peirson 6617 (POM, WS); n. of Middletown, Apr. 8, 1951, Raven 2777 (POM); 8 mi. s.e. of Middletown, 1,100 ft. alt., June 21, 1945, Ripley & Barneby 6923 (WS); 1 mi. s. of Lakeport, on Hopland-Lakeport Highway, Apr. 25, 1936, Robbins (POM); opposite Mirabel Mine, May 1, 1936, Robbins (POM); 3 mi. n. of Napa Co. line, on road from Angwyn to Middletown, Mar. 23, 1941, Storer 26 (UC); 6.5 mi. w. of Bartlett Springs, May 6, 1928, Wolf 2006 (DS); T. 14N., R. 11W., 2,500 ft. alt., Apr. 15, 1934, Yates 3764 (UC). MARIN CO.: Tamalpais, June 4, 1892, Brandege (UC); Mt. Tamalpais, May 23, 1915, Eastwood (CAS); Mt. Tamalpais, July 5, 1902, Jones (POM); Mt.

Tamalpais, June 13, 1892, Palmer 2365 (US); Rock Springs, Mt. Tamalpais, ca. 2,000 ft. alt., June 8, 1941, Rose 41260 (MO, UC). MENDOCINO CO.: Mt. Sanhedrin, 4,700 ft. alt., May 29, 1927, Bacigalupi 1527 (DS, POM); Ukiah (Apr. 19, 1866), 1860-67, Bolander 4668 (GH, MO, UC, US); Buck Rock Ridge, June 7, 1928, Eastwood 15293 (CAS, GH, NY, UC); near Bell Springs, June 22, 1937, Eastwood & Howell 4696 (CAS); Anthony Peak, July 10, 1941, Eastwood & Howell 9870 (CAS, POM, WS); Ukiah, Apr. 20, 1896, Fritchey 4 (MO); along the road to Anthony Peak, July 10, 1943, Heller (UC, WTU); Mt. Sanhedrin, July 16-17, 1921, Holman (UC); summit of Anthony Peak, on line between Mendocino and Tehama Cos., 6,500 ft. alt., July 10, 1949, Hoffman 2895, grown at Pullman (UC, WS); June 1, 1937, Purdy (CAS); e. of Round Valley, Coast Mts., n. of San Francisco, June, 1884, Rattan (DS); Round Valley, 1898, Westerman (UC); 4 mi. e. of "Surveyor's Camp" at Mendocino-Glenn Co. line, 5,150 ft. alt., May 29, 1949, Wiggins 12183 (DS, POM, WTU). NAPA CO.: Calistoga-Middletown Highway 3 or 4 mi. n. of Toll House, May 1, 1927, Baker 2147a (UC); Conn Valley, near the slipway, 300 ft. alt., Apr. 30, 1954, Barneby 11336 (CAS); 3.5 mi. n. of Knoxville, Apr. 8, 1939, Cantelow 3906 (CAS); State Highway 128, 11 mi. e. of Rutherford, May 19, 1953, Crampton 1302 (POM); 1 mi. n. of Knoxville on road to Lower Lake, 1,500 ft. alt., Apr. 6, 1939, Gould 614 (GH, MO, NY, UC, US); ca. 3 mi. w. of Knoxville on the road to Upper Lake, May 16, 1941, Heller 16129 (MO, NY, UC, WTU); Hunting Creek, Napa-Lake Co. line, Mar. 20, 1947, Hoffman 870 (UC); Pope Creek Canyon, 5.5 mi. e. of Pope Valley, Napa Range, Apr. 3, 1931, Howell 6140 (CAS, POM); Pope Valley, Apr. 16, 1909, Hunt (UC); Mts., near St. Helena, Apr., 1923, Hunt (CAS); Mt. St. Helena, May, 1893, Jepson (NY); Upper Conn Valley, May 1, 1894, Jepson (DS, UC, US); Conn Valley, Apr. 23, 1915, Jepson 6250 (UC); Pope Valley, Linekilm Creek Canyon, May 22, 1938, Jepson 18816 (UC); Pope Valley, Apr. 19, 1931, Jussel (CAS); near Walter Springs, Pope Creek Canyon, 5.5 mi.

e. of Pope Valley, Apr. 3, 1931, Keck 1071 (DS, GH, MO, POM); 1.3 mi. s. of Knoxville, May 29, 1933, Keck 2375 (DS); 0.6 mi. w. of Knoxville on road from Monticello to Lower Lake, Apr. 24, 1938, Morrison & Carter 1355 (CAS, DS, MO, NY, POM, UC, US, WS, WTU); 0.5 mi. n.w. of Knoxville, T. 16N., R. 6W., 2,000 ft. alt., Apr. 24, 1938, Schreiber 2504 (UC); w. side of Steel Canyon, 8 mi. s. of Monticello, on road to Napa, May 9, 1948, Stebbins 3936 (UC); head of Moore's Creek, 3-4 mi. e. of Angwin, 1,100 ft. alt., May 21, 1902, Tracy 1591 (UC, WS); Pope Valley, Apr. 23, 1909, Wallace (UC); Conn Valley, May 9, 1944, Wilcox (UC). SAN MATEO CO.: near Mt. Umunhum, 3,350 ft. alt., May 9, 1920, Davis (UC); Crystal Springs Lake, Apr., 1903, Elmer 4831 (CAS, DS, MO, NY, ORE, POM, UC, US); Redwood City Hills, Apr. 23, 1941, Hoover 4907 (DS, NY, UC, US, WS); Jasper Ridge, Santa Cruz Mt. Peninsula, Apr. 11, 1918, Kimber & Roush (CAS); Jasper Ridge, May 13, 1921, Mason (WTU); Emerald Lake, w. of Redwood City, Apr. 16, 1935, Rose 35095 (UC, WTU); Emerald Lake, hills w. of Redwood City, 500 ft. alt., May 16, 1948, Rose 48111 (NY, POM, US, WTU); near Emerald Lake, w. of Redwood City, Apr. 23, 1949, Wiggins 12049 (DS, POM, UC, WTU). SANTA CLARA CO.: above Isabel Creek on Livermore Road, May 19, 1923, Bacigalupi (DS, UC); Loma Prieta, May 8, 1920, Dale (DS); Mt. Hamilton, June 18, 1941, Eastwood 9687 (CAS); Mt. Hamilton, Apr. 29, 1923, Eastwood 11676 (CAS); near Stanford University, Apr. 16, 1902, Baker 539 (GH, MO, NY, POM, UC, WS); Mt. Hamilton, May 31, 1907, Heller 8618 (DS, GH, MO, NY); near Mt. Umunkum, 3,350 ft. alt., May 9, 1920, Hieborn 200 (DS); Mt. Hamilton, 3 mi. e. of summit, on road to Isabel Creek, May 13, 1937, Keck & Clausen 4519 (POM); Summit, Mt. Hamilton, 4,100 ft. alt., May 30, 1907, Pendleton 889 (UC); on e. side of Mt. Hamilton, 3,800 ft. alt., Apr. 1, 1934, Sharsmith 776 (UC); divide between Arroyo Bayo and Santa Isabella Valley, 2,250 ft. alt., Apr. 28, 1935, Sharsmith 1900 (UC, WS); e. side of Mt. Hamilton, 3,800 ft. alt., May 2, 1935,

Sharsmith 1928 (UC, WS); e. side of Mt. Hamilton, 3,800 ft. alt., May 26, 1935,
Sharsmith 3225 (DS, UC); n.e. ridge of Copernicus Peak, Mt. Hamilton, 3,800 ft.
 alt., June 2, 1935, Sharsmith 3239 (UC, WS); on n.e. ridge of Copernicus Peak,
 Mt. Hamilton, 3,800 ft. alt., May 22, 1936, Sharsmith 3716 (UC). SHASTA CO.:
 near Afterthought Mine, May 1, 1900, Baker (UC); Castle Crage, 3,000 ft. alt.,
 July 10, 1894, Foster (NY); headwaters of the Sacramento R., 1879, Lemmon 1441
 (GH); no location, 1896, Stove (MO). SISKIYOU CO.: Forest House Mt., s. of
 highway from Yreka to Fort Jones, ca. 7 mi. s.w. of Yreka, 4,500 ft. alt., June
 11, 1936, Babcock & Stebbins 1913 (UC); Scott Mt., 5,400 ft. alt., June 16,
 1957, Baker 13123 (CAS, UC); Scott Mt., trail to Carmen Lake, 5,700 ft. alt.,
 July 8, 1949, Balls 13918 (POM, WS); 6 mi. s.w. of Yreka, 3,200 ft. alt., May
 16, 1954, Barneby 11520 (CAS); no location, 1879, Bradley (UC); Marble Mt.,
 along trail on summit, n. of West Fork of Wooley Creek, Aug. 6, 1908, 7,000 ft.
 alt., Butler 110 (POM, UC); ca. 2 mi. up Scott Mt., grade out Callahan, May 21,
 1936, Cantelow (CAS); n. slope Scott Mt., 4,000 ft. alt., May 21, 1936,
Cantelow (CAS); on Scott Mt., 5 mi. s.e. of Callahan, May, 1947, Constance &
Mason, grown at Pullman (WS); Mount Eddy, Aug. 30, 1912, Eastwood 2004 (CAS,
 NY, US); Cantera, May 29, 1923, Eastwood 12003 (CAS); near Yreka on Fort Jones
 road, Apr. 20, 1934, Eastwood & Howell 1742 (CAS); Plowman's Valley--Valley of
 Upper East Fork of Scott R., i.e., from the w. base of the Gazelle Grade to
 about Callahan, June 12-16, 1948, Ferris & Lorraine 11716 (CAS, DS, POM, UC,
 WS, WTU); Gazelle Mt. grade, road between Callahan and Gazelle, 4,921 ft. alt.,
Ferris & Lorraine 11840 (CAS, DS, POM, UC, WS, WTU); e. side of Mt. Eddy,
 July 22, 1916, Heller 12491 (CAS, DS, GH, MO, NY, OSC, WTU); e. slope of Mt.
 Eddy, ca. 7,000 ft. alt., July 9, 1920, Heller 13437 (DS, MO, NY, US); ca. 5
 mi. s. and 5 mi. w. of Weed, 7,000 ft. alt., July 14, 1963, Holloway (WS);
 Caribou Basin, Salmon-Trinity Alps, 6,500-7,500 ft. alt., July 26, 1937,

Howell 13526 (CAS); 5 mi. s. of Callahan, on Scott Mt. road, May 17, 1947,
Mason 14764 (UC); Divide, s. of Callahan on road to Trinity Center, 5,000 ft.
 alt., May 18, 1949, Munz 13304 (POM, WTU); s.w. of McKinley Mt., w. of Yreka,
 June 22, 1941, Ownbey & Brown 2427 (WS); ridge road to Deadwood Lookout, mts.
 w. of Yreka, T. 45N., R. 1W., June 25, 1952, Ownbey & Preece 3342, grown at
 Pullman (WS); Shasta Springs, June, 1922, Soares (CAS); n.-sloping ridge
 between Little and Big Carmen Lakes, n. side of Scott Mt., Siskiyou-Trinity
 Cos. line, ca. 8 mi. s.e. of Callahan, ca. 6,300 ft. alt., July 9, 1956,
Tillett 665 (POM); ridge just above Grouse Lake (headwaters of Grouse Creek),
 5,700 ft. alt., May 28, 1950, Wiggins 12384 (DS, UC). SOLANO CO.: hills near
 White Sulphur Springs, Mar., 1874, Greene (NY). SONOMA CO.: Pine Mt., at the
 Geysens, 1864, Bolander 3955 (US); Layton Mine, Main Austin Creek, May 30,
 1947, Hoffman 557 (WS); Jensen's Ranch, head of Dohrman Creek, Apr. 28, 1934,
Mason 8074 (UC). STANISLAUS CO.: LaPuerta Creek, May, 1903, Elmer 4632 (CAS,
 DS, MO, NY, POM, UC, US). TEHAMA CO.: on Paskenta grade, May 29, 1934,
Bacigalupi 2412 (DS); e. shoulder of South Yolla Bolly Mt., ca. 1 mi. e. of
 Mt. Linn summit, 7,500 ft. alt., July 16, 1955, Bacigalupi, Robbins, Wagnon,
& Barbe 5315 (UC); near Lookout, Anthony Peak, close to boundary of Tehama and
 Mendocino Cos., ca. 6,900 ft. alt., July 11, 1949, Baker 12137 (POM); on the
 e. ridge of Yolla Bolly (Mt. Linn), 7,500 ft. alt., July 16, 1955, Barbe 167
 (POM, UC); Log Spring Ridge between Log Spring and Government Flat, July 9,
 1941, Eastwood & Howell 9732 (CAS); Government Flat, July 9, 1941, Eastwood &
Howell 9815 (DS, CAS); near Yolla Bolly Guard Station, Yolla Bolly Mts., T.
 27N., R. 10W., S. 23, 5,000 ft. alt., July 5, 1950, Hoffman 3232, grown at
 Pullman (UC, WS); 0.4 mi. from Ball Rock, 6,500 ft. alt., July 1, 1950, Hoff-
man 3237, grown at Pullman (UC, WS); South Yolla Bolly Mt., Middle Eel-Yolla
 Bolla Primitive Area, 8,000 ft. alt., July 17, 1952, Kellogg 75 (UC, WS, WTU);

e. flank of South Yolla Bolly Peak, 7,700 ft. alt., July 26, 1951, Munz 16926 (CAS, NY, POM); Ball Mt., Road 0.5 mi. below Eagle Peak Road, Mendocino National Forest, June 23, 1953, Sharsmith 4343 (UC, WS); w. of Paskenta, along logging road, May 3, 1953, Wagon 12635 (POM). TRINITY CO.: Saddle between North Yolla Bolly and Black Rock Mts., Yolla Bolly Middle Eel Primitive Area, 6,900 ft. alt., June 30, 1949, Alexander & Kellogg 5728 (UC, US, WS); s. of Peanut, 2,600 ft. alt., May 18, 1954, Barneby 11553 (CAS); South Fork Mt., toward "Auto Rest," May 30, 1927, Connick (UC); South Fork Mt. Blake Lookout Road, 7.5 mi. from Junction, Alton-Redbluff Highway, June 8, 1939, Cantelow (CAS); summit of Scott Mt., 5,350 ft. alt., June 9, 1939, Cantelow 3910 (CAS); Scott Mts., n. of Carrville, June 25, 1937, Eastwood & Howell 4998 (CAS, UC); head of Parker Creek, 6,600 ft. alt., July, 1909, Hall 8646 (UC, US); Scott Mt., July 6, 1948, Hoffman 2546 (WS); Blue Ridge, Lassic Group, ca. 5,000 ft. alt., July 13, 1949, Hoffman 2883, grown at Pullman (UC, WS); 1.1 mi. n. of White Rock Guard Station, on the line between Trinity and Tehama Cos., July 3, 1950, Hoffman 3249, grown at Pullman (UC, WS); summit of the gap between North Yolla Bolly and Black Rock Peaks, 7,000 ft. alt., July 4, 1950, Hoffman 3447, grown at Pullman (WS); Scott Mt., between Trinity and Siskiyou Cos., July 29, 1937, Howell 13622 (CAS, NY); Mt. Bolly, 6,000 ft. alt., July 2, 1880, Kleeberger (CAS); 14.5 mi. n.e. of Forest Glen on Rt. 36, toward Peanut, June 12, 1967, Mingrone & McNeal 98 (WS); 1 mi. n. of "Racetrack," 5,500 ft. alt., July 2, 1942, Parks & Tracy 11595 (DS, GH, MO, NY, UC, US, WTU); 3 mi. n. of Peanut, 2,500 ft. alt., June 13, 1955, Rose 55081 (CAS); 1 mi. s.w. of Peanut, 2,500 ft. alt., June 13, 1955, Rose 55081 (POM); South Fork Mt., Mary Blaine Mt., 6,400 ft. alt., Aug. 3, 1935, Tracy 14514 (UC); 15.5 mi. n. of Mina, on road to Hoaglin and Zenia, May 31, 1951, Vollmer & Beane 4 (DS).

OREGON. CURRY CO.: head of Lawson Creek, 4,000 ft. alt., June 25, 1929, Leach & Leach 2393 (ORE, WILLU). JOSEPHINE CO.: e. slope of Eight Dollar Mt., near Deer Creek, June 14, 1929, Applegate 5727 (DS, WILLU); Rough and Ready Creek, Illinois Valley, Apr. 24, 1930, Applegate 6143 (DS); e. slope of Eight Dollar Mt., June 17, 1932, Applegate 7268 (DS); Waldo, June 19, 1932, Applegate 7305 (DS); along old road from Gasquet to Waldo, just n. of California State boundary, 2,900 ft. alt., Bacigalupi, Tracy, Constance, Moran, Rodriguez, & Carlquist 3430 (UC); Waldo, May 18, 1936, Bellinger (WILLU); Page Mt., May 21, 1923, Braaten & Erdmann (ORE); Illinois Valley, May 19, 1936, Cantelow 1323 (CAS); Illinois R., 3 mi. w. of Selma, 1,350 ft. alt., May 18, 1942, Constance & Rollins 2978 (DS, GH, MO, NY, POM, UC, US, WS, WTU); 6 mi. below Belice, 1942, Constance & Rollins, grown at Pullman (WS); Rough and Ready Creek, T. 40S., R. 8W., S. 18, 1,400 ft. alt., May 6, 1941, Detling 4703 (DS, ORE); Rough and Ready Creek, T. 40S., R. 8W., S. 18, 1,400 ft. alt., May 13, 1946, Detling 5655 (DS, ORE, POM, UC, WTU); Grants Pass, May 17, 1885, Drake & Dickson 764 (NY); Redwood Highway at North Fork of Illinois R., Apr. 12, 1934, Eastwood & Howell 1427 (CAS); near Waldo on Camp Chicago Trail, Apr. 19, 1934, Eastwood & Howell 1690 (CAS); near Waldo, May 20, 1928, Gale 242 (DS, GH, MO, POM, US); Grant's Pass, May, 1887, Henderson 1364 (GH); Grant's Pass, May 7, 1886, Henderson 1364 (OSC); Grant's Pass, May 6, 1887, Henderson (ORE); Grant's Pass, May 7, 1887, Henderson (US); Eight Dollar Mt., near Kirby, Apr. 16, 1926, Henderson 5987 (CAS, DS, MO, ORE); Siskiyou Mts., 10 mi. s.e. of Takilma, on road to Happy Camp, ca. 4,000 ft. alt., July 6, 1939, Hitchcock & Martin 5196 (DS, NY, UC, WTU); Happy Camp (California)--O'Brien (Oregon) road, 6.9 mi. n. of California-Oregon line, 3,800 ft. alt., July 9, 1948, Hoffman 2625 (WS); 5.4 mi. e. of junction of Takilma-Holland Road with the Waldo-O'Brien Road, on the road to Happy Camp, California,

July 15, 1950, Hoffman 3247, grown at Pullman (WS); Waldo, May, 1884, Howell 282 (ORE); "Eight Dollar Mt.," May 31, 1884, Howell (GH); Waldo, June 13, 1884, Howell (DS, NY, US, WS, WTU); Crescent City--Grant's Pass road, 1 mi. n. of road to Waldo, June 6, 1929, Kildale 7902 (DS); Waldo, 1,500 ft. alt., May 18, 1930, Kildale 9615 (DS); between McGrew Way and "Blue Turn," along Wimer Road, 5 mi. w. of O'Brien, June 19, 1950, Kruckeberg 1796 (NY, POM, UC, WS, WTU); Redwood Highway near Kerby, May 28, 1936, Lund (OSC); Siskiyou National Forest, May 14, 1938, Overlander (OSC); 3 mi. s.w. of O'Brien Post-Office, July 9, 1940, Ownbey, grown at Pullman (WS); Tennessee Mt. lookout road, Tennessee Pass, 5 mi. w. of Kirby, June 3, 1967, Ownbey & Mingrone 3492 (WS); along Whiskey Creek, 4.4 mi. s.w. of O'Brien, June 3, 1967, Ownbey & Mingrone 3494 (WS); near Waldo, June 24, 1952, Ownbey & Preece 3332 (WS); 4 mi. s.e. of Takilma, July 8, 1918, Peck 8204 (WILLU); Eight Dollar Mt., June 13, 1904, Piper 6148 (GH, US); Apple-gate R., June 2, 1939, Purdy (CAS); Illinois R., June, 1879, Rattan (DS, GH); Waldo, 1,600 ft. alt., July 3, 1948, Ripley & Barneby 9585 (CAS); Kerby, May, 1948, Robinson (OSC); Rough and Ready Desert, Apr. 29, 1940, Rogers (OSC); Happy Camp Road near Takilma, May 11, 1934, Rowntree (CAS); Takilma, June 1, 1938, Rowntree (CAS); Illinois Valley, near Selma, June 5, 1942, Small (WS); Eight Dollar Mt., May 4, 1923, Sweetser (ORE); 10 mi. s.w. of Waldo, June 7, 1928, Thompson 4611a (US); Rough and Ready Creek, at crossing of Redwood Highway, 1,450 ft. alt., May 24, 1933, Tracy 12320 (UC); along Whiskey Creek Road, 2.9 mi. s.w. of O'Brien, May 26-29, 1961, Weiler 61189 & Nelson 733 (ORE, UC); Waldo Grayback Area, Siskiyou Mts., 1,600 ft. alt., T. 40S., R. 8W., S. 28, Aug. 26, 1949, Whittaker SS362-S (WS); s. slope, Waldo Hill, 2,500 ft. alt., Aug. 31, 1949, Whittaker (WS).

12. Allium lemmonii S. Watson

Allium lemmonii S. Watson in Proc. Am. Acad. 14:234. 1879. Type (GH), collected by J. G. Lemmon in Sierra Valley, Sierra Co., California, in 1874,

and isotype (UC) studied. Allium anceps var. lemmonii Jepson, Fl. Calif. 1:279. 1921.

Allium incisum Nelson and Macbride in Bot. Gaz. 56:470. 1913, not Fomine in Monit. Jard. Bot. Tiflis 14:52. 1909. Type, Nelson & Macbride 1790 (RM), from loose soil, in swales, House Creek, Owyhee [actually extreme s.w. Twin Falls] Co., Idaho, June 29, 1912, not seen. Isotypes (GH, MO, US, WTU) studied. Allium scissum Nelson & Macbride in Bot. Gaz. 65:58. 1918.

Bulb ovoid, outer coats brownish to grayish with faint transverse cellular reticulations, inner coats white; leaves 2 per scape, thick, broadly linear, flat and somewhat falcate, 3 to 5 mm broad, longer than the scape, deciduous at maturity; scape 5 to 8 cm tall, stout, much compressed and 2-winged, deciduous at maturity; bracts of the inflorescence 2 or more, ovate or broadly lanceolate, gradually long-acuminate; umbel 10- to 30 or more-flowered; pedicels 2 to 3 times as long as the perianth; perianth segments 6 to 7 mm long, linear-lanceolate, acute to acuminate, entire, white to pale rose with slightly thickened green midribs; stamens shorter than to about as long as the perianth segments, anthers yellow, filaments dilated at the base; ovary with 6 prominent ridges giving the appearance of crests, style about as long as the perianth, stigma capitate, entire; capsule crestless; seeds black, shining, alveoli not pustuliferous. $n=7$.

Illustration.--Abrams, Ill. Fl. Pac. States 1:392. 1923.

Distribution.--Heavy soils, northern Sierra Nevada, in Lassen and Modoc Cos., California, to northeastern Nevada, southwestern Idaho and southeastern Oregon (Fig. 6).

CALIFORNIA. ALPINE CO.: Carson Pass, June 14, 1940, Eastwood & Howell 8413 (DS); 0.5 mi. w. of Monitor Pass, elev. 8,300 ft., July 10, 1963, Howell 39728 (CAS, WS); near Monitor Pass road, ca. 7 mi. from E. Carson R., ca. 8,300 ft., July 9, 1958, Howitt 49 (CAS); ca. 1/4 mi. w. of summit of Monitor Pass, along California state highway 89, elev. ca. 8,200 ft., July 2, 1961, Hutchison 2148 (WS); Monitor Pass, road from Topaz to Markleeville,

8,250 ft. alt., July 27, 1955, Munz 21278 (WS); Monitor Pass, 0.5 mi. w. of summit, ca. 8,300 ft. alt., July 10, 1963, Rose 63200 (CAS, WS); Monitor Pass, July, 1961, Sherfey (CAS); 1 mi. w. of Mono Co. line, along State Highway 89, ca. 7,800 ft. alt., June 28, 1957, Wiggins 14202 (DS, NY, UC, WS). LASSEN CO.: experimental forest at Patterson Flat, June 15, 1961, Hormay (WS). MODOC CO.: Alturas road near Timber Mt., May 20, 1936, Applegate 10329 (DS); Ft. Bidwell, Apr., 1878, Austin (GH); opposite trail to Hackmore, on way from Alturas to Klamath Falls, 4,400 ft. alt., May 15, 1950, Balls 14698, grown at Pullman (WS); Modoc National Forest near Canby, May 30, 1946, Hoffman 682 (UC, WS); Parker Creek, Warner Mts., s. and e. of Alturas, 5,200 ft. alt., June 10, 1932, Payne 533 (UC); Patterson Mill, Modoc Forest, June 19, 1929, Smith 1130 (UC). LASSEN CO.: s. end of Madeline Plains, June 3, 1897, Applegate 3029 (DS); Pine Creek Meadows, June, 1879, Austin (GH); Harvey's Ranch, July 7, 1894, Baker & Nutting (UC); Madeline plains, June, 1898, Bruce 2280 (NY); overflow of Pitt R., 1 mi. w. of Bieber, May 26, 1940, Hitchcock 6640 (DS, MO, NY, UC, WS, WTU); Experimental Forest at Patterson Flat, June 15, 1961, Hormay (UC); Eagle Lake, 27 mi. from Susanville, 5,000 ft. alt., June 30, 1897, Jones (POM); U.S. Highway 395, 1.8 mi. s. of Ravendale, June 17, 1958, Raven & Solbrig 13288 (CAS, WS); Grass Valley, immediately s.w. of Blacks Mt. Experimental Forest, 5,500 ft. alt., T. 33N., R. 7E., S. 27, Oct., 1945, Robbins (WS); Burgess Spring Experiment Range, 5,900 ft. alt., June 10, 1936, Short S-416 (UC); 14.8 mi. w. of Harvey Mt. Lookout, 5,850 ft. alt., T. 33N., R. 7E., S. 8, June 4, 1940, Simontacchi 805 (UC). NEVADA CO.: Prosser, June 13, 1886, Sonne (UC); just e. of Boca Reservoir and s. of East Boca Spring Road, 5,600 ft. alt., May 24, 1966, True 2861 (CAS); Russell Valley on Dry Creek, ca. 5 mi. n.e. of Hobart Mills, 5,650 ft. alt., May 25, 1966, True 2877 (CAS). PLACER CO.: Sierra Valley s. side, 5,500 ft. alt., June 2, 1927, Smith 2070 (CAS); Prosser Creek, on road

to Sierra Valley, June 13, 1886, Sonne 411 (DS). PLUMAS CO.: no location, 1879, Austin (NY); Sierra Valley, 5 mi. s. of Beckwourth, on road to Sierraville, June 18, 1962, Howell 37819A (CAS); Sierra Valley near Beckwourth, elev. 4,880 ft., June 18, 1962, Howell 37767 (CAS); Portola, spring, 1965, Menzies (CAS); Sierra Valley, spring, 1965, Menzies (CAS); 20 mi. n. of Chilcoot, 6,000 ft. alt., May 17, 1947, Munz 11846, grown at Pullman (CAS, DS, NY, WS, WTU); 2.5 mi. e. of Beckwith Butte, 4,900 ft. alt., T. 22N., R. 14E., S. 11, May 21, 1935, Sawyer 12 (UC). SIERRA CO.: middle of Sierra Valley, along road from Hawley railroad station (on Western Pacific main line) to Loyalton, 4,860 ft. alt., T. 22N., R. 8W., July 8, 1953, Bacigalupi, Mason, & Sweeney 4294 (CAS, UC, WTU); e. edge of s. arm of Sierra Valley, 4.7 mi. n.e. of Sierraville, (w. slope of Rice Hill), ca. 5,000 ft. alt., May 27, 1962, Bacigalupi & Heckard 8484 (UC, WTU); along State Highway 89, 6.8 mi. n. of Sierraville, 5,000 ft. alt., June 13, 1962, Breedlove 3495 (DS, WS); along State Highway 89, 10 mi. s. of Sierraville, 6,400 ft. alt., June 13, 1962, Breedlove 3515 (DS, WS); Mountain Valley 2 mi. s. of Calpine on Highway 89, May 17, 1941, Cantelow (CAS); Sierra Valley between Sierraville and Loyalton, May 14, 1954, Howell & Barneby 29548 (CAS); along Little Truckee R., 10 mi. s.w. of Sierraville, Ownbey & Ownbey 2931 (WS); at Newman Point, 3.5 mi. n.e. of Sierraville, on road to Loyalton, 5,000 ft. alt., May 21, 1937, Stebbins & Jenkins 2114 (DS, UC).

IDAHO. OWYHEE CO.: just w. of Three Creek Post Office, 38 mi. s.w. of Rogerson, June 27, 1950, Ownbey 3271, grown at Pullman (WS). TWIN FALLS CO.: 22 mi. w. of Rogerson, 1 mi. s. of House Creek Ranch, July 5, 1949, Christ & Christ 18386 (NY, WS); just inside cattle guard, 23 mi. s.w. of Rogerson (1 mi. n.e. of House Creek), June 27, 1950, Ownbey 3270 (WS); s.e. corner of F. Hoelzle's ranch, ca. 1.5 mi. w. of Roseworth Reservoir and 20 mi. w. of

Rogerson, 5,400 ft. alt., June 3, 1959, Passey & Hugie (US).

NEVADA. ELKO CO.: 1 mi. s.w. of Lamoille, May 23, 1941, Holmgren 843 (UC, WS); Stampede, June 13, 1902, Kennedy 505 (MO, UC); w. of Wells, 5,800 ft. alt., June 5, 1943, Ripley & Barneby 5534 (WS); w. of Wells, 5,800 ft. alt., May 20, 1945, Ripley & Barneby 6453 (CAS); Ruby Mts., July 4, 1916, Stricklett (DS). WASHOE CO.: ridge s. of Alum Creek, 6,400 ft. alt., June 11, 1909, Heller 9742 (CAS, DS, GH, NY, UC); Anderson's Ranch, n. of Reno, May, 1904, Kennedy 868 (DS, MO, WS). WHITE PINE CO.: Hastings Pass, s. end of Ruby Range, May 27, 1928, Mason 4836 (UC).

OREGON. BAKER CO.: Baker, 1,000 m. alt., June 17-21, 1916, Eggleston 12616 (US); near Baker, May 31, 1935, Hanna 1673 (WTU); ca. 2 mi. s.e. of Baker, May 31, 1967, Ownbey & Mingrone 3471 (WS). HARNEY CO.: ca. 2 mi. s.w. of Drewsey, May 31, 1955, Hitchcock 20722 (NY, WS, WTU); 15 mi. w. of Juntura, June 1, 1967, Ownbey & Mingrone 3477 (WS); 20 mi. w. of Juntura, June 1, 1967, Ownbey & Mingrone 3479 (WS). MALHEUR CO.: 3 mi. s.w. of Harper, 2,500 ft. alt., T. 20S., R. 41E., S. 24, May 2, 1959, Cronquist 8169 (DS, NY, POM, UC, WS, WTU); on Bully Creek, near Westfall, May 9, 1900, Cusick 2379a (ORE, POM, WS); no location, June 11, 1901, Cusick 2559 (MO, NY, ORE, POM); near the steel bridge over Owyhee R., 2 mi. from Watson, Apr. 26, 1927, Henderson 8810 (CAS, ORE); beyond Harper, road to Westfall, May 10, 1927, Henderson 8815 (CAS, ORE); hills, near Agency Valley, near Beulah, May 11, 1927, Henderson 8817 (ORE); ca. 15 mi. s.w. of Vale, May 31, 1955, Hitchcock 20657 (NY, WS, WTU); 16 mi. n. of Scott Butte and junction of Highway 95 and road to Burns, May 28, 1957, Hitchcock & Muhlick 21100 (DS, WS, WTU); 22 mi. n. of Scotts Butte and of the junction of Highway 95 and the cutoff road to Burns, May 28, 1957, Hitchcock & Muhlick 21108 (WS); near Harper Ranch, 800 m. alt., May 22, 1896, Leiberg 2097 (NY, ORE); Barren Valley, 1,275 m. alt., June 2, 1896, Leiberg 2196 (NY,

ORE, US); Juniper Springs, 1,310 m. alt., June 14, 1896, Leiberg 2262 (ORE); directly s. of Harper Junction, June 1, 1967, Ownbey & Mingrone 3476 (WS); Harper, May 4, 1940, Peck 20551 (NY, OSC, WILLU, WS); 6 mi. e. of Juntura, May 9, 1940, Peck 20690 (UC, WILLU); Owyhee Canyon, 5 mi. above Rome, June 9, 1953, Peck 21818 (CAS, NY, UC, WILLU).

13. Allium tolmiei Baker & S. Watson

Key to the Varieties of Allium tolmiei

1. Stamens 1/2 to rarely 4/5 as long as the perianth segments; bulb coats without evident reticulations; ovary often distinctly crested.
 2. Leaves twice as long as the scape; ovary obscurely crested 13a. A. tolmiei var. tolmiei
 2. Leaves little longer than the scape; ovary prominently crested 13b. A. tolmiei var. platyphyllum
1. Stamens about as long as the perianth segments; bulb coats with an inner membrane with distinct cellular reticulations; ovary obscurely or not at all crested 13c. A. tolmiei var. persimile

13a. Allium tolmiei Baker ex S. Watson var. tolmiei

Allium tolmiei Baker ex S. Watson in Proc. Am. Acad. 14:234. 1879. Type (GH), collected by "a friend of Mr. Tolmie" [John McLeod], between Burnt and Malheur Rivers, Snake Country, probably in n.e. Malheur Co., Oregon, studied. Allium douglasii var. β Hooker, Fl. Bor. Am. 2:185. 1839. Allium tolmiei Baker in Bot. Mag. Ser. III. 32: under t. 6227. 1876, nomen subnudum. Allium douglasii var. tolmiei Traub in *Herbertia* 12(1945):68. 1947. Allium idahoense Traub in *Herbertia* 12(1945):69. 1947.

Allium cusickii S. Watson in Proc. Am. Acad. 14:228. 1879. Type, Cusick 179 (GH), Union Co., Oregon, 1876, studied.

Allium anceps var. aberrans M. E. Jones in *Contrib. West. Bot.* 12:31, fig. 61. 1902. Type, Jones 6593 (POM), Weiser, Washington Co., Idaho, April 25, 1900, and isotypes (CAS, DS), studied.

Bulb ovoid, outer coats brown, inner coats white to pink, both without definite reticulations; leaves 2 per scape, flat, thick, and commonly strongly falcate, 1 to 8 mm broad, up to twice as long as the scape, deciduous at maturity; scape 5-25 cm tall, compressed to strongly flattened and winged,

deciduous at maturity; bracts of the inflorescence 2, ovate to lanceolate, acuminate; umbel 10- to 40 or more-flowered; pedicels 2 to 3 times as long as the perianth; perianth segments 6 to 10 mm long, erect, lanceolate, acute, entire, involute at the tip, almost white to pink, with prominent darker mid-ribs; stamens 1/2 to 3/4 as long as the perianth segments, anthers yellow or purple, filaments dilated below and united into a ring at the base; ovary crestless, or obscurely crested with 6 (or 3) low processes, style included, stigma capitate, entire or obscurely lobed; capsule mostly crestless, seeds black, dull, alveoli not pustuliferous. $\bar{n}=7$.

Illustrations.--Abrams, Ill. Fl. Pac. States 1:387. 1923. Abrams, *ibid.* 1:386, as *A. pleianthum*. Abrams, *ibid.* 1:387, as *A. cusickii*.

Distribution.--Rocky, gravelly, or clayey soils, eastern Oregon, southeastern Washington, adjacent Idaho, and northeastern California (Fig. 5).

CALIFORNIA. LASSEN CO.: along Ash Creek, above Ash Creek Public Camp, off road from Adin to Madeline, 5,200 ft. alt., May 18, 1950, Balls 14767 (CAS, POM, WS, WTU); Dry Creek, s. of Alturas, ca. 10 mi. on Highway 395, June 9, 1946, Hoffman 731 (UC, WS); s. of Ravendale, 5,550 ft. alt., May 30, 1944, Ripley & Barneby 5968 (WS); n. of Madeline, 5,600 ft. alt., May 30, 1944, Ripley & Barneby 5978 (WS). MODOC CO.: near 3 mile Ranger Station sign, road from Eagleville to Patterson Mill, 7,300 ft. alt., June 8, 1946, Alexander & Kellogg 4702 (UC, US, WS, WTU); Dismal Swamp, n. end of Warner Mts., 7,400 ft. alt., June 26, 1946, Alexander & Kellogg 4835 (UC, WS); n. slope of Bidwell Mt., Warner Mts., July 9, 1932, Applegate 7586 (DS, POM); Adobe Flats, Goose Lake Valley, May, 1894, Austin 165 (UC); Fort Bidwell, 6,500 ft. alt., June, 1903, Manning 67 (UC, US); Parker Creek, 5,200 ft. alt., June 10, 1932, Payne (CAS); Willow Ranch, 3,000-4,500 ft. alt., May 16, 1940, Willits 253 (DS).

IDAHO. ADA CO.: Boise City, Apr., 1881, Wilcox (GH, NY, US). ADAMS CO.: along Little Salmon R., 10 mi. s. of Pollock, Apr. 13, 1947, Ownbey & Ward 3119, grown at Pullman (WS); 7 mi. e. of bridge below Homestead, Oregon, June 29, 1950, Ownbey 3289, grown at Pullman (WS). GEM CO.: Squaw Butte, near Sweet, May 9, 1936, Tucker 544 (NY); Squaw Creek (Sweet), 3,500 ft. alt., May 9, 1911, Macbride 835 (DS, GH, MO, NY, POM, UC, US). IDAHO CO.: near Hibbs Cow Camp, Seven Devils Mts., June 26, 1940, Aase, grown at Pullman (WS); s. slope near Heavens Gate, Seven Devils Mts., June 27, 1940, Aase, grown at Pullman (WS); along the Little Salmon R., ca. 10 mi. s. of Pollock, May 28, 1950, Baker 6692 (OSC, WS); 3 mi. s. of Pollock, on cliffs in canyon of Little Salmon R., May 15, 1937, Christ & Ward 7264 (NY); Seven Devils Camp, Seven Devils Mts., July 11, 1941, Christ 12491 (NY); Heaven's Gate, Seven Devil Mts., T. 24N., R. 1W., S. 32, July 12, 1950, Jones 198 (GH, NY, POM, US, WS, WTU); above left fork, Squaw Creek, Snake R. Canyon, 3,500 ft. alt., May 15, 1937, Munro 86 (WS); Hibbs Cow Camp, Seven Devils Mts., June 26, 1940, Ownbey & Meyer 2085 (contaminated with A. brandegei) (WS); 10 mi. s. of Pollock, June 17, 1966, Ownbey & Mingrone, grown at Pullman (WS); Dry Diggins, Seven Devils Mts., 8,000 ft. alt., June 13-30, 1937, Packard 331 (MO, UC, WS); Sheep Creek, 1,275 ft. alt., T. 25N., R. 2W., Apr. 10, 1926, Ransom & Ridout 88 (POM); Dry Diggins, Seven Devils Mts., 7,400 ft. alt., T. 23N., R. 2W., July 20, 1927, St. John & Mullen 8475 (WS). NEZ PERCE CO.: Winchester Hill, June 10, 1933, Christ 2154 (NY); 3 mi. s. of Zaza, June 12, 1944, Christ 14215 (NY); Craig Mts., just n. of Lake Waha, May 17, 1952, Baker 8918 (OSC, WS); about Lewiston, 1,500-2,000 ft. alt., May 12, 1896, Heller & Heller 3054 (DS, MO, NY, UC, US); red clay hills, Waha, Craig Mts., June 21, 1894, Henderson 2722 (GH, WS); Soldiers Meadows and elsewhere, Craig Mts., June 21-24, 1894, Henderson 2723 (GH, US); bluffs of the Clearwater, above Lewiston, near Spalding, May 6, 1899,

Henderson 4805 (GH); on slopes overlooking Salmon R. Canyon, Craig Mts., May 25, 1941, Ownbey & Aase 2391 (WS); no location, Apr., 1892, Sandberg (MO); Valley of Clearwater R., Apr. 23, 1892, Sandberg, MacDougal, & Heller 1 (CAS, NY, US); s.e. of Lewiston, May 8, 1938, Sharsmith 3540 (GH, UC, WS, WTU). OWYHEE CO.: 5 mi. e. of DeLamar, in Owyhee Mts., July 10, 1944, Christ 14323 (NY); U.S. 95, ca. 5 mi. n.e. of Oregon State Line, n. of Jordan Valley, June, 1959, Cronquist, grown at Pullman (WS); summit between Mud Flat and Poison Creek, June 5, 1946, Maguire & Holmgren 26287 (DS, MO, NY, UC, US, WS, WTU); 13 mi. s.w. of Mud Flat on Juniper Mt. road, June 7, 1946, Maguire & Holmgren 26331 (DS, MO, NY, POM, UC, US, WS, WTU). PAYETTE CO.: 14 mi. e. of Payette, on n. side of Willow Creek, Apr. 29, 1948, Christ & Christ 17282 (NY); Payette, Apr., 1936, Purdy (CAS). WASHINGTON CO.: 9 mi. n. of Weiser, along Snake R., Apr. 29, 1948, Christ & Christ 17248 (NY); Weiser, July 5, 1899, Jones (POM); Monroe Creek, 2,200 ft. alt., Apr. 20, 1900, Jones 6591 (GH, MO, NY, POM, US); 18 mi. below Weiser, 2,000 ft. alt., Apr. 28, 1900, Jones 6594 (MO, POM); Weiser, 2,200 ft. alt., Apr. 19, 1900, Jones 6653 (POM); railroad right-of-way, 1.0 mi. w. of Eaton, June 1, 1967, Ownbey & Mingrone 3476, grown at Pullman (WS); 1 mi. e. of Eaton, Apr. 12, 1947, Ownbey & Ward 3114, grown at Pullman (NY, WS).

OREGON. BAKER CO.: hills near Eagle Valley, May, 1901, Cusick (ORE); Shoemaker, June 1, 1939, Gustafson (OSC); 2 mi. w. of Unity, May 30, 1955, Hitchcock 20565 (NY, WS, WTU); 5 mi. w. of Hereford, July 3, 1942, Ownbey & Aase 2572 (WS); 3 mi. s.e. of Unity, July 4, 1942, Ownbey & Aase 2574 (WS); 2 mi. s.e. of Unity, 39 mi. n.w. of Brogan, June 19, 1966, Ownbey & Mingrone 3453 (WS); 4 mi. s.e. of Baker City, 4,000 ft. alt., June 4, 1945, Ripley & Barneby 6575 (WS). CROOK CO.: summit of Lookout Mts., July 9, 1901, Cusick 2654 (GH, MO, NY, ORE, POM, UC, US); summit of Lookout Mt., no date, Jones

(POM); Upper Canyon Creek, Ochoco Forest, June 28, 1932, Peck 17168 (WILLU); canyon of Crooked R., 20 mi. above Prineville, May 2, 1947, Peck 24127 (WS); Prineville, May 13, 1907, Whited 3190 (US). DESCHUTES CO.: Hampton, June, 1938, Farnham & Beach 114 (OSC); 3 mi. e. of Millican, June 18, 1937, Peck 19369 (CAS). GILLIAM CO.: 0.5 mi. s.e. of Geo. White Ranch, 9 mi. n.w. of Lonerock, above to w. of East Fork, May 28, 1955, Hitchcock 20489 (NY, OSC, WS, WTU). GRANT CO.: Strawberry Lake, Strawberry Mts., s. of Prairie City, June 11, 1930, Applegate 6205 (DS); just s. of Meadow Creek Pass, 6 mi. s.w. of Dale, ca. 4,000 ft. alt., T. 7S., R. 31E., S. 22, May 19, 1950, Cronquist 6375 (NY, ORE, OSC, POM, UC, US, WS, WTU); 11 mi. s. of Canyon City, T. 15S., R. 31E., May 21, 1950, Cronquist 6394 (NY, ORE, OSC, POM, UC, US, WS, WTU); 6 mi. n.e. of Mt. Vernon, ca. T. 13S., R. 31E., May 21, 1950, Cronquist 6395 (NY, ORE, OSC, POM, UC, US, WS, WTU); at Fields Creek summit, 24 mi. s.e. of Dayville, 5,350 ft. alt., T. 14S., R. 29E., S. 32, June 8, 1953, Cronquist 7106 (GH, NY, WS, WTU); near Prairie City, May 10, 1928, Gale 132 (DS, MO, WTU); 0.4 mi. e. of Dixie Summit on Highway 26, June 17, 1962, Gillett & Taylor 11287 (WS); near Prairie City, Apr. 23, 1925, Henderson 5112 (CAS, DS, GH, MO, ORE); Mt. Vernon, Apr. 25, 1925, Henderson 5113 (CAS, DS, GH, MO); summit of Dixie Mt., 8,000 ft. alt., June 13, 1925, Henderson 5394 (CAS, DS, GH, MO, ORE); grade above Prairie City, John Day Highway, May 25, 1927, Henderson 8814 (CAS, ORE); ca. 1/4 mi. e. of Chicken Hill Lookout, ca. 8 mi. w. of Anthony Lake, July 17, 1952, Hitchcock 19730 (WTU); ca. 18 mi. e. of John Day, along Highway 28, May 29, 1955, Hitchcock 20555 (NY, WTU); 2 mi. n.e. of Prairie City, May 27, 1963, Hitchcock & Muhlick 22487 (WS, WTU); ca. 4 mi. n.e. of Prairie City, May 30, 1964, Hitchcock 23675 (UC, WS, WTU); n.w. of Long Creek, 4,065 + ft. alt., Lawrence 876 (OSC); 9 mi. n. of Long Creek, June 16, 1941, Ownbey & Brown 2410, grown at Pullman (WS); 22 mi. n.e. of Prairie City, just n. of Blue Mt.

Pass, June 19, 1966, Ownbey & Mingrone 3454 (WS); 17 mi. n. of Mt. Vernon, June 20, 1966, Ownbey & Mingrone 3458 (WS); near summit of Ritter Butte, 9 mi. n. of Long Creek, elev. 3,990 ft., June 20, 1966, Ownbey & Mingrone 3459 (WS); 5.6 mi. e. of Hamilton and 6.2 mi. n.w. of Long Creek, June 5, 1967, Ownbey & Mingrone 3502 (WS); Strawberry Mts., 2 mi. s. of Strawberry Lake, July 15, 1921, Peck 10252 (DS, NY); Buck Creek on North Fork of the Malheur R., n. of Mt. Vernon, 4,800 ft. alt., May 7, 1952, Wagg (OSC); Belshaw Meadows, 4,650 ft. alt., T. 12S., R. 29E., S. 12, July 26, 1945, Weber 3103, grown at Pullman (WS); s. side of Fox Valley, Old Ryan Ranch, 4,000 ft. alt., T. 11S., R. 29E., S. 34, July 26, 1945, Weber 3104, grown at Pullman (WS); summit of Prairie Hill, 5,980 ft. alt., Malheur National Forest, T. 15S., R. 35-1/2E., S. 24, Aug. 11, 1945, Weber 3125, grown at Pullman (WS). HARNEY CO.: near Wagontire, Apr. 26, 1936, Bellinger (WILLU); a scant mi. w. of Middle Fork of the Malheur R., 17 mi. w. of Juntura on the road to Burns, ca. 3,500 ft. alt., T. 20-21S., R. 35-36E., Apr. 26, 1959, Cronquist 8146, grown at Pullman (DS, NY, POM, UC, WS, WTU); 11 mi. n.w. of Drewsey, ca. 4,000 ft. alt., T. 19S., R. 34E., S. 29, May 5, 1959, Cronquist 8185, grown at Pullman (NY, POM, UC, WS, WTU); w. slope above the head of McCoy Creek, not far from the rim of Kiger Canyon, Steens Mts., 80 mi. s.e. of Burns, ca. 9,000 ft. alt., T. 33S., R. 33E., S. 1 or 2, July 15, 1959, Cronquist 8700, grown at Pullman (NY, WS, WTU); from Steens Mts., June 30, ?, Cusick 1984a (GH, ORE); T. 24S., R. 25E., NE 1/4, S. 29, June 5, 1956, Eckert (WS); 300 meters n.w. of Fish Lake, Steens Mts., 7,200 ft. alt., July 8, 1955, Ferris 12899 (DS, POM, WS, WTU); Administration Area, Squaw Butte, June 6, 1938, Frichel P-2 (OSC); Squaw Butte, May 20, 1941, Gilkey (OSC); Steens Mts., Region, 15.5 mi. due e. s.e. of Frenchglen, T. 32S., R. 32.75E., S. 36, July 8, 1953, Hansen 315 (OSC); Steens Mts. Region, 19.5 mi. due e. s.e. of Frenchglen, T. 33S., R. 33E., S. 1, July 31, 1953, Hansen 544 (OSC); open

summit of divide between Sawtooth and Gunther Creeks, Blue Mts. foothills, May 15, 1927, Henderson 8811 (CAS, ORE); 2.5-3 mi. s. of Burns, May 6, 1927, Henderson 8818 (CAS, ORE); Steens Mts. Pass, above Anderson Valley, June 6, 1927, Henderson 8819 (CAS); near divide of Steens Mts., out of Anderson Valley, June 6, 1927, Henderson 8819-1/2 (ORE); high hill of Blue Mts., Sawtooth Creek, June 18, 1927, Henderson 8822 (CAS, ORE); Sheep Camp, 5,500 ft. alt., Steens Mts., June 15, 1927, Henderson 8824 (CAS, ORE); near Fish Lake, 6,000-7,000 ft. alt., Steens Mts., July 20, 1927, Henderson 8825 (ORE); Silver Creek, May 29, 1927, Henderson 9320 (ORE); ca. 15 mi. w. of Burns along Highway to Bend, May 30, 1957, Hitchcock & Muhlick 21224 (WTU); 28 mi. w. of Burns on road to Bend, May 30, 1957, Hitchcock & Muhlick 21232 (DS, WS, WTU); Riley Ranch, w. of Burns, in Silver Creek Valley, Bend Road, June 4, 1927, Leach 8820 (CAS, ORE); near Burns, 1927, Leach (WTU); Steens Mts., opposite Andrews, 1,950 m. alt., Leiberg 2552 (GH, NY, UC, US); 11 mi. e. of Frenchglen on way to Fish Lake, w. slope of the Steens Mts., June 14, 1946, Maguire & Holmgren 26445 (NY, UC); Administration Area, Squaw Butte, June 21, 1937, Oglesby 221 (OSC); 4 mi. w. of Highway on Gravel Ridge Road, 18 mi. n. of Burns, June 17, 1941, Ownbey & Brown 2412 (WS); 19 mi. w. of Juntura, June 1, 1967, Ownbey & Mingrone 3478 (WS); Stinking Water Mt., 1/4 mi. s. of highway 20, on Stinking Water access road, June 1, 1967, Ownbey & Mingrone 3481 (WS); 35 mi. s.w. of Burns on Highway 395, June 27, 1952, Ownbey & Preece 3359, grown at Pullman (WS); Burns, June 18, 1912, Peck 1337 (WILLU); 8 mi. w. of Riley, June 22, 1925, Peck 13855 (UC, WILLU); top of Steens Mts., 5 mi. s. of head of Wild Horse Creek, 7,000 ft. alt., June 29, 1925, Peck 14063 (DS, WTU); 8 mi. w. of Burns, June 19, 1937, Peck 19381 (WILLU); w. slope of Stinking Water Mt., May 4, 1940, Peck 20529 (CAS); Wright's Point, Harney Valley, May 10, 1940, Peck 20694 (WILLU); 19 mi. n.e. of Wagontire, June 25, 1941, Peck 20922 (WILLU); 13 mi. n.e. of Wagontire,

June 25, 1941, Peck 20923 (UC); 20 mi. n. of Burns, June 29, 1941, Peck 20950
 (ORE, WILLU); 20 mi. n. of Burns, June 29, 1941, Peck 20959 (UC, WILLU); 5 mi.
 w. of Van, June 30, 1941, Peck 20991 (CAS); Stinking Water Mt., June 10, 1942,
Peck 21156 (WILLU); Stinking Water Mts., June 1, 1943, Peck 21646 (WS); Stink-
 ing Water Mt., June 25, 1948, Peck 25379 (WS); 15 mi. n.w. of Wagontire, 4,300
 ft. alt., June 4, 1944, Ripley & Barneby 6079 (WS); Squaw Butte, May 9, 1936,
Robins (OSC); headwaters of McCoy Creek, Steens Mts., 9,000 ft. alt., July 3,
 1934, Train 112 (US); Steens Mts., n. end Juniper Grade, 5,000 ft. alt., June
 4, 1935, Train (OSC); 0.5 mi. n. of Allison Ranger Station, 5,500 ft. alt.,
 T. 19S., R. 26E., S. 15, July 5, 1945, Weber 2971, grown at Pullman (WS); Fish
 Lake, Steens Mts., 8,000 ft. alt., July 12, 1947, Yancey (OSC). JEFFERSON CO.:
 near Crooked R., bridge on Dalles-California Highway, May 3, 1948, Peck 24139
 (WS); e. of Madras, 2,900 ft. alt., June 9, 1953, Steward & Steward 6379 (OSC,
 WS, WTU). KLAMATH CO.: 11 mi. e. of Dairy, May 28, 1948, Peck 24986 (UC, WS).
 LAKE CO.: e. slope of Crane Mt., Warner Mts., July 7, 1932, Applegate 7491
 (DS, WS); Goose Lake Valley, June, 1898, Austin 2281 (NY, UC); Barley Camp,
 near Big Lake, 1,730 m. alt., June, 1911, Eggleston 6952 (NY, US); Button
 Springs, 1,470 m. alt., June 30, 1894, Leiberg (MO); near pond 4 km. alt., n.
 from Button Springs, 1,470 m. alt., June 30, 1894, Leiberg 377 (GH, NY, ORE,
 UC, US); at Mile Post 41, T. 35S., R. 17E., S. 10, June 18, 1941, Ownbey &
Brown 2414 (WS); n. slope of Glass Butte, June 16, 1943, Peck 21899 (UC, WILLU);
 Quartz Mt., June 28, 1948, Peck 25462 (UC, WS). MALHEUR CO.: Malheur Butte,
 800 m. alt., May 12, 1896, Leiberg 2032 (GH, NY, ORE, POM, UC, US); plateau
 between head of Cottonwood and Kinney Creeks, 1,220 m. alt., May 26, 1896,
Leiberg 2138 (US); 8.1 mi. from Jordan Valley toward Sheaville, June 6, 1963,
Mann (WS); n. of Rockville, May 7, 1940, Peck 20634 (WS); 5 mi. e. of Juntura,
 May 9, 1940, Peck 20689 (WILLU); 15 mi. n. of Ontario, May 17, 1950, Peck 25938

(CAS); Falen Ranch, Sheaville, 4,000 ft. alt., June 1, ?, Train (US). MORROW CO.: 18 mi. s.w. of Heppner, T. 4S., R. 25E., May 14, 1950, Cronquist 6343 (NY, ORE, OSC, POM, UC, US, WS, WTU); 20 mi. n. of Spray along Highway 207 to Heppner, May 29, 1955, Hitchcock 20532 (NY, WS, WTU); summit of hill on Rt. 207, 37.6 mi. s. of Heppner, May 22, 1966, Ownbey & Mingrone 3442 (WS); 16 mi. s.e. of Heppner, near Willow Creek, 4,808 ± ft. alt., July 16, 1917, Standley 708 (OSC); Rock Creek, 870 m. alt., May 18, 1894, Leiberg (MO); near Rock Creek, 890 m. alt., May 19, 1894, Leiberg 74 (GH, NY, ORE, POM, UC, US). UMATILLA CO.: 5 mi. n. of Ukiah, 3,600 ft. alt., T. 4S., R. 31E., S. 27, May 19, 1950, Cronquist 6363 (NY, ORE, OSC, POM, UC, WS, WTU); on ridge top, 10 mi. w. of Pilot Rock, T. 1S., R. 30-1/2E., May 25, 1950, Cronquist 6402 (NY, ORE, OSC, POM, UC, US, WS, WTU); 6 mi. n. of Ukiah, June 16, 1941, Ownbey & Brown 2408, grown at Pullman (WS); 5 mi. e. of Lehman Springs Junction, June 20, 1966, Ownbey & Mingrone 3460 (WS); 6 mi. n. of Ukiah Junction, June 1, 1945, Weber 2877, grown at Pullman (WS); 3 mi. n.e. of Lehman Springs, T. 4S., R. 34E., June 4, 1945, Weber 2893, grown at Pullman (WS). UNION CO.: Long Creek, May 21, 1949, Anderson 21 (OSC); no location, July, 1901, Burnaugh (OSC); no location, May, June, 1886, Cusick 443 (GH); near North Powder, May 10, 1928, Gale 264 (DS, MO); on s.w. slope, 13 mi. n. of North Powder, July 2, 1942, Ownbey & Aase 2568 (WS). WALLOWA CO.: stony hills toward Snake R., May, June, 188?, Cusick 1443 (ORE); Bald Knob, 6,500 ft. alt., June 23, 1907, Jardine 18 (US); at top of grade, n. of Chico Guard Station toward Billy Meadows, July 1, 1942, Ownbey & Aase 2558 (WS); 15 mi. n.e. of Enterprise, July 3, 1933, Peck 17469 (DS, NY, WILLU); Bald Knob, n. slope, June 23, 1907, Sampson & Pearson 31 (US); Bald Knob, on scabland, June 23, 1907, Sampson & Pearson 32 (US); summit of Mt. Wilson, 5,000 ft. alt., May 20, 1897, Sheldon 8105 (MO, NY). WASCOCO.: Lost Valley, May 15, 1882, Howell (NY, US). WHEELER CO.: ca.

12 mi. on road from Mitchell to Prineville on Highway 26, May 9, 1957, Calder, Savile, & Taylor 20721 (WS); e. slope, 6 mi. n. of Fossil, 3,000 ft. alt., T. 6S., R. 21E., May 26, 1940, Cronquist 6423 (NY, UC, US, WS, WTU); Mitchell, May 15, 1885, Howell 549 (GH); 5 mi. n. of Fossil, May 22, 1966, Ownbey & Mingrone 3438 (WS); 6 mi. w. of Fossil, May 22, 1966, Ownbey & Mingrone 3440 (WS); 10 mi. s.w. of Mitchell, June 5, 1967, Ownbey & Mingrone 3495 (WS); on Rt. 207, 3 mi. n.e. of Mitchell, June 5, 1967, Ownbey & Mingrone 3497 (WS); 14 mi. e. of Mitchell, 3,600 ft. alt., June 6, 1945, Ripley & Barneby 6633 (CAS, WS); summit between Bridge Creek and Mountain Creek, 4,500 ft. alt., May 17, 1952, Steward & Bratz 6083 (OSC); e. side of Younger Spring, 5,700 ft. alt., T. 13S., R. 33E., S. 17, June 28, 1945, Weber 2952, grown at Pullman (WS); Bird Lava, 4,500 ft. alt., T. 13S., R. 23E., S. 20, June 28, 1945, Weber 2954, grown at Pullman (WS); 5.5 mi. e. of Pisgah Lookout, 5,800 ft. alt., June 28, 1945, Weber 2957, grown at Pullman (WS).

WASHINGTON. ASOTIN CO.: overlooking Grande Ronde R., just above Rattlesnake Creek, s.w. of Anatone, T. 7N., R. 44E., ca. S. 25, Apr. 24, 1949, Cronquist 5728 (CAS, DS, GH, NY, POM, UC, US, WS, WTU); Gooseneck Ridge, May 14, 1963, Daubenmire 63148 (WS); T. 8N., R. 46E., S. 27, May 25, 1964, Hitchcock 23488 (DS, NY, WTU); 6.6 mi. n. of Asotin on Washington highway 3, June 2, 1962, Gillett & Taylor 10996 (WS); just before crossing bridge of Grande Ronde R., at the bottom of Rattlesnake Grade, May 16, 1965, Mingrone 7, grown at Pullman (WS); along Rt. 129, 2 mi. s. of Anatone, May 16, 1965, Mingrone 8 (WS); 1 mi. n. of Anatone, June 8, 1941, Ownbey & Aase 2403 (WS); 7 mi. s. of Anatone, June 8, 1941, Ownbey & Aase 2404, grown at Pullman (WS); just s. of Big Butte, Blue Mts., June 29, 1942, Ownbey & Aase 2544, grown at Pullman (WS); along Grande Ronde R., at mouth of Rattlesnake Creek, Apr. 27, 1947, Ownbey, Aase, & Witt 3123, grown at Pullman (WS); 0.5 mi. below Big Butte lookout,

May 15, 1966, Owney & Mingrone (WS); n. of Grande Ronde, T. 7N., R. 46E.,
 May 20, 1922, St. John & Brown 3835 (WS); Rogersburg, T. 7N., R. 47E., S. 19,
 May 20, 1922, St. John & Brown 4196 (WS); Big Butte, 6 mi. w. of Anatone,
 4,500 ft. alt., May 30, 1928, St. John & Palmer 9607 (WS). COLUMBIA CO.:
 Abels Ridge, T. 10N., R. 41E., Blue Mts., Apr. 16, 1949, Beuchner, grown at
 Pullman (WS). GARFIELD CO.: 4 mi. from Umatilla National Forest, above
 Pomeroy, Blue Mts., May 19, 1936, Beinke 141 (WTU); summit, Abels Ridge, 12 mi.
 s. of Pomeroy, May 9, 1947, Daubenmire, grown at Pullman (WS); small streams,
 Blue Mts., s. of Pomeroy, May 18, 1936, Maxfield 76 (UC); s.w. of Pomeroy in
 Blue Mts., May 18, 1936, Meyer 296 (MO, WS). WHITMAN CO.: bank of Snake R.,
 just below Truax, Apr. 27, 1941, Owney & Aase 2380 (WS); Snake R., Truax,
 Apr. 22, 1916, Pickett 374 (MO, UC, WS, WTU).

13b. Allium tolmiei var. platyphyllum (Tidestrom) Ownbey

Allium platyphyllum Tidestrom in *Torreyia* 16:242. 1916. Type, Coville 2362
 (US), on steep scabland, on the trail from Chico to Billy Meadows. Valley
 of Peavine Creek, Wallowa National Forest, alt. about 1,200 meters, May 31,
 1907, studied. Allium tolmiei var. platyphyllum Ownbey in *Res. Stud. St.*
Coll. Wash. 18:28. 1950.

Bulb ovoid, outer coats brown, inner coats white, both without evident
 reticulations; leaves 2 per scape, flat, thick, somewhat falcate, 3 to 10 mm
 broad, about as long as the scape, deciduous at maturity; scape 10 to 25 cm
 tall, strongly flattened and 2-edged, winged, the wings sometimes minutely
 crenulate, deciduous at maturity; bracts of the inflorescence 2, lanceolate,
 acuminate; umbel 10- to 40 or more-flowered; pedicels less than twice the
 length of the perianth, perianth segments 8 to 12 mm long, lanceolate, acumi-
 nate, entire, involute at the tip, white to pink with prominent midribs;
 stamens 2/3 to 4/5 as long as the perianth segments, anthers yellow or purple,
 filaments dilated below and united into a ring at the base; ovary distinctly
 crested with 6 low processes, style about equaling the perianth segments,

stigma capitate, entire; capsule distinctly crested; seeds black, dull, alveoli not pustuliferous. $n=14$.

Distribution.--Rocky slopes and prairies, northeastern Oregon, Wallowa and Union Cos., and Idaho Co., Idaho (Fig. 4).

IDAHO. IDAHO CO.: a few mi. s. of Grangeville, June 25, 1940, Aase, grown at Pullman (WS); 12 mi. s. of Grangeville, May 28, 1938, Beinke 450 (WS); near Grangeville, no date, Christ 3108 (NY); lower slopes of Mt. Idaho, 8 mi. s. of Grangeville, May 30, 1938, Christ 10077 (NY); Joseph, May 21, 1939, Christ 10209 (NY); 3 mi. n. of Ferdinand, in Lawyer Canyon, May 28, 1940, Christ 10984 (NY); White Bird Summit, T. 29N., R. 2E., June 15, 1941, Davis 3212 (CAS); Whitebird, June 27, 1932, Gail & Long 13888 (NY); 0.5 mi. s.w. of Whitebird Summit, T. 29N., R. 2E., S. 5, June 19, 1950, Jones 83 (POM, WS); near Grangeville, June 17, 1942, Gleason 456 (WS); 6 mi. s. of Grangeville, May 29, 1944, Hitchcock & Muhlick 8462 (CAS, DS, GH, NY, US, WS, WTU); 6 mi. s. of Grangeville (with 8462), May 29, 1944, Hitchcock & Muhlick 8463 (CAS, DS, GH, NY, US, WS, WTU); slopes along Whitebird grade, ca. 10 mi. s. of Grangeville, May 28, 1938, Meyer 1452 (GH, MO, UC, WS); 4 mi. s.w. of Grangeville, June 1, 1941, Ownbey & Aase 2398 (WS); 4 mi. s.w. of Grangeville, June 1, 1941, Ownbey & Aase 2398a (WS); 2 mi. down Whitebird Grade above Salmon R., June 1, 1941, Ownbey & Aase 2399 (WS); 2 mi. s.e. of Ferdinand, June 1, 1941, Ownbey & Aase 2400 (WS); Salmon R. Canyon, 1.0 mi. above mouth of White Bird Creek, May 2, 1959, Ownbey, grown at Pullman (WS); 6 mi. s.w. of Grangeville on old Rt. 95, June 17, 1966, Ownbey & Mingrone 3446 (WS); 6 mi. s.w. of Grangeville, 3,750 ft. alt., June 14, 1951, Ripley & Barneby 10737 (CAS, WS).

OREGON. UNION CO.: 7 mi. e. of Elgin, July 2, 1942, Ownbey & Aase 2565 (WS); 6 mi. e. of Elgin, June 20, 1966, Ownbey & Mingrone 3462 (WS); 7 mi. e. of Elgin, June 20, 1966, Ownbey & Mingrone 3463 (WS). WALLOWA CO.: ca.

7 mi. n. of Enterprise, May 27, 1949, Baker 6072 (NY, OSC, WS); ca. 23 mi. n. of Enterprise, June 2, 1950, Baker 6792 (NY, OSC, WS); along Crow Creek, 11 mi. s. of Chico P.O., July 1, 1942, Ownbey & Aase 2555 (WS); along grade directly above Chico Guard Station, ca. halfway up, July 1, 1942, Ownbey & Aase 2556 (WS); at top of grade from Chico Guard Station toward Billy Meadows, July 1, 1942, Ownbey & Aase 2557 (WS); 6 mi. s.e. of Paradise, 4,400 ft. alt., T. 5N., R. 44E., S. 36(?), date ?, Ownbey 3171, grown at Pullman (WS); 30 mi. n. of Enterprise on Rt. 3, on rim of Joseph Creek Canyon, just n. of Joseph Canyon Lookout, May 22, 1966, Ownbey & Mingrone 3445 (WS); near summit of grade, Rt. 82, 5 mi. w. of Minam, May 31, 1967, Ownbey & Mingrone 3469 (WS).

13c. Allium tolmiei var. persimile Ownbey

Allium tolmiei var. persimile Ownbey in Res. Stud. St. Coll. Wash. 18:29. 1950. Type, Ownbey & Aase 2578 (WS), moist to dry sand along seasonal watercourse, 3 miles north of Hornet Creek Ranger Station, Cuddy Mts. (16 miles n.w. of Council), Adams Co., Idaho, July 5, 1942, and isotypes (NY, WS), studied.

Bulb ovoid, outer coats brown, with an inner membrane with distinct cellular reticulations, inner coats white to pink; leaves 2 per scape, flat, thick, slightly falcate, 3 to 7 mm broad, about as long as the scape; usually persistent at maturity; scape 10 to 20 cm tall, not strongly flattened or winged, usually persistent at maturity; bracts of the inflorescence 2 or 3, ovate to lanceolate, acuminate; umbel 10- to 50 or more-flowered; pedicels less than twice as long as the perianth; perianth segments 8 to 10 mm long, lanceolate, acute, entire, involute at the tip, pinkish with prominent midribs; stamens nearly as long as the perianth segments, anthers yellow or purple, filaments dilated below and united into a ring at the base, ovary crestless, style about as long as the perianth segments, stigma capitate, entire; capsule crestless, seeds black, dull, alveoli not pustuliferous. $n=21$.

Distribution.--Sandy rocky soil and along seasonal water courses, known only from Adams Co., Idaho (Fig. 4).

IDAHO. ADAMS CO.: Indian Valley, 2,300 ft. alt., July 15, 1899, Jones 6650 (POM); 25 mi. n.w. of Council, on road to Cuprum, June 28, 1950, Ownbey 3284, grown at Pullman (WS); 17 mi. n.w. of Fruitvale on road to Bear, June 18, 1966, Ownbey & Mingrone 3450 (WS); 20 mi. n.w. of Fruitvale on road to Cuprum, June 18, 1966, Ownbey & Mingrone 3451 (WS); 2.6 mi. n. of Hornet Creek Ranger Station, Cuddy Mts., June 18, 1966, Ownbey & Mingrone 3452 (WS).

14. Allium siskiyouense Ownbey

Allium siskiyouense Ownbey in Munz, Calif. Fl. 1372. 1959. Without Latin diagnosis. Type (WS), grown at Pullman, Washington, from bulbs of Ownbey & Preece 3336, from Siskiyou Mts., 1.0 mi. s. of summit, Jackson Co., Oregon, studied.

Allium falcifolium var. demissum Jepson, Fl. Calif. 1:280. 1921. Type, Jepson 2830 (UC), Marble Mt., California, July 5, 1907, studied.

Bulbus ovoideus, tunicis interioribus roseis, exterioribus cinerascens fuscisve sine vel cum reticulis inconspicuis; foliis 2 late linearibus glaucis falcatis 3-5 mm latis scape duplo-plus duplo longioribus in maturitate deciduis; scape 4-6 cm alto complanto 2-alato in maturitate deciduo, alis serrulantibus papillosisve; involucre 2-bracteato, bracteis ovatis, acuminatis; umbella 10-20-flora, pedicellis perianthio longioribus; perianthii segmentis 8-11 mm longis ellipticilanceolatis obtusis saepe denticulatis roseis lilacinisve, nervis viridis prominulis; staminibus longitudine 2/3-3/4 perianthii segmentis aequantibus, filamentis saepe papillosis, basibus dilatatis; ovario cristato, processibus tribus parallelis dorsalibus, stylo incluso, stigmate capitato integro; capsula cristata; seminibus nigris rugosis alveolatis, alveolis non pustulatis.

Bulb ovoid, outer coats grayish or brownish, inner coats pink, both not at all or inconspicuously reticulate; leaves 2 per scape, broadly linear,

glaucous, falcate, 3 to 5 mm broad, twice as long as the scape or more, deciduous at maturity; scape 4 to 6 cm tall, flattened, 2-edged and winged, deciduous at maturity; the wings serrulate or papillose; bracts of the inflorescence 2, ovate, acuminate; umbel 10- to 20-flowered; pedicels longer than the perianth; perianth segments 8 to 11 mm long, elliptic-lanceolate, obtuse, often denticulate, pink to lilac with prominent green midribs; stamens $2/3$ to $3/4$ as long as the perianth segments, anthers yellow or purple, filaments often papillose and dilated below; ovary crested, the 3 processes forming parallel ridges along the back of the lobes, style included, stigma capitate, entire; capsule crested; seeds black, shining, alveoli not pustuliferous. $n=7$.

Illustration.--Abrams, Ill. Fl. Pac. States 1:386. 1923, as A. watsonii.

Distribution.--Heavy rocky soil, area of the Siskiyou Mts., California into Jackson and Josephine Cos., Oregon (Fig. 4).

CALIFORNIA. DEL NORTE CO.: summit of Happy Camp-Waldo road, 5,400 ft. alt., July 15, 1950, Hoffman 3244, grown at Pullman (UC, POM, WS); Siskiyou Mts., summit, June, 1884, Howell (GH); Siskiyou Mts., June 17, 1884, Howell (DS, NY, US, WS). HUMBOLDT CO.: Trinity Summit, Corral Prairie, 5,200 ft. alt., July 12, 1932, Tracy 10484 (GH, UC, WS); South Fork Mt., along summit near Blake Lookout, ca. 5,600 ft. alt., July 16, 1933, Tracy 12789 (UC, WS, WTU). SISKIYOU CO.: summit of Siskiyou Mts., between Happy Camp and O'Brien, Oregon, July 8, 1940, Aase & Ownbey, grown at Pullman (WS); Yreka Hills, May 3, 1909, Butler 791 (DS, POM, UC); near Yreka, Apr. 10, 1910, Butler 1167 (DS, POM, UC, US); Goosenest Foothills, 5,000 ft. alt., June 19, 1910, Butler 1577 (US); Marble Mt., 8,000 ft. alt., June, 1901, Chandler 1647 (DS, MO, NY, UC, US); between King's Castle and Black Mts., w. side of ridge, ca. 6,000 ft. alt., July 9, 1939, Hitchcock & Martin 5319 (DS, MO, NY, POM, UC, US, WS, WTU); near

summit of road from Takilma, Oregon to Happy Camp, California, June 23, 1954, Hitchcock 20239 (NY, WS, WTU); 7.5 mi. n. of West Branch Camp, 4,600 ft. alt., Waldo-Happy Camp Road, July 8, 1948, Hoffman 2589 (UC, WS); on the higher peak of Baldy Mt., over 5,700 ft. alt., July 13, 1950, Hoffman 3239, grown at Pullman (UC, WS); e. slope of Baldy Lookout, July 13, 1950, Hoffman 3251, grown at Pullman (UC, WS); at Packers Valley above Hammonds Camp, Marble Mts., 6,800 ft. alt., July 12, 1951, Hoffman 3793, grown at Pullman (WS); top of Siskiyou Mts., near Happy Camp Trail, June, 1884, Howell 283 (ORE); Crest of Siskiyou on road from Happy Camp to Cave Junction, Oregon, 5,100 ft. alt., June 22, 1958, Lenz 23298 (POM); 2nd Camp, Marble Mt. Wilderness Area, July, 1963, Mann, Tucker, & Holloway (WS); Marble Mt., July 7, 1940, Meyer & Biddulph, grown at Pullman (WS); Baldy Mt., ca. 6 (air-line) mi. w. of Happy Camp, Siskiyou Mts., 5,700 ft. alt., July 2, 1952, Munz 17898 (CAS, NY, WTU); Yreka, Apr. 20, 1914, Smith 637 (CAS); Yreka, Apr. 20, 1914, Smith 638 (GH); summit of the Siskiyou at crossing of the Takilma-Happy Camp Road, 3 mi. s. of Oregon-California Line, June 16, 1951, Tracy 19491 (UC).

OREGON. JACKSON CO.: near Ashland, w. Cascade Mts., June 12, 1895, Applegate 722 (GH); near Ashland, w. slope Cascade Mts., 3,000 ft. alt., June 13, 1895, Applegate 772 (US); Inlow ranch, Dead Indian road, Cascade Mts., June 13, 1895, Applegate 722 (DS); head of Samson Creek, 4,000 ft. alt., June 1, 1895, Applegate 722a (DS); dry crest of Siskiyou Mts., near Pilot Rock, 5,500 ft. alt., May 23, 1898, Applegate 2268 (DS, US); crest of Keene Creek ridge, summit of Green Spring Mt., May 22, 1924, Applegate 4076 (DS); Jenny Creek, near Pinehurst, May 16, 1925, Applegate 4277 (DS); Jenny Creek, near Pinehurst, May 16, 1925, Applegate 4316 (UC, WILLU); on Pilot Rock, summit of the Siskiyou Mts., June 18, 1928, Applegate 5525 (DS); near top of Green Spring Mt., Keene Creek, June 16, 1932, Applegate 7244 (DS, WILLU); near Siskiyou Summit, May 20,

1936, Cantelow 1324 (CAS); just below Siskiyou Camp, May 20, 1936, Cantelow (CAS); w. slope of Cascades, 4,000 ft. alt., July 10, ?, Cusick 2869a (ORE, POM); High Cascades, June, 1927, Heckner (WTU); Siskiyou Summit on state highway 4520, June 21, 1922, Heller 13634 (WTU); Bever Creek Grade, from Applegate R. to Dutchman Peak, 2.1 mi. w. of summit, ca. 6,300 ft. alt., July 10, 1948, Hoffman 2618 (UC, WS); on Table Rock, Apr. 18, 1887, Howell (MO, NY, ORE, US, WTU); Siskiyou Summit on Pacific Highway, 4,200-4,600 ft. alt., June 23, 1929, Kildale & Gillespie 8349 (DS); on Dead Indian Road to Lake o' the Woods, June 14, 1950, Kruckeberg 1787, grown at Pullman (WS); Grizzly Range, e. of Medford, 1,700 m. alt., June 21, 1899, Leiberg 4132 (ORE, US); near summit of Siskiyou Mts., 5 mi. n. of the California line, July 3, 1940, Ownbey 2169, grown at Pullman (WS); 0.1 mi. e. of Pinehurst, June 2, 1967, Ownbey & Mingrone 3488 (WS); 1.0 mi. s. of the summit (Siskiyou Mt.) on the old Siskiyou road, June 2, 1967, Ownbey & Mingrone 3491 (WS); on s. slope of Siskiyou Mts., near the California line, June 25, 1952, Ownbey & Preece 3336, grown at Pullman (WS); Dead Indian Road, July 7, 1931, Peck 16727 (DS, WILLU); w. of Pinehurst, 4,550 ft. alt., June 9, 1945, Ripley & Barneby 6687 (CAS); Jenny Creek, Green Springs Highway, May 25, 1942, Small, grown at Pullman (WS); at Crystal Springs, "reached by crossing the bridge across Lost River at Olene, and driving ca. 1 mi. n.e.," June 5, 1942, Small, grown at Pullman (WS); summit of ridge between Dutchman Peak and Little Red Mt., 6,500 ft. alt., T. 40S., R. 2W., S. 25, Siskiyou Mts., July 14, 1950, Whittaker (WS); summit slopes of Big Red Mt., 7,000 ft. alt., T. 40S., R. 1W., S. 21, Siskiyou Mts., July 15, 1950, Whittaker 336 (WS). JOSEPHINE CO.: Lake Mt., Oregon Caves National Monument, July 14, 1936, Applegate 10582 (DS); Sand Ridge, ca. 2 mi. e. of the Oregon Caves, July 27, 1939, Applegate 11972 (DS, UC); top of ridge, ca. 1 mi. e. of the Oregon Caves, Siskiyou Mts., July 28, 1939, Applegate 11975 (DS, UC); at

the summit of the Siskiyou Mts., 4,500 ft. alt., June 21, 1922, Heller 13634 (DS, MO, NY, US); on Lake Mt. Trail, 4 mi. e. of Oregon Caves, Siskiyou Mts., July 3, 1939, Hitchcock & Martin 5141 (WTU); cliffs above Bolan Lake, Siskiyou Mts., near California border, July 7, 1939, Hitchcock & Martin 5260 (NY, WTU); Siskiyou Mts., June 17, 1884, Peck (WTU); Mt. Grayback, 4,000-6,000 ft. alt., June 27, 1936, Thompson 12977 (MO, NY, WS, WTU).

15. Allium crenulatum Wiegand

Allium crenulatum Wiegand in Bull. Torr. Bot. Club 26:135, pl. 355, fig. 1. 1899. Type, Flett 44 (CU), loose gravel near the summit of the Olympic Mts., in the vicinity of the headwaters of the Quilcene River, Jefferson Co., Washington, July 23, 1897, not seen. There is no question concerning its identity.

Allium vancouverense Macoun in Cat. of Canadian Plants 4:37. 1888, nomen subnudum. Isotypes (GH, NY, US), collected by J. Macoun, Mt. Arrowsmith, Vancouver Island, July 17, 1887, studied.

Allium watsoni Howell in Fl. N. W. Am. 1:642. 1902. Type, Howell 368 (ORE), Elkhead, Douglas Co., Oregon, Apr., 1881, and isotype (GH), studied.

Allium cascadense M. E. Peck in Proc. Biol. Soc. Wash. 49:109. 1936. Type, Leach 4486 (in herb. of Mrs. Leach in 1936), Jefferson Park, alt. 1,700 m., Linn Co., Oregon, Aug. 9, 1933, not seen. Isotype (WILLU), studied.

Bulb obliquely ovoid, often paired, outer coats grayish or brownish, inner coats whitish, both without reticulations; leaves 2 (rarely 1) per scape, narrow, falcate, 1.5 to 4 mm broad, twice the length of the scape, deciduous at maturity, the margins sometimes crenulate; bracts of the inflorescence 2, lanceolate, acute; umbel 12- to 20-flowered; pedicels shorter than the perianth; perianth segments 6 to 12 mm long, lanceolate, acute, pinkish with conspicuous dark rose midribs; stamens 1/2 to 2/3 as long as the perianth segments, anthers yellow or purple, filaments dilated below; ovary with 6-parted crest, style included, stigma capitate, entire; capsule obscurely crested or crestless; seeds black, shining, alveoli not pustuliferous. $\underline{n}=7$.

Illustrations.--Bull. Torr. Bot. Club 26, t. 355. 1899. Abrams, Ill. Fl. Pac. States 1:387. 1923.

Distribution.--Talus slopes and serpentine soils, high elevations, southern Vancouver Island, Olympic Mts., Washington, eastward to the Wenatchee Mts., and at high altitudes west of the Cascade Range in Oregon (Fig. 5).

BRITISH COLUMBIA. VANCOUVER, ISLAND.: Mt. Arrowsmith, Aug. 7, 1901, Anderson, Geol. Survey of Canada no. 70914 (US); Aug. 7, 1901, Fletcher & Anderson 1101 (WS); Hills Cowichan, July, 1916, Anderson (WS); near Mt. Becker, Forbidden Plateau, July 25, 1961, Calder & MacKay 31899 (WS); Mt. Arrowsmith, July, 1916, Carter (ORE); Mt. Arrowsmith, 3,500 ft. alt., Aug. 13, 1926, Carter (GH); Mt. Arrowsmith, 4,500 ft. alt., June 29, 1906, Rosendahl 1640 (NY); Lake Cowichan, by Mesatchie Mt., 3,400 ft. alt., July 23, 1916, Simpson (WS).

OREGON. BENTON CO.: Mary's Peak, July 4, 1913, Alexander (OSC); Mary's Peak, T. 12S., R. 7W. S. 28, 4,090 ft. alt., Detling 6894 (ORE); Top of Mary's Peak, w. of Corvallis, 4,000 ft. alt., June 16, 1916, Gilbert 36 (OSC, US); summit of "Mary's Peak," July 22, 1881, Henderson (ORE); near summit of Mary's Peak, June 19, 1952, Ownbey & Preece 3305 (WS); summit of Mary's Peak, June 19, 1952, Ownbey & Preece 3306 (WILLU, WS); Mary's Peak, June 16, 1940, Powell (OSC); top of Mary's Peak, T. 12S., R. 7W., N.W. 1/4 S. 28, 4,050 ft. alt., Sturges 289 (OSC, WS, WTU); Mary's Peak, July 11, 1943, Taylor 1065 (WILLU). CLACKAMAS CO.: 3 mi. w. of Table Rock, May 30, 1924, Peck 13236 (WILLU). CLATSOP CO.: Saddle Mt., T. 6N., R. 8W., S. 28, 2,500 ft. alt., July 22, 1963, Dennis 2555 (DS); Saddle Mt., T. 6S., R. 8W., S. 19, 3,250 ft. alt., June 14, 1949, Detling 6447 (DS, ORE, UC); Saddle Mt. (Middle Peak), T. 6N., R. 8W., S. 29, 3,100 ft. alt., June 27, 1951, Detling 6964 (ORE); part way up Saddle Mt., July 9, 1962, French 2139 (WS); Saddle Mt., June 29, 1940, Gilkey (OSC); Saddle Mt., June 6, 1942, Gilkey (ORE, OSC); summit of Onion

Peak, ca. 4 mi. e. of Arch Cape, elev. 3,060 ft., July 7, 1967, Heckard 1637 (UC, WS); Saddle Mt., June 22, 1952, Howell 28431, grown at Pullman (CAS, POM, WILLU, WS); Saddle Mt., June 15, 1936, Ifft 58 (DS); near the summit of Saddle Mt., June 11, 1967, Mingrone & McNeal 97 (WS); Saddle Mt., June 10, 1928, Patterson 39 (ORE); Saddle Mt., June 24, 1938, Rossbach & Rossbach 518 (DS).

CURRY CO.: Squirrel Camp, s. of Agnes, Siskiyou National Forest, June 7, 1928, Leach & Leach 1713 (ORE); near Bear Camp, Siskiyou National Forest, June 6, 1928, Leach & Leach 1714 (ORE); Tincup Creek, June 14, 1930, Leach & Leach 2938 (ORE); Squirrel Camp, near Agnes, no date, Leach (WTU); Snow Camp, 4,000-4,250 ft. alt., July, 1916, Thompson 49 (DS); on shoulder of Humbug Mt., June 25, 1938, Rossbach & Rossbach 445 (DS).

DOUGLAS CO.: summit, w. of Abbot's Butte, boundary between Jackson and Douglas Cos., 5,500 ft. alt., June 29, 1898, Applegate 2590 (DS, US); s. base of Hershberger Mt., upper waters of Rogue R., July 13, 1929, Applegate 6024 (DS); Oakland, Apr., 1881, Howell (GH); near Roseburg, May, 1881, Howell (ORE); Coast Mts., Roseburg, June 20, 1887, Howell 723 (GH); near Abbott's Butte, 1,700 m. alt., July 6, 1899, Leiberg 4228 (ORE, US).

LANE CO.: Calapooya Range, Bohemia Mt., summit, 5,976 ft. alt., July 4, 1948, Baker 5571 (OSC, UC, WS); O'Leary Mt., T. 17S., R. 6E., S. 5, 4,800 ft. alt., June 28, 1938, Detling 3109 (WS); Coburg Hills, T. 17S., R. 3W., S. 1, 2,300 ft. alt., Detling 6853, grown at Pullman (ORE, WS); summit, Bohemia Mt., Calapooya Mts., June 22, 1952, Ownbey & Preece 3310 (WS); n. slope of Horse Pasture Mt., 10 mi. s. of McKenzie Bridge, July 1, 1914, Peck 2534 (WILLU).

LINN CO.: Monument Peak, 4,680 ft. alt., June 19, 1947, Aller 416 (OSC); Monument Peak, June 8, 1940, Gilkey (OSC); Monument Peak, elev. ca. 4,700 ft., June 24, 1967, Marttala (WS); Monument Peak, on a pinnacle ca. 1/2 mi. e. of the lookout, elev. ca. 4,700 ft., July 1, 1967, Marttala (WS).

MARION CO.: top of House Mt., May 30, 1926, Peck 14635 (WILLU).

WASHINGTON. CHELAN CO.: Jolly Mt. (Mt. Stuart area), July 15, 1933, Eastwood (OSC); Leavenworth, May 18, 1928, St. John, Eggleston, Beals, & Warren 9498 (WS); Lookout Mt., near Leavenworth, 5,000 ft. alt., May 23, 1931, Thompson 6489 (OSC, WTU); above head of Beverly Creek, 5,200 ft. alt., June 13, 1931, Thompson 6619 (DS, GH, OSC, US, WTU); at Stuart Pass, Wenatchee Mts., 7,000 ft. alt., July 27-31, 1931, Thompson 7721 (WTU); Tronson Ridge, 3,500 ft. alt., May 21, 1932, Thompson 8303 (US, WTU); top of ridge across Ingalls Creek from Crystal Creek, T. 22N., R. 16E., S. 3, July 20, 1948, Ward & Sheldon 736 (WS).

CLALLAM CO.: above Idaho Camp, Hurricane Ridge, Olympic National Park, July 23, 1940, Aase, grown at Pullman (WS); near Obstruction Point, Hurricane Ridge, Olympic National Park, July 23, 1940, Biddulph, grown at Pullman (WS); n. of Hurricane Lookout, 5,600 ft. alt., July 25, 1956, Brockman (WTU); Olympic Mts., July, 1900, Elmer 2492 (DS, MO, NY, ORE, US, WS); Mt. Angeles, 4,500 ft. alt., July 22, 1931, Howell 7464 (CAS, POM); Mt. Angeles, Aug., 1932, Johnson (POM); Hurricane Ridge, 4,500 ft. alt., July, 1931, Jones 3236 (UC, WTU); trail between Hurricane Ridge and Mt. Angeles, Aug. 12, 1951, Kruckeberg, grown at Pullman (WS); along Hurricane Ridge, 5,800 ft. alt., Aug. 11, 1937, Meyer 1116 (MO); e. side of Obstruction Point ridge, 6,100 ft. alt., Sept. 5, 1937, Meyer 1257 (GH, MO, US, WS); Blue Mt., 6,000 ft. alt., July 15, 1937, Muenschler & Muenschler 11139 (NY); Mt. Angeles, 5,500 ft. alt., Olympic Mts., Aug. 2, 1930, Thompson 5533 (DS, GH, MO, WTU); Mt. Angeles, 5,500 ft. alt., July 17, 1931, Thompson 7429 (DS, GH, MO, POM, UC, WTU); Mt. Angeles, 5,300 ft. alt., July 15, 1932, Thompson 8762 (DS, GH, MO, NY, US, WTU); Mt. Angeles, 5,200 ft. alt., July 15, 1933, Thompson 9444 (MO, NY, POM, UC, WTU); Hurricane Ridge, 4,500 ft. alt., Thompson 10614 (MO, NY, WTU); Hurricane Ridge, 6,000 ft. alt., Sept. 6, 1937, Thompson 14213 (GH, MO, NY, UC, US, WTU). JEFFERSON CO.: s. slope of Constance Ridge, Olympic Mts., 5,000 ft. alt., Meyer 716 (MO, WS); summit of

Mt. Steele, 7,000 ft. alt., Aug., 1895, Piper 2218 (GH, US, WS); Marmot Pass, 6,500 ft. alt., Aug. 13, 1931, Thompson 7959 (MO, WTU); Marmot Pass, 6,000 ft. alt., Thompson 11060 (CAS, DS, MO, NY, POM, US, WTU). GRAYS HARBOR CO.: Baldy Peak, 4,000 ft. alt., July 25, 1897, Lamb 1330 (MO, WS); summit of Col. Bob Lookout, 4,700 ft. alt., July 9, 1931, Thompson 7239 (MO, WTU); e. s.e. slope, Hurricane Ridge, Olympic Mts., 5,125 ft. alt., Aug. 24, 1966, Tisch 500, grown at Pullman (WS). KITTITAS CO.: ridge s. of highest peak n.e. of Fish Lake, 30 mi. n.w. of Cle Elum, 5,600 ft. alt., July 6, 1942, Hitchcock 7970 (WTU); cliffs of Wenatchee Mts., s. of Cashmere, ca. 6 mi. w. of Mission Peak, July 17, 1954, Hitchcock 20337 (NY, WTU); at Mt. Lilian, Table Rock Area, just below summit, 2 mi. off Liberty-Wenatchee Road, ca. 5,500 ft. alt., July 4, 1952, Kruckeberg 3043 (WTU); along trail to Koppen Peak, via Johnson Creek, 5,000 ft. alt., T. 22N., R. 15E., S. 14, s.w. corner, June 23, 1960, Kruckeberg 5016 (WTU); ridge between Standup and Bean Creeks, surmounted by Earl Peak, N. Fork Teanaway R. drainage, July 10, 1960, Kruckeberg 5079 (WTU); s. slope of summit e. of Upper Naneum Meadow, on road from Mt. Lillian to Mission Peak, T. 21N., R. 19E., 5-6,000 ft. alt., Wenatchee Mts., May 13, 1947, Weber & Schultz, grown at Pullman (WS); Valley of the Swauk R., T. 17 & 18, R. 21, 750-1,800 m. alt., May-Sept., 1913, Sharpless 32 (GH); at head of Beverly Creek, 5,500 ft. alt., July 13, 1932, Thompson 8761 (MO, US, WTU); Table Mt., Wenatchee Mts., 5,000 ft. alt., July 3, 1933, Thompson 9271 (POM, WTU); Paddy-Go-Easy Pass, 5,000 ft. alt., June 17, 1934, Thompson 10678 (US, WTU); ridge near Liberty, 3,000 ft. alt., May 11, 1935, Thompson 11473 (CAS, DS, MO, NY, POM, WS, WTU). MASON CO.: Mt. Washington Trail, 4,500 ft. alt., Aug. 5, 1951, Freer 428 (WTU); near the summit of Mt. Steele, 6,000 ft. alt., Aug. 14, 1937, Meyer 1162 (WS).

16. Allium pleianthum S. Watson

Allium pleianthum S. Watson in Proc. Am. Acad. 14:233. 1879. Lectotype (GH), collected by Rev. R. D. Nevius, in John Day Valley, Blue Mts., Oregon, in 1874, studied.

Bulb obliquely ovoid, outer coats grayish or brownish, inner coats white or pink, both without distinct reticulations; leaves 2 per scape, flat, falcate, longer than the scape, 3 to 7 mm broad, deciduous at maturity; scape 5 to 9 cm tall, flattened, slightly winged, entire or somewhat crenulate; deciduous at maturity; bracts of the inflorescence 2, lanceolate, acuminate; umbel 17- to 25-flowered; pedicels 2 to 3 times as long as the perianth; perianth segments 10 to 12 mm long, lanceolate, acute, widely spreading, white to pink with dark midribs; stamens $3/4$ as long as the perianth segments, anthers yellow or purple, filaments dilated below and adnate to the perianth segments at the base; ovary with a distinct, 6-parted crest, style long, just included, stigma capitate, entire; capsule usually crested; seeds black, dull, alveoli not pustuliferous. $n=14$.

Distribution.--Heavy clay soils, known only from near Clarno and Mitchell, Wheeler Co., Oregon (Fig. 6).

OREGON. WHEELER CO.: 3 mi. n.e. of Clarno, T. 7S., R. 19E., May 6, 1950, Cronquist 6263 (WS, WTU); along Bridge Creek, 8 mi. n.w. of Mitchell, T. 11S., R. 21E., S. 4, 2,100 ft. alt., May 2, 1953, Cronquist 6915 (CAS, DS, GH, NY, OSC, POM, UC, WS WTU); 1.5 mi. e. of Clarno, T. 7S., R. 19E., S. 33, May 22, 1966, Ownbey & Mingrone 3439 (WS); 6.5 mi. w. of Mitchell, June 5, 1967, Ownbey & Mingrone 2496 (WS).

17. Allium parvum Kellogg

Allium parvum Kellogg in Proc. Calif. Acad. 3:54, fig. 13. 1863. Type, grown by H. G. Bloomer from bulbs sent from Washoe, Nevada, by A. A. Veach, not found and presumably lost. Allium tribracteatum var. parvum Jepson, Fl. Calif. 1:276. 1921.

Allium tribracteatum var. andersoni S. Watson in Bot. King Exped. 353. 1871. Lectotype, Anderson 63 (GH), sandy ridges, Carson City, Nevada, studied.

Allium pleianthum var. particolor Jones in Contrib. West. Bot. 10:31, fig. 61. 1902. Type, Jones 6656 (POM), Centreville, Nevada, alt. 6,300 ft., June 3, 1893, and isotype (GH), studied. The locality given in the original

publication is "Spring Valley, eastern Nevada, at 6,000-6,500° alt., in flower June 3, 1895." The two statements are linked by Jones's indication that the GH specimen is "var. particolor Jones, part of type."

Allium modocense Jepson, Fl. Calif. 1:279. 1921. Type, Steffen 43 (803) (UC), Jess Valley, 5,000 ft., Modoc Co., California, June 10, 1917, studied.

Bulb ovoid, outer coats grayish, inner coats white, both without evident reticulations; leaves 2 (sometimes 1) per scape, flat, thick, strongly falcate, commonly serrulate-denticulate, 2-5 mm broad, and 2-3 times as long as the scape, deciduous at maturity; scape 3 to 8 cm tall, flattened and winged, deciduous at maturity; bracts of the inflorescence 2, ovate to lanceolate, acuminate; umbel 5- to 10-flowered; pedicels about as long as the perianth, perianth segments 7 to 10 mm long, the 3 outer larger and broader, erect, entire, oblong, somewhat obtuse, the 3 inner, linear-lanceolate, sub-acute, rose to purple with conspicuous brown or purple midribs; stamens about 2/3 as long as the perianth segments, inner ones slightly longer than the outer ones, anthers yellow, pale-bluish or purple, filaments slightly dilated at the base; ovary crested with 3 (rarely 6) rounded processes, style about as long as the perianth segments, stigma capitate, entire to obscurely lobed; capsule crested; seeds black, dull, alveoli not pustuliferous. $n=7$.

Illustrations.--Proc. Calif. Acad. I. 3:55. 1863, not seen. Abrams, Ill. Fl. Pac. States 1:384. 1923.

Distribution.--Gravelly and stony clay slopes, Nevada, eastern Oregon, and adjacent Idaho and Utah, to northern and eastern California (Fig. 3).

CALIFORNIA. ALPINE CO.: Carson Pass, 8,000 ft. alt., July, 1965, Ackley (CAS); Carson Pass, June 17, 1940, Eastwood & Howell 8413 (CAS); Ebbetts Pass, June 18, 1940, Eastwood & Howell 8538 (CAS). MONO CO.: 3.7 mi. e. of Virginia Lakes resort, w. of Conway Summit off Highway 395, 9,000 ft. alt., June 15, 1941, Cantelow (CAS); Bodie, 8,374 ft. alt., June 27, 1945, Alexander & Kellogg 4317 (DS, US, WS). ELDORADO CO.: 41 mi. beyond Placerville,

Apr. 29, 1928, Robbins (POM). FRESNO CO.: North Fork of Kings R., 7,000 ft. alt., July, 1900, Hall & Chandler 442 (UC); less than a mile beyond Kaiser Pass on extension of Highway 168, June 29, 1951, Quibell & Quibell 101 (CAS, DS, POM, UC); Rock Mead. (or Long Mead.) n. of Black Peak, and just n. of emergence of South Fork Big Creek into Mead., above Huntington Lake, 8,950 ft. alt., July 26, 1953, Quibell 2997 (UC); first slope up the peak from the broad saddle between Helm and Big Creek drainages (tributaries of North Fork Kings R. and San Joaquin R.), s.w. of Black Peak, Aug. 5, 1953, Quibell 3178 (POM); University Peak, 12,300 ft. alt., Kearsarge Pass region, Sierra Nevada, Aug. 16, 1937, Sharsmith 3232 (UC). LASSEN CO.: between Susanville and Janesville, May 13, 1930, Gillespie 9371 (DS); s. of Surprise Valley, Modoc Co., 3,000-4,500 ft. alt., Apr. 28, 1940, Willits 199 (DS). MADERA CO.: Sierra National Forest, Shuteye Mt., 8,200 ft. alt., Aug. 22, 1907, Murdoch 2556 (GH, NY, US). NEVADA CO.: Hobart Mills, May 18-June 6, 1925, Drew (DS); Truckee, May, 1894, Sonne (NY); near Truckee, May 2, 1887, Sonne 450 (MO); on road to Donner, May 8, 1887, Sonne (DS); Truckee, July, 1887, Sonne (NY); road to Donner Lake, May 2, 1888, Sonne (UC); Truckee, May, 1894, Sonne (DS, ORE, US). PLACER CO.: Donner Pass to Mt. Lincoln, July 21, 1943, Howell 18655 (CAS). PLUMAS CO.: Hills, May, 1874, Austin (NY); no locality, 1877, Austin (GH); on trail to Long Valley, June, 1927, Eastwood 14623 (CAS); 2 mi. e. of Blairsden, 4,900 ft., May 14, 1954, Howell & Barneby 29557 (CAS); s.w. of Diamond Mt., s. of Susanville, 7,100-7,500 ft. alt., July 9, 1937, Stebbins & Jenkins 2274 (DS, UC). SHASTA CO.: Mt. Lassen trail above Drakesbad, June 20, 1929, Applegate 5769 (DS); Lassens Peak, Aug., 1896, Austin 433 (US); near base of Lassen Butte, 7,000 ft. alt., June 29, 1899, Copeland (DS); Castella, May 30, 1904, Piper 6397 (US). SIERRA CO.: along the Little Truckee R., 10 mi. s. of Sierraville on State Highway 89, 6,400 ft. alt., June 13, 1962, Breedlove 3527 (CAS, DS, WS); ca.

3.5 mi. e. of Loyalton, 5,300 ft. alt., May 22, 1937, Stebbins & Jenkins 2129 (GH, UC). SISKIYOU CO.: ridge between Tule Lake and Lower Klamath Marsh, Apr. 26, 1925, Applegate 4238 (DS, POM, WS); along Panther Creek, cascade between the two upper meadows, Mt. Shasta, 7,800 ft. alt., July 28, 1941, Cooke 16119 (MO); Plowman's Valley, "is along the upper e. fork of Scott R., i.e. from the w. base of the Gazells Grade to about Callahan--fide R. S. Ferris, 1950," 3,900 ft. alt., Apr. 11, 1946, Parker 122 (DS, POM, WS). TULARE CO.: between Rabbit Meadow and Big Meadow, along forest service road to Big Meadow and Horse Corral Meadow, Sequoia National Forest, 7,600 ft. alt., July 22, 1958, Bacigalupi & Alava 6488 (UC); plateau just s.w. of Siberian Outpost, 11,400 ft. alt., Aug. 27, 1937, Sharsmith 3442 (UC).

IDAHO. GEM CO.: Squaw Butte near Sweet, May 9, 1936, Tucker 602 (NY). WASHINGTON CO.: 3 mi. s. of Midvale, May 13, 1938, Christ 9319 (NY); middle slopes on Hitt Mt., Weiser National Forest, June 15, 1943, Christ 14043 (NY); 2 mi. s. of Midvale, on Midvale Hill, Apr. 29, 1948, Christ & Christ 17257 (NY); 15 mi. n. of Weiser, May 5, 1947, Davis (POM); divide along highway 10 mi. n. of Weiser, T. 4N., R. 4W., May 9, 1940, Davis 1965 (CAS); Weiser, July 5, 1899, Jones (POM); Mann's Creek Hill, 2,500 ft. alt., Apr. 25, 1900, Jones 6592 (DS, MO, NY, POM, US); 5 mi. s.w. of Midvale, summit of Midvale Hill, June 18, 1966, Ownbey & Mingrone, grown at Pullman (WS); summit of Midvale Hill, 5 mi. s.w. of Midvale, June 1, 1967, Ownbey & Mingrone 3472 (WS); 5.5 mi. s.w. of Midvale, 3,327 ft. alt., June 12, 1946, Ownbey & Ownbey 2760, grown at Pullman (WS); 6 mi. s.w. of Midvale, Apr. 13, 1947, Ownbey & Ward 3115, grown at Pullman (WS).

NEVADA. ELKO CO.: 1 mi. s.w. of Cave Creek Post Office, Ruby Valley, May 25, 1928, Mason 4757 (UC). EUREKA CO.: n. slope of Lone Mt., w. of Eureka, 6,700 ft. alt., June 13, 1944, Ripley & Barneby 6242 (WS).

HUMBOLDT CO.: summit s. of Buckskin Mt., Santa Rosa Mts., 14 mi. s. and 14 mi. e. of McDermitt, June 13, 1946, Ownbey & Ownbey 2791, grown at Pullman (WS).

MINERAL CO.: slope n. of Cat Creek, 9,000 ft. alt., July 9, 1945, Alexander & Kellogg 4421, grown at Pullman (DS, WS); Mt. Grant, 10,700 ft. alt., July 13, 1945, Alexander & Kellogg 4421A, grown at Pullman (DS, WS); Hawthorne, 6,000 ft. alt., Apr. 15, 1907, Jones (POM).

NYE CO.: Currant Creek, May 14, 1941, Eastwood & Howell 9416 (CAS); summit above Cherry Creek, Quinn Canyon Range, 7,500 ft. alt., June 8, 1945, Maguire & Holmgren 25347 (NY, WS, WTU).

ORMSBY CO.: near Carson City, Nevada, Anderson 286 (GH); Carson City, Nevada, alt. 5-7,000 ft., Apr., 1868, Watson 1188 (GH, NY, US).

STOREY CO.: Virginia City, May 22, 1882, Jones (POM); near top of grade 6 mi. n.w. of Virginia City, just e. of County line, June 18, 1946, Ownbey & Ownbey 2922, grown at Pullman (WS).

WASHOE CO.: 4 mi. s.w. of Reno, 5,000 ft. alt., Apr. 13, 1929, Canby 32 (POM); e. of Surprise Valley, on highway 8A, 11.9 mi. e. of California-Nevada state line, 6,000 ft. alt., May 30, 1956, Chisaki & Tavares 880 (UC, WS, WTU); on the s.w. outskirts of Reno, just s. of 3000 W. Plumb Lane, Apr. 29, 1962, Elder (CAS); Constantia, Apr. 15, 1927, Haley (CAS, WS); hills n. of Reno, 4,600 ft. alt., Apr. 8, 1910, Heller 9982 (DS, NY, US); Morrill's Lake, above Marmol Station, 6,000 ft. alt., May 2, 1910, Heller (DS, CAS); Reno, no date, Hillman (POM); Reno, 4,500 ft. alt., Apr. 22, 1897, Jones 6661 (MO, NY, POM); 6 mi. n.w. of University of Nevada Campus, Reno, June 20, 1946, Ownbey & Ownbey 2924, 2926, grown at Pullman (WS); 7 mi. s.w. of Vya, 6,000 ft. alt., June 1, 1944, Ripley & Barneby 6018 (WS); vicinity of Carson, Spring, 1901, Stunmitz (DS); 1 mi. s. s.e. of Poeville, n.w. of Reno, 6,750 ft. alt., June 1, 1938, Tillotson 36 (UC); w. of Highway 395, near Steamboat Springs, Mar. 31, 1963, Williams (CAS); on Peavine Lookout Road, 3.4 mi. from Highway 395, 6,300 ft. alt., Apr. 22, 1962, Williams (CAS).

OREGON. BAKER CO.: ca. 10 mi. s. of Unity, no date, Hitchcock 20578 (NY, WS, WTU). CROOK CO.: on side of Forked Horn Butte, Redmond, May 12, 1912, Whited A15 (DS, NY, ORE, OSC, US). GILLIAM CO.: near Lone Rock, 1,240 m. alt., May 25, 1894, Leiberg 112 (GH, NY, MO, ORE, UC, US). GRANT CO.: about Prairie City, Apr. 23, 1925, Henderson 5111 (CAS, DS, MO, ORE). HARNEY CO.: 5 mi. s. of Narrows, May 20, 1929, Applegate 5579 (DS); overlooking the South Fork of the Malheur R., 30 mi. s. of Juntura, 3,500-4,000 ft. alt., T. 25S., R. 36E., S. 15, Apr. 23, 1959, Cronquist 8143, grown at Pullman (NY, WS); at the top of the Trout Creek Mts., T. 41S., R. 38E., S. 9, elev. ca. 9,000 ft., July 9, 1959, Cronquist, grown at Pullman (WS); Steens Mts., Region, 4 mi. due s.e. of Frenchglen, T. 32S., R. 32-1/2E., S. 10, June 16, 1953, Hansen 149 (OSC); 12-15 mi. from Frenchglen, Blitzen R., May 20, 1927, Henderson 8812 (CAS); summit ca. 20 mi. e. of Burns, May 31, 1955, Hitchcock 20717 (NY, WTU); near Burns, 1927, Leach (WTU); summit, Stinking Water Mt., 1/4 mi. s. of Rt. 20, on Stinking Water access road, ca. 20 mi. w. of Juntura, June 1, 1967, Ownbey & Mingrone 3480 (WS); Stinking Water Mt., June 19, 1942, Peck 21159 (OSC, WILLU); Stinking Water Mt., June 1, 1943, Peck 21647 (WS); Landmark Mt., Trout Creek, 5,200 ft. alt., May 17, ?, Train (US). JEFFERSON CO.: 10 mi. n. of Madras, 2,250 ft. alt., T. 9S., R. 14E., S. 27, May 8, 1938, Detling 2668 (ORE, WS). DESCHUTES CO.: 4 mi. s.e. of Sisters, Apr. 28, 1940, Peck 20509 (CAS, UC, WILLU); Redmond, May 2, 1912, Whited A15 (GH); Redmond, May 3, 1916, Whited 15 (MO). KLAMATH CO.: Grizzly Hill, Swan Lake Valley, May 3, 1925, Applegate 4251 (DS, WILLU); Grizzly Hill, Swan Lake Valley, May 28, 1933, Applegate 8322 (DS); near Klamath Falls, Apr. 16, 1928, Henderson 9354 (CAS, DS, ORE); Klamath Falls, Apr. 26, 1942, Krause (WILLU); Keno, May 27, 1948, Peck 24946 (WS); Pelican City, May 25, 1942, Small, grown at Pullman (WS). LAKE CO.: 15 mi. w. of Lakeview, June 2, 1967, Ownbey & Mingrone 3486 (WS); Goose Lake Valley near

Lakeview, June 28, 1927, Peck 15318 (WILLU); 17 mi. n.w. of Paisley, June 1, 1948, Peck 25048 (WS); n. end of Crump Lake, June 7, 1948, Peck 25125 (WS); Hart Mt., 6,500 ft. alt., June 11, 1948, Peck 25172 (UC, WILLU); on Hart Mt., 6,500 ft. alt., June 15, 1941, Reeder & Merkle 195 (OSC); 12 mi. w. of Lakeview, 5,200 ft. alt., June 2, 1944, Ripley & Barneby 6042 (WS). MALHEUR CO.: ridge-top overlooking the Malheur R., 2 mi. n.e. of Juntura, 3,500 ft. alt., T. 21S., R. 38E., Apr. 27, 1959, Cronquist 8151, grown at Pullman (DS, NY, OSC, POM, UC, WS, WTU); just beyond Becker's, road from Westfall to Beulah, May 10, 1927, Henderson 6816 (CAS, ORE); near Harper Ranch, 1,200 m. alt., May 24, 1896, Leiberg 2130 (ORE, US); head of Cottonwood and Keeny Creeks, 1,220 m. alt., May 26, 1896, Leiberg 2138 (ORE). WHEELER CO.: on s.w. side of Sutton Mt., 3,100 ft. alt., T. 10S., R. 21E., S. 29, Apr. 30, 1953, Cronquist 6911 (GH, NY, POM, WS, WTU); slopes near Spray, Apr. 17, 1935, Thompson 11343 (CAS, DS, MO, POM, UC, US, WTU).

UTAH. TOVELE CO.: Dutch Mt., w. Utah, June 12, 1891, Jones (MO, POM, US).

18. Allium jacintense (Munz) Mingrone & Ownbey

Allium parvum var. jacintense Munz, Man. So. Calif. Bot. 86, 597. 1935. Type, Munz & Johnson 5512 (POM), locally abundant on dry stony slope, Kenworthy, San Jacinto Mts., alt., 4,650 ft., May 21, 1922, and isotypes (DS, GH, POM, UC, WS), studied. Allium jacintense Mingrone & Ownbey, hoc loc.

Bulb ovoid, outer coats grayish or brownish, inner coats white, both without evident reticulations; leaves 2 per scape, linear, flat and falcate, 5 to 6 mm broad, slightly longer than the scape, deciduous at maturity; scape 9 to 12 cm tall, terete or slightly compressed, with 2 to 4 narrow hyaline wings, deciduous at maturity; bracts of the inflorescence 2, ovate, obtuse, mostly joined 1/3 to 1/2 their length; umbel 8- to 18-flowered; pedicels stout, about twice as long as the perianth; perianth segments 9 to 11 mm long,

conspicuously obtuse, lance-oblong, rose-purple with darker midribs; stamens 1/2 as long as the perianth segments, anthers yellow, filaments dilated below and adnate to the perianth segments at the base; ovary with an obscure 3-parted crest, style included, stigma capitate, somewhat 3-lobed; capsule crestless or obscurely crested; seeds black, dull, alveoli not pustuliferous.

Distribution.--Dry stony slopes, known only from the San Jacinto Mts. area, Riverside Co., California (Fig. 5).

CALIFORNIA. RIVERSIDE CO.: Hemet Valley, 4,500 ft. alt., San Jacinto Mts., May 21, 1922, Peirson 3069 (POM, UC).

19. Allium punctum Henderson

Allium punctum Henderson in Rhodora 32:23. 1930. Type, Henderson 8813 (ORE), in moist, or later dry, rocky flats, near the Donner-and-Blitzen River, 8 to 10 miles north of Frenchglen, Harney Co., Oregon, May 20, 1927, and isotype (CAS), studied.

Allium miser Piper in M. E. Jones, Contrib. West. Bot. 10:13. 1902, nomen subnudum. Type collection, W. C. Cusick 2375 (GH, NY, ORE, MO, UC, US, WS), sliding sand of Juniper Mt., Mahleur Co., Oregon, May 7, 1900, studied.

Bulb ovoid, outer coats dark gray or brown, some of them with distinct transversely elongate cellular reticulations, inner coats white; leaves 2 per scape, narrow, linear, slightly to strongly falcate, 2 to 3 mm broad, slightly to more commonly much longer than the scape, deciduous at maturity; scape 3 to 5 cm tall, compressed but not winged, deciduous at maturity; bracts of the inflorescence 2, broadly ovate, abruptly acuminate or acute; umbel 12- to 16-flowered; pedicels a little longer than the perianth; perianth segments 8 to 10 mm long, oblong-lanceolate, rounded to barely acute at the apex, white to pink with conspicuous rose-colored midribs, at maturity, rose colored and perianth cup shaped; stamens 2/3 as long as the perianth segments, anthers yellow, filaments dilated below and united into a ring at the base; ovary crested with 3 broad, short, processes, style included, stigma capitate,

entire; capsule crested, sometimes obscurely so; seeds black, dull, alveoli not pustuliferous. $n=7$.

Distribution.--Heavy rocky flats, southeastern Oregon, in Lake, Harney, and Malheur Cos. (Fig. 6).

OREGON. HARNEY CO.: Valley of the Donner and Blitzen R., w. of Steens Mt., 25 mi. s. of Narrows, May 20, 1929, Applegate 5583 (DS); ca. 10 mi. n. of P. Ranch (Frenchglen), near Donner and Blitzen R., May 20, 1929, Applegate 5585 (DS); along the e. front of Steens Mts., 1.0 mi. s. of Alvord Creek, 100 mi. s.e. of Burns, T. 35S., R. 36E., S. 4-5, elev. ca. 7,000 ft., May 22, 1959, Cronquist 8257 (NY, POM, UC, WS, WTU); on n.e. slope overlooking Alvord Creek, ca. 1.0 mi. above Alvord Ranch, 100 mi. s.e. of Burns, elev. 4,500-5,000 ft., May 22, 1959, Cronquist 8271 (DS, NY, OSC, POM, UC, WS, WTU); 20 mi. n. of Frenchglen, T. 29S., R. 31E., S. 4, May 30, 1957, Hitchcock & Muhlick 21197 (WS, WTU); 0.5 mi. s. of Wagontire, June 1, 1967, Ownbey & Mingrone 3482 (WS); Wagontire, June 21, 1941, Peck 20840 (OSC, UC, WILLU); 18 mi. n. of Frenchglen, June 16, 1948, Peck 25265 (OSC, WS). LAKE CO.: 20 mi. s.s.w. of Wagontire, between Grays Butte and the n. end of Alkali Lake, T. 30S., R. 23E., S. 3, elev. ca. 4,500 ft., May 14, 1959, Cronquist 8237 (NY, WS, WTU). MALHEUR CO.: 16 mi. n. of Scotts Butte and junction of Highway 95 and road to Burns, May 28, 1957, Hitchcock & Muhlick 21101 (DS, WS, WTU); 22 mi. n. of Scotts Butte and of the junction of Highway 95 and the cutoff road to Burns, May 28, 1957, Hitchcock & Muhlick 21106 (DS, OSC, WS, WTU).

20. Allium cratericola Eastwood

Allium cratericola Eastwood in Leaflet West. Bot. 1:132. 1934. Type, Eastwood 6864 (CAS), in the crater area on Mount St. Helena, California May 1, 1918, and isotypes (DS, US), studied.

Allium parvum var. bruceae Jones in Contrib. West. Bot. 10:12, fig. 16. 1902. Type, Mrs. C. C. Bruce 1907 (POM), Yankee Hill, Butte Co., California, April, 1897, verified by M. Ownbey. Isotype (US), studied.

Bulb ovoid, outer coats grayish or brownish, inner coats white, thin and papery without evident reticulations; leaf 1 (rarely 2) per scape, flattened, but scarcely falcate, 3 to 12 mm broad, mostly twice as long as the scape or longer, deciduous at maturity; scape 2 to 5 cm tall, somewhat flattened, deciduous at maturity; bracts of the inflorescence 3 (2 to 4), ovate, long-acuminate; umbel 20- to 30 or more-flowered; pedicels about as long as the perianth; perianth segments 10 to 14 mm long, linear-oblong, obtuse, pale pink to dark purple with darker midribs (purple); stamens $3/4$ as long as the perianth segments, anthers purple or yellow, filaments dilated below and united at the base and with the perianth segments; ovary crested with 3 blunt short processes closely surrounding the style, style included, stigma capitate; capsule crested; seeds black, dull, alveoli not pustuliferous. $n=7, 14$.

Distribution.--Volcanic and serpentine soils at low elevations, North Coast Ranges of Trinity, Lake, Colusa, and Napa Cos., California, and along the lower foothills of the Sierra Nevada in Butte and Tuolumne Cos. (Fig. 6).

CALIFORNIA. BUTTE CO.: Foothills, Doc Mill, 1899, Bruce 1901 (DS, NY); summit of Table Mt., Apr. 3, 1938, Heller 15012 (DS, MO, NY, POM, UC, US, WS, WTU); on the summit of Table Mt., Mar. 19, 1951, Hoffman 3771 (UC, WS); at Table Mt., e. of Chico near Cherokee, Apr. 12, 1959, Mann (WS); Table Mt., e. of Chico, Apr. 4, 1965, McClintock (CAS). COLUSA CO.: T. 14N., R. 5W., s.e. corner S. 9, 1,300 ft. alt., Feb. 25, 1961, flowered at Davis Mar. 21, 1961, Mann, with paired leaves; second specimen single leaved, Apr. 2, 1961 (WS). LAKE CO.: near foot of grade n. of Lakeport, May 1, 1938, Baker 8950 (CAS); 2.9 mi. w. of Lakeport on road from Hopland, Apr. 29, 1929, Mason 5241 (UC). NAPA CO.: "The Crater," 3 mi. s. St. Helena Inn, Apr. 10, 1926, Baker 174a (DS); Mt. St. Helena, June 6, 1915, Eastwood (CAS); old crater, Mt. St. Helena, May 9, 1923, Eastwood (CAS); "Crater Country," Mt. St. Helena, Apr. 4, 1931,

Howell 6168 (CAS); the Crater Country, 3.5 mi. s.e. from summit of Mt. St. Helena, Apr. 4, 1931, Keck 1090 (DS, POM). TRINITY CO.: 0.5 mi. w. of turn off to Peanut and Hayford from Highway 36, May 12, 1952, Balls & Lenz 17209 (NY, POM, WTU); s. of Peanut, 2,600 ft. alt., May 18, 1954, Barneby 11554 (POM, WS). TUOLUMNE CO.: Red Hills above Peoria Flat, Apr. 11-16, 1919, Ferris 1606 (CAS, DS, NY, US); Hills w. of Rawhide, Apr., 1918, Williamson (DS).

21. Allium tribracteatum Torrey

Allium tribracteatum Torrey in Pacif. Rail. Rep. 4 (Bot.):148. 1857. Type (NY), collected by Dr. J. M. Bigelow, from hillsides, Duffield's Ranch, Sierra Nevada, May 10, 1853-54, isotype (US) and photographs of the type (CAS, WS), studied. According to Jepson (Fl. Calif. 276), this locality is east of Sonora, Tuolumne Co., California.

Bulb ovoid, outer coats brownish, inner coats white, both with obscure mostly oblong reticulations; leaves 2 per scape, flattened but scarcely falcate, 1 to 3 mm broad, 2 to 3 times as long as the scape, deciduous at maturity, scape 3 to 5 cm tall, terete or only slightly flattened, deciduous at maturity; bracts of the inflorescence 2 or usually 3, ovate, abruptly acuminate; umbel 15- to 20-flowered; pedicels scarcely longer than the perianth; perianth segments 7 to 11 mm long, narrowly oblong to lanceolate, obtuse or acute, white or rose with prominent midribs; stamens just shorter than the perianth segments, anthers yellow or purple, filaments dilated at the base; ovary crestless or with an obscure 3-parted crest, style included, stigma obscurely 3-lobed; capsule crestless or obscurely crested, seeds black, dull, alveoli not pustuliferous. $n=7$.

Illustrations.--Abrams, Ill. Fl. Pac. States 1:384. 1923. Fultz, Lily, Iris, and Orchid S. Calif. 15. 1928, not seen.

Distribution.--Rocky ridges and slopes, California, medium to high elevations, from Mt. Shasta, south through the Sierra Nevada, to the Tehachapi Mts., and the Frazier Mt. area (Fig. 5).

CALIFORNIA. ALPINE CO.: Carson Pass, June 17, 1940, Eastwood & Howell 8460 (CAS); Carson Pass, summit, ca. 8,600 ft. alt., June 17, 1940, Rose 40624 (MO). AMADOR CO.: Peddler Hill, 3 mi. n.e. of Lumberyard, Sierra Nevada, 8,700 ft. alt., June 13, 1937, Crum 1929 (UC, US, WS). CALAVERAS CO.: summit of Dandenelle View Trail, Calaveras Big Trees State Park, ca. 5,000 ft. alt., May 23, 1953, Raven 5519 (CAS, WS). FRESNO CO.: Huntington Lake, 7,000 ft. alt., July 1, 1920, Ferguson 387 (UC). KERN CO.: Tehachapi, June, 1884, Curran (GH); Tehachapi, May 13, 1913, Eastwood 3238 (CAS, WS); n.w. slope of Black Mt., 6,600-7,000 ft. alt., Greenhorn Mt., July 11, 1962, Howell 38556 (CAS); e. slope of the Greenhorn Mts., ca. 1 mi. n.e. of Evans Flat, near the road to Waggy Flat, ca. 5,800 ft. alt., June 11, 1942, Smith 657 (UC, WS). MADERA CO.: Plains, 1899, Bruce (DS). MARIPOSA CO.: Mariposa, Apr. 10, May 9, 1893, Cogdon (UC); near Mariposa, Apr. 16, May 10, 1893, Condon (DS); Mariposa, Apr., 1894, Congdon (UC); West Water Ditch, Mariposa, Apr. 19, 1896, Congdon (NY); hills, w. side of Mariposa Valley, May 15, 1903, Congdon (US); West Water Ditch, Mariposa, Apr. 25, 1904, Congdon (UC, WS); w. side, Mariposa Valley, Apr., May, Congdon (UC); Mt. Bullion, Apr. 25, 1941, Eastwood & Howell 8779 (CAS, US); 1 mi. n.w. of Mt. Bullion, 2,100 ft. alt., Apr. 25, 1941, Rose 41188 (MO, NY, UC). NEVADA CO.: on slopes in back of Omega Historical Marker, 4,000 ft. alt., June 2, 1962, Mott 1864 (CAS). PLACER CO.: Pyramid Creek, Placerville Road, 6,250 ft. alt., May 28, 1933, Mason 7242 (UC); Cisco, June, 1914, Valentien (UC). PLUMAS CO.: no location, July 4, 1938, Cantelow (CAS); e. of Drakesbad, s. side of Soda Creek, July 4, 1938, Cantelow 2299 (CAS); along road on summit, Spanish Peak, 7,000 ft. alt., July 4, 1933, Fritz (UC); above Silver Lake on Spanish Peak, 6,500 ft. alt., May 25, 1940, Hansen (OSC); about the airfield w. of Chester, 4,280 ft. alt., May 21, 1938, Heller 15104 (DS, MO, NY, POM, UC, WS, WTU). SHASTA CO.: Lassens Peak, Aug., 1896, Austin

433 (MO, UC); Lassen Park, near Lake Helen, 8,500 ft. alt., Aug. 3, 1927, Brues (GH); s. slope of Diamond Peak, 7,400 ft. alt., June 20, 1961, Howell 36567 (CAS); from central to upper portion of trail to summit of Lassen Peak, Lassen National Park, June 23, 1926, Peirson 6839 (POM); Drakesbad, Lassen National Park, June, 1927, Sulliffe (CAS). SISKIYOU CO.: upper edges of Panther Meadow, s.w. slopes of Mt. Shasta, 7,500 ft. alt., July 1, 1959, Bacigalupi & Bacigalupi 7200 (UC); Panther Creek Sand Flats, 6,500 ft. alt., July 1, 1938, Cooke 11163 (CAS, DS, OSC, UC); trail from Horse Camp to Wagon Camp, Mt. Shasta, 7,000 ft. alt., June 17, 1946, Cooke & Cooke 17501 (WS); along Squaw Valley Creek, Mt. Shasta, 8,000 ft. alt., July 10, 1947, Cooke 17659 (WS); near highway, Scott Mt., May 31, 1951, Vollmer & Beane 17 (DS). TUOLUMNE CO.: ridge between Long Barn and Pinecrest, ca. 5,600 ft. alt., Howell 29006 (CAS, POM, WS); near Dardanelle, middle fork Stanislaus R., ca. 6,000 ft., June 5, 1954, Howell 29934 (CAS); near Gaylor Lakes, vicinity of Tioga Pass, Sierra Nevada, 9,500 ft. alt., July 5, 1928, Mason 4878 (UC); slopes of Mahan Peak, Yosemite National Park, 8,500 ft. alt., July 25, 1938, Mason 11993 (UC, WS); Bailey Ridge, 9,300 ft. alt., July 25, 1938, Mason 12026 (UC); 4 mi. e. of Long Barn on Rt. 108, June 15, 1967, Mingrone & McNeal 99 (WS); s.w. of Strawberry Lake, June 30, 1946, Ownbey & Ownbey 2964, grown at Pullman (WS); 4 mi. e. of Long Barn, 5,400 ft. alt., May 15, 1955, Wiggins 13422 (DS, UC). VENTURA CO.: 2 mi. s. of Lockwood Valley Road, on road to Thorn Meadows, San Emigdio Range, 5,800 ft. alt., May 12, 1962, Breedlove 2737 (DS, WS); w. side Frazier Mt., 7,500 ft. alt., June 3, 1933, Epling & Wheeler 1780 (POM); summit, Frazier Mt., May 19, 1934, Epling (POM).

22. Allium scilloides Douglas ex. S. Watson

Allium scilloides Douglas ex S. Watson in Proc. Am. Acad. 14:229. 1879. Type (K), collected by Douglas near Priest's Rapids, Columbia River, Washington, not seen. Photographs of type (GH, NY, POM, WS), studied.

Allium fragile A. Nelson in Univ. Wyoming Publ. Bot. 1:123, fig. 7. 1926.
Type, E. Nelson 1617 (RM), Ahtanum Creek, Yakima Co., Washington, April 6, 1924, not seen, but from the description and locality, there is little doubt concerning its identity.

Bulbs globose to ovoid, outer coats reddish or brownish with obscure cellular reticulations, inner coats white; leaves 2 per scape, flat, falcate, 2 to 4 mm broad, up to twice longer than the scape, deciduous at maturity, the margins scarcely papillose; scape 4 to 7 cm tall; strongly flattened, 2-edged or winged, scarcely papillose, deciduous at maturity; bracts of the inflorescence 2 or 3, broadly ovate, acute; umbel 5- to 12-flowered; pedicels longer than the perianth; perianth segments at anthesis 6 to 8 mm long, broadly elliptic, obtuse, white or pinkish, with green midribs, becoming broadly lanceolate, strongly keeled, and reddish-purple, connivent, and closely investing the fruit; stamens 1/2 to 3/4 as long as the perianth segments, anthers purple, filaments dilated below, united into a ring with the perianth segments at the base; ovary crestless or with an obscure 3-parted crest, style included, stigma capitate, entire or 3-lobed; capsule crestless; seeds black, dull, alveoli not pustuliferous. $n=7$.

Illustration.--Nelson, Univ. Wyoming Publ. Bot. 1:123, fig. 7. 1926, as A. fragile.

Distribution.--Sandy rocky soil, central Washington east of the Cascades, from Grant and Douglas Cos., south through Kittitas, Yakima, and Klickitat Cos. (Fig. 5).

WASHINGTON. DOUGLAS CO.: near the summit of Badger Mt., 4,100 ft. alt., May 31, 1949, English, grown at Pullman (WS). GRANT CO.: Dry Falls, Apr. 3, 1938, Daubenmire 3811 (WS); Dry Falls State Park, May 19, 1966, Ownbey & Mingrone, grown at Pullman (WS); at the top of Coulee Wall, ca. 1 mi. n. of Park Lake, Apr. 24, 1942, Ownbey & Weber 2522, grown at Pullman (WS); s. slope of Coulee Wall, 0.5 mi. n. of Park Lake, Grand Coulee, Apr. 20, 1935, Rollins

851 (MO, UC, US, WS); Ephrata, Apr. 1, 1921, St. John 6011 (WS); s. slope, half-way up hill, Park Lake, Grand Coulee, Apr. 19, 1935, Zaring 67 (WTU). KITTITAS CO.: 9 mi. s.w. of Ellensburg, May 21, 1966, Ownbey & Mingrone 3432 (WS); 10 mi. s.w. of Ellensburg, May 21, 1966, Ownbey & Mingrone 3433 (WS); 10 mi. s.w. of Ellensburg on old road to Yakima, Apr. 24, 1942, Ownbey & Weber 2529 (WS); Ginkgo State Park, Mar. 14, 1936, Smith 214A (WS, WTU); w. end of Rye Grass Mt., Ginkgo State Park, Apr. 4, 1936, Smith 272 (WS, WTU); w. end of Rye Grass Mt., Ginkgo Petrified Forest State Park, Apr. 14, 1936, Smith 1751 (DS, WTU). KLICKITAT CO.: 4 mi. s.w. of Bickleton, Apr. 25, 1942, Ownbey & Weber 2535 (WS); 2 mi. s. of Bickleton, Apr. 6, 1934, Pickett, McMurray, & Dillon 1469 (WS, WTU). YAKIMA CO.: 3 mi. w. of Fort Simcoe, 2,000 ft. alt., Apr. 5, 1936, Burgner 5 (WTU); Ahtanum Ridge, Yakima Indian Reservation, Mar. 26, 1935, Heidenreich 55 (WS); hills s. of White Swan, Mar. 14, 1942, Hoover 5593 (CAS, UC, WTU); above Priest Rapids, Apr. 7, 1922, St. John 3321 (WS, WTU); Cowiche Ridge, 15 mi. w. of Yakima, Apr. 2, 1933, Warren 1888 (WTU); 8 mi. w. of Tampico, Apr. 23, 1933, Warren 1949 (WTU).

23. Allium robinsonii Henderson

Allium robinsonii Henderson in Rhodora 32:22. 1930. Type, Henderson 5110 (ORE), sand and gravel, mouth of the John Day River, Sherman Co., Oregon, April 8, 1925, and isotypes (CAS, DS, GH, MO, WILLU), studied.

Bulb ovoid, outer coats grayish to brownish, inner coats white, both mostly without reticulations; leaves 2 per scape, flat, strongly falcate, 1 to 2 mm broad, twice as long as the scape or longer, deciduous at maturity, scape 3 to 7 cm tall, slender, flattened and slightly 2-edged, deciduous at maturity; bracts of the inflorescence 2, ovate, abruptly acute; umbel 5- to 12-flowered; pedicels slightly shorter than the perianth; perianth segments 7 to 9 mm long, oblong, obtuse, white to pale pink with red midribs; stamens 1/2 to 2/3 as long as the perianth segments, anthers purple, filaments dilated below and joined

at the base; ovary with distinct 3- or 6-parted crest, style included, stigma capitate, entire; capsule obscurely crested; seeds black, dull, alveoli not pustuliferous. $n=7$.

Distribution.--In sand or gravel, along the Columbia River from Vantage, Kittitas Co., Washington to the mouth of the John Day River, Sherman Co., Oregon (Fig. 6).

OREGON. MORROW CO.: 2 mi. e. of Hepner Junction, Apr. 13, 1938, Peck 19853 (CAS, WILLU, WS); near Boardman, May 4, 1940, Peck 20531 (WILLU).

SHERMAN CO.: at mouth of John Day R., May 5, 1928, Gale 105 (DS, US, WTU); bank of Columbia R., just below mouth of John Day R., Apr. 26, 1942, Ownbey & Weber 2536 (WS); 10 mi. e. of Rufus, Apr. 17, 1935, Thompson 11349 (MO, WTU).

UMATILLA CO.: banks of the Columbia R., near Umatilla, Apr. 26, 1882, Howell (NY); Umatilla, May 1, 1882, Howell (MO).

WASHINGTON. BENTON CO.: on peninsula into Columbia R. at Hanford, T. 13N., R. 27E., S. 24, Apr. 22, 1953, Davis 111 (WS); 5 mi. w. of Pasco of Highway 410, Apr. 25, 1943, Enright 7 (WS); banks of the Columbia R., near Umatilla, Apr. 26, 1882, Howell (ORE); between Rattlesnake Hills and White Bluffs, Apr. 7, 1934, Pickett, McMurray, & Dillon 1481 (WS, WTU); 6.5 mi. n.e. of Benton City, 400 ft. alt., Apr. 28, 1950, Rose 50085 (CAS, NY, POM, UC, US, WS). FRANKLIN CO.: along Columbia R., 10 mi. n.w. of Pasco, Apr. 11, 1965, Morehouse (WS); on Columbia R., 3 mi. w. of Pasco, Apr. 1, 1927, Zundel (WS). GRANT CO.: between highway and Columbia R., ca. 1.0 mi. s. of Vantage bridge, Apr. 4, 1966, Ownbey (WS); Beverly, Apr. 8, 1922, St. John 3344 (WS); near Vantage, May 2, 1931, Thompson 6102 (DS, GH, MO, NY, OSC, US, WS, WTU); near Vantage, May 2, 1931, Thompson 6124 (DS, GH, MO, OSC, POM, US, WTU); e. side of Columbia R., ca. 2 mi. above Beverly, May 7, 1950, Witt & Witt, grown at Pullman (WS). KITTITAS CO.: hills above Columbia R., 3 mi. s. of Vantage

Ferry, on e. side of river, Apr. 24, 1949, Hitchcock 18956 (POM, UC, WS, WTU).
 WALLA WALLA CO.: on hillside, Reese, Apr. 5, 1923, St. John, Warren, & Hardy 3126 (MO, NY, UC); Wallula, Apr. 17, 1891, Suksdorf 2006 (WS). YAKIMA CO.:
 near Priests Rapids, Apr. 13, 1935, Jones 6370 (POM); bank of Columbia R., at
 Priests Rapids, Apr. 25, 1942, Ownbey & Weber 2531, grown at Pullman (WS);
 Columbia R., Priests Rapids, Apr. 8, 1922, St. John 3325 (WS).

24. Allium hoffmanii Ownbey

Allium hoffmanii Ownbey in Munz, Calif. Fl. 1374. 1959. Without Latin diagnosis. Type, F. W. Hoffman 2890 (WS), on serpentine, at a small lake, north side of Red Lassic, headwaters of the Little and Big Van Duzen Rivers, 5,500 ft. alt., near the boundary line between Humboldt and Trinity Counties, California, July 14, 1949, and isotype (WS), studied.

Bulbus ovoideus, tunicis interioribus albidis roseisve, exterioribus cinerascentibus fuscisve sine reticulis distinctis; folio solitario plane vel late concavo-convexo subcrasso vix falcato 4-8 mm lato scapum multo superanti in maturitate deciduo; scape 5-10 cm alto tenui plus minusve complanato in maturitate deciduo; involucro plerumque 3-4-bracteato, bracteis ovatis, acuminatis, 7-9 (15)-nervatis; umbella 10-ultra 40-flora, pedicellis perianthio subaequilongis; perianthii segmentis 8-10 mm longis lineari-lanceolatis subacutis integris purpurascens, nervis viridis conspicuis; staminibus exsertis, antheris purpureis, filamentis valde glandulosi-papillatis, basibus paulo dilatatis et perianthii segmentis adnatis; ovario cristato, cristae processibus sex humilibus in fructu obscuris, stylo exserto, stigmatibus capitato plus minusve trilobato; seminibus nigris rugosis alveolatis, alveolis non pustulatis.

Bulb ovoid, outer coats grayish or brownish, inner coats white to pink, both without definite reticulations; leaf 1 per scape, flat or broadly channeled above, rather thick, but scarcely falcate, 4 to 8 mm broad, longer than the scape, deciduous at maturity; scape 5 to 10 cm tall, slender, more or less flattened, deciduous at maturity; bracts of the inflorescence usually 3 or 4,

ovate, acuminate, 7-9 (15)-nerved; umbel 10- to more than 40-flowered, pedicels about as long as the perianth; perianth segments 8 to 10 mm long, linear-lanceolate, mostly acute, entire, purplish-pink with conspicuous green midribs; stamens exserted, anthers purple, filaments little dilated below but adnate to the perianth segments at the base, strongly papillose-glandular; ovary crested with 6 low processes, style exserted, stigma capitate, somewhat 3-lobed; capsule not or obscurely crested; seeds black, dull, alveoli not pustuliferous. n=7.

Distribution.--Serpentine soils, northwestern California in adjoining areas of Shasta, Trinity, and Tehama Cos. (Fig. 3).

CALIFORNIA. SHASTA CO.: 1.8 mi. w. of Regan Meadow Camp Ground, 5,500 ft. alt., T. 28N., R. 11W., S. 1, July 19, 1949, Hoffman 2886 (WS).
TEHAMA CO.: Junction of Wildwood and Regan Meadow roads, exactly on the line between Tehama and Trinity Cos., 5,000 ft. alt., July 2, 1950, Hoffman 3238 (WS). TRINITY CO.: Perry Salt-log serpentine, Mt. Lassic Group, July 17, 1949, Hoffman 2884 (WS); Blue Ridge, Lassic Group, July 13, 1959, Hoffman 2893 (WS).

25. Allium burlewii Davidson

Allium burlewii Davidson in Bull. So. Calif. Acad. Sci. 15:17. 1916. Type, Davidson 3000 (LAM), collected by Fred Burlew on Mt. San Antonio, Los Angeles Co., California, June 1, 1915, verified by M. Ownbey. Isotype (US), studied.

Allium johnstoni Jones ex Jepson, Fl. Calif. 1:276. 1921, nomen. Type collection, I. M. Johnson 1484 (DS, GH, POM, UC), granite soil, head of San Antonio Canon, San Antonio Mts., Alt: 8,000 ft., July 4, 1917, studied.

Bulb ovoid, outer coats grayish or brownish, usually without reticulations; leaf 1 per scape, broadly concave-convex or flat, not strongly falcate, 1 to 10 mm broad, twice as long as the scape or longer, deciduous at maturity; scape 2 to 8 cm tall, terete or somewhat flattened, deciduous at maturity;

bracts of the inflorescence 3, broadly ovate, obtuse or abruptly acuminate; umbel 8- to 18-flowered; pedicels slightly shorter than the perianth; perianth segments 7 to 10 mm long, lanceolate, entire, pink to purple, with dark midribs; stamens about as long as the perianth segments or exserted, anthers purple, filaments not or little dilated at the base, united below; ovary with an obscure 6-parted crest or crestless, style exserted, stigma capitate, entire; capsule crestless or obscurely crested; seeds dull black, alveoli not pustuliferous. $n=7$.

Illustration.--Abrams, Ill. Fl. Pac. States 1:388. 1923.

Distribution.--Sandy or gravelly soils at medium to high elevations, southern California, southern Sierra Nevada, Tehachapi Mts., to the Mt. Pinos Region, through the San Gabriel, San Bernardino and San Jacinto Mts., and the Inner South Coast Ranges (Fig. 3).

CALIFORNIA. FRESNO CO.: along Pitman Creek, 7,500 ft. alt., 3-4 mi. s. of Huntington Lake, July 5, 1936, Robinson 6192 (POM). KERN CO.: upper e. slopes of Mt. Pinos, 8,300 ft. alt., May 29, 1954, Bacigalupi & Robbins 4510 (UC); top of Cerro Noroeste (Abel Mt.), 8,300 ft. alt., June 5, 1963, Blakley 6004 (CAS, POM); Shephard's Peak, vicinity of Bisses Station, June 26, 1895, Dudley 417 (DS), atypical; Piute Peak, 6-8,000 ft. alt., June, 1897, Purpus 5333 (MO, UC, US); n.e. slope of Mt. Pinos, 7,800 ft. alt., June 14, 1956, Twisselmann 2943 (CAS). LOS ANGELES CO.: near top of Mt. San Antonio, June, 1916, Burlew (UC), abnormal; s. slope Mt. San Antonio (Baldy), San Gabriel Mts., 9,000 ft. alt., June 28, 1952, Cambell 17292 (NY, POM WTU); Bear Canyon Trail to Summit of Mt. San Antonio, 7-8,000 ft. alt., June 8, 1927, Craig (UC); Mt. San Antonio, July 1, 1916, Davidson 3164 (GH, UC); Throop Peak, San Gabriel Mts., 9,100 ft. alt., June 5, 1963, Griesel 805 (POM); San Antonio Mts., n. slopes, 5,500-9,000 ft. alt., June 18, 1899, Hall 1238 (NY, UC); Swartout

Canon, San Antonio Mts., 6,700 ft. alt., June 3-5, 1900, Hall 1497 (DS, MO, UC, US); Mt. San Antonio, 9,000 ft. alt., June 14, 1931, Hastings (NY); Ontario Peak, 6,000 ft. alt., June 15, 1917, Johnston 1268 (DS, UC, WTU); Baldy Lookout of U.S. Forest Service, 6,750 ft. alt., June 20, 1917, Johnston 1490 (DS, UC, WS); along trail up San Antonio Mt. (Baldy), June 23, 1931, Mathias 923 (MO); Swartout Valley, San Antonio Mts., 7,300 ft. alt., June 17, 1921, Munz 4612 (POM, UC); Vincent Gulch, San Gabriel Mts., 6,400 ft. alt., May 26, 1923, Munz 6840 (GH, POM, UC); n. side "Old Baldy" Mts., June, 1887, Parish (DS); "Baldy," Mt. San Antonio, 9,500 ft. to summit, July 8, 1918, Peirson 2 (UC); summit North Baldy, 9,250 ft. alt., Mt. San Antonio, June 17, 1918, Peirson 4 (POM, UC); Summit Ontario Ridge, 8,600 ft. alt., July 7, 1918 Peirson 266 (POM, UC); n. slope Mt. Waterman, 7,000 ft. alt., June 16, 1921, Peirson 2842 (WS); n. slope of Strawberry Peak, 5,500 ft. alt., May 27, 1924, Peirson 4628 (POM); Old Baldy Trail, below "The Narrows," 7,200 ft. alt., June 9, 1908, Reed 2354 (DS). RIVERSIDE CO.: San Jacinto Mts., 9,000 ft. alt., July 7, 1895, Anthony (UC), atypical; near Tahquitz, 6,500 ft. alt., June-July, 1901, Hall 2310 (UC), atypical; Caramba, Tahquitz Creek, 6,000 ft. alt., June 21, 1922, Jaeger (DS, US), atypical; San Jacinto Mts., 1921, Jaeger (POM); slopes of Tahquitz Valley, July 7, 1922, Jaeger (OSC); ridge e. of Tahquitz Peak, 7,800 ft. alt., June 27, 1921, Jaeger 801 (US), atypical; San Jacinto, June, 1880, Parish & Parish 587 (DS), atypical; desert side of Tahquitz Peak, 8,000 ft. alt., June, 1921, Spencer 1712 (GH), atypical. SAN BENITO CO.: Valleaito region, either on Griswold hills or at New Idria mine, 2,500 ft. alt., Apr., 1936, Lyon 774 (UC); along Clear Creek near road, ca. 7 mi. from Hernandez, May 5, 1956, Raven, Stebbins, & Tomich 9195A (CAS); along Clear Creek, 3 to 4 mi. n.e. of Hernandez, 3,000 ft. alt., May 4, 1952, Stebbins, Hunziker, Stutz, & Zohary 5062 (CAS). SAN BERNARDINO CO.: Crystal Creek, San Bernardino Mts., 7,500 ft. alt., May 12,

1927, Jaeger (POM); n. slope Waterman Canyon, June 16, 1924, Johnston (POM); Deep Creek, May 8, 1926, Jones (POM); along Lythe Creek, San Gabriel Forest Reserve, 1,800 m. alt., Apr. 28, 1898, Leiberg 3363 (US); on summit of ridges about Mt. Baldy, 8,000 ft. alt., San Gabriel Mts., June 15, 1927, Mason 3770 (UC); Bear Valley, 7,300 ft. alt., June 11, 1922, Munz 5688 (POM, UC); s.w. of Stockton Flat at head of North Fork of Lythe Creek, T. 2N., R. 7W., S. 3, San Gabriel Mts., July 5, 1946, Ownbey & Ownbey 2979, grown at Pullman (WS); Bear Valley, San Bernardino Mts., June, 1886, Parish 1854 (DS, GH); Big Meadow, Upper Santa Ana R., San Bernardino Mts., 7,100 ft. alt., June 21, 1922, Peirson 3352 (POM, WS); Bear Valley, 7,000 ft. alt., May 23, 1922, Pierce (POM).

SANTA BARBARA CO.: top of San Rafael Peak, 6,560 ft. alt., June 12, 1961, Blakley 4425 (DS); near Lookout, Big Pine Mt., 6,800 ft. alt., June 9, 1959, Pollard (CAS). TULARE CO.: Kern River Valley, Tobias Meadow, toward French Joe's, July 13, 1895, Dudley 663 (DS), atypical. VENTURA CO.: Mt. Pinos, June 13, 1908, Abrams & McGregor 248 (DS, NY, US); Reyes Peak camp ground, 6,600 ft. alt., June 9, 1963, Blakley 6014 (POM); Top Frazier Mt., June 17, 1896, Dudley & Lamb 4577 (DS); Griffins, July, 1902, Elmer 3972 (CAS, DS, GH, MO, NY, POM, US); Mt. Pinos, 8,000 ft. alt., June 8, 1931, Epling & Dunn (MO, US); Summit of Frazier Mt., 8,000 ft. alt., June 3, 1933, Epling & Wheeler 1807 (CAS, POM, UC); summit of Mt. Pinos, 8,800 ft. alt., June 18, 1953, Grant & Grant 18514 (VG 9276) (POM); Mt. Pinos, near summit, 8,200 ft. alt., July 5, 1905, Hall 6514 (UC); Chula Vista Camp, Mt. Pinos, May 26, 1928, Howell 3832 (CAS); Mt. Pinos, 6,500-8,500 ft. alt., May 18, 1940, Lewis 1480 (UC); Mt. Pinos, 7,500-8,800 ft. alt., June 11, 1923, Munz 7028 (NY, POM, UC); Frazier Mt., just above Chuckupate Forest Camp, T. 8N., R. 20W., S. 16, July 6, 1946, Ownbey & Ownbey 2984, grown at Pullman (WS); Summit of Abel Mt., 8,300 ft. alt., July 1, 1949, Pollard (CAS).

26. Allium obtusum Lemmon

Allium obtusum Lemmon in Greene, Pittonia 2:69. 1890. Type (probably ND), collected by Lemmon (?), rare in the sub-alpine region of Gold Lake, Plumas Co., California, June 26, 1889, not seen. Its identity is not questioned.

Allium ambiguum M. E. Jones, Contrib. West. Bot. 10:18, fig. 35. 1902. Type, Jones 6660 (POM), Summit, Sierra Nevada Mts., California, July 26, 1900, and isotype (GH), studied. Contrary to Jones's remarks, the type collection includes plants with 3 bracts and the capsule generally is obscurely crested. Allium concinnum K. Brandegee ex Jones, Contrib. West. Bot. 10:86. 1902, nomen.

Bulb ovoid, outer coats grayish, with or without fine, nearly rectangular reticulations, inner coats whitish; leaf 1 per scape, broadly concave-convex or flat, perhaps not falcate, 3 to 5 mm broad, twice as long as the scape, deciduous at maturity; scape 4 to 8 cm tall, slender, little flattened, deciduous at maturity; bracts of the inflorescence 2 to 4 (usually 3), ovate, acuminate; umbel 10- to 20 or more-flowered; pedicels about as long as the perianth; perianth segments 5 to 8 mm long, oblong-ovate, obtuse, rarely lanceolate, acute, rose-colored with broad green midribs to greenish white with purple midribs; stamens 1/2 to 2/3 as long as the perianth segments, anthers yellow or purple, filaments dilated below and adnate to the perianth segments at the base; ovary crested, style included, stigma subentire; capsule crested with 6 short acute processes; seeds dull black or shining, alveoli not pustuliferous. $n=7$.

Illustration.--Abrams, Ill. Fl. Pac. States 1:388. 1923.

Distribution.--Sandy, gravelly slopes, high elevations in the Sierra Nevada Mts., from Plumas Co. to Tulare Co., California, and the area of Mt. Rose, Washoe Co., Nevada (Fig. 4).

CALIFORNIA. ALPINE CO.: Lake Alpine, June 21, 1935, Allen 505 (UC, WS); s. slope of Bald Peak, June 29, 1936, Hoover 1430 (UC); w. of Kit Carson Pass, 6,000 ft. alt., atypical, Mason 3332 (GH, UC); Lake Alpine Region,

8,400 ft. alt., ca. 2 mi. n. of the lake, July 25, 1935, Peirson 11590 (POM, UC). AMADOR CO.: no location, May, 1886, atypical, Brandege (MO); along State Highway 88, 23 mi. e. of Pine Grove, Sierra Nevada, 5,400 ft. alt., June 14, 1962, Breedlove 3639 (CAS, DS, WS); Pedlar, 7,000 ft. alt., July, 1894, Hansen 583 (UC); Armstrong's Station, 5,000 ft. alt., May, 1895, atypical, Hansen 1255 (DS, MO, UC); 22 mi. e. of Pine Grove, June 15, 1967, Mingrone & McNeal 100 (WS). BUTTE CO.: on road from Magalia to Lovelock at Mosquito Creek on ridge before reaching Little Butte Creek, 2,600 ft. alt., May 1, 1951, Hoffman 3773, grown at Pullman (UC, WS). ELDORADO CO.: summit between Lucile and Lake of Woods, near Lake Tahoe, July 17, 1904, Baker (UC); Mt. Tallac, July 21, Aug. 15, 1906, Eastwood 1189 (CAS); Fallen Leaf, Gilmore Lake, June 30, 1920, Ehlers 692 (UC); Armstrong's Station, 5,300 ft. alt., June 14, 1895, Hansen 1255 (US); trail between Eagle Lake and the Velma Lakes, Lake Tahoe Region, June 28, 1925, Howell 1241 (CAS); Echo Lake Divide, 8,500 ft. alt., July 7, 1925, Peirson 6316 (POM, WS); trail to Mt. Tallac above Alpine Springs, 7,200 ft. alt., July 24, 1907, Reed & Pendleton 1650 (UC); Shoulder of Mt. Ralston, 8,000 ft. alt., July 6-21, 1901, Setchell & Dobie (UC). FRESNO CO.: slopes above French Fork, July 6, 1933, Bacigalupi & Ferris 2246 (DS, NY); ridge between South Lake and Swede Lake, just above the latter, Dinkey Lakes Region, Sierra National Forest, 9,360 ft. alt., Aug. 15, 1958, Bacigalupi & Quibell 6633 (UC, WS); Huntington Lake Region, near summit of Kaiser Peak, 10,000 ft. alt., July 20, 1935, Everett & Johnson 7504 (POM, WS); below Nellie Lake, 8,000 ft. alt., July 4, 1917, Grant 1019 (UC); high Sierra District, Sierra National Forest, 10,500 ft. alt., July 17, 1954, Kruckeberg 3486 (WTU); upper Dinkey Lakes, headwaters Dinkey Creek, 1 mi. n. of 10,612 ft. Three Sisters, 9,500 ft. alt., July 13, 1952, Quibell 1010 (NY, POM); at top of slope above n.e. corner of 9,200 ft. Swede Lake, near headwaters of Dinkey Creek,

9,400 ft. alt., Quibell 1040 (NY); on trail from n.w. corner 9,150 ft. Main Dinkey Lake to Coyote L.-s.w. flank 9,773 ft. high point, n. edge upper Dinkey Lakes area, 9,400 ft. alt., July 16, 1952, Quibell 1046 (POM); s.w. of 8,850 ft. Strawberry Lake, on n. slope of 9,984 ft. Red Mt., ca. 4 mi. s.e. of Huntington Lake, 9,100 ft. alt., Aug. 8, 1952, Quibell 1165 (CAS, NY, POM); Upper French Canyon Basin, n.w. shore of Steelhead Lake, 11,350 ft. alt., Aug. 6, 1955, Quibell 5395 (POM); Lake in Red Mts., Basin, 10,500 ft. alt., Aug. 10, 1952, Raven 5019 (CAS); Hilgard Branch, Bear Creek, 9,800 ft. alt., July 5, 1954, Raven 7209 (CAS); Upper Basin, 10,400 ft. alt., July 24, 1956, Raven 9808 (CAS); at Kaiser Pass, June 8, 1928, Russell 56 (DS); Jackass Meadow, 7,500 ft. alt., June 19, 1937, Winblad (CAS). MADERA CO.: near Garnet Lake, 9,700 ft. alt., July 24, 1941, Howell 16431 (CAS); near Isberg Lake, 9,800 ft. alt., Aug. 12, 1958, Howell 34321 (CAS, WS); Mt. Lyell, 10,500 ft. alt., July 16, 1909, Jepson 3332 (UC); ridge s. of Lower Beck Lake, 9,800 ft. alt., July 10, 1951, Kehlein (POM); Moraine Meadow near Givens Creek, 9,200 ft. alt., July 7, 1941, Mason 12501 (UC). MARIPOSA CO.: Gin Flat near Yosemite Valley, June, 1964, Ackley (CAS); Thousand Island Lake Yosemite National Park, July 19, 1919, Clemens (CAS); Porcupine Flat, Aug. 13, 1907, Eastwood 239 (CAS); Mt. Hoffmann, Aug. 14, 1907, Eastwood 395 (CAS); at top of Chilnualna Falls, Yosemite Park, 7,500 ft. alt., May 27, 1923, Howell 23 (CAS); El Capitan summit, 7,600 ft. alt., Yosemite Park, July 6, 1911, Jepson 4360 (UC); Yosemite, May, 1922, Michaels (CAS); Mt. Donohue, Yosemite National Park, July 23, 1935, Schreiber 2068 (UC); summit of El Capitan, 7,649 ft. alt., vicinity of Yosemite Valley, June 21, 1936, Sharsmith 2152 (UC). MONO CO.: Slate Creek Basin, e. of Mt. Conness, 10,300 ft. alt., June 30, 1934, Abrams, Blake, & Keck 2869 (CAS, UC); Peak above Mono Lake, 10,000 ft. alt., July 6, 1863, Brewer 1799 (US); Slate Creek Valley, between Split Lake and Alpine Lake, 10,350 ft. alt., July 29,

1932, Clausen 535 (DS); Dana Plateau, Aug. 10, 1944, Howell 20299 (CAS); s. end of Saddle Bag Lake, Sierra Nevada Mts., 10,100 ft. alt., July 12, 1936, Kirkwood 245 (CAS); top of Duck Pass, 10,900 ft. alt., Mono-Fresno Cos., July 26, 1944, Pollard (CAS). NEVADA CO.: Castle Peak, July 9, 1902, Jones (CAS, POM); on bank above highway near A.S.U.C. lodge, near Norden, May 26, 1944, Jorgensen 447 (DS, WTU); Highway 20, near Sardine Spring, ca. 17 mi. e. of Nevada City, 5,000 ft. alt., May 12, 1966, True 2803 (CAS). PLACER CO.: Yuba Pass, 6,000 ft. alt., June 2, 1936, Babcock & Stebbins 1579 (UC); Summit, June 10, 1898, Eastwood (NY, ORE); Deer Park, Lake Tahoe Region, June 15-19, 1912, Eastwood 408 (CAS); Seven Lakes, Lake Tahoe Region, June 15-19, 1912, Eastwood 416 (CAS); Seven Lakes, Lake Tahoe Region, June 15-19, 1912, Eastwood 417 (US); Five Lakes, Lake Tahoe Region, June 15-19, 1912, Eastwood 417 (CAS); Desolation Valley Trail, 8,600-8,800 ft. alt., Lake Tahoe Region, June 21, 1930, Randall (UC); Rainbow, n. of Cisco, ca. 5,700 ft. alt., June 23, 1946, Rose 46207 (GH); Cisco, June, 1914, Valentien (UC). PLUMAS CO.: near Blairsdan, Feather River Region, July 27, 1921, Head (CAS, UC). SIERRA CO.: Lake Independence, Feather River Region, June 17, 1921, Head (CAS); Gold Lake Meadows, Feather River Region, June 25, 1921, Head (CAS); top of Bear ridge, Feather River Region, July 25, 1921, Head (CAS). TULARE CO.: Five Lakes Basin, near Long Lake, Sequoia National Park, 10,300 ft. alt., July 28, 1943, Ferris & Lorraine 10886 (DS, GH, POM, WS, WTU); Alba Peak, Sierra Nevada Mts., near Sequoia National Park, July 2, ?, 12,000 ft. alt., Grant 5013 (DS, POM); Little Five Lakes Basin, Aug. 2, 1942, Howell 17593 (CAS); Columbine Lake, Aug. 7, 1942, Howell 17801 (CAS); Siberian Pass Creek, 11,000 ft. alt., July 25, 1949, Howell 25722 (CAS); Olancha Peak, 9,500 ft. alt., July 22, 1950, Howell 27169A (CAS); w. side, Franklin Pass, 11,000 ft. alt., July 18, 1951, Howell 27915 (CAS, NY, WS); Siberian Pass Creek, 11,000 ft. alt., July 25,

1949, Munz 14209, grown at Pullman (POM, UC, WS, WTU); on a ridge running n. from Indian Rock toward Kern's Peak, 9,300 ft. alt., T. 19S., R. 34E., S. 15, July 3, 1963, Reveal 478 (WS); Balch Park, June 7, 1937, Winblad (CAS).

TUOLUMNE CO.: Surprise Lake, 9,700 ft. alt., T. 2N., R. 23E., S. 17, July 22, 1936, Hawbecker (UC); Gaylor Lakes, 10,800 ft. alt., Aug. 12, 1944, Howell 20364 (CAS); Sunrise Trail to Lake Merced, 8,500 ft. alt., July 7, 1909, Jepson 3166 (UC); Tuolumne R., near Conness Creek, 8,300 ft. alt., July 18, 1909, Jepson 3361 (UC); Tuolumne Falls, Tuolumne Meadows, 8,500 ft. alt., July 20, 1911, Jepson 4474 (UC); Macomb Ridge, 9,400 ft. alt., July 30, 1911, Jepson 4558 (UC); White Mt., Mount Conness Range, Sierra Nevada, July 24, 1936, Mason 11322 (UC); Twin Lakes, 9,000 ft. alt., Aug. 1, 1937, Mason 14840 (UC, WS); on ridge w. of Strawberry Lake, T. 4N., R. 18E., June 30, 1946, Ownbey & Ownbey 2963, grown at Pullman (WS); Upper Cow Creek, 7,250 ft. alt., July 3, 1938, Quick 1959 (CAS); above Jack Main Canyon in vicinity of Mahan Peak Sierra Nevada, 7,800 ft. alt., July 25, 1938, atypical, Sharsmith 3688 (WS, WTU).

NEVADA. WASHOE CO.: on trail to Mt. Rose through Tahoe Meadows, 8,600 ft. alt., June 2, 1939, Henrichs 505 (NY); near Mt. Rose, 8,500-10,500 ft. alt., Aug. 4, 1938, Howell 14185 (CAS, UC, WTU); Mt. Rose road, off Rt. 395, Mar., 1965, Menzies & Menzies (CAS).

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