

# SCROPHULARIACEAE OF THE CENTRAL ROCKY MOUNTAIN STATES.

By FRANCIS W. PENNELL.

## INTRODUCTION.

The purpose of a series of papers, of which this is the first, is to present in summarized form our knowledge of the plants of the family Scrophulariaceae growing within the states of Wyoming, Colorado, and Utah, and in Idaho west to the 113th meridian. Within this area it is planned to consider all species, and to give for each its taxonomic history, its flowering season, and its distribution.

Eastward from these states occur the Black Hills, with a flora akin to that of the foothills of the Rocky Mountains, and southward from them a great expanse of high plains in all respects identical with the high plains of eastern Colorado. To include the former and a large portion of the latter, the area of this study has been extended eastward to the 100th meridian. From this additional territory—western Kansas, western Nebraska, and southwestern South Dakota—comparatively few specimens have been seen, and consequently the specimens here cited do not indicate with the same degree of completeness the distribution of the species. However, eastward the species of this family are few and mostly long known.

Within the large area of this study, an area except for slight irregularities on its northwestern boundaries rectangular in outline, occurs a considerable diversity of natural environment, but a much greater diversity of flora. The lower and vastly the larger portion consists of a flat or rolling tableland, sloping upward from our eastern frontier, the Platte River below North Platte at about 750 meters altitude, to about 2,130 meters altitude on the continental divide in southern Wyoming. Northward, westward, and southward occur various broad valleys and relative depressions. The most important are the valleys of the Powder, Tongue, and Bighorn rivers in northern Wyoming; of the Snake River in southeastern Idaho; the broad basin of the Great Salt Lake, itself about 1,300 meters in altitude, and the deserts westward; the valley of the Virgin River of southwestern Utah, at St. George but 840 meters

above the sea; a large portion of the drainage of the Colorado River and its tributaries, the Green, the Grand, and the San Juan; and the valley of the Rio Grande in southern Colorado. This whole area impresses the traveler by its apparent botanical uniformity. It is throughout a country naturally arid; the gray dull growth of the sagebrush (*Artemisia*) is over the higher land, varied in the lowland with the somewhat livelier hues of the greasewood (*Sarcobatus*). Between the scattered plants bare earth is always visible, for sagebrush can not be said to "cover" or "clothe" the ground, nor does the greasewood hide the whiteness of the alkali in which it grows. Westward and southwestward the aridity increases; through much of central and southern and over enormous areas of western Utah the land is even without sagebrush—a desert almost or quite devoid of vegetation.

Through a land seemingly so uniform one would expect a uniform flora, but in *Penstemon*, the genus with which my studies have made me most familiar, precisely the opposite is the case. The high plains of the east have their distinctive species; others enter the valleys of northern Wyoming from the plains of Montana; different species occur on the "Red Desert," the valley of the Green River in southwestern Wyoming; in the North or Middle Park of northern Colorado; in the Grand or the Gunnison valleys of western Colorado; in the San Juan and Dolores valleys of southwestern Colorado; in the western drainage of the Colorado River from the base of the Uintas southward to northern Arizona; in the valley of the Virgin; in the Salt Lake Valley; and through the valley of the Snake River. No species of the lowland occurs over more than two or three of these regions. Ill-defined divisions within larger areas may be noted, as the valley of the Arkansas River from Pueblo to Las Animas counties, Colorado, and the valley of the Duchesne River in northeastern Utah. Evidently the factor controlling the development of species has been not diversity of valleys one from another, but simply the geographic isolation of each.

Throughout this dry country permanent watercourses are few, and their isolation when upon different river systems would seem far greater than that of the upland plains. Yet the few aquatic or wetland Scrophulariaceae are wide-ranging species, and occur in streams draining to the Atlantic and to the Pacific. Such are several species of *Mimulus* and *Veronica*. Doubtless the explanation of this seeming anomaly is that these species owe their distribution to the transporting agency of birds.

The surface of this plateau was summarized as level or rolling, and such also are the geologic strata; but eastward, and much more so westward, this surface is broken by steep escarpments, buttes, and bluffs which mark the edge of geologic formations, many of them

geologic faults. It is also more evident westward that the streams, and temporary washes as well, have cut for themselves deep and precipitous chasms. The greatest of these are along the Colorado River, but in Utah such canyons occur along most of the lowland streams. The flora of the buttes and canyon walls brings down to the plateaus many species of the hills. Low, flat or slightly sloping table-topped ridges, whose steeper slopes are conspicuously covered by junipers, occur over much of this area, and many of the species which geographically are ascribed to certain valley plains grow only upon these "mesas."

From central Colorado, or in fact from central northern New Mexico, northward and westward, the basal plateau is broken by many mountain chains. All these are more or less isolated. Some are low ridges scarcely to be distinguished from the mesas except by their sharper contour, but some are among the highest mountains of the continent, having about their bases masses of foothills which themselves resemble mountains. From the viewpoint of plant distribution these mountains and the highlands about them may be grouped in three associations:

1. *Northern Rockies*.—These enter our region from the northwest and include all ranges north of the great "saddle" valley plateau of southern Wyoming. They include the ranges about Yellowstone Park, the Teton and Wind River ranges, and the outlying Bighorn Mountains.

2. *Southern or Colorado Rockies*.—These include all the intricate chains of mountains of Colorado, extending northward into the Medicine Bow Range of southeastern Wyoming, and including the outlying La Sal and Abajo mountains of southeastern Utah.

3. *Wasatch or Utah Rockies*.—These extend from the Bear River Range of southeastern Idaho southward across central Utah to the southwestern extremity of that State. Adjoining or somewhat outlying these to the east are the Uinta Mountains, extending to the Colorado line across northeastern Utah, and, farther south, the Henry Mountains. Dr. Rydberg includes the Wasatch in the Southern Rockies, but at least the *Penstemon* flora of each group is quite distinct.

While each of these mountain groups has its peculiar species, the parallelism of the vegetation upon each is most striking. This parallelism is dependent upon altitude, and much has been written concerning the zones of vegetation or life zones which may be recognized. From the sagebrush semidesert at the base one ascends to a scattered low growth of junipers and pinyons; then to a "chaparral" of shrubby, gnarled oaks; then to an open belt of conifers, largely of *Pinus scopulorum*; then to a denser forest of other pines and *Pseudotsuga*, with open groves of *Populus tremuloides*, the

quaking aspen; next to a belt of spruce and fir; then out above the few stunted, highest growing individuals of these to the open alpine meadows and slopes. In this progress, corresponding to increased altitude, there is increased moisture. The alpine meadows are continually moist from more or less permanent snowdrifts, while here and lower on the slopes frequent showers occur in summer.

The foothills exist as a particularly wide and definite zone to the east of the Southern Rockies, and a peculiar flora of foothill species extends from Las Animas County, Colorado, to Albany County, Wyoming. The Black Hills of South Dakota are essentially a foothill region. Ranges of foothills, with a characteristic flora, running through southwestern Wyoming, southeastern Idaho, and northern Utah, connect the Northern with the Wasatch Rockies. In Utah and western Colorado many of the ranges are equivalent to the mountain foothills. In their flora the low mountains, the foothills, and the lower slopes of the main mountain chains are identical.

The different zonal treatments of the life of the Central Rocky Mountain States are based primarily upon the account and the classic map of Dr. C. Hart Merriam,<sup>1</sup> a map of the United States which, however, shows but little detail for this region. The work which Dr. Merriam then roughly outlined has, under his direction or stimulus, since been carried out in greater detail and made far more satisfactory by the United States Biological Survey. A series of state biological surveys has been begun, and for our area that for Colorado,<sup>2</sup> by Merritt Cary, was published in 1911, and that for Wyoming,<sup>3</sup> by the same author, in 1917. These contain excellent maps and interesting and pertinent text. His discussion is based upon personal field study, including practically every portion of these states and botanical even more than zoological evidence. The maps, slightly modified, as explained below, have been my best guide in expressing the zonal distribution of species.

In the plant distribution of the area covered by my study, Dr. Rydberg has been especially interested. In the Bulletin of the Torrey Botanical Club he is publishing a series of sketches of Rocky Mountain vegetation, zone by zone; but the paper which logically introduces these sketches and gives the author's delimitation of each zone is one published in the Memoirs of the New York Botanical Garden.<sup>4</sup> I am greatly indebted to this outline and to an unpublished

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<sup>1</sup> Life zones and crop zones of the United States, by C. Hart Merriam. U. S. Dept. Agr. Biol. Surv. Bull. 10. 1898.

<sup>2</sup> A biological survey of Colorado, by Merritt Cary. U. S. Dept. Agr. N. Amer. Fauna 33. 1911.

<sup>3</sup> Life zone investigations in Wyoming, by Merritt Cary. U. S. Dept. Agr. N. Amer. Fauna 42. 1917.

<sup>4</sup> 6: 477-499. 1916.

map by the same author. The map covers the entire area of my study, but it is not based upon so full a field acquaintance and does not attempt the detailed zonal delineation which makes Cary's map so valuable. However, in general terminology and broad limitation of zones I have followed it.

The terminology used by Rydberg is in accord with that used abroad, and its names have more appropriateness than have those of Merriam, followed by Cary. A third nomenclature has been evolved by Mr. Marcus E. Jones in his studies of Utah vegetation. Apparently, Jones has reached the same conclusions as to the belts of vegetation to be recognized, so that his names may be correlated readily with those in current use. The three systems of zonal nomenclature are:

RYDBERG.	MERRIAM.	JONES.
Lower Sonoran.	Lower Sonoran.	Tropical.
Upper Sonoran.	Upper Sonoran.	Lower Temperate.
Submontane (Subboreal). <sup>1</sup>	Transition.	Middle Temperate.
Montane.	Canadian } Hudsonian. }	Upper Temperate.
Subalpine.		
Alpine.	Alpine-Arctic.	Alpine.

The main point of divergence in which I follow Rydberg and not Merriam is in carrying the northern boundary of the Upper Sonoran Zone eastward and northeastward across the high plains following the divide between the Arkansas and Kansas river systems to the south, and the Platte drainage to the north. In the plains any zonal limit must be broad and more or less vague, but it certainly seems to accord better with *Penstemon* distribution to recognize from this line northward an area of Subboreal plains than it does to commence such an area in Montana. Slighter divergence from Cary's maps is in considering the Arkansas Valley above the Royal Gorge to be wholly Submontane (or Transition), with only some Upper Sonoran intrusion—at Salida I found only foothill *Penstemons*. The same treatment applies to the isolated Upper Sonoran areas or, as I view them, local Upper Sonoran intrusions into the Submontane Zone, above the canyon of the Grand River.

Of botanical collections made within this total area there have been many, and yet, such is the diversity of the flora that with collections much more ample than those of many areas of the same size eastward, our knowledge of the flora is still much less complete. The best known sections are the foothills of eastern Colorado, especially those easily reached from Denver, Boulder, Fort Collins, or Colorado

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<sup>1</sup> "Subboreal" applies to the Great Plains, "Submontane" to the mountains and intermontane plateaus.

Springs, and the more or less immediate vicinity of Laramie, Wyoming, and of Salt Lake City, Utah, and Yellowstone Park.

At some time, from the early expeditions of James, Nuttall, and Frémont, to the present day of resident collectors, Osterhout, Ramaley, Nelson, Jones, and Garrett, nearly every natural region of this area has been visited by botanists. But most of the land is still practically unsettled, much is reached only with great difficulty, since railroad lines are far apart and mostly away from the mountains, and many sections have been visited but once or twice, and that at only one season of the year, so that even to-day, in spite of a century of collecting, it is evident that a great amount of further exploration needs to be done. The truth of this will appear after noting in the following revision the number of species which have been collected but once, but for which it is quite feasible to predict a natural range. Such is *Penstemon paysonii* of the Dolores Valley.

My own field work, of which primarily this revision is the outgrowth, was undertaken in the summer of 1915. The itinerary of the trip, listing only places for collecting, follows:

June 5-7. Pueblo, Pueblo County, Colorado.

8. North Cheyenne Canyon, El Paso County, Colorado.
9. Manitou, Garden of the Gods, El Paso County, Colorado.
10. Nob Hill, South Cheyenne Canyon, North Cheyenne Canyon, Bear Creek Canyon, El Paso County, Colorado.
- 11, 12. Palmer Lake, El Paso County, Colorado.
12. Aurora, Denver County, Colorado.
13. Golden, Morrison, Jefferson County, Colorado; Valverde, Denver County, Colorado.
14. Boulder, Marshall, Boulder County, Colorado.
15. Denver, Valverde, Denver County, Colorado.
- 16, 17. Windsor, Weld County, Colorado.
17. Horsetooth Mountain, Larimer County, Colorado.
18. Fort Collins, Owl Canyon, Larimer County, Colorado.
20. Laramie, Albany County, Wyoming.
21. Rawlins, Carbon County, Wyoming.
22. Wamsutter, Sweetwater County, Wyoming.
23. Point of Rocks, Sweetwater County, Wyoming.
24. Green River, Sweetwater County, Wyoming.
- 24, 26. Evanston, Uinta County, Wyoming.
- 26, 27. Echo, Summit County, Utah.
- 27, 28. Devils Slide, Morgan County, Utah.
29. Parleys Canyon, Salt Lake County, Utah.
30. Salt Lake City, Becks Hot Springs, Salt Lake County, Utah.

- July 1. South Fork of Big Cottonwood Creek, Salt Lake County, Utah.
2. Emigration Canyon, Salt Lake County, Utah.
3. Along Madison River, along Gibbon River, Yellowstone National Park, Wyoming.
- 3, 4. Upper Geyser Basin, Yellowstone National Park, Wyoming.
5. West Thumb and near mouth of Yellowstone Lake, Yellowstone National Park, Wyoming.
6. Yellowstone Canyon, Hedges Peak, Yellowstone National Park, Wyoming.
7. Mammoth Hot Springs, Golden Gate, Swan Lake, Yellowstone National Park, Wyoming.
8. Near Gibbon Falls, Yellowstone National Park, Wyoming.
9. Ashton, Fremont County, Idaho.
- 10, 11. Pocatello, Bannock County, Idaho.
12. Big Cottonwood Canyon, Salt Lake County, Utah.
- 13-15. Silver Lake, Salt Lake County, Utah.
14. Little Cottonwood Canyon, Salt Lake County, Utah.
- 16, 17. Near mouth of Provo Canyon, Utah County, Utah.
17. Rock Canyon, Slide Canyon, Soldier Summit, Utah County, Utah.
18. Castle Gate, Helper, Price, Carbon County, Utah.
- 19-21. Glenwood Springs, Garfield County, Colorado.
22. Grand Junction, Mesa County, Colorado.
24. Ouray, Ouray County, Colorado.
25. Mount Abram, Ouray County, Colorado.
26. Ouray, Ouray County, Colorado.
27. Along Canyon Creek, along Sneffels Creek, Yankee Boy Basin, Ouray County, Colorado.
28. Along Horsethief Trail, east of Ouray, Ouray County, Colorado.
- 29, 30. Cimarron, Montrose County, Colorado.
- 30, 31. Sapinero, Gunnison County, Colorado.
31. Gunnison, Gunnison County, Colorado.
- August 1. Near Gunnison River, west of Gunnison, Gunnison County, Colorado.
- 1, 2. Sargents, Saguache County, Colorado.
3. Salida, Chaffee County, Colorado; Canon City, Fremont County, Colorado.
4. Pueblo, Pueblo County, Colorado; Garden of the Gods, El Paso County, Colorado.
5. Pikes Peak, El Paso County, Colorado.

August 6. North Cheyenne Canyon, South Cheyenne Canyon,  
El Paso County, Colorado.

7. Near switch west of Arena, Jefferson County, Colorado.

8-10. Tolland, Gilpin County, Colorado.

11. Golden, Jefferson County, Colorado.

12. Valverde, Denver County, Colorado.

13, 14. Windsor, Weld County, Colorado.

17. Julesburg, Sedgwick County, Colorado; Ogallala, Keith  
County, Nebraska.

18. North Platte, Lincoln County, Nebraska.

To Prof. Ellsworth Bethel, of Denver, Colorado, with whom I collected June 13 to 15, to Mr. G. E. Osterhout, of Windsor, Colorado, with whom I collected June 16 to 18, July 20 to 28, and August 13 and 14, and to Prof. A. O. Garrett of Salt Lake City, Utah, with whom I collected June 29 to July 1, and July 12 to 15, I am under obligations for scientific assistance and unstinting hospitality.

Of all species of Scrophulariaceae seen collections were made, these at as many localities as possible. Duplicates were freely included and these have been distributed to leading herbaria. Descriptions of fresh flowers were made and field notes taken of other features. It would be difficult to overestimate the value of such records.

Since my return from the Rockies in August, 1915, much time has been devoted to the study of these Scrophulariaceae. At first I planned to consider little more than the species of the route traversed, extending my study to the northern limit now adopted, but definitely excluding the species of the southern tier of counties in Colorado and of southern and southwestern Utah. This southern country includes many species possessed in common with the northern portions of New Mexico and Arizona, and many or most of these do not reach the main line of the Denver & Rio Grande Railroad, along which I collected. But certain causes have led to the inclusion of these.

Rydberg's *Flora of the Rocky Mountains*, recently published, includes all species to the southern boundary of Colorado and Utah, and he had desired me to extend the range of this study to the same limit. Also, in asking from herbaria the loan of specimens, exclusive of southernmost Colorado and southern and western Utah, I have received in all cases full representation from these entire states. It has seemed appropriate, in view of the courtesy extended and the opportunity thus afforded, to make full use of these specimens. The study of this additional material has delayed the present report, but the chance to review the rich collections of Jones, Ward, Brandegee, and many others has made the delay worth while.



Specimens have been seen from most of our leading herbaria. The herbaria in which a given collection is to be found are indicated by the following letters:

- A. Academy of Natural Sciences, Philadelphia.
- B. University of Colorado.
- D. State Museum, Denver, Colorado.
- E. Brooklyn Botanic Garden.
- F. Field Museum of Natural History.
- H. Gray Herbarium.<sup>1</sup>
- K. Royal Botanic Garden,<sup>1</sup> Kew, England.
- M. Missouri Botanical Garden.
- P. University of Pennsylvania.
- R. Rocky Mountain Herbarium, University of Wyoming.
- S. Stanford University.<sup>1</sup>
- U. United States National Herbarium.
- Y. New York Botanical Garden.
- Z. New York State Museum.

To the custodians who have generously aided by lending material, I am much indebted.

Also, I have seen the herbarium of Prof. A. O. Garrett and the large herbarium of Mr. George E. Osterhout. The latter is of special value for the Colorado species. While I have not as yet seen the collection at the Gray Herbarium, through the kindness of Mr. J. Francis Macbride I have verified all types there. The type of *Penstemon petiolatus* T. S. Brandeg., at the University of California, has been critically examined at my request by Dr. H. M. Hall, formerly of that institution.

In the following account, keys to species are included and descriptions are provided for all species considered new. So far as possible all types have been verified. Full synonymy is given, but only for names of the area considered. The paragraph concerning distribution is primarily so restricted, and includes statements of environment; of altitude followed by that of life zone; of the province or physiographic natural region; of the actual surface distribution; and, in cases where the species occurs beyond the area considered, of its wider range. So far as the facts are known, statements of flowering seasons are made. These are compiled from records accompanying specimens seen, and not accepted from literature. By this process our information, while accurate, is obviously imperfect and will need many additions from future field observation.

Specimens are listed only from the area outlined. Under *Collinsia* and *Scrophularia*, genera with but one species each in our area, none are cited, although to afford a basis for the summary of the range

<sup>1</sup> Herbaria not seen, but to which duplicates of my specimens have been sent.

indicated, counties from which specimens have been seen are stated. Under *Chionophila*, a monotypic genus, no specimens are cited, but for a plant so local it is of interest to know the peaks upon which it occurs. For these genera the numbers of my own collections are given. Under *Penstemon*, a genus of many species and these much confused, it has been thought best fully to cite localities and specimens seen, the latter one to a county. All care has been taken to attribute localities to their proper county, but in this there is necessarily some possibility of error. The county is used as a logical, easily located unit of area. The name of each county is followed by a colon, and throughout county names are in alphabetical sequence.

### SYSTEMATIC TREATMENT.

#### VERBASCUM L.

##### KEY TO THE SPECIES.

Leaves green, dentate, glabrous, not decurrent; stem (above) and calyx with simple glandular hairs; inflorescence lax; pedicels 10 to 15 mm. long; sepals lanceolate, 5 to 6 mm. long, much shorter than the capsule; corolla 25 to 30 mm. wide, yellow or white; filaments all densely lanose with knobbed purple hairs; capsule 7 to 8 mm. long, glandular-puberulent; seeds dark gray, 0.8 to 0.9 mm. long.

1. *V. blattaria*.

Leaves yellowish green, finely crenate, decurrent; stem, leaves, and calyx densely woolly with stellate-branched nonglandular hairs; inflorescence densely crowded; pedicels very short or none; sepals ovate, 6 to 8 mm. long, slightly shorter than or equaling the capsule; corolla 20 to 22 mm. wide, always yellow; 3 posterior filaments lanose with filiform yellow hairs, the 2 anterior ones glabrous; capsule 6 to 8 mm. long, stellate-pubescent; seeds brownish gray, 0.4 to 0.5 mm. long.....2. *V. thapsus*.

##### 1. *Verbascum blattaria* L.

Fields and roadsides; rare (Boulder, Colorado, *Osterhout* 2462). Introduced from Europe.

##### 2. *Verbascum thapsus* L.

Fields and roadsides; frequent (*Pennell* 5958, 6116). Introduced from Europe.

#### LINARIA L.

##### KEY TO THE SPECIES.

Corolla (excluding spur) 15 to 18 mm. long, yellow, the posterior lip arched over the anterior one, the anterior lip forming a conspicuous protruding orange palate, the spur tapering from a broad stout base; capsule 10 mm. long, much exceeding the sepals; style 8 mm. long; seeds 1.7 mm. long, flattened circularly and broadly winged; stem 30 to 100 cm. tall, densely leafy; young stems not prostrate.....1. *L. linaria*.

Corolla (excluding spur) 14 to 17 mm. long, blue, the posterior lip erect, the anterior one broadly spreading but not forming a raised palate, the spur very slender throughout; capsule 2 to 3 mm. long, equaling or slightly exceeding the sepals; style 1 to 1.5 mm. long; seeds 0.3 to 0.4 mm. long, cylindrical, obtusely prismatic-angled, not winged; stem slender, 20 to 80 cm. tall, less leafy; young stems prostrate.....2. *L. texana*.

1. *Linaria linaria* (L.) Karst.

Fields and roadsides; rare (Gunnison, Colorado, *Shear* 5074). Introduced from Europe.

2. *Linaria texana* Scheele.

*Linaria texana* Scheele, *Linnaea* 21: 761. 1848. "Zwischen Houston und Austin (Texas) häufig: Römer." Type not seen or verified, but description evidently of the plant here characterized.

Occasional in sandy fields or along railroads, base of foothills of northeastern Colorado, at altitudes of 1,500 to 1,740 meters; possibly locally introduced; flowering in June.

COLORADO: Boulder: *Penard* 89. Jefferson: Golden, *Pennell* 6386. Larimer: Horse-tooth Mountain, *Pennell* 5856.

Closely related to the eastern *L. canadensis* (L.) Dum.-Cours., but mostly distinguishable as follows:

Corolla of early flowers (excluding spur) 7 to 8 mm. long, the spur 2.4 mm. long; sepals linear-lanceolate, acuminate to subulate-tipped; seeds sharply prismatic, the angles thin, the faces smooth to somewhat tuberculate. Apparently native through the eastern Coastal Plain, Massachusetts to Florida and eastern Texas; Illinois, and likely introduced elsewhere northward and inland.

*L. canadensis.*

Corolla of early flowers (excluding spur) 14 to 17 mm. long, the spur 5 to 9 mm. long; sepals lanceolate to ovate-lanceolate, obtusish to acute; seeds not sharply prismatic, the angles more or less rounded, the angles and faces densely tuberculate. From South Carolina, southwestern Missouri, Colorado, and Vancouver Island southward, within the tropics through the Cordilleras and Andes to Argentina and Chile. (*L. subandina* Diels is evidently a synonym. From Florida to Texas, and perhaps elsewhere, intermediates with *L. canadensis* occur.) ..... *L. texana.*

COLLINSIA Nutt.

1. *Collinsia parviflora* Lindl.

*Collinsia parviflora* Lindl. Bot. Reg. 13: pl. 1082. 1827. "Received by the Horticultural Society from Mr. David Douglas, in 1827, by whom it was found in the vicinity of the River Columbia." In account of *C. grandiflora* Lindl. (op. cit., pl. 1107), "We learn from [Mr. Douglas] that the species published at folio 1082 of the present volume is confined to the rocks in the vicinity of the ocean." Type station evidently near the mouth of the Columbia, probably near Fort Vancouver, Washington. Specimen in herbarium of Columbia University, New York Botanical Garden, labeled "N. West. Amer.," received by Torrey from Lindley, if not actually an isotype,<sup>1</sup> is certainly authentic.

Moist or dry, shady or open, loamy soil, gravelly or rocky, on banks and hillsides, at altitudes of (1,350) 1,500 to 2,850 meters; Submontane and Montane zones; flowering from mid-April to late August, depending upon latitude and altitude. Foothills and lower mountain slopes, descending into plateaus along canyon sides and river banks; throughout the area. British Columbia and Keeweenaw County, Michigan, to northern New Mexico and southern California.

SOUTH DAKOTA: Meade County.

<sup>1</sup>The word isotype is used to denote specimens of the type collection other than the type itself.

WYOMING: Albany (5875),<sup>1</sup> Carbon, Fremont, Laramie, Lincoln, Sheridan, Uinta (5911), and Weston counties. Yellowstone National Park (5993, 6005, 6017, 6026).

IDAHO: Bannock (6058) and Fremont (6051) counties.

COLORADO: Archuleta, Boulder (5829), Clear Creek, Delta, Denver (5836), Douglas, El Paso (5805, 5812), Fremont, Gilpin, Grand, Gunnison, Huerfano, Jefferson (5818), Larimer (5857), Montezuma, Montrose, and Pueblo counties.

UTAH: Beaver, Box Elder, Cache, Kane, Morgan (5946), Piute, Salt Lake (5981, 5982), Summit (5928, 5938), Utah, Washington, and Weber counties.

## SCROPHULARIA L.

### 1. *Scrophularia occidentalis* (Rydb.) Bicknell.

*Scrophularia nodosa occidentalis* Rydb. Contr. U. S. Nat. Herb. 3: 517. 1896. "Rapid City [South Dakota], altitude 1,000 m., July 25, [1892, P. A. Rydberg] (No. 914)." Isotype seen in herbarium of New York Botanical Garden.

*Scrophularia occidentalis* Bicknell, Bull. Torrey Club 23: 315. 1896.

Moist soil, loam or sand, frequently gravelly or rocky, woodland, especially thickets along streams, more rarely in open, at altitudes of 1,350 to 2,700 (3,000) meters; Submontane (Subboreal) and Montane zones; flowering from early June to middle of August, depending upon latitude and altitude. Foothills and lower mountain slopes, descending into plateaus along canyon sides and river banks; throughout the area. A widespread species, apparently not distinct from *S. leporella* Bicknell of the Atlantic states.

SOUTH DAKOTA: Fall River and Pennington counties.

IDAHO: Bannock (6057) and Fremont (6047) counties.

COLORADO: Boulder (5832), Clear Creek, Denver (5837, 6391), El Paso (5778, 5783, 5809, 5815, 6336), Garfield (6161, 6171), Grand, Gunnison (6278, 6279), Huerfano, Jefferson (5819, 5824, 6388), La Plata, Larimer (5852, 5866), Montrose, Routt, Summit, and Weld counties.

UTAH: Box Elder, Cache, Morgan (5942), Salt Lake (5966, 5974, 5983, 6077), San Juan, Utah (6117, 6122, 6128), and Weber counties.

## CHIONOPHILA Benth.

### 1. *Chionophila jamesii* Benth.

*Chionophila jamesii* Benth. in DC. Prodr. 10: 331. 1846. "In montibus Scopulosis Americae borealis juxta nives perpetuas (James!) \* \* \* (v. in herb. Torrey et Hook.)." Isotype seen in herbarium of New York Botanical Garden, doubtless from Pikes Peak.

Moist, gravelly slopes, above timber line, at altitudes of 3,600 to 4,200 meters; Alpine Zone; flowering from early July to late August. High mountains, Medicine Bow Mountains of southeastern Wyoming, southward through the Front Range of northeastern Colorado; on Pikes Peak; on the San Juan and Uncompahgre mountains of southwestern Colorado; doubtless through intervening ranges.

WYOMING: Albany: Medicine Bow Mountains.

COLORADO: Boulder: Arapahoe Peak; Longs Peak. Clear Creek: Berthoud Pass; Douglass Mountain; Grays Peak; Mount Flora; Mount Lincoln. El Paso: Pikes Peak (6330, 6335). Jackson: Ethel Peak. Larimer: Mountains above Beaver Creek; Estes Park; Longs Peak. Mineral: Near Pagosa Peak. Ouray: Mount Hayden. San Juan: Red Mountain. Summit: Mount Bartlett. County uncertain: Sawatch Range; Sierra Sangre de Cristo.

<sup>1</sup> In *Collinsia*, *Scrophularia*, and *Chionophila* numbers refer to specimens of my own collecting.

PENSTEMON [Mitchell] Schmidel.<sup>1</sup>

KEY TO SECTIONS.

Anther sacs opening from the distal apex, throughout or partially; seeds grayish brown or brown, deepening to blackish, minutely or obsolete reticulate.

Corolla scarlet, somewhat fleshy, the throat tubular. *ELMIGERA* (Reichenb.) Benth.

Corolla 25 to 30 mm. long, the posterior lobes 5 mm. long, united one-half their length, the anterior lobes scarcely spreading; anther sacs 2 mm. long, lanceolate, minutely puberulent, slightly united at base; seeds 2.5 mm. long, less sharply angled; leaves at base of stem obovate, those on the stem ovate, the upper ones rounded at base, the opposite leaves completely clasping the stem; thyrsus strict, the peduncles and pedicels short. .I. *Centhranthifolii*.

Corolla 30 to 35 mm. long, the posterior lobes 8 to 12 mm. long, united two-thirds to three-fourths their length, the anterior lobes decurved-reflexed; anther sacs 1.5 to 2 mm. long, triangular-ovate, scarcely puberulent, broadly united at base; seeds 2 to 2.2 mm. long, sharply angled; leaves at base of stem lanceolate-oblong, those on the stem linear to lanceolate, narrowed at base and slightly clasping, the opposite leaves not meeting; thyrsus lax, the peduncles and pedicels longer. . . . .II. *Barbati*.

Corolla dull red, blue, purplish blue, or white, membranous, the throat usually wider.

Anther sacs glabrous to lanate; seeds merely angled; corolla throat terete or anteriorly flattened and ridged within. Inflorescence thyrsoid, rarely seeming racemose; leaves thin to succulent, not coriaceous; plants herbaceous to suffrutescent at base. *EUPENSTEMON* Benth.

Corolla throat rounded anteriorly; seeds brown, 1.5 to 5 mm. long; stems erect from base, not suffrutescent; plants probably biennial.

Corolla glandular-puberulent within, white or red.

Corolla red, the throat narrow; sterile filament glabrous; leaves entire; plants glabrous, glaucous. . . . .III. *Utahenses*.

Corolla white, the throat broad; sterile filament bearded; leaves frequently dentate; plants rough-puberulent, not glaucous. . . .IV. *Albidi*.

Corolla not glandular-puberulent within, blue or purplish blue (except in *Spectabiles* and *Petiolati*).

Leaves broadly linear to orbicular.

Corolla throat nearly tubular, the posterior lobes united but slightly at base, the corolla scarcely 2-lipped. Plants cinereous-puberulent; corolla glabrous within. . . . .V. *Fremontiani*.

Corolla throat evidently inflated anteriorly, the posterior lobes united at least one-fourth their length, the corolla evidently 2-lipped.

Leaves relatively thin, not fleshy; plants scarcely or not glaucous (except in *Spectabiles* and *Petiolati*); sterile filament relatively slender, scarcely or but slightly enlarged distally; seeds 1.5 to 3.5 mm. long, finely and closely reticulate; posterior corolla lobes more arched, usually but slightly spreading.

Plants more or less densely puberulent or pubescent; corolla mostly purplish, the posterior lobes mostly less united, always for less than one-half their length; anther sacs always glabrous, the line of contact between the sacs relatively long. Sterile filament conspicuous, densely bearded with yellow or orange hairs; seeds more evidently reticulate. . . . .VI. *Cristati*.

<sup>1</sup> C. C. Schmidel, *Icones Plantarum* 2. 1762. Type, from description and pre-Linnean citation, *Chelone penstemon* L. This would establish the orthography "*Penstemon*."

Plants glabrous or finely puberulent, rarely decidedly so; corolla mostly blue, the posterior lobes mostly more united, for one-third to usually over one-half their length; anther sacs glabrous to lanose, with short line of contact.

Stem leaves ovate to orbicular, dentate or serrate, glaucous; corolla (probably in ours) not blue.

Corolla 15 mm. long, scarcely inflated, strongly bearded within, apparently reddish; anther sacs short, semicircular; sterile filament not exerted, relatively short-bearded; leaves orbicular, dentate, the lower ones on conspicuous petioles, the upper ones distinct; plants cinereous-puberulent, glandular-pubescent in the inflorescence .. **VII. Petiolati.**

Corolla 25 to 30 mm. long, strongly inflated, slightly bearded within, "cream-white, and usually suffused or particolored with pink"; anther sacs ovate; sterile filament conspicuously exerted, bearded with long hairs; leaves ovate, serrate, the lowest somewhat petioled, the upper ones frequently connate; plants glabrous below, glandular-pubescent in the inflorescence..... **VIII. Spectabiles.**

Stem leaves linear to lance-ovate, entire, not or scarcely glaucous, the upper ones always distinct; corolla blue. Sterile filament bearded with short hairs or glabrous..... **IX. Glabri.**

Leaves relatively thick, more or less fleshy; plants strongly glaucous; sterile filament relatively broad, more or less enlarged distally (bearded with relatively short hairs); seeds 2.5 to 5 mm. long, more coarsely alveolate-reticulate; corolla lobes all widely spreading (posterior lobes united less than one-half their length).

**X. Coerulei.**

Leaves filiform to narrowly linear.

Corolla 13 to 15 mm. long, the throat straight, inflated anteriorly, pubescent within over bases of the anterior lobes; sterile filament bearded; plants 10 to 30 cm. tall, the leaves more or less crowded at or near the base..... **XI. Laricifolii.**

Corolla 15 to 20 mm. long, the throat decurved, narrow, not inflated, puberulent within over bases of all the lobes; sterile filament glabrous; plants 20 to 40 cm. tall, the leaves more scattered on the stem..... **XII. Ambigui.**

Corolla throat flattened and 2-ridged within anteriorly; seeds grayish brown, 0.5 to 2 mm. long; stems usually depressed and more or less suffrutescent at base; plants probably all perennials.

Corolla white, glandular-puberulent within over bases of all the lobes; leaves coarsely sinuate-dentate..... **XIII. Deusti.**

Corolla blue or chocolate-purple, pubescent to lanose within over bases of the anterior lobes; leaves, at least the basal ones, entire or nearly so.

Corolla 8 to 22 mm. long, pale to deep blue, pubescent within over bases of the anterior lobes, these equaling or somewhat exceeding the posterior ones.

Corolla somewhat expanding, the posterior lobes more or less spreading; seeds pale toward the margin, lighter in shade, 0.5 to 2 mm. long; stems erect, diffuse-spreading only at base, not forming mats; plants finely puberulent or glabrous..... **XIV. Graciles.**

Corolla nearly tubular, the posterior lobes projecting; seeds uniformly dense, very dark, 1.5 to 2 mm. long; stems lower, diffuse-spreading partially or throughout, forming mats; plants more or less puberulent.....**XV. Caespitosi.**  
 Corolla 25 to 30 mm. long, lavender-blue or chocolate-purple, lanose within over bases of the strongly projecting anterior lobes.

**XVI. Whippleani**

Anther sacs densely comose; seeds slightly wing-angled; corolla throat strongly flattened anteriorly and ridged within; inflorescence by reduction seemingly racemose; leaves coriaceous; plants shrubby, woody below. *DASANTHERA* (Raf.) Pennell<sup>1</sup>.....**XVII. Fruticosi.**

Anther sacs opening partially by short confluent proximal slits, the anthers horse-shoe-shaped; seeds pale gray, minutely honeycombed. Plants shrubby at base; corolla widely inflated, glabrous without and within; sterile filament glabrous. *SACCANTHERA* Benth.

Corolla scarlet-red, the throat nearly tubular, deeply 2-lipped, the posterior lobe projecting, the anterior ones strongly descending-recurved.

**XVIII. Bridgesiani.**

Corolla violet or blue, the throat inflated, shallowly 2-lipped, the lobes all spreading.

**XIX. Heterophylli.**

I. CENTRANTHIFOLII.

Stem glabrous; leaves glabrous or nearly so; sepals triangular-ovate, acute to acuminate, 3 to 5 mm. long.....1. *P. eatoni*.

Stem and leaves finely pubescent or puberulent; sepals triangular-ovate to lanceolate, acute or more frequently long-acuminate, 3 to 7 mm. long.

1a. *P. eatoni undosus*.

II. BARBATI.

Anther sacs not lanate, more spreading; corolla throat relatively broad.

Corolla within the throat glabrous anteriorly or with a few white hairs; sepals mostly 3 to 5 mm. long.....2. *P. torreyi*.

Corolla within throat lanate anteriorly with yellow hairs; sepals mostly 5 to 9 mm. long.

Stem and leaves glabrous; stem leaves linear or nearly so.....3. *P. barbatus*.

Stem and leaves puberulent; stem leaves broader than linear.

3a. *P. barbatus puberulus*.

Anther sacs more or less lanate, slightly thicker and more erect; corolla throat narrow.

4. *P. trichander*.

III. UTAHENSES.

A single species.....5. *P. utahensis*.

IV. ALBIDI.

A single species.....6. *P. albidus*.

V. FREMONTIANI.

Plants 40 to 80 cm. tall; basal and lower leaves obovate, emarginate, the upper leaves oblong-ovate; calyx lobes broadly ovate, abruptly short-caudate, with relatively conspicuous, erose, scarious margins; corolla 23 to 25 mm. long; sterile filament nearly or quite glabrous.....7. *P. jonesii*.

<sup>1</sup> *Dasanthera* Raf. Amer. Month. Mag. 2: 267. 1818. Type species, *Gerardia fruticosa* Pursh.

Plants 10 to 30 cm. tall; basal and lower leaves oblanceolate to obovate, acutish, the upper leaves lanceolate; calyx lobes acute to acuminate, with narrow, scarcely erose, scarious margins; corolla 15 to 20 mm. long; sterile filament bearded.

Calyx lobes acute; anther sacs glabrous; sterile filament moderately bearded.

8. *P. leptanthus*.

Calyx lobes acuminate; anther sacs barbate; sterile filament but slightly bearded.

9. *P. fremontii*.

#### VI. CRISTATI.

Anther sacs opening nearly throughout, the line of contact of the sacs short; basal and lower leaves linear to linear-lanceolate; sterile filament densely bearded throughout with orange-golden hairs; seeds blackish.

Corolla 20 to 25 mm. long, much more than twice exceeding the sepals; stems relatively stout.....10. *P. auriberbis*.

Corolla 12 mm. long, much less than twice exceeding the sepals; stems slender.

11. *P. parviflorus*.

Anther sacs opening throughout, the line of contact of the sacs longer; basal and lower leaves lanceolate to ovate; sterile filament bearded, especially distally, with yellow hairs; seeds brown.

Corolla throat moderately (i. e., less abruptly) inflated, slightly pubescent to glabrous within anteriorly, all the lobes spreading; anther sacs with moderate line of contact; sterile filament bearded with short hairs, rarely slightly exerted.

Inflorescence, stems (throughout), and calyx cinereous-puberulent but not glandular; plants 2 to 10 cm. tall; basal leaves 1.2 to 3 cm. long....12. *P. dollus*.

Inflorescence, stems (above), and calyx glandular-pubescent; plants taller; basal leaves 3 to 6 cm. long.

Basal leaves lanceolate; stem leaves narrowed to a clasping base; corolla 18 to 22 mm. long; anther sacs oblong-lanceolate, with medium line of contact; plants 8 to 16 cm. tall.....13. *P. paysonii*.

Basal leaves ovate; stem leaves cordate-clasping at base; corolla 15 to 17 mm. long; anther sacs ovate, with longer line of contact; plants 10 to 40 cm. tall.....14. *P. moffatti*.

Corolla throat abruptly and strongly inflated, lanose within anteriorly, the posterior lobes arched and projecting forward (not spreading); anther sacs with long line of contact; sterile filament bearded with long hairs, usually exerted.

Corolla throat not contracted distally, the lobes one-fourth to one-third the total length; anther sacs with line of contact nearly equaling the length of each.

Corolla 20 to 35 mm. long, the throat very widely inflated, the lobes one-third the corolla length; basal leaves ovate, rough-puberulent, more or less lanate-pubescent; stem (above) and sepals white-lanate with gland-tipped hairs.

Stem leaves lanceolate, entire or nearly so; corolla 25 to 35 mm. long.

15. *P. eriantherus*.

Stem leaves lanceolate-linear, more or less dentate with salient teeth; corolla 20 to 28 mm. long.....15a. *P. eriantherus saliens*.

Corolla 15 to 20 mm. long, the throat less inflated, the lobes one-fourth the corolla length; basal leaves lanceolate, roughish-puberulent to glabrate; stem (above) and sepals puberulent with gland-tipped hairs.

16. *P. ophianthus*.

Corolla throat obviously contracted distally, the lobes one-fifth the corolla length; anther sacs with line of contact longer than the length of each.

17. *P. cleburnei*.

#### VII. PETIOLATI.

A single species.....18. *P. petiolatus*.



VIII. SPECTABILES.

A single species.....19. *P. palmeri*.

IX. GLABRI.

Anther sacs glabrous (or in *P. hallii* sometimes with a small tuft of hairs precisely at the summit of the filament).

Anther sacs with relatively long line of contact, opening throughout.

Corolla throat abruptly inflated and decurved at base; sterile filament short-bearded (very rarely glabrous); anther sacs with relatively long line of contact; sepals glandular-puberulent externally, with broad lacerate scarious margin. Plants 5 to 25 cm. tall.....20. *P. hallii*.

Corolla throat gradually much expanded from the base, not abruptly decurved; sterile filament glabrous (very rarely with a few hairs at apex); anther sacs with short line of contact; sepals glabrous externally, with or without a narrow entire scarious margin.

Plants 5 to 10 cm. tall, puberulent; basal leaves 2 to 2.5 cm. long; stem leaves few; thyrsus of 1 or 2 1-flowered fascicles; sepals ovate, not or scarcely scarious-margined; corolla glabrous within.....21. *P. parvus*.

Plants 40 to 90 cm. tall, glabrous; basal leaves 6 to 12 cm. long; stem leaves numerous; thyrsus of many several-flowered fascicles; sepals oblong-ovate, slightly scarious-margined; corolla glabrous or sparsely pubescent within anteriorly.....22. *P. unilateralis*.

Anther sacs scarcely contiguous, the line of contact very short.

Anther sacs opening throughout.

Sepals narrowly ovate, more or less caudate-tipped, conspicuously scarious-margined, glabrous externally; lower stem leaves narrowly oblanceolate, sometimes 12 cm. long.....23. *P. magnus*.

Sepals lanceolate-acuminate, not or obscurely scarious-margined, glandular-puberulent externally; lower stem leaves lanceolate, tapering distally, 4 to 10 cm. long.....24. *P. leiophyllus*.

Anther sacs opening partially.

Plants 40 to 70 cm. tall, glabrous throughout; sepals broadly ovate, more or less abruptly acuminate; corolla glabrous externally, the throat more inflated anteriorly; sterile filament slightly bearded.....25. *P. laevis*.<sup>1</sup>

Plants 20 to 35 cm. tall, cinereous-puberulent throughout; sepals ovate-acuminate; corolla glandular-puberulent externally, the throat less inflated anteriorly; sterile filament glabrous.....26. *P. wardii*.

Anther sacs hispid-pubescent to lanate on the sides, scarcely contiguous, the line of contact of the sacs very short.

Anther sacs short-pubescent with relatively stiff hairs.

Anther sacs opening throughout.

Corolla 25 to 30 mm. long, the throat much inflated anteriorly and slightly narrowed to the orifice, the anterior lobes abruptly deflexed-spreading and pubescent or glabrous at base within; sepals not glandular-puberulent externally.

Sepals 2 to 4 mm. long, nearly orbicular, with short acute or no tip; corolla pubescent or glabrous within.....27. *P. glaber*.

Sepals 5 to 7 mm. long, mostly ovate, with more or less prolonged acuminate tip.

<sup>1</sup> For description of a related new species, *Penstemon tidestromii*, omitted in the key, see p. 379.

- Sterile filament relatively slender, scarcely or not lobed at the apex, bearded near the apex with yellow hairs; corolla 23 to 30 (-33) mm. long, usually decidedly pubescent within; sepals with an acuminate tip nearly equaling or exceeding the body; stem glabrous or puberulent ..... 28. *P. alpinus*.
- Sterile filament relatively stout, frequently or mostly bilobate at the apex, glabrous (rarely with a few hairs at apex); corolla 30 to 40 mm. long, slightly pubescent or glabrous within; sepals with an acuminate tip shorter than the body; stem puberulent. .... 29. *P. brandegei*.
- Corolla 15 to 25 (-30) mm. long, the throat inflated anteriorly and not narrowed to the orifice, the anterior lobes spreading and glabrous at the base within; sepals minutely and usually obscurely glandular-puberulent externally.
- Corolla widening from a narrow basal tube; sepals ovate, with acuminate tip; plants 30 to 100 cm. tall.
- Corolla 15 to 22 mm. long, the posterior lobes united less than one-half their length; sepals with a long acuminate tip. .... 30. *P. saxosorum*.
- Corolla (20-) 22 to 30 mm. long, the posterior lobes united over one-half their length; sepals with a short acuminate tip. .... 31. *P. subglaber*.
- Corolla gradually widening from a broad basal tube; sepals broadly ovate, acute; plants 10 to 20 cm. tall. .... 32. *P. uintahensis*.
- Anther sacs opening partially.
- Corolla 27 to 30 mm. long, the throat slightly narrowed to the orifice; sepals broadly ovate to orbicular, with broad scarious denticulate margin and short acuminate tip; thyrsus strongly secund; stem leaves lanceolate, narrowed to slightly rounded at the base. .... 33. *P. cyaneus*.
- Corolla 20 to 30 mm. long, the throat not narrowed to the orifice; sepals lanceolate to ovate, with no or moderate scarious margin, acuminate-attenuate; thyrsus not strongly secund; stem leaves with a broader rounded base.
- Corolla 20 to 25 mm. long; sepals attenuate-tipped, not or scarcely scarious-margined.
- Stem leaves ovate, the largest 2 to 6 cm. wide; stem glabrous throughout or puberulent only near the base; capsules 9 to 12 mm. long.
34. *P. cyananthus*.
- Stem leaves lanceolate, the largest mostly 1 to 1.5 cm. wide; stem more puberulent, frequently so nearly throughout; capsules 8 to 10 mm. long. .... 34a. *P. cyananthus subglaber*.
- Corolla 25 to 30 mm. long; sepals shorter-tipped, decidedly scarious-margined; stem glabrous or puberulent. .... 34b. *P. cyananthus longiflorus*.
- Anther sacs lanate with flexuous white hairs.
- Corolla deep blue, the throat obviously exceeding the basal tube; anther sacs less densely lanate; sterile filament more or less bearded (rarely glabrous in *P. strictus*); thyrsus strict, secund; pedicels relatively short; herbage brighter green, rarely glaucous.
- Anther sacs lanate-pubescent with slender hairs, these shorter than or about equaling the width of the sac.
- Anther sacs opening partially; pedicels and sepals somewhat glandular-puberulent.
- Leaves lanceolate, the cauline ones narrowly so, mostly acuminate, the largest 6 to 10 cm. long; sepals with broad scarious margin, acuminate to an attenuate tip; corolla 20 to 30 mm. long.<sup>1</sup>

<sup>1</sup> For description of a related new species, *Penstemon mensarum*, omitted in the key, see p. 380.

Sepals 8 to 9 mm. long, the margin finely denticulate distally and with an acuminate-attenuate tip, this nearly or quite equaling the sepal body; corolla 30 mm. long, the posterior lobes projecting; leaves lanceolate, the widest 0.9 to 1.1 cm. wide..35. *P. scariousus*.

Sepals 4 to 6 mm. long, the margin coarsely denticulate distally and with an acuminate tip, this much shorter than the sepal body; corolla 20 mm. long, the posterior lobes apparently more spreading; leaves linear-lanceolate, the widest 0.7 to 0.9 cm. wide.

36. *P. garrettii*.

Leaves ovate to lanceolate, the cauline ones lanceolate, obtuse to acute, the largest ones 3 to 7 cm. long; sepals with obscure narrow scarious margin, acute; corolla 15 to 20 mm. long.....37. *P. cyanocaulis*.

Anther sacs opening throughout; pedicels and sepals glabrous. Corolla 15 mm. long; plant 10 cm. tall.....38. *P. caryi*.

Anther sacs lanate with tortuous hairs, these mostly much exceeding the width of the sac.

Sepals 7 to 10 mm. long, long-acuminate, with broad conspicuous scarious margin, slightly puberulent; corolla more widely expanded.

39. *P. strictiformis*.

Sepals 3 to 5 mm. long, obtuse to acute (or short-acuminate), with narrow scarious margin, glabrous; corolla less widely expanded.

Basal leaves and stem (throughout) nearly or quite glabrous, usually not or but slightly glaucous; leaves mostly lanceolate, those of the stem frequently narrower.....40. *P. strictus*.

Basal leaves and stem (at base or frequently throughout) puberulent, more commonly glaucous; leaves narrower, the basal ones narrowly lanceolate, the cauline ones linear.....40a. *P. strictus angustus*.

Corolla pale blue, the throat scarcely exceeding the relatively long basal tube; anther sacs densely lanate with long hairs; sterile filament glabrous; thyrsus lax, less secund; pedicels relatively long; herbage more glaucous.

41. *P. comarrhenus*.

#### X. COERULEI.

Stamens and style included; anther sacs explanate.

Corolla 40 to 45 mm. long, glabrous within, the lobes slightly spreading; sterile filament closely short-bearded near the apex; capsule 20 to 25 mm. long, conspicuously acuminate.....42. *P. grandiflorus*.

Corolla 10 to 25 mm. long, the lobes strongly spreading; sterile filament strongly bearded toward the apex; capsule 10 to 15 mm. long, acuminate.

Corolla 15 to 25 mm. long, lanate-pubescent within at base of the anterior lobes lavender-pink to lavender-blue; sterile filament very densely bearded.

Corolla (15-) 20 to 25 mm. long; sterile filament strongly enlarged distally, very densely bearded with golden hairs; stem leaves ovate, the upper ones acuminate, all firm to somewhat fleshy.

Sepals ovate-acuminate; sterile filament bristle-bearded to the apex; basal and stem leaves lanceolate to lance-ovate.

Thyrsus strongly secund, composed of relatively lax fascicles; flowers lavender-pink; leaves firm, very glaucous, scarcely veined.

Corolla 20 to 25 mm. long; stem leaves lanceolate to lance-ovate; plants tall.....43. *P. secundiflorus*.

Corolla 15 to 20 mm. long; stem leaves narrower; plants smaller.

43a. *P. secundiflorus lavendulus*.

Thyrsus not secund, composed of close fascicles; flowers bluish; leaves somewhat fleshy, slightly glaucous, evidently reticulate-veined.

44. *P. osterhoutii*.

Sepals broadly ovate, mostly acute; sterile filament more shortly bearded, much of the expanded white apex frequently glabrous; basal and stem leaves broadly obovate to elliptic-ovate.....

45. *P. versicolor*.  
Corolla 15 to 20 mm. long; sterile filament slightly enlarged distally, densely bearded with yellowish hairs; stem leaves ovate, the upper ones acuminate to rounded-mucronate, thickened-fleshy.

Corolla 18 to 20 mm. long; sterile filament relatively short-bearded.

46. *P. lentus*.

Corolla 15 to 18 mm. long; sterile filament relatively long-bearded.

47. *P. pachyphyllus*.

Corolla 10 to 25 mm. long, glabrous within (sometimes somewhat lanate-pubescent in *P. arenicola*), changing from pink to coerulean blue; sterile filament less densely bearded.

Corolla 25 mm. long; sterile filament slightly enlarged distally, slightly bearded near the apex; sepals lance-attenuate, 8 mm. long; stems in large clumps; lowest leaves linear, the upper ones lanceolate; bracts large, ovate-acuminate, the lower ones elongate.....

48. *P. haydeni*.  
Corolla 10 to 20 mm. long; sterile filament obviously enlarged distally, more strongly bearded, especially toward the apex; sepals acute to acuminate, 4 to 8 mm. long; stems in small clumps; lowest leaves not conspicuously narrower than the upper ones; bracts not so conspicuously enlarged.

Sterile filament moderately enlarged distally, but not terminating in a broad white apex; seeds more than one-half as wide as long, dark brown; lower bracts more or less elongate, linear-lanceolate to lanceolate.

Leaves linear to lanceolate, acuminate; corolla 15 to 20 mm. long.

Bracts elongate, mostly gradually tapering from the base; corolla 15 to 18 mm. long, the lobes spreading less than 12 mm. wide; capsule narrowly ovate to ovate, mostly 7 to 8 mm. wide.

49. *P. angustifolius*.

Bracts less elongate, mostly abruptly contracted from the widened base; corolla usually nearly 20 mm. long, the lobes spreading 15 mm. wide; capsule more broadly ovate, about 10 mm. wide.

49a. *P. angustifolius caudatus*.

Leaves mostly oblanceolate, obtusely mucronate to short-acuminate; corolla 10 to 15 mm. long.....

50. *P. arenicola*.  
Sterile filament expanded distally into a broad white apex; seeds less than or about one-half as wide as long, reddish brown; lower bracts not elongate, ovate.

Sepals lance-acuminate; capsule pale brown; seeds about 3 mm. long.

51. *P. nitidus*.

Sepals ovate, acutish to acute; capsule dark brown; seeds about 4 to 5 mm. long.....

45. *P. versicolor*  
Stamens and style conspicuously exerted; anther sacs approximate.

52. *P. cyathophorus*.

## XI. LARICIFOLII.

Plants grayish-puberulent; leaves narrowly linear, more crowded on the lower part of the stem and on the basal branches arising from the elongate caudex; corolla throat strongly inflated.

Plants closely puberulent.....

53. *P. coloradoensis*.  
Plants more loosely and strongly puberulent.....

53a. *P. coloradoensis sileri*.

Plants essentially glabrous; leaves filiform or nearly so, closely tufted on abbreviated basal branches arising from the shortened caudex; corolla throat less inflated.

Corolla throat evidently inflated, 9 to 10 mm. long, evidently 2-lipped, the posterior lobes 4 to 7 mm. long, the lobes spreading to a breadth of 10 to 15 mm., "white"; anther sacs ovate-lanceolate; sterile filament densely bearded dorsally.....54. *P. exilifolius*.

Corolla throat slightly inflated, 10 to 12 mm. long, slightly 2-lipped, the posterior lobes 3 to 4 mm. long, the lobes spreading to a breadth of less than 11 mm., light red-violet; anther sacs linear-lanceolate; sterile filament slightly to moderately bearded dorsally.....55. *P. laricifolius*.

XII. AMBIGUI.

A single species.....56. *P. ambiguus*.

XIII. DEUSTI.

A single species.....57. *P. deustus*.

XIV. GRACILES.

Corolla glabrous externally (rarely with a few glandless hairs distally).

Sepals triangular, slightly scarious but nearly entire below, one-third to two-fifths the length of the capsule. Thyrsus of lax fascicles; flowers more distinctly pediceled.....58. *P. watsoni*.

Sepals long-acuminate to caudate-tipped, conspicuously scarious and more or less erose-lacerate below, at least one-half the length of the capsule.

Corolla 8 to 10 mm. long, the throat 2 mm. wide.

Calyx glabrous externally.

Sepals with long caudate tip and with relatively slightly toothed scarious margin.....59. *P. procerus*.

Sepals with short caudate tip and with relatively more lacerate scarious margin.....59a. *P. procerus aberrans*.

Calyx pubescent externally.....59b. *P. procerus pulvereus*.

Corolla 10 to 18 mm. long, the throat 2.5 to 4 mm. wide.

Corolla 10 to 14 mm. long, densely pubescent within, deep violet-blue; sepals with conspicuously broad, strongly lacerate margin below, and relatively shorter tip, always glabrous; thyrsus densely congested..60. *P. rydbergii*.

Corolla 15 to 18 mm. long, slightly to moderately pubescent within, lighter violet-blue; sepals with narrower, less lacerate margin below, and relatively longer tip, pubescent or glabrous; thyrsus less densely congested.

61. *P. aggregatus*.

Corolla glandular-puberulent externally.

Corolla pale to deep blue, the throat 1.8 to 4 mm. wide; capsule lance-ovate, 5 to 7 mm. long; plants erect, 10 to 80 cm. tall; thyrsus of many several-flowered axillary clusters.

Corolla deep or violet blue, slightly paler anteriorly, the throat less strongly ridged within anteriorly and not apparently inflated posteriorly, the posterior lobes abruptly spreading and but little exceeded by the anterior ones; plants ascending from creeping stems.

Corolla 15 to 20 mm. long; stem puberulent in lines. Blades of basal leaves over 3 cm. long.

Corolla 17 to 20 mm. long, deep blue, the throat slightly inflated; sepals 3.5 to 7 mm. long, with broad and more or less lacerate scarious margin; stem leaves nearly always entire; thyrsus more crowded; plants paler green.....62. *P. pseudoprocerus*.

Corolla 15 to 18 mm. long, violet-blue or blue, the throat more inflated; sepals 3 to 4 mm. long, with narrow, nearly entire, scarious margin; stem leaves frequently dentate; thyrsus lax; plants deeper green.

63. *P. virens*.

Corolla 8 to 12 mm. long; stem uniformly puberulent.

Plants greenish, minutely puberulent, 10 to 30 cm. tall; basal leaves ovate to broadly oval; stem leaves mostly oblong-lanceolate to oval-ovate; sepals lanceolate, two-thirds to three-fourths the length of the capsule.

Trailing subaerial rhizome-like stems much developed; blades of basal leaves ovate to broadly ovate, acute, 1.5 to 2.5 cm. long, 1 to 2 cm. wide; stem leaves mostly oval-ovate.....64. *P. brevifolius*.

Trailing subaerial rhizome-like stems little developed; blades of basal leaves broadly ovate, obtuse (to acutish), 2 to 3 cm. long, 1.5 to 2.2 cm. wide; stem leaves mostly oblong-lanceolate..65. *P. obtusifolius*.

Plants grayish, evidently puberulent throughout, 20 to 40 cm. tall; basal leaves lanceolate to narrowly ovate; stem leaves lanceolate; sepals triangular to ovate-acuminate, about one-half the length of the capsule.....66. *P. humilis*.

Corolla pale blue, decidedly paler anteriorly, the throat strongly ridged within anteriorly and abruptly and slightly inflated posteriorly, the posterior lobes projecting, spreading only at the apex, somewhat exceeded by the anterior ones; plants strictly erect.

Plant grayish-puberulent throughout. Rootstock slender, much branched and densely matted. Leaves entire.....67. *P. radicosus*.

Plants green, minutely puberulent or glabrous; rootstock stout, less branched and not matted.

Leaves entire; blades of basal leaves mostly 2 to 3 cm. long, those of the cauline ones lanceolate-linear and mostly shorter than the internodes; thyrsus lax, the lower peduncles ascending, mostly 2 to 4 cm. long, the pedicels over 5 mm. long.....68. *P. oliganthus*.

Leaves denticulate; blades of basal leaves mostly 3 to 5 cm. long, those of the cauline ones narrowly lanceolate and mostly longer than the internodes; thyrsus more strict, the lower peduncles erect, rarely 2 cm. long, the pedicels shorter.....69. *P. gracilis*.

Corolla violet, the throat 5 to 6 mm. wide; capsule ovate, 8 to 9 mm. long; plants spreading in tufts, 10 cm. tall; thyrsus of few usually 1-flowered fascicles.

70. *P. harbourii*.

#### XV. CAESPITOSI.<sup>1</sup>

Leaves linear-lanceolate to obovate.

Leaves cinereous-whitened; plants little spreading.

Stems 15 to 20 cm. tall; calyx lobes not scarious, acutish, 3 to 5 mm. long; corolla 16 to 20 mm. long, the anterior lobes decidedly exceeding the posterior ones.

71. *P. retrorsus*.

Stems rarely 10 cm. tall; calyx lobes scarious-margined below, acuminate, dentate, 5 to 8 mm. long; corolla 15 to 17 mm. long, the anterior lobes scarcely exceeding the posterior ones.....72. *P. thompsoniae*.

Leaves light green; plants widely spreading, forming mats.

Corolla 20 to 25 mm. long, with broad tube, more deeply 2-lipped. Anterior corolla lip 5 to 7 mm. long.....73. *P. crandallii*.

<sup>1</sup> Limitation of species of this group difficult and unsatisfactory. They need much more field study.

Corolla 15 to 20 mm. long, with narrow tube, less deeply 2-lipped.

Leaves glabrate; calyx lobes less puberulent, scarious-margined. Stems usually more ascending, sometimes 10 cm. tall.

Leaves obovate, obtusish; calyx lobes acute.....74. *P. suffrutescens*.

Leaves lanceolate, acute or acutish; calyx lobes acuminate....75. *P. xylus*.

Leaves canescent; calyx lobes densely puberulent, not or scarcely scarious-margined.

Leaves narrowly oblanceolate to obovate, reaching 1 to 2 cm. long; branches more ascending at apex, frequently 3 to 4 cm. tall.

76. *P. caespitosus*.

Leaves spatulate-obovate, mostly shorter; plant with branches scarcely ascending.....76a. *P. caespitosus perbrevis*.

Leaves linear or nearly so. Plants heathlike.

Corolla 16 to 18 mm. long.

Leaves canescent; calyx lobes densely puberulent, not or scarcely scarious-margined; corolla more pubescent within.....77. *P. teucrioides*.

Leaves glabrous or nearly so; calyx lobes slightly puberulent, scarious-margined; corolla usually less pubescent within.....78. *P. glabrescens*.

Corolla 12 to 14 mm. long.....79. *P. abietinus*.

#### XVI. WHIPPLEANI.

A single species.....80. *P. whippleanus*.

#### XVII. FRUTICOSI.

Leaves ovate, dentate with spreading teeth, pubescent, 2 to 3 cm. long; sterile filament 0.25 to 0.5 mm. wide, slightly lanose or glabrous distally.

81. *P. montanus*.

Leaves lanceolate, slightly dentate or entire, glabrous, 3 to 6 cm. long; sterile filament 1 to 1.5 mm. wide, strongly lanose near the apex.....82. *P. fruticosus*.

#### XVIII. BRIDGESIANI.

A single species.....83. *P. bridgesii*.

#### XIX. HETEROPHYLLI.

Anthers purple; seeds 1.5 to 2 mm. long; sepals lanceolate, 5 to 8 mm. long; leaves lanceolate to ovate, 3 to 5 cm. long, green; stems puberulent.

Corolla lavender-violet, 20 to 30 mm. long; anther sacs frequently more or less pubescent on the sides; leaves elliptic-ovate, 4 to 5 cm. long, usually conspicuously acuminate; plants 30 to 70 cm. tall.....84. *P. platyphyllus*.

Corolla violet-blue, 15 to 19 mm. long; anther sacs always glabrous on the sides; leaves lanceolate to oblanceolate, 3 to 5 cm. long, obtuse to acute or somewhat acuminate; plants 10 to 40 cm. tall.....85. *P. leonardi*.

Anthers dark gray; seeds 2 to 3 mm. long; sepals rounded-ovate, 2 mm. long; leaves linear-lanceolate, 6 to 9 cm. long, glaucous; stems glabrous. Corolla violet, 25 to 30 mm. long; plants 60 to 80 cm. tall.....86. *P. sepalulus*.

#### 1. *Penstemon eatoni* A. Gray.

*Penstemon eatoni* A. Gray, Proc. Amer. Acad. 8: 395. 1872. "Mr. Watson \* \* \* in company with Professor Eaton, found it abundantly in Provo Canyon, Wasatch Mountains," Utah. Isotype, *S. Watson* 776, collected in July, 1869, at 1,800 meters altitude, seen in the herbarium of Columbia University, at the New York Botanical Garden.

Rocky ravines and mountain sides, in the open or among junipers, at altitudes of 1,500 to 2,600 (3,000) meters; Upper Sonoran and Submontane zones; flowering from late April to late July. Foothills and mesas, through the southern Wasatch region from Utah and Wasatch counties to Washington County, Utah, in the San Juan Valley of southwestern Colorado, and in northern Arizona. Southward probably passes into *P. eatoni undosus*.

COLORADO: Montezuma:<sup>1</sup> Mesa Verde, *Vreeland* (M).

UTAH: Beaver: Frisco (U, Y); Milford, *Rydberg & Carleton* 6301 (Y), 6303 (Y). Carbon: Castle Gate, *Pennell* 6137 (H, U, Y). Piute: Jugtown (near Marysvale), *Jones* 5405q (U). San Pete: Indianola, *Tidestrom* 2252 (U). Utah: American Fork Canyon; Provo, *Pennell* 6111 (A, D, S, Y), 6114 (Y), 6121 (F, M, P, R, Y); Thistle (M, U, Y). Wasatch: Midway, *Carleton & Garrett* 6709 (U, Y). Washington: Santa Clara Valley, *Jones* 5129a (M, U, Y); Springdale (U). Wayne: Bromide Mine, *Jones* 5695am (U).

### 1a. *Penstemon eatoni undosus* Jones.

*Penstemon eatoni undosus* Jones, Proc. Calif. Acad. II. 5: 715. 1895. "[*M. E. Jones*] No. 5110ah. April 26, 1894, in red sand at St. George, Utah, 2,700° alt." Type seen in U. S. National Herbarium; isotype in herbarium of New York Botanical Garden.

This is the same as *P. coccinatus* Rydb., described from Arizona. Apparently more variable, at least in sepal length, than the species, and here distinguished solely by the pubescence. Perhaps a form rather than a variety, but it seems to have a different range.

"Among the junipers in gravelly soil"; doubtless in situations similar to those of *P. eatoni*, but known from altitudes of 810 to 1,650 meters; Upper Sonoran Zone; flowering from late April to mid-June. In the Colorado drainage, southwestern Colorado, southern Utah, and northern Arizona.

COLORADO: Montezuma: Mesa Verde, *Cary* 186 (U). Montrose: Naturita, *Payson* 333 (F, M, R).

UTAH: Grand: Court House Wash, *Eastwood* 6104 (Y). Kane: Johnson, *Jones* 5289u (U). Washington: St. George, *Jones* 5110ah (U, Y); Silver Reef (Y).

### 2. *Penstemon torreyi* Benth.

*Penstemon torreyi* Benth. in DC. Prodr. 10: 324. 1846. "Versus montes Scopulosos (iter Longl) \* \* \* (v. in herb. Torr.)." Type seen in herbarium of Columbia University at the New York Botanical Garden.

*Penstemon barbatus torreyi* A. Gray, Proc. Amer. Acad. 11: 94. 1876.

Rocky sagebrush and wooded slopes, at altitudes of 1,800 to 3,000 meters; Submontane and Montane zones; flowering from mid-June to late August. Foothills, lower slopes of mountains, and on mesas, from Garfield, Lake, and Teller counties, central Colorado, southward into New Mexico; on both continental slopes.

COLORADO: Archuleta: La Pagosa, *Newberry* (U). Chaffee: Buena Vista; Salida, *Pennell* 6308 (Y). Costilla: Placer, *Shear* 3630 (Y). El Paso: Artists Glen, *Clements* 100 (M, U, Y); Bison Creek (F); Cascade; Mount Manitou (F); North Cheyenne Canyon (Y); Ute Pass (M, P). Fremont: Canon City, *Brandege* 85 (M). Garfield: Glenwood Springs; Shoshone, *Pennell* 6160 (D, M, U, Y), 6163 (R, Y). Gunnison: Sapinero, *H. N. Wheeler* (B). Hinsdale: Lake City, *Newberry* (Y). Lake: Twin Lakes, *Porter* (A). La Plata: Rockwood, *Tweedy* 418 (U). Las Animas: Berwind (B); Stonewall, *Beckwith* 170 (Y); Trinidad (U, Y).

<sup>1</sup> In lists of exsiccatae names of counties are given in alphabetical sequence, and are each followed by a colon.



Mineral: Wagon Wheel Gap, *B. H. Smith* (A). Montrose: Cimarron, *Pennell* 6249 (F, Y). San Miguel: Norwood Hill, *Walker* 457 (R). Teller: Florissant, *Ramaley* 1374 (B).

3. *Penstemon barbatus* (Cav.) Roth.

*Chelone barbata* Cav. Icon. Pl. 3: 22. pl. 242. 1794. "Habitat in Imperio Mexicano, unde nuperrime introducta in hortum Regium Pharmaceuticum \* \* \* Floruit \* \* \* 1794." Type not verified.

*Penstemon barbatus* Roth, Catal. Bot. 3: 49. 1806.

Through central highlands of Mexico, apparently extending northward to southern Utah. Reported from an altitude of 864 meters.

UTAH: Washington: St. George, *Palmer* (F, Y).

3a. *Penstemon barbatus puberulus* A. Gray.

*Penstemon barbatus puberulus* A. Gray in Torr. U. S. & Mex. Bound. Bot. 114. 1859. "Guadalupe cañon [Arizona], May, 1851; *Thurber*." Type not verified, but evidently the plant here considered.

Arizona and apparently southern Utah. Probably a distinct species.

UTAH: Without locality: *Bishop* 154 (U).

4. *Penstemon trichander* (A. Gray) Rydb.

*Penstemon barbatus trichander* A. Gray, Proc. Amer. Acad. 11: 94. 1876. "S. W. Colorado, T. S. Brandegee, in Hayden's Exploration, 1875." Isotype (no. 149, "ex herb. J. H. Redfield") seen in herbarium of Academy of Natural Sciences of Philadelphia.

*Penstemon trichander* Rydb. Bull. Torrey Club 33: 151. 1906.

Hillsides, at altitudes of 1,650 to 2,100 meters; probably Submontane Zone; flowering from mid-June to late July. Foothills and mesas, San Juan and Dolores valleys, southwestern Colorado and southeastern Utah.

COLORADO: Archuleta: La Pagosa (U); Piedra, *Baker* 597 (F, M, U, Y). La Plata: Durango, *Baker, Earle & Tracy* 513 (F, M, U, Y). Montezuma: Mesa Verde, *Vreeland* 877 (Y). Montrose: La Sal Creek, *Payson* 453 (M). San Miguel: Norwood Hill, *Walker* 457.1 (R).

UTAH: San Juan: Allen Canyon, southwest of Abajo Mountains, *Rydberg & Garrett* 9300 (U, Y), 9303 (Y).

5. *Penstemon utahensis* Eastw.

*Penstemon utahensis* Eastw. Zoe 4: 124. (July) 1893. "It was collected between Hatch's Wash and Monticello [Utah], May 28, 1892." Isotypes, labeled "May, 1892," seen in herbarium of Missouri Botanical Garden and U. S. National Herbarium.

*Penstemon confusus* Jones, Zoe 4: 280. (October) 1893. "Collected by me at Detroit, western Utah, May 26, 1891." Specimens collected by Jones at Detroit and labeled "June, 1891. *Penstemon Parryi* Gray var. *imberbis* Jones," seen in herbarium of the Missouri Botanical Garden and U. S. National Herbarium. Description composite, of this red-flowered plant and of the blue-flowered *P. pachyphyllus* A. Gray. *P. utahensis*, as here understood, varies in size and acumination of sepals and in width of corolla tube, *P. confusus*, with large acute sepals and broad tube, representing the extreme variation from the type.

*Penstemon eastwoodiae* Heller, Muhlenbergia 1: 4. 1900. New name for *P. utahensis* Eastw., not *P. glaber utahensis* S. Wats. 1871.

Dry sandy or gravelly slopes, at altitudes of 1,600 to 2,100 meters; Upper Sonoran and Submontane zones; flowering early May to mid-June. Foothills and lower mountains, southern Utah (from Sevier County southward) and northern Arizona.

UTAH: Garfield: Canyon above Tropic, *Jones* 5312ae (U). Iron: Cedar City, *Jones* 5204w (U). Kane: *Siler* (A). Millard: Detroit, *Jones* (M, U). Piute: Marysvale, *Jones* 5338aa (U), 5388p (U), 5410h<sup>1</sup> (U). San Juan: Between Hatch Wash and Monticello, *Eastwood* (M, U). Sevier: Salina Canyon, *Jones* 5419d (U). Washington: Beaverdam Mountains, *Parry* 152 (A, F, M, Y); Silver Reef (U).

#### 6. *Penstemon albidus* Nutt.

*Penstemon albidus* Nutt. Gen. Pl. 2: 53. 1818. "Hab. On the plains of the Missouri, common, from the confluence of the River Platte to the Mountains." Type seen in herbarium of the Academy of Natural Sciences of Philadelphia.

*Chelone albida* Spreng. Syst. Veg. 2: 813. 1825.

Sandy to stony or clayey prairies and low hills, in the open, known from altitudes of 900 to 1,830 (2,100) meters; Upper Sonoran and Subboreal zones; flowering from mid-May to early July. High plains, west to the base of the foothills of eastern Colorado and Wyoming. Manitoba to Kansas, eastern Colorado, and Montana.

SOUTH DAKOTA: Custer: Hermosa, *Rydberg* 920 (U). Fall River: Hot Springs, *Rydberg* 918 (U, Y). Meade: Fort Meade, *Forwood* 284 (U). Pennington: Over 1843 (U). Stanley: Cedar Pass (U); Fort Pierre, *Hayden* (Y). Washabaugh: Bear Creek (U); Eagle Nest Butte, Over 2084 (U).

NEBRASKA: Cherry: Fort Niobrara, *Wilcox* (Y). Deuel: *Rydberg* 278 (U). Hooker: Mullen, *Rydberg* 1316 (U). Keith: Ogallala, *Pennell* 6401 (H, M, Y). Lincoln: Hershey; North Platte, *Pennell* 6408 (Y). Sheridan: Hay Springs, *MacDougal* 38 (Y). Thomas: Halsey (P); Thedford, *Rydberg* 1316 (U).

KANSAS: Ford: Dodge City, *Ellis* (U, Y). Gove: *Hitchcock* 377a (U, Y). Hamilton: Syracuse, *Thompson* 83 (U). Logan: *Hitchcock* 377 (U, Y). Meade: Meade, *B. B. Smyth* 137 (U). Seward: *Carleton* 213 (U).

WYOMING: Crook: Sundance, *Nelson* 2241 (M). Goshen: Torrington, *Nelson* 8290 (M). Johnson: Buffalo, *Lothian* (R). Laramie: Cheyenne, *Ball* 1769 (U). Sheridan: Big Horn, *Tweedy* 2328 (Y).

COLORADO: Bent: Rule Creek; Las Animas, *Osterhout* 3917. Denver: Denver, *Pennell* 5844 (Y). Elbert: Bijou Basin, *Jones* 171 (B, F, Y). El Paso: Nob Hill, *Pennell* 5795 (Y). Kiowa: Eads, *Baker, Earle & Tracy* 813 (M, Y). Logan: Sterling, *Osterhout* 988 (Y). Prowers: 25 miles south of Lamar, *Osterhout* 5060. Sedgwick: Julesburg, *Pennell* 6398 (B, D, U, Y). Weld: Greeley, *Johnston* 281 (M); Pawnee Buttes (B).

#### 7. *Penstemon jonesii* Pennell, sp. nov.

Stems several, 40 to 80 cm. tall, finely pubescent throughout with reflexed hairs; lowest leaves narrowed to petiole-like bases, the longest 7 to 9 cm. long, spatulate-oblongate to obovate, more or less deeply emarginate; lower stem leaves similar, the upper ovate, rounded-clasping, the bases of each pair meeting, finely pubescent throughout; thyrus narrow, of 10 to 20 fascicles, each of 2 short axillary branches, their pedicels longer than the peduncle; sepals 3 to 4 mm. long, broadly ovate, abruptly short-caudate, with evident erose scarious margin, glabrous; corolla 23 to 25 mm. long, the tube gradually expanding into the cylindrical throat, the two together 18 to 19 mm. long, 5 to 6 mm. wide, slightly inflated, rounded, the lobes 5 to 6 mm. long, the 2 posterior ones united and arched for three-fifths their length, the 3 anterior ones united two-fifths their length, all the free portions projecting forward, glabrous without and within, blue (not seen fresh); anther sacs divaricate, 2 to 2.2 mm. long, with short line of contact, each opening partially distally, the suture fimbri-

<sup>1</sup> "At the top of the grade between Marysvale and Monroe," probably in Sevier County.

olate, the sacs elsewhere with minutely puberulent surface; sterile filament included, flattened, scarcely enlarged distally, glabrous or with a few short hairs at apex; capsule ovate, glabrous (not seen mature).

Type in the U. S. National Herbarium, no. 260627, collected at Springdale, Utah, altitude 1,200 meters, in flower, May 17, 1894, by M. E. Jones, (no. 5250, in part; distributed as *P. glaber* Pursh). Another sheet of the same collection is the type of *P. laevis*, described below (p. 347).

At altitudes of 1,200 to 1,600 meters; Upper Sonoran Zone; flowering in May. Virgin and Kanab valleys, southwestern Utah.

UTAH: Kane: Kanab, Jones 5286x (M). Washington: Springdale, Jones 5250 (U).

8. *Penstemon leptanthus* Pennell, sp. nov.

Stems several, 15 to 25 cm. tall, below densely canescent-puberulent with reflexed hairs, above becoming glabrate, from a short branched caudex; leaves not thickened, dull pale green above and beneath, obscurely veined, entire, densely cinereous-puberulent, those at the base of the stem with lanceolate blades, these obtuse to acutish, 5 to 6 cm. long, gradually narrowed to margined petioles 1 to 2 cm. long, the leaves on the stem sessile (the bases of opposite leaves not meeting), acutish, the largest 3 to 5 cm. long, 0.5 to 0.9 cm. wide; thyrsus narrow, less than one-half the height of the plant, of about 9 fascicles, each of 2 axillary short branches, their pedicels shorter than the peduncle; sepals 3 mm. long, ovate, acute, obscurely or not ribbed, slightly scarious-margined and slightly erose, proximally nearly glabrous; corolla 13 to 15 mm. long, the tube and throat 11 to 12 mm. long, the throat slightly inflated and rounded ventrally, the 2 posterior lobes 2 to 3 mm. long, united and arched about one-fourth their length, projecting, the 3 anterior lobes 2 to 3 mm. long, united at base, slightly spreading, the corolla glabrous without and within, probably blue (not seen fresh); anther sacs divaricate, 1 mm. long, lanceolate-oblong, minutely puberulent, opening distally most of their length, the suture glabrous; sterile filament scarcely exerted, flat, scarcely enlarged distally, bearded on the posterior face, especially distally, with yellow hairs; capsule not seen.

Type in the U. S. National Herbarium, no. 146868 (in part), collected in central Utah, in flower, by L. F. Ward in 1875. This was probably part of Ward's no. 280, collected at Twelve Mile Creek Canyon, near Mayfield, Utah, June 28, 1875, although mounted with and bearing the label of Ward 546 from The Button, Aquarius Plateau, Utah (see remarks under *P. parvus*, p. 345). It was distributed as *P. acuminatus* Dougl.

9. *Penstemon fremontii* Torr. & Gray.

*Penstemon fremontii* Torr. & Gray; A. Gray, Proc. Amer. Acad. 6: 60. 1862. "On the Uinta plains, very abundant and in large patches. June 5, 1844." Type, collected by Frémont, seen in herbarium of Columbia University at the New York Botanical Garden.

*Penstemon glaber fremontii* Jones, Contr. West. Bot. 12: 62. 1908.

Dry butte sides and sagebrush draws, at altitudes of 1,800 to 2,100 meters; Upper Sonoran Zone; flowering from late May to late June. Red Desert of southwestern Wyoming and northwestern Colorado.

WYOMING: Sweetwater: Bitter Creek (R, Y); Red Desert, Pennell 5882 (Y); Steamboat Mountain (R); Wamsutter, Pennell 5884 (H, M, U, Y).

COLORADO: Rio Blanco: Meeker, Osterhout 2608 (Y). Routt: Hayden, Osterhout 5107, 5224.

10. *Penstemon auriberbis* Pennell, sp. nov.

Stems several, 10 to 20 cm. tall, below cinereous-puberulent with reflexed hairs, above spreading-pubescent with narrow-headed gland-tipped hairs; leaves linear to

linear-lanceolate, the longest 4 to 10 cm. long, 0.2 to 0.7 cm. wide, those at the base of the stem narrowed to petiole-like bases, those of the stem sessile, rounded to narrowed at base, partly clasping, all finely canescent-puberulent, the upper leaves and bracts more or less glandular-pubescent; thyrsus narrow, of 3 to 6 fascicles, each composed of 2 short axillary branches, their pedicels shorter than or equaling the peduncle; sepals 8 mm. long, lanceolate, acuminate, glandular-pubescent; corolla 20 to 25 mm. long, the tube 4 to 5 mm. long, 3 to 3.5 mm. wide, the throat 8 to 10 mm. long, 8 to 9 mm. wide, much-inflated and rounded, the lobes 8 to 10 mm. long, 8 mm. wide, the 2 posterior ones united and arched for one-half their length, the 3 anterior ones united slightly at base, all the free portions widely spreading, the corolla externally glandular-puberulent, within somewhat pubescent over the bases of the anterior lobes, purplish blue, not or faintly lined within the throat; anther sacs widely divaricate, 1.4 to 1.5 mm. long, lance-oblong, with short line of contact, pale, or violet-tinged on side, from distal apex opening nearly throughout, the suture fimbriate; sterile filament 15 to 17 mm. long, more or less exerted, flattened, gradually enlarged distally, at times decurved at apex, densely bearded on the posterior face nearly to the base with orange-golden hairs; capsule 8 to 10 mm. long, ovate, acuminate, glabrous; seeds 2.5 to 3 mm. long, irregularly lanceolate-curved in outline, the angles obscure, the surface finely alveolate-reticulate, blackish brown.

Type in the herbarium of the New York Botanical Garden, collected on a dry sandy sagebrush slope, east of Fountain Creek, northeast of Pueblo, Pueblo County, Colorado, altitude about 1,400 meters, in flower, June 5, 1915, by F. W. Pennell (no. 5731).

This species has been identified as *P. jamesii* Benth., but examination of the type of that species, in Torrey's herbarium (Columbia University Herbarium) at the New York Botanical Garden, shows that his name should replace *P. similis* A. Nels. *P. similis* occurs on the Staked Plains of eastern New Mexico and northwestern Texas, and it was doubtless on these or in near-by western Oklahoma, while on the return route of Long's expedition, that Doctor James collected his plant. *P. jamesii* differs from *P. auriberbis* by having wider leaves, larger flowers, and anther sacs which dehisce throughout and have a broad line of contact.

Sandy or loam sagebrush slopes, at altitudes of 1,250 to 2,100 (2,200) meters; Upper Sonoran Zone; flowering mid-May to late June. High plains in the Arkansas Valley of southeastern Colorado.

COLORADO: Costilla: Sangre de Cristo Creek, *Rydberg & Vreeland* 5635<sup>1</sup> (Y). El Paso: Fountain, *Redfield* 514 (M). Fremont: Canon City, *Pennell* 6312 (D, F, H, M, P, R, U, Y). Huerfano: Badito (Y); La Veta (Y); Walsenburg, *Rydberg & Vreeland* 5633 (R, Y). Las Animas: Barela, *T. A. Williams* (Y). Otero: Apishpa River; Rocky Ford, *Osterhout* 2084 (Y). Pueblo: Pueblo, *Pennell* 5731 (H, R, U, Y), 5733 (D, F, M, P, Y); Swallows (M, R, U, Y).

A hybrid with *P. angustifolius caudatus* (Heller) Rydb. was collected at Pueblo, *Pennell* 5733a (U, Y).

#### 11. *Penstemon parviflorus* Pennell, sp. nov.

Stem 15 to 20 cm. tall, cinereous-puberulent with reflexed hairs, above spreading-pubescent with gland-tipped hairs; leaves linear to linear-lanceolate, the longest about 5 cm. long, 0.3 to 0.5 cm. wide, those at the base of the stem gradually narrowed to petiole-like bases, those of the stem sessile, gradually narrowed to base, partly clasping, canescent-puberulent, the upper leaves and bracts more or less glandular-pubescent; thyrsus narrow, of at least 6 loose fascicles, each composed of 2 axillary

<sup>1</sup> As this is only record from west of Sangre de Cristo Range, and as the collectors upon the same expedition collected extensively east of that range, it is probable that there has been some confusion of data.

branches, their pedicels shorter than the peduncle; sepals 8 mm. long, lanceolate, acuminate, glandular-pubescent; corolla 12 mm. long, the tube and throat 7 mm. long, about 4 mm. wide, much inflated and rounded, the lobes 4 to 5 mm. long, the 2 posterior ones united and arched one-third to one-half their length, the 3 anterior ones united slightly at base, their free portions spreading, the corolla externally glandular-puberulent, within pubescent over the bases of the anterior lobes, probably purplish blue (not seen fresh); anther sacs widely divaricate, 1 to 1.2 mm. long, with short line of contact, the suture fimbriolate, the surface elsewhere minutely puberulent; sterile filament about 5 to 6 mm. long, apparently included, flattened, enlarged distally, densely bearded on the posterior face nearly to the base with yellow hairs; capsule not seen.

Type in the U. S. National Herbarium, no. 215626, collected at Mancos, Montezuma County, Colorado, in flower, July, 1890, by Alice Eastwood. This was distributed as *P. jamesii* Benth.

Upper Sonoran Zone.

### 12. *Penstemon dolius* Jones, sp. nov.

Stems several, 2 to 12 cm. tall, from a short branched caudex, cinereous-puberulent throughout with reflexed hairs; leaves dull above, pale beneath, cinereous-puberulent, those at the base of the stem with lanceolate-ovate blades, these acute, 1.2 to 3 cm. long, narrowed into margined petioles 0.7 to 2 cm. long, the stem leaves sessile (opposite leaves not meeting around the stem), oblanceolate, obtusish to acute, the largest mostly 1.5 to 4 cm. long, 2 to 8 mm. wide; thyrsus narrow, over one-half the height of the plant, composed of 3 to 6 fascicles, each consisting of 2 short axillary branches; sepals 7 to 9 mm. long, linear-lanceolate, acuminate, obscurely or not ribbed, entire, not scarious-margined, densely puberulent; corolla 15 to 18 mm. long, the tube and throat 11 to 13 mm. long, the throat somewhat inflated and rounded ventrally, the 2 posterior lobes 2 to 5 mm. long, united and arched much less than one-half their length, the 3 anterior lobes 3 to 6 mm. long, all the free lobes widely spreading, the corolla externally sparsely glandular-puberulent, within slightly pubescent or glabrous over the bases of the anterior lobes, blue (not seen fresh); anther sacs widely divaricate, 0.8 to 0.9 mm. long, lance-oblong, minutely puberulent, distinct, with medium line of contact, opening throughout, the suture fimbriolate; sterile filament 8 to 10 mm. long, scarcely exerted, flat, slightly enlarged distally, moderately bearded, especially toward apex, with relatively (to *P. eriantherus*) short yellow hairs on the posterior face; capsule not seen.

Type in the U. S. National Herbarium, collected at Willow Springs, Nevada, in flower, June 5, 1891, by M. E. Jones. Isotypes in herbaria of the New York Botanical Garden and the Missouri Botanical Garden.

Probably dry sagebrush slopes, at altitudes of 1,500 to 1,650 meters; Upper Sonoran Zone; flowering mid-May to early June. Valley of Duchesne River, northeastern Utah, of the Sevier River in central Utah, and in eastern Nevada.

UTAH: Sevier: Red hills north of Redmond, *Eggleston* 11130 (U). Wasatch: Theodore to Myton, *Jones* (U, Y; this collection differs in its dwarf habit and more widely spreading corolla lobes, and only because of the variability in the corolla lobes of the type of *P. dolius* is it placed with this species).

In the Gray Herbarium are two specimens bearing data in the handwriting of Asa Gray, "S. Utah, Siler in litt.," determined by him as *P. "pumilus var. Thompsoniae."* These are evidently an undescribed plant allied to *P. dolius* but which has the line of contact of the more puberulent anther sacs very short. The specimens are both incomplete, showing only the inflorescence.

13. *Penstemon paysonii* Pennell, sp. nov.

Stems several, 8 to 16 cm. tall, from a short branched caudex, below cinereous-puberulent with reflexed hairs, above pubescent with gland-tipped hairs; leaves pale green above and beneath, cinereous-puberulent, those at the base of the stem with lanceolate acute blades 1.5 to 3 cm. long, these narrowed into margined petioles 1.5 to 3 cm. long, the stem leaves sessile (opposite leaves meeting around stem), linear-lanceolate, obtusish to acute, the largest mostly 4 to 5 cm. long, 3 to 5 mm. wide; thyrsus narrow, over one-half the height of the plant, composed of 4 to 6 fascicles, each of these consisting of 2 axillary shortened branches, their pedicels shorter than the peduncle; sepals 8 to 9 mm. long, lanceolate, acuminate, obscurely or not ribbed, entire, slightly scarious-margined proximally, glandular-puberulent; corolla 18 to 22 mm. long, the tube and throat 14 to 16 mm. long, the throat somewhat inflated and rounded ventrally, the 2 posterior lobes 4 to 5 mm. long, united and arched much less than one-half their length, the 3 anterior lobes 5 to 6 mm. long, united at base, all the free portions spreading, the corolla externally glandular-puberulent, within glabrous, blue (not seen fresh); anther sacs widely divaricate, 0.9 mm. long, oblong-lanceolate, minutely puberulent, distinct, with medium line of contact, opening throughout, the suture slightly fimbriolate; sterile filament not exerted, flat, slightly enlarged distally, moderately strongly bearded distally with relatively (to *P. eriantherus*) short yellow hairs on the posterior face; capsule not seen.

Type in the herbarium of the Missouri Botanical Garden, collected on rocky hillsides at Naturita, Montrose County, Colorado, altitude 1,620 meters, in flower, April 27, 1914, by Edwin Payson (no. 257). Isotypes in herbarium of Field Museum of Natural History and Rocky Mountain Herbarium.

Upper Sonoran Zone. Valley of Dolores River in southeastern Colorado.

14. *Penstemon moffatti* Eastw.

*Penstemon moffatti* Eastw. Zoe 4: 9. 1893. "It was collected at Grand Junction [Colorado] along the railroad to the coal beds." Specimen in herbarium of the New York Botanical Garden, collected at Grand Junction by Alice Eastwood, May, 1891, is doubtless an isotype.

*Penstemon pseudohumilis* Jones, Contr. West. Bot. 12: 65. 1908. "This grows in clay soil at Price, Utah, [M. E. Jones] May 29, 1898 (type in Herb. Jones)." Type not verified, but apparently of the species here considered.

Arid sagebrush plains and slopes, at altitudes of 1,400 to 1,600 meters; Upper Sonoran Zone; flowering in May. In the Grand River drainage of western Colorado and eastern Utah.

COLORADO: Mesa: De Beque (Y); Grand Junction, Eastwood (M, U, Y), Pennell 6173 (D, F, H, R, U, Y).

UTAH: Grand: Thompsons ("Thompson's Springs"), Jones (M, Y).

15. *Penstemon eriantherus* Pursh.

*Penstemon eriantherus* Pursh, Fl. Amer. Sept. 737. 1814. "In Upper Louisiana, Bradbury \* \* \* v. s. in Herb. Bradbury." According to Bradbury (Travels 318. 1817), "Common on bluffs from Big Bend to Aricara Village," South Dakota. Type or isotype, labeled "Louisiana, Bradbury," seen in herbarium of the Academy of Natural Sciences of Philadelphia. Not *P. erianthera* Nutt. in Fraser's Cat. 1813, *nomen nudum*; later published by Nuttall in 1818. The latter is *P. glaber* Pursh, a species with hirsute anthers. Pursh, attempting to apply Nuttall's catalogue name to the specimens brought back by Bradbury from the joint Missouri expedition of Bradbury and Nuttall, applied *erianthera* to a species with glabrous anthers, misled evidently by the long beard of the sterile filament. To the writer it seems a violation of scientific accuracy to hold such a misnomer, but according to all present codes the

name, because in Pursh's Flora first accompanied by a description, must be maintained as there applied.

*Penstemon cristatus* Nutt. (in Fraser's Cat. 1813, *nomen nudum*) Gen. Pl. 2: 52. 1818. "Hab. On arid denudated argillaceous hills from the confluence of Teeton River and the Missouri [South Dakota] to the Mountains." Type seen in herbarium of the Academy of Natural Sciences of Philadelphia. The original name of Nuttall, which in justice should be restored.

*Chelone erianthera* Steud. Nom. Bot. 186. 1820-4.

*Chelone cristata* Spreng. Syst. Veg. 2: 813. 1825.

Dry sandy plains and rocky hills, in the open, at altitudes of 1,400 to 2,400 meters; Submontane (Subboreal) Zone; flowering from early June to early July. Northern high plains, upper Missouri drainage south to southeastern Wyoming.

SOUTH DAKOTA: Custer: Bull Springs, *Rydberg* 919, in part (U). Meade: Elk Canyon,

*Rydberg* 919, in part (U, Y); Fort Meade (U). Stanley: Saddle Pass, *Over* 6116 (U).

WYOMING: Albany: Dale Creek; Laramie, *Pennell* 5877 (Y); Tie Siding. Carbon:

Fort Steele, *Tweedy* 4304 (U, Y); Saratoga (F); T B Ranch (M). Converse:

Douglas, *Bates* (E). Fremont: Shoshone Agency, *S. R. Martin* (P). Laramie:

Near Cheyenne, *Greene* (Y); Islay (U). Sheridan: Between Sheridan and Buf-

falo, *Tweedy* 3418 (Y). Weston: Newcastle, *J. M. Bates* (U). Yellowstone

National Park: Gardiner River, *Tweedy* 865 (F, U).

15a. *Penstemon eriantherus saliens* (Rydb.) Pennell.

*Penstemon saliens* Rydb. Mem. N. Y. Bot. Gard. 1: 344. 1900. "Montana: Columbia Falls, *Mrs. J. J. Kennedy*, 53." Type seen in herbarium of the New York Botanical Garden.

The prevalent form in western Montana, extending into the Yellowstone National Park.

WYOMING: Yellowstone National Park: Mammoth Hot Springs, *Scheuber* 331 (Y).

16. *Penstemon ophianthus* Pennell, sp. nov.

Stems several, 10 to 30 cm. tall, from a branched caudex, below densely puberulent with reflexed hairs, above puberulent with spreading gland-tipped hairs; leaves dull green above and beneath, entire or slightly sinuate-dentate, somewhat cinereous-puberulent to glabrate, those at the base of the stem with lanceolate, obtuse to acutish blades 3 to 5 cm. long, these gradually narrowed into margined petioles 2 to 3 cm. long, the stem leaves sessile (opposite leaves not meeting around stem), acutish, the largest mostly 6 to 7 cm. long, 0.8 to 1 cm. wide; thyrsus narrow, mostly over one-half the height of the plant, composed of 4 to 10 fascicles, each consisting of 2 short axillary branches, their pedicels about equaling the peduncle; sepals 7 to 9 mm. long, lanceolate, acuminate, obscurely or not ribbed, entire, slightly scarious-margined proximally, glandular-puberulent; corolla 15 to 20 mm. long, the tube and throat 11 to 15 mm. long, the throat inflated and rounded ventrally, the 2 posterior lobes 4 to 5 mm. long, united and arched one-third their length, projecting forward, the 3 anterior lobes 4 to 5 mm. long, united at base, spreading; corolla externally glandular-puberulent, within lanate with long (white) hairs over the bases of the anterior lobes, bluish (not seen fresh; "red-lilac" according to *Payson* 347); anther sacs widely divaricate, 0.8 mm. long, ovate, glabrous, distinct, with long line of contact, this equaling the length of either sac, opening throughout, the suture nearly glabrous; sterile filament exerted, flat, scarcely enlarged distally, slightly decurved at the apex, bearded on the posterior face, especially distally, with long yellow hairs; capsule 10 to 11 mm. long, ovate, acuminate, glabrous; seeds 3 to 3.5 mm. long, irregularly lanceolate-curved in outline, the angles prominent, the surface finely alveolate-reticulate, dark brown.

Type in the U. S. National Herbarium, no. 327015, collected at Thurber, Utah, altitude 2,100 meters, in flower and fruit, August 1, 1894, by M. E. Jones (no. 5708; distributed as *P. moffatti* Eastw.). Isotypes in herbaria of Missouri Botanical Garden and New York Botanical Garden.

Dry mesas, at altitudes of 1,600 to 2,100 meters; Upper Sonoran Zone; flowering late May to late June. Colorado drainage of southwestern Colorado and southeastern Utah, southward into northern New Mexico and northern Arizona.

COLORADO: Montezuma: Mancos, *Baker, Earle & Tracy* 410 (F, M, U, Y). Montrose: Naturita, *Payson* 347 (F, M).

UTAH: Garfield: *Siler* (M). Wayne: Thurber, *Jones* 5708 (M, U, Y).

#### 17. *Penstemon cleburnei* Jones.

*Penstemon cleburnei* Jones, Contr. West. Bot. 12: 62. 1908. "This is common on the Green River Desert, Wyoming, at Granger and Green River, and appears to have been first collected since the time of Nuttall by Cleburne, June 27, 1875. It is also A. Nelson's no. 4716." Type (in Jones Herbarium) and specimen of Nuttall not seen, but description, and also specimen of A. Nelson, indicate the plant here considered.

*Penstemon auricomus* A. Nels.; Rydb. Bull. Torrey Club 36: 688. 1909. "*Penstemon jamesii* A. Nelson, Bull. Torrey Club 25: 547. 1898" (as to description). "Recent collections \* \* \* by the writer in the Red Desert of Wyoming in 1897 (no. 3052) and again in 1898 (no. 4716)." Isotype, *Nelson* 3052, collected at Green River, Sweetwater County, Wyoming, May 31, 1897, seen in herbarium of the New York Botanical Garden.

Stony hillsides, at altitudes of 1,800 to 2,000 meters; Upper Sonoran Zone; flowering from late May to late June. Red Desert of southwestern Wyoming.

WYOMING: Carbon: Fort Steele, *Nelson* 5384 (R). Sweetwater: Green River, *Nelson* 3052 (M, R, Y), 4716 (F, R), *Pennell* 5893 (Y).

#### 18. *Penstemon petiolatus* T. S. Brandeg.

*Penstemon petiolatus* T. S. Brandeg. Bot. Gaz. 27: 455. 1899. "Sheep mountain, Nevada, at 5,000 ft. altitude, *Dr. C. A. Purpus*, no. 6136." Isotype seen in herbarium of the New York Botanical Garden; also, through the courtesy of Dr. H. M. Hall, a fragment of the type from the University of California. The original description must be modified so as to denote a plant cinereous-puberulent throughout, somewhat glandular-pubescent on the stem above and on the inflorescence, and with a bearded sterile filament. The original collection consisted of plants past normal flower, but with old shriveled corollas still attached. The specimens of A. L. Siler cited below are certainly the same species, and are in full blossom. They show more clearly the glandular inflorescence and the bearded sterile filament, and apparently that the corolla is reddish.

"Crevices of limestone rock"; probably Upper Sonoran Zone; flowering in March. Beaverdam Mountains of southwestern Utah and mountains of southern Nevada.

UTAH: Washington: Beaverdam Mountains, *Siler* (A).

#### 19. *Penstemon palmeri* A. Gray.

*Penstemon palmeri* A. Gray, Proc. Amer. Acad. 7: 379. 1868. "Arizona, in Skull Valley, and on Rio Verde, near Fort Whipple, Drs. Elliott Coues and Edward Palmer."

At an altitude of about 2,400 meters; Upper Sonoran Zone; flowering in late June. Southwestern Utah and central Arizona to eastern California.

UTAH: Beaver: Frisco, *Jones* 1820 (F, U, Y). Kane: *Siler* (A).

#### 20. *Penstemon hallii* A. Gray.

*Penstemon hallii* A. Gray, Proc. Amer. Acad. 6: 70. 1862. "Rocky Mountains near Clear Creek [Colorado], etc., in the alpine region, coll. 1862, Parry, Hall and



Harbour: no. 388, distrib. Hall and Harbour." Isotypes seen in herbaria of the Academy of Natural Sciences of Philadelphia, Field Museum of Natural History, Missouri Botanical Garden, and Brooklyn Botanic Garden.

Rocky knolls, above timber line, at altitudes of 3,100 to 3,900 meters; Alpine Zone; flowering from early July to late August. High mountains, Front Range from Grays Peak southward, Sawatch Range, Pikes Peak, Sangre de Cristo Range, and San Juan and adjacent ranges, Colorado.

COLORADO: Chaffee: Mount Princeton, *Sheldon* 549 (U). Clear Creek: Grays Peak, *Patterson* 119 (F, M, U, Y); Mount McClellan (F). El Paso: Mount Garfield (Y); Pikes Peak, *Pennell* 6328 (D, R, Y). Lake: Mount Elbert, *W. A. Henry* (U). Park: Mountains north of Boreas (U); mountains above Como (Y); Horseshoe Mountain, *Coulter* (U, Y). San Juan: Engineer Mountain (F); Mineral Point (M); Needle Mountains (U); Silverton, *Tweedy* 167 (U). Summit: Argentine Pass, *Jones* 408 (B, Y). County uncertain: Sangre de Cristo Range, *Brandege* 805 (M).

21. *Penstemon parvus* Pennell, sp. nov.

Stems several, 5 to 10 cm. tall, from a relatively long slender caudex, slender, puberulent, not glandular or glaucous; leaves green, not glaucous, obscurely veined, puberulent, those at the base of the stem with oblanceolate-obovate acutish blades, 2 to 2.5 cm. long and 4 to 5 mm. wide, narrowed into ill-defined petiole-like bases, those of the stem similar, smaller, with narrowed, slightly clasping base, becoming much reduced in the inflorescence; thyrsus narrow, probably secund, raceme-like, not over one-fourth the height of the plant, composed of 1 or 2 fascicles, each consisting of 1 or 2 axillary one-flowered branches (the flowers but 1 to 4); sepals 4 mm. long, ovate, acute, not veined, not or scarcely scarious-margined and erose-margined, sparsely and finely glandular-puberulent; corolla 20 mm. long, the tube and throat 14 mm. long, the tube narrow, the throat inflated and rounded ventrally, the 2 posterior lobes 6 mm. long, united and arched over one-half their length, probably projecting, the 3 anterior lobes slightly shorter, united at base, the free portions spreading; corolla externally glandular-puberulent, within glabrous, blue (not seen fresh); anther sacs widely divaricate, 1 mm. long, lance-ovate, distinct, opening from distal apex throughout, glabrous; sterile filament about equaling the anterior pair, slightly enlarging distally, glabrous; capsule not seen.

Type in the U. S. National Herbarium, no. 146868 (in part), collected at The Button, Aquarius Plateau (Garfield or Wayne County), Utah, altitude 3,400 to 3,500 meters, in flower, August 11, 1875, by L. F. Ward (no. 546); distributed as *P. acuminatus* Dougl.

Alpine Zone.

22. *Penstemon unilateralis* Rydb.

*Penstemon unilateralis* Rydb. Bull. Torrey Club 33: 150. 1906. Based upon "*P. secundiflorus* A. Gray, Syn. Fl. 2<sup>1</sup>: 263. 1878. Not *P. secundiflorus* Benth." Statement of type locality from Gray: "Mountains of Colorado, common at 8 or 9,000 feet." Specimens named by Gray seen; none designated as type, but name sufficiently definite.

Usually in gravelly soil, on hillsides and along streams, at altitudes of 1,400 to 2,800 (3,000) meters; Submontane and Montane zones; flowering from mid-June to late August. Foothills and lower slopes of mountains, descending usually along rivers into high plains northward, from southeastern Wyoming to southern Colorado, on both continental slopes.

WYOMING: Laramie: Cheyenne, *Nelson* 1997 (M).

COLORADO: Arapahoe: Littleton, *Eggleston* 11213 (U). Boulder: Boulder, *Pennell* 5845 (Y); Coal Creek; Eldorado Springs; Lyons (M); Sulphide (B, Y). Chaffee: Buena Vista, *Sheldon* (U, Y, Z); Granite (U); Mount Harvard (Y). Clear Creek:

Empire, *Patterson* 258 (A, F, M, P, Y); Georgetown (Y); Idaho Springs (Y) Costilla: Sangre de Cristo Creek, *Rydberg & Vreeland* 5631 (Y). Denver: Valverde, *Pennell* 5846 (Y). Douglas: *H. S. Smith* 5136 (Y); Elbert: Bijou Basin, *Jones* 155 (F). El Paso: Colorado Springs, *Shear* 4789 (U, Y); Garden of the Gods; Manitou (M, P, Y); Palmer Lake; South Cheyenne Canyon; Ute Pass (M). Fremont: Wilson Creek, *Brandege* 419 (M). Gilpin: Central City (Y); Eldora to Baltimore, *Tweedy* 5714A (Y). Lake: Twin Lakes, *C. W. Derry* (F). Larimer: Dale Creek; Estes Park (M, U); Fort Collins, *Crandall* 1866 (Y); Laporte (Y); Pennocks (Y); Poudre Canyon (Y). Las Animas: Stonewall, *Beckwith* 157 (Y), 164 (Y); Trinidad (Y). Park: Como, *Shear* 4586 (Y); Webster Canyon (M). Teller: Florissant, *Ramaley* 1313 (B). Weld: Evans (Y); Windsor, *Pennell* 5863 (P, S, U, Y).

### 23. *Penstemon magnus* Pennell, sp. nov.

Stems several, 40 cm. tall, from a caudex, stout, glabrous, bluish glaucous; leaves light green, scarcely glabrous, obscurely veined, glabrous, those at the base of the stem with oblanceolate, obtusish to obtuse blades 7 to 8 cm. long, narrowed into scarcely defined petioles (bases of lowest leaves not meeting around stem), the largest leaves 12 cm. long and 1.4 cm. wide; thyrsus narrowly elongate, one-half the height of the plant, composed of 7 or 8 fascicles, each consisting of 2 short axillary branches, the pedicels equaling the peduncle; sepals 6 to 7 mm. long, narrowly ovate, acuminate, obscurely and finely ribbed, with white to pinkish, scarious, denticulate margin, glabrous; corolla about 25 to 27 mm. long, the tube and throat about 18 to 20 mm. long, the throat strongly inflated and rounded ventrally, the 2 posterior lobes about 6 to 7 mm. long, united and arched about one-half their length, the 3 anterior lobes slightly longer, united at base, the free portions widely spreading; corolla glabrous without and within, probably deep blue (not seen fresh); anther sacs divaricate, 2.3 to 2.5 mm. long, oblong, distinct, opening from the distal apex nearly throughout, glabrous (except for minute ciliation of suture); sterile filament shorter than the anterior pair, scarcely enlarged and slightly flattened distally, bearded on the posterior face distally with a few short yellow hairs; capsule 15 to 20 mm. long, ovate, acuminate, glabrous; seeds 3 to 4 mm. long, irregularly rectangular in outline, curved, the angles sharp, not winged, the surface very minutely alveolate-reticulate, dark brown, slightly glistening.

Type in the herbarium of the New York Botanical Garden, collected in low, open grounds, near Teller (North Park), Jackson County, Colorado, altitude 2,400 meters, in flower, July 30, 1884, by C. S. Sheldon (no. 90; distributed as *P. confertus caeruleo-purpureus* A. Gray).

Probably Montane Zone.

### 24. *Penstemon leiophyllus* Pennell, sp. nov.

Stems one or several, 15 to 60 cm. tall, from a short branched caudex, glabrous, glandular-puberulent in the inflorescence, slightly glaucous; leaves dull pale green, slightly glaucous, finely veined, acute, altogether 10 to 13 cm. long, 1.3 to 2 cm. wide, narrowed into petiole-like bases of about one-third the total length, the leaves of the stem smaller, clasping from a broadly rounded base (bases of opposite leaves meeting around stem), becoming reduced to small bracts through the inflorescence; thyrsus narrow, secund, less than one-half the height of the plant, composed of 5 to 15 fascicles, each consisting of 2 short axillary branches, their pedicels somewhat exceeding the peduncle; sepals 6 to 7 mm. long, lanceolate, acuminate, not veined, with obscure or no scarious margin, entire, glandular-puberulent; corolla 25 to 30 mm. long, the tube and throat 17 to 20 mm. long, the throat decidedly inflated and rounded ventrally, the 2 posterior lobes 8 to 10 mm. long, united and arched about two-thirds their length, projecting, the 3 anterior lobes equaling or exceeding the posterior

ones, united at base, the free portions widely spreading; corolla externally glandular-puberulent, within glabrous, blue; anther cells distinct, opening distally throughout, glabrous; sterile filament nearly equaling the anterior pair, scarcely enlarging distally, flattened, slightly bearded to glabrous on the posterior face distally; capsule ovate, acuminate, glabrous (not seen mature).

Type in the U. S. National Herbarium, no. 260622, collected at Mammoth Creek, Utah, altitude 2,400 meters, in flower, September 10, 1894, by M. E. Jones (no. 6026b; distributed as *P. glaber utahensis* S. Wats.).

"Gravelly slopes," at altitudes of 2,100 to 2,700 meters; probably Submontane Zone; flowering in early September. Mountains of southwestern Utah.

UTAH: Garfield: Panguitch Lake, Jones 6015ar (U), 6015as (U); Mammoth Creek, Jones 6026b (U). Washington: Pine Valley Mountains, Purpus 6203 (U); St. George (M).

25. *Penstemon laevis* Pennell, sp. nov.

Stems one or several 40 to 70 cm. tall, from a short branched caudex, glabrous throughout, glaucous; leaves pale dull green, somewhat glaucous, obscurely veined, glabrous, those at the base of the stem with narrowly obovate to ovate, obtuse (at times retuse, with or without a mucro) blades, altogether 10 to 15 cm. long, 2 to 3 cm. wide, narrowed into petiole-like bases one-third the total length, the stem leaves similar, smaller, clasping from a more or less broadly rounded base (bases of opposite leaves nearly or quite meeting around stem), becoming reduced and bractlike through the inflorescence; thyrsus narrow, secund, about one-half the height of the plant, composed of 9 to 18 fascicles, each consisting of 2 short axillary branches, their pedicels probably exceeding the peduncle; sepals 4 to 7 mm. long, broadly ovate, more or less abruptly acuminate, not veined, with relatively broad erose-denticulate scarious margin, glabrous; corolla 20 to 30 mm. long, the tube and throat 14 to 20 mm. long, the throat decidedly inflated and rounded ventrally, the 2 posterior lobes 6 to 10 mm. long, united and arched one-half their length, projecting, the 3 anterior lobes nearly equaling the posterior ones, united at base, the free portions spreading; corolla glabrous without and within, blue (not seen fresh); anther sacs widely divaricate, 1.8 to 2 mm. long, oblong-lanceolate, distinct, opening distally three-fourths their length, minutely puberulent; sterile filament shorter than the anterior pair, scarcely enlarging distally, flattened, bearded with yellow hairs on the posterior face near the apex; capsule not seen.

Type in the U. S. National Herbarium, no. 260632, collected in red sand at Springdale, Washington County, Utah, altitude 1,200 meters, in flower, May 17, 1894, by M. E. Jones (no. 5250, in part; distributed as *P. glaber* Pursh).

"Red sand," at altitudes of 1,000 to 1,700 meters; Lower Sonoran and Upper Sonoran zones; flowering from middle to late May. Southwestern Utah.

UTAH: Kane: Johnson, Jones 5289y (U); Kanab, Jones 5289x (U). Washington: Near Canaan Ranch, Jones 5262, in part (M); Rockville, Jones 5224v (U); Springdale, Jones 5250 (M, U).

26. *Penstemon wardii* A. Gray.

*Penstemon wardii* A. Gray, Proc. Amer. Acad. 12: 82. 1876. "Utah, near Glenwood, at 5,300 feet, L. F. Ward, in Powell's Expedition." Isotype, collected in flower, June 4, 1875, near Glenwood, Utah, at 1,560 meters altitude, L. F. Ward 162, seen in U. S. National Herbarium.

*Penstemon glaber wardii* Jones, Contr. West. Bot. 12: 62. 1908.

At an altitude of about 1,600 meters; Upper Sonoran or Submontane Zone; flowering in mid-June. Sevier County, central Utah.

UTAH: Sevier: 4 miles up Salina Canyon, Jones 5419b (U).

27. *Penstemon glaber* Pursh.

*Penstemon glaber* Pursh, Fl. Amer. Sept. 738. 1814. "In upper Louisiana. Bradbury. \* \* \* v. s. in Herb. Bradbury." According to Bradbury (Travels, 319) "Alluvia of the Missouri, above the Big Bend," South Dakota. Isotype, labeled "Louisiana. Bradbury," seen in herbarium of the Academy of Natural Sciences of Philadelphia.

*Penstemon eriantherus* Nutt. (in Fraser's Cat. 1813, *nomen nudum*) Gen. Pl. 2: 52. 1818. "P. glabra Pursh \* \* \* Hab. In arid soils near the confluence of Shian [Cheyenne] River," South Dakota.

*Penstemon gordonii* Hook. in Curtis's Bot. Mag. 73: pl. 4319. 1847. "For the opportunity of figuring this \* \* \* species \* \* \* I am indebted to Edward Leeds, Esq., of Manchester, who raised it from seeds given him by Mr. Shepherd of the Botanic Gardens, Liverpool, and which had been collected by Mr. Gordon in the valley of the Platte River, on the east side of the Rocky Mountains."

Gravelly or alluvial banks, at altitudes of 1,200 to 2,100 (3,150) meters; Subboreal (Submontane) Zone (probably rarely ascending to Alpine Zone); flowering from early June to early August. High plains and foothills in drainage of Missouri River, south to Albany County, Wyoming. North Dakota to western Nebraska and central Wyoming.

SOUTH DAKOTA: Custer: Custer, *Rydberg* 916, in part (U). Fall River: Edgemont, *Rydberg & Bessey* 4910 (F, Y). Lawrence: Deadwood, *Rydberg* 916, in part (Y); Nasby (Y); Spearfish Canyon (F). Meade: Fort Meade, *Forwood* 287 (U). Pennington: Rapid Creek, *Over* 1842 (U). County uncertain: "Hills of Shian River," *Geyer* 124 (U, Y).

NEBRASKA: Banner: Lawrence Fork, *Rydberg* 276 (U, Y). Dawes: Pine Ridge, *Webber* (Y). Morrill: West of Chimney Rock, *Engelmann* (M). Sioux: War Bonnet Canyon, *T. A. Williams* (Y).

WYOMING: Albany: McGill Ranch, *Nelson* 7457 (B). Crook: Devils Tower, *L. W. Carter* (Y); Sundance Mountain (F, M). Fremont: Birds Eye, *Nelson* 9352 (M, U, Y); North Fork of Wind River (U). Johnson: Mouth of Trabing Creek, *Willits* 408 (R). Niobrara: U L Ranch, *Knowlton* 152 (U, Y). Park: Needle Mountain, *Cary* 612 (U). Sheridan: Big Horn, *Tweedy* 2330 (Y), Dome Lake Road,<sup>1</sup> *Nelson* 8541 (R); headwaters of Tongue River (Y). Washakie: Head of Middle Fork of Powder River, *Goodding* 285 (F, M, Y). Weston: Stockade Beaver, *Nelson* 9487 (R).

28. *Penstemon alpinus* Torr.

*Penstemon alpinus* Torr. Ann. Lyc. N. Y. 1: 35. 1824. "Hab. with the preceding ["On James (=Pikes) Peak, \* \* \* 10,000 feet above the level of the ocean, near the region of perpetual snow," collected in July, 1820, by Dr. Edwin James]." Type seen in herbarium of Columbia University at the New York Botanical Garden. Name unfortunate, as plant rarely reaches timber line and grows mostly upon the lower mountain slopes and foothills. Although it does occur on the middle slopes of Pikes Peak, it would appear more probable that Doctor James, in making his habitat note, confused this plant with the truly alpine *P. hallii*, so abundant above timber line on Pikes Peak; or quite possibly Torrey simply assumed that this came from the same altitudes as the plants which precede it in his report. The type, in accordance with Torrey's description, is a quite glabrous plant.

*Chelone alpina* Spreng. Syst. Veg. 4: Cur. Post. 235. 1827.

*Penstemon glaber alpinus* A. Gray, Proc. Amer. Acad. 6: 60. 1862-3.

*Penstemon riparius* A. Nels. Bull. Torrey Club 25: 379. 1898. "Collected at Laramie [Wyoming] by Mr. Elias Nelson, June 18, 1897, and fruited specimens later in the season. Type specimen in Herb. Univ. of Wyoming, no. 3185." Type seen in

<sup>1</sup> Stem pubescent: forma *pubicaulis* Pennell.

Rocky Mountain Herbarium. Here maintained as a puberulent to pubescent form, *P. alpinus* forma *riparius* (A. Nels.) Pennell (indicated in the following lists by an asterisk).

*Penstemon oreophilus* Rydb. Bull. Torrey Club 31: 642. 1905. "Colorado: Eldora to Baltimore, 1903, Tweedy 5711 (type)." Type seen in herbarium of the New York Botanical Garden.

Species variable in size, pubescence, width of leaves, shape and length of calyx lobes, pubescence on anther sacs, etc., and possibly to be considered a subspecies of the much more stable *P. glaber*.

Gravelly soil, at altitudes of 1,350 to 3,000 (3,600) meters; Submontane and Montane zones, ascending to Alpine; flowering from early June to late August. River banks in the high plains, slopes of foothills, and mountains, southeastern Wyoming to central Colorado.

WYOMING: Albany: Chug Creek, Nelson 7309 (M, U, Y); Dunn Ranch (Y); Laramie,\* E. Nelson 3185 (R, Y); Laramie Peak\* (U); Prayers Crossing\* (U); Sibylee\* (Y). Carbon: Fort Steele (R); Medicine Bow, Goodding 39 (M, U). Goshen: Fort Laramie, Nelson 9194 (R).

COLORADO: Boulder: Allenspark (B, R); Crescent (B); Eldora,\* Robbins 2391 (B, R); Nederland\* (B); Pine Cliff\* (B); St. Vrain Creek\* (B); Sugarloaf Mountain\* (B); Ward,\* Osterhout (Y). Clear Creek: Bard Creek (F); Deer Creek\* (F); near Empire,\* Patterson 256 (Y); near Georgetown\* (F). Denver: Military Park (M); Valverde, Pennell 5825 (M, Y), 5842 (F, H, R, S, Y). El Paso: Bald Mountain (Y); Cheyenne Mountain (Y); Colorado Springs,\* Jones 973 (F); Crystal Park (M, U, Z); Green Mountain Falls (U, Z); Manitou (Y); North Cheyenne Canyon, (Y); Pikes Peak (Pennell 6338, near Mountain View), Pennell 6320 (D, K, Y), 6321 (P, Y); Quartz Ridge (Y); South Cheyenne Canyon (Y); Ute Pass (M). Fremont: Brandegee (M). Gilpin: Central City\* (Y); Eldora to Baltimore (Y); Mammoth Gulch (B); Tolland, Pennell 6374 (Y),\* 6374A (Y), 6376 (Y). Jefferson: Bergen Park (M); Buffalo Creek Canyon, Rusby (Y); Golden, Jones 824 (B, Y); Morrison (A). Larimer: Estes Park\*; Horsetooth Mountain,\* Cowen 1807 (Y), 4201; Moraine Park\*; Stove Prairie Hill\* (Y). Saguache: Marshall Pass, Baker 869 (Y). Teller: Rosemont, Blumer (F). Weld: Evans, Johnston 641 (Y).

#### 29. *Penstemon brandegei* Porter.

*Penstemon cyananthus brandegei* Porter; Port. & Coult. Syn. Fl. Colo. 91. 1874. "Sierra Mojado, Brandegee." Isotype seen in herbarium of the Missouri Botanical Garden. This differs from other specimens here associated with it in having the corolla more lanate within, and in having the sterile filament, at least in some flowers, bearded with a very few hairs. The name is here used for what is believed to be a definite species, although some specimens, including the type, appear to approach *P. alpinus*.

*Penstemon brandegei* Porter; Rydb. Mem. N. Y. Bot. Gard. 1: 343. 1900. As to synonymy; description compounded of this and *P. cyaneus*.

Probably in environments similar to those preferred by *P. alpinus*, at altitudes of 1,800 to 2,400 meters; Submontane Zone; flowering from late June to late July. Probably foothills and lower mountain slopes, perhaps descending to high plains, southeastern Colorado and northeastern New Mexico, on the Atlantic slope.

COLORADO: Fremont: Canyon City, Brandegee 930 (M). Las Animas: Fisher Peak (Y); Trinidad, Beckwith 160 (Y), 162 (Y); Wootton (Y).

#### 30. *Penstemon saxosorum* Pennell, sp. nov.

Stems several, 10 to 80 cm. tall, from a short branched caudex, slender, glabrous, not or scarcely glaucous; leaves green, not or scarcely glaucous, glabrous, those at the base of the stem with lanceolate, obscurely acute blades 5 to 7 cm. long, narrowed

into indefinite petiole-like bases of nearly one-half the total length, those of the stem similar, narrowly to broadly lanceolate, clasping from a narrowed (or above widened) base, longer than the internodes, the largest 5 to 9 cm. long, 0.5 to 1.8 cm. wide; thyrsus narrowly elongate, strongly secund, nearly one-third the height of the plant, composed of 5 to 9 fascicles, each consisting of 2 short axillary branches, the longest pedicels equaling or exceeding the peduncle; sepals 5 to 7 mm. long, ovate, with a caudate tip sometimes nearly equaling the body, obscurely veined, with white to pinkish, scarious, more or less denticulate margin, finely glandular-puberulent; corolla 16 to 22 mm. long, the tube and throat 11 to 16 mm. long, the throat strongly inflated and rounded ventrally, the 2 posterior lobes 5 to 6 mm. long, united and arched one-third to one-half their length, projecting, the 3 anterior lobes slightly longer, united at base, the free portions widely spreading; corolla very sparsely glandular-puberulent externally, glabrous within, deep blue (not seen fresh); anther sacs widely divaricate, 1.2 to 1.4 mm. long, lanceolate, distinct, opening from distal apex throughout, pubescent on the side with short hairs; sterile filament about equaling the anterior pair, slightly enlarged distally, flattened, bearded on the posterior face distally with short yellow hairs; capsule not seen.

Type in the herbarium of the New York Botanical Garden, collected on rocky hillsides, Woods Creek, Albany County, Wyoming, in flower, July 3, 1903, by L. N. Goodding (no. 1428; distributed as *P. strictus* Benth.).

Rocky slopes, at altitudes of 2,500 to 2,800 meters; Montane Zone; flowering from early July to mid-August. Hills, mountain slopes, and mesas, southeastern Wyoming and northern and west-central Colorado; on both continental slopes.

WYOMING: Albany: Centennial Mountain, *Nelson* 8759 (F, M, U, Y); near Fox Park, *Nelson* 9060 (M); Cummins (M); Woods Creek, *Goodding* 1428 (A, B, M, P, U, Y). Carbon: Battle Lake, *Nelson* 4186 (R).

COLORADO: Delta: Oak Mesa, north of Hotchkiss, *Cowen* (Y). Jackson: Camp Creek, *Goodding* 1455 (B, M, U, Y); Spicer, *Goodding* 1507 (A, B, M, U, Y). Routt: Anita Peak, *Goodding* 1759 (A, B, M, P, U, Y); Hahns Peak, *Goodding* 1704 (B, R, U, Y), *Tweedy* 4299 (U, Y).

### 31. *Penstemon subglaber* Rydb.

*Penstemon glaber utahensis* S. Wats. in King, Geol. Expl. 40th Par. 5: 217. 1871. "Uinta Mountains, (Pack's cañon) Utah; 7,000 feet altitude [S. Watson] (771) [in 1869]." Isotype, collected July, 1869, seen in herbarium of Columbia University at the New York Botanical Garden.

*Penstemon utahensis* A. Nels. Bull. Torrey Club 26: 242. 1899. Not *P. utahensis* Eastw. 1893.

*Penstemon subglaber* Rydb. Bull. Torrey Club 36: 688. 1909. New name for *P. glaber utahensis* S. Wats.

Gravelly sagebrush slopes, at altitudes of 2,100 to 3,000 meters; Submontane and Montane zones; flowering from early July to early September. Foothills and lower slopes of the Teton and Wasatch ranges, western Wyoming to Sevier County, Utah.

WYOMING: Fremont: Wind River Mountains, *Forwood* (U). Lincoln: Headwaters of Cliff Creek (Y); Gros Ventre River, *Nelson* 3981 (R). Uinta: Evanston, *Pennell* 5940 (Y); Fort Bridger (A, P).

UTAH: Salt Lake: Near Salt Lake, *Stokes* (U). San Pete: Ephraim Canyon, *Tidestrom* 221 (U); Manti Canyon (M); Mount Pleasant (U). Sevier: Fish Lake, *Jones* 5717q (U). Summit: Peck Canyon, *Watson* 771 (U, Y). Utah: Soldier Summit, *Pennell* 6129 (D, F, K, P, S, Y).

### 32. *Penstemon uintahensis* Pennell, sp. nov.

Stems several, 10 to 20 cm. tall, from a short caudex, slender, glabrous, sparsely glandular-puberulent in the inflorescence, not glaucous; leaves green, not or scarcely

glaucous, very obscurely veined, glabrous, those at the base of the stem with narrow, oblanceolate, rounded but mucronately acute blades 3 to 5 cm. long and 0.6 to 0.8 cm. wide, narrowed into petiole-like bases of nearly one-half the total length, those of the stem similar, clasping from a narrowed base, smaller, becoming much reduced in the inflorescence; thyrsus narrow, strongly secund, raceme-like, nearly one-third the height of the plant, composed of 5 or 6 fascicles, each consisting of 2 short axillary branches, the pedicels equaling the peduncle; sepals 5 to 6 mm. long, broadly ovate, with a slightly defined short acute tip, apparently not veined, with broad, white to pinkish, strongly and irregularly denticulate margin, finely glandular-puberulent; corolla 18 to 20 mm. long, the tube and throat 12 to 13 mm. long, the tube broad, the throat inflated and rounded ventrally, the 2 posterior lobes 5 to 6 mm. long, united and arched about one-third their length, projecting, the 3 anterior lobes 6 to 7 mm. long, united at base, the free portions spreading; corolla externally sparsely glandular-puberulent, within glabrous, probably blue (not seen fresh); anther sacs widely divaricate, 1 to 1.2 mm. long, lance-ovate, distinct, opening from the distal apex throughout, pubescent on the side with short hairs; sterile filament apparently equaling the anterior pair, gradually enlarging distally, flattened, bearded on the posterior face distally with yellow hairs; capsule not seen.

Type in the herbarium of the New York Botanical Garden, collected on crest of mountains, Dyer Mine, Uinta Mountains, Uinta County, Utah, in flower, June 30, 1902, by L. N. Goodding (no. 1221; distributed as *P. hallii* A. Gray). Isotypes in herbarium of Field Museum of Natural History and U. S. National Herbarium.

Alpine Zone.

### 33. *Penstemon cyaneus* Pennell, sp. nov.

Stems several, 40 to 80 cm. tall, from a short stout caudex, glabrous throughout, not or slightly glaucous; leaves light green, not glaucous, obscurely veined, glabrous, those at the base of the stem with lanceolate acute blades 15 cm. long and 1 to 2 cm. wide, narrowed into petiole-like bases of about one-third the total length, those of the stem lanceolate, clasping from a narrowed (or, in the upper leaves, widened) base, the longest 6 to 10 cm. long, becoming much reduced in the inflorescence; thyrsus narrowly elongate, strongly secund, nearly one-half the height of the plant, composed of 7 to 12 fascicles, each consisting of 2 axillary branches; pedicels shorter than (or the longest exceeding) the peduncle; sepals 4.5 to 5 mm. long, broadly ovate to nearly orbicular, with an evident short-acuminate tip, finely veined in age, with very broad, white to bluish, irregularly denticulate, scarious margin, glabrous; corolla 27 to 30 mm. long, the tube and throat 19 to 21 mm. long, the tube narrow, the throat inflated and rounded ventrally, somewhat contracted to the orifice, the 2 posterior lobes 8 to 9 mm. long, united one-third their length, projecting, the 3 anterior lobes slightly longer, united and flattened for 4 mm., the free lobes spreading to deflexed; corolla glabrous without and within, (early changing from violet-pink to) deep sky blue, violet toward tube; anther sacs divaricate, 1.8 to 2 mm. long, lanceolate, distinct, opening from the distal apex two-thirds to four-fifths their length, violet-purple on the sides, pubescent on the side with short fine hairs; sterile filament shorter than or equaling the anterior pair, violet-blue, gradually enlarging distally, flattened, bearded on the posterior face distally with yellow hairs; capsule 12 to 15 mm. long, ovate, acuminate, glabrous; seeds 2 to 3 mm. long, irregularly quadrangular in outline, curved, the angles sharp, thin, not winged, the surface finely alveolate-reticulate, brown, glistening.

Type in the herbarium of the New York Botanical Garden, collected in dry sagebrush, along railroad north of Ashton, Fremont County, Idaho, altitude of 1,560 to 1,590 meters, in flower and immature fruit, July 9, 1915, by F. W. Pennell (no. 6046).

Open sagebrush slopes, frequently gravelly or rocky, at altitudes 1,500 to 2,000 (3,000) meters; Submontane Zone; flowering mid-June to early August. Foothills

and high plains, Park County and Yellowstone National Park, Wyoming, and adjacent Montana (in Madison Valley) to Blaine County, Idaho.

WYOMING: Yellowstone National Park: Near Mammoth Hot Springs, *Mearns* 496 (U), 1079 (Y), 1216 (Y), 2638 (U), *A. & E. Nelson* 5633 (M, U, Y), *Pennell* 6034 (H, P, Y); Spring Creek (R); Witch Creek (F); Yellowstone Lake (M, U).

IDAHO: Bingham: "Big Butte Station," *Palmer* 234 (U), 235 (U), 474 (U). Fremont: Ashton, *Pennell* 6046 (Y); Mount Chauvet, *Rydberg & Bessey* 4912 (F, U, Y), 4913 (Y); St. Anthony, *Merrill & Wilcox* 821 (U, Y).

#### 34. *Penstemon cyananthus* Hook.

*Penstemon cyananthus* Hook. in Curtis's Bot. Mag. 75: pl. 4464. 1849. "It is \* \* \* an inhabitant of \* \* \* the upper valleys of the Platte River in the Rocky Mountains, where seeds were collected by Mr. Burke. These seeds were reared by Messrs. Lucombe, Pince and Co., in whose Exeter nursery the plants flowered beautifully \* \* \* in May 1849." Type not seen or verified.

*Penstemon glaber cyananthus* A. Gray, Proc. Amer. Acad. 6: 60. 1862-63.

Varies in width of leaf and size of flowers. Southward (at Mount Nebo) specimens occur with more scarious calyx lobes, possibly approaching *P. cyananthus longiflorus*.

Mostly gravelly or rocky soil, sagebrush slopes, and openings in mountain woods, at altitudes of (1,300) 1,500 to 3,000 meters; Submontane and Montane zones, at times descending and ascending from these; flowering from late May to mid-August. Hills and mountains from southwestern Montana southward to Piute County, Utah; abundant in the Wasatch Range.

WYOMING: Uinta: Evanston, *Pennell* 5898 (Y), 5900 (F, P, Y); Medicine Butte, *Pennell* 5907 (Y).

IDAHO: Bear Lake: Fish Haven Canyon, *Mulford* 230 (M, Y). Fremont: Ashton, *Pennell* 6046B (Y).

UTAH: Cache: Cache Junction (M, U); Logan, *C. P. Smith* 1613 (R), 2201 (Y). Davis: Farmington Canyon; Kaysville, *Armstrong* 328 (Y). Juab: Mount Nebo, *Goodding* 1104 (F, U, Y). Morgan: Devils Slide, *Pennell* 5943 (B, H, M, R, U, Y). Piute: Mountains north of Bullion Creek, *Rydberg & Carlton* 7113, in part (Y). Salt Lake: Alta; Altus, *Pennell* 5962 (H, P, R, S, Y), 5967 (Y; albino); east of Barclay, *Pennell* 5956 (M, Y); South Fork of Big Cottonwood Creek, *Pennell* 5976 (Y); City Creek Canyon (Y); Dry Canyon (Y); Emigration Canyon, *Pennell* 5984; benches near Salt Lake City (Y); Silver Lake, *Pennell* 6085 (Y); above Sulphur Baths (F, M). Sevier: Belknap, *Stokes* (U, Y). Summit: Echo, *Pennell* 5935 (D, U, Y). Tooele: Ophir City,<sup>1</sup> *E. S. Blackwell* (P). Utah: Rock Canyon, east of Provo, *Pennell* 6123 (F, Y). Weber: Ogden, *Meehan* (A).

#### 34a. *Penstemon cyananthus subglaber* (A. Gray) Pennell.

*Penstemon fremontii subglaber* A. Gray, Syn. Fl. 2<sup>1</sup>: 262. 1878. "Idaho," in mountains near Fort Hall, *Burke*. Type in Gray Herbarium, verified by Mr. J. F. Macbride, who in a letter says of it, "The leaves are narrower than usual in *P. cyananthus*." A corolla sent me shows it to be this form.

Stems puberulent below, frequently for most of their length; leaves prevailing lanceolate, the largest stem leaves 6 to 7 cm. long, 1 to 1.5 cm. wide, more densely puberulent; corolla about 20 mm. long; capsule 8 to 10 mm. long. Otherwise as in the species.

Dry sagebrush slopes, at altitudes of 1,500 to 2,100 meters; Submontane Zone; flowering in July and early August. Hills and lower mountain slopes, western Wyoming, eastern Idaho, and northwestern Utah. Probably grades into the species. WYOMING: Lincoln: Spread Creek, *Tweedy* 231 (Y).

<sup>1</sup> More puberulent on stem, although glabrous above.



IDAHO: Bannock: Pocatello, *Pennell* 6061 (M, R, Y), 6062 (F, H, U, Y), 6066 (P, Y).

Fremont: Ashton, *Pennell* 6046a (Y); near Fall River (M).

UTAH; Box: Holstein Ranger Station, Minidoka National Forest, *J. H. Kroencke* 22548 (U. S. Forest Service Herb.).

34b. *Penstemon cyananthus longiflorus* Pennell, subsp. nov.

Stems puberulent, at least below, to nearly or quite glabrous; calyx lobes broader, with more evidently scarious margin and relatively shorter tips; corolla 25 to 30 mm. long, with longer tube at base; inflorescence more secund. Otherwise as in the species.

Type in the herbarium of Columbia University at New York Botanical Garden, collected at Beaver City, Utah, in flower, by Edward Palmer (no. 376; distributed as *P. glaber cyananthus*).

Southwestern Utah. Probably Submontane Zone; flowering in late July.

UTAH: Beaver: Beaver City, *Palmer* 376 (M, Y). Millard: Filmore National Forest, *L. Tuttle* 25318 (U. S. Forest Service Herb.). Piute: Near Marysvale, *Rydberg & Carlton* 7083 (Y).

35. *Penstemon scariousus* Pennell, sp. nov.

Stems several, 20 to 30 cm. tall, from a branched caudex, sparsely glandular-puberulent in the inflorescence, dull or slightly glaucous; leaves apparently dull green and somewhat glaucous, obscurely veined, glabrous, those at the base of the stem with broadly oblanceolate, acute blades 6 to 7 cm. long, narrowed into petiole-like bases about two-thirds the length of the blade, those of the stem similar, lanceolate, clasping (bases of the upper meeting around stem), the largest 7 to 9 cm. long, 0.9 to 1.1 cm. wide; thyrsus narrow, racemiform, strongly secund, about one-third the height of the plant, composed of 4 to 6 fascicles, each consisting of 2 axillary ascending branches; pedicels shorter than or equaling the peduncle; sepals 8 to 12 mm. long, ovate-lanceolate, with a caudate tip nearly or quite equaling the length of the body, obscurely or not veined, proximally with a conspicuous broad, white, scarious, slightly denticulate margin, sparsely and minutely glandular-puberulent; corolla about 30 mm. long, the tube and throat 20 mm. long, the tube narrow, the throat inflated and rounded ventrally, the 2 posterior lobes 10 mm. long, united and arched two-fifths to one-half their length, the free portions projecting, the 3 anterior lobes slightly longer, united at base, the free portions spreading; corolla externally glabrous, within glabrous or slightly pubescent over bases of anterior lobes, blue (not seen fresh); anther sacs widely divaricate, 1.8 mm. long, oblong-lanceolate, distinct, opening from the distal apex for three-fourths to four-fifths their length, densely pubescent on the side with loose white hairs, their length not exceeding the width of the sacs; sterile filament shorter than the anterior pair, gradually enlarging distally, flattened, bearded on the posterior face distally with scattered (or at apex more dense) short yellow hairs; capsule not seen.

Type in the U. S. National Herbarium, no. 507700, collected on aspen slopes, east of Musinia Peak, Wasatch Mountains, headwaters of Muddy Creek, Utah, altitude 2,700 meters, in flower, September 12, 1907, by Ivar Tidestrom (no. 568).

Also collected in the Uinta Mountains by H. D. Longille (no. 120; U, Y).

Montane Zone.

36. *Penstemon garrettii* Pennell, sp. nov.

Stems several, 20 to 40 cm. tall (very sparsely glandular-puberulent in the inflorescence), from a stout branched caudex, dull or slightly glaucous; leaves apparently dull green and somewhat glaucous, obscurely veined, glabrous, those at the base of the stem with lanceolate acute blades 6 to 7 cm. long, narrowed into petiole-

like bases about one-half their length, those of the stem similar, narrowly lanceolate, clasping, the largest 6 to 10 cm. long, 0.7 to 0.9 cm. wide; thyrsus narrowly racemiform, strongly secund, less than one-half the height of the plant, composed of 7 to 10 fascicles, each consisting of 2 erect axillary branches; longer pedicels exceeding the peduncle; sepals 4 to 6 mm. long, ovate, with an acuminate tip about one-half the length of the body, obscurely veined in fruit, with conspicuous broad, white, scarious, coarsely and irregularly denticulate margin, finely and sparsely glandular-puberulent; corolla about 20 mm. long, the tube and throat 15 mm. long, the tube narrow, the throat inflated and rounded ventrally, the 2 posterior lobes 5 mm. long, united and arched one-half their length, apparently spreading, the 3 anterior lobes slightly longer, united at base, the free portions spreading; corolla glabrous without and within, probably blue (not seen fresh); anther sacs widely divaricate, 1.2 to 1.4 mm. long, oblong-lanceolate, distinct, opening from the distal apex nearly throughout, pubescent on the side with loose white hairs, their length not exceeding the width of the sacs; sterile filament shorter than the anterior ones, gradually enlarging distally, flattened, bearded on the posterior face distally with scattered (or at apex dense) short yellow hairs; capsule 8 to 9 mm. long, ovate, acuminate, glabrous, brownish; seeds about 2 mm. long, irregularly quadrangular in outline, curved, the angles sharp, not winged, the surface finely alveolate-reticulate, brown, slightly glistening.

Type in the herbarium of the New York Botanical Garden, collected in crevices in travertine rock in exposed places, "Hot Pots," near Midway, Wasatch County, Utah, in flower and fruit, July 6, 1905, by E. C. Carlton and A. O. Garrett (no. 6697). Isotypes in herbarium of Academy of Natural Sciences of Philadelphia, Rocky Mountain Herbarium, and U. S. National Herbarium.

At altitudes of 1,900 to 2,100 meters; probably Submontane Zone; flowering in early July. Eastern slope of the Wasatch Range, northeastern Utah.

UTAH: Utah: Price Canyon at Kyune, *Jones* 5603g (U). Wasatch: Near Midway, *Carlton & Garrett* 6697 (A, R, U, Y); "Hot Pots," July 4, 1905, *Garrett* 1329 (A).

### 37. *Penstemon cyanocaulis* Payson.

*Penstemon cyanocaulis* Payson, Bot. Gaz. 60: 380. 1915. "Collected on high, dry mesas near Naturita [Montrose County, Colorado], May 25, 1914, where it is rather infrequent; alt. about 5,800 ft.; [Edwin Payson] no. 348." Type seen in Rocky Mountain Herbarium.

Dry, rocky or gravelly soil, at altitudes of 1,600 to 2,000 meters; Upper Sonoran Zone; flowering in late May. Mesas and foothills, drainage of Grand River, southwestern Colorado and southeastern Utah.

COLORADO: Montrose: Naturita, *Payson* 348 (F, M, R); Paradox, *Walker* 166 (U, Y). UTAH: San Juan: Near Little Springs, western slope of La Sal Mountains, *Rydberg & Garrett* 8540 (Y).

### 38. *Penstemon caryi* Pennell, sp. nov.

Stem 10 cm. tall, from a caudex, slender, glabrous throughout, purplish glaucous; leaves apparently pale green, obscurely veined, glabrous, those at the base of the stem with narrowly lanceolate, obtuse blades 7 cm. long, narrowed into petiole-like bases about one-third the total length, those of the stem similar, nearly linear, the largest 4 to 5 cm. long, 0.2 to 0.3 cm. wide; thyrsus racemiform, strongly secund, one-third the height of the plant, composed of 4 fascicles, each consisting of 2 axillary ascending branches; longest pedicels equaling the peduncle; sepals 5 mm. long, ovate, with a long acuminate tip nearly equaling the length of the body, with white scarious margin, glabrous; corolla 15 mm. long, the tube and throat 11 mm. long, the throat inflated and rounded ventrally, the 2 posterior lobes 4 mm. long, united and

arched for one-third their length, projecting, the 3 anterior lobes 5 mm. long, united at base, the free portions spreading; corolla glabrous without and within, probably blue (not seen fresh); anther sacs widely divaricate, 1.4 to 1.5 mm. long, oblong-lanceolate, distinct, opening from the distal apex throughout, pubescent on the side with loose white hairs, their length not exceeding the width of the sac; sterile filament shorter than the anterior pair, gradually enlarging distally, flattened, bearded on the posterior face distally with scattered (or at apex dense) short yellow hairs; capsule not seen.

Type in the U. S. National Herbarium, no. 858840, collected in the Bighorn Mountains, Wyoming, altitude 2,400 meters, in flower, June 4, 1910, by Merritt Cary (no. 504).

Probably Submontane Zone.

### 39. *Penstemon strictiformis* Rydb.

*Penstemon strictiformis* Rydb. Bull. Torrey Club 31: 642. 1905. "Colorado: Mancos, 1898, Baker, Earle & Tracy 76 (type)." Type seen in herbarium of the New York Botanical Garden.

At altitudes of 1,900 to 2,100 meters; probably Submontane Zone; flowering from late June to July. Foothills, valley of San Juan River in southwestern Colorado.

COLORADO: Archuleta: Pagosa Springs, B. H. Smith (A). La Plata: Durango, Eastwood (U). Mineral: Wagonwheel Gap, A. D. McNair 16718 (U. S. Forest Service Herb.). Montezuma: Mancos, Baker, Earle & Tracy 76 (F, M, Y), Eastwood (Y).

### 40. *Penstemon strictus* Benth.

*Penstemon strictus* Benth. in DC. Prodr. 10: 324. 1846. "In montibus Scopulosis ad fontes fl. Sweetwater (Frémont!) \* \* \* (v. in herb. Torrey)." Type, labeled as collected August 7, 1842, seen in herbarium of Columbia University at the New York Botanical Garden. On August 7 Frémont was about South Pass, Sweetwater County, Wyoming, in the region assigned by Bentham as that of the type.

Variable, especially southward, in amount and length of hairs on the anther sacs and on the sterile filament, and in the length and acumination of the sepals. Northward more frequently with nearly linear leaves (this the typical state), although rarely such forms occur southward. Pubescence on petioles and bases of stems more pronounced southward in the La Sal Mountains, Utah.

Sagebrush and wooded slopes, at altitudes of 1,800 to 2,800 (3,000) meters; Submontane and Montane zones; flowering from mid-June to early August. Foothills, mountain slopes, and mesas, southern Wyoming, through Colorado to northern New Mexico. On both continental slopes.

WYOMING: Albany: Centennial, Nelson 3314 (M, U, Y); Cummins (M, U, Y); Laramie (Y); Sheep Mountain (F); Sybille Creek (U). Carbon: Encampment, Tweedy 4297 (U, Y); Hayden Forest (U); Hilton's; near T B Ranch (R). Fremont: Near South Pass, Frémont (Y). Sweetwater: Leucite Hills, Merrill & Wilcox 676 (U, Y), 705 (U, Y).

COLORADO: Archuleta: Arboles, Baker 602 (F, M, U, Y); Pagosa Springs (A). Conejos: South of Antonito, Crandall 4196 (Y). Costilla: Near Grayback, Rydberg & Vreeland 5629 (Y), 5630 (R, Y); Sangre de Cristo Creek (Y). Delta: Tongue Creek, Mesa Grande, Purpus 257 (F). Eagle: Gypsum Creek Canyon, Crandall (M); Wolcott. El Paso: Palmer Lake, Mrs. Osterhout 286. Garfield: Glenwood Springs, Pennell 6146 (B, D, F, H, Y), 6154 (R, Y), 6155 (U, Y), 6167 (Y). Grand: Coulter; Hot Sulphur Springs, Ramaley & Robbins 3612 (B). Gunnison: Gunnison, Pennell 6289 (M, Y); near Mount Carbon (U); Sapinero, Pennell 6271 (H, Y). Jackson: Michigan Creek; Pearl (U, Y); Walden, Goodding 1500 (A, B, M, P,

U, Y). La Plata: Durango (U); La Plata River, *Baker, Earle & Tracy* 660 (F, M, Y); Parrote City (M). Mineral: Wagon Wheel Gap, *B. H. Smith* (A). Montezuma: Chicken Creek, *Baker, Earle & Tracy* 354 (F, M, R, U, Y); Dolores (U); Mancos (Y). Montrose: Cerro Summit (Y); Cimarron, *Pennell* 6253 (D, K, M, P, S, Y); Tabeguache Basin (F, M). Ouray: Ouray, *Pennell* 6179 (A, R, U, Y), 6243 (F, Y); Ridgway (U). Rio Blanco: Meeker, *Robbins* 7143 (B); Rio Blanco (B). Routt: Elk River (Y); Hayden (F, Y); Steamboat Springs, *Crandall* (U); Yampa. Saguache: Sargents, *Pennell* 6303 (Y). Summit: Mount Guyot, *J. P. Anderson* (M).

UTAH: Grand: La Sal Mountains, *Purpus* 7008 (M, U). San Juan: Ridge north of Brumley Creek, *Rydberg & Garrett* 8935 (U, Y); Geyser Canyon (U, Y). Uinta: Carter Dugway, *Goodding* 1406 (R).

#### 40a. *Penstemon strictus angustus* Pennell, subsp. nov.

Stem usually puberulent, at least below; basal leaves narrowly lanceolate, 5 to 10 cm. long, 0.5 to 1.1 cm. wide, puberulent, glaucous; stem leaves linear or nearly so; corolla 25 to 32 mm. long (frequently larger than in the species). Otherwise as in the species.

Type in the herbarium of the New York Botanical Garden, collected at Piedra, Colorado, in flower, by C. F. Baker (no. 604; distributed as *P. strictus* Benth.).

Sagebrush slopes, at altitudes of 2,000 to 2,400 meters; Submontane Zone, but probably descending into Upper Sonoran; flowering in early July. Mesas and foothills, southwestern Colorado and southeastern Utah.

COLORADO: Archuleta: Piedra, *Baker* 604 (M, U, Y). Delta: Coal Springs Ranger Station (Y). La Plata: Durango, *T. S. Parsons*. Montezuma: Mancos, *Baker, Earle & Tracy* 405 (F, M, U, Y).

UTAH: San Juan: Along Brumley Creek, *Rydberg & Garrett* 8879, in part (Y), 8880(Y).

#### 41. *Penstemon comarrhenus* A. Gray.

*Penstemon comarrhenus* A. Gray, Proc. Amer. Acad. 12: 81. 1876 "Common in Utah, especially southward, coll. by Gordon, E. W. Emerson, Mrs. Thompson, Siler and recently by L. F. Ward." According to a memorandum by Mr. J. F. Macbride the specimen of Gordon, of which but a fragment is in the Gray Herbarium, is *P. strictus* Benth. This fails to answer the original description of *P. comarrhenus*. Of the remaining specimens cited, that of Ward was evidently particularly studied, and, as this fully answers the description, it may be considered as the type. Isotype seen in herbarium of Columbia University at the New York Botanical Garden.

Rocky or gravelly sagebrush slopes, at altitudes of 1,400 to 2,600 (3,000) meters Upper Sonoran and Submontane zones; flowering from late June to early August. Mesas in Colorado drainage and westward, western Colorado and central Utah.

COLORADO: Delta: Cedar Edge, *Baker* 245 (M, U, Y). Garfield: Glenwood Springs, *Pennell* 6157 (B, K, S, Y), 6159 (A, D, F, H, M, P, R, U, Y); Newcastle (B). Montezuma: Mesa Verde, *F. E. Lutz* (Y). Montrose: Naturita (F, M, P); Paradox, *Walker* 130 (U, Y). San Miguel: Norwood Hill, *Walker* 429 (U).

UTAH: Beaver: Beaver City, *E. Palmer* 375 (U, Y). Carbon: Castle Gate (M, U, Y); Helper, *Pennell* 6141 (Y), 6142 (H, Y). Garfield: Aquarius Plateau, *Rydberg & Carlton* 7383 (U, Y), *Ward* 462 (F, M, U); Panguitch Lake (U). Grand: Near Wilson Mesa, *Rydberg & Garrett* 8417 (Y). La Sal Mountains, *Purpus* 6613 (M, U). Kane: Asa's, *Jones* 6030q (U). Piute: Marysvale, *Rydberg & Carlton* 7030 (Y). San Juan: Monticello, *Rydberg & Garrett* 9159 (Y). Sevier: Fish Creek Canyon, *Garrett* 2503 (M, Y); Fish Lake. Wayne: Mount Ellen, *Jones* 5684as (U).

42. *Penstemon grandiflorus* Nutt.

*Penstemon grandiflorus* Nutt. in Fraser's Cat. 1813. "It was first met with near the confluence of the River Platte [with the Missouri], from whence it continues to the Andes. [Nuttall.]"

*Penstemon bradburii* Pursh, Fl. Amer. Sept. 738. 1814. "*P. grandiflorum* Fraser, Catal. 1813." Description, but no habitat given. Probable isotype seen in herbarium of the Academy of Natural Sciences of Philadelphia.

*Chelone bradburii* Steud. Nom. Bot. 186. 1820-24.

*Chelone grandiflora* Spreng. Syst. Veg. 2: 813. 1825.

Plains, at altitudes of 900 to 1,200 meters; Upper Sonoran and Subboreal zones; flowering from late May to late June. High plains, within the Missouri drainage, occurring probably rarely through eastern Wyoming and eastern Colorado.

SOUTH DAKOTA: Custer: Hermosa, *Rydberg* 915 (U). Fall River: Hot Springs, C. S. *Williamson* (A). Meade: Fort Meade, *Forwood* 288 (U). Stanley: Fort Pierre, *Hayden* (A).

NEBRASKA: Cherry: Fort Niobrara, *T. E. Wilcox* (Y). Dawes: Belmont (Y); Crawford, *MacDougal* 118 (Y). Thomas: Halsey, *Krautter* (P).

WYOMING: Sheridan: Little Goose Grade, *Nelson* 2333, in part (U, Y).

COLORADO: "Eastern Colorado," *W. J. Laybourn* (M).

43. *Penstemon secundiflorus* Benth.

*Penstemon secundiflorus* Benth. in DC. Prodr. 10: 325. 1846. "In montibus Scopulis (Frémont!) \* \* \* (v. in herb. Torrey)." Type seen in herbarium of Columbia University at the New York Botanical Garden. Lacks satisfactorily opened flowers, but leaves and young flowers indicate the plant here considered. The specimen is labeled "Fremont-2nd. Exped.," "named by Bentham"; unfortunately the number of collection is lost, but Frémont upon his second expedition was in eastern Colorado.

Sagebrush slopes, granitic soil, at altitudes of 1,500 to 2,700 meters; Submontane Zone (perhaps entering lower Montane Zone); flowering from late May to early June. Foothills and outlying hills in high plains, often abundant, from Albany County, Wyoming, southward on the eastern continental slope to Bernalillo County, New Mexico.

WYOMING: Albany: Crow Creek (Y); Laramie, *Pennell* 5876 (Y); Sand Creek (Y); Table Mountain (M, U).

COLORADO: Boulder: Boulder, *Pennell* 5833 (K, P, S, Y); Miramonte (B); Nederland (B); St. Vrain Creek (B); Valmont (F). Chaffee: Near Buena Vista (U, Y); Salida, *Pennell* 6309 (D, R, Y). Clear Creek: Clear Creek Canyon (F, U); Empire, *Patterson* 254 (A, F, M, P, Y); Georgetown (M). Denver: Denver, *Pennell* 5843 (Y); Valverde, *Pennell* 5839 (B, Y). El Paso: Crystal Park (Y); Eastonville (U); Garden of the Gods, *Pennell* 5779 (Y), 6316 (Y); Manitou, *Pennell* 5782 (Y), 5789 (U, Y); North Cheyenne Canyon, *Pennell* 5773 (D, F, H, M, R, Y), 5776 (Y); Pring (U); South Cheyenne Canyon, *Pennell* 5793 (Y), 6342 (F, H, M, P, U, Y); Ute Pass (M); Palmer Lake, *Pennell* 5808 (Y). Gilpin: Lake Ranch (Y); Rollinsville, *Overholts* (M, Y). Grand: Middle Park, *W. A. Henry* (F, M). Jackson: Camp Creek, *Goodding* 1457 (B, M, P, U, Y). Jefferson: West of Arena, *Pennell* 6346 (Y); Golden, *Pennell* 5817 (Y), 6383 (Y); Morrison, *Pennell* 5823 (U, Y). Larimer: Estes Park (U); Fort Collins (Y); Fossil Creek (B); Horsetooth Mountain, *Pennell* 5860 (D, F, H, Y); La Porte (Y); Owl Canyon, *Pennell* 5868 (A, M, R, Y); Ten-mile Creek (B). Park: South Park, *Wolf* 300 (A, U, Y). Weld: Carr, *Johnston* 3 (M).

**43a. *Penstemon secundiflorus lavendulus* Pennell, subsp. nov.**

Stems 20 to 40 cm. tall, relatively slender; basal leaves lanceolate; stem leaves more or less narrowly lanceolate, acuminate from a not conspicuously widened base; inflorescence one-half the height of the plant; sepals about 4 mm. long, ovate, acute to acuminate, with scarious, white to pink margins; corolla smaller and narrower than in the species, 15 to 20 mm. long, a paler lavender-pink to lavender-blue; capsule not seen. Otherwise nearly as in the species.

Type in the herbarium of the New York Botanical Garden, collected on bluff of Baculite Mesa, altitude 1,530 meters, six miles northeast of Pueblo, Pueblo County, Colorado, in flower, June 7, 1915, by F. W. Pennell (no. 5739). Isotypes in U. S. National Herbarium, herbarium of Missouri Botanical Garden, Gray Herbarium, and Rocky Mountain Herbarium.

Upper Sonoran Zone.

**44. *Penstemon osterhoutii* Pennell, sp. nov.**

Stems one to several, 40 to 80 cm. tall, from a short branched caudex, glabrous, slightly pale or bluish glaucous; leaves thickened, greenish, slightly glaucous, evidently reticulate-veined, glabrous, those at the base of the stem with ovate acute blades 7 to 9 cm. long, narrowed into margined petioles 3 to 5 cm. long, those of the stem clasping (bases of opposite leaves meeting around stem), lanceolate-ovate to ovate, acuminate from a widened base, the largest mostly 6 to 9 cm. long, 3 to 4 cm. wide; thyrsus narrowly elongate, nearly one-half (or more) the height of the plant, composed of 5 to 10 fascicles, each consisting of 2 short axillary branches, their pedicels shorter or longer than the peduncle; sepals 7 to 8 mm. long, ovate, acuminate, fine-ribbed, with broad, white to pink, scarious margin, glabrous; corolla 20 mm. long, the tube and throat 13 mm. long, the throat inflated and rounded ventrally, the 2 posterior lobes 7 mm. long, united and arched one-third to nearly one-half their length, the 3 anterior slightly longer, 7 mm. wide, united about two-fifths their length, all the free portions widely spreading; corolla externally glabrous, within lanate-pubescent over the base of the anterior lobes, glabrous elsewhere, blue or bluish (not seen fresh); anther sacs widely divaricate (explanate), 1 to 1.2 mm. long, oblong, distinct, with short line of contact, opening throughout, the suture glabrous; sterile filament 14 to 15 mm. long, slightly exserted, flat, much enlarged distally, recurved at apex, very densely bearded on the posterior face distally with golden-yellow hairs; capsule 10 to 13 mm. long, ovate, acuminate, glabrous, pale brown; seeds 3 to 4 mm. long, irregularly lanceolate-curved in outline, the angles sharp, semiwinged, the surface alveolate-reticulate, cinnamon-brown, glistening.

Type in the herbarium of the New York Botanical Garden, collected at Glenwood Springs, Garfield County, Colorado, in flower, May 24, 1911, by G. E. Osterhout (no. 4575).

Loamy sagebrush slopes, at altitudes of 1,700 to 2,100 meters. Submontane Zone; flowering from late May to late June. Valley of Grand River in Eagle and Garfield counties, Colorado.

COLORADO: Eagle: State Bridge, *Osterhout* 4213. Garfield: Glenwood Springs, *Osterhout* 4575 (Y), 4702 (Y), *Pennell* 6158 (A, D, F, H, M, R, S, U, Y), 6165 (F, Y), 6170 (B, K, P, Y), 6172 (Y).

**45. *Penstemon versicolor* Pennell, sp. nov.**

Stems several, 20 to 35 cm. tall, from a short branched caudex, glabrous, bluish glaucous; leaves thickened, dull green, glaucous, obscurely reticulate-veined, glabrous, those at the base of the stem with obovate acutish blades 3 to 4 cm. long, narrowed into scarcely defined petioles (less than 1 cm. long), those of the stem cordate-clasping (opposite leaves meeting), ovate, acute, from a cordate base, the largest

mostly 3 to 5 cm. long, 2 to 2.5 cm. wide; thyrsus narrowly elongate, one-half (or more) the height of the plant, composed of 6 to 12 fascicles, each consisting of 2 short axillary branches, their pedicels longer than or equaling the peduncle; sepals 5 to 6 mm. long, ovate, acutish to acute, obscurely and finely ribbed, with white to pinkish scarious margins, glabrous; corolla 20 mm. long, the tube and throat 14 mm. long, the throat inflated and rounded ventrally, the 2 posterior lobes 6 mm. long, united and arched one-third their length, the three anterior lobes slightly longer, united at base, all the free portions widely spreading; corolla externally glabrous, within lanate-pubescent with few hairs over the base of anterior lobes or glabrous, pink, changing to blue, within throat with more or less conspicuous red-purple lines; anther sacs widely divaricate (explanate), 1 mm. long, oblong, slightly confluent, with short line of contact, opening throughout, the suture glabrous; sterile filament 14 to 15 mm. long, slightly exserted, flat, much enlarged distally into a broad white obtuse expansion, recurved at the apex, bearded on the posterior face distally with two lines of short dense golden-yellow hairs; capsule 10 to 12 mm. long, ovate, acuminate, glabrous, brown; seeds 4 to 5 mm. long, irregularly lanceolate in outline, nearly straight, irregularly convolute, the angles sharp, semiwinged, the surface alveolate-reticulate, cinnamon-brown, glistening.

Type in the herbarium of the New York Botanical Garden, collected on high prairie (mesa) east of Pueblo, Pueblo County, Colorado, in flower, June 5, 1915, by F. W. Pennell (no. 5732). Isotypes in the U. S. National Herbarium and in the Rocky Mountain Herbarium.

Loam sagebrush mesas, at altitudes of 1,400 to 1,700 meters; Upper Sonoran Zone; flowering in early June. Upper valley of Arkansas River, Colorado.

COLORADO: Fremont: Canon City, *Brandegee* (M). Pueblo: East of Pueblo, *Pennell* 5732 (R, U, Y); west of Pueblo, *Pennell* 5734 (D, F, H, M, P, U, Y), 6315 (B, D, F, H, K, M, P, R, S, U, Y).

46. *Penstemon lentus* Pennell, sp. nov.

Stems several, 20 to 30 cm. tall, from a relatively long, branched caudex, glabrous, pale or bluish glaucous; leaves strongly thickened, pale or dull green, glaucous, in age evidently reticulate-veined, glabrous, those at the base of the stem with more or less broadly oval, obtuse to acute blades 2.5 to 4 cm. long, rather abruptly narrowed into strongly margined petioles 1.5 to 2.5 cm. long, those of the stem clasping (bases of opposite leaves meeting around stem), lanceolate to ovate, acute or obtuse with a mucro, the largest mostly 3 to 7 cm. long, 1 to 2 cm. wide; thyrsus narrowly elongate, one-third to one-half the height of the plant, composed of 4 to 8 fascicles, each consisting of 2 short axillary branches, the pedicels shorter or longer than the peduncle; sepals 3 to 6 mm. long, ovate, acute to acuminate, fine-ribbed, with evident narrow, white to pinkish, slightly sinuate, scarious margins, glabrous; corolla 18 to 20 mm. long, the tube and throat 13 to 14 mm. long, the throat somewhat inflated and rounded ventrally, the 2 posterior lobes 5 to 6 mm. long, united and arched one-fourth their length, the 3 anterior lobes slightly longer, 4 to 6 mm. wide, united at the base, all free portions more or less spreading; corolla externally glabrous, within slightly lanate-pubescent over the bases of the anterior lobes, glabrous elsewhere, blue or bluish (not seen fresh); anther sacs widely divaricate (explanate), 0.9 to 1 mm. long, oblong, distinct, with relatively long line of contact, opening from the distal apex throughout, the suture glabrous; sterile filament slightly exserted, flat, slightly enlarged distally, recurved at apex, densely bearded on the posterior face toward the apex with relatively short, yellow hairs; capsule 8 mm. long, ovate, acuminate, glabrous; seeds 2 to 3 mm. long, curved in outline, the angles sharp, the surface dull brown.

Type in the herbarium of the New York Botanical Garden, collected at Arboles, Colorado, in flower, June 3, 1899, by C. F. Baker (no. 596; distributed as *P. acumi-*

*natus* Dougl.). Isotypes in herbarium of Missouri Botanical Garden and U. S. National Herbarium.

Dry hills and mesas, at altitudes of 1,800 to 2,100 meters; Upper Sonoran Zone; flowering in late May and early June. Valleys of the San Juan and Dolores rivers, southwestern Colorado and southeastern Utah.

COLORADO: Archuleta: Arboles, *Baker* 596 (M, U, Y). Montezuma: Mancos, *Eastwood* (Y). Montrose: Naturita, *Payson* 340 (F, M).

UTAH: San Juan: Monticello, *Rydberg & Garrett* 9209, in part (Y).

#### 47. *Penstemon pachyphyllus* A. Gray.

*Penstemon nitidus major* Benth. in DC. Prodr. 10: 323. 1846. "In montibus Scopulosis (Frémont!). (v. in herb. Torrey)." Type, from "Hillsides of Du Chene Fork," Wasatch County, Utah, collected, in flower, May 31, 1844, by J. C. Frémont (Second Expedition, no. 485), seen in herbarium of Columbia University at the New York Botanical Garden. Type bears also the annotation "'*P. pachyphyllus*' Gray mss."

*Penstemon acuminatus congestus* Jones, Proc. Calif. Acad. II. 5: 714. 1895. "[*M. E. Jones*] no. 5262. May 19, 1894, near Canaan Ranch, Utah, 5,000° alt., in sand." *Jones* 5262, seen only in the herbarium of the Missouri Botanical Garden, includes specimens of two species, *P. laevis* and *P. pachyphyllus*. The latter, fitting the description and being the same as the other collections cited, is taken as typical.

*Penstemon pachyphyllus* A. Gray; Rydb. Fl. Rocky Mts. 770, 1066. 1917. Based upon *P. nitidus major* Benth.

Stems several, 30 to 60 cm. tall, from a short branched caudex, glabrous, pale or bluish glaucous; leaves strongly thickened, pale green, glaucous, in age evidently reticulate-veined, glabrous, those at the base of the stem with oval obtuse (with a mucro) blades 5 to 7 cm. long, narrowed into strongly margined petioles 3 to 5 cm. long, those of the stem clasping (bases of opposite leaves meeting around stem), lanceolate-oval to ovate, mostly 3 to 5 cm. long, 2 to 4 cm. wide; thyrsus narrowly elongate, one-third to one-half the height of the plant, composed of 5 to 10 fascicles, each consisting of 2 short axillary branches, their pedicels shorter or longer than the peduncle; sepals 5 mm. long, ovate, acute, fine-ribbed, with evident white to pinkish, slightly sinuate, scarious margin, glabrous; corolla 15 to 18 mm. long, the tube and throat 10 to 12 mm. long, the throat somewhat inflated and rounded ventrally, the 2 posterior lobes 5 to 6 mm. long, united and arched one-third their length, the 3 anterior lobes slightly longer, 4 to 5 mm. wide, united at base, all free portions widely spreading; corolla externally glabrous, within lanate-pubescent over the base of the anterior lobes, glabrous elsewhere, blue or bluish (not seen fresh); anther sacs widely divaricate (explanate), 1 to 1.2 mm. long, oblong, distinct, with relatively long line of contact, opening from the distal apex throughout the suture, glabrous; sterile filament 10 to 12 mm. long, slightly exerted, flat, slightly enlarged distally, recurved at apex, densely bearded on the posterior face distally with apparently dull yellow hairs; capsule 10 to 14 mm. long, ovate, acuminate, glabrous, pale brown; seeds 2 to 3 mm. long, thick-crescentic, curved in outline, the angles sharp, semiwinged, the surface alveolate-reticulate, cinnamon-brown, glistening.

Loamy sagebrush slopes, at altitudes of 1,500 to 2,600 meters; Upper Sonoran and Submontane zones; flowering from late May to late June. Colorado Valley from Duchesne River southward to northern Arizona.

UTAH: Beaver: Frisco, *Jones* 1812 (F, Y). Carbon: Helper, *Pennell* 6143 (H, U, Y); Price, *Pennell* 6145 (P, Y). Sevier: Near Richfield, *Ward* 166 (U); head of Salina Canyon, *Jones* 5441a (M, R, Y). Wasatch: "Hillsides of Du Chene Fork," *Frémont* 485 (Y). Washington: Near Canaan Ranch (near Rockville), *Jones* 5262, in part (M).



48. *Penstemon haydeni* S. Wats.

*Penstemon haydeni* S. Wats. Bot. Gaz. 16: 311. 1891. "First collected by Dr. F. V. Hayden, in the Laramie Mountains of Wyoming, during some one of his early surveys, without flowers or fruit. \* \* \* Rediscovered during the past season, in flower and fruit, by Mr. H. L. Webber, on the Dismal River in Thomas County, Nebraska, about a hundred miles west of the 100th meridian." Description evidently based upon specimen of H. L. Webber, collected in 1891, which is therefore taken as type; cotype, collected July 12, 1889, seen in herbarium of Columbia University at New York Botanical Garden. The plant of Hayden I have not seen; it is possibly not of this species.

Dry, sandy soil, at altitudes of about 800 meters; Subboreal Zone; flowering from early June to early July. Sandhills of western Nebraska.

NEBRASKA: Cherry: 20 miles south of Valentine, *Bates* (Y). Thomas: Near Plummer Ford, Dismal River, *Rydborg* 1506 (U, Y); Dismal River, *Webber* (Y); Halsey, *Krautter* (P).

49. *Penstemon angustifolius* Nutt.

*Penstemon angustifolius* Nutt. (in Fraser's Cat. 1813, *nomen nudum*), Pursh, Fl. Amer. Sept. 738. 1814. "In Upper Louisiana, *Bradbury* \* \* \* *v. s. in herb. Bradbury.*" According to *Bradbury* (Travels, 318), "Near the Mintaree village," North Dakota. Pursh's description possibly included also *P. gracilis*, but Nuttall, under account of *P. coeruleus*, designated which is to be considered typical. Isotype, collected by *Bradbury* in Louisiana, seen in herbarium of Academy of Natural Sciences of Philadelphia.

*Penstemon coeruleus* Nutt. Gen. Pl. 2: 52. 1818. "Hab. On the plains of the Missouri, near Fort Mandan and the Indian towns."

*Chelone angustifolia* Steud. Nom. Bot. 186. 1820-4. Not *C. angustifolia* H. B. K. 1817.

*Chelone coerulea* Spreng. Syst. Veg. 2: 813. 1825.

Varies irregularly, the leaves linear to lanceolate, the bracts conspicuously elongate to short, the stem and leaves glabrous to finely puberulent.

Prairies, at altitudes of 800 to 2,300 meters; Subboreal, southward into Upper Sonoran Zone; flowering from mid-May to early July. High plains, westward to base of foothills in eastern Wyoming and Colorado. North Dakota and eastern Wyoming to southeastern Colorado; including subspecies to northern New Mexico.

SOUTH DAKOTA: Fall River: Hot Springs, *Rydborg* 917 (U, Y). Stanley: For Pierre, *Hayden* (A). Todd: Rosebud, *E. J. Wallace* (R). Washabaugh: Bear Creek, *Over* 2083 (U).

NEBRASKA: Cherry: Fort Niobrara, *T. E. Wilcox* (Y); Merriman. Deuel: *Rydborg* 275, in part (Y). Hooker: Mullen, *Rydborg* 1284 (U). Keith: Ogallala, *Pennell* 6402 (H, K, R, U, Y). Lincoln: Hershey; North Platte, *Pennell* 6407 (A, F, M, Y). Scotts Bluff: Eaglenest Butte, *Hayden* (Y). Sheridan: Near Hay Springs, *MacDougal* 103 (Y). Thomas: Halsey (P); Thedford, *Rydborg* 1284 (U, Y).

KANSAS: County uncertain: Kansas National Forest, *d'Allemand* (U. S. Forest Service Herb.).

WYOMING: Albany: Laramie, *Pennell* 5872 (Y); Lookout (M); near Prayers Crossing (U); Red Buttes (B, Y); Sand Creek (Y). Goshen: Fort Laramie, *Nelson* 8304 (U, Y). Laramie: Cheyenne (U); Corlett, *Johnston* 1 (M).

COLORADO: Boulder: White Rocks, *Ramaley* (B). Cheyenne: Arapahoe, *Mrs. S. B. Walker* (F). Denver: Denver, *Wolf* 291 (F, U). El Paso: Garden of the Gods, *Pennell* 5780 (Y); Manitou, *Pennell* 5787 (Y), 5788; Nob Hill, *Pennell* 5796 (Y); North Cheyenne Canyon, *Pennell* 5772 (D, Y); South Cheyenne Canyon, *Pennell* 6341 (D, P, Y). Gilpin: Tolland ("along R. R. track, probably introduced"),

*Ramaley* 10497 (B). Larimer: "The Glades," *Pennell* 5865 (Y); Fossil Creek (B); Livermore (B); Owl Canyon, *Pennell* 5869 (Y); Red Mountain, (B); Ten-mile Creek (B). Las Animas: Stonewall, *Beckwith* 165 (Y); Trinidad (Y). Lincoln: Hugo, *C. D. Marsh* (U; approaching *P. angustifolius caudatus*). Sedgwick: Julesburg, *Pennell* 6399 (R, U, Y). Weld: Crow Creek (U); Evans (Y); Greeley (Y); Pawnee Buttes (B); Peckham (M); Windsor, *Pennell* 5848 (M, Y), 5849 (Y).

49a. *Penstemon angustifolius caudatus* (Heller) Rydb.

*Penstemon caudatus* Heller, Minn. Bot. Stud. 2: 34. 1898. "The type is our no. 3580, collected May 26, 1897, at Barranca, Taos County [New Mexico], altitude 6,900 feet. It is very abundant in open grassy, sandy soil, about Barranca station, growing in large patches." Probable isotype, *Heller* 3581, seen in herbarium of the New York Botanical Garden.

*Penstemon angustifolius caudatus* Rydb. Bull. Torrey Club 33: 151. 1906.

Prairies, at altitudes of 1,000 to 2,300 meters; Upper Sonoran Zone; flowering from mid-May to early June. High plains, valley of the Arkansas River in southeastern Colorado and in western Kansas, to Taos County, northern New Mexico. Variable and very inconstantly distinguished; perhaps a robust form, rather than a geographical subspecies of *P. angustifolius*.

KANSAS: Wallace: Wallace, *W. A. Kellerman* (U, Y).

COLORADO: Bent: Rule Creek, *Osterhout* 4869. El Paso: Colorado Springs, *Eggleston* 11155 (U). Fremont: Canon City, *Pennell* 6311 (H, R, U, Y). Huerfano: Near La Veta, *Rydberg & Vreeland* 5642 (Y), 5643 (Y), 5644 (Y), 5645 (Y); Ojo (Y); Walsenburg (Y). Las Animas: Wootton, *Rusby* (Y). Otero: La Junta, *Osterhout* 3963. Prowers: 25 miles south of Lamar, *Osterhout* 5071. Pueblo: Beulah (B, R); Pueblo, *Pennell* 5738 (Y), 6314 (D, F, M, Y). Yuma: Wray, *Osterhout* 5257.

50. *Penstemon arenicola* A. Nels.

*Penstemon arenicola* A. Nels. Bull. Torrey Club 25: 280. 1898. "Abundant in the sand dunes in the hill region of the Red Desert, near Point of Rocks [Wyoming]. Collected June 1, 1897. \* \* \* Type specimen in herb. University of Wyoming, no. 3090." Isotype seen in herbarium of Columbia University at the New York Botanical Garden.

Sandy hills and plains, at altitudes of 1,900 to 2,100 meters; Upper Sonoran Zone; flowering from early to middle June. Red Desert of southwestern Wyoming.

WYOMING: Sweetwater: Point of Rocks, *Nelson* 3090 (M, Y), *Pennell* 5889 (D, F, P, U, Y); 15 miles north of Point of Rocks, *Merrill & Wilcox* 693 (U); southeast of Red Desert, *Pennell* 5881 (H, M, R, Y); Steamboat Mountain, *Nelson* 7050 (R). Uinta: Carter (R); Fort Bridger, *Nelson* 4598 (R); Henrys Fork (R).

51. *Penstemon nitidus* Dougl.

*Penstemon nitidus* Dougl.; Benth. in DC. Prodr. 10: 323. 1846. "In collibus siccis ad flumina Saskatchewan, Assinaboin et Red River (Douglas! Richardson!) \* \* \* (v. s.)." Type not seen or verified.

Prairies, at an altitude of 1,500 meters; Subboreal Zone; flowering in June. High plains, entering northern Wyoming in valley of Tongue River. Manitoba to Alberta and northern Wyoming.

WYOMING: Sheridan: Jackson Creek (R); Little Goose Grade, *Nelson* 2333, in part (M); *Tweedy* 47 (Y), 2332 (Y), 3417 (Y). Sweetwater: South Butte, "Thirteen Mile," *Nelson* 3554 (R).

52. *Penstemon cyathophorus* Rydb.

*Penstemon cyathophorus* Rydb. Bull. Torrey Club 31: 643. 1905. "Colorado: Pearl, 1901, Tweedy 4307 (type)." Type seen in herbarium of the New York Botanical Garden.

"Meadows," "sagebrush", at altitudes of 2,400 to 2,600 meters; probably Montane Zone; flowering from early June to late July. Middle and North Park, northern Colorado and adjacent southeastern Wyoming.

WYOMING: Carbon: "Hiltons" ("North Park in edge of Wyoming"), Osterhout 986. COLORADO: Grand: Sulphur Springs, Clements (Y), Osterhout 2975, 3255. Jackson: Grizzly Creek (Y); Pearl, Tweedy 4307 (U, Y).

53. *Penstemon coloradoensis* A. Nels.

*Penstemon coloradoensis* A. Nels. Bull. Torrey Club 26: 355. 1899. "Of this species I have before me specimens from two collections made near Mancos, Colorado, by Messrs. Baker, Earle and Tracy, 1898, and distributed as *P. caespitosus* Nutt." Type (no. 70, collected in flower June 23, 1898) seen in the Rocky Mountain Herbarium. The second collection referred to (no. 27, collected in flower June 21, 1898) is *P. xylus* A. Nels.

Sagebrush plains, at altitudes of 900 to 2,100 meters; Upper Sonoran Zone; flowering from mid-June to early July. San Juan Valley of southwestern Colorado to southern Utah, northwestern New Mexico, and northern Arizona.

COLORADO: La Plata: Durango, Crandall 1826 (B, F, R, U, Y). Montezuma: Dolores (Y); Mancos, Baker, Earle & Tracy 70 (F, M, R, U, Y).

UTAH: Washington: Pine Valley (U. S. Forest Service Herb.); St. George, Palmer (Y).

53a. *Penstemon coloradoensis sileri* (A. Gray) Pennell.

*Penstemon linarioides sileri* A. Gray, Syn. Fl. 2<sup>1</sup>: 270. 1870. "S. Utah, Siler." Probable isotype, from Osmer, Siler 90, seen in herbarium of the Missouri Botanical Garden.

Probably only a form of *P. coloradoensis*.

Southern Utah; flowering from middle to late June.

UTAH: Kane: Sink Valley, Jones (M, U).

54. *Penstemon exilifolius* A. Nels.

*Penstemon exilifolius* A. Nels. Bull. Torrey Club 28: 230. 1901. "The latter [A. Nelson 7460] is taken as the type and is from Halleck Cañon [Wyoming], July 6, 1900." Isotype seen in herbarium of the New York Botanical Garden.

Dry, stony plateaus and hillsides, at altitudes of 2,200 to 2,700 meters; probably Montane Zone; flowering from early July to early August. Southeastern Wyoming and northeastern Colorado.

WYOMING: Albany: Cummins (R); Halleck Canyon, Nelson 7460 (B, M, U, Y); Laramie Hills, E. Nelson 52 (Y); Laramie Plains, Nelson 419 (M, U, Y); Red Buttes; Sheep Mountain, Goodding 2086 (U, Y); near Upper Laramie River, Frémont 2nd Exped. 533 (Y); west of Sherman (M).

COLORADO: Larimer: Medicine Bow Mountains, Crandall (Y).

55. *Penstemon laricifolius* Hook. & Arn.

*Penstemon laricifolius* Hook. & Arn. Bot. Beech. Voy. 376. 1841. "Hab. Snake Fort, Snake Country, [a friend of] Mr. Tolmie." Isotype, labeled "Snake Country," and probably from southeastern Idaho, seen in herbarium of Columbia University at New York Botanical Garden.

*Penstemon exilifolius desertus* A. Nels. Bull. Torrey Club 28: 231. 1901. "On dry sandstone ridges \* \* \* Point of Rocks [Wyoming], Jun. 12, 1900 [A. Nelson] no. 7160." Isotype seen in herbarium of New York Botanical Garden.

Dry sandstone ridges, at altitudes of 2,100 to 2,400 meters; Submontane Zone; flowering from mid-June to early July. Interior low ridges, central and southwestern Wyoming and (probably) southeastern Idaho.

WYOMING: Fremont: Big Sandy (U); Birds Eye, *Nelson* 9363 (M, U, Y); Camp Stambaugh (U); Wind River Mountains (U). Hot Springs: Owl Creek, *Parry* 206, in 1873 (A, F, Y). Natrona: Bessemer, *Goodding* 181 (M, U, Y); Garfield Peak (R); Platte River Canyon (M). Sweetwater: Leucite Hills (U); Point of Rocks, *Nelson* 4748 (R), 7160 (B, F, M, U, Y), *Pennell* 5888 (U, Y).

IDAHO: "Snake Country, [a friend of] *Tolmie*" (Y).

#### 56. *Penstemon ambiguus* Torr.

*Penstemon ambiguus* Torr. Ann. Lyc. N. Y. 2: 228. 1828. "Hab. Near the Rocky Mountains [*E. P. James* in 1820]." Type, collected probably in eastern Colorado, northeastern New Mexico, or northwestern Texas, seen in herbarium of Columbia University at the New York Botanical Garden.

*Leiostemon purpureus* Raf. Atl. Journ. 1: 145. 1832. Based upon "*Penstemon ambiguum*" Torr.

*Penstemon ambiguus foliosus* Benth. in DC. Prodr. 10: 321. 1846. "In montibus Scopulosis (Fremont!). (v. in herb. Torrey.)." Type, *Frémont* 623; according to his notes, collected "On the high level prairie, Jul. 7, 1844," probably in Cheyenne County, Colorado; seen in herbarium of Columbia University at the New York Botanical Garden.

*Leiostemon ambiguus* Greene, Leaflets 1: 223. 1906.

Prairies, at altitudes of 800 to 1,300 meters; Upper Sonoran Zone; flowering from mid-June to mid-July. High plains, on both continental slopes, western Oklahoma and eastern Colorado to southwestern Utah and Chihuahua.

COLORADO: Cheyenne (?): *Frémont* (Y). Logan: Sterling, *Osterhout* 990. Otero: Rocky Ford, *Berg* 1836 (Y). Yuma: Wray, *Osterhout* 3984, 4332 (Y); Yuma.

UTAH: San Juan: Near Bluff, *Rydberg & Garrett* 9934 (Y). Washington: St. George, *Palmer* 379 (F, Y).

#### 57. *Penstemon deustus* Dougl.

*Penstemon deustus* Dougl.; Lindl. Bot. Reg. 16: pl. 1318. 1830. "P. deustum Douglas in herb. Hort. Soc. Native of Northwest America, where it was found by Mr. Douglas on scorched, rocky plains, in the interior. Our drawing was made in the Garden of the Horticultural Society in September, 1829." Type not seen or verified, but description evidently of plant here considered.

Dry, rocky soil, at altitudes of 1,500 to 2,200 meters; Submontane Zone; flowering from early to late July. Bighorn County, Wyoming to Washington, southward to Nevada and northern California.

WYOMING: Bighorn: *Worthley* 35 (U). Park: "Stinkingwater," *Parry* 207 (A, F, M, Y). Yellowstone National Park: Near Excelsior Geyser (F); Golden Gate, *Pennell* 6029 (D, H, P, S, Y); Junction Butte (U); Mammoth Hot Springs (F, M, U, Y); Obsidian Creek (R); Silver Gate (Y); head of Swan Lake Valley (U); divide between Snake River and Yellowstone Lake (U).

IDAHO: Bingham: Big Butte Station, *Palmer* 481 (U). Bonneville: Idaho Falls, *Palmer* 372 (U). Fremont: Ashton, *Pennell* 6045 (F, M, R, U, Y); St. Anthony (U, Y).

#### 58. *Penstemon watsoni* A. Gray.

*Penstemon fremontii parryi* A. Gray in King, Geol. Expl. 40th Par. 5: 218. 1871. "Colorado (*Parry*). Toyabe, Diamond and East Humboldt Mountains, Nevada;

(6-7,000 feet altitude) [*S. Watson*] (773)." Specimen collected in Colorado by C. C. Parry in 1862 and labeled *P. fremontii* Torr. & Gray, doubtless type or isotype, seen in U. S. National Herbarium.

*Penstemon watsoni* A. Gray, Syn. Fl. 2<sup>1</sup>: 267. 1878. "Mountains of W. Colorado, Utah, and Nevada (*Fremont, Parry, Watson, Wheeler, Vasey, Ward, &c.*), to borders of Arizona, *Palmer*." Isotype, labeled as from Austin, Nevada, collected in flower, July, 1868, *S. Watson* 773, seen in herbarium of the New York Botanical Garden.

*Penstemon phlogifolius* Greene, Leaflets 1: 164. 1906. "Castle Gate, Utah, M. E. Jones, 1894, sheet 237290, U. S. Herb." Type, *M. E. Jones* 5486s, collected in flower, June 23, 1894, seen in U. S. National Herbarium.

Sagebrush slopes, among junipers, summits of mesas, at altitudes of 1,800 to 2,600 (2,700) meters; Submontane and Upper Sonoran zones; flowering from mid-June to early July. Valley of Grand River in Colorado, westward across the Great Basin to southern Idaho, central Nevada, and northern Arizona. Eastern (our) plants, usually with more cuspidate calyx teeth, are perhaps of subspecific rank.

WYOMING: Uinta: Fort Bridger, *Porter* (Y).

COLORADO: Eagle: Red Cliff; *Wolcott, Osterhout* 2109 (R). Garfield: Glenwood Springs, *Pennell* 6168 (U, Y); Grizzly, *Pennell* 6162 (A, B, D, M, Y). Grand: Sulphur Springs, *Ramaley & Robbins* 3611 (B, R).

UTAH: Carbon: Castle Gate, *Jones* 5486s (M, U, Y), *Pennell* 6140 (D, F, H, K, P, R, S, U, Y). Iron (or Beaver): Buckskin Valley, *Engelhardt & Doll*. San Pete: Mountains east of Gunnison (Twelve Mile Creek Canyon), *Ward* 280 (M, U). Sevier: Fish Lake, *Rydberg & Carlton* 7633 (Y); canyon east of Glenwood (Brine Creek Canyon above Kings Meadows), *Ward* 308 (F, M, U); head of Salina Canyon, *Jones* 5433 (F, M, U, Y). Utah: Provo, *Coulter* (U).

IDAHO: Fremont: 12 miles east of Beaver, *Redeker* 58 (R).

#### 59. *Penstemon procerus* Dougl.

*Penstemon procerus* Dougl.; *Graham*, Edinb. N. Phil. Journ. 7: 348. 1829. "Raised at the Botanic Garden, Edinburgh, from seeds gathered by Mr. Drummond." Drummond's specimens would be from Alberta or Saskatchewan.

*Penstemon micranthus* Nutt. Journ. Acad. Phila. 7: 45. 1834. "Hab. In the valleys of the Rocky Mountains, near the sources of the Columbia [*N. B. Wyeth*]." Type, collected by *Wyeth*, July 11, in Fremont County, Idaho, or in Lincoln County, Wyoming, seen in herbarium of Academy of Natural Sciences of Philadelphia.

*Lepteiris parviflora* Raf. New Fl. 2: 73. 1836. (Type of genus *Lepteiris* Raf.) "Oregon \* \* \* collected by *Wyeth*." Type apparently the same as of *P. micranthus* Nutt.

*Penstemon confertus violaceus* Trautv. Bull. Acad. St. Pétersb. 5: 344. 1839. "Found by Mr. Drummond on the Rocky Mountains." Based upon *P. procerus* Dougl.

*Penstemon confertus coeruleo-purpureus* A. Gray, Proc. Amer. Acad. 6: 72. 1862-63. "Plains of the Saskatchewan, and through the Rocky Mountains to the coast range of Oregon and British Columbia." Aggregate name to go with earliest described component, *P. procerus* Dougl.

*Penstemon confertus procerus* Coville, Contr. U. S. Nat. Herb. 4: 169. 1893.

*Penstemon procerus micranthus* Jones, Bull. Univ. Mont. Biol. Ser. 15: 45. 1910.

Moist to dryish grassy slopes, at altitudes of (1,500) 1,900 to 3,200 (3,900) meters; Montane and Subalpine zones, rarely ascending to Alpine or descending to Submontane; flowering from mid-June to mid-August. Widespread through the Rockies, south to Chaffee County, Colorado. Manitoba to British Columbia, south in the mountains to Colorado, Utah, and Washington.

WYOMING: Carbon: Copperton, *Tweedy* 4303 (U, Y); Hilton's. Fremont: Leckie, *Merrill & Wilcox* 578 (U, Y), 581 (U, Y), 719 (U); Union Pass (Y). Johnson:

Eastern slope of Bighorn Mountains, *Tweedy* 3415 (Y). Lincoln: Cokeville<sup>1</sup> (R); La Barge (U); Mount Leidy (Y); Upper Hoback Basin, *C. C. Curtis* (Y). Sheridan: Big Horn, *Tweedy* 2329 (Y). Sweetwater: Bush Ranch, *Nelson* 7107, in part (Y). Uinta: Evanston, *T. A. Williams* (U). Yellowstone National Park: Devils Cut (U); along Madison River, *Pennell* 5991 (Y); near Mammoth Hot Springs (A, M); Middle Gardiner Falls (F); Swan Lake, *Pennell* 6036a (Y); Wraith Falls (M, U).

IDAHO: Fremont: Canyon Creek, *Merrill & Wilcox* 881, in part (U, Y).

COLORADO: Boulder: Caribou, *Penard* 526 (Y). Chaffee: Mount Harvard, *Clements* (Y). Clear Creek: Bard Creek Valley,<sup>1</sup> *Patterson* 255 (F, M, P, Y); Graymont;<sup>1</sup> Mount Lincoln<sup>1</sup> (U). Gilpin: Central City, *Scovell* (E). Jackson: Big Creek Park; near Pinkhampton (Y, Z); Walden,<sup>1</sup> *Goodding* 1502, in part (A, B, M, P, U, Y). Lake: Leadville (A, M, U); Mount Massive (F); Tennessee Pass, *D. A. Saunders* (Y); Twin Lakes (F, U). Larimer: Cameron Pass; Chambers Lake, *Crandall* (Y). Park: Between Como and Boreas,<sup>1</sup> *Cowen* 389 (M, U); South Park, *Wolf* (F, U). Summit: Breckenridge,<sup>1</sup> *Mackenzie* 145 (A, M); Farnham (M).

UTAH: Salt Lake: Altus (F); Clayton Peak (M, U); Gogorza, *Pennell* 5964 (F, H, R, U, Y); Silver Lake, *Pennell* 6083 (M, Y), 6105 (D, P, S, Y). Summit: Parley Park, *Watson* 783 (Y).

**59a. *Penstemon procerus aberrans* (Jones) A. Nels.**

*Penstemon confertus aberrans* Jones, Proc. Calif. Acad. II. 5: 715. 1895. "[*M. E. Jones*] no. 560li. July 6, 1894, Soldier Summit, Utah, 7,300° alt., in gravel." Type seen in U. S. National Herbarium.

*Penstemon procerus aberrans* A. Nels. Bot. Gaz. 54: 146. 1912.

Gravelly soil, low sagebrush and meadows, at altitudes of 2,100 to 2,700 meters; Submontane and Montane zones; flowering from early July to early August. Wasatch Mountains of central Utah.

UTAH: Garfield: Aquarius Plateau, at head of Poison Creek, *Rydberg & Carlton* 7377 (Y), 7436 (Y). Sevier: Fish Lake, *Jones* 5740 (F, M, U), *Rydberg & Carlton* 7511 (U, Y), *Ward* 342 (F, M, U). Utah: Soldier Summit, *Jones* 560li, in part (U), *Pennell* 6130 (F, H, M, R, Y).

**59b. *Penstemon procerus pulvereus* Pennell, subsp. nov.**

Sepals lanceolate-attenuate, more or less caudate, with relatively conspicuous scarious margins, more or less densely canescent-puberulent; corolla densely lanose within. Otherwise as in the species, with which it frequently grows and evidently intermingles.

Type in the herbarium of the New York Botanical Garden, collected on moist meadow knolls, north of Swan Lake, Yellowstone National Park, Wyoming, in flower, July 7, 1915, by F. W. Pennell (no. 6036).

Grassy soil, meadows; at altitudes of 1,900 to 2,700 meters; Montane and Submontane zones; flowering from mid-June to mid-August. Mountains, southwestern Montana, western Wyoming, and southeastern Idaho.

WYOMING: Fremont: Union Pass, *Nelson* 833 (F, M, U). Lincoln: Buffalo Fork, *Tweedy* 228 (Y); head of Clarks Fork (U); Gros Ventre River (U). Sweetwater: Bush Ranch, *Nelson* 7107, in part (M, U). Yellowstone National Park: Devils Cut (U); Gardiner River (Y); Mammoth Hot Springs (M, U); near Swan Lake, *Pennell* 6036 (F, H, K, M, P, R, U, Y); Wraith Falls (M, Y); mouth of Yellowstone Lake, *Pennell* 6013 (A, D, R, S, Y).

Approaching *P. rydbergii*.

IDAHO: Fremont: Beaver Canyon, *Shear* 3033 (Y), 3053 (Y); Canyon Creek (U, Y); Island Park (F).

60. *Penstemon rydbergii* A. Nels.

*Penstemon rydbergii* A. Nels. Bull. Torrey Club 25: 281. 1898. "It was met with in abundance in an aspen grove in a draw in the Laramie Hills [Wyoming], July 1, 1897. Type specimen collected at Green Top [Albany County], in Herb. University of Wyoming, A. Nelson no. 3214." Isotype seen in herbarium of Columbia University at the New York Botanical Garden.

*Penstemon erosus* Rydb. Bull. Torrey Club 28: 28. 1901. "Colorado: Indian Creek Pass, 1900, *F. K. Vreeland*, 615 (type)." Type seen in herbarium of the New York Botanical Garden.

*Penstemon lacerellus* Greene, Leaflets 1: 161. 1906. "At Sargents', southern Colorado, 5 July, 1901, C. F. Baker, n. 352, as in U. S. Herb." Type seen in U. S. National Herbarium.

*Penstemon latiusculus* Greene, Leaflets 1: 161. 1906. "Stony ground along stream banks at Gunnison, Colo., 24 July, 1901, C. F. Baker, n. 588, as in U. S. Herb." Type seen in U. S. National Herbarium.

Intergrades with *P. procerus*; apparently nearest to *P. procerus aberrans*, from which, however, its larger flowers and more lacerate sepals distinguish it.

Moist grassy flats or slopes, aspen thickets, at altitudes of (2,100) 2,200 to 3,000 (3,300) meters; Submontane and Montane zones; flowering from late June to mid-August. Mountains, eastern Wyoming, southward on both continental slopes, through most of Colorado.

WYOMING: Albany: Antelope Basin (M, U, Y); Centennial, *Nelson* 8725, in part (M, U, Y); Chug Creek (M, U, Y); Green Top, *Nelson* 3214 (M, Y); Nashs Fork (Y); head of Pole Creek (Y); Sherman (F). Carbon: Hayden Forest, *Eggleston* 11242 (U). Johnson: Crazy Woman Creek, *T. A. Williams* (U). Laramie: Horse Creek, *E. Nelson* 80 (Y).

COLORADO: Chaffee: Salida, *Clements* 253 (Y). Clear Creek: Grays Peak (U); Mount McClellan, *E. L. Greene* (E). Delta: On Tongue Creek, Mesa Grande, *Purpus* 303 (F). Grand: Middle Park, *W. A. Henry* (M). Gilpin: Central City (Y); Eldora to Baltimore (Y); Tolland, *Pennell* 6371 (Y), 6377 (M, U, Y). Gunnison: Gunnison, *Baker* 588 (M, U, Y), *Pennell* 6288 (D, R, Y); Parlin (Y); Pitkin (Y); Sapinero (B). Huerfano: Indian Creek Pass, *Vreeland* 615. Larimer: Mountains, *Osterhout* 57. Mineral: Wagon Wheel Gap, *B. H. Smith* (A, F). Montezuma: Chicken Creek, *Baker, Earle & Tracy* 658 (F, M, U, Y). Ouray: Engineer Mountain, *Purpus* 706 (F). Park: Como, *Crandall* 1795 (Y); Saguache: Marshall Pass (U, Y); Sargents, *Baker* 352 (M, U, Y), *Pennell* 6293 (A, D, H, K, Y), 6301 (Y). Summit: Robinson, *Shear* 3329 (U, Y).

UTAH: Uinta: Youngs Springs, *Goodding* 1196 (F, M, U, Y).

61. *Penstemon aggregatus* Pennell, sp. nov.

Stems few or several, slightly decumbent at base, erect, 30 to 80 cm. tall, from a much-branched rootstock, puberulent in lines to glabrous above, pale green; leaves pale green, obscurely veined, glabrous, those at the base of the stem much tufted, the blades lanceolate, acute (or the lowermost obtuse), entire, altogether 5 to 17 cm. long, narrowed into a petiole-like base one-half to two-thirds the length of blade, the stem leaves lanceolate or narrowly lanceolate, the upper ones slightly clasping, the largest 7 to 15 cm. long, 1 to 3 cm. wide; thyrsus narrow, not secund, less than one-half the height of the plant, composed of 3 to 8 rather close fascicles, each consisting of 2 axillary, closely erect branches, their pedicels shorter to much longer than the peduncle; sepals 5 to 7 cm. long, lanceolate-attenuate, acuminate, not veined, with white

(to purplish), scarious, nearly entire to proximally erose margins, canescent-puberulent or canescent-ciliate or nearly or quite glabrous; corolla 15 to 18 mm. long, the tube and throat 9 to 11 mm. long (the latter 3 to 4 mm. wide), the throat flattened, 2-grooved anteriorly, the 2 posterior lobes 5 to 6 mm. long, united and arched one-third to one-half their length, with free projecting lobes, the 3 anterior lobes slightly longer, united at the base, the free lobes spreading; corolla externally glabrous (or in bud pubescent with loose nonglandular hairs), within slightly to moderately pubescent with yellowish hairs over the bases of anterior lobes, light blue-violet, more violet on throat, bluer on lobes, paler within and much paler on throat anteriorly; anther sacs widely divaricate, 0.7 mm. long, broadly oval, distinct, opening throughout, glabrous; sterile filament shorter than the fertile ones, slightly wider distally, slightly bearded distally on the dorsal face with yellowish hairs; capsule 6 mm. long, elliptic-ovate, acuminate, glabrous, pale brown; seeds 0.7 to 0.9 mm. long, irregularly quadrangular in outline, not curved, the angles rather blunt, not winged, the surface evidently alveolate-reticulate, glistening, gray, pale toward margin.

Type in the herbarium of the New York Botanical Garden, collected on margin of a draw on mountain side, conglomerate, 1 to 2 miles south of Evanston, Uinta County, Wyoming, altitude about 2,100 to 2,200 meters, in flower, June 26, 1915, by F. W. Pennell (no. 5918).

Apparently most closely allied to *P. rydbergii*, with which it may occasionally intergrade. Usually it may be distinguished readily from this not only by the characters given in the key, but also because it rarely blackens to the same degree.

Sagebrush slopes, among willows, and openings in forest, at altitudes of 1,800 to 2,900 meters; Montane and Submontane zones; flowering from late June to late August. Mountain slopes, through the Wasatch region from southern Lincoln County, Wyoming to Sevier County, Utah; through mountains eastward to Medicine Bow Range of southeastern Wyoming and Middle Park of northern Colorado; on the Uncompahgre Plateau and doubtless on intervening ridges. Extends northwestward into southern Idaho.

WYOMING: Albany: Centennial, *Nelson* 8725, in part (F, U); Fox Park (R). Carbon: Hilton Ranch (near Colorado line), *Osterhout* 1703. Lincoln: La Barge, *Stevenson* 164, in part (U). Uinta: Evanston, *Pennell* 5918 (A, D, F, H, K, M, R, U, Y); Medicine Butte, *Pennell* 5917 (Y).

COLORADO: Grand: Sheephorn Divide, *Shear & Bessey* 4016 (Y); head of Willow Creek (M). Jackson: Rabbit Ears, *Goodding* 1567 (B, M, U, Y); foot of Mount Richtophen (on the Michigan) (U, Y); near Teller (F, Z). Larimer: Cameron Pass, *Osterhout* 56. Montrose: Uncompahgre Divide, *Payson* 559 (M). Routt: Columbine (U, Y); Steamboat Springs, *Goodding* 1606 (A, B, M, U, Y).

UTAH: Salt Lake: Barclay, *Pennell* 5954 (B, P, Y). San Pete: Big Horseshoe Summit (U); Ephraim Canyon, *Tidestrom* 313 (U). Sevier: Fish Lake, Mount Terrill, *Tidestrom* 1823 (U). Summit: Echo Canyon, *Watson* 763 (U). Utah: Soldier Summit, *Pennell* 6131 (D, H, M, R, S, U, Y). Wasatch: Daniels Canyon, *Garrett* 2838 (Y).

### 62. *Penstemon pseudoprocerus* Rydb.

*Penstemon pseudoprocerus* Rydb. Mem. N. Y. Bot. Gard. 1: 346. 1900. "Montana: Bridger Mountains, June 12, 1897, *Rydberg & Bessey*, 4919 (type)." Type seen in herbarium of the New York Botanical Garden.

*Penstemon pseudohumilis* Rydb. Mem. N. Y. Bot. Gard. 1: 347. 1900. "Idaho: Mt. Chauvet, July 29, 1897, *Rydberg & Bessey* 4915 (type)." Type seen in herbarium of the New York Botanical Garden.

*Penstemon owenii* A. Nels. Bot. Gaz. 34: 32. 1902. "Collected again in 1899, August 16, by the writer, this time also on the Tetons [Wyoming] at an alpine sta-



tion, no. 6516 being the type." Isotype seen in herbarium of New York Botanical Garden.

*Penstemon procerus pseudoprocerus* A. Nels. in Coulter, New Man. Rocky Mount. 444. 1909.

Varies in the length of tip and laceration of the sepals, the type having a short tip and more lacerate, broad, scarious margin, nearly the opposite extreme being *P. pseudohumilis*.

Open rocky hillsides, at altitudes of 1,900 to 2,700 (3,150) meters; Montane and Submontane zones; flowering from late June to mid-August. Mountain slopes, extending southward in the Bighorn and Teton ranges; southern Montana, northern Wyoming, southern Idaho, and eastern Oregon.

WYOMING: Bighorn: *Worthly* 96 (U). Fremont: Upper Buffalo to head of Du Noir River, *C. C. Curtis* (Y). Lincoln: Sheep Mountain, *Tweedy* 230 (Y); Teton Mountains, *A. & E. Nelson* 6516 (M, Y). Sheridan: Headwaters of Tongue River, *Tweedy* 46 (Y). Yellowstone National Park: Devils Cut (U); Electric Peak (F, U); Hedges Peak, *Pennell* 6021 (Y); Mammoth Hot Springs, *Pennell* 6035 (A, D, H, K, M, P, R, S, Y); Whirlwind Peak, *Cary* 589 (U).

IDAHO: Fremont: Beaver Canyon (Y); Mount Chauvet, *Rydberg & Bessey* 4915 (U, Y).

### 63. *Penstemon virens* Pennell.

*Penstemon virens* Pennell; Rydb. Fl. Rocky Mts. 773, 1066. 1917. "Type: Stony hillsides, foothills north of Morrison, Colo., 1915, *Pennell* 5821 (N. Y.)." Type seen in herbarium of the New York Botanical Garden.

Stems several to many, slightly decumbent at base, erect, 15 to 45 cm. tall, from much-branched rootstocks, slender, puberulent in lines, loosely glandular-pubescent above, green; leaves thin, green, dull to rather lustrous, obscurely veined, glabrous, those at the base of the stem much tufted, the blades lanceolate, acute, entire or rarely sparingly and slightly serrate, altogether 6 to 9 cm. long, narrowed into a petiole-like base nearly equaling to slightly exceeding the length of blade, the stem leaves lanceolate, acute, somewhat clasping, entire or serrulate-dentate above, the largest 3 to 7 cm. long, 0.5 to 1.2 cm. wide; thyrsus narrow, not secund, one-third to one-half the height of the plant, composed of 3 to 9 loose fascicles, each consisting of 2 axillary ascending branches, their pedicels shorter than the peduncle; sepals 3 to 4 mm. long, ovate, acuminate, slightly veined, with whitish, scarious, nearly entire margins, loosely glandular-pubescent; corolla 15 to 18 mm. long, the tube and throat 11 to 13 mm. long, the throat 3 to 4.5 mm. wide, inflated, but slightly flattened and 2-grooved anteriorly, the 2 posterior lobes 5 to 6 mm. long, united and arched one-third their length, with free recurved erect lobes, the 3 anterior lobes 5 to 6 mm. long, united proximally, the free lobes spreading; corolla externally glandular-pubescent, within slightly lanose-pubescent with whitish hairs over the bases of the anterior lobes, blue, more violet on throat and when young, paler within and slightly paler without, the throat anteriorly veined within with red-purple lines, these more evident on the anterior lobes; anther sacs widely divaricate, 0.7 to 0.8 mm. long, broadly ovate, distinct, opening throughout, glabrous, dark gray-blue; sterile filament nearly or quite equaling the anterior ones, not or slightly wider distally, densely bearded distally with yellow hairs; capsule 6 to 7 mm. long, ovate, acuminate, glabrous, greenish brown; seeds 1 to 1.2 mm. long, irregularly angular in outline, scarcely curved, the angles sharp, not winged, the surface reticular, dull dark gray or brownish gray, not pale toward margin.

Rocky, wooded slopes, at altitudes of 1,600 to 3,000 meters. Submontane and Montane zones: flowering from late May to early August. Foothills, eastern slope of Medicine Bow Range, southeastern Wyoming, to Culebra Range, southeastern Colorado; common through middle areas; also west of Medicine Bow Mountains in

upper valley of North Platte River, in Carbon County, Wyoming, and Jackson County, Colorado, perhaps crossing from the north into Middle Park.

WYOMING: Albany: Cooper Hill (A, B, M, P, U, Y); Laramie, *Pennell* 5873 (D, F, M, Y); head of Pole Creek (A, M, U, Y); Sand Creek (B, M, U, Y); Sherman (M, U). Carbon: Encampment, *Tweedy* 4305 (U, Y). Laramie: Horse Creek, *Buffum* (F); west of Islay (U).

COLORADO: Boulder: Boulder, *Pennell* 5826 (A, M, U, Y); Eldora Lake (B); Lyons (M); Miramonte (B); Nederland (B); St. Vrain Creek (B); Sugarloaf Mountain (B); Ward (B, M, Y). Clear Creek: Empire (A, M, U, Y); near Georgetown, *Patterson* 117 (F, M, U, Y); Graymont (U); Grays Peak (F, M, Y); Leavenworth Mountain (F). Douglas: *Mrs. S. B. Walker* (F). El Paso: Cheyenne Mountain (Y); Crystal Park (M, U, Y); Eastinville (U); Lake Moraine (F); Manitou, *Pennell* 5784 (B, Y); North Cheyenne Canyon, *Pennell* 5774 (Y), 6339 (D, H, U, Y); Palmer Lake, *Pennell* 5807 (H, U, Y); Pikes Peak (above Halfway House), *Pennell* 6319 (R, Y); South Cheyenne Canyon, *Pennell* 5792 (F, M, R, Y). Fremont: Canon City, *Brandegge* (M). Gilpin: Antelope (B); Eldora to Baltimore (Y); Tolland, *Pennell* 6355 (F, P, Y). Grand (?): "Middle Park," *Henry* (M; with specimens of *P. watsoni*). Huerfano: Turkey Creek and tributaries (Y); Wahatoya Canyon, *Rydberg & Vreeland* 5638 (Y). Jackson: Camp Creek, *Goodding* 1458 (A, B, M, P, U, Y). Jefferson: Golden, *Pennell* 5816 (M, Y), 6387 (Y); Morrison, *Pennell* 5821 (D, H, R, U, Y); Platte Canyon (U). Larimer: Dale Creek (Y); Dixon Canyon (F, U); Estes Park (M, R, U); Horsetooth Mountain, *Pennell* 5853 (F, K, P, R, Y), 5854 (S, Y), 5861 (D, Y); Howes Gulch (Y); North Box Elder (B); Owl Canyon, *Pennell* 5871 (Y); Pinewood; Rist Canyon (M); Ten-mile Creek (B). Las Animas: Brantly Canyon, *Osterhout* (Y). Park: South Park, *Wolf* 297 (U, Y). Pueblo: Near Beulah, *Robbins* 4489 (B).

#### 64. *Penstemon brevifolius* (A. Gray) A. Nels.

*Penstemon humilis brevifolius* A. Gray, Syn. Fl. 2<sup>1</sup>: 267. 1878. "*P. humilis*, var. ? Watson l. c. [in King, Geol. Expl. 40th Par. 5: 220. 1871]. \* \* \* Utah, in the Wahsatch Mountains, at 9,000 or 10,000 feet, *Watson, Eaton*." According to Watson (loc. cit.), "In the Wahsatch Mountains; 9-10,000 feet altitude; July, August (781)." Isotype, *Watson* 781, collected in Cottonwood Canyon, Utah, altitude 2,700 meters, July, 1869, seen in herbarium of Columbia University at the New York Botanical Garden.

*Penstemon brevifolius* A. Nels. in Coulter, New Man. Rocky Mount. 445. 1909.

Rocky cliffs and summits, at altitudes of 2,400 to 3,200 meters; Montane and Subalpine zones; flowering from mid-June to late July. Northern Wasatch Mountains, Utah, and East Humboldt Mountains, Nevada.

UTAH: Salt Lake: Alta (F, Y); near Clayton Peak (M): Emigration Canyon, *Pennell* 5986 (H, M, R, U, Y); Lake Blanche, *Pennell* 5975 (D, H, M, P, R, U, Y); near Silver Lake, *Pennell* 6086 (F, K, S, Y), 6092 (A, Y). Toole: Ophir City, *E. S. Blackwell* (P). Utah: American Fork Canyon, *Jones* 1405 (F, U).

#### 65. *Penstemon obtusifolius* Pennell, sp. nov.

Stems several, more or less decumbent at base, erect, 15 to 20 cm. tall, from much-branched rootstocks, slender, below puberulent with reflexed hairs, above glandular-pubescent, light green; leaves thin, pale green, dull, obscurely veined, glabrous, those at the base of the stem much tufted, the blades broadly oval, obtuse or nearly so, entire, 2 to 3 cm. long, 1.5 to 2.2 cm. wide, abruptly narrowed to a slightly margined petiole about equaling the length of blade, the stem leaves oblong-lanceolate; acutish, clasping, entire or serrulate, the largest 2.3 cm. long, 0.5 to 0.7 cm. wide; thyrsus narrow, not secund, one-third to one-half the height of the plant composed of about 4 loose fascicles, each consisting of 2 axillary ascending branches, their pedi-

cels shorter than the peduncle; sepals 5 mm. long, lanceolate, acuminate, finely glandular-pubescent; corolla 10 to 12 mm. long, the tube and throat 7.5 to 9 mm. long, the throat 2 to 2.5 mm. wide, somewhat inflated, somewhat flattened and 2-grooved anteriorly, the 2 posterior lobes 2.5 to 3 mm. long, all the lobes united near base, the free lobes spreading; corolla externally glandular-puberulent, within slightly lanose-pubescent over the bases of the anterior lobes, blue (not seen fresh); anther sacs widely divaricate, 0.5 mm. long, broadly oval, distinct, opening throughout, glabrous, grayish; sterile filament nearly or quite equaling the anterior ones, scarcely wider distally, bearded distally with short yellow hairs; capsule not seen.

Type in the U. S. National Herbarium, no. 260682, collected at Springdale, Washington County, Utah, altitude 1,200 meters, in flower, May 16, 1894, by Marcus E. Jones (no. 5249am; distributed as *P. humilis brevifolius* S. Wats.).

Upper Sonoran Zone.

66. *Penstemon humilis* Nutt.

*Penstemon humilis* Nutt.; A. Gray, Proc. Amer. Acad. 6: 69. 1862. "*P. humilis* Nutt., in herb. Acad. Philad. \* \* \* Rocky Mountains, Nuttall (a very depauperate doubtless alpine specimen in herb. Acad. Philad.)". Aggregate, but name to be applied to Nuttall's plant. Type, doubtless collected by Nuttall on hills in southwestern Wyoming or southeastern Idaho, seen in herbarium of Academy of Natural Sciences of Philadelphia.

*Penstemon collinus* A. Nels. Bull. Torrey Club 25: 279. 1898. "Type specimen in Herb. University of Wyoming [A. Nelson] no. 2960, Evanston [Wyoming], May 28, 1897." Isotype seen in herbarium of the New York Botanical Garden.

Gravelly sagebrush slopes, at altitudes of 1,500 to 2,400 meters; Submontane Zone (descending rarely into Upper Sonoran Zone); flowering from mid-May to early July. Foothills, from Jacksons Hole southward through the Teton and northern Wasatch regions to Juab County, Utah, southern Idaho, and northeastern Nevada.

WYOMING: Lincoln: Cokeville, *Nelson* 4549 (F); Jacksons Hole, *Hayden* (M); La Barge (U). Uinta: Evanston, *Nelson* 2960 (M, Y), 7197 (B, M, U, Y), *Pennell* 5894 (B, D, Y), 5901 (K, P, Y), 5922 (A, S, Y); base of Medicine Butte, *Pennell* 5914 (Y); Piedmont (R).

IDAHO: Bannock: Oxford; Pocatello, *Pennell* 6063 (A, F, H, M, R, U, Y); Soda Springs (M, Y). Bear Lake: Montpelier, *Macbride* 15 (M, U, Y), 202 (M, U).

UTAH: Cache: Logan, *C. P. Smith* 1629 (E, R), 2202 (Y). Juab: Eureka, *Jones* (M, U, Y). Morgan: Devils Slide, *Pennell* 5941 (F, U, Y), 5951 (Y). San Pete: Ephraim Canyon, *Tidestrom* 1171 (U); Indianola (U); San Pitch Mountains (U). Sevier: Fishlake Forest, *Eggleston* 11127 (U). Summit: Echo, *Pennell* 5930 (Y), 5936 (H, M, Y). Uinta: Brush Creek Canyon, *Goodding* 1289 (F, U, Y). Utah: Provo, *Pennell* 6112 (A, D, F, H, K, M, P, R, U, Y).

67. *Penstemon radicosus* A. Nels.

*Penstemon radicosus* A. Nels. Bull. Torrey Club 25: 280. 1898. "Type specimens in Herb. University of Wyoming, [A. Nelson] no. 2962, Evanston [Wyoming], May 28, 1897." Isotype seen in herbarium of the New York Botanical Garden.

Dry, gravelly slopes, sides of mesas, sagebrush draws, at altitudes of 1,600 to 2,300 meters; Submontane, descending into Upper Sonoran Zone; flowering from late May to early July. Mesas and foothills from Medicine Bow River westward across southern Wyoming to the valley of Snake River in southern Idaho, southward entering North Park, Colorado, Summit County, Utah, and northern Nevada, northward through valley of Henry River and entering southwestern Montana and Yellowstone National Park.

WYOMING: Albany: Ridge (R); Rock River, *Goodding* 27 (F, M, U, Y). Carbon: Boggs (Y); Fort Steele (U, Y); Freezeout Hills (F); Medicine Bow (R); Rawlins, *Pennell* 5879 (F, H, M, R, Y). Fremont: Pacific Springs, *Parry* 208 (F). Lincoln: Cokeville, *Nelson* 4659 (R). Sweetwater: Bush Ranch (B, M, U, Y); Leucite Hills (U, Y); Point of Rocks, *Pennell* 5887 (Y); Tipton; Wamsutter, *Pennell* 5883 (A, B, D, F, H, K, M, P, R, S, U, Y), 5885 (Y; albino). Uinta: Evanston, *Nelson* 2962 (M, Y), *Pennell* 5896 (D, P, Y), 5903 (A, K, M, U, Y), 5920 (F, H, Y); base of Medicine Butte, *Pennell* 5915 (R, Y). Yellowstone National Park: Mammoth Hot Springs, *Pennell* 6033 (B, P, S, Y); on south fork of Shoshone (Y).

IDAHO: Bannock: Oxford (Y); Pocatello, *Pennell* 6064 (A, B, D, F, H, K, M, P, R, S, U, Y). Bingham: Big Butte Station, *Palmer* 203 (U). Fremont: Beaver Canyon, *Rydberg* (Y).

COLORADO: Jackson: Pinkham Creek, *Goodding* 1471 (A, B, M, U, Y).

UTAH: Summit: Echo, *Pennell* 5939 (Y).

### 68. *Penstemon oliganthus* Woot. & Standl.

*Penstemon oliganthus* Woot. & Standl. Contr. U. S. Nat. Herb. 16: 172. (Feb. 12) 1913. "Type in the U. S. National Herbarium, no. 259061, collected in the mountains west of Grants Station [New Mexico], August 1, 1892, by E. O. Wootton." Type seen in the U. S. National Herbarium. Unfortunately this consists of late, small, shriveled-flowered specimens, with only few and small basal leaves still attached.

*Penstemon griffinii* A. Nels. Bot. Gaz. 56: 70. (July 16) 1913. "Collected by Alfred A. Griffin in the Rio Grande Valley [Colorado], on moist east slopes, at 8,200 feet, July 28, 1912, no. 145." Type seen in the Rocky Mountain Herbarium.

Grassy glens, open pine woods, and rocky hillsides, at altitudes of 2,100 to 2,600 meters; Submontane and Montane zones; flowering from late July to mid-August. Mountain slopes from Park County, Colorado, southward to north-central New Mexico.

COLORADO: Chaffee: Base of Mount Princeton, *Sheldon* 243 (U), 554 (U, Y); Salida, *Pennell* 6310 (D, R, U, Y). Fremont(?): Wet mountain valley, *Redfield* 5981 (M), 6021 (M). Park: Divide west of salt works, South Park, *Porter* (F, Y). Mineral: Wagonwheel Gap, *Griffin* 145 (R).

### 69. *Penstemon gracilis* Nutt.

*Penstemon gracilis* Nutt. Gen Pl. 2: 52. 1818. "Hab. from the Arikarees [South Dakota] to Fort Mandan [North Dakota], in depressed soils." Type seen in herbarium of Academy of Natural Sciences of Philadelphia.

*Chelone gracilis* Spreng. Syst. Veg. 2: 813. 1825.

*Penstemon digitalis gracilis* Trauttv. Bull. Acad. St. Pétersb. 5: 345. 1839.

*Penstemon pubescens gracilis* A. Gray, Proc. Amer. Acad. 6: 69. 1862-3.

Moist grassy places, at altitudes of 1,000 to 2,100 meters; Submontane and Upper Sonoran zones; flowering from early June to mid-July. High plains, entering north-central Wyoming and eastern Colorado to the base of the foothills. Manitoba to Saskatchewan, south probably to Kansas and northeastern New Mexico.

SOUTH DAKOTA: Fall River: Hot Springs, *Rydberg* 921, in part (Y). Lawrence: Deadwood, *Carr* 35 (U, Y); Este (Y); Lead City (Y). Meade: Bear Butte ("Bear's Peak") (M); Fort Meade, *Forwood* 286 (U). Pennington: Rapid City, *Visher* (F). Stanley: Cedar Pass (U); Fort Pierre, *Geyer* 127 (U). Washabaugh: Cottonwood Canyon, *Visher* 200 (Y).

NEBRASKA: Deuel: *Rydberg* 279 (Y). Lincoln: Hershey, *Mell* 75 (U). Thomas: Halsey, *Krautter* (F).

WYOMING: Johnson: Eastern slope of Bighorn Mountains, *Tweedy* 3413 (Y), 3414 (Y). Sheridan: Little Goose Creek, *Nelson* 2375 (R).

COLORADO: Boulder: Boulder, *Ramaley* 9593 (B). Douglas: Larkspur, *Johnston & Hedgcock* 436 (Y). El Paso: North of Cheyenne Canyon, *Bessey* (Y); Colorado Springs; Monument Park (A, U); Palmer Lake (U); Ute Pass (M). Huerfano: Wahatoya Creek, *Rydberg & Vreeland* 5640 (P).

70. *Penstemon harbourii* A. Gray.

*Penstemon harbourii* A. Gray, Proc. Amer. Acad. 6: 71. 1862. "Rocky mountains of Colorado Territory, in the high alpine region, no. 396 of Hall and Harbour's distribution; found only by Mr. J. P. Harbour." Isotype seen in herbarium of Columbia University at the New York Botanical Garden.

*Penstemon bakeri* Greene, Pittonia 4: 318. 1901. "At 11,500 feet in the mountains about Pagosa Peak, southern Colorado, 6 Aug., 1899, C. F. Baker."

Rocky slopes above timber line, especially on rock slides, at altitudes of 3,300 to 4,100 meters; Alpine Zone; flowering from early July to early August. High mountains of Colorado, from Medicine Bow Mountains to Sangre de Cristo Range and La Plata Mountains.

COLORADO: Chaffee: Mount Princeton, *Sheldon* 241 (U), 553 (U, Y). Clear Creek: Above Berthoud Pass (M); near Georgetown (M); Grays Peak (M, U); Mount Flora (M); Mount McClellan, *Patterson* 118 (F, M, U, Y). Fremont: Sangre de Cristo Range, *Brandegees* 804 (M). Gunnison: Sheep Mountain, *Purpus* 607 (F). Larimer: Near Lulu Pass, *Osterhout* 603; Mount Richtophin (Y). La Plata: La Plata Mountains (U); Virginia Gulch, south slope of Needle Mountains, *Cross* 27 (U). Ouray: Along Horsethief Trail east of Ouray, *Pennell* 6236 (A, B, D, F, H, K, M, P, R, S, U, Y). Mount Abram, *Pennell* 6187 (U, Y). San Miguel: Yellow Mountain, Ophir, *J. V. Brewster* (D). Summit: Mount Baldy (M); Mount Breckenridge, *Hall & Harbour* 396 (A, E, F, M).

71. *Penstemon retrorsus* Payson, sp. nov.

Stems loosely tufted, much branched below, spreading and soon ascending and erect, 10 to 20 cm. tall, from a very short caudex, pubescent with reflexed-spreading cinereous hairs; leaves light green, not veined, cinereous-pubescent, entire, the blades of lower leaves oblanceolate, attenuate to an ill-defined petiole, the stem leaves sessile, lanceolate, the largest leaves mostly 2.5 to 3.5 cm. long, 0.3 to 0.4 cm. wide; thyrsus narrow, composed of 6 to 12 fascicles, each consisting of 2 axillary branches, each of these bearing several flowers, their pedicels usually shorter than the common peduncle; sepals 3 to 4 mm. long, ovate-lanceolate, acutish to acute, not ribbed, not scarious-margined, densely and finely cinereous-pubescent; corolla 16 to 20 mm. long, the tube and throat 13 to 15 mm. long, the throat slightly inflated, flattened and 2-ridged within ventrally, the 2 posterior lobes 2.5 to 3 mm. long, united and arched about two-thirds their length, projecting, the 3 anterior lobes 3 to 5 mm. long, united at base, spreading; corolla externally glandular-puberulent, within pubescent over the bases of the anterior lobes, glabrous elsewhere, blue (not seen fresh); anther sacs widely divaricate, 0.6 mm. long, ovate, glabrous, distinct, with relatively long line of contact, opening throughout, the suture minutely ciliolate; sterile filament included, flat, not enlarged distally, bearded most of its length (densely distally) with golden-yellow hairs on the posterior face; capsule not seen.

Type in the herbarium of the New York Botanical Garden, collected on a dry adobe hill near Montrose, Colorado, altitude 1,740 meters, in flower, June 15, 1915 by Edwin Payson (no. 673).

Adobe hills, at an altitude of 1,740 meters; Upper Sonoran Zone; flowering in mid-June. Valley of Uncompahgre River in western Colorado.

COLORADO: Montrose: Montrose, *R. Dawson* (D); *Payson* 673 (Y).

72. *Penstemon thompsoniae* (A. Gray) Rydb.

*Penstemon pumilus thompsoniae* A. Gray, Syn. Fl. 2<sup>1</sup>: 269. 1878. "S. Utah, Mrs. Thompson." Type, from Kanab, Utah, collected in 1872, seen in Gray Herbarium.

*Penstemon thompsoniae* Rydb. Bull. Torrey Club 36: 690. 1909.

Southern Utah and northern Arizona.

UTAH: Kane: Kanab, Mrs. Thompson (H). Without data, Bishop 250 in 1872 (U).

73. *Penstemon crandallii* A. Nels.

*Penstemon crandallii* A. Nels. Bull. Torrey Club 26: 354. 1899. "I am indebted to Prof. C. S. Crandall for specimens of this plant, collected by him near Como, Park County, Colorado, July 23, 1897." Type seen in Rocky Mountain Herbarium.

"Gravelly places," at altitudes of 2,800 to 3,000 meters; Montane Zone; flowering from early July to early August. Park and Chaffee counties, central Colorado.

COLORADO: Chaffee: South Cottonwood Gulch, Sheldon 547 (U, Y, Z). Park: Como, Cowen (F, M, U, Y), Crandall 4197 (Y), Shear 4582 (Y), 4583 (Y).

74. *Penstemon suffrutescens* Rydb.

?*Penstemon caespitosus suffruticosus* A. Gray, Syn. Fl. 2<sup>1</sup>: 270. 1878. "Utah, near Beaver, Palmer." Type, in fruiting stage, seen in Gray Herbarium. Pedicels and calyx more glandular than in *P. suffrutescens*. Probably distinct.

*Penstemon suffrutescens* Rydb. Bull. Torrey Club 38: 503. (Sept. 30) 1901. "Colorado: Ridgway, 1895, F. Tweedy 170." Type, collected June 20, seen in herbarium of the New York Botanical Garden.

*Penstemon procumbens* Greene, Pl. Baker. 3: 23. (Nov. 18) 1901. "Forming large mats on open slopes at Keblar Pass [Colorado], 7 Aug., 1901, [C. F. Baker] n. 733." Isotype seen in U. S. National Herbarium. With smaller, broader leaves, and more procumbent habit than specimens seen of *P. suffrutescens*; needs further field study.

"Woods," at altitudes of 2,200 to 3,000 meters; Submontane and Montane zones; flowering from late June to early August. Gunnison and Delta to Ouray counties, west-central Colorado, and probably to central Utah.

COLORADO: Gunnison: Keblar Pass, Baker 733 (M, U, Y); Elk Mountains, Brandegee (M). Ouray: Ridgway, Tweedy 170 (U, Y).

UTAH: Piute: Mountains north of Bullion Creek, near Marysvale, Rydberg & Carlton 7106 (Y).

75. *Penstemon xylus* A. Nels.

*Penstemon xylus* A. Nels. Bot. Gaz. 34: 31. 1902. "The specimens before me were collected by Mr. H. N. Wheeler at Sapinero, Colorado, 1898, no. 446." Type seen in Rocky Mountain Herbarium. Apparently but one specimen collected by me while at Sapinero, and this among dense growths of *P. teucrioides*. Perhaps the "species," at least at times, represents an intermediate (hybrid?) between *P. teucrioides* and *P. suffrutescens*. Needs further field study.

Sagebrush hills, at altitudes of 1,700 to 2,800 meters; Upper Sonoran and Submontane zones; flowering from late May to mid-July. Scattered through western Colorado and southeastern Utah.

COLORADO: Delta: Paonia, Osterhout 4523 (Y); Mesa Grande (F). Eagle: Wolcott, Osterhout 2112. Fremont: Brandegee (M). Gunnison: Sapinero, Pennell 6269 (Y), H. N. Wheeler 446 (B). Hinsdale: Lake City, Purpus 721 (F). Mineral: Wagonwheel Gap, B. H. Smith (A). Montrose: Cimarron, Baker 333 (F, M, R, U, Y); Naturita, Payson 361 (R). Ouray: Ridgway, Tweedy 171 (U).

UTAH: La Sal Mountains, Purpus 5693 (M).

76. *Penstemon caespitosus* Nutt.

*Penstemon caespitosus* Nutt.; A. Gray, Proc. Amer. Acad. 6: 66. 1862. "Rocky Mountains, Nuttall (a diminutive specimen in herb. Acad. Philad.)." Type, labeled "R. Mts., N. Calif.," seen in herbarium of the Academy of Natural Sciences of Philadelphia.

Dry, gravelly, sagebrush slopes, at altitudes of 1,800 to 2,100 meters; Submontane Zone; flowering from late May to early July. Foothills and lower mountain slopes, Wasatch Mountains, southwestern Wyoming, Uinta Mountains of northern Utah, and in northern Colorado.

WYOMING: Carbon: Saratoga, *Buffum* 713 (F, R). Uinta: Carter (R); Fort Bridger; Evanston, *Pennell* 5895 (F, H, M, U, Y); Leroy (R).

COLORADO: Eagle: McCoys, *Osterhout* 2762 (Y). Grand: Mount Bross, *Patterson* (F, M, Y); Sulphur Springs (Y); Willow Creek (M). Moffat: North of Craig, *Osterhout* 2623 (Y). Routt: Egeria Park, *Eastwood* (Y).

UTAH: Uinta: Dyer Mine, *Goodding* 1237 (F, R, U, Y).

76a. *Penstemon caespitosus perbrevis* Pennell, subsp. nov.

Leaves shorter, 0.5 to 1 (sometimes 1.2) cm. long, much more abruptly widening upward, spatulate-obovate, nearly all with petiole-like bases; sepals less attenuate, acuminate; plants closely prostrate, the ultimate ascending branches very short. Otherwise as in the species.

Type in the herbarium of the New York Botanical Garden, collected on dry sagebrush summit of mesa, at Castle Gate, Carbon County, Utah, altitude about 2,200 to 2,400 meters, in shriveled blossom, July 18, 1915, by F. W. Pennell (no. 6138).

Sagebrush-covered mesas, at altitudes of (1,600) 2,100 to 2,400 meters; Upper Sonoran and Submontane zones; flowering from early June to early July. Wasatch region of central Utah.

UTAH: Carbon: Castle Gate, *Pennell* 6138 (R, U, Y). Garfield: Tropic, *Jones* 5312ai (U). Utah: Soldier Summit, *Jones* 5599 (M, U, Y); near Thistle (U, Y).

77. *Penstemon teucrioides* Greene.

*Penstemon teucrioides* Greene, Pl. Baker. 3: 23. 1910. "Collected at Sapinero [Colorado], 19 June [1901]; said to be common there on dry ground, [C. F. Baker] n. 186." Isotype seen in U. S. National Herbarium.

Dry, stony, sagebrush slopes, at altitudes of 2,100 to 2,800 meters. Submontane Zone; flowering from late June to early August. Common to abundant in Gunnison Valley, west-central Colorado.

COLORADO: Gunnison: Gunnison, *Pennell* 6283 (Y); Sapinero, *Baker* 186 (M, R, U, Y), *Pennell* 6263 (B, F, Y), 6268 (D, H, K, M, P, R, U, Y), 6276 (A, S, Y), *H. N. Wheeler* 399 (B, R). Hinsdale: Lake City, *Purpus* 721, in part (F). Saguache: Sargents, *Pennell* 6302 (D, F, H, M, R, U, Y).

78. *Penstemon glabrescens* Pennell, sp. nov.

Stems tufted, much branched, prostrate and ascending, spreading, 7 to 15 cm. tall, from a woody caudex, with long woody prostrate stems, puberulent with reflexed cinereous hairs; leaves somewhat thickened, light green above and beneath, not veined, sparsely puberulent above proximally or usually glabrate, entire, all cauline, the blades sessile, linear, acute, the largest mostly 1 to 1.5 cm. long, 0.7 to 1 mm. wide; thyrsus narrow (flowers seemingly axillary), composed of 4 to 8 fascicles, each consisting of 2 axillary branches, each bearing 1 or 2 flowers; sepals 5 to 8 mm. long, lance-ovate to ovate, acuminate to caudate, not ribbed, proximally with margins more or less scarious and erose, slightly glandular-puberulent; corolla 16 to 18 mm.

long, the tube and throat 12 to 13 mm. long, the throat slightly inflated, flattened and 2-ridged within ventrally, the 2 posterior lobes 4 to 5 mm. long, united and arched two-thirds their length, projecting, the 3 anterior lobes 4 to 5 mm. long, united at base, spreading; corolla externally glandular-puberulent, within slightly pubescent over the bases of the anterior lobes, glabrous elsewhere, sky-blue, within violet at base of lobes, pale within the throat, on anterior side with violet lines, one of these extending medianly into each lobe (not seen fresh); anther sacs widely divaricate, 1 mm. long, oblong, glabrous, distinct, with short line of contact, opening throughout, the suture minutely ciliolate; sterile filament included, flat, scarcely enlarged distally, bearded nearly throughout (densely so distally) with golden-yellow hairs on the posterior face; capsule 7 mm. long, ovate, acuminate, glabrous; seeds 1.5 to 1.7 mm. long, irregularly quadrangular, curved, the angles sharp, not winged, the surface very minutely alveolate-reticulate, blackish, slightly glistening.

Type in the herbarium of the New York Botanical Garden, collected on open mesas and gravelly hillsides at Pagosa Springs, Colorado, in flower, July 2, 1917, by E. Bethel.

Open sagebrush (?) mesas and slopes, frequently gravelly, at altitudes of 2,000 to 2,200 meters; Upper Sonoran Zone; flowering from June to late July. Valley of San Juan River in southwestern Colorado.

COLORADO: Archuleta: Pagosa Springs, *Bethel* (D, Y). La Plata: Bayfield, *Bethel* (D, Y). Montezuma: Lone Mesa (U); Mancos, *Baker, Earle & Tracy 27* (F, M, U, Y).

79. *Penstemon abietinus* Pennell, sp. nov.

Stems tufted, much branched, prostrate and ascending, spreading, less than 5 cm. tall, from a thick woody caudex, although often with long woody prostrate stems, densely grayish-puberulent with reflexed hairs; leaves thickened, dull pale green above and beneath, not veined, sparsely puberulent above or glabrate, entire, all cauline, the blades sessile, linear, acute, the largest mostly 1 to 1.2 cm. long, 0.8 to 1.2 mm. wide; thyrsus narrow (flowers seeming axillary), composed of few (1 to 4) fascicles, each consisting of 2 axillary shortened branches, each of these bearing usually but a single flower; sepals 4 to 5 mm. long, lanceolate-attenuate, acuminate, not ribbed, proximally with slightly erose, expanded, scarious margins, slightly glandular-puberulent; corolla 12 to 15 mm. long, the tube and throat 8 to 10 mm. long, the throat scarcely inflated, flattened and 2-ridged within ventrally, the 2 posterior lobes 4 to 5 mm. long, united and arched one-third to two-fifths their length, projecting, the 3 anterior lobes 4 to 5 mm. long, united at base, spreading; corolla externally glandular-puberulent, within slightly pubescent over bases of the anterior lobes, glabrous elsewhere, blue (not seen fresh); anther sacs widely divaricate, 1 mm. long, oblong-ovate, glabrous, distinct, with short line of contact, opening throughout, the suture nearly glabrous; sterile filament included, flat, scarcely enlarged distally, densely bearded nearly throughout with golden-yellow hairs on the posterior face; capsule not seen.

Type in the U. S. National Herbarium, no. 237297, collected at Ireland Ranch, head of Salina Canyon, Utah, altitude 2,400 meters, in flower, June 15, 1894, by Marcus E. Jones (no. 5440; distributed as *P. caespitosus* Nutt.). Isotype in herbarium of New York Botanical Garden.

Probably Submontane Zone.

UTAH: Sevier: Ireland Ranch, head of Salina Canyon, *Jones 5440* (F, M, R, U, Y); Salina Experiment Station, Fishlake Forest, *Eggleston 11138* (U).

80. *Penstemon whippleanus* A. Gray.

*Penstemon glaucus stenosepalus* A. Gray, Proc. Amer. Acad. 6: 70. 1862. "Rocky Mountains, about Pikes Peak, Clear Creek, &c., Dr. James in herb. Torr., Dr



Parry, 261, 262, and coll. 1862, distributed by Hall and Harbour, 399." Isotype, Parry 261, "from the headwaters of Clear Creek and the alpine ridges lying east of Middle Park, Colorado," collected in 1861, seen in herbarium of the New York Botanical Garden.

*Penstemon whippleanus* A. Gray, Proc. Amer. Acad. 6: 73. 1862. "Arroyas in the Sandia Mountains, New Mexico, east of the Rio Grande, Dr. J. M. Bigelow, in Whipple's Expedition, Oct., 1853." Sterile filament in species slightly barbed at apex to nearly or (in type material) quite glabrous.

*Penstemon stenosepalus* Howell, Fl. Northw. Amer. 1: 514. 1901.

Occurs in several apparently distinct color forms, separable only by field observation. Through the Colorado and Utah mountains red-violet is prevalent, but high on some mountains—e. g., Pikes Peak—a very pale greenish brown form occurs. In the Wasatch Mountains I have seen the color lavender, but Watson says that this is not the prevalent form. In the Teton Mountains, Wyoming (*Nelson* 100) a blue form exists.

Wooded or subalpine grassy mountain slopes, at altitudes of (2,200) 2,500 to 3,600 (3,900) meters; Subalpine and Montane zones, ascending to Alpine Zone; flowering from early July to late August. High mountains, from Teton and Wind River mountains, Wyoming, southward through Bear River Range, Idaho, through nearly all chains of Colorado and Utah to northern New Mexico and northern Arizona.

WYOMING: Albany, Carbon, Fremont, Lincoln, and Park counties.

IDAHO: Oneida County.

COLORADO: Boulder, Chaffee, Clear Creek, Delta, El Paso (6326), Gilpin (6361, 6362), Grand, Gunnison, Hinsdale, Huerfano, Jackson, Lake, La Plata, Larimer, Mineral, Montrose, Ouray (6192, 6202, 6206, 6210, 6244), Park, Routt, Saguache, San Juan, San Miguel, and Summit counties.

UTAH: Grand, Piute, Salt Lake (6074, 6104), San Juan, San Pete, Sevier, Summit, Utah, and Wayne counties.

### 81. *Penstemon montanus* Greene.

*Penstemon montanus* Greene, Pittonia 2: 240. 1892. "Mr. Tweedy's n. 866, from alpine heights on the mountains of Yellowstone Park, Wyoming." Isotype, collected on Mount Norris, in flower, July, 1885, seen in U. S. National Herbarium.

Rocky slopes, at altitudes of 2,400 to 3,000 (3,200) meters; Subalpine and perhaps neighboring zones; flowering from late July to late August. High mountains, from Yellowstone and Wasatch mountains to San Pete County, Utah. In southwestern Montana and central Idaho.

WYOMING: Lincoln: Buffalo Fork, *Tweedy* 232 (Y), 233 (Y); headwaters of Cliff Creek (Y); Hoback River Canyon (U). Park: "Stinking-water," *Parry* 204 (F). Yellowstone National Park: Electric Peak, *Rydberg & Bessey* 4909 (F, U, Y); Mount Norris (U).

IDAHO: Fremont: Mount Chauvet, *Rydberg & Bessey* 4908 (F, R, U, Y). Franklin: Western boundary of Franklin Basin, *C. P. Smith* 2296 (R, Y).

UTAH: Salt Lake: Little Cottonwood Canyon, *Jones* (M, U). San Pete: Black Mountain, *Manti*, *Jones* (M). Utah: Silver Lake, American Fork Canyon, *Jones* (M, U).

### 82. *Penstemon fruticosus* (Pursh) Greene.

*Gerardia fruticosa* Pursh, Fl. Amer. Sept. 423. pl. 18. 1814. "In great abundance in the pine forests of the Rocky Mountains. *M. Lewis* \* \* \* v. s. in *Herb. Lewis*." Specimen (from Lambert Herbarium) in herbarium of Academy of Natural Sciences of Philadelphia labeled "*Gerardia suffruticosa* n. sp. new species. A small shrub from the Rocky Mountain, abundant in piny lands, Jun. 15, 1806." According to E. Coues (Proc. Acad. Phila. 1898: 293. 1899), Lewis and Clark were, on June 15,

1806, along Collins Creek, a branch of the Kooskooskee; now Nahwah River, or Lolo Fork of Clearwater River, in Clearwater County, Idaho. Isotype seen in herbarium of Academy of Natural Sciences of Philadelphia. The type shows leaves relatively strongly serrate, a variable character, but it has broadly lanceolate sepals, thus differing from *P. scouleri* Hook.

*Dasanthera fruticosa* Raf. Amer. Month. Mag. 267. 1818. Type of genus *Dasanthera* Raf.

*Penstemon crassifolius* Lindl. Bot. Reg. 24: pl. 16. 1838. "A native of the North West coast of North America, whence seeds were sent by the late Mr. Douglas to the Horticultural Society of London in whose garden it was figured in June last." This represents the state of the species with leaves most nearly entire.

*Penstemon fruticosus* Greene, Pittonia 2: 239. 1892.

*Penstemon menziesii crassifolius* Schelle in Beissner, Schelle & Zaber, Handb. Laubh. Benen. 432. 1903.

*Penstemon fruticosus crassifolius* Krautter, Contr. Bot. Lab. Univ. Pa. 3: 100. 1908.

Rocky woodland, mountain slopes, at altitudes of 2,000 to 2,300 meters; Montane Zone; flowering from early July to early August. Bighorn Mountains and Yellowstone National Park, Wyoming, westward. Western Montana and northern Wyoming to eastern Washington and eastern Oregon.

WYOMING: Park: Grinnell Creek, *Cary* 569 (U). Yellowstone National Park: Crevasse Mountain; Golden Gate, *Pennell* 6030 (F, H, Y); along Madison River, *Pennell* 5990 (Y); Mammoth Hot Springs (M, U, Y); Slough Creek (U); Spring Creek (R); Upper Geyser Basin, *Pennell* 6001 (R, U, Y).

IDAHO: Fremont: Henrys Lake and Mount Chauvet, *Rydberg & Bessey* 4907 (F, U, Y).

### 83. *Penstemon bridgesii* A. Gray.

*Penstemon bridgesii* A. Gray, Proc. Amer. Acad. 7: 379. 1868. "No. 218 in Californian collection of the late Thomas Bridges." Isotype seen in herbarium of the New York Botanical Garden.

Rocky cliffs, canyons, mountain slopes, at altitudes of 1,800 to 2,600 meters; Submontane and Montane zones; flowering from mid-June to late August. Low mountains, Sierra el Late, Montezuma County, Colorado and Abajo Mountains, San Juan County, Utah, westward across southern Utah. Extending to northern Arizona and central and southern California.

COLORADO: Montezuma: Sierra el Late, *Brandege* 1293 (M).

UTAH: Piute: Marysvale, *Rydberg & Carlton* 7123 (U, Y). San Juan: Sierra Abajo (U, Y); Western Bears Ear, Elk Mountains, *Rydberg & Garrett* 9373 (U, Y), 9374 (Y). Sevier: Clear Creek Canyon, *Garrett* 2517 (M, Y); canyon south of Glenwood (U). Wayne: Jukes Butte, Henry Mountains, *Jones* 5664 (M, U, Y).

### 84. *Penstemon platyphyllus* Rydb.

*Penstemon heterophyllus latifolius* S. Wats. in King, Geol. Expl. 40th Par. 5: 222. 1871. "Wahsatch Mountains; 5-8,000 feet altitude. [*S. Watson*] (787)." Isotype, collected in Cottonwood Canyon, Utah, July, 1869, seen in herbarium of Columbia University at the New York Botanical Garden.

*Penstemon latifolius* Krautter, Contr. Bot. Lab. Univ. Pa. 3: 194. 1908. Not *P. latifolius* Hoffmg. 1824.

*Penstemon platyphyllus* Rydb. Bull. Torrey Club 36: 690. 1909. "Utah: Cottonwood Cañon, July, 1869, *S. Watson* 787." Type is isotype of *P. heterophyllus latifolius* S. Wats.

Rocky mountain slopes and canyons, at altitudes of 1,300 to 2,400 meters; Subalpine Zone, descending on canyon sides into Upper Sonoran Zone; flowering from

mid-May to late July. Western slope of Wasatch Mountains from Weber to Utah counties, Utah.

UTAH: Davis: Farmington Canyon, *Pammel & Blackwood* 3659 (M). Salt Lake: Big Cottonwood Canyon, *Pennell* 6067 (H, M, R, U, Y), 6068 (U, Y); South Fork of Big Cottonwood Creek, *Pennell* 5980 (A, B, F, M, R, Y); City Creek Canyon (U, Y); Emigration Canyon, *Pennell* 5985a (F, Y); Mill Creek Canyon (U, Y); Parleys Canyon. *Pennell* 5957 (D, H, K, M, P, R, S, U, Y); Red Butte (F, M). Utah: American Fork Canyon, *Jones* 1888 (F, M, U). Weber Mountains near Ogden, *Coulter* (Y).

**85. *Penstemon leonardi* Rydb.**

*Penstemon leonardi* Rydb. Bull. Torrey Club 40: 483. 1913. "Utah: Diehl's Grove, Wahsatch Mountains, Aug. 1, 1884, *Leonard* (type, in herb. N. Y. Bot. Gard.)." Type seen.

Rocky hillsides, frequently among shrubs, at altitudes of 1,900 to 3,000 meters; Montane, descending to upper Submontane Zone; flowering from late June to early August. Franklin Basin of southeastern Idaho, southward through the Wasatch region to Washington County, Utah.

IDAHO: Oneida: Franklin Basin, *C. P. Smith* 2278 (Y).

UTAH: Morgan: Peterson Canyon, *Pammel & Blackwood* 3866 (M). Salt Lake: Bingham Canyon (M); divide between Big Cottonwood Canyon and Heber Valley (U, Y); Diehls Grove, *Leonard* 179 (Y); Emigration Canyon, *Pennell* 5985 (D, F, H, P, U, Y); Parleys Canyon, *Pennell* 5953 (A, H, K, R, Y), 5961 (M, S, U, Y). Kane: *Siler* (A). Summit (?): Deer Creek, *Jones* (F, Y). Utah: Aspinwall Peak, American Fork Canyon, *Jones* (M, U). Washington: Pine Valley Peak, *Purpus* 6193 (U).

**86. *Penstemon sepalulus* A. Nels.**

*Penstemon azureus ambiguus* A. Gray, Syn. Fl. 2<sup>1</sup>: 272. 1878. "Cañons of the Wahsatch Mountains, Utah, viz. of the Provo and American Fork, *Watson &c.*" Probable isotype, *Watson* 786, collected July, 1869, in Provo Canyon, seen in herbarium of the New York Botanical Garden.

*Penstemon sepalulus* A. Nels. in *Coulter, New. Man. Rocky Mount.* 444. 1909. "In the mountains of northwestern Colorado, in adjacent Utah and Wyoming." Based primarily upon *P. azureus ambiguus* A. Gray.

Rocky canyon sides, at altitudes of 1,500 to 1,800 (2,300) meters; Upper Sonoran and Submontane zones; flowering from mid-June to late July. Western slopes of Wasatch Mountains, central Utah.

UTAH: Salt Lake: *Garrett* 907 (Y). Utah: American Fork Canyon, *Jones* 1883 (F, U, Y); Kyune, *Jones* 5613e (U); Provo, near mouth of Provo Canyon, *Pennell* 6110 (A, D, H, K, M, P, R, S, U, Y), 6113 (Y); Slide Canyon, *Pennell* 6120 (F, Y).

The two following species have been detected in material recently examined by the writer.

**25a. *Penstemon tidestromii* Pennell, sp. nov.**

Stems one or several, 30 to 50 cm. tall, from a caudex, puberulent, glabrate above, glaucous; leaves pale dull green, somewhat glaucous, obscurely veined, puberulent, those at the base of the stem with oblanceolate obtuse (at times retuse) blades altogether 10 to 12 cm. long, 1 to 1.5 cm. wide, narrowed into petiole-like bases one-third the total length, the stem leaves similar, smaller, slightly clasping from a narrowed base (bases of opposite leaves not meeting around stem), becoming reduced and bractlike through the inflorescence; thyrsus narrow, secund, from one-third to two-thirds the

height of the plant, composed of (about) 9 to 15 fascicles, each of 2 short axillary branches, their pedicels (when in bloom) shorter than the peduncles; sepals 3 to 5 mm. long, narrowly ovate, acute to slightly acuminate, not veined, with no or narrow, slightly denticulate, scarious margin, glabrous or glabrate; corolla 15 to 20 mm. long the tube and throat 12 to 15 mm. long, the throat somewhat inflated and rounded ventrally, the 2 posterior lobes 3 to 5 mm. long, united and arched one-third to one-half their length, projecting, the 3 anterior lobes about equaling the posterior ones, united at base, the free portions spreading; corolla glabrous without and within, blue (not seen fresh); anther sacs widely divaricate, 1.6 to 1.8 mm. long, oblong-lanceolate, distinct, opening from distal apex nearly (or quite) throughout, glabrous; sterile filament equaling the anterior pair, scarcely enlarging distally, flattened, bearded with yellow hairs on the posterior face, more densely so distally; capsule not seen.

Type in the U. S. National Herbarium, no. 507825, collected in the oak zone, "XL" Canyon, San Pitch mountains, central Utah, altitude 1,650 meters, in flower, June 24, 1908, by Ivar Tidestrom (no. 1296).

"Occasional in the oak zone," at altitudes of 1,650 to 1,800 meters; Upper Sonoran Zone; flowering in June. Wasatch and San Pitch mountains of central Utah.

UTAH: San Pete: "XL" Canyon, San Pitch Mountains, *Tidestrom* 1296 (U); Ephraim Canyon, *Tidestrom* 1134 (U).

Related to *P. laevis* (p. 347) and *P. wardii* (p. 347), the three species to be distinguished as follows:

Corolla glandular-puberulent externally; sterile filament glabrous; plants 20 to 25 cm. tall, densely cinereous-puberulent. . . . . *P. wardii*.

Corolla glabrous externally; sterile filament bearded; plants 30 to 70 cm. tall, glabrous or finely puberulent.

Plant glabrous throughout; sepals 4 to 7 mm. long, conspicuously acuminate, with scarious dentate margins; corolla 20 to 30 mm. long; leaves at the base of the stem ovate, those on the stem conspicuously clasping by a rounded base . . . . . *P. laevis*.

Plant puberulent; sepals 3 to 5 mm. long, acute or slightly acuminate, with margins slightly or not scarious; corolla 15 to 20 mm. long; leaves at base of stem oblanceolate, those on the stem narrowed to a slightly clasping base. . *P. tidestromii*.

### 35a. *Penstemon mensarum* Pennell, sp. nov.

Stem 40 to 50 cm. tall, from a slender caudex, finely glandular-pubescent in the inflorescence, slightly glaucous; leaves dull green, not glaucous, obscurely veined, glabrous, those at the base of the stem with oblong, obtuse to acutish blades 5 to 6 cm. long, narrowed into petiole-like bases about one-half length of blade, those of the stem similar, oblanceolate, the upper clasping (bases meeting around stem), the largest 8 cm. long, 1.5 cm. wide; thyrsus lax, secund nearly one-half height of plant, composed of at least 8 fascicles, each consisting of 2 axillary ascending branches; pedicels shorter than to equaling the peduncles, together reaching 20 mm. long; sepals 4 mm. long, oblong-ovate, acutish to acute, obscurely or not veined, proximally with obscure narrow whitish margin, finely glandular-pubescent; corolla 20 to 24 mm. long, the tube and throat 15 mm. long, the throat somewhat inflated and rounded ventrally, the 2 posterior lobes 4 mm. long, united and arched two-fifths their length, the free portions projecting, the 3 anterior lobes much longer, united at base, the free portions spreading; corolla externally glandular-puberulent, within glabrous, blue (not seen fresh); anther sacs widely divaricate, 1 mm. long, oblong-lanceolate, distinct, opening from the distal apex for nearly the entire length, pubescent on the side with slender white hairs, their length much less than the width of the sacs; sterile filament as long as the anterior pair, gradually enlarging distally, flattened, bearded on posterior face distally with scattered (or at apex dense) yellow hairs; capsule not seen.

Type in the U. S. National Herbarium, no. 1012411, collected on deep clayey loam, Battlement National Forest, Colorado, altitude 2,700 meters, in flower, July 15, 1912, by A. F. McDuffie (U. S. Forest Service, no. 7919).

To be placed in the key before *P. scariosus*, *P. garrettii*, and *P. cyanocaulis*, and to be separated as follows:

- Corolla glandular-puberulent externally; pedicels and sepals strongly glandular-pubescent; inflorescence laxer.....*P. mensarum*.  
Corolla glabrous externally; pedicels and sepals sparsely glandular-puberulent; inflorescence more congested.....*P. scariosus*, *P. garrettii*, *P. cyanocaulis*.