

Northwestern American Plants

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OREGON STATE COLLEGE,
CORVALLIS, OREGON. PRINTED
AT THE COLLEGE PRESS. 1945.

OREGON STATE MONOGRAPHS

Studies in Botany
Number 9, March 1945
Published by Oregon State College
Oregon State System of Higher Education
Corvallis, Oregon

FOREWORD

Out of a need, frequently met by the writer and others, for quick reference to more detailed information concerning gross anatomy and life history stages of our Northwestern plant species than generally is to be found in—or indeed is appropriate to—any local flora, the following pages have been prepared as the first unit in a proposed series of illustrated studies of plant species native to Northwestern America.

The opportunity to begin this work unfortunately coincided with the war and its necessarily induced travel limitations. This fact somewhat changed the method of pursuit though not the direction of the project. Since field work was restricted to gasoline-ration range, it was impossible in any case already begun to include all the species of a given genus, for some are widely scattered. Therefore, this first paper offers, of necessity, a more miscellaneous collection than was at first contemplated. It is hoped, however, that as further contributions are made, taxonomic units eventually can be segregated, and the uniformity of the earlier plan become visible.

Again, travel restrictions have, in several cases, prevented completion of life-history data, since flowering and fruiting stages must be obtained at different seasons, and the second field trip was not forthcoming. Some of these are laid aside for completion under more favorable circumstances; but others, such as the three species of *Lilium*, are retained here, in the hope that missing stages may be added later.

Included in this paper is a revised consideration of the genus *Boschniakia* in the Northwest. This work was begun at the Gray Herbarium in 1930, and was supplemented later by field studies in Oregon.

While some of the plants considered in the following pages have been illustrated by previous authors, others are figured here for the first time. All illustrations and descriptions were made from life; and, in most cases, a comparison of large numbers of specimens, both in the field and in the writer's garden, was possible. The names of colors used in the descriptions, when followed by (R), are those of Ridgway's Color Standards and Nomenclature.

In even so short a paper as this, many persons have assisted, and their help is sincerely appreciated. It is a pleasure to mention in particular, Mrs. Ethelda Craig, Mrs. Norma Rees, Miss Katherine Hughes, Mrs. Daisy Overlander, and Miss Mary Awdry Radcliffe, for valuable assistance; the General Research Council for subsidizing the study; the College Press for careful handling of the details of publication; and the various herbarium curators and librarians who kindly loaned material to aid in the study.

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Northwestern American Plants

BOSCHNIAKIA IN WESTERN UNITED STATES

BOSCHNIAKIA C. A. Mey.

Family: OROBANCHACEAE

Parasitic herbs, the stems fleshy, arising from corm-like thickenings at junction with root of host. Leaves scale-like, imbricated [or sometimes scarcely so at base, particularly in *B. rossica* (Cham. & Schlecht.) B. Fedtsch]. Flowers nearly or quite sessile, borne singly in axils of bracts, the whole structure a densely crowded fleshy spike. Bractlets, when present, generally 2. Calyx truncate, or with 1 to several short or long lobes or teeth. Corolla with throat broader than tube, more or less curved, bilabiate, upper lip entire or emarginate, lower lip 3-lobed. Stamens 4, nearly equaling corolla, to slightly exserted. Stigma generally lobed in accordance with number of carpels. Ovary uniloculate, with 2 to 4 placentae. Capsule 2- to 4-valved. Seeds many, with conspicuously favose coats, but internally little differentiated.

This genus, though represented by few species throughout the world, has nevertheless occasioned much controversy concerning both generic and specific boundaries. When first established, on the basis of a single species, it was satisfactorily delimited, but has proved inelastic to new members; and the species themselves are in some cases ill-defined.

Of the species of Western America, *B. rossica* (C. & S.) B. Fedtsch (*B. glabra* C. A. Mey.), not known south of a line through Alaska eastward to Great Slave Lake, is eliminated from this discussion, since it is readily distinguished from other North American species and offers no confusion. In passing, it may be said that one of several characters separating it from other species is its very small seeds (not more than one-fourth the diameter of other American *Boschniakia* seeds). In addition, it is reported parasitic only on *Alnus fruticosa*, and therefore is restricted to the region inhabited by that shrub. This places it in Kamchatka, the Kuriles, the Aleutians, from Kotzebue Sound south to Sitka, and east to Great Slave Lake (Hultén, 1930).

The names of particular interest to us in this paper are:

Orobanche tuberosa Hooker, Fl. Bor. Am. 2: 92, t. 168. 1838.

Boschniakia Hookeri Walpers, Rep. Bot. Syst. 3: 479. 1844.

B. strobilacea A. Gray, Pac. R. R. Rep. 4: 118, 1856.

Orobanche tuberosa Hook. was described from specimens collected by Archibald Menzies on "the Northwest Coast of America." Piper (1915) states that this collection was made at Nootka Sound, Vancouver Island. Gray apparently transferred this species, at least in his own mind, to *Boschniakia*; because he refers (1856) to *B. tuberosa*; apparently, however, with no reference to origin. Jepson (1925) officially transfers the species, citing *B. strobilacea* Gray as a synonym.

Boschniakia Hookeri Walp. is based on Hooker's *Orobanche tuberosa*, and the description, with a change of three or four words, is an exact copy of Hooker's description of the latter species.

B. strobilacea A. Gray, Pac. R. R. Rep. 4: 118. 1856.

"dry and rocky hills, South Yuba, California." This species Gray distinguished from *B. tuberosa* and *B. glabra* "of Oregon" by the much broader scales and the 3 slender teeth (anterior and lateral) of the calyx. In his Synoptical Flora (1886) he extends the range of *B. strobilacea* "northward into Oregon." But the next year (1887) he states, "I have now reason to think that *B. Hookeri* and my *B. strobilacea* may be the same species."

Karl M. Wiegand (1896) reporting on the genus, considered it too narrowly limited to include recent species, but concluded, "*B. Hookeri* is probably not distinct from *B. strobilacea*, as Dr. Gray suggested."

W. L. Jepson (1897), discussing the genus, quotes from Gray's Synoptical Flora the statement that *B. Hookeri* Walp. was obtained on the Northwest Coast by Menzies, but had not been collected since his day. He notes Dr. Gray's later opinion that the two species are probably synonymous, but apparently does not accept this view, since he retains the later name, though he extends the range of *B. strobilacea* from the San Bernardino Mountains of California on the south, to Mt. Finlayson near Victoria, British Columbia, on the north. His paper is illustrated by two excellent photographs, the legend of one reading, "Tubers of *Boschniakia strobilacea* Gray, on roots of *Arbutus Menziesii*." Later (1925) Jepson transferred to this genus the specific epithet employed by Hooker in *Orobanche tuberosa* (Hooker 1838), and included within it, i. e. *Boschniakia tuberosa*, all reported Pacific collections between Mexico and northern British Columbia.

The treatment by local floras of the Northwest varies. Thomas Howell (1902) recognized two species in Oregon, *B. strobilacea* to the south and *B. Hookeri* "near the sea," though the latter name is listed with a question. Whether it was the authenticity of the species or of the citation that was in doubt, however, we have no present means of determining. Sweetser and Kent (1908) had essentially Howell's point of view. Frye and Rigg (1912) likewise recognized both species, but with no critical notes on habitat; while Piper (1915) and Peck (1941) refer all Oregon specimens to *B. Hookeri* Walp.

Throughout the early discussions covering this genus, the matter of host has generally only vaguely entered, perhaps for the reason that in most work done on these species, only herbarium specimens have been seen. No mention of host is made in the original description accompanying any one of the three

specific epithets involved in this paper. Later Gray (1880) quotes Brewer as saying that *Boschniakia strobilacea* is "parasitic on the roots of manzanita." Beck (1890), employing the all-embracing name, *Orobanche Hookeri*, cites the host as "*Arctostaphylos* species (manzanita)." Jepson (1897) states, "The host plant is usually some species of manzanita. The host of Bigelow's plants was not reported; Brewer's specimens were taken from manzanita, as also the Mt. St. Helena plants (Jepson's collection). The plants of Piper were on *Gaultheria Shallon*, and those of Mr. Weber were said to have been on madrone (*Arbutus Menziesii*). All the host plants, therefore, are of the Ericaceae." Origin of the photograph accompanying the article, labeled, "Tubers of *Boschniakia strobilacea* Gray, on roots of *Arbutus Menziesii*" was not noted. Piper (1915), employing *B. Hookeri* Walp. as all-inclusive, with *B. strobilacea* in synonymy, says, "Northward the plant is parasitic on *Gaultheria Shallon* or rarely on *Arctostaphylos*; southward the common host is *Arctostaphylos* but sometimes *Arbutus Menziesii*." Peck (1941) notes: "*Boschniakia Hookeri* Walp. . . . on various Ericaceae, coniferous woods, Coast Mts. to Calif."

The writer's own findings, based on both field and laboratory studies, agree with those of Howell and of Frye and Rigg, that two species occur in Oregon; further, that they are parasitic on different hosts. From observations made numerous times on the species that keeps to the coast line it appears certain that it is always associated with *Gaultheria Shallon* Pursh, commonly called salal. Indeed, the range of this species corresponds, both in reality and in literature, with the range of *Gaultheria Shallon*. The longest distance from the coast that this species, thus far studied, has been found, is 45 miles, on the slopes of Alsea Mountain in Lincoln County, Oregon; but this still is in salal range, and the parasite was growing on its roots.

The only statement found in literature that might dispute the restriction of this plant to a single host is Piper's (1915), previously quoted: "Northward the plant is parasitic on *Gaultheria Shallon* or rarely on *Arctostaphylos*." Whether this statement is based on Dr. Piper's own observations or on the reports of other collectors it is impossible to determine; but the latter seems probable, and the explanation may be simple. Commonly, in areas where this species of *Boschniakia* is found, *Arctostaphylos columbiana* Piper and *A. Uva-ursi* (L.) Spreng. abound, as well as *Vaccinium* of several species. Certainly there is every opportunity for the parasite to attack roots of other Ericaceae. But time after time, in our own experience, the parasitized root has been traced back to its origin, which always proved to be *Gaultheria*. A striking example is a case in which, near North Bend, Oregon, a specimen

of *Boschniakia* was found surrounded by two species of *Arctostaphylos* and two of *Vaccinium*, with no other genera in sight. Our earlier conclusion appeared in this case to break down until the writer followed the attached root several feet across a trail and under the roots of other plants, finally coming to its source—a *Gaultheria* plant not more than a foot high, completely overshadowed by a manzanita. Unless one is specifically seeking to determine this point, the host can easily be mistaken, particularly since the roots of several of these genera of Ericaceae are similar in appearance.

This coastal *Boschniakia* is, in flower, a slender plant, either purple or yellow. Its distinguishing characteristics are described later. It extends from northern Vancouver Island, along the coast through Washington and Oregon, into California at least as far as San Francisco Bay.

Inland, beyond the range of *Gaultheria Shallon*, in Josephine County, Oregon, and southward into California, occurs a larger species, parasitic upon *Arctostaphylos* and, according to several authorities previously mentioned, *Arbutus Menziesii*. The species of *Arctostaphylos* change from the coastal area to the warmer, drier, interior; and this second species of *Boschniakia* apparently does not attack those of the coast. Curiously, if it be true that it is sometimes found on *Arbutus Menziesii*, it does not follow the range of that tree northward. One herbarium specimen bore, on its label, "Found under *Arbutus Menziesii*." Perhaps here, also, the identity of the host may have been mistaken, for the parasite is commonly found where both madrone (*Arbutus Menziesii*) and manzanita (*Arctostaphylos* spp.) occur. Our collections have all been from manzanita. At any rate, this species, as isolated in this paper, has never been reported upon *Gaultheria Shallon*; neither, apparently, does it occur on coastal species of *Arctostaphylos*, its range coinciding with that of several inland species of the latter genus.

This inland species of *Boschniakia* is a larger thicker plant, distinguishable in several respects, other than host, from the coastal form, as later pointed out. It is true that considerable variation occurs in the structure of both species, but such variation is embraced within somewhat well-marked limits; and the combination of characters, in each case, results in unmistakable identity.

The generic and specific descriptions are slightly emended to accommodate modifications now known to exist in these species.

KEY TO THE OREGON SPECIES:

Plant 8 to 12 cm tall, parasitic on *Gaultheria Shallon*; bracts generally acute, widest near middle or base; style slightly curved at apex; stigma not 4-lobed.....*B. Hookeri*

Plant 15 to 20 cm tall, parasitic on *Arctostaphylos* spp., also reported on *Arbutus Menziesii*; bracts generally truncate or obtuse, widest near apex; style erect; stigma typically distinctly or obscurely 4- (very rarely 3-) lobed.....*B. strobilacea*

BOSCHNIAKIA HOOKERI Walp.

Small ground cone

Family: OROBANCHACEAE

Orobanche tuberosa Hook., Fl. Bor. Am. 2: 92. 1838. not Vell. Fl. Flum. 257. 1825.*Boschniakia Hookeri* Walp. Rep. 3: 479. 1844.*Orobanche Hookeri* (Walp.) G. Beck, Monogr. Orob. 85. 1890.*Boschniakia tuberosa* (Hook.) Jepson, Man. Fl. Pl. Calif. 1925, in part.*Kopsiopsis tuberosa* (Hook.) G. Beck, Das Pflanzenreich 4, 261: 305. 1930.*Boschniakia strobilacea* of authors, not Gray in Pac. R. R. Rep. 4: 118. 1856.

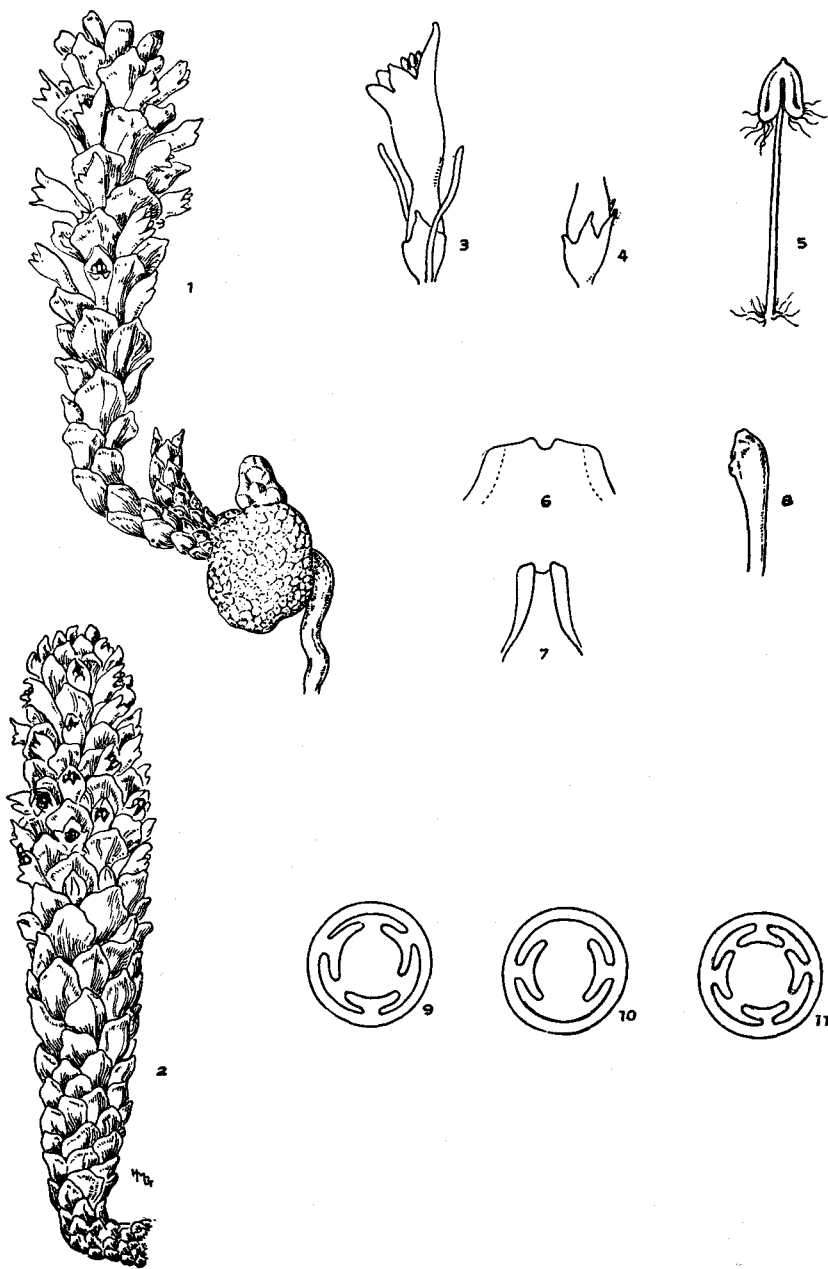
Plant yellow, dark red, or purple, 8 to 12 cm tall, fleshy, 3 cm or less in thickness through flowering portion, sterile stalk generally long and slender; corm-like base 5 cm or less in diameter, minutely tessellate to somewhat coarsely verrucose; flowering stems solitary or caespitose; scales and bracts generally many, rarely few, bracts generally closely imbricate, scales loosely or scarcely so; bracts 1 cm—or slightly more or less—long, .5 to .75 cm broad, more or less acute at apex, generally widest near middle or below; flower 1 to 1.5 cm long, subtended by 2 slender bractlets or none; calyx generally with 2 or 3 short abruptly slender teeth; corolla somewhat bent above (extent of curve variable), upper lip longer than lower, more or less truncate, emarginate or entire, edges incurved; filament slender with small tuft of short hairs at base; anther erect, mucronate at tip, sacs somewhat divergent, dehiscing below, with a few long hairs at base; style slender, somewhat curved at apex; stigma variable, but generally asymmetrical and obscurely or rarely conspicuously 2- or 3-lobed, the shape appearing to vary with number of carpels; placentae generally 2 or 3 (sometimes 4); seeds 2 mm, more or less, in diameter, variable in shape, generally angled from pressure, favose.

Parasitic on *Gaultheria Shallon* Pursh, following the range of the host from northern British Columbia southward along the coast, through Vancouver Island, Washington, Oregon, and northern California. Type locality: "The Northwest Coast of America."

A specimen in the Oregon State College Herbarium, collected in Curry County by George Hanson, exhibited together with several normal aerial spikes one which, while bearing fully matured capsules that were crowded with apparently normal mature seeds, remained completely subterranean.

PLATE 1

- Figures 1, 2. *Boschniakia Hookeri*, x 3, showing variability in plants.
3. Flower, x $1\frac{1}{2}$ diameters.
 4. Another form of calyx, x $1\frac{1}{2}$ diameters.
 5. Stamen, x 6 diameters.
 6. Upper corolla lip open.
 7. Upper corolla lip as naturally folded.
 8. Stigma, x 8 diameters.
 - 9, 10, 11. Diagrammatic cross section of ovary, No. 11 rare.



BOSCHNIAKIA STROBILACEA Gray

Ground cone. Cone plant

Family: OROBANCHACEAE.

Boschniakia strobilacea A. Gray, Pac. R. R. Rep. 4: 118. 1856.*Kopsiopsis strobilacea* (Gray) G. Beck, Das Pflanzenreich 4, 261: 306. 1930.*Boschniakia tuberosa* of authors, not *Orobanche tuberosa* Hook. Fl. Bor. Am. 2:92. 1838.*Boschniakia Hookeri* of authors, not Walp. Rep. 3:479. 1844.

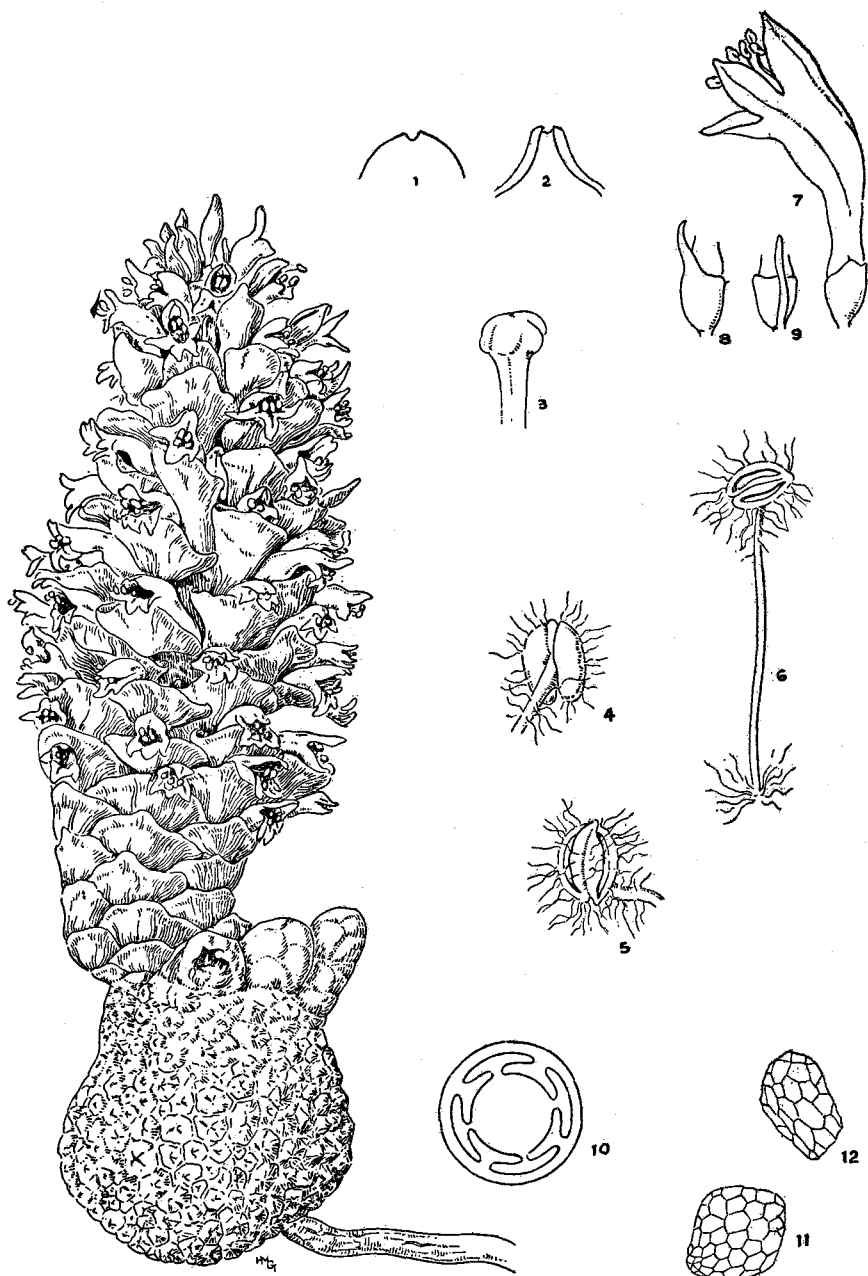
Plant dark red or purple, 15 to 25 cm tall, fleshy, stout, 3.5 to 6 cm thick through flowering portion, sterile stalk generally short and thick; corm-like base 5 to 8 cm in diameter, coarsely verrucose, verrucae geometrical, acute or truncate, often with radiating clefts from center; flowering stems solitary or often caespitose; scales and bracts many, conspicuously imbricate; bracts 1.5 to 2 cm long, 1 to 1.5 cm broad, somewhat variable in shape, but generally truncate or obtuse, broadest above the middle; flower 1.5 cm or longer, without bractlets (rarely with 2 to 4, these more commonly occurring on lower flowers of the spike); calyx truncate or 1- to 3-toothed, teeth short or sometimes as long as the tube; corolla noticeably bent at center; lower lip equalling upper, latter obtuse, sometimes emarginate, the edges incurved; filament slender, with tuft of long hairs at base and apex; anther generally not erect, not conspicuously mucronate, sparsely or copiously villous over most of surface, pollen sacs not diverging; style slender, erect; stigma generally noticeably 4-lobed; placentae 4 (very rarely 3); seeds 2 mm, more or less, in diameter, variable in shape, conspicuously favose.

Parasitic on inland species of *Arctostaphylos*; also reported on *Arbutus Menziesii* Pursh. Occurs from Josephine County, Oregon, southward into the mountains of California. Type locality: "South Yuba, California."

PLATE 2

Boschniakia strobilacea, $\frac{3}{8}$ diameter.

- Figure 1. Upper corolla lip open.
 2. Upper corolla lip as naturally folded.
 3. Stigma, x 8 diameters.
 4, 5. Two views of anther, x 6 diameters.
 6. Stamen, x 6 diameters.
 7. Flower, x 2 diameters.
 8, 9. Two forms of calyx, No. 9 with bractlet, x 2 diameters.
 10. Cross section of ovary (diagrammatic), x 6 diameters.
 11, 12. Two forms of seed, x 8 diameters.



MISCELLANEOUS PLANT STUDIES

ABIES PROCERA Rehd.

Noble fir

Family: PINACEAE

Pinus nobilis Dougl., ex D. Don in Lamb. Descr. Genus *Pinus* ed. 3 (8°) v. 2. 1832.

Abies nobilis (Dougl.) Lindl., Penny Cyc. 1: 30. 1833. Not *A. nobilis* A. Dietr., Fl. Berlin 793. 1824.

A. procera Rehd., Rhodora 42: 522. 1940.

Tree 35 to 100 m tall, reaching diameter of 2.5 m; bark of young trees grayish, of older trees reddish-brown, deeply furrowed; branches stiff, lowermost in young trees sometimes somewhat drooping, others rigidly at nearly right angles to trunk; young twigs pubescent; leaf buds resin-coated; needles of cone-bearing branches stiff, scarcely flattened, not grooved above, acute, with few stomata above, more beneath, these not conspicuous on upper side of tip as in needles of sterile branches; scar oval or somewhat 4-angled; needles of sterile lateral branches flattened, grooved above, ridged beneath, obtuse or notched at apex; stomatal rows of upper surface broken and few except at apex, not on glaucous background; stomatal rows on under surface several, often 6, generally continuous, borne on white glaucous area; scar of flattened leaf nearly circular; resin ducts of needles 2, adjacent to lower epidermis; staminate strobili Vandyke red (R), short-cylindrical to ellipsoid, axillary, clustered in somewhat spike-like form; pollen grain dark and opaque in larger lobe, otherwise translucent; carpellate cone 10 to 20 cm long, 6 to 8 cm thick; scales 2.5 to 3 cm wide, nearly as long, including narrow stipelike base, fan-shaped, puberulent on lower surface, particularly on exposed inrolled margin; bract $\frac{1}{2}$ or more longer than scale, reflexed over scale below, fimbriate to lacerate, abruptly contracted at apex to long point; seed russet (R), enclosed on 2 sides, at maturity, by long truncate obovate very pale buckthorn brown (R) wing; maturing seed enlarging beyond stipitate base of scale and eventually helping to disengage latter from axis; cotyledons 4 or 5 or sometimes more, blunt; hypocotyl violet carmine (R).

Cascade Mountains and high peaks of the Coast Range, Washington and Oregon; Siskiyou Mountains, southern Oregon to northern California. The timberline tree on Mt. Chintimini (Mary's Peak) (4,097 ft.) and Monument Peak (4,683 ft.). Discovered near the Columbia River in the Cascade Mountains, by David Douglas in 1825.

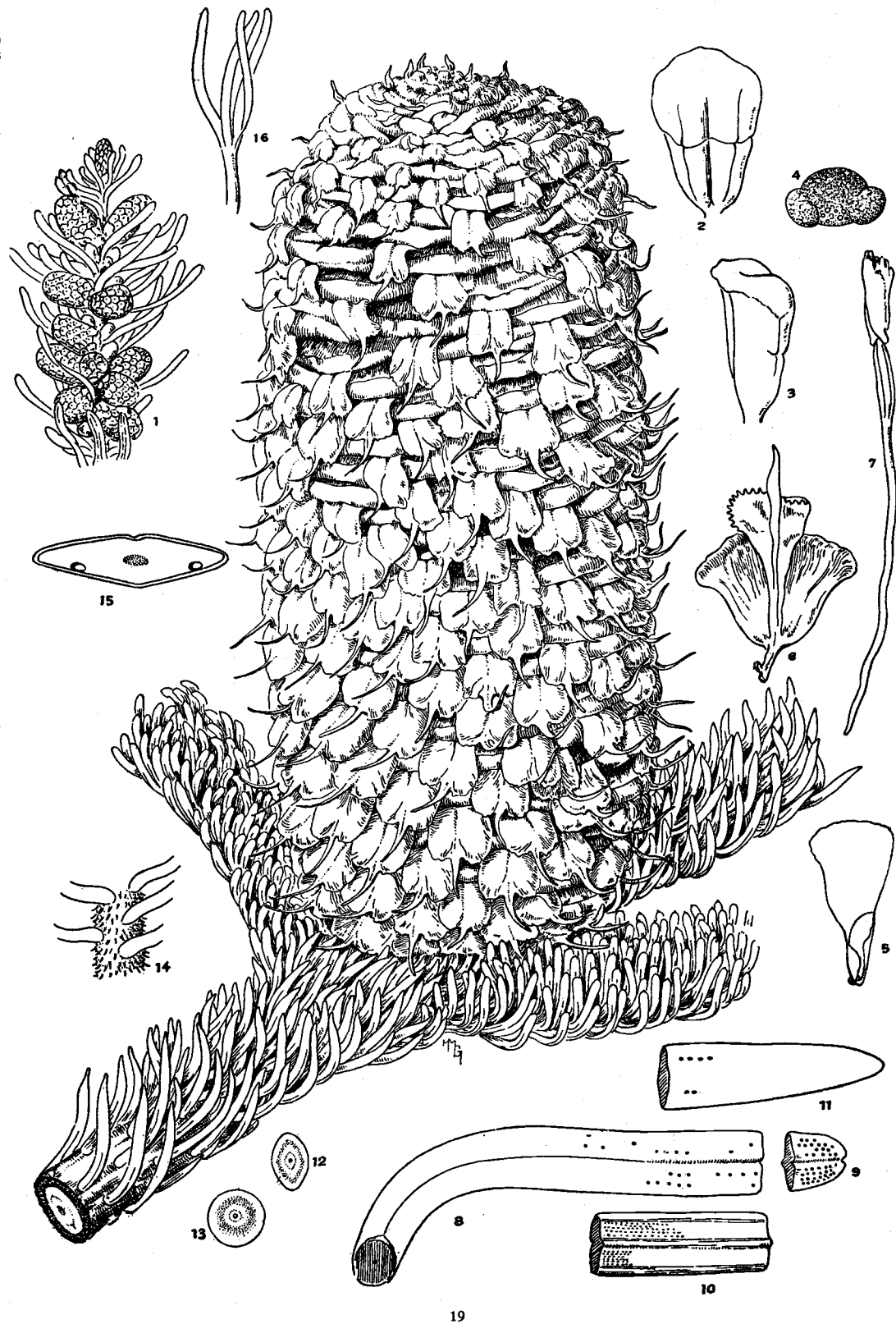
Almost sprucelike in habit, this is one of our noblest conifers, and is characteristic of middle and higher mountain elevations of Oregon and Washington; its altitudinal range extending from 1,400 to 6,000 feet. According to Peavy (1922. 1929) it is the most valuable commercial species of the true firs of the Pacific Coast, but in industry has long passed under the incorrect name "larch," apparently to escape the common prejudice against the wood of the genus *Abies*. It is the dominant species on Larch Mountain near Portland, which undoubtedly was named for this species rather than for true larch or tamarack which is characteristic rather of the eastern slope of the Cascades.

PLATE 3

Abies procera cone x 1, with scales separating from axis.

Figure 1. Staminate twig, x 1.

- 2, 3. Stamen, 2 views, x 8 diameters.
4. Pollen grain.
5. Seed, x 1.
6. Scale and bract, x $1\frac{1}{2}$ diameters.
7. Emerging seedling, x 1.
8. Portion of leaf from sterile branch, ventral view, x 6 diameters.
9. Tip of same, x 6 diameters.
10. Dorsal view of same x 6 diameters.
11. Tip of leaf from cone-bearing branch, x 6 diameters.
12. Scar of leaf from cone-bearing branch, x 6 diameters.
13. Scar of leaf from sterile branch, x 6 diameters.
14. Segment of young twig, showing pubescence, x 2 diameters.
15. Cross section of leaf from sterile twig.
16. Cotyledons, x 1.



ERYTHRONIUM GRANDIFLORUM Pursh

Yellow Erythronium, Yellow lamb's tongue

Family: LILIACEAE

- Erythronium grandiflorum* Pursh, Fl. Am. Sept. 1: 231. 1814.
E. giganteum Lindl., Bot. Reg. t. 1786. 1835.
E. grandiflorum Lindl. var. *giganteum* Hook., Fl. Bor. Am. 2: 182. 1839.
E. grandiflorum Lindl. var. *minus* Hook, Fl. Bor. Am. 2: 182. 1839.
E. grandiflorum Lindl. var. *albiflorum* Hook., Fl. Bor. Am. 2: 182. 1839.
E. Nuttallianum Regel, Gartenfl. 20: 227, pl. 695. 1871. Not R. & S.
E. grandiflorum Lindl. var. *parviflorum* S. Wats., Proc. Am. Acad. 26: 129. 1891.
E. obtusatum Goodding, Bot. Gaz. 33: 67. 1902.
E. utahense Rydb., Fl. Rocky Mts. 165, 1061. 1917.
E. leptopetalum Rydb., Fl. Rocky Mts. 165, 1061. 1917.

Corm long, much sheathed, outer sheaths thicker and darker than inner; leaves not mottled, oblong to oblanceolate, generally acute, the outer wider; flowers one to several, varying greatly in size, segments generally long-lanceolate, acuminate, strontian yellow (R), white at base, 2-4 cm long, 4-8 mm broad, sacs of inner segments conspicuous, nearly equal but two outer less inflated; filaments naphthalene violet (R), scarcely widened at base, those of outer set shorter; unopened anthers cinnamon (R) with purple lines; pollen mass yellow ocher (R); stigmatic branches conspicuous; capsule generally attenuate at base, sometimes shorter and stouter below.

This species, both typical and in its white-anthered or golden-anthered form (Applegate 1935) is distributed from the Rocky Mountains of Idaho, Montana, Wyoming, Colorado, and Utah, to northern California, thence northward along the Cascades, and touching the tips of isolated peaks such as Monument and Fairview, west of the main Cascade backbone in Oregon. The white-anthered form is found also in the Coast Range.

PLATE 4

Erythronium grandiflorum, x 1.

- Figure 1. Inner perianth segment, ventral view, x $1\frac{1}{2}$ diameters.
 2. Inner perianth segment, dorsal view, x $1\frac{1}{2}$ diameters.
 3. Base of inner segment, ventral view x 6 diameters.
 4. Base of inner segment, dorsal view, x 6 diameters.
 5. Pistil, x $2\frac{3}{4}$ diameters.
 6. Outer perianth segment, x $1\frac{1}{2}$ diameter.
 7. Stamen, x $2\frac{3}{4}$ diameters.
 8. Capsule, x 1.
 9. Corm, x 1.



ERYTHRONIUM MONTANUM S. Wats.

Alpine lamb's tongue, Avalanche lily

Family: LILIACEAE

Erythronium montanum S. Wats., Proc. Am. Acad. 26:130. 1891.

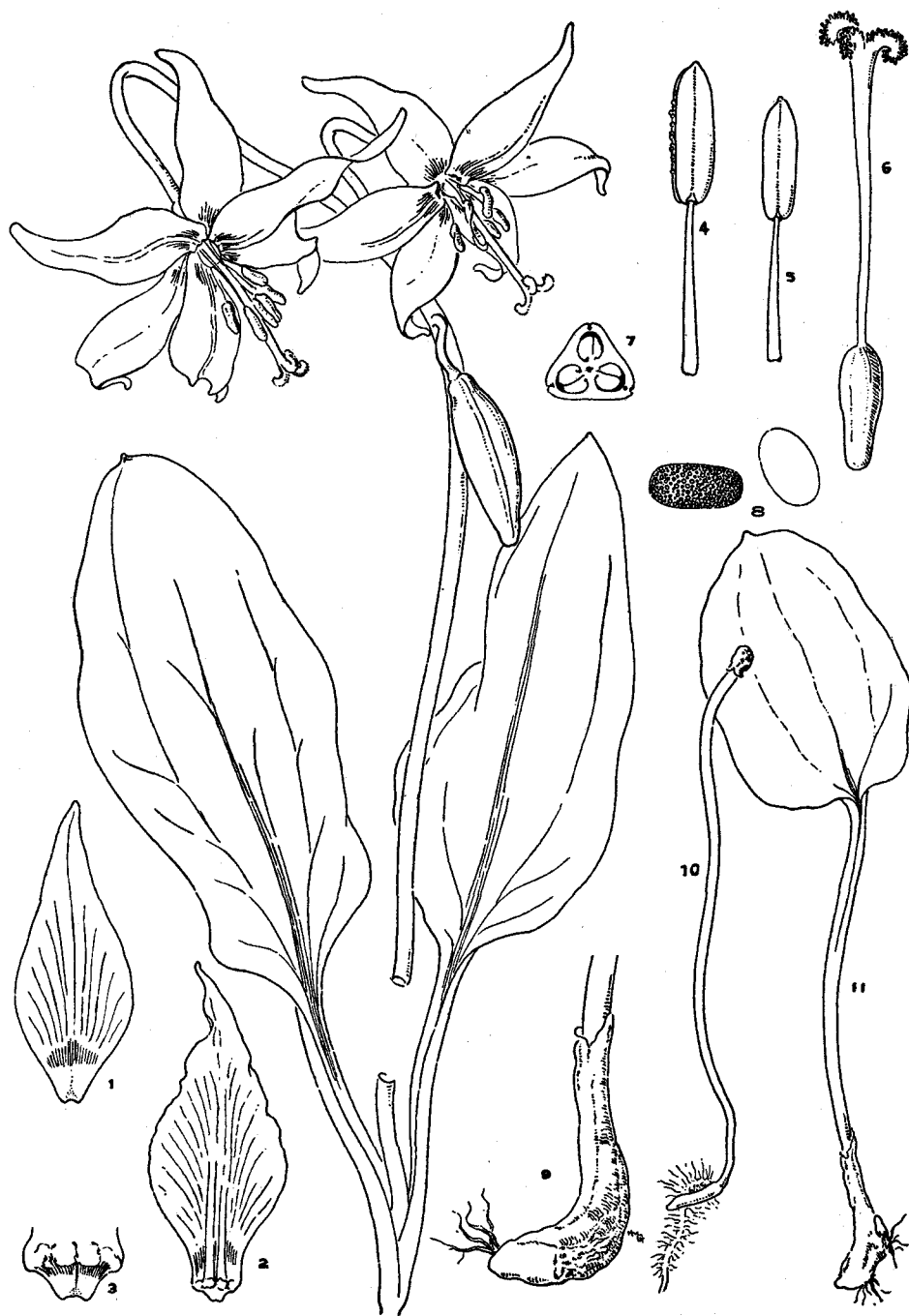
Corms slender, on older plants the thickened bases of preceding years' corms sometimes present in a long chain; leaves unmottled, broad, obtuse or acute at apex, generally abruptly narrowed at base to a slender petiole; flowers one to several, segments pure white within, yellow at base, outer segments often pink-tinged without, the buds pink before opening; median sacs of inner segments somewhat inflated, the lateral narrow and ridge-like; both anthers and filaments of outer set of stamens shorter than those of inner, filaments of both sets narrow; style long, thickened above, stigmatic branches recurved; seedling with very slender corm; single leaf of second-year plant short, broad.

E. montanum is found from northern Linn County northward through the Cascades in Oregon and Washington, in the Olympics, and into British Columbia. Colonies sometimes are large, often isolated on the sides of higher peaks. This species is the "avalanche lily" of Mt. Hood and Mt. Rainier.

PLATE 5

Erythronium montanum x 1

- Figure 1. Outer perianth segment, x $1\frac{1}{2}$ diameters.
2. Inner perianth segment, x $1\frac{1}{2}$ diameters.
3. Crests of inner segment, x $2\frac{3}{4}$ diameters.
4. Stamen opposite inner segment, x $2\frac{3}{4}$ diameter.
5. Stamen opposite outer segment, x $2\frac{3}{4}$ diameters.
6. Pistil, x $2\frac{3}{4}$ diameters.
7. Cross section of ovary, x 3 diameters.
8. Pollen grains.
9. Corm, x 1.
10. Seedling before sloughing of testa, x $1\frac{1}{2}$ diameters.
11. Second year plant, x $\frac{2}{3}$ diameters.



ERYTHRONIUM CITRINUM S. Wats.

Small fawn lily. Adder's tongue

Family: LILIACEAE

Erythronium citrinum S. Wats. Proc. Am. Acad. 22: 480. 1887.

Corm long and slender, generally bearing remains of several previous years' corms, sometimes also bearing offsets resulting in a cluster of plants arising from one source; leaves mottled, lanceolate to oblong, outer generally obtuse, inner acute, petioles sheathing, often reddish; scape sometimes reddish, bearing 1 to 7 or 8 flowers, often appearing fasciated; flowers wide-spreading, segments creamy white, sometimes pink-tinged without, greenish-yellow at base; median sacs of inner segments inflated, lateral sacs smaller; stamens of two sets differing only in length of filaments, latter slender; style clavate, stigma 3-lobed, sometimes obscurely so; capsule obovoid, seed slightly roughened at apex.

This species occurs in a limited area of southwestern Oregon and adjacent California. Type collected "in the Deer Creek Mts., Josephine Co., Oregon."

PLATE 6

Erythronium citrinum x 1.

- Figure 1. Base of inner perianth segment, ventral view, x $2\frac{3}{8}$ diameters.
2. Base of inner segment, dorsal view, x $2\frac{3}{8}$ diameters.
3. Inner perianth segment, ventral view, x $1\frac{1}{8}$ diameters.
4. Outer perianth segment, ventral view, x $1\frac{1}{8}$ diameters.
5. Stamen opposite inner segment, x $2\frac{3}{8}$ diameters.
6. Stamen opposite outer segment, x $2\frac{3}{8}$ diameters.
7. Pistil, x $2\frac{3}{8}$ diameters.
8. Cross section of ovary, x 4 diameters.
9. Pollen grains.

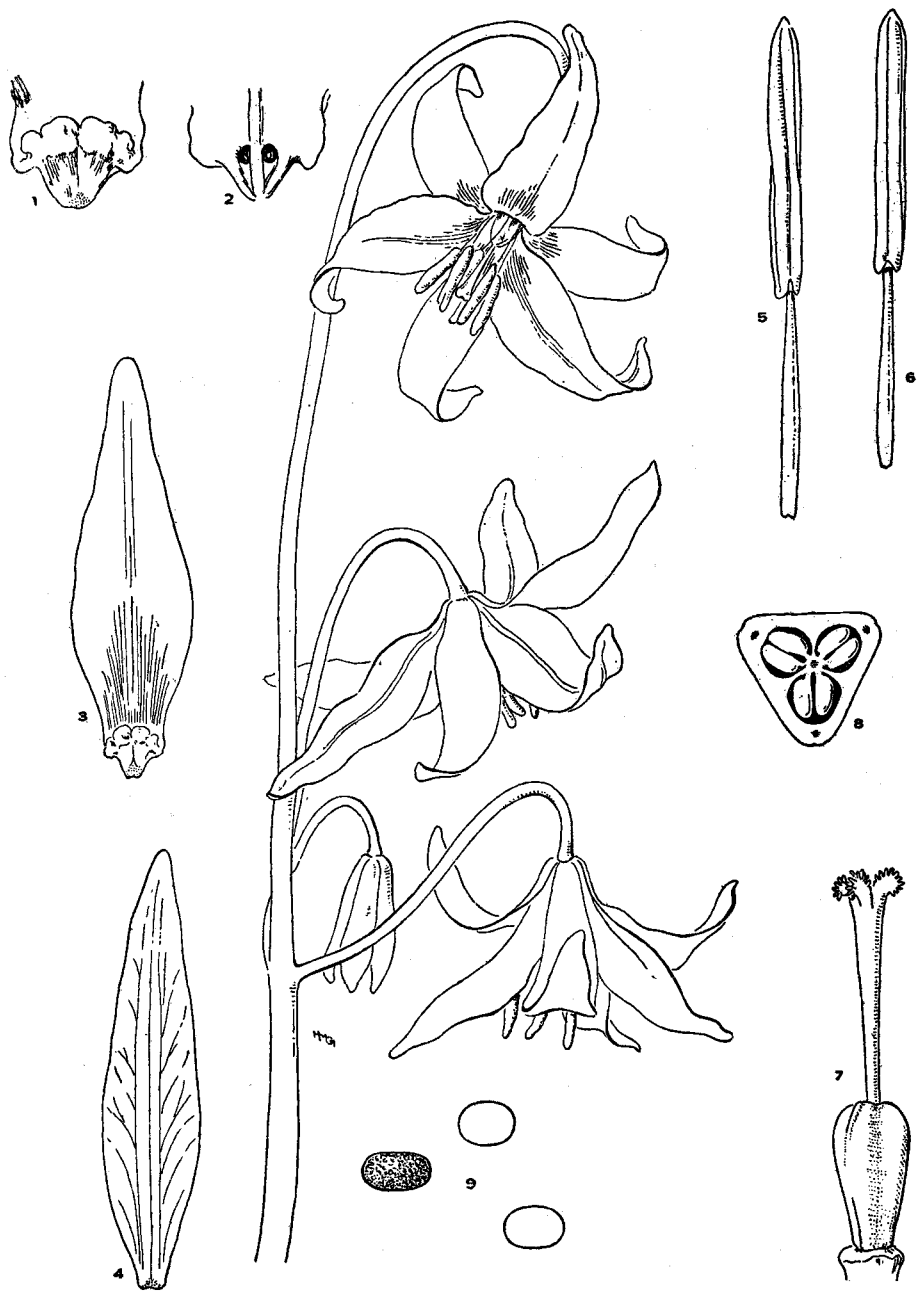
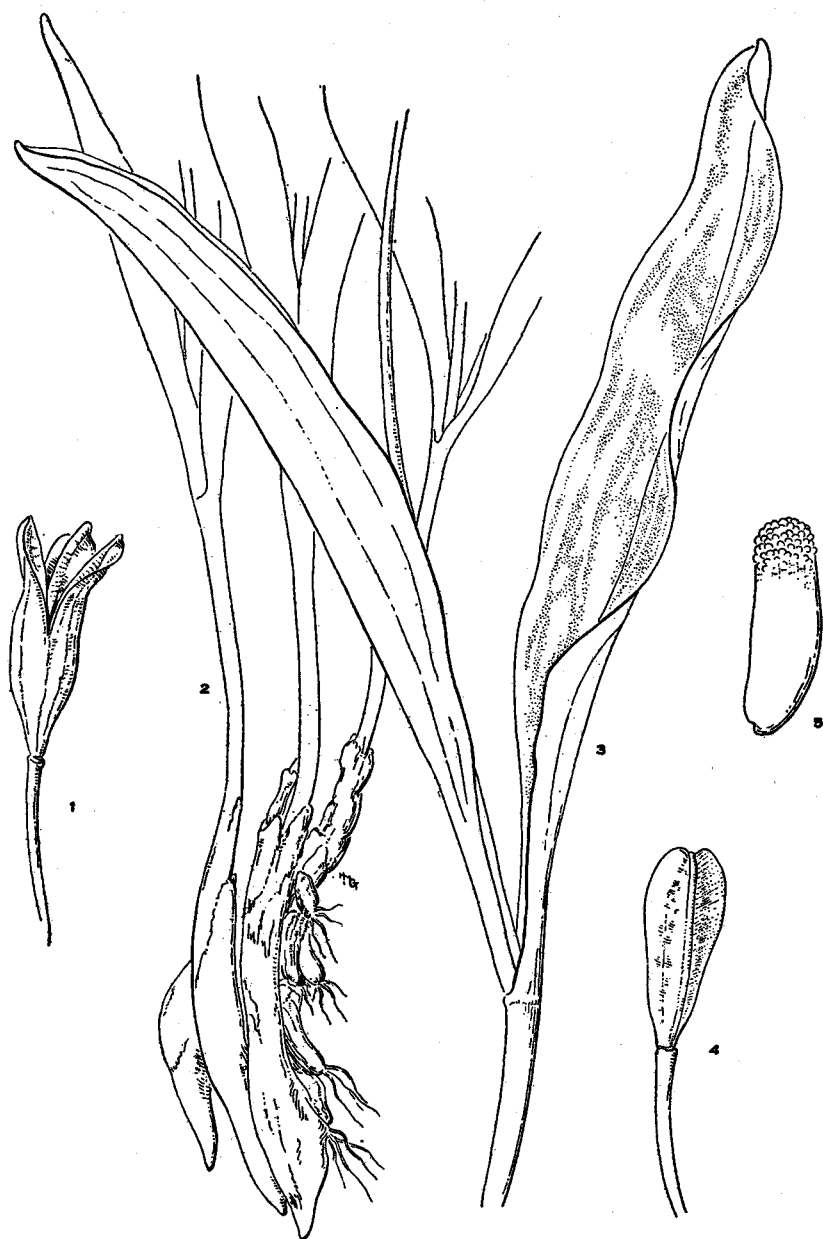


PLATE 7

Erythronium citrinum

- Figure 1. Mature capsule after dehiscence, x 1.
2. Corm with current offshoots bearing aerial stems, and with remains of previous years' corms, x $\frac{2}{3}$ diameter.
3. Leaves, x $\frac{2}{3}$ diameter.
4. Mature capsule before dehiscence, x 1.
5. Seed, x 9 diameters.



ERYTHRONIUM HENDERSONII S. Wats.

Lavender lamb's tongue

Family: LILIACEAE

Erythronium Hendersonii S. Wats. Proc. Am. Acad. 22:479. 1887.

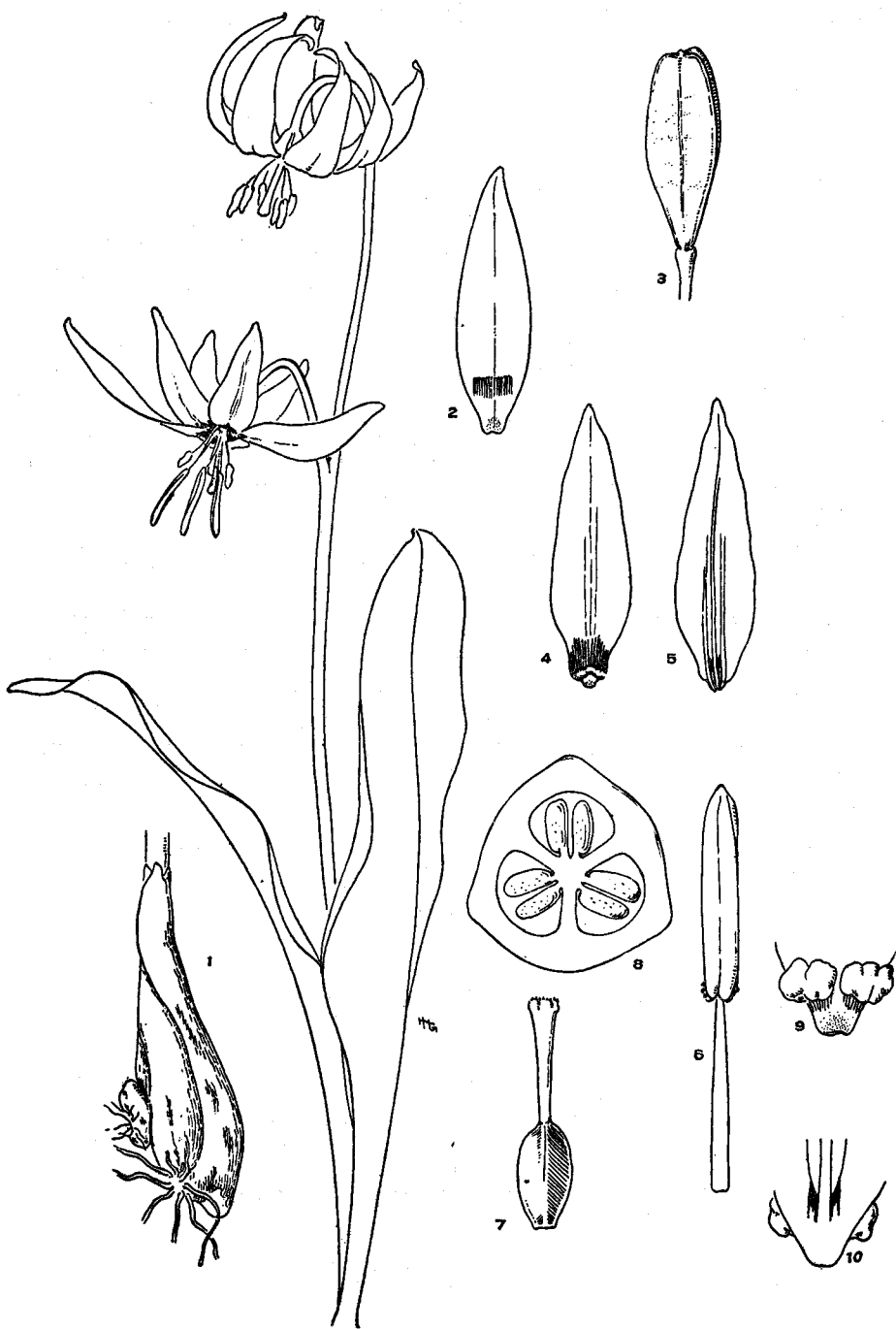
Corm somewhat curved and flattened; leaves generally mottled, broad, the outer leaf generally obtuse, the inner acute, both narrowed to slender or winged petioles; scape one- to several-flowered, sometimes appearing fasciated, purplish; perianth segments variable, often broadly lanceolate, lavender with dark purple marking at base, this more extensive on inner segment, yellowish or whitish band between purple and lavender; appendages variable, inflated; filaments narrow, scarcely widened below; pistil purple, stigma obscurely 3-lobed to nearly entire; capsule somewhat obovoid.

This is one of a group of narrowly-limited endemics found in southern Oregon and a small section of northern California. Its entire known range covers an area probably not more than 80 miles in diameter. Though in some parts of this area it is very abundant, it was unknown to science until 1887 when it was collected by Professor L. F. Henderson, for whom it was named by Dr. Watson.

PLATE 8

Erythronium Hendersonii, x $\frac{3}{8}$ diameter.

- Figure 1. Corm, x 1.
2. Outer perianth segment, x 1.
3. Capsule, x 1.
4. Inner perianth segment, ventral view, x 1.
5. Inner perianth segment, dorsal view, x 1.
6. Stamen, x $2\frac{3}{8}$ diameters.
7. Pistil, x $2\frac{3}{8}$ diameters.
8. Cross section of ovary, x 10 diameters.
9. Base of inner perianth segment, ventral view, showing crests.
10. Base of inner perianth segment, dorsal view.



ERYTHRONIUM REVOLUTUM Smith

Pink Erythronium, Pink lamb's tongue or deer-tongue

Family: LILIACEAE

Erythronium revolutum Smith, Rees' Cyclop. 13: no. 3. 1809.*E. grandiflorum* Pursh var. *Smithii* Hook. Fl. Bor. Am. 2: 182. 1839.*E. revolutum* Smith var. *Bolanderi* S. Wats., Proc. Am. Acad. 26: 129. 1891.*E. revolutum* Smith var. *Johnsonii* Purdy, Bailey Cyclop. Hort. 1900. 1914.

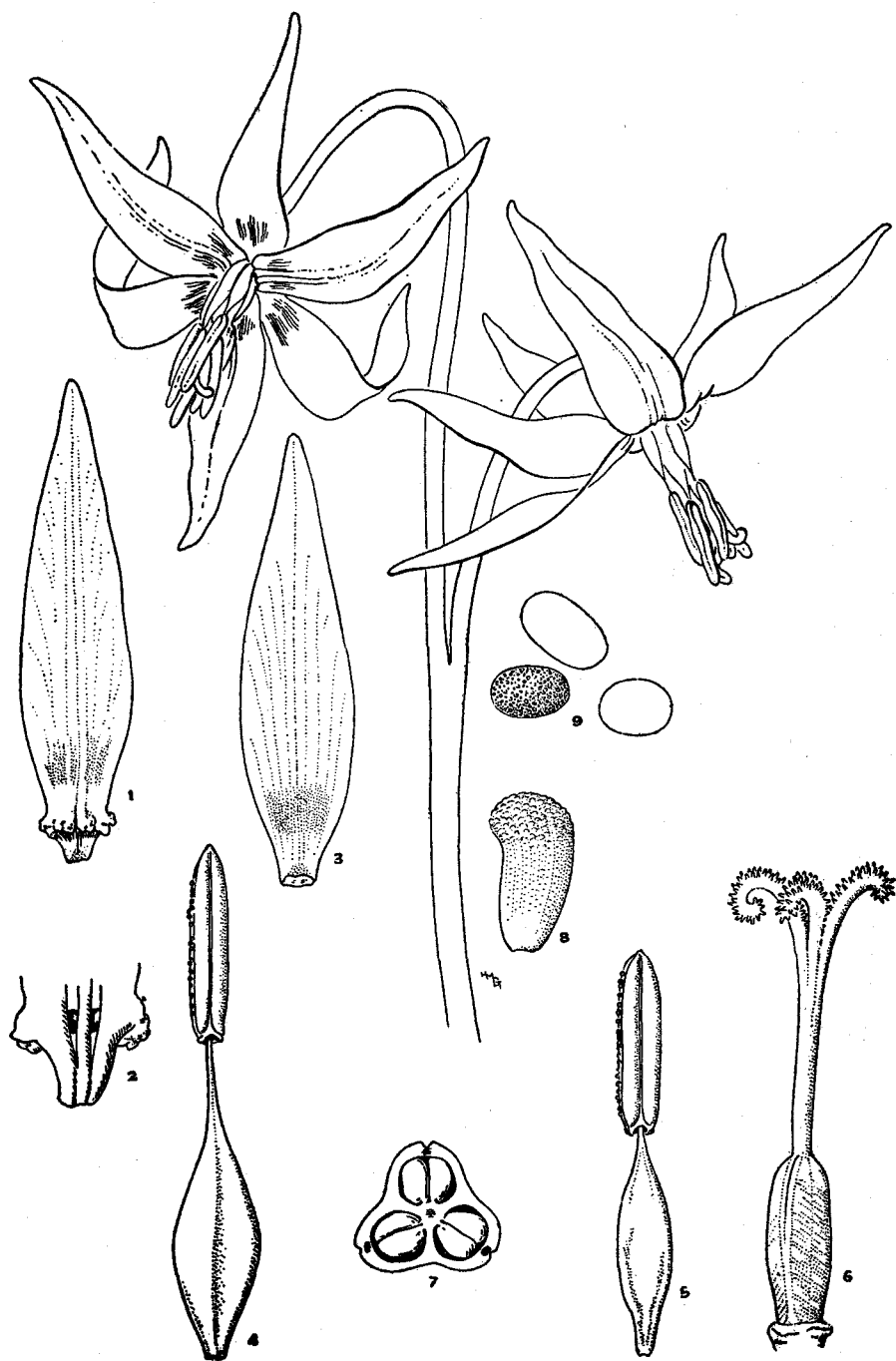
Rhizome thick, heavily encased; the fleshy remains of old corms, each with its persisting tuft of roots, often remaining for several years; leaves usually mottled, generally broad, the inner acute, the outer often obtuse, both narrowed to winged petioles; flowers one to several, the segments narrowly lanceolate, generally acuminate, rose-pink with golden band near base, sacs of inner segments crestlike, not greatly inflated but spreading narrowly laterally; filaments conspicuously flattened, those opposite outer segments shorter and narrower than those of inner set, and somewhat constricted between crests of inner segments; style-branches conspicuous, recurved; capsule slightly and abruptly narrowed at base.

This, the most showy of western *Erythroniums* was also, apparently, the first western species to be discovered. The earliest known collection was made by Archibald Menzies on Vancouver Island in 1793. Later the species was found in Oregon and northern California; but not by botanists in Washington until 1925. This is the more interesting from the fact that it is common in areas of the Washington coast where it was known by school children fifty years ago. Throughout its entire range it is restricted to the coastal region, reaching as far inland only as Chitwood in Oregon. Although in this state it extends from Curry to Clatsop counties, it is not generally distributed throughout this area but occurs in more or less isolated colonies.

PLATE 9

Erythronium revolutum x 1.

- Figure 1. Inner perianth segment, ventral view, x $1\frac{1}{2}$ diameters.
 2. Base of inner segment, dorsal view, x $2\frac{2}{3}$ diameters.
 3. Outer perianth segment, ventral view, x $1\frac{1}{2}$ diameters.
 4. Stamen opposite inner segment, x $2\frac{2}{3}$ diameters.
 5. Stamen opposite outer segment, x $2\frac{2}{3}$ diameters.
 6. Pistil, x $2\frac{2}{3}$ diameters.
 7. Cross section of ovary, x 6 diameters.
 8. Immature seed, x 6 diameters.
 9. Pollen grains.



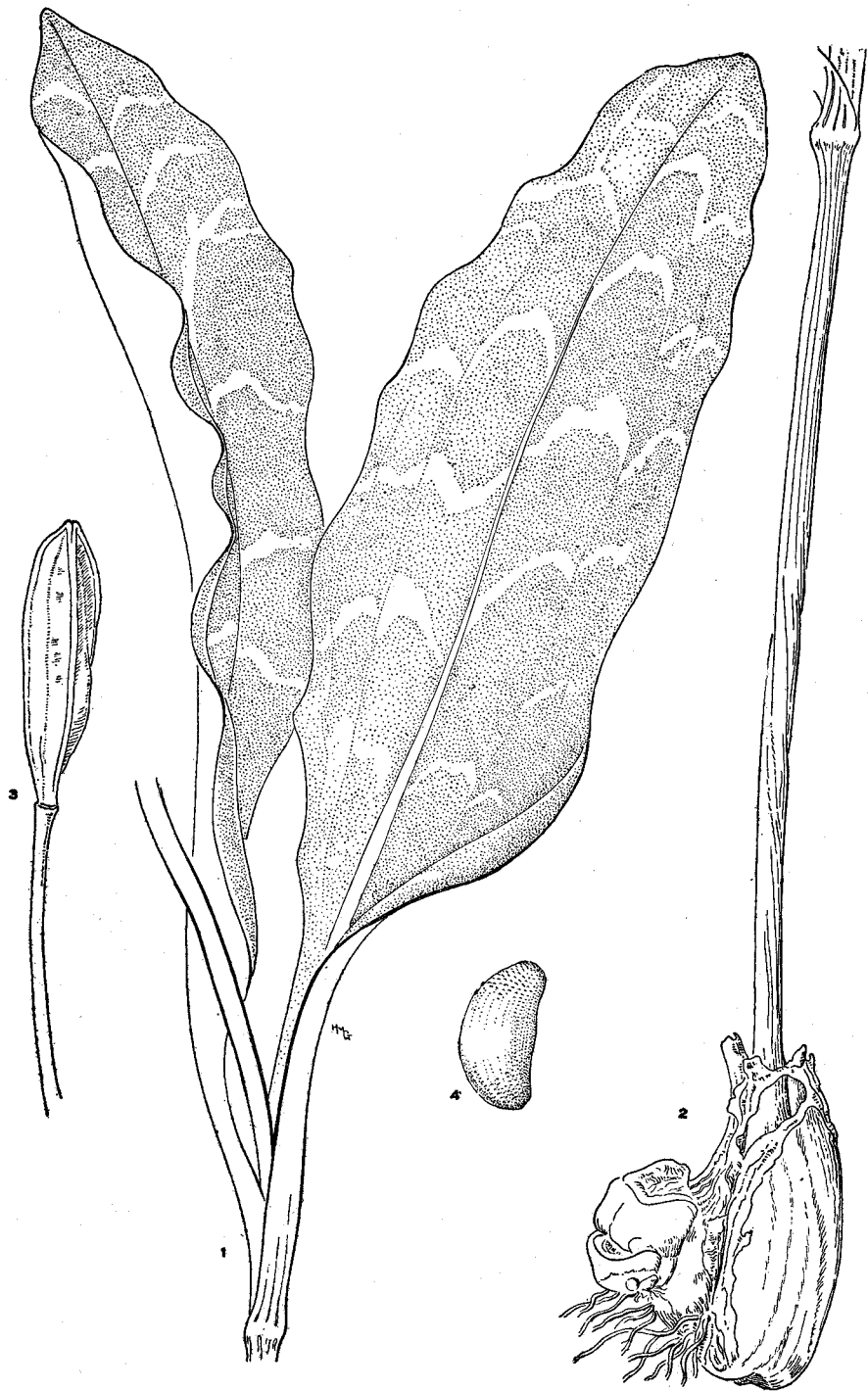


PLATE 10

Erythronium revolutum

- Figure 1. Leaves, x 1.
 2. Corm, with remains of previous years' corms, x 1.
 3. Capsule, x 1.
 4. Seed, x 4 diameters.

ERYTHRONIUM OREGONUM App.

Fawn lily, Cream lamb's tongue

Family: LILIACEAE

Erythronium oregonum Applegate, Madroño 3: 58-113. 1935.*Erythronium giganteum* of authors, not Lindley.*Erythronium grandiflorum* Pursh var. *albiflorum* of authors, not Hooker.

Corm 4-5 cm long, 10-20 mm wide, somewhat flattened laterally, slightly curved, generally broadest near base, apex round-pointed, white, but corm more or less enclosed in brownish scales, the inner scarious, the outer thicker, remains of last year's corm present; scape 30 cm or less in height; outer leaf 15 cm, more or less, long, about 5 cm wide, rounded at apex, gradually or sometimes abruptly narrowed to winged petiole; inner leaf somewhat shorter and narrower, more or less lanceolate, more acute at apex; both leaves shining green beneath, generally "water-marked" above, the intervening areas green or often dark brownish (dark mottling generally more conspicuous in plants grown in open); peduncles 1-4 (rarely more, often 2-) flowered; perianth segments nearly equal, somewhat contorted, reaching 5 cm in length, typically pale cream (seafoam yellow R), citron-green (R) at base, with primuline yellow (R) area above, narrow-lanceolate to broader, or even obovate, the outer segments generally slightly broader than inner, inner segments centrally ridged lengthwise and bearing near base 4 crest-like sacs, the 2 outer sacs less inflated than inner, 2 openings distinct on dorsal side; filaments of shorter stamens (those opposite outer perianth segments) less flattened than those of longer stamens, slightly inflated and deformed by pressure of adjoining 2 crests; anthers of both long and short stamens typically golden yellow; style branches conspicuous, spreading; ovary 3-angled, the angles rounded and slightly notched above; capsule long-obovoid, 3-angled; seeds minutely roughened, slightly curved, broader at apex than base; seedling with single narrow leaf, developing minute corm; two-year plant with broader leaf and remains of preceding year's corm.

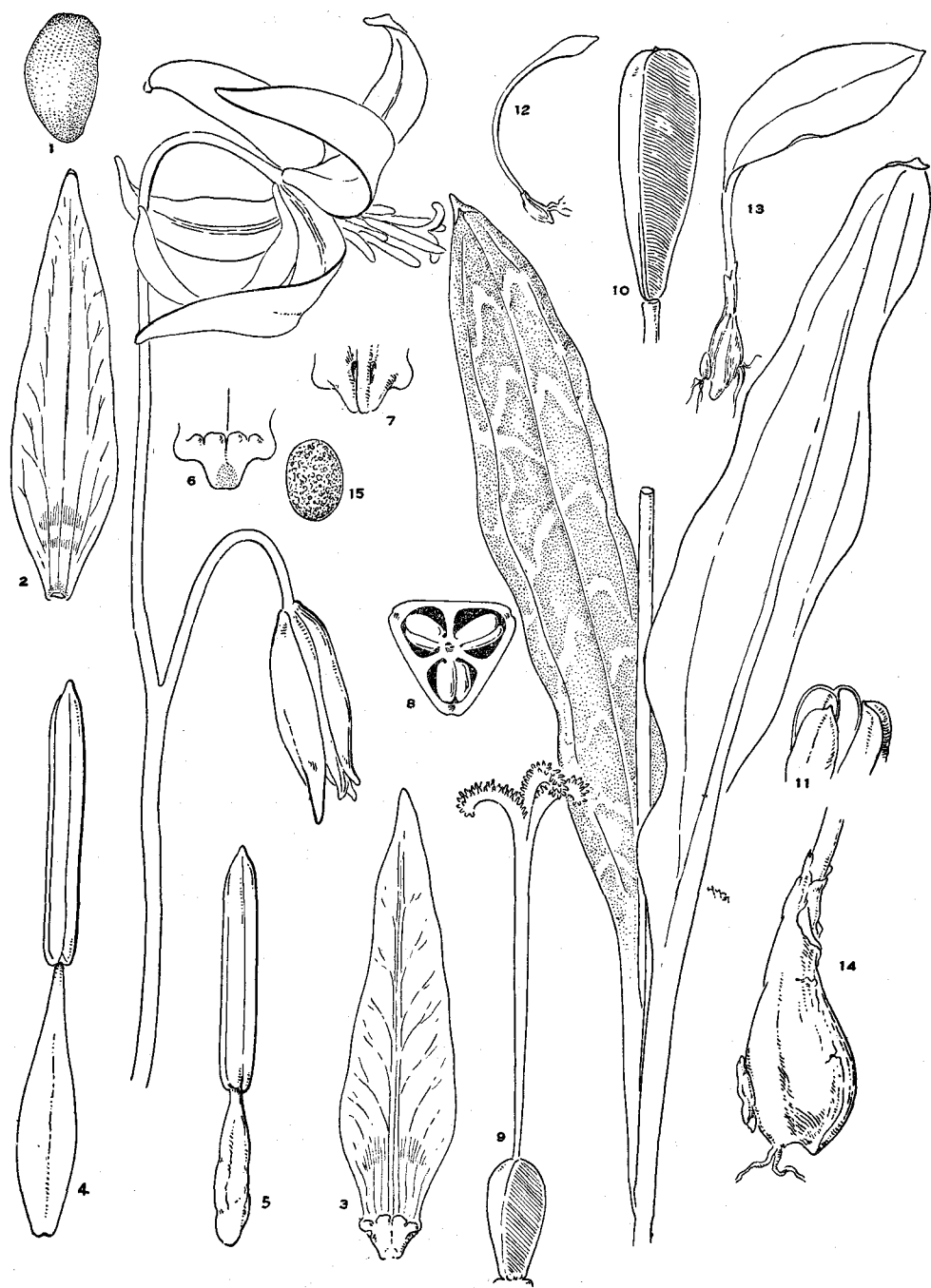
Not until 1935 (Applegate) was this species, which is abundantly represented from British Columbia to west-central Oregon, and again in Coos and Curry counties, Oregon, given a specific name. For many years it had erroneously been cited under the names *E. giganteum* Lindl. and *E. grandiflorum* Pursh var. *albiflorum* Hook. These two latter names are now, by Mr. Applegate, reduced to synonymy under *E. grandiflorum* Pursh.

About Olympia, Washington, and northward into British Columbia occurs a delicate white-flowered form of *E. oregonum*; and in southwestern Oregon, northward to Washington County, Oregon, but thinning out in its northward range, a white-anthered form (*E. oregonum* App. subsp. *leucandrum* App.). In Benton County, Oregon, this form is more inclined to inhabit woods along Willamette River bottom lands, while the typical golden-anthered form is abundant in the foothills.

PLATE 11

Erythronium oregonum App. subsp. *leucandrum* App. x 1.

- Figure 1. Seed, x 4 diameters.
2. Outer perianth segment, x $1\frac{1}{3}$ diameters.
 3. Inner perianth segment, x $1\frac{1}{3}$ diameters.
 4. Stamen opposite inner segment, x 3 diameters.
 5. Stamen opposite outer segment, x 3 diameters.
 6. Base of inner segment, ventral view, x $2\frac{2}{3}$ diameters.
 7. Base of inner segment, dorsal view, x $2\frac{2}{3}$ diameters.
 8. Cross section of ovary, x 6 diameters.
 9. Pistil, x 3 diameters.
 10. Capsule, x 1.
 11. Apex of opened capsule, x 1.
 12. First year plant, x $\frac{2}{3}$ diameter.
 13. Second year plant, x $\frac{2}{3}$ diameter.
 14. Corm, x 1.
 15. Pollen grain.



FRITILLARIA LANCEOLATA Pursh

Mission bells, Spider lily, Coffee lily, Rice-root lily

Family: LILIACEAE

- Fritillaria lanceolata* Pursh, Fl. Am. Sept. 1: 230. 1814.
Amblyrium lanceolata Sweet, Hort. Brit. ed. 1: 427. 1827.
Lilium affine Schult., Syst. Veg. 7: 400. 1829.
Fritillaria mutica Lindl., Bot. Reg. t. 1663. 1835.
Fritillaria lanceolata var. *floribunda* Benth., Pl. Hartweg. 338. 1857.
Fritillaria viridea Kell., Proc. Calif. Acad. Sci. 2: 9. 1863.
Liliorhiza viridea Kell., ibid., p. 48. 1863.
Fritillaria esculenta Nutt. ex Baker, Jour. Linn. Soc. 14: 271. 1874.
Fritillaria lanceolata var. *gracilis* Wats., Proc. Am. Acad. Sci. 14: 259. 1879.
Fritillaria mutica var. *gracilis* Jepson, Fl. West. Mid. Calif. 188. 1901.
Fritillaria Lunellii Nelson, Proc. Biol. Soc. Wash. 20: 35. 1907.
Fritillaria lanceolata var. *tristulis* Grant, in Jepson Fl. Calif. 1: 308. 1921.
Fritillaria ojaiensis Davidson, Bull. So. Calif. Acad. Sci. 21: 41. 1922.
Fritillaria eximia Eastwood, Lfts. West. Bot. 2: 112. 1938.

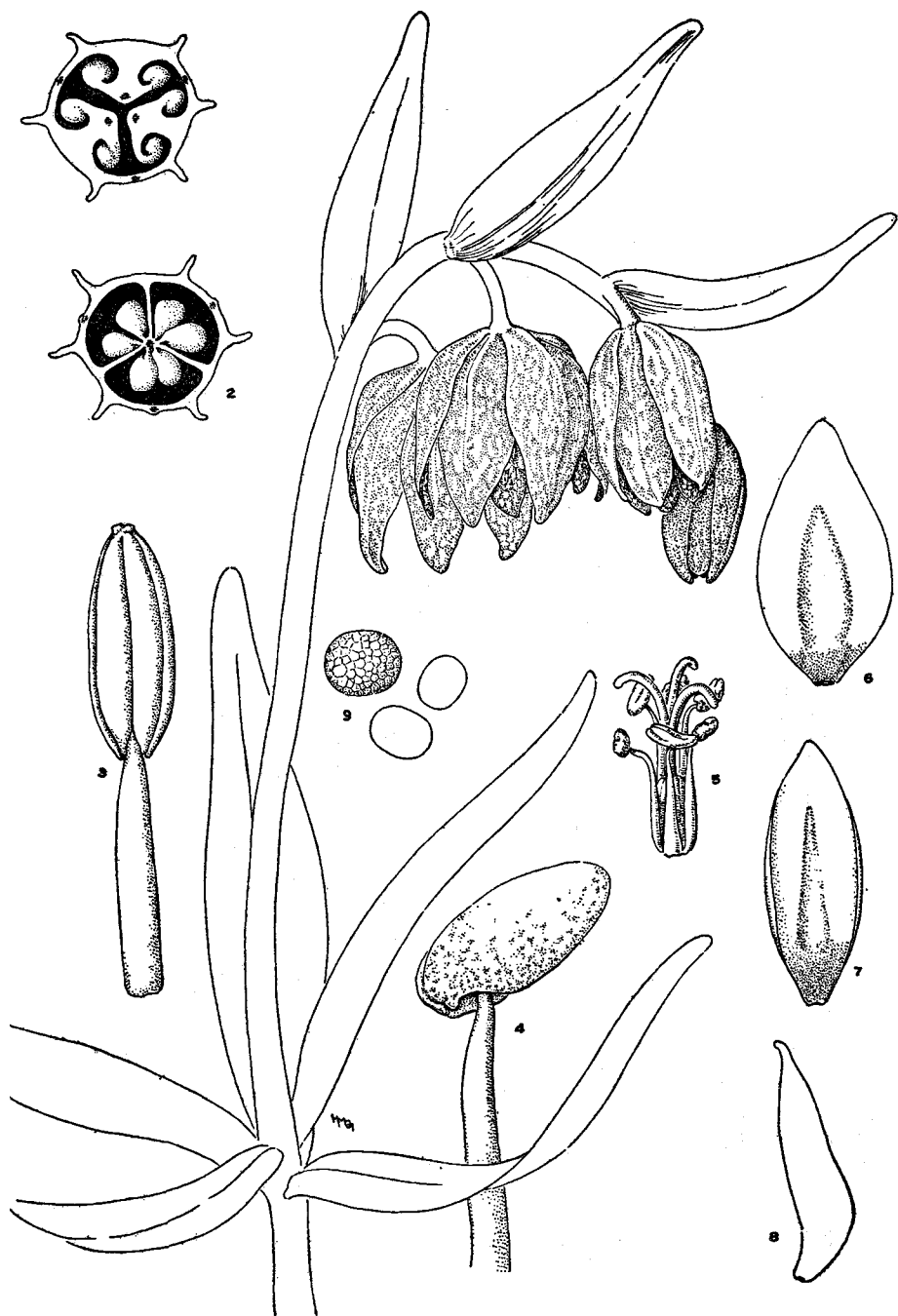
Dorothy E. Beetle's Monograph of the North American Species of *Fritillaria* (1944) convincingly discusses the foregoing synonymy. She says (p. 136): "It would seem that the *Fritillaria lanceolata* complex is a system of ecotypes in which the various habitats have developed their own races within the species." Her statement seems borne out by her own studies and the observations of others in the field. Certainly vegetative reproduction, as she suggests, has a definite place in the picture, perhaps even to a greater extent than is at present known. A large colony observed this season by the writer was completely sterile, not a single ovary having matured, though young plants, growing from bulblets surrounding the parent plants, were numerous. While scattered individuals may be found, generally this species occurs in colonies, with extreme variation in size, color, markings of flowers, leaf shape, and arrangement.

In Oregon the species has an altitudinal range from sea level to 4,000 feet or more.

PLATE 12

Fritillaria lanceolata, x 1

- Figure 1. Cross section upper part of ovary, x 8 diameters.
 2. Cross section lower part of ovary, x 8 diameters.
 3. Stamen before anthesis, x 4 diameters.
 4. Stamen after anthesis, x 4 diameters.
 5. Stamens and pistil.
 6. Outer perianth segment, x $1\frac{1}{2}$ diameters.
 7. Inner perianth segment, x $1\frac{1}{2}$ diameters.
 8. Lateral view, outer perianth segment, x $1\frac{1}{2}$ diameters.
 9. Pollen grains.



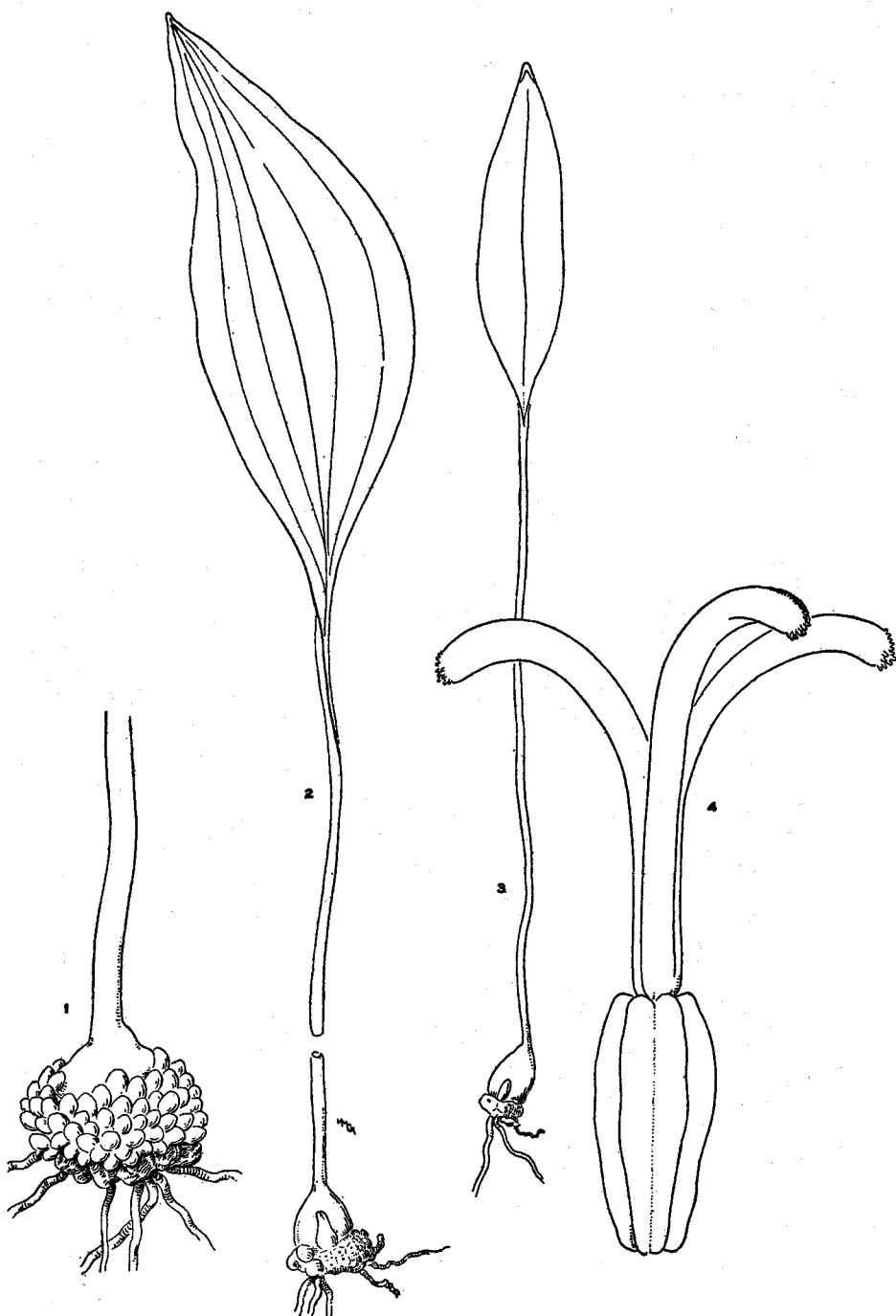


PLATE 13

Fritillaria lanceolata

- Figure 1. Corm, x $\frac{3}{4}$ diameter.
 2. Third year plant, x $\frac{3}{4}$ diameter.
 3. Second year plant, x $\frac{3}{4}$ diameter.
 4. Pistil, x 4 diameters.

LILIUM WASHINGTONIANUM Kell.

Lady Washington lily, Mt. Hood lily, Santiam lily, Cascade lily

Family: LILIACEAE

Lilium Washingtonianum Kell., Proc. Calif. Acad. Sci. 2: 13. 1863. Not

L. Washingtonianum Dombroin, Flor. Mag. t. 33. 1872.

Lilium Washingtonianum Kell. var. *purpureum* Baker, Jour. Linn. Soc. 14: 233. 1874.

Bulb elongated (10 to 20 cm), subrhizomatous, the scales 2.5 to 5 cm long, narrow, rather thin, not jointed; stem 6 to 15 dm tall, somewhat ridged above; leaves generally horizontal, 3.5 to 14 cm long, mostly oblanceolate, undulate or not, arranged in several whorls with occasional leaves solitary; flowers campanulate, generally white at first, aging purplish, those of older plants racemose or subumbellate, those of young plants often solitary; buds somewhat declinate at junction with pedicels; flower fragrant; outer segments averaging 8 or 9 cm (longer or shorter), white at first with sometimes a dorsal wash of Thulite Pink (R), greenish at tip and base, white within, or translucent to dorsal wash and thus appearing faintly shell-pink, Crees Green (R) at base, a longitudinal line of Primrose Yellow (R) from base to middle, Dahlia Purple (R) dots scattered sparingly over area below; inner segments broader than outer, with similar color and markings, purple dots generally more numerous; both inner and outer segments spreading, long-clawed, yielding nectar at base; filaments of stamens slender, slightly and gradually widened below; anthers dehiscent entire length, valves of the two pollen sacs turning back to back; style very narrowly clavate, obscurely 3-lobed, stigmas papillose; capsule 2.5 to 3 cm long, 1.5 to 2 cm broad, oblong or obovoid, abruptly narrowed at base, truncate above, 6-ridged.

Both slopes of the Cascades in Oregon, originally extending westward into the Willamette Valley, but now rare in that region; above timber line at 4,500 to 6,000 feet on isolated peaks of the Calapooya Mountains; Siskiyou Mountains; near the coast in Southern Oregon, southward into California.

Fifty years ago plants of this species were common on the lowlands of the Willamette Valley in the vicinity of Monroe and Junction City, and scattered plants along hedgerows and in the grainfields remained until as recently as ten years ago. Cultivation and pasturage, however, together with their popularity for gardens, have combined to eliminate them from such accessible areas.

The plants appear naturally adaptive to a rather wide range of conditions. On various isolated peaks in the Calapooya Mountains they grow in the open above timberline, in company with *Gilia aggregata* (Pursh) Spreng., *G. capitata* Hook., *Veratrum insolitum* Jeps., *Leptodactylon Nuttallii* (Gray) Rydb., *Polemonium carneum* Gray, and other species representing overlapping floras. On the eastern slope of the Cascades they are found in greatest abundance in dry open pine forests; while they occur in typical thickets and clearings of the more humid western slope, in company with *Holodiscus discolor* (Pursh) Maxim., *Philadelphus Lewisii* Pursh, *Acer circinatum* Pursh, and *Rubus* spp., interspersed with Douglas fir.

PLATE 14

Lilium Washingtonianum x $\frac{1}{2}$ diameter.

- Figure 1. Stamen, closed, x 2 diameters.
2. Partly developed capsule.
3. Anther, open, x 1.
4. Outer perianth segment, x 1.
5. Inner perianth segment, x 1.
6. Cross section of ovary, x 6 diameters.
7. Pistil, x 2 diameters.



LILIUM RUBESCENS S. Wats.

Chaparral lily, Lilac lily

Family: LILIACEAE

Lilium rubescens S. Wats., Proc. Am. Acad. 14: 256. 1879.*Lilium Washingtonianum purpureum* Masters, Gard. Chron. 2: 322. 1874. Not Baker, 1874.

Bulb subrhizomatous, 3.5 to 5 cm long; scales 2.5 cm or less long, generally broadly lanceolate; stem 5 to 7.5 dm tall; leaves more or less erect, oblanceolate, smaller above, in several complete or broken whorls, a few leaves scattered alternately on stem, especially below whorls; flowers 2 to 10, nearly white at first, aging purplish, solitary, racemose, or rarely subumbellate; outer segments narrower than inner, latter dorsally ridged longitudinally through center, both segments at length revolute, greenish below, at first white above with yellowish longitudinal line through center, surface generally copiously and minutely dotted with Dahlia Purple (R) to Mineral Red (R), rarely without dots; apex of both segments minutely papillose; filaments of stamens slender, anthers completely dehiscent, style short-clavate, obscurely 3-lobed, stigmas papillose.

Josephine and Jackson counties, Oregon, to San Francisco Bay Region, California. In open woods; also among chaparral of *Arctostaphylos* spp., *Quercus vaccinifolia* Kell., and *Lithocarpus densiflora* (H. & A.) Rehd. var. *echinoides*. (R. Br.) Abrams.

Certain resemblances between this species and *L. Washingtonianum* have occasioned nomenclatorial confusion in the work of early authors.

Both species bear leaves in several whorls; and the flowers of both are generally at first white, aging purplish. *L. rubescens* averages shorter in height, however, with all corresponding parts definitely smaller; the buds are erect, the perianth is revolute not campanulate; the segments differ in shape, as illustrated, and are not conspicuously long-clawed; while the style is very short-clavate, in comparison with the long slender style of *L. Washingtonianum*.

Watson (1879) describes the flowers of the latter as horizontal, those of *L. rubescens* as ascending; and Abrams (1923. 1940) keys out the two species on this basis, though his illustrations are not completely convincing except in the case of buds. Both from observation in the field and from comparison of many herbarium specimens the present writer finds this an uncertain point of separation, at least in mature flowers. In *L. Washingtonianum* the buds often are suberect; and the flowers, on first opening and for some time after, maintain the same position, though later they may become horizontal or even slightly reflexed. In this case, the pedicels again straighten, for the fruits are erect. In *L. rubescens*, the pedicels not uncommonly stand at almost right angles to the stem, and may be curved apically to place the

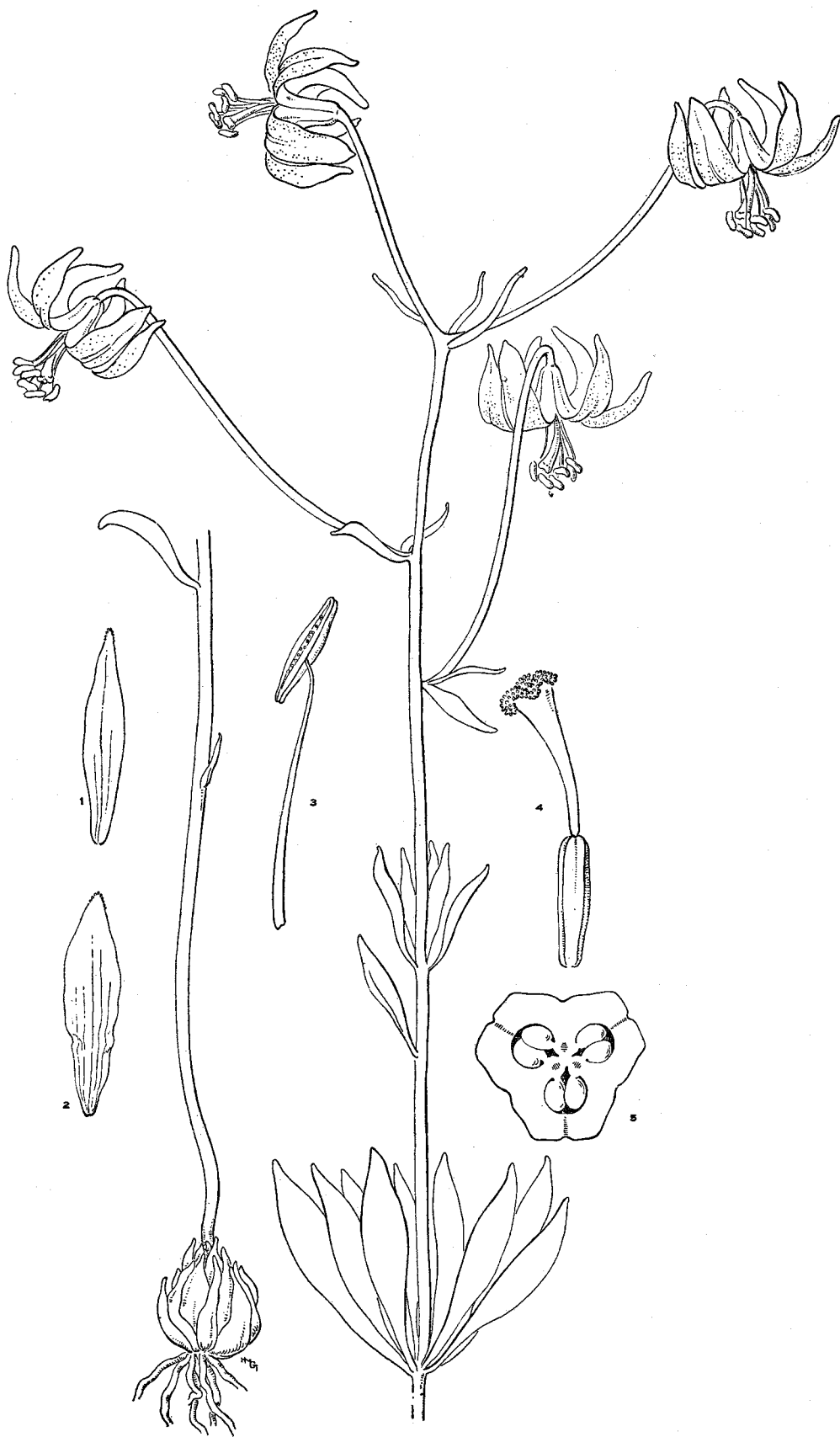
flower in a horizontal or even pendent position. In both species, however, flower position appears to vary with circumstances, and is not a safe diagnostic character.

L. Washingtonianum Kell. var. *purpureum* Masters (Masters, 1874) is cited by Watson and other writers as a synonym of *L. rubescens*; and this probably is correct, though Masters himself believed he was dealing with *L. Washingtonianum* var. *purpureum* Baker (1874), which obviously was an aging or naturally purple-tinted form (the latter, according to Purdy in Jepson, Fl. Calif. 1:310. 1922) of *L. Washingtonianum*. Masters describes his variety from two specimens, one umbellate, the other racemose. His habit illustration, made from the first specimen, identifies it rather clearly as *L. rubescens*, though in somewhat unusual form; but the separate single flower is atypical in its proportions.

PLATE 15

Lilium rubescens, x $\frac{3}{4}$ diameter.

- Figure 1. Outer perianth segment, x 1.
2. Inner perianth segment, x 1.
3. Stamen, x 2 diameters.
4. Pistil, x 2 diameters.
5. Cross section of ovary, x 10 diameters.



LILIUM OCCIDENTALIS Purdy

Western lily, Red lily

Family: LILIACEAE

Lilium occidentale Purdy, Erythea 5: 103. 1897.

Bulb subrhizomatous, scales thick, fleshy, jointed; stem 6 to 18 dm tall, leaves linear to narrowly lanceolate, reaching 1.5 dm, alternate, or often with several whorls near middle of stem, scattered above and below; flowers one to many, racemose or subumbellate, on pedicels 7 to 22 cm long; perianth segments at first spreading, then recurved, outer segments broadly lanceolate, greenish at base, with a broad central longitudinal orange, coarsely black-dotted or purple-dotted stripe to middle or above, segment ox-blood red (R) from here to apex; inner segments similar but narrower (sometimes oblanceolate), the orange area shorter; filament slightly widened at base; style obscurely 3-lobed, stigmas papillose.

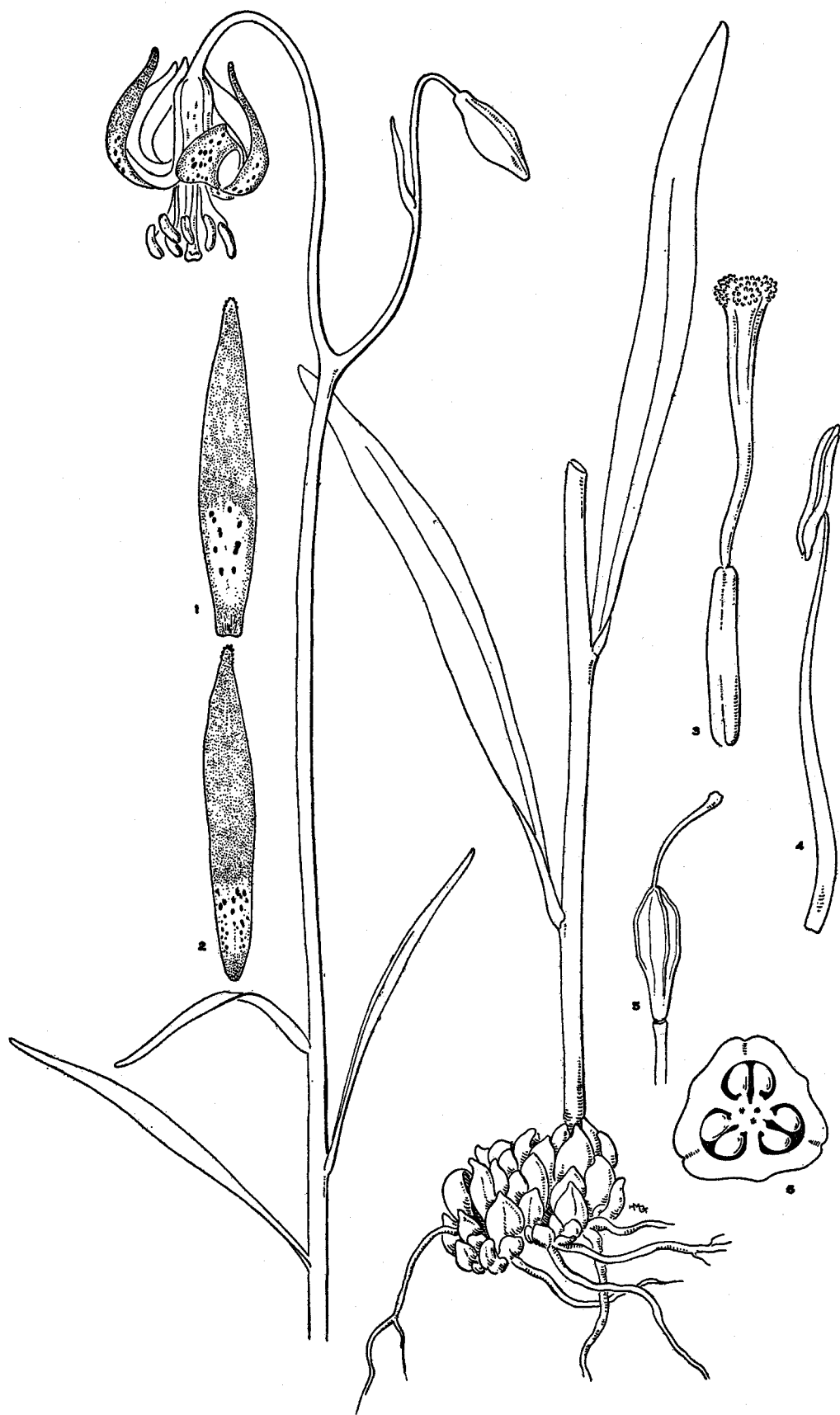
Bogs near coast, from Curry County, Oregon, to Humboldt County, California. Type locality: Humboldt County, California.

A lily living within very narrow environmental limits, and said by Purdy (1897) to be replaced south of Ten Mile River in Mendocino, California, by *L. maritimum* Kell.

PLATE 16

Lilium occidentale, x $\frac{2}{3}$ diameter.

- Figure 1. Outer perianth segment, x 1.
2. Inner perianth segment, x 1.
3. Pistil, x 2 diameters.
4. Stamen, x 2 diameters.
5. Partly developed capsule.
6. Cross section of ovary, x 10 diameters.



TRILLIUM CHLOROPETALUM (Torr.) How.

Giant trillium

Family: LILIACEAE

Trillium sessile L. var. *giganteum* H. & A., Beechey 402. 1841.*Trillium sessile* L. var. *chloropetalum* Torr., Pac. R. R. Rep. 4: 151. 1856.*Trillium sessile* L. var. *angustipetalum* Torr., Pac. R. R. Rep. 4: 151. 1856.*Trillium sessile* L. var. *californicum* S. Wats., Proc. Am. Acad. 14: 273. 1879.*Trillium chloropetalum* Howell, Fl. N. W. Am. 1: 661. 1902.*Trillium giganteum* Heller, Bull. S. Calif. Acad. Sci. 2: 67. 1903.*Trillium giganteum* Heller var. *chloropetalum* Gates, Ann. Mo. Bot. Gard. 4: 50. 1917.*Trillium giganteum* Heller var. *angustipetalum* Gates, Ann. Mo. Bot. Gard. 4: 51. 1917.

Rhizome stout, more or less horizontal; stem stout, 12 to 24 cm tall; leaves broadly ovate, sessile, obtuse or abruptly acute at apex, overlapping at base, dark green, sometimes dark-mottled; flower sessile, the 5 whorls slightly fused at base; bud erect; sepals generally narrowly oblong; petals narrowly obovate, at first white or greenish, changing with age to pink, then dark reddish purple; stamens of 2 sets nearly equal in length, one generally doubled over style, anthers long, narrow, filaments very short, 1/6 to 1/8 as long as anthers; fruit fleshy, becoming dark purple, remaining enclosed in slightly accrescent sepals; seedling with a single slender leaf; leaf of second year single, broad; third or fourth year, plant bearing three leaves but no blossom.

Moist woods, western Oregon to Washington and California.

Interesting characteristics of this species are the erect style-branches which become more or less twisted about each other as the fruit develops; the elaborate fluting of the stigmatic lining of the style-branches; and the exceedingly wrinkled lining of the ovary locules.

PLATE 17

Trillium chloropetalum, x $\frac{3}{4}$ diameter.

- Figure 1. Petal, x $1\frac{1}{2}$ diameters.
 2. Sepal, x $1\frac{1}{2}$ diameters.
 3. Pistil, x 3 diameters.
 4. Stamen, ventral view, x 3 diameters.
 5. Stamen, dorsal view, x 3 diameters.
 6. Bud, x $\frac{3}{4}$ diameter.
 7. Pollen grains.

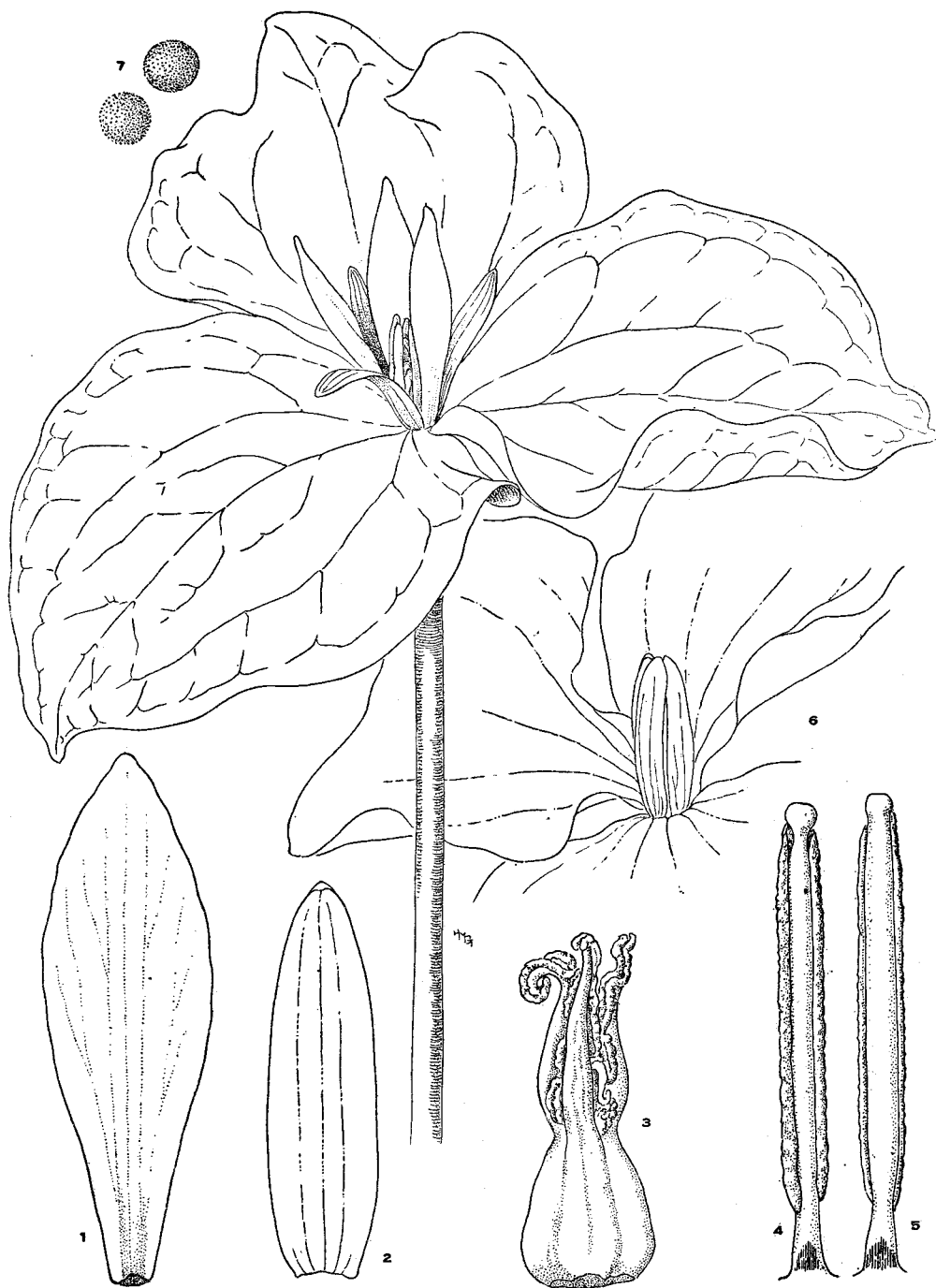
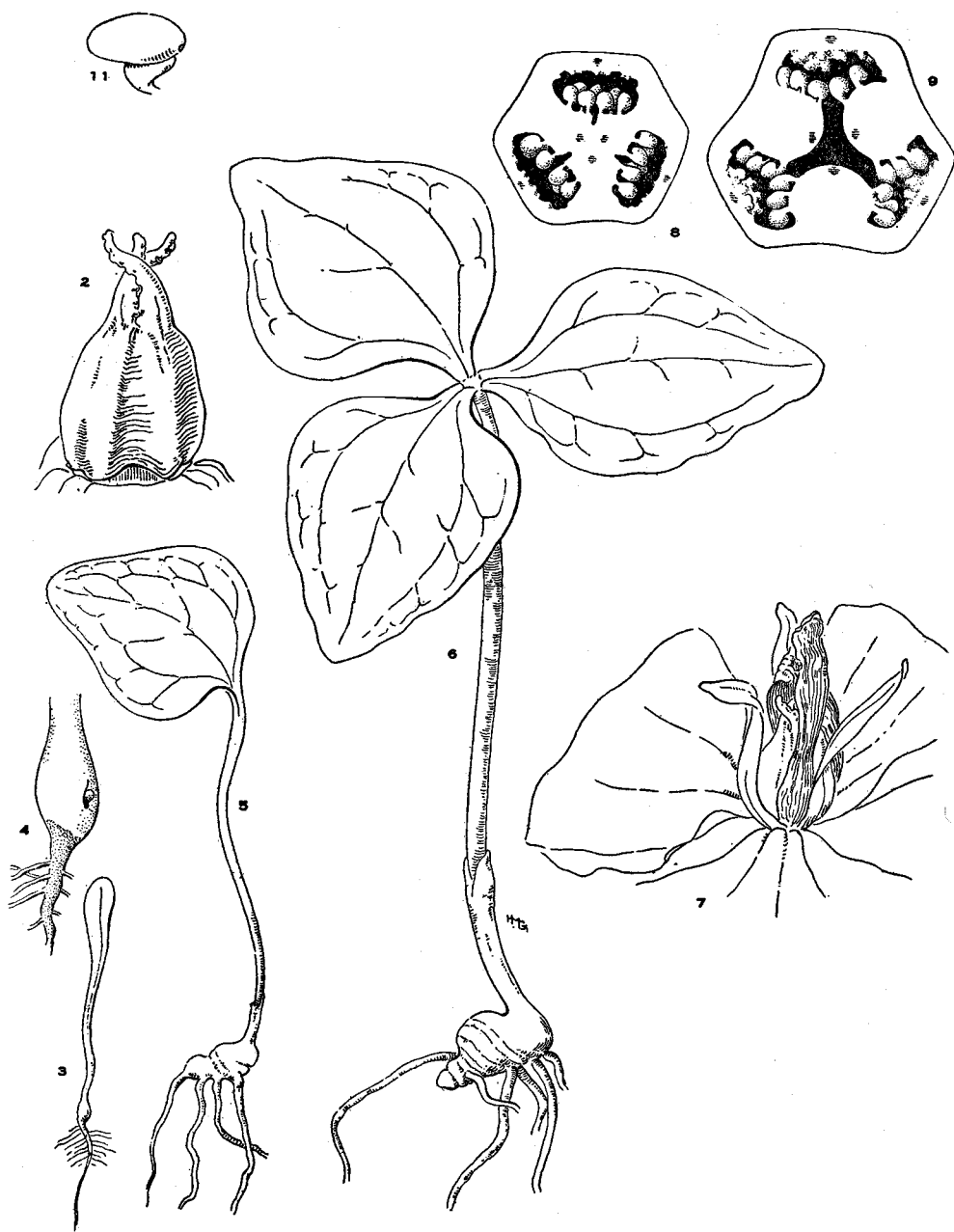


PLATE 18

Trillium chloropetalum.

- Figure 1. Ovule.
2. Fruit, x 1.
3. Seedling, x $\frac{3}{4}$ diameter.
4. Base of seedling, x 4 diameters.
5. Second year plant, x $\frac{3}{4}$ diameter.
6. Third or fourth year plant, x $\frac{3}{4}$ diameter.
7. Fruit with slightly accrescent calyx, $\frac{3}{4}$ diameter.
8. Cross section of ovary near base.
9. Cross section of ovary near middle.



TRILLIUM OVATUM Pursh

Western trillium, Wake-robin, Wood lily

Family: LILIACEAE

Trillium ovatum Pursh, Fl. Am. Sept. 1: 245. 1814.*Trillium californicum* Kellogg, Proc. Calif. Acad. 2: 50. 1860.*Trillium crassifolium* Piper, Erythea 7: 104. 1899.*Trillium Scouleri* Rydb., Bull. Torr. Club. 33: 394. 1906.*Trillium venosum* Gates, Ann. Mo. Bot. Gard. 4: 66. 1917.

Corm vertical to horizontal; stem 12 to 24 cm tall, at first curved below leaves, this part of plant first pushing through earth; leaves broadly ovate, abruptly acuminate; flower pediceled, more or less nodding, white, turning pinkish with age; sepals oblong; petals variable, broadly ovate to narrowly oblong, usually much longer than sepals, sometimes oblique at base; stamens opposite petals somewhat shorter than those of outer set, filaments $\frac{1}{2}$ to $\frac{3}{4}$ as long as narrow anthers, nectariferous at base; ovary broadest about middle, style branches spreading; fruit conspicuously winged, enclosed in strongly accrescent sepals; leaf of seedling narrow; single leaf of second-year plant narrow-petioled, blade small, broad, abruptly narrowed at apex; three leaves of third-year plant, narrower than those of mature plants.

The most common and abundant *Trillium* species of Oregon. It occurs in moist woods, on both sides of the Cascades, north to British Columbia, south to California.

PLATE 19

Trillium ovatum, x $\frac{2}{3}$ diameter.

- Figure 1. Stamen, dorsal view, x 3 diameters.
 2. Stamen, ventral view, x 3 diameters.
 3. Petal, x $1\frac{1}{2}$ diameters.
 4. Sepal, x $1\frac{1}{2}$ diameters.
 5. Pistil, x 3 diameters.
 6. Partly developed fruit within accrescent calyx.
 7. Cross section of upper part of ovary, x $3\frac{1}{2}$ diameters.
 8. Cross section of lower half of ovary, x $3\frac{1}{2}$ diameters.
 9. Detail of placenta.
 10. Ovule.
 11. Pollen grain.

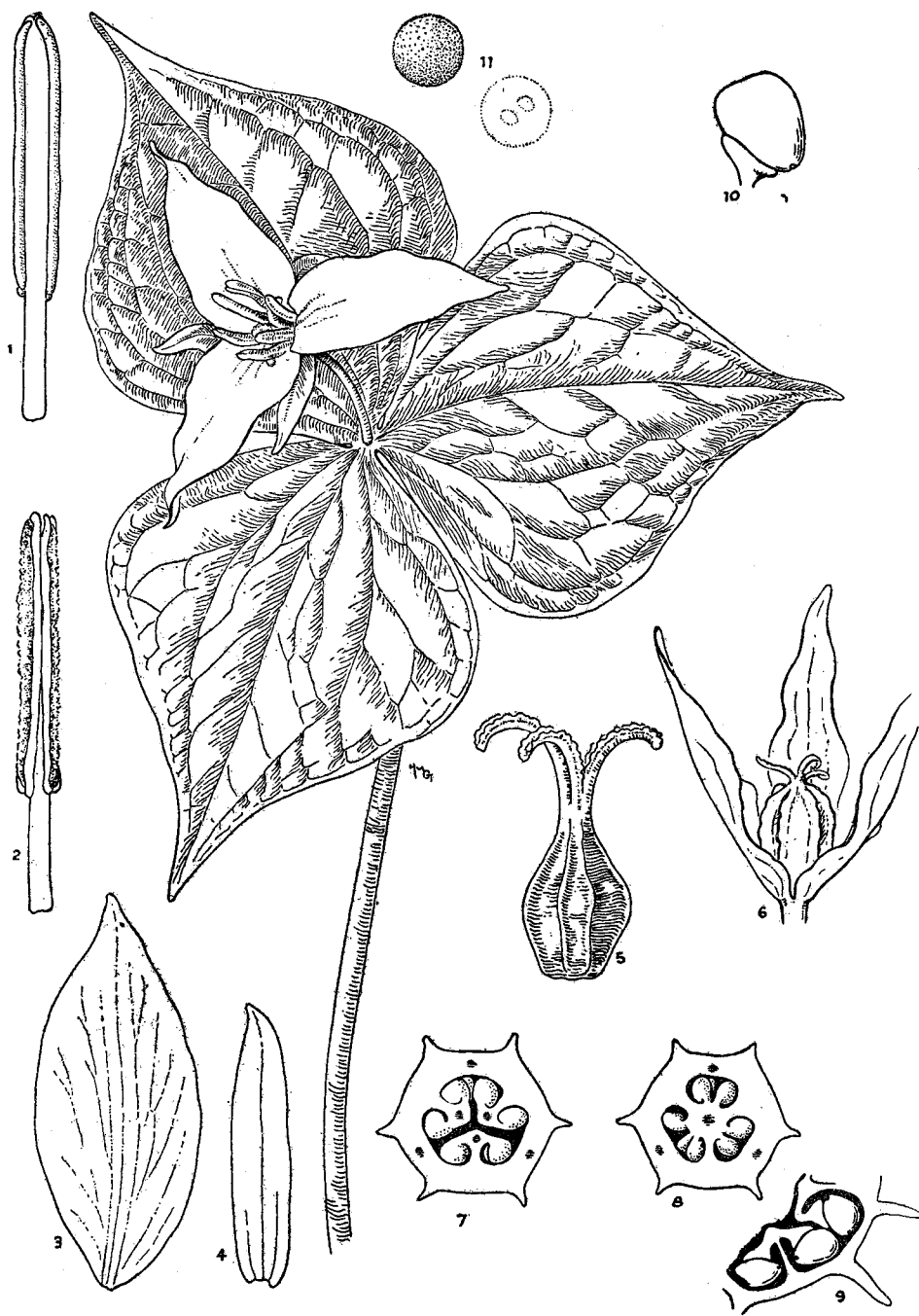
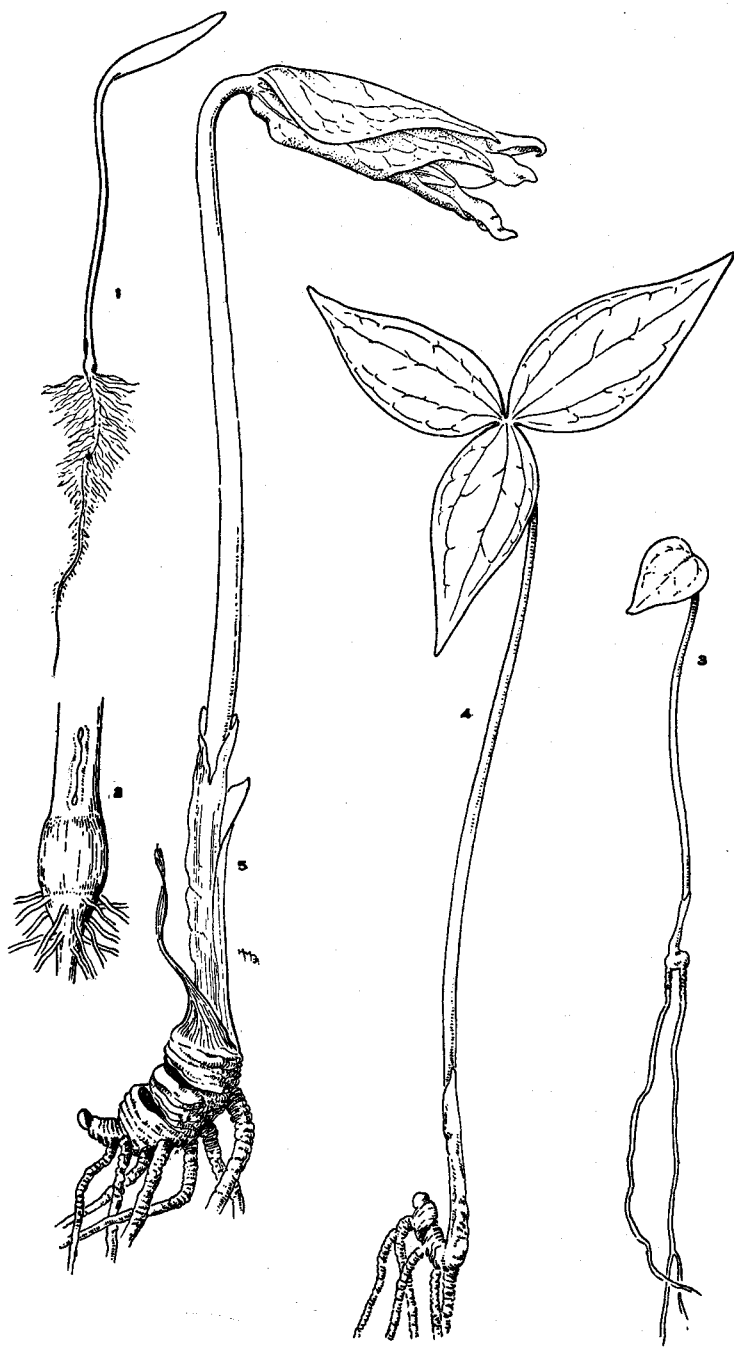


PLATE 20

Trillium ovatum

- Figure 1. Seedling, x 1.
2. Base of seedling, x 5 diameters.
3. Second year plant, x 1.
4. Third year plant, x 1.
5. Fourth or fifth year plant, rolled leaves enclosing flower; showing position during emergence from ground.



TRILLIUM RIVALE S. Wats.

Nodding trillium, Brook trillium

Family: LILIACEAE

Trillium rivale S. Wats. Proc. Am. Acad. 20: 378. 1885.

Rhizome thickened, horizontal, generally much branched, basal leaves and aerial stems often arising in pairs; stem 10 to 20 cm tall, green or purplish; leaves petiolate, acute to acuminate at apex, obtuse to subcordate at base, veins generally whitish above, purplish beneath, petioles $\frac{1}{2}$ to (rarely) $1\frac{1}{2}$ times length of blades; peduncle 3 to (rarely) 10 cm long; flower more or less nodding, becoming recurved in fruit; sepals ovate to oblong, obtuse to acute, 12 to 15 mm long; petals $\frac{1}{2}$ to $\frac{3}{4}$ longer than sepals, rhombic, white, often purple-dotted, attached to base of ovary; anthers pale yellow, outer stamens attached to ovary $\frac{1}{6}$ its length, inner stamens attached $\frac{1}{3}$ its length; ovary elongated, narrowed above, obscurely angled, stigma obscurely 3-lobed, pale yellow; capsule fleshy, broad, narrowed abruptly above; second-year plants with small corms and one or two long-petioled simple leaves.

The most interesting character of this smallest *Trillium* in Oregon is the adnation of flower parts. All whorls are fused at the base, as shown in the illustration, the outer stamens continuing above the separation of sepals and pistil, the inner stamens continuing adnate for one-third the length of the ovary.

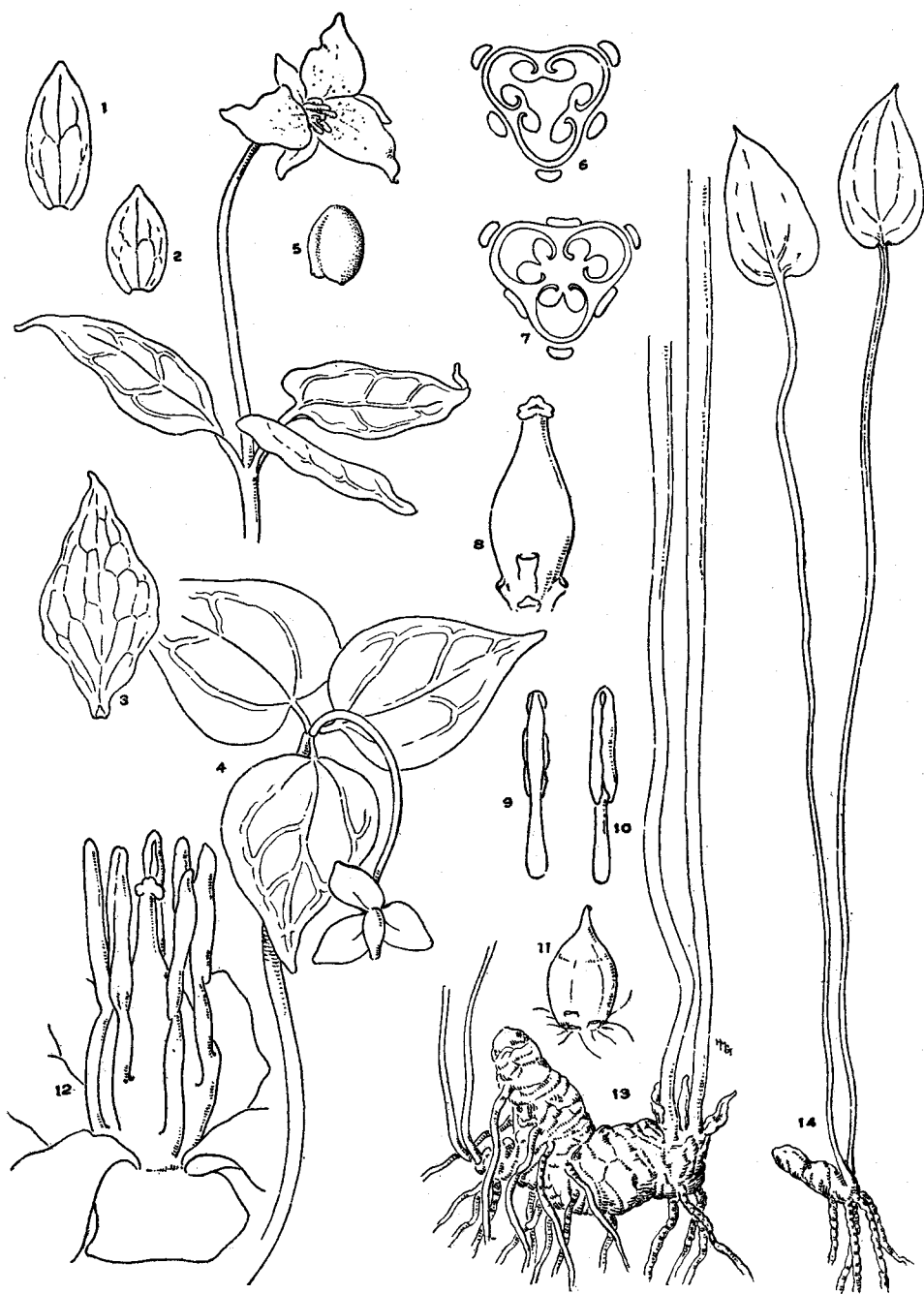
The species is found in Coos and Curry counties in Oregon, and in adjacent California. Type locality: "Big Hat, 30 miles east of Crescent City," California.

PLATE 21

Trillium rivale, x 1.

Figures 1, 2. Two forms of sepals, x 2 diameters.

3. Petal, x 2 diameters.
4. Older plant showing recurved capsule, x 1.
5. Ovule.
6. Cross section of upper part of ovary.
7. Cross section of lower half of ovary.
8. Pistil, x 5 diameters, showing adnation of sepal, petal, and stamen bases.
9. Stamen, dorsal view, x 4 diameters.
10. Stamen, ventral view, x 4 diameters.
11. Partly matured fruit.
12. Detail of flower structure, x 7 diameters.
13. Rhizome, with bases of two stems, x 1.
14. Second or third year plant, x 1.



CALYPSO BULBOSA (L.) Oakes

Angel slipper, Fairy slipper

Family: ORCHIDACEAE

Cypripedium bulbosum L., Sp. Pl. 2: 951. 1753.*Calypso borealis* Salisb., Parad. Lond. pl. 89. 1806.*Cytherea borealis* Salisb., Trans. Hort. Soc. Lond. 1: 301. 1812. nom. nud.*Calypso bulbosa* (L.) Oakes, Cat. Vermont Pl. 28. 1842.*Calypso bulbosa* f. *occidentalis* Holz., Contr. Nat. Herb. 3: 251. 1895.*Calypso occidentalis* Heller, Bull. Torr. Club 25: 193. 1898.*Cytherea bulbosa* (L.) House, Bull. Torr. Club 32: 382. 1905.

Corm-like subterranean structure consisting of swollen fused leaf-base and stem, with a minute axillary bud; foliage leaf solitary, basal, blade 3 to 5.5 cm. long, broadly oval or ovate, conspicuously veined, appearing more or less plaited, cordate or subcordate at base; petiole broad, winged, the winged margins fusing to form a solid structure deeply to shallowly furrowed above, hollow at base to form cavity for axillary bud, petiole glabrous or with a few minute dark red hairs; scape 4 to 16 cm tall, with 2 scarious reduced leaves below, a bract above; bract scarious, sometimes rose-colored, tubular at base; upper and lateral perianth segments long-lanceolate, 1.5 to 2.5 cm, rose-colored (rarely pale lavender or white), but differing in size and venation as illustrated; lip mottled with reddish-brown and purple, broad and winged at base, saccate, with 2 apical protuberances nearly hidden by apronlike expansion of margin, a tuft of whitish to golden hairs at upper entrance of tube; column winged; pollinia covered above by fitted lid, beneath by scarious membrane; sticky stigmatic opening beneath pollinia leading to unobstructed passageway to ovary; placentae intricately branched; ovules minute.

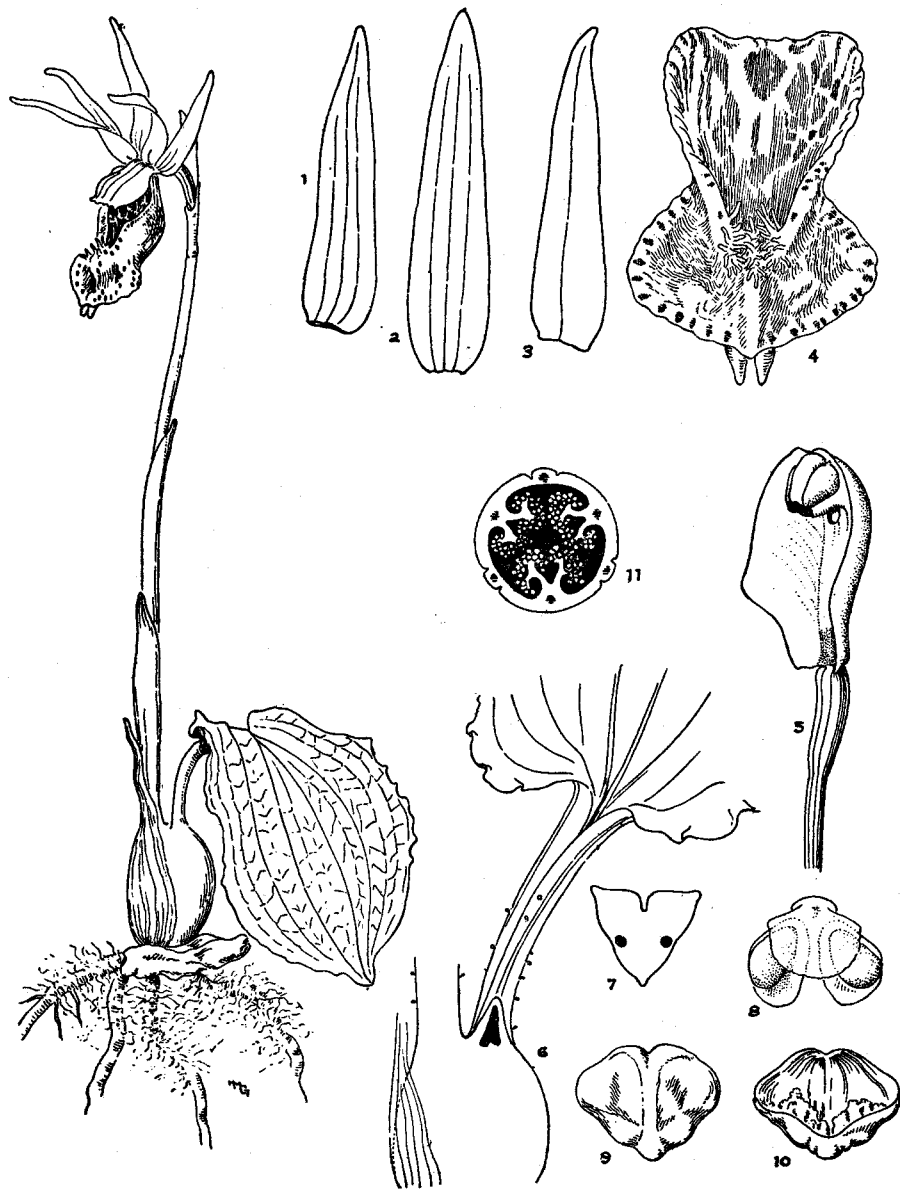
Woods, Alaska, to California and Arizona; also eastward to Labrador and New England, local southward and in the Great Lakes Region; also northern Europe and Asia. Type locality: "Lapponia, Russia, Siberia."

One of the most delicately beautiful orchids of the northern hemisphere, this is also one of the most abundant in deep woods of Northwestern America. Unfortunately, however, its slight hold upon the earth renders it the most easily exterminated of any of our species; and it is noticeably retreating before the clearing of forests, extension of roads into formerly inaccessible areas, and increase in and wider distribution of population.

PLATE 22

Calypso bulbosa, x 1.

- Figure 1. Lateral sepal, x 2 diameters.
- 2. Upper sepal, x 2 diameters.
- 3. Lateral petal, x 2 diameters.
- 4. Posterior petal, x 2 diameters.
- 5. Ovary and column, x 3 diameters. Stigmatic opening visible beneath anthers.
- 6. Section of leaf base, x 2 diameters.
- 7. Cross section of petiole above base.
- 8. Pollinia, x 6 diameters.
- 9. Operculum of pollinia, dorsal view, x 6 diameters.
- 10. Operculum of pollinia, ventral view, x 6 diameters.



ANEMONE DELTOIDEA Hook.

Western white anemone, Wood anemone, Wind flower

Family: RANUNCULACEAE

Anemone deltoidea Hook., Fl. Bor. Amer. 1:6. 1829.

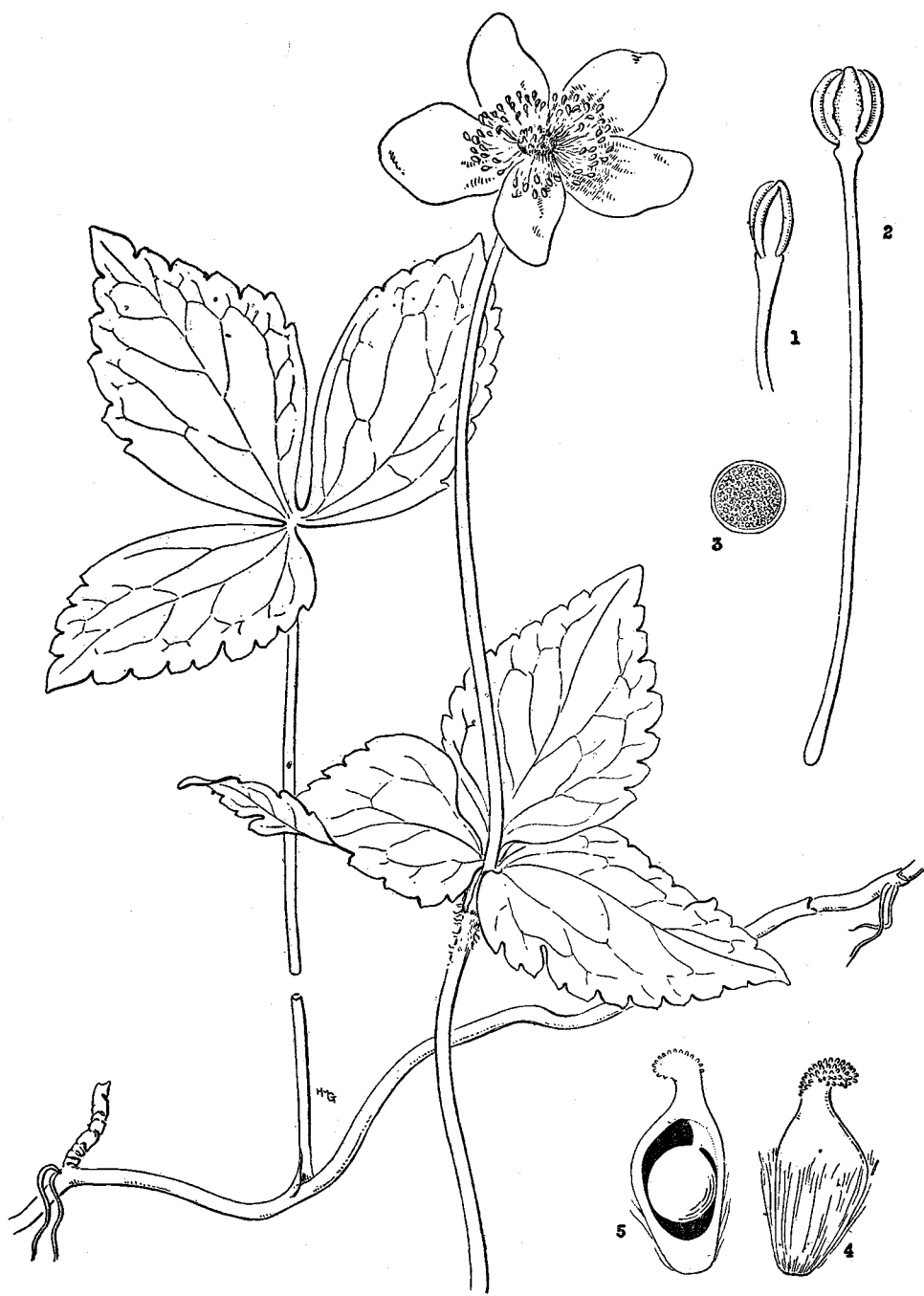
Rhizome long, very slender, producing basal leaves and aerial stems at different points; stem slender, 3 dm or less high, generally with scattered hairs, these more numerous immediately below cauline leaves; basal leaves shorter than stem, 3-foliolate, solitary, on long slender petioles, petiole base broadened to form small scarious sheath about rhizome, leaflets 3 to 6 cm long, 2.5 to 3 cm wide, ciliate, more or less scattered-hairy on veins below, cuneate and sometimes purplish at base, nearly sessile, coarsely toothed, lateral leaflets asymmetrical; cauline leaves 3, resembling terminal leaflet of basal leaf, sometimes larger, more or less fused at base to form hairy cup around stem; peduncles slender, solitary, glabrous or slightly hairy; sepals white, 2.5 cm or less long, varying in width in a single flower, 2 often narrower; stamens numerous, filaments white, anthers pale cream; upper half of achenes glabrous, lower half generally densely hirsute.

Coniferous and mixed woods, Salmon River, British Columbia, southward through western Washington and Oregon into Humboldt and Siskiyou counties, California. Type locality: near mouth of Columbia River, there collected by both Douglas and Scouler.

PLATE 23

Anemone deltoidea, x 1.

- Figures 1, 2. Stamen, 2 anther views, x 10 diameters.
3. Pollen grain.
4. Pistil, x 15 diameters.
5. Longitudinal section of pistil, x 15 diameters.



CHRYSAMPHORA CALIFORNICA (Torr.) Greene

Western pitcher plant, Cobra plant

Family: SARRACENIACEAE

Darlingtonia californica Torr., Smiths. Contr. 6⁴:5, pl. 12. 1854.*Chrysamphora californica* (Torr.) Greene, Pittonia 2: 191. 1891. Not *Darlingtonia* DC., 1825.

Perennial nearly acaulescent herb with stout, scaly, creeping rhizomes; leaves sometimes reaching 6.5 dm in length, tubular, enlarged and hooded at apex, margins fused nearly to apex, leaving opening on under side of hood, apex bearing 2-lobed appendage; fused leaf margins below opening forming a more or less crisped "ruffle" extending entire length of leaf, this splitting at base into 2 scarious plates to form sheath enclosing succeeding bud; tube conspicuously veined, hood and upper part of tube covered dorsally with translucent dots, inner surface of upper part of hood very smooth, lower part and inner surface of tube clothed with stiff retrorse hairs; base of tube containing liquid; inner wall clothed with long hairs; scapes equaling or longer than outer leaves, bearing several scale leaves; flower solitary; sepals 4 to 7 cm long, long-oblongate or oblong, pale or yellowish green, sometimes tinged with purple; petals 2 to 5 cm long, broader than sepals, narrowed above by incurved margins, dark red-purple; stamens 15, 3 per petal, $\frac{1}{4}$ or less the length of pistil, anthers with one large dorsal and one small ventral pollen sac, filaments swollen at base, apparently twisted to bring anthers into posterior-anterior position; ovary fleshy, 5-lobed, broader above, concave at apex; style scarcely extending above lobes, style-branches 5; capsule terra cotta (R) 2.5 to 4.5 cm long, obovoid, depressed at apex, loculicidally dehiscent, the valves separating from a central core; seeds numerous, light, cinnamon-rufous (R), stipitate, clavate, with soft spinelike processes.

Bogs of coast and mountains: near the coast, Lincoln County, Oregon, southward to the Siskiyou Mountains, and in the Sierra Nevada to Nevada County, California. In Oregon, confined principally to coastal bogs, but found in a few inland bogs of Josephine County. An oral report, some years ago, that this species had been found near Sylvia Lake, Montesano, Grays Harbor County, Washington, has not been confirmed. Type locality: California, marsh bordering a small tributary of the Upper Sacramento, a few miles south of Shasta Peak.

The secondary common name of this species, cobra plant, is more appropriate than the name, pitcher plant, generally used in this family. The shape of the leaves, the motion, in a breeze, of the appendages, even the rustling of the stiff foliage in a colony of these plants, have sinister suggestions. The leaf is in no sense a pitcher, as suggested by the leaves in some other genera, but is a particularly effective insect trap. The location of translucent spots opposite and above the point of entrance of flies and other insects undoubtedly contributes to their imprisonment, as do also the glass-like smoothness of the upper inner surface of the hood, and the stiffly downward-pointing hairs of the lining of the tube.

Once the insect is inside, flying out is difficult and crawling out practically impossible. Eventually, apparently, it drowns in the liquid held by the tube; and by the end of a season a leaf may be filled nearly to the entrance by the remains of insects, together with snails, spiders, and other unwary organisms that have become trapped.

This is a monotypic genus confined to a small area in the Pacific Coast states. Because of an earlier homonym, the generic name *Darlingtonia*, first applied to and generally employed for this species, is untenable. Though most western floras still use the earlier name, in the hope that it may be conserved by a later Botanical Congress, the fact that it has not yet been proposed for conservation, seems to justify here the recognition of its present legitimate name.

PLATE 24

Chrysamphora californica, x $\frac{1}{2}$ diameter.

- Figure 1. Pollen grains.
2. Seed, x 8 diameters.
3. Stamen, lateral view, x 6 diameters.
4. Stamen, ventral view, x 6 diameters.
5. Stamen, dorsal view, x 6 diameters.
6. Pistil, x $1\frac{1}{2}$ diameters.
7. Sepal, x $1\frac{1}{2}$ diameters.
8. Petal, x $1\frac{1}{2}$ diameters.
9. Ovules, x 6 diameters.
10. Cross section of ovary, x 2 diameters.
11. Cross section of leaf base.
12. Matured and dried capsule, x $\frac{2}{3}$ diameter.



VIOLA CUNEATA Wats.

Butterfly violet, Two-eyed violet

Family: VIOLACEAE

Viola cuneata Wats., Proc. Am. Acad. 14: 290. 1879.

Rhizome simple or branched, sometimes intricately so; stem 5 to 15 cm tall, often several from base; leaf blades narrowly to broadly rhombic-ovate, cuneate to truncate at base, irregularly crenate, the lower long-petioled, petioles sometimes purplish; stipules small, entire; flowers several, peduncles somewhat shorter than or as long as the leaves, bearing 2 bracts near flower; upper petals cream-colored within, deep purple without, opaque-appearing, sometimes with a small purple spot on face; lateral and lower petals whitish, more or less translucent to the purple back, lateral petals with deep purple blotch below center of face, lower petal heavily veined with purple; spur rounded, very short; lower stamens with short glandular projections into spur, ovate extensions of filaments above anthers fimbriate nearly to apex; lateral and upper stamens smaller, filament-extension broad, not or scarcely fimbriate above anthers; style hollow, broadly clavate, with lateral tufts of hairs near apex; stigmatic opening fringed with circle of hairs; ovary broad; few seeds generally developing.

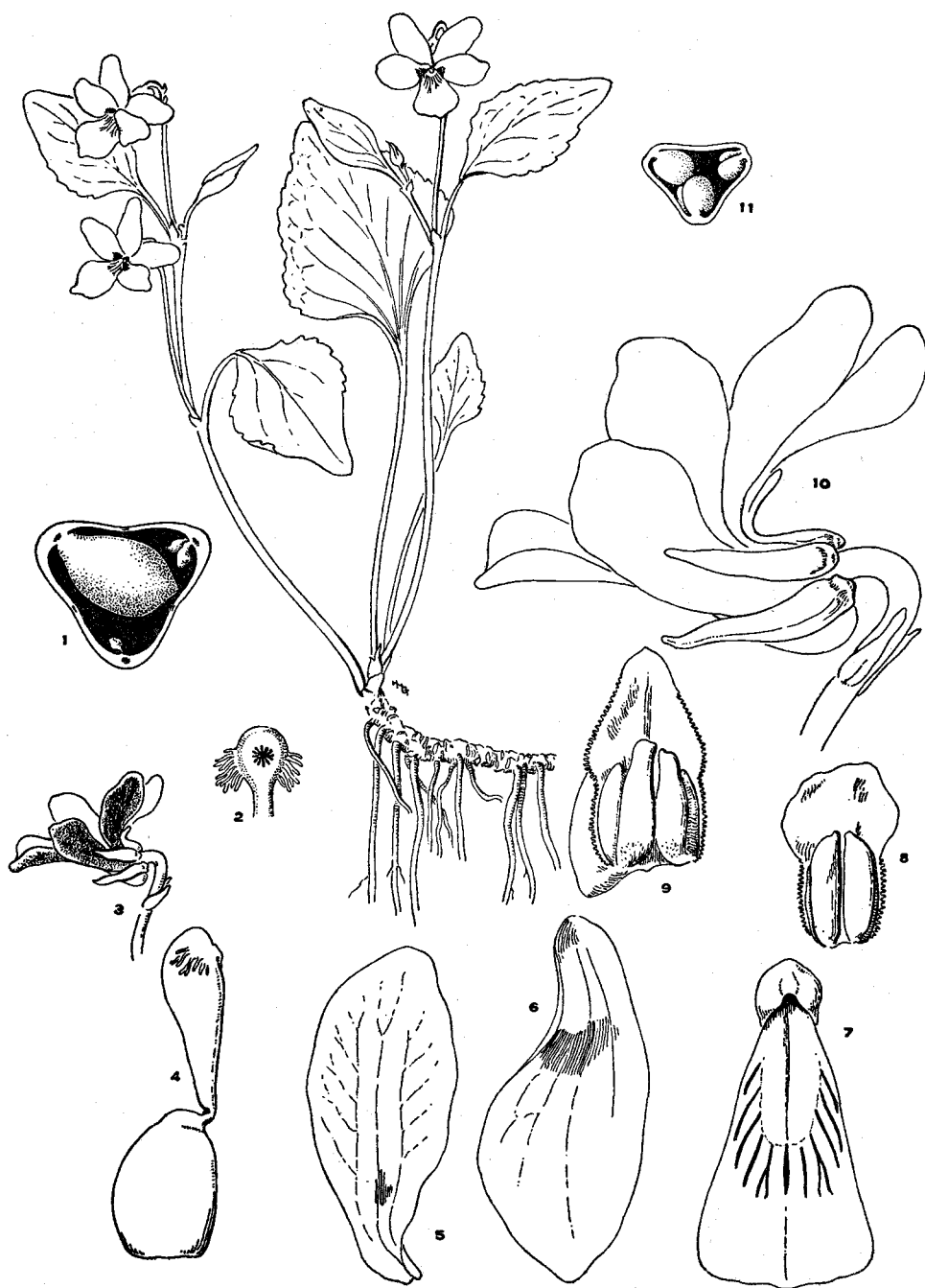
A narrowly-limited endemic, known only from Josephine and Curry counties in Oregon and the northern counties of California. Altitudinal limits, 2,000 to 6,000 feet. Rocky soil, open woods, or shrubby thickets.

Type locality: Humboldt County, California.

PLATE 25

Viola cuneata, x 1.

- Figure 1. Cross section of mature fruit, x 6 diameters.
2. Stigma, x 10 diameters.
3. Lateral view of flower, x $1\frac{1}{2}$ diameters, to show purple dorsal coloring of petals.
4. Pistil, x 10 diameters.
5. Upper petal, x 4 diameters.
6. Lateral petal, x 4 diameters.
7. Lower petal, x 4 diameters.
8. Upper stamen, ventral view, x 10 diameters.
9. Lower stamen, x 10 diameters, showing glandular projection into petal spur.
10. Lateral view of flower, x 4 diameters.
11. Cross section of ovary, x 10 diameters.



VIOLA OCCIDENTALIS Howell

White bog violet

Family: VIOLACEAE

Viola primulifolia L. var. *occidentalis* Gray, Bot. Gaz. 11: 255. 1886.*Viola occidentalis* Howell, Fl. Nw. Am. 69. 1897.

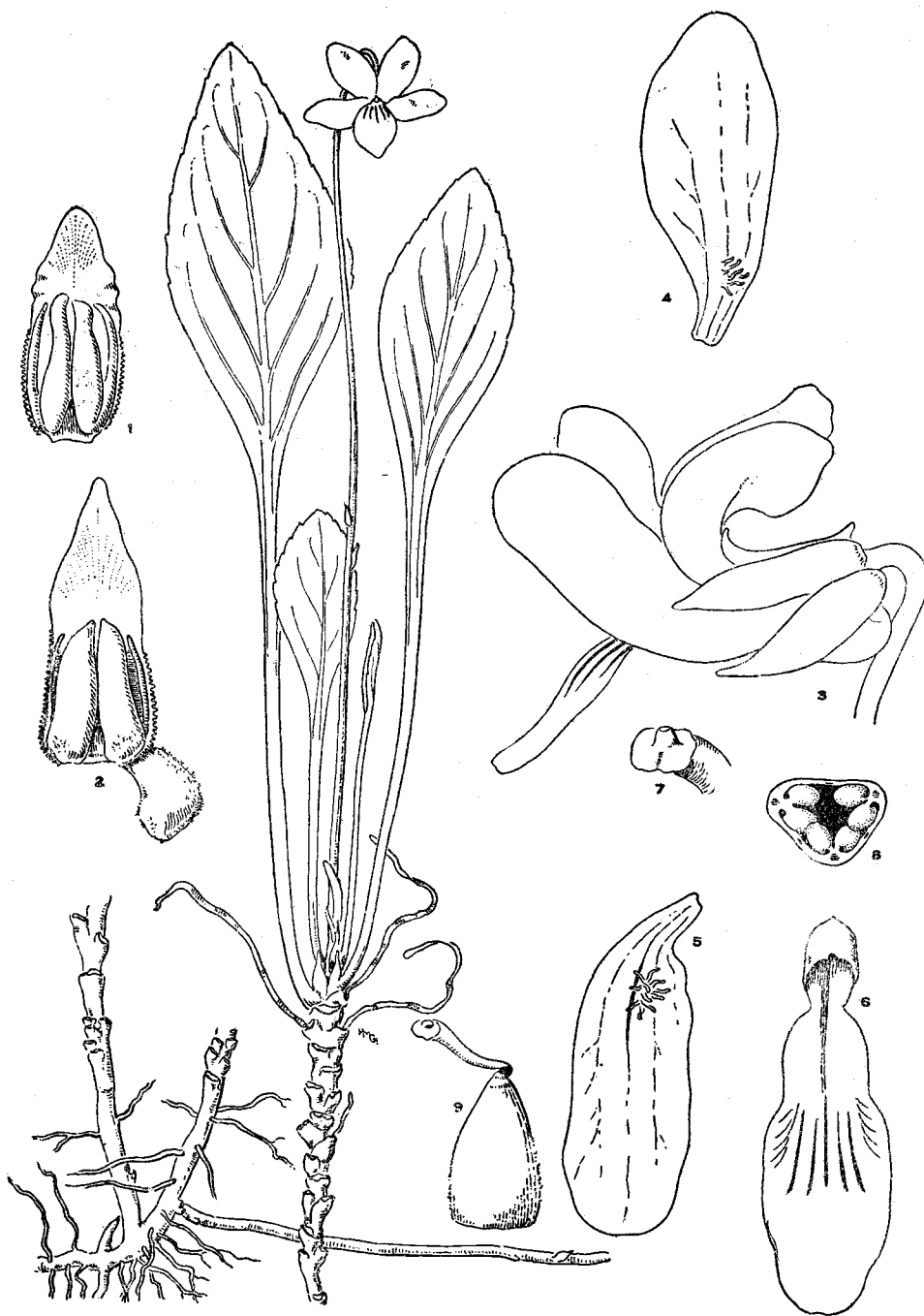
Plant acaulescent; rhizome freely branched, producing slender running stolons, the subterranean portion of a colony often densely matted; herbage glabrous; leaf blade broadly or narrowly ovate or lanceolate to elliptical, acute at apex, attenuate at base into slender winged petiole; veins of blade very conspicuous on upper surface, margins obscurely crenate; peduncle slender, nearly as long as leaves, bearing 2 minute entire bracts near middle, flower white or bluish-tinged; upper petal often with tuft of few hairs; lateral petals with larger tuft, and sometimes with single purple stripe; lower petals veined with purple; spur somewhat longer than in *Viola cuneata*; glandular appendage of lower stamens asymmetrically clavate, slightly puberulent, extension of filament long-narrowed at apex; lateral and upper stamens with broader, shorter extensions; style narrowly clavate, stigmatic opening elevated, without hairs.

Known only from Josephine County, Oregon; and Del Norte County, California. Sphagnum bogs and marshes, from near sea level to 5,000 feet. Type locality: Waldo, Oregon.

PLATE 26

Viola occidentalis, x 1.

- Figure 1. Upper stamen, x 10 diameters.
2. Lower stamen, x 10 diameters, showing glandular projection into petal spur.
3. Lateral view of flower, x 4 diameters.
4. Upper petal, x 4 diameters.
5. Lateral petal, x 4 diameters.
6. Lower petal, x 4 diameters.
7. Stigma, x 10 diameters.
8. Cross section of ovary, x 10 diameters.
9. Pistil, x 10 diameters.



OENANTHE SARMENTOSA Presl.

Water celery, Water parsley

Family: UMBELLIFERAE

Oenanthe sarmentosa Presl., in DC. Prod. 4: 138. 1830.

Rhizome short, thick, more or less erect, sometimes slightly chambered, but generally solid; stems more or less erect, sometimes decumbent and rooting at nodes; leaves bi- or tripinnate, leaflets ovate, broadly dentate to lobed, the vein of each tooth extending through center to apex; involucre bract one to several or none, sometimes leaf-like; involucre of several narrow bractlets; fruit elongated, with long styles.

Wet places west of the Cascades, northward to British Columbia, southward to California. Type locality: Nootka Sound.

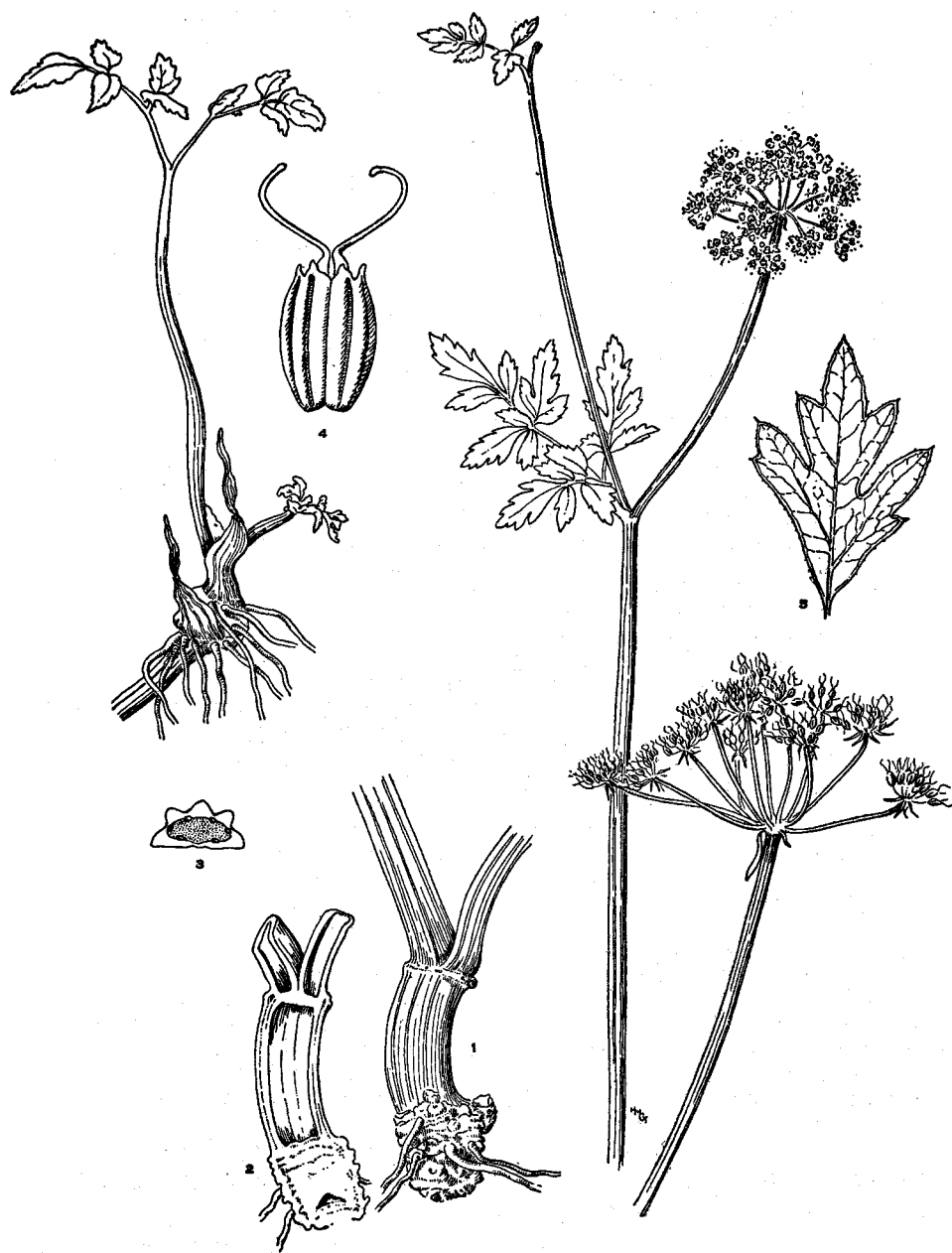
Because this harmless species frequents the same habitat as poisonous *Cicuta Douglasii* it is important that the farmer be able to distinguish them, at any season, from each other. In the discussion of *Cicuta Douglasii* in this paper, leaf venation is shown to be a ready method of separating the two species in the vegetative stage.

In Western Oregon swamps and ponds, the latter species is far less common and abundant than *Oenanthe sarmentosa*. It occurs, however, east of the Cascades, where *Oenanthe* is not found.

PLATE 27

Oenanthe sarmentosa, x $\frac{1}{2}$ diameter.

- Figure 1. Rhizome and base of aerial stem, x $\frac{1}{2}$ diameter.
2. Same, longitudinal section.
3. Cross section of mericarp, x 6 diameters.
4. Schizocarp, x 6 diameters.
5. Terminal leaflet, to show venation.



CICUTA DOUGLASII (DC.) C. & R.

Western water hemlock

Family: UMBELLIFERAE

Sium Douglasii DC., Prodr. 4: 125. 1830.*Cicuta maculata* L. sensu Hook. & Arn. Bot. Beechey Voy. 142. 1841. Not L. 1753.*C. californica* Gray, Proc. Amer. Acad. 7: 344. 1867.*C. crassifolia* Nutt., Rep. Wilkes Exped. 17: 316. 1874.*C. virosa* var. *californica* Coulter & Rose, Rev. N. Amer. Umbel. 130. 1888.*C. occidentalis* Greene, Pittonia 2: 7. 1889.*C. occidentalis* f. *frondosa* Greene, Pittonia 2: 7. 1889.*C. purpurata* Greene, Pittonia 2: 8. 1889.*C. vagans* Greene, Pittonia 2: 9. 1889.*Cicuta Douglasii* (DC.) Coulter & Rose, Contr. U. S. Nat. Herb. 7: 95. 1900.*C. grandifolia* Greene, Leaf. Bot. Obs. 2: 124. 1909.*C. Douglasii* var. *occidentalis* Jones, Bull. Univ. Mont. Biol. ser. 15: 42. 1910.*C. frondosa* Greene, Leaf. Bot. Obs. 2: 236. 1912.*C. subfalcata* Greene. Ibid. p. 237.*C. valida* Greene. Ibid. p. 238.*C. Sonnei* Greene. Ibid. p. 239.*C. fimbriata* Greene. Ibid. p. 240.*C. cinicola* A. Nels., Bot. Gaz. 54: 141. fig. 1. 1912.*C. occidentalis* f. *californica* Wolff, ex Engl. Pflanzenr. 4288: 90: 82. 1927.*C. occidentalis* f. *oregonensi-idahoensis* Wolff. Ibid. p. 82.*C. occidentalis* f. *arizonensis* Wolff. Ibid. p. 82.*C. occidentalis* f. *wyomingensis* Wolff. Ibid. p. 82.

Rhizome of older plants thick, long, marked externally by old half-encircling leaf scars, internally characterized by conspicuous often vertically compressed hollow internodes separated by thin plates, and by exudation on cut surface of a yellow resinous liquid; aerial stem of older plants generally stout, 10 to 15 dm tall; leaves bipinnate or often incompletely tripinnate; leaflets variable, narrowly to broadly lanceolate, generally asymmetrical at base (lateral leaflets), sharply serrate to incised, lateral veins leading to notches between teeth, thence branching to teeth tips; stem, petiole, leaf rachis, peduncle, and pedicel, all ribbed by elevated strands of collenchyma; umbels large, compound, rays 12 to 20; bracts several, slender, short, or generally none or one; flowers small, white, pedicels 3 to 8 mm long; calyx teeth acute to acuminate; petals broad, crisped, abruptly narrowed to point at apex; fruit orbicular, somewhat compressed, constricted at commissure, ribs conspicuous, oil tubes 1 to an interval, 2 on the commissure; styles short.

Poisonous plants growing in or bordering marshes; Alaska, British Columbia, Alberta, Montana, to California, Mexico, New Mexico, and Arizona. Type locality: "Northwestern America," Douglas.

The imposing synonymy adopted from Mathias and Constance (1942). confirms the present writer's conclusions based on field and greenhouse studies of a smaller number of entities. The relationship of *C. Douglasii*, *C. occidentalis*, and *C. vagans*, has been of particular interest; and, at various times,

specimens typifying these three species, collected in widely separated areas, have been grown under identical greenhouse conditions. At the end of the growing season, the plants were too similar, even to position of the rhizome, to admit of specific separation.

Because of the toll in livestock that this species takes annually from Oregon ranches, farmers are interested in learning methods of distinguishing it from its nontoxic associates. *Oenanthe sarmentosa* Presl., a harmless species commonly growing in habitats similar to those of *Cicuta Douglasii*, and often in close proximity to it, may by the uninitiated be mistaken for it, particularly in the vegetative stage. Accordingly, in 1933, Mr. A. B. Collett, graduate student at Oregon State College, prepared a simple key that would enable farmers to distinguish, at a glance at any stage of growth, these two species. The best diagnostic character found was that the lateral veins of the leaflets in *Oenanthe sarmentosa* are distinctly directed to the teeth tips; while those in *Cicuta Douglasii* appear to end at the sinus between two teeth where, in reality, each vein after connecting with the vein below parallels the tooth margin to its apex.

Since that time it has been learned that this peculiarity in venation had earlier been used by Bigelow (1817) and others in the identification of various members of the Umbelliferae; and more recently (1936) Bomhard has employed it in relation to *Cicuta* and *Angelica*.

PLATE 28

Cicuta Douglasii, x 1.

- Figure 1. Terminal leaflet, to show venation.
2. Longitudinal section of rhizome.
3. Variation in leaflets.
4. Cross section of schizocarp, x 6 diameters.
5. Umbel at fruiting stage.
6. Mature schizocarp, x 6 diameters.
7. Single flower, x 6 diameters.



DODECATHEON HENDERSONII Gray

Shooting star

Family: PRIMULACEAE

Dodecatheon integrifolium Mich. var. *latifolium* Hook., Fl. Bor. Am. 2: 119. 1838.*Dodecatheon Hendersonii* Gray, Bot. Gaz. 11: 232. 1886.*Dodecatheon latifolium* (Hook.) Piper, Contr. U. S. Nat. Herb. 11: 446. 1906.

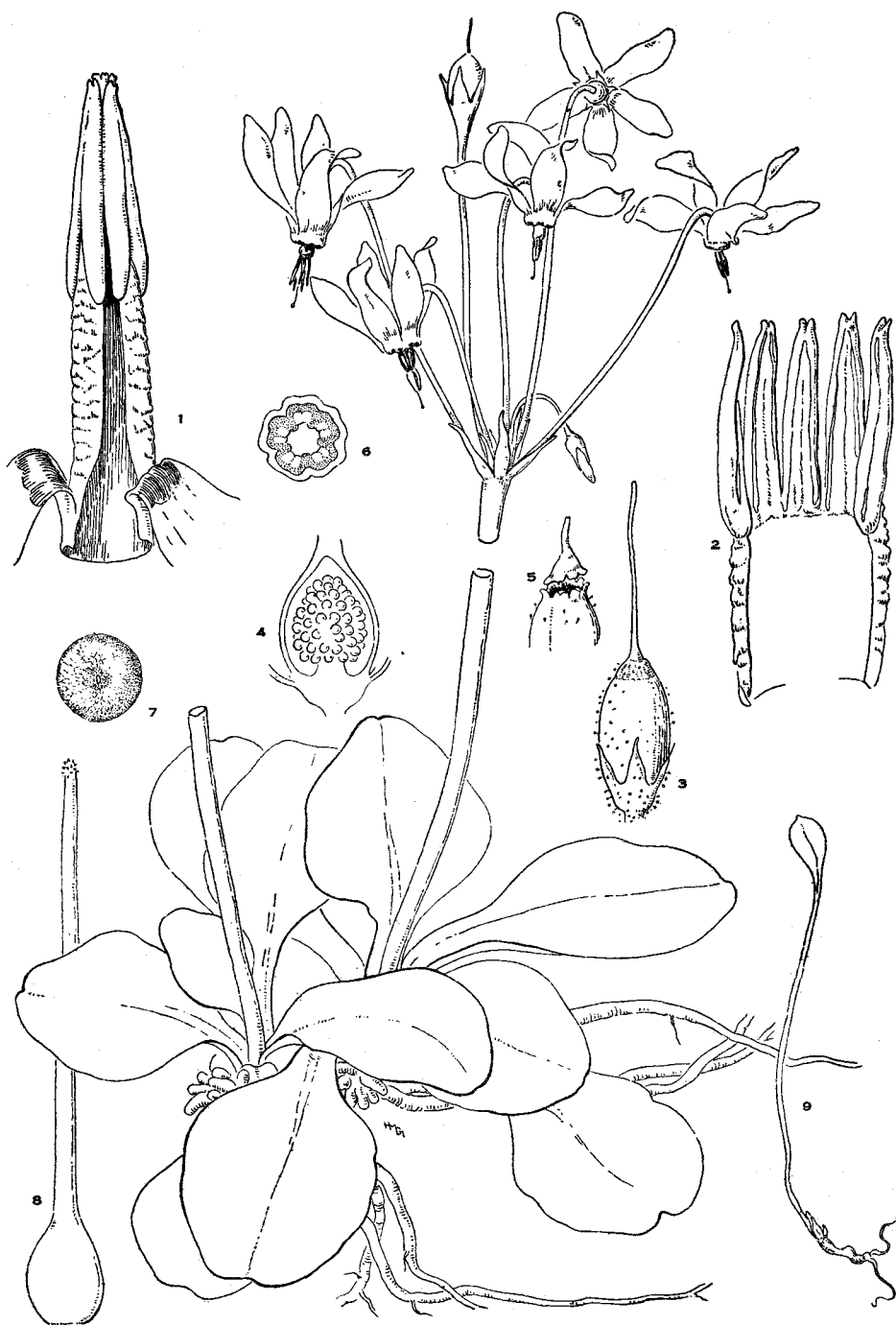
Underground stem short, bearing masses of ricelike offshoots and a few long, thick roots; leaves more or less glaucous, narrowed to winged petioles at base, broadened above to ovate, obovate, or roundish blades with obtuse, truncate, or retuse apices, margins entire or slightly toothed; scapes 1 to 5 dm tall, bearing an umbel of 3 to 12 flowers; bracts narrowly to broadly lanceolate; calyx minutely glandular-hairy, the lobes generally 5 (rarely 4), acute or acuminate, reflexed; corolla lobes generally 5 (rarely 4), pale pink to (generally) deep rose, much longer than the tube, reflexed; corolla tube with a yellow lobed area beneath the segments, beneath this a black-purple area correspondingly lobed, each lobe with a pair of yellow spots; filaments of stamens fused into a dark purple outwardly-wrinkled tube; anthers nearly black, free, dehiscent ventrally; style slender, the exposed portion purplish, undivided; ovary oblong-ovoid or ellipsoid, minutely glandular-hairy, green except magenta tip above line of dehiscence; fruit urceolate, circumscissile, the line of dehiscence near apex, capsule generally splitting longitudinally, beneath cap, into 10 short teeth; seed somewhat flattened, depressed at center.

In shade of taller herbage or in open woods, Willamette Valley, Oregon, northward to Alaska, south to California.

PLATE 29

Dodecatheon Hendersonii x 2/3 diameter.

- Figure 1. Stamen tube, slit, x 8 diameters.
 2. Stamen tube, open, x 6 diameters.
 3. Capsule before splitting, with calyx, x $1\frac{1}{2}$ diameters.
 4. Longitudinal section of ovary, at anthesis, x 5 diameters.
 5. Tip of capsule at maturity, showing dehiscence, x $1\frac{1}{2}$ diameters.
 6. Design at base of corolla, x $2\frac{2}{3}$ diameters. Yellow spots on dark purple ground, surrounded by yellow band.
 7. Seed, x 6 diameters.
 8. Pistil, x 6 diameters.
 9. Cormling.



PETASITES SPECIOSA (Nutt.) Piper

Colt's foot

Family: COMPOSITAE

Nardosmia speciosa Nutt., Trans. Am. Phil. Soc. 7: 288. 1841.*Petasites speciosa* (Nutt.) Piper, Mazama 2: 97. 1901.*Petasites palmata* of authors, not *Tussilago palmata* Ait. [= *Petasites palmata* (Ait.) Gray].

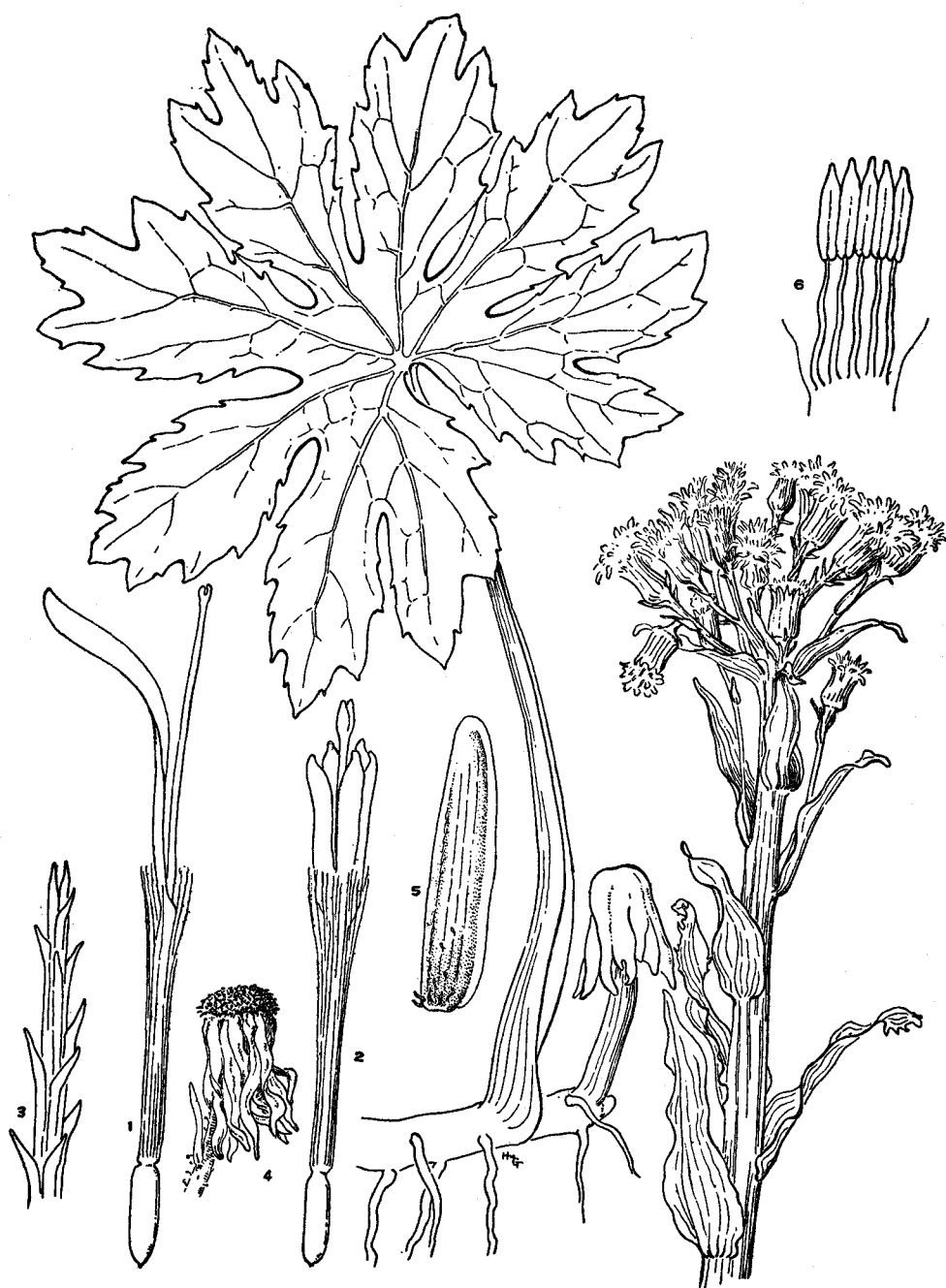
Stout perennial herb with thick horizontal rhizome; flowering stem appearing before the foliage leaves, stout, erect, ridged, clothed with reduced leaves, bearing panicle of heads; foliage leaves basal, rudimentary at beginning of flowering, but quickly developing, and coeval with later flowering and fruiting stage, nearly round in outline, generally 9-lobed from obviously a fundamentally 3-branched system of veins, sinuses cut halfway or more to base, the lobes again slightly lobed or coarsely toothed; leaf blades in bud reflexed and folded about petiole, appearing peltate; modified leaves of flowering stem sessile, somewhat sheathing below, entire or the apices irregularly toothed; heads unisexual or bisexual, rayed or rayless, some heads predominately pistillate, bearing many (60 or more) white ligulate florets and a few white or purplish perfect disk florets; involucre bracts narrow, parallel, thickened (fleshy) through center, with 3 parallel obscure veins, margins (especially one) somewhat scarios; ligulate flowers when present, generally 60 or more to a head, perfect flowers few (2 or 3) to about 30, or sometimes wanting in a head; pappus hairs minutely barbed; ligulate corollas slender with long style slightly 2-branched at apex; disk corollas shorter than rays, less slender; entire plants often sterile; receptacle minutely foveolate.

Damp shady places, from the Cascades to the coast in Oregon, northward into British Columbia, southward into California. Type locality: "Shady forests of the Oregon (Columbia R.) and Wahlamet" (Willamette).

PLATE 30

Petasites speciosa x $\frac{3}{4}$.

- Figure 1. Ligulate floret x 8 diameters.
2. Disk floret x 8 diameters.
3. Tip of pappus hair, greatly enlarged.
4. Head after escape of florets, x 2 diameters.
5. Involucre bract x 4 diameters.
6. Stamens x 16 diameters.



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