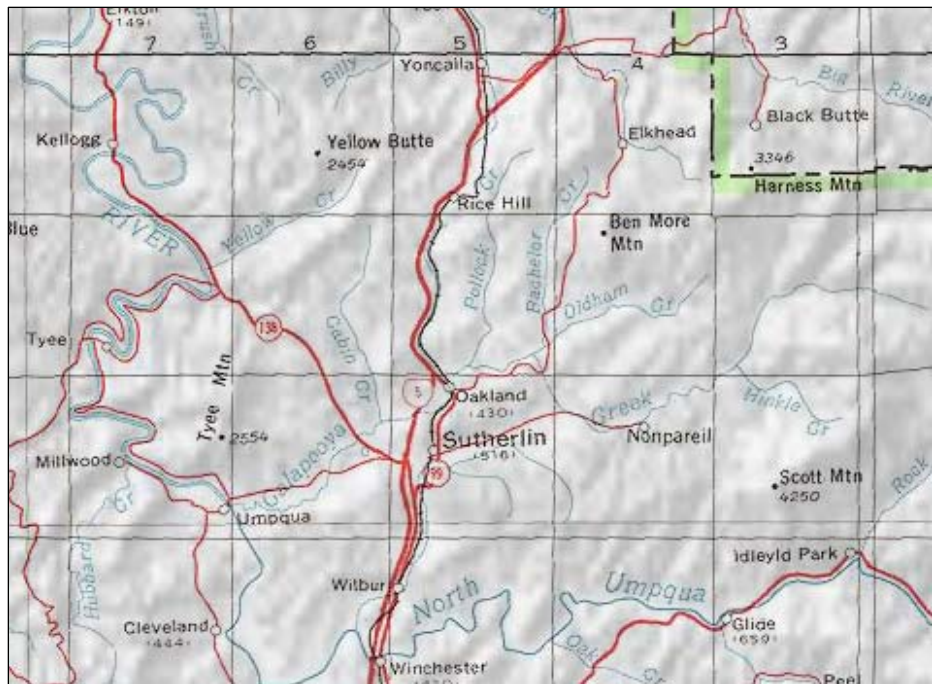


Popcornflowers of the Umpqua River watershed: distinguishing rare and common species



Prepared by
Melissa Carr, Kelly Amsberry, and Robert Meinke

for U.S. Fish and Wildlife Service
(Grant No. OR-EP-2, Seg. 17)

December 31, 2007

Contents

Introduction.....	1
Key to the popcornflowers of the Umpqua River watershed, Oregon.....	2
Rusty popcornflower (<i>Plagiobothrys nothofulvus</i>).....	4
Slender popcornflower (<i>Plagiobothrys tenellus</i>).....	5
Rough popcornflower (<i>Plagiobothrys hirtus</i>).....	6
Scouler's popcornflower (<i>Plagiobothrys scouleri</i>).....	8
Coral seeded allocarya (<i>Plagiobothrys figuratus</i> ssp. <i>corallicarpus</i>).....	9
Fragrant popcornflower (<i>Plagiobothrys figuratus</i> ssp. <i>figuratus</i>).....	10
APPENDIX A: Popcornflower Distributions.....	11
APPENDIX B: Supplemental Illustrations.....	12
APPENDIX C: References.....	13

Photo Credits

Coral seeded allocarya – Kelly Amsberry (habitat)
Rough popcornflower – Stephen Meyers (habit), Troy Maddux (habitat)
Slender popcornflower – Gerald Carr (all photos)
All other photos by Melissa Carr

Introduction

Rough popcornflower (*Plagiobothrys hirtus*) is a rare plant found only within the Umpqua River watershed in Douglas County, Oregon. It is listed as endangered by the State of Oregon and the U.S. Fish and Wildlife Service, and thus receives both state and federal protection. Several similar, more common popcornflowers can also occur within the range of rough popcornflower, complicating species identification. This guide is intended to aid in distinguishing between these similar species and to help ensure that protections are extended to the appropriate popcornflower populations. Although no populations of coral seeded allocarya, another rare popcornflower of southwestern Oregon, are currently known to occur in Douglas County, the species is included in this guide because of its similarity to rough popcornflower in appearance and habitat. It occurs in neighboring counties and may potentially be found within the range of rough popcornflower.

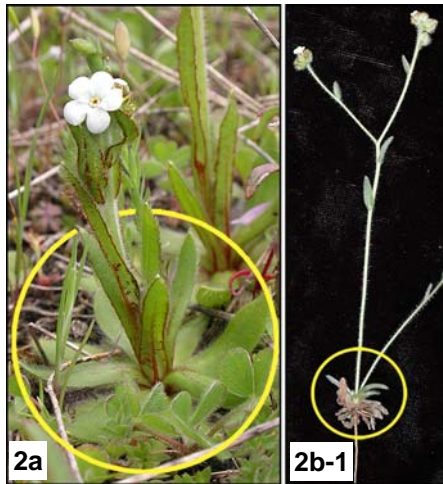
The guide includes an identification key composed of a series of paired alternative statements describing plant characteristics leading users to the identity of a particular popcornflower. Descriptive profiles of each popcornflower follow the key and include additional photographs and important features for distinguishing between popcornflower species. A map depicting the Oregon distribution of each of the popcornflower species covered (Appendix A) and illustrations that clarify significant botanical terms (Appendix B) are located at the end of the guide.

This is a non-technical guide for general use. It can be used by landowners and managers to determine whether or not their property contains rough popcornflower. However, using the guide does **NOT** fulfill federal or state survey requirements for planned land use actions on public lands known to contain the endangered species. For more information about the rough popcornflower and about non-federal public land manager responsibilities pertaining to the species, contact Oregon Department of Agriculture's Native Plant Conservation Program (<http://www.oregon.gov/ODA/PLANT/CONSERVATION/index.shtml>). Information for federal land managers is available from the U.S. Fish and Wildlife Service (<http://www.fws.gov/endangered>). For a technical plant identification key encompassing the Douglas County Umpqua River watershed, refer to Abrams (1951) or Peck (1961).

Key to the popcornflowers of the Umpqua River watershed, Oregon

The endangered rough popcornflower is easily confused with several other popcornflower (*Plagiobothrys*) species that may share its range. This non-technical key is a tool for distinguishing among these look-alike native popcornflowers and is not designed for use outside the Umpqua River watershed of Douglas County. The key presents pairs of alternative statements describing plant features. To use the key, begin by reading the first pair of statements, 1a and 1b. Select the statement that best describes the plant you are trying to identify and proceed as indicated. Continue in this manner, selecting traits that describe your species while eliminating those that do not, until you reach the statement that uniquely identifies your species.

Each of the popcornflower species occurring in Douglas County has flowers that consist of a greenish outer leaf-like layer (the **calyx**, see Appendix B) that has five lobes, and an inner layer made up of five white petals that are fused together at the base. Fresh flowers usually have bright yellow centers that fade to white with age. Flower clusters (**inflorescences**) are initially coiled at the ends of stems (see Appendix B). The inflorescences uncurl and elongate as flowers open successively from base to tip. Each species produces up to four nutlets (tiny, hard fruits) per flower.



1a Leaves at plant base arranged in **distinct rosette** (circled in figs. 2a & 2b-1) that persists throughout flowering and fruiting. Usually occurs in dry, well-drained soils.
Go to 2 a&b

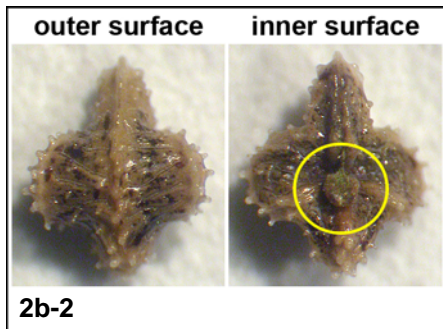
1b Plant lacks distinct, persistent basal rosette of leaves. Usually occurs in saturated, poorly-drained soils.
Go to 3 a&b

2a Margins and midribs of leaves purple-red; plants release reddish sap when bruised. Nutlets not cross-shaped.

Rusty popcornflower (*P. nothofulvus*)

2b Sap and leaf margins not purple-red. **Nutlets cross-shaped**, nutlet scar (where fruit attached to plant) near middle of inner surface (circled in fig. 2b-2).

Slender popcornflower (*P. tenellus*)



3a Upper stems and leaves covered in **stiff, outward-spreading hairs** (fig. 3a); stems stout, approximately 4-5 mm in diameter. Plants **perennial** (surviving more than two years) in favorable conditions, growing 50-60 cm tall.

Rough popcornflower (*P. hirtus*)

3b Stems and leaves covered in **hairs mostly lying flat against plant surfaces** (fig. 3b); stems generally 2 mm in diameter or less. Plants **annuals** (completing the lifecycle within a year), usually less than 45 cm tall.

Go to 4 a&b



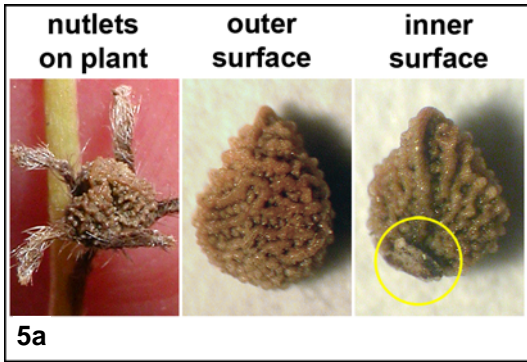
4a Plants diminutive, typically **5-15 cm tall**, sometimes taller (fig. 4a-1). Flowers generally 2-4 mm wide. **Inflorescences often unpaired**, with just one coiled inflorescence at the end of each stem (fig. 4a-2, Appendix B).

Scouler's popcornflower (*P. scouleri*)



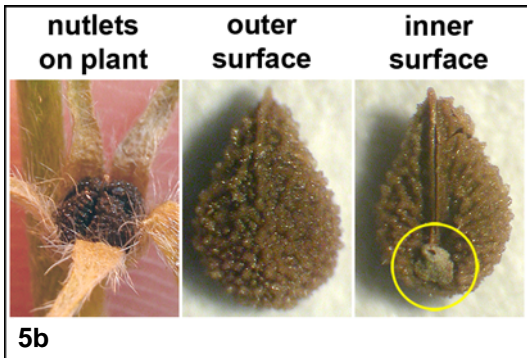
4b Plants usually **15-45 cm tall** (fig. 4b-1). Flowers generally 5-8 mm wide. Coiled **inflorescences usually in pairs** at the ends of stems (fig. 4b-2, Appendix B).

Go to 5 a&b



5a Nutlets with coral-like texture, deeply pitted, with irregular high ridges and warty projections. Nutlet scar (where fruit attached to plant; circled in fig. 5a) located on lower part of inner surface of nutlet, very near, but not directly at, the base (see Appendix B).

Coral seeded allocarya (*P. figuratus* ssp. *corallicarpus*)



5b Nutlets not as deeply pitted as 5a, ridges less pronounced, with low relief warty projections. Nutlet scar (circled in fig. 5b) located distinctly on the inner side of the nutlet, near but not reaching the base, slightly higher than scar of 5a (see Appendix B).

Fragrant popcornflower (*P. figuratus* ssp. *figuratus*)

Rusty popcornflower (*Plagiobothrys nothofulvus*)



General: Plants are annuals (completing the lifecycle within a year), generally 20-40 cm tall. This species secretes a distinctive purplish-red sap when bruised.

Stems: One or more erect stems, covered in sharp, spreading white hairs, arise from base of plant.

Leaves: The midrib and margins of stem leaves are purple-red, distinguishing it from all other popcornflower species of Douglas County (see key 2a). Stem leaves are linear to lanceolate (broadest below the middle and tapering above the middle of the leaf, see Appendix B), sparse, and alternately arranged along the stem. Leaves at the base of the plant are arranged in a rosette that persists throughout the flowering and fruiting period. Rosette leaves are 3-10 cm long, 5-15 mm wide, and are somewhat narrowed where they attach to the stem and widened near the tip.

Flowers: The calyx is covered in rust-colored hairs. Flowers are generally 4-8 mm wide.

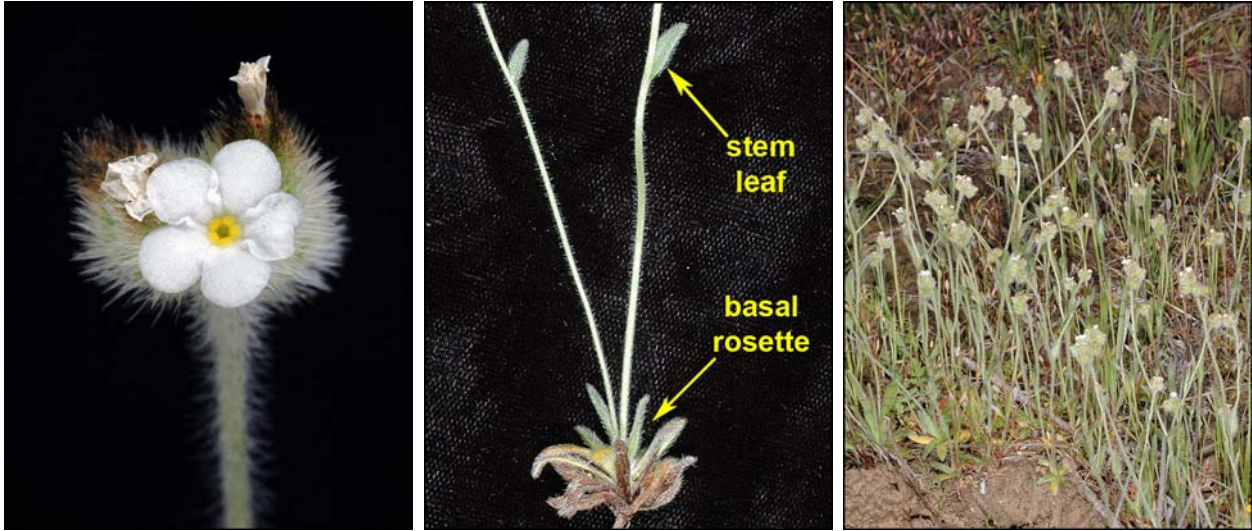
Bloom time: March through May.

Habitat: Grassy fields and hillsides; woodlands. Usually in well-drained soils below 800 m (2,600 ft).

Range: Washington to Mexico; in Oregon, southward west of the Cascades and at the eastern end of the Columbia River Gorge.

Distinguishing the Species: The distinct, persistent rosette of leaves at the base of rusty popcornflower plants, as well as the species' reddish sap and reddish leaf margins, set it apart from rough popcornflower, which lacks a persistent rosette, and has stems bearing many bright green leaves that lack red coloration. Rusty popcornflower blooms in early spring, and there is little overlap in flowering between the two species.

Slender popcornflower (*Plagiobothrys tenellus*)



General: Plants are annuals, generally 5-25 cm tall, with distinctive fruits.

Stems: Typically, several erect, slender, stems arise from the base of the plant. Stems can be branched or unbranched and are covered in soft, outward-spreading hairs that are either straight or bent at the end.

Leaves: A distinct rosette of leaves at the base of the plant persists throughout the flowering and fruiting period. These basal leaves are 1-2.5 cm long and range in shape from widest near the base of the leaf and narrowing toward the tip, to widest near the tip of the leaf and narrowing toward the base. Stem leaves are sparse, usually alternately arranged along the stem, and tend to be widest near the base and tapering near the tip. All leaves are covered in long, soft hairs.

Flowers: Flowers small, about 3 mm wide. The calyx is covered with short, soft white to brownish hairs.

Bloom time: March to early June.

Fruit: Nutlets are 1-2 mm long and are thickly cross-shaped (see key 2b); nutlet scar is located near middle of the inner face of the fruit (see Appendix B).

Habitat: Various, including grassy to rocky slopes, meadows, scrub, and woodlands, usually in well-drained soils that are very dry in summer.

Range: British Columbia and Idaho south to Mexico.

Distinguishing the Species: The small stature, distinct basal rosette of leaves, tiny flowers, and cross-shaped nutlets of slender popcornflower make it readily discernable from the larger rough popcornflower, which lacks a persistent basal rosette and produces egg-shaped nutlets. Additionally, slender popcornflower begins blooming much earlier and there is little flowering overlap between the species.

Rough popcornflower (*Plagiobothrys hirtus*)



General: Plants can be annuals (completing the lifecycle within a year) averaging 30 cm tall, or short-lived perennials (surviving more than 2 years) reaching 50-60 cm tall. Seeds germinate in fall when vernal pools begin to fill with water, and plants persist through the winter as submerged rosettes (a form lacking stems with dense clusters of leaves attached at the base of the plant). As vernal pools start drying out in late spring, plants grow rapidly, developing flowering stems, and losing the basal rosette of leaves before flowering is complete.

Stems: Main stem is erect and usually unbranched at the base, with upturned-spreading flowering stems branching off above. Upper stems covered with stiff outward-spreading hairs; stems stout, 4-5 mm in diameter.

Leaves: On the lower main stem, leaves are arranged in pairs such that leaves of each pair are opposite one another on the stem and fused together at their bases. Leaves are usually alternately arranged along upper stems. All leaves are linear (long and narrow with approximately parallel edges, see Appendix B) with hairy margins. Leaves near base of plant are often lacking hairs on upper and lower surfaces, while leaves of upper stems are often covered in outward-pointing hairs. During fall and winter, plants are immersed in water and produce hairless, thickened, fleshy leaves with extensive internal air spaces. This “submerged foliage” is distinctly different from the hairy, flattened foliage produced by emergent plants (see photos on following page).

Flowers: Plants produce a showy display of many 6-10 mm wide flowers born on paired coiled inflorescences at the ends of stems (see Appendix B).

Bloom time: Flowering begins in late May or early June in sites near Sutherlin and in late June at populations farther north. Depending on conditions, flowering can continue through September.

Habitat: Seasonally wet pools that dry completely by mid-summer at elevations below 170 m (560 ft). Requires full sun exposure.

Range: Found only in Douglas County, Oregon and restricted to the Sutherlin Creek, Calapooya Creek, and Yoncalla Creek watersheds.

Species Variation: Rough popcornflower traits can vary significantly between populations due to both genetic and environmental differences. Plants of different populations can vary in the timing of events such as flowering and seedling emergence, as well as exhibit differences in growth and appearance. Plants at the northernmost part of the species' range can grow to 60 cm high and survive over two years, while plants at one southerly population reach only 20-30 cm tall and complete the lifecycle within a year. Differences between populations in the number of flowers produced per plant and in the production of adventitious roots (roots sprouting from various points along a stem) have been documented, as well.

Hybridization: Rough popcornflower is potentially threatened by hybridization with the more common and closely related fragrant popcornflower. Hybrids can potentially outcompete "pure" rough popcornflowers and threaten the survival of this endangered species. Fragrant popcornflower grows at two of the sites in which rough popcornflower occurs, and it has been speculated that the plants at one of these locations are actually hybrids between the two species. Greenhouse crosses between rough popcornflower and fragrant popcornflower have produced viable seeds, indicating that hybrids may potentially be created in nature.

Special Status: Listed as endangered by the U.S. Fish & Wildlife Service and the State of Oregon, incurring both federal and state protection.



Emergent rosettes with both thickened, fleshy "submerged foliage" and flattened "emergent foliage."



Submerged rosettes sometimes float to the water surface, later rooting in new areas of a wetland.

Scouler's popcornflower (*Plagiobothrys scouleri*)



General: Diminutive annuals, usually 5-15 cm tall. Rosettes of long, narrow leaves attached at the base of the plant are sometimes formed before flowers develop, but rosettes do not persist throughout the flowering period.

Stems: Plants have one to several slender, upturned spreading and/or erect stems covered in hairs that are generally pressed down against the stem surface.

Leaves: Lower stem leaves are arranged in pairs, the leaves of each pair opposite one another on the stem. Upper stem leaves are alternately arranged. Leaves are covered in hairs that mostly lie flat against leaf surfaces.

Flowers: Flowers very small, usually 2-4 mm wide. Inflorescences often unpaired, with just one coiled inflorescence at the end of a stem (see Appendix B).

Bloom time: May to August.

Habitat: Open areas in low-lying wet meadows that dry out in summer. Often occurs with fragrant popcornflower.

Range: Southern British Columbia to southern Oregon.

Distinguishing the Species: Scouler's popcornflower is much shorter and smaller than rough popcornflower, with smaller flowers and narrower stems. The hairs that cover the stems and leaves of the two species are distinctly different: hairs of the slender popcornflower are softer and tend to lie flat against stem and leaf surfaces, while hairs of the rough popcornflower are stiff, coarser, and spread straight outward from stem and leaf surfaces.

Coral seeded allocarya (*Plagiobothrys figuratus* ssp. *corallicarpus*)



General: This popcornflower very closely resembles the fragrant popcornflower (*Plagiobothrys figuratus* ssp. *figuratus*). Nutlets (fruits) must be present in order to distinguish the two subspecies.

Stems: Plants have several to many stems that are erect or spreading. Stems are covered in hairs that lie flat against the stem surface and are approximately 2 mm in diameter.

Leaves: Lower stem leaves are arranged in pairs, with leaves of each pair opposite one another on the stem; upper stem leaves are alternately arranged. Leaves are primarily linear in shape and all are covered with hairs that mostly lie flat against leaf surfaces.

Flowers: Flowers are usually 5-8 mm wide and arranged in coiled, usually paired, inflorescences at the ends of stems (see Appendix B). Inflorescences are showy, bearing many flowers. The calyx is covered in soft, straight hairs that are often brown to rust-colored.

Bloom time: May to July.

Fruit: Nutlets are 1-1.5 mm long with coral-like texture, deeply pitted, with irregular high ridges and warty projections. Nutlet scar (see key 5a) is located on the lower part of the inner surface of the nutlet, very near, but not directly at, the base.

Habitat: Open areas in low-lying wet meadows that dry out in summer.

Range: Restricted to the Upper Rogue River Valley in Jackson and Josephine Counties, Oregon.

Special Status: Federally recognized as a Species of Concern (species considered as a potential candidate for listing under the federal Endangered Species Act); candidate species for protection by the state of Oregon.

Distinguishing the Species: Coral seeded allocarya tends to be shorter and smaller than rough popcornflower, with narrower stems. Stem and leaf hairs are important in distinguishing between the species: hairs of coral seeded allocarya are softer and typically lie flat against stem and leaf surfaces, while hairs of rough popcornflower are stiff, coarser, and spread straight outward from stem and leaf surfaces. Though nutlets of the species are similar, those of coral seeded allocarya have more prominent ridges and warty projections.

Fragrant popcornflower (*Plagiobothrys figuratus* ssp. *figuratus*)



General: Plants are annuals, reaching 10-40 cm tall. Rosettes of long, narrow leaves attached at the base of the plant are sometimes formed before flowers develop, but rosettes do not persist throughout the flowering period.

Stems: Plants have several to many stems that are erect or spreading. Stems are covered in hairs that lie flat against the stem surface and are approximately 2 mm in diameter.

Leaves: Lower stem leaves are arranged in pairs, with leaves of each pair opposite one another on the stem; upper stem leaves are alternately arranged. Leaves are primarily linear in shape and all are covered with hairs that mostly lie flat against leaf surfaces.

Flowers: Flowers are usually 5-8 mm wide and arranged in coiled, usually paired, inflorescences at the ends of stems (see Appendix B). Inflorescences are showy, bearing many flowers with a strong, sweet aroma, as the species' common name implies. The calyx is covered in soft, straight hairs that are often brown to rust-colored.

Bloom time: May to July.

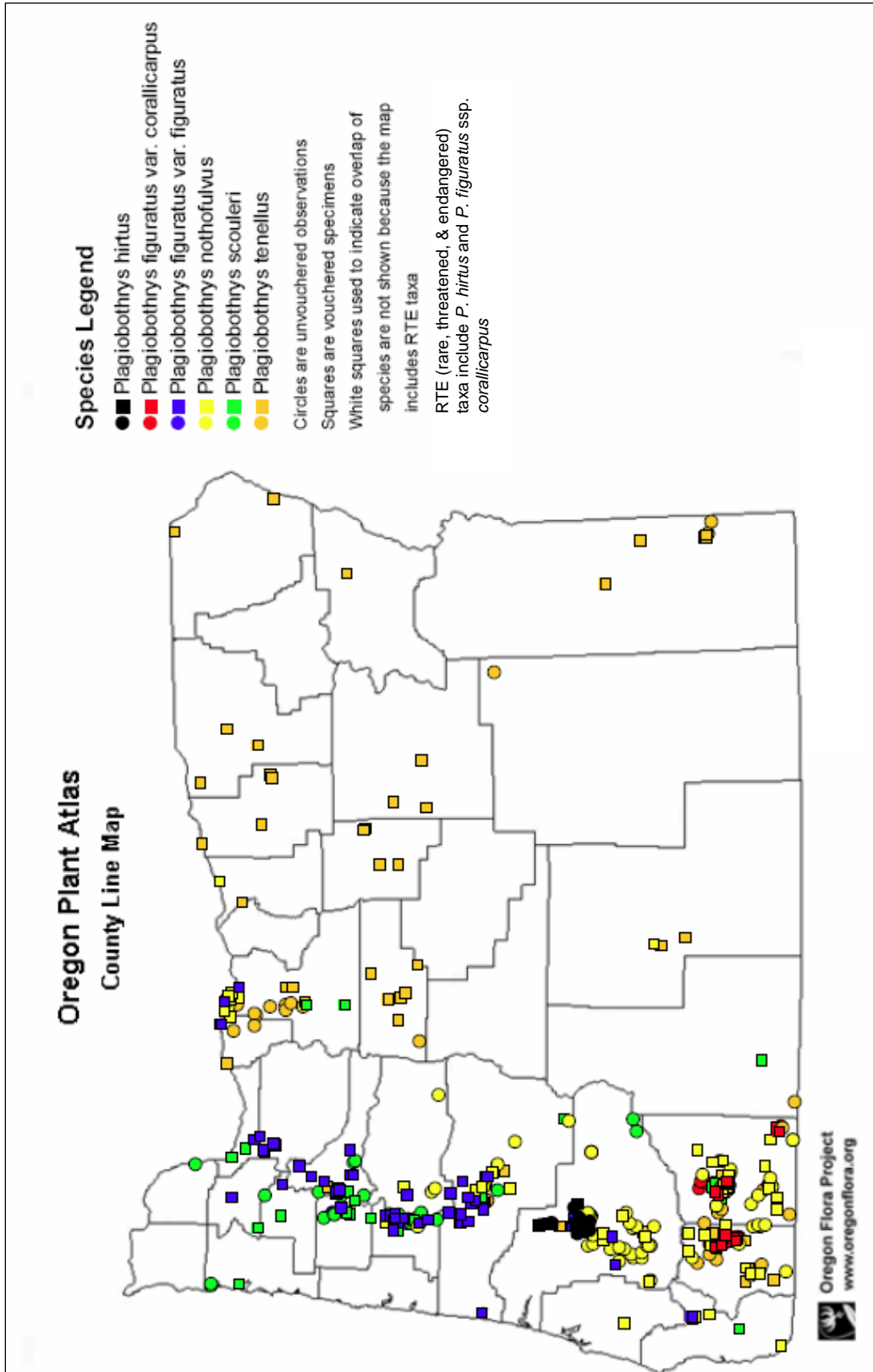
Fruits: Nutlets are 1-1.7 mm long and are moderately pitted and ridged (less so than those of coral seeded allocarya), with low relief warty projections. Nutlet scar (see key 5b) is located distinctly on the inner side of the nutlet, near, but not reaching, the base (slightly higher than scar of coral seeded allocarya).

Habitat: Open areas in low-lying wet meadows that dry out in summer. Often occurs with Scouler's popcornflower.

Range: British Columbia to southern Oregon.

Distinguishing the Species: Fragrant popcornflower tends to be shorter and smaller than rough popcornflower, with narrower stems. Stem and leaf hairs are important for differentiating between the two species: hairs of fragrant popcornflower are softer and typically lie flat against stem and leaf surfaces, while hairs of rough popcornflower are stiff, coarser, and spread straight outward from stem and leaf surfaces.

APPENDIX A: Popcornflower Distributions



Statewide distributions of popcornflower species potentially occurring in the Umpqua River watershed, Douglas County. Map courtesy of the Oregon Flora Project.

APPENDIX B: Supplemental Illustrations

Leaf Shape



Linear



Lanceolate—widest near the base and narrowing toward the tip



Oblanceolate—widest near the tip and narrowing toward the base

Flower Features & Arrangement



Calyx



Unpaired Coiled Inflorescence



Paired Coiled Inflorescence

Fruits



Calyx with 4 nutlets



Nutlets outlined in red

Outer Nutlet Surface—portion of nutlet surface visible when nutlet is attached within the calyx (surface seen in photos on left).

Inner Nutlet Surface—portion of nutlet surface containing point of attachment to plant; surface that is hidden from view as a nutlet develops on the plant and is only visible when the nutlet is removed from the calyx.

APPENDIX C: References

Abrams, L. 1951. Illustrated flora of the Pacific states, Vol. 3: Geraniaceae to Scrophulariaceae. Stanford University Press, Stanford, CA.

Amsberry, K. and R.J. Meinke. 2002. Investigations of hybridization and population differentiation, and their conservation and recovery implications for the endangered species, *Plagiobothrys hirtus*. Report to U.S. Fish and Wildlife Service. Oregon Department of Agriculture, Salem, Oregon.

Chambers, K. L. 1989. The taxonomic relationships of *Allocarya coralllicarpa* (Boraginaceae). *Madroño* 36:281

Gilkey, H.M. and L.R.J. Dennis. 2001. Handbook of Northwestern Plants. Oregon State University Press, Corvallis, OR.

Hickman, James C. (ed.). 1993. The Jepson manual. University of California Press, Berkeley, CA.

Hitchcock, C.L. and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, WA.

Hitchcock, C.L., A. Cronquist, M. Owenby, and J.W. Thompson 1959. Vascular plants of the Pacific Northwest, Part 4: Ericaceae through Campanulaceae. University of Washington Press, Seattle, WA.

Kozloff, E.N. 2005. Plants of Western Oregon, Washington, and British Columbia. Timber Press, Inc., Portland, Oregon.

Peck, M.E. 1961. A manual of the higher plants of Oregon. Binfords and Mort, Portland, Oregon.