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A NEW *RANUNCULUS* (RANUNCULACEAE) SPECIES FROM SOUTH-CENTRAL WASHINGTON

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ABSTRACT

A new *Ranunculus* species, *Ranunculus basalticus* Giblin sp. nov., is described from sagebrush-steppe and low elevation grassland areas of south-central Washington. The species is close in appearance to two sympatric *Ranunculus* species, the narrow endemic *R. triternatus* A.Gray and the broadly distributed *R. glaberrimus* Hook. However, discrete morphological, ecological, and distribution differences easily separate *R. basalticus* from these other species. The earliest record of *R. basalticus* dates to 2004 in the form of a digital photo, with subsequent voucher specimens first collected in 2009. Additional field collecting, along with photo submissions to iNaturalist, suggest that *R. basalticus* is a narrow endemic of Kittitas, Klickitat, and Yakima counties in Washington. It most commonly occurs in soil-stabilized basalt talus, for which the specific epithet refers. Although *R. basalticus* appears to have a narrow distribution, within its range, population sizes can exceed 100 plants. All currently documented populations are on public lands managed for multiple uses, though there appear to be no direct threats to these populations.

Key Words: Basalt, endemic, Epirotes, Ranunculaceae, *Ranunculus basalticus*, *Ranunculus triternatus*.

Ranunculus L. is a cosmopolitan genus with more than 600 species occurring in diverse habitats from sea level to the alpine (Tamura 1995). The most recent comprehensive treatment for *Ranunculus* in North America north of Mexico reports 76 species (Whittemore 1997), although that treatment does not reflect the later segregation of several small genera, such as *Arcteranthis* Greene, *Beckwithia* Jeps., *Ceratocephala* Moench, *Ficaria* Guett., and *Halerpestes* Greene to create a monophyletic *Ranunculus* (Emadzade et al. 2010). Hybridization and polyploidy have contributed to diversification in the genus, with introgression among sympatric taxa well-documented (Liao et al. 2008; Hörandl et al. 2009; Cruzan et al. 2021; Bobrov et al. 2022).

A total of 22 *Ranunculus* species comprising 40 taxa are currently reported from Washington State in western North America (Legler 2018). With the exception of one narrowly endemic species (*R. triternatus* A.Gray), these taxa are broadly distributed either regionally or continentally, and none is reported to form hybrid swarms where sympatric in the Pacific Northwest (Legler 2018).

Ranunculus glaberrimus Hook. is broadly distributed across western North America from British Columbia to California, east to the Rocky Mountains and northern Great Plains. In Washington it most frequently occurs east of the Cascades crest in sagebrush desert and ponderosa pine forest openings between 100–800 m, although alpine populations do occur on the eastern edge of the Olympic Mountains in western Washington. The species is easily recognized by its simple leaves with blades that range from narrowly elliptic to reniform with apices that vary from entire to deeply three-lobed.

Ranunculus triternatus is endemic to the eastern Columbia River Gorge area of Klickitat County, Washington, and adjacent Hood River and Wasco counties in Oregon (Legler 2018). Flora of North America reports isolated populations of this taxon in Nevada and Idaho (Whittemore 1997); however, we and other researchers were unable to locate those specimens and consider such occurrences unlikely (Holmgren and Holmgren 2012). As the specific epithet indicates, the leaves are triternate, and the leaflet lobes are linear. Although *R. triternatus* occurs at elevations between 150–1000 m, similar to that of

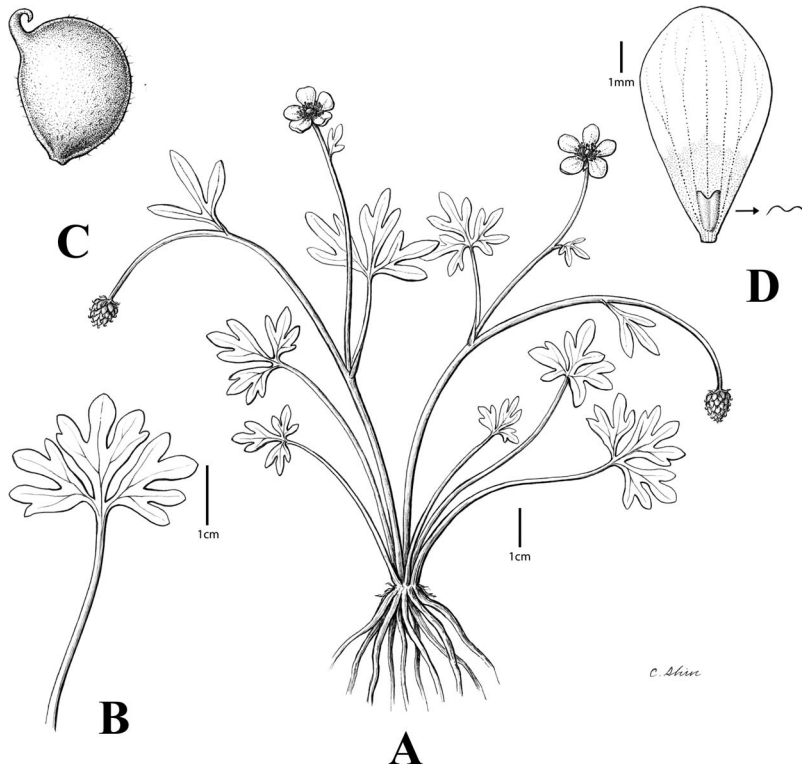


FIG. 1. *Ranunculus basalticus*. A. Habit. B. Ternate leaf. C. Achene with curved beak and short hairs. D. Petal with notched nectary and adjacent illustration highlighting undulating nature of nectary surface. Illustrations based on type specimens. Illustrations by Crystal Shin.

R. glaberrimus across its range, voucher- and photo-based evidence suggest that these two species seldom if ever occur in close proximity in this area (Consortium of Pacific Northwest Herbaria 2023, iNaturalist 2023). Additional studies are needed to determine potential microsite differences between known occurrences.

In 2009, specimens of *Ranunculus* were collected in Klickitat County, Washington, in oak savannah habitat with ternate basal leaves that could be interpreted as intermediate in leaf morphology to both *R. triternatus* and *R. glaberrimus*. Additional specimens of such plants have since been collected from other locations in Kittitas, Klickitat, and Yakima counties of Washington through 2023, and images of such plants from yet more locations appear on iNaturalist (2023) and the Burke Herbarium Image Gallery (2023) dating as far back as 2004. Subsequent examination of specimens at WTU and additional field work indicate that the plants with ternate basal leaves also have nectary gland and achene beak morphologies that differ from those of either *R. glaberrimus* or *R. triternatus*. Field work has also shown that the plants with ternate basal leaves do not form hybrid swarms where they co-occur with *R. glaberrimus*. Finally, the range of this form is only minimally sympatric with *R. triternatus*, where they share a

southern and northern distribution edge, respectively, but do not co-occur in proximity to one another. Based on distinct leaf, flower, and fruit morphologies (Figs. 1, 2), lack of apparent interbreeding with *R. glaberrimus*, and discreet distribution differences from *R. triternatus* (Fig. 3), we believe it is best to recognize those plants with ternate basal leaves at the rank of species, which we describe here as *Ranunculus basalticus* Giblin. Based on the key for the Flora of North America *Ranunculus* treatment, this species would belong to the section Epirotes (Whittemore 1997).

TAXONOMIC TREATMENT

Ranunculus basalticus Giblin, sp. nov. (Figs. 1, 2).

TYPE: USA, Washington, Kittitas Co., Yakima River Canyon. West side of Yakima River, approximately 300 m west along and 200 m south of trail; north-facing soil-stabilized basalt scree slope, 430 m elevation, 46.85392, -120.48814, 25 April 2023, Giblin 8974. (holotype: WTU 433410; isotypes: OSC, US, WS).

Perennial herbs, 5–25 cm, glabrate, caespitose. **Roots** fibrous-thickened, to 15 cm long, tapering only slightly throughout their length. **Stems** lax, sometimes

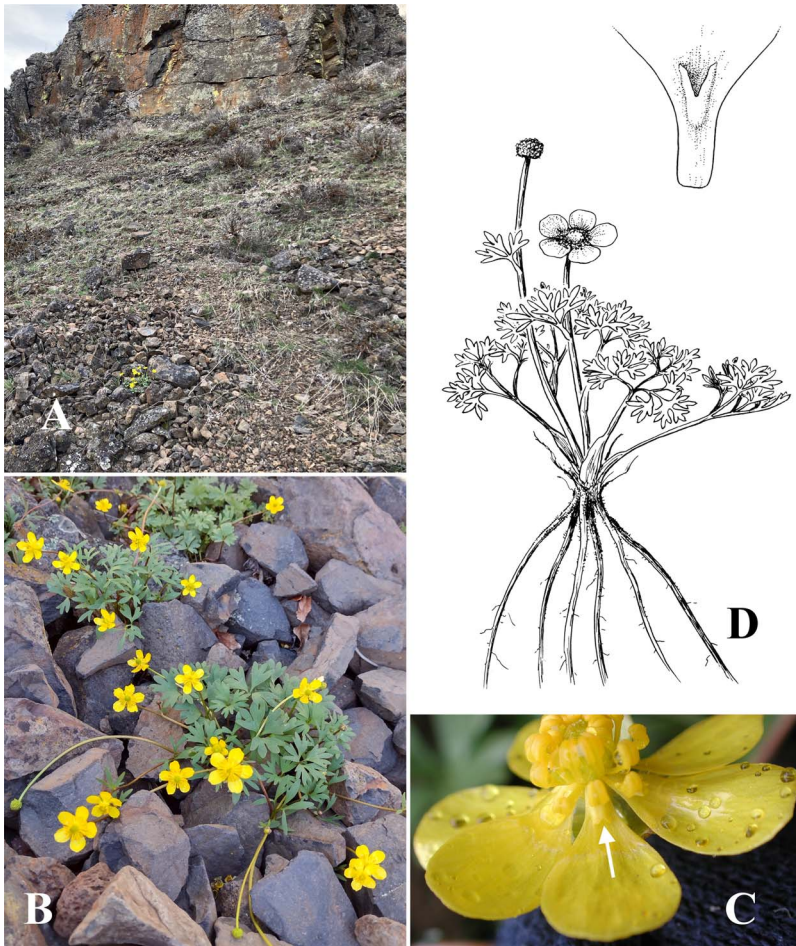


FIG. 2. Photos of *Ranunculus basalticus* habitat, growth habit, and nectary morphology. A. Example of soil-stabilized basalt scree where *Ranunculus basalticus* often grows. Photo by Peter Zika. B. *Ranunculus basalticus* growing in basalt talus (Photo by David Giblin). C. *Ranunculus basalticus* nectary. Photo by David Giblin. D. *Ranunculus triternatus* illustration highlighting triternate leaves and deeply notched nectary. Illustration by Jeanne R. Janish.

arcuate, generally longer than high, red when young, drying brownish, with conspicuous to inconspicuous longitudinal ribs. **Leaves** basal, 5–15, long-petiolate, petioles to 8 cm; blades ternate, occasionally simple and lobed to base, wider than to as wide as high, 6–22 × 15–32 mm, lightly bluish-green; leaflets mostly sessile, occasionally on flattened petiolules to 4 mm long, usually with three deeply divided lobes; leaflet lobes (0-)3(-5), 2–22 × 1–10 mm, shallowly to fully cleft, broadly oblanceolate to ovate or obovate, margins entire. **Inflorescences** with 1–2 bracts, bracts ternate, occasionally simple and lobed to base, from wider than high to higher than wide, 2.5 cm × 2.5 cm, bractlets or bractlet lobes oblanceolate to ovate or obovate, margins entire; flowers typically terminal and solitary, occasionally also axillary. **Peduncles** 3–15 cm at anthesis, mostly glabrate, occasionally short-hairy at base of receptacle, elongating in fruit. **Receptacles** sparsely hairy with crisped hairs to 0.5

mm; globose at anthesis, elongating to 7 mm in fruit. **Flowers** bisexual; sepals 5(6), free, often red and gibbous when young, brownish-green at maturity, glabrous, 5–9 × 3–6 mm, ovate-elliptic, with conspicuous, mostly parallel veins; petals 5, free, yellow, sometimes drying white, glabrous, 7–13 × 5–11 mm, obovate with short, broad claw, veins conspicuous, branching distally; nectary to 2 mm, golden, margins adnate with petal nearly entire length, distal margin entire to shallowly bifid, eciliate; stamens clavate, anther sacs to 1.2 mm, confluent with filaments, dehiscing abaxially; filaments flattened at anthesis, to 3 mm in length at maturity; carpels 25–40, glabrous at anthesis with straight, flattened beak; **Fruits** mature achenes to 2 mm long, sparsely short-hairy, moderately compressed laterally, keeled dorsally, beak strongly curved to uncinat.

Paratypes. USA. Washington, **Kittitas Co.**, Umtanum Creek Recreation Area. West side of Yakima

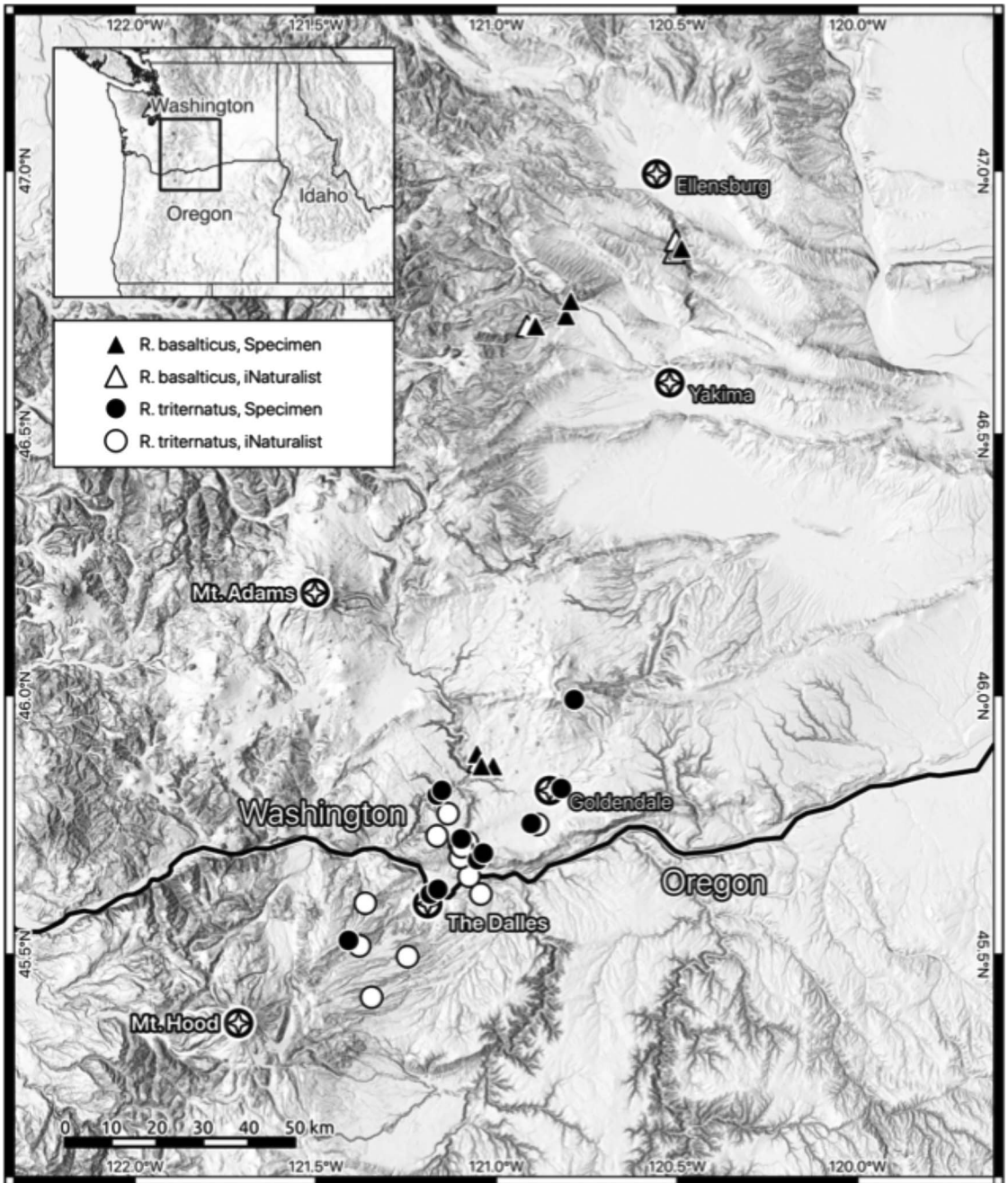


FIG. 3. Map of study area, with inset showing location of study area in Washington and adjacent Oregon. Geographic distribution of *R. basalticus* (filled triangles - specimens; open triangles - iNaturalist observations) and *R. triternatus* (filled circles - specimens; open circles - iNaturalist observations). The two species are sympatric only at their known southern and northern ranges, respectively. Map by John Haskins.

River, approximately 300 m west along trail and 200 m south of trail, 430 m elevation, 46.5392, -120.48814, 28 April 2023, *Giblin 8965* (WTU); **Klickitat Co.**, Klickitat State Wildlife Recreation Area west of the Glenwood Highway. Canyon Creek, a tributary of the Little Klickitat River. Volcanic rock outcrop

above creek on east side of drainage, elevation 365 m, 45.8653, -121.00915; 1 April 2009, *Carolyn Wright 2241* (WTU); Klickitat State Wildlife Recreation Area. Canyon Creek. Middle of west-facing slope on east bank of Canyon Creek. 508 m elevation, 45.8890, -121.0538; 23 April 2009, *Paul Slichter, s.n.* (WTU);

Klickitat State Wildlife Recreation Area west of the Glenwood Highway. East slope above Canyon Creek. Volcanic rock outcrop, elevation 425 m; T5N, R14E, sect. 34; 3 May 2009, *Carolyn Wright 2242* (WTU); Klickitat State Wildlife Area, Canyon Creek. Plants in open, steep, rocky basalt swales, slope 30–40°, occasionally less, 1162 ft elevation [352 m], 45.863403, –121.041449; 21 March 2014, *Paul Slichter, s.n.* (WTU); Klickitat State Wildlife Recreation Area. Canyon Creek. 370 m elevation, 45.8653, –121.0414; 21 March 2014, *Paul Slichter, s.n.* (WTU); Klickitat State Wildlife Recreation Area. Canyon Creek, elevation 355 m, 45.8634, –121.0414; 21 March 2014. *Paul Slichter, s.n.* (WTU); **Yakima Co.**, Oak Creek Wildlife Area. Bear Canyon. Approximately 0.75 km from trailhead, west side of trail; elevation 640 m; 46.70875, –120.89615; 25 May 2022, *David Giblin 8706* (WTU); Oak Creek Wildlife Area. Bear Canyon. Approximately 0.75 km from trailhead, west side of trail, 50 m elevation higher upslope than *David Giblin 8706* site, elevation 690 m, 46.70848, –120.89671; 25 May 2022, *David Giblin 8708* (WTU); Oak Creek Wildlife Area. South side of Tieton River, elevation 520 m, 46.72654, –120.80789, 25 April 2023. *Giblin 8996* (WTU); Oak Creek Wildlife Area. Bear Canyon. Approximately 50 m north from parking area, elevation 613 m, 46.70669, –120.89127; 25 April 2023. *Giblin 9000* (WTU).

with it showing almost exclusive preference for thin soils that develop over basalt scree, talus, or ledges. It is not found in adjacent areas lacking exposed basalt or in areas of exposed basalt lacking soil (i.e., it does not grow up through openings in basalt talus).

All documented populations of *R. basalticus* occur on state and federal public lands managed for multiple uses (e.g., recreation, cattle grazing, hunting). There appear to be no immediate direct threats to the persistence of this species on these lands. Fortunately, it often grows on steep slopes and in rock crevices that are not likely to be impacted by cattle grazing, off-road vehicles, mountain biking, or hiking activities. Perhaps the greatest threats are indirect through the consequences of short wildfire return intervals that tend to increase establishment and cover of introduced grass species such as *Bromus tectorum* L. (Brooks et al. 2004). We recommend that *R. basalticus* be placed on the Review List by the Washington Natural Heritage Program to document the abundance and distribution of this species more fully. It is possible that additional populations of *R. basalticus* occur on tribal and private lands within the known range of this species. Pursuing access to these lands and assessing potential threats to extant populations of *R. basalticus* should be part of any conservation plan developed.

DISTRIBUTION AND HABITAT

Range. endemic to Kittitas, Klickitat, and Yakima counties in Washington. *Habitat:* *Quercus garryana* Douglas ex Hook. savannah, partially vegetated scree and talus of grassy slopes, and basalt ledges; 300–700 m.

PHENOLOGY

Flowering. February–May.

ETYMOLOGY

The specific epithet *basalticus* refers to the basalt scree and talus slopes where this species is found. On this basis the recommended common name is Basalt Buttercup.

DISCUSSION OR CONSERVATION IMPLICATIONS

Within Rabinowitz’s (1981) seven forms of rarity framework, *R. basalticus* is a narrowly distributed habitat specialist. Despite its narrow distribution, specimen and online photo data indicate at least 15 localities for *R. basalticus*. Field work to date has documented several populations with robust numbers (e.g., more than 100 plants in a population). However, our field observations suggest that the habitat preferences for this species is rather narrow,

KEY TO SYMPATRIC *RANUNCULUS* TAXA IN SOUTH-CENTRAL WASHINGTON

The key here treats native *Ranunculus* taxa flowering from late winter to spring that co-occur in sagebrush-steppe, low elevation grassland, and *Q. garryana* savannah habitats of south-central Washington and adjacent Oregon. Although there are other *Ranunculus* taxa that can occur in this area, none flower over a similar time period or are close in appearance to the taxa treated in the key.

1. Plants annual; achenes short-hairy on lateral faces; leaves simple, basal and lower cauline blades deeply 3-parted, segments undivided or 2 to 4-lobed, margins entire or 2–4-dentate; Whitman County, Washington, and adjacent west-central Idaho, and east end of Columbia River Gorge in Washington and Oregon, south to Baja California, Mexico . . . *R. hebecarpus* Hook. & Arn.
- 1’ Plants perennial; achenes not short-hairy on lateral faces; leaves simple or compound
 2. Leaves simple, deeply lobed to undivided; nectary scale generally sparsely ciliate on upper margin; achene beak curved or straight *R. glaberrimus*
 3. Basal leaf blades elliptic to oblanceolate, mostly entire; stem leaves entire to 3-lobed; sagebrush and juniper scrubland to subalpine meadows; disjunct in Olympic Mountains in Washington, otherwise occurring east of the Cascades crest from central British Columbia to

- northwestern California, east to the Rocky Mountains and northern Great Plains var. *ellipticus* (Greene) Greene
- 3' Basal leaf blades mostly ovate to obovate, occasionally wider than long, more often shallowly lobed than entire; stem leaves entire or 3-lobed, lobes generally equal in size; sagebrush desert and grasslands generally at low elevations; occurring east of the Cascades crest from southern British Columbia to northwest California, east to Montana, Wyoming, and South Dakota var. *glaberrimus*
- 2' Leaves compound; nectary scale not ciliate on upper margin; achene beak curved or straight
4. Leaves triterately dissected; leaflet lobes narrowly linear to linear, distinctly petiolulate, petiolules 6–15 mm; achene beak straight; nectary scale deeply notched; open slopes with basalt swales, oak savannah; 150–1000 m elevation; Klickitat County, Washington, to Hood River and Wasco counties, Oregon *R. triternatus*
- 4' Leaves ternately dissected; leaflet lobes oblanceolate to ovate or obovate, generally sessile, occasionally on petiolules to 4 mm; achene beak curved to uncinate; nectary scale entire to shallowly bifid; open slopes with basalt swales, oak savannah; 300–700 m elevation; Kittitas, Yakima and Klickitat counties, Washington *R. basalticus*
- HOBBS, AND D. PYKE. 2004. Effects of invasive alien plants on fire regimes. *Bioscience* 54:677–688.
- BURKE HERBARIUM IMAGE GALLERY. 2023. Website <https://burkeherbarium.org/imagecollection/> [accessed on 13 April 2023].
- CONSORTIUM OF PACIFIC NORTHWEST HERBARIA. 2023. Website <https://www.pnwherbaria.org/data/search.php> [accessed 14 April 2023].
- CRUZAN, M. B., P. G. THOMPSON, N. A. DIAZ, E. C. HENDRICKSON, K. R. GERLOFF, K. A. KLINE, H. M. MACHIORLETE, AND J. M. PERSONINGER. 2021. Weak coupling among barrier loci and waves of neutral and adaptive introgression across an expanding hybrid zone. *Evolution* 75:3098–3114.
- EMADZADE, K., C. LEHNEBACH, P. LOCKHART, AND E. HÖRANDL. 2010. A molecular phylogeny, morphology, and classification of genera of Ranunculaceae (*Ranunculaceae*). *Taxon* 59:809–828.
- HOLMGREN, N. H. AND P. K. HOLMGREN. 2012. *Ranunculus*. Pp. 120–154 in N. H. Holmgren, P. K. Holmgren, J. L. Reveal, and Collaborators (eds.), *Intermountain Flora: Vascular Plants of the Intermountain West*, U. S.A., Vol. 2, Part A. New York Botanical Garden Press, New York, NY.
- HÖRANDL, E., J. GREILHUBER, K. KLIMOVA, O. PAUN, E. TEMSCH, K. EMADZADE, AND I. HODOLOVA. 2009. Reticulate evolution and taxonomic concepts in the *Ranunculus auricomus* complex (*Ranunculaceae*): insights from analysis of morphological, karyological and molecular data. *Taxon* 58:1194–1216.
- INATURALIST CONTRIBUTORS, iNATURALIST (2023). iNaturalist Research-grade Observations. iNaturalist.org. Occurrence dataset https://www.inaturalist.org/observations?place_id=any&quality_grade=research&subview=map&taxon_id=78824&verifiable=any/ [accessed 4 April 2023].
- LEGLER, B. S. 2018. *Ranunculus*. Pp. 93–100 in D. E. Giblin, B. S. Legler, P. F. Zika, and R. G. Olmstead (eds.), *Flora of the Pacific Northwest: an illustrated manual*, 2nd ed. University of Washington Press, Seattle, WA.
- LIAO, L., L. XU, D. ZHANG, L. FANG, H. DENG, J. SHI, AND T. LI. 2008. Multiple hybridization origin of *Ranunculus cantoniensis* (4×): evidence from trnL-F and ITS sequences and fluorescent *in situ* hybridization (FISH). *Plant Systematics and Evolution* 276:31–37.
- RABINOWITZ, D. 1981. Seven forms of rarity. Pp. 205–217 in H. Synge (ed.), *The biological aspects of rare plant conservation*. John Wiley and Sons, Chichester, United Kingdom.
- TAMURA, M. 1995. Pp. 223–519 in P. Hiepko (ed.), *Angiospermae Ordnung Ranunculales. Fam. Ranunculaceae. II. Systematic Part. Die natürliche pflanzenfamilien* (2nd ed., 17aIV). Duncker Humblot, Berlin, Germany.
- WHITTEMORE, A. T. 1997. *Ranunculus*. Pp. 356–357 in *Flora of North America* Editorial Committee eds. 1993+. *Flora of North America North of Mexico* [Online]. 22+ vols. New York and Oxford. Vol. 3: Magnoliophyta: Magnoliidae and Hamamelidae. Website http://floranorthamerica.org/Ranunculus_triternatus. [accessed 15 March 2023].

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LITERATURE CITED

- BOBROV, A. A., J. BUTKUVIENE, E. V. CHERMERIS, J. PATAMSYTE, C. LAMBERTINI, A. AUCINA, Z. SINKEVICIENE, AND D. NAUGZEMYS. 2022. Extensive hybridization in *Ranunculus* section *Batrachium* (*Ranunculaceae*) in rivers of two postglacial landscapes of East Europe. *Scientific Reports* 12:12088.
- BROOKS, M. L., C. M. D'ANTONIO, D. M. RICHARDSON, J. B. GRACE, J. E. KEELEY, J. M. DITOMASO, R. J.