

**POTENTILLA TRANSITORIA (ROSACEAE),
A NEW SPECIES FROM THE MIDDLE ROCKY MOUNTAINS OF NORTH AMERICA,
WITH NOTES ON MORPHOLOGICALLY SIMILAR SYMPATRIC SPECIES**

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ABSTRACT

Potentilla transitoria Ertter, **sp. nov.**, is described for subpalmate- to subpinnate-leaved plants from the Middle Rocky Mountains of North America that are morphologically intermediate between palmate-leaved *P. multisecta* and pinnate-leaved *P. ovina* var. *ovina*. Although the new species is primarily based on morphological and ecogeographic characteristics, at least some support is provided by preliminary molecular phylogenetic analysis. The current taxonomic status of the morphologically similar sympatric species *P. ovina*, *P. multisecta*, and *P. glaucophylla* var. *perdissecta* is briefly summarized, with particular attention given to noteworthy populations at the northern end of their respective geographic ranges. Current and potential conservation status is also summarized for all four taxa.

Among the elements of variation within *Potentilla* that were specifically excluded from the treatment of the genus in Flora of North America North of Mexico (Ertter et al. 2015) were collections from eastern Idaho, southwestern Montana, western Wyoming, and adjacent Colorado that appeared to be transitional between *P. multisecta* (S. Wats.) Rydb. (in sect. *Concinnae* (Rydb.) A. Nelson) and *P. ovina* J.M. Macoun var. *ovina* (in sect. *Multijugae* (Rydb.) A. Nels.). These collections were mentioned in the discussions of both *P. multisecta* and *P. ovina* var. *ovina*, noting that this geographic area is apparently a zone of intergradation that also may involve *P. glaucophylla* Lehm. var. *perdissecta* (Rydb.) Soják (in sect. *Graciles* (Rydb.) A. Nels.) and unresolved variation in sect. *Subjugae* (Rydb.) A. Nels.

Subsequent to the publication of Ertter et al. 2015, research continued on this and other unresolved taxonomic quandaries in *Potentilla* and related genera, mostly involving extensive fieldwork and examination of herbarium specimens. Although the complex variation displayed by *Potentilla* from the area referenced above is far from resolved and is likely an indication of active evolution, a name is provided here for core populations that are sufficiently coherent morphologically, geographically, and edaphically to merit taxonomic recognition, with at least some level of molecular phylogenetic support. Species rank is used because the morphological characters are intermediate

between those of pinnate-leaved *Potentilla ovina* var. *ovina* and palmate- (to subpalmate)-leaved *P. multisecta* and *P. glaucophylla* var. *perdissecta*, intergrading with all three but not being clearly closer to one or the other.

Taxonomic treatment

As the initial stage in a standard taxonomic analysis, potentially relevant herbarium specimens, representing nearly 100 separate collections, were accumulated at either UC/JEPS or SRP (i.e., the herbaria where the first author splits her research time). Fieldwork by the first author in 2008 and 2009 included populations at both ends of the new species' range: the Lost River and White Knob mountains in eastern Idaho, and on the Continental Divide in Carbon Co., Wyoming. At each of the nine populations or subpopulations encountered, ecological information was recorded, habit and other data not always evident from pressed specimens was noted, photographs were taken, and large collections were made that documented the range of variation within each population. Relevant co-occurring species and possible intermediates were also collected.

Table 1. Summary of diagnostic features of *Potentilla transitoria* and morphologically comparable sympatric species *P. ovina* var. *ovina*, *P. multisecta*, and *P. glaucophylla* var. *perdissecta*. Yellow highlighting indicates some of the more diagnostic distinctions.

	<i>P. ovina</i> var. <i>ovina</i>	<i>P. transitoria</i>	<i>P. multisecta</i>	<i>P. glaucophylla</i> var. <i>perdissecta</i>
stem orientation	prostrate to decumbent	decumbent becoming prostrate	prostrate	(decumbent) \pm ascending to erect
stem length (dm)	(0.3-)0.8-2	0.2-1(-1.5)	0.5-2(-2.7)	(0.5-)1-2.5(-3)
stem:basal lf length ratio	(1-)1.5-2.5(-3)	(1-)1.5-2.5(-3)	1-2(-3)	(1.5-)2-3(-4)
petiole length (cm)	(0.5-)1-2(-3)	(0.3-)0.7-2.5(-4)	1-6(-13)	(0.2-)1.5-5(-10)
petiole hair length (mm)	1-2	(1-)1.5-3	1-1.5	absent or \pm 1-1.5(-2)
lf dissection	pinnate	subpalmate to subpinnate	palmate (subpalmate)	palmate to subpalmate
lflet number	7-13	5-7	(3-)5	(3-)5(-7)
fraction of lf axis with lflets	$\frac{1}{2}$ (- $\frac{2}{3}$)	$\frac{1}{4}$ - $\frac{1}{2}$ (or less)	apex (to 1/6)	apex (to 1/5)
lflet incision	\pm all of margin incised $\frac{3}{4}$ + to midvein	\pm all of margin incised nearly to midvein	distal $\frac{1}{2}$ + incised $\frac{3}{4}$ + to midvein	distal $\frac{1}{2}$ to $\frac{2}{3}$ incised $\frac{2}{3}$ - $\frac{3}{4}$ + to midvein
lflet tooth/lobe length (mm)	2-6(-9)	(2-)3-6(-7)	3-10(-14)	(2-)4-9(-12)
pedicel length (cm)	(0.8-)1-2(-3)	(0.5-)1-2(-3)	1-3(-4)	(1-)1.5-3(-4)
pedicel orientation in fruit	straight to recurved	\pm recurved	recurved	straight (to recurved)
achene length (mm)	1.8-2	1.8-2.1	2-2.5	1.2-1.8

A standard taxonomic analysis was then undertaken; i.e., iterative sorting of pressed specimens by different suites of potentially diagnostic characters, coupled with detailed comparisons of the same characters in morphologically similar sympatric species, to determine any taxonomically meaningful patterns supported by multiple independently varying characters. The morphological and ecogeographic characters used in the current analysis were primarily those previously ascertained to be taxonomically informative in *Potentilla* (Ertter et al. 2015). Of the nearly 100 separate collections examined for the study, about half were determined to represent a reasonably cohesive new species by this technique; these specimens were then used as the source for quantitative and qualitative features that comprise the new species description below. The most diagnostic characters are summarized in Table 1, in comparison with *P. ovina* var. *ovina*, *P. multisecta*, and *P. glaucophylla* var. *perdissecta*. Characteristics of the comparative taxa are primarily derived from the treatment of the genus in Flora of North America (Ertter et al. 2015), with modifications to *P. glaucophylla* var. *perdissecta* based on additional material. Descriptions and terminology combine the species templates used for sect. *Multijugae* and sect. *Concinnae* in Ertter et al. (2015). All photos are by the first author except as indicated.

POTENTILLA TRANSITORIA Ertter, **sp. nov.** (Figs. 1–7). **TYPE: USA. Wyoming.** Carbon Co.: Continental Divide ca 30 airmiles S of Rawlins on Road 71 (Sage Creek Rd, BLM 401), jeep road on W ridge above aspen grove, 41°24.0'N 107°14.2'W, ca 8200 ft, 3 Jul 2008, *Ertter & Woodruff 19195* (holotype: UC 2072643; isotypes: GB, K, MO, NY, RM, US, WIS, WTU).

Differs from pinnate-leaved *Potentilla ovina* and palmate-leaved *P. multisecta* in having subpalmate to subpinnate leaves bearing 5(–7) leaflets on $\frac{1}{4}$ – $\frac{1}{2}$ or less of the leaf axis, as well as longer hairs on the petiole (mostly 1.5–3 mm vs. 1–2 mm).

Plants tufted to tightly matted (mats to nearly 3 dm diam.); caudex often much-branched, branches often elongate, from long thickened taproot. **Stems** decumbent becoming prostrate, 0.2–1(–1.5) dm long, (1–)1.5–2.5(–3) times length of basal leaves. **Basal leaves** subpalmate to subpinnate with distal leaflets \pm distinct, (1–)1.5–7(–10) cm long; petiole (0.3–)0.7–2.5(–4) cm long, long hairs verrucose, common to abundant, ascending-appressed, (1–)1.5–3 mm long (those of outer leaves often shorter and shaggier), short and cottony hairs absent, glands absent or sparse; leaflets 5–7, on distal $\frac{1}{4}$ – $\frac{1}{2}$ (or less) of leaf axis, rarely with additional rudimentary unlobed leaflets proximally, separate or \pm overlapping, proximal pair separated from others by (1–)2–5(–10) mm of leaf axis, central leaflet \pm obovate, (0.5–)1–1.5(–2.5) cm \times 0.4–1.3(–1.8) cm, nearly all of margin pinnately incised nearly to midvein, teeth (2–)3–5 per side, oblanceolate-linear, not overlapping, (2–)3–6(–7) mm long, surfaces similar, green to more often gray, straight to straight-cripsed hairs 1–2 mm long, stiff, mostly on veins and margins abaxially, sparse to common adaxially, rarely absent, cottony hairs absent, glands sparse to common. **Cauline leaves** (0)1(2). **Inflorescences** 1–5-flowered, openly cymose. **Pedicels** (0.5–)1–2(–3) cm long, \pm recurved in fruit. **Flowers:** epicalyx bractlets elliptic to linear, (1.5–)2–3 mm long; hypanthium (pressed) 3–5 mm diam., 1–2 mm deep; sepals (2.5–)3.5–4.5 mm long, apex \pm acute; petals (3–)5–6 \times 3–4 mm, canary yellow, lacking prominent darker basal patch; filaments 1–2 mm long, anthers 0.6–0.9 mm long; carpels 10–15, styles slender, 2–3 mm long. **Achenes** 1.8–2.1 mm long, smooth or faintly rugose, not carunculate.

Flowering from May to July (August). Open ridges, cliffs, rocky slopes, and outcrops, on primarily carbonate substrates, in sagebrush/grassland, open subalpine forests, alpine fellfield; 1670–3200 m elevation.

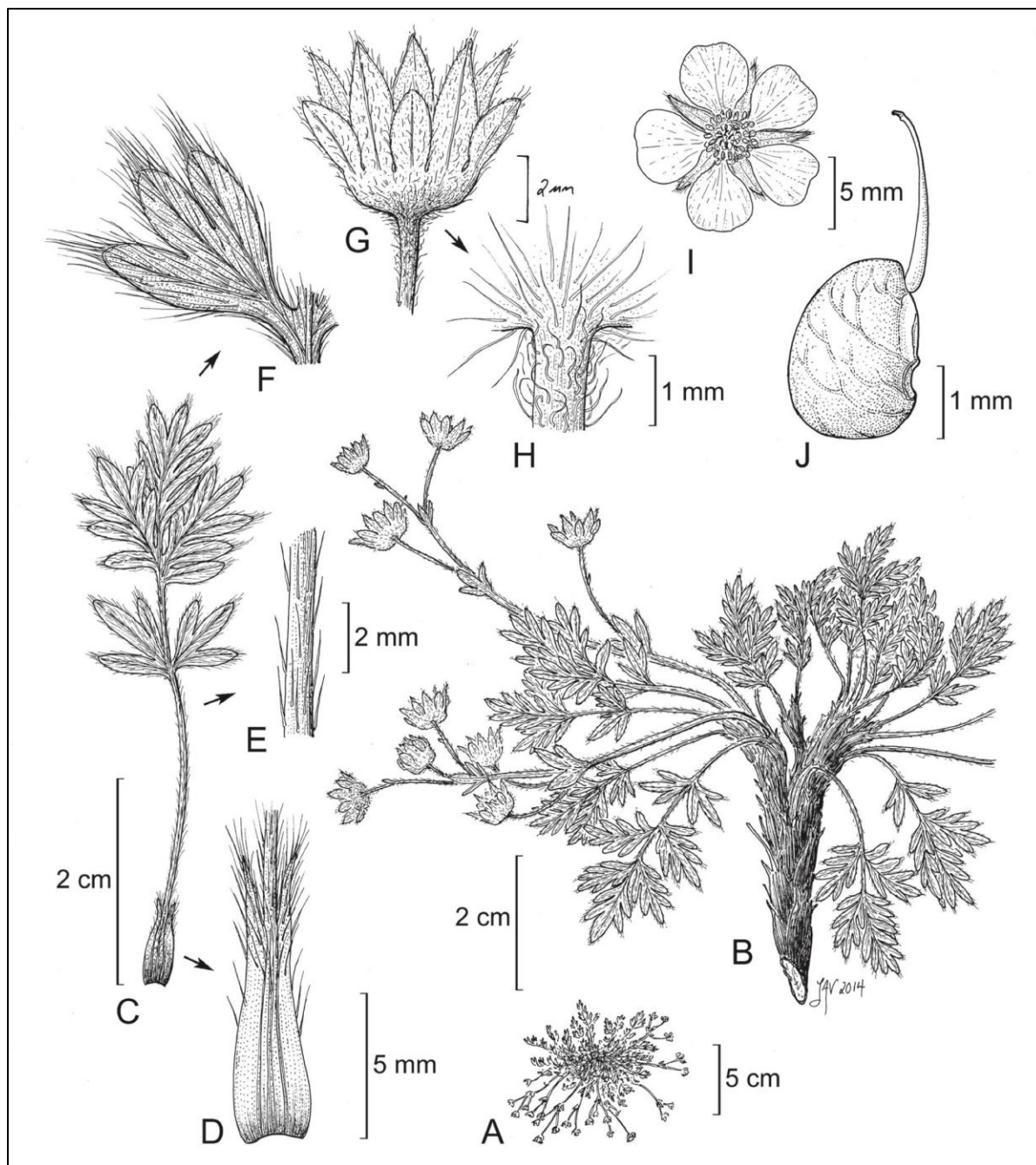


Figure 1. *Potentilla transitoria* Ertter. A. Thumbnail habit. B. Habit. C. Basal leaf. D. Vestiture of sheathing leaf base and stipules. E. Vestiture of petiole. F. Abaxial vestiture of lateral leaflet. G. Side view showing calyx, epicalyx, and hypanthium. H. Vestiture at apex of pedicel and base of hypanthium. I. Flower. J. Achene and style. Drawn by Linda Ann Vorobik from Ertter & Woodruff 19195, supplemented by field photos.

Other representative collections. **COLORADO.** Moffat Co.: ca 1.6 mi SSW of N entrance to Irish Canyon, *Baker & Deardorff 83-47* (BRY), summit of Zenobia Peak, *Johnston 2058* (BRY). **IDAHO.** Blaine Co.: Hemingway Peak, Boulder Mts., *Mansfield et al. 23113* (CIC). Butte Co.: Head of S Fk Eight Mile Creek and Mormon Gulch, Lemhi Range, *Henderson & Jensen 1440* (ID), 1.5 mi NW of Pass Creek Lakes, Lemhi Range, *Moseley 09* (ID), divide between Uncle Ike Creek and Mormon

Gulch, Lemhi Range, *Moseley 29* (ID). Clark Co.: Medicine Lodge Creek, *Davis 3149* (IDS), N-facing slope of peak at head of Mormon Gulch, *Henderson 2592* (ID), 1 mi E of Deep Creek, *Mancuso 2756* (ID), ridge between N Fk Fritz Creek and N Fk Webber Creek, *Wellner 2360* (ID). Custer Co.: Road NE of Antelope Pass, *Ertter et al. 19614* (SRP, UC, WIS, WTU & to be distributed), S of trail to Borah Peak just below timberline, *Ertter et al. 19617* (CIC, ID, IDS, MONTU, SBBG, SRP, UC, WIS, WTU & to be distributed); pass in mts 7 mi N of Dickey, *Hitchcock et al. 3797* (NA, WTU; mixed coll. w/ *P. ovina*), E side of The Swamps, White Knob Mts., *Moseley 304* (ID). Lemhi Co.: Big Bear Creek, Beaverhead Mts., *Atwood & Craig 13232* (BRY), 0.5 mi E of Bell Mt. at head of Meadow Canyon, Lemhi Mts., *Mancuso & Lehman 3428* (ID). Power Co.: Deep Creek Peak, *Moseley & Bernatas 1429* (ID). **MONTANA.** Beaverhead Co.: Ridge 1 mi N of Red Rock River, *Lesica 6766* (MONTU, UC), mountain 1.5 mi S of Basin Creek, *Lesica 6769* (MONTU [mixed with *P. multisecta*; see discussion], UC), Pileup Canyon, Tendoy Mts., *Vanderhorst 4943* (UC). **UTAH.** Box Elder Co.: Raft River Mts., *Goodrich & Atwood 17084* (ID, RM, UTC). Daggett Co.: Death Valley ca 6.5 mi due SW of Manila, *Huber 522* (BRY, RM, RSA). Uintah Co.: Limestone Mtn., *Huber 712* (BRY). **WYOMING.** Carbon Co.: Continental Divide on Sage Creek Road, ca 30 airmi S of Rawling, *Ertter & Woodruff 19193* (SRP, UC), ca 14 airmi NNW of Bridger Peak, Sierra Madre, *Hartman 23630* (RM), ridge NE of Hwy 71 ca 25 mi S of Rawlins, *Johnston 2051* (UTC, RSA, WTU), ca 1 mi SE of junction of Hwy 71 and County Rd 503, *Johnston 2056* (CAS, UC). Park Co.: Top of Clayton Mtn., Absaroka Mts., *Evert 4360* (RM). Sublette Co.: T28N R115W S16 SESW, *Kass 3972* (BRY, RM), E side Hogsback Ridge above Calpet, *Cramer 473* (RM), Prospector Mtn., *Schultz & Schultz 2798* (UTC). Sweetwater Co.: NE of Cedar Mtn., *Aldrich 33* (RM), Cedar Mtn. 2.4 mi N from Cedar Rim Road, *Refsdal 5765* (BRY), 45 mi S of Green River, *Ripley & Barneby 7907* (CAS).

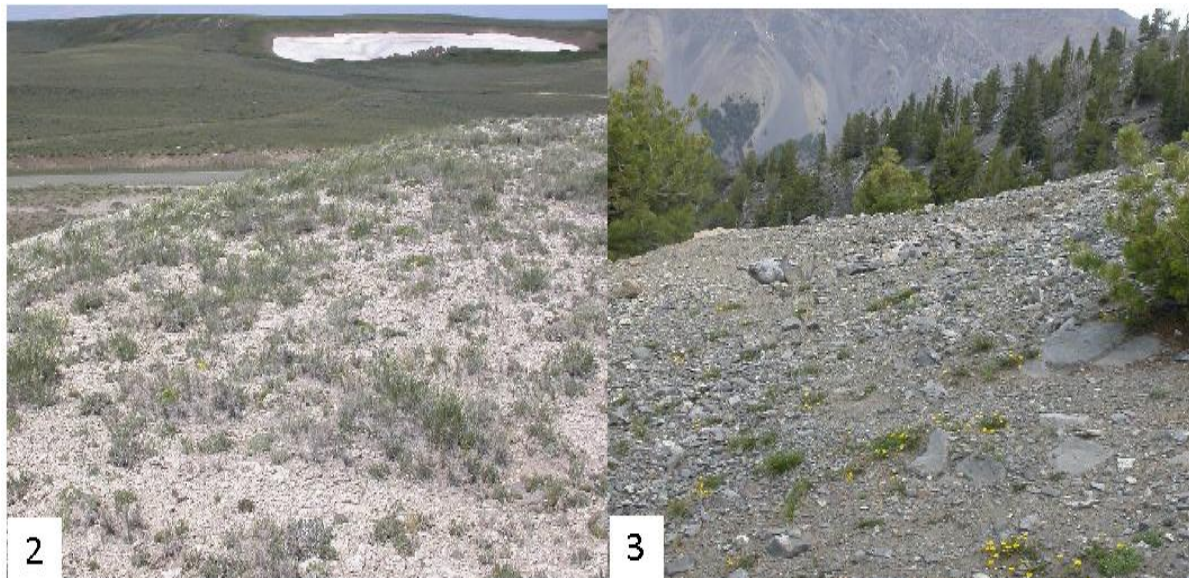
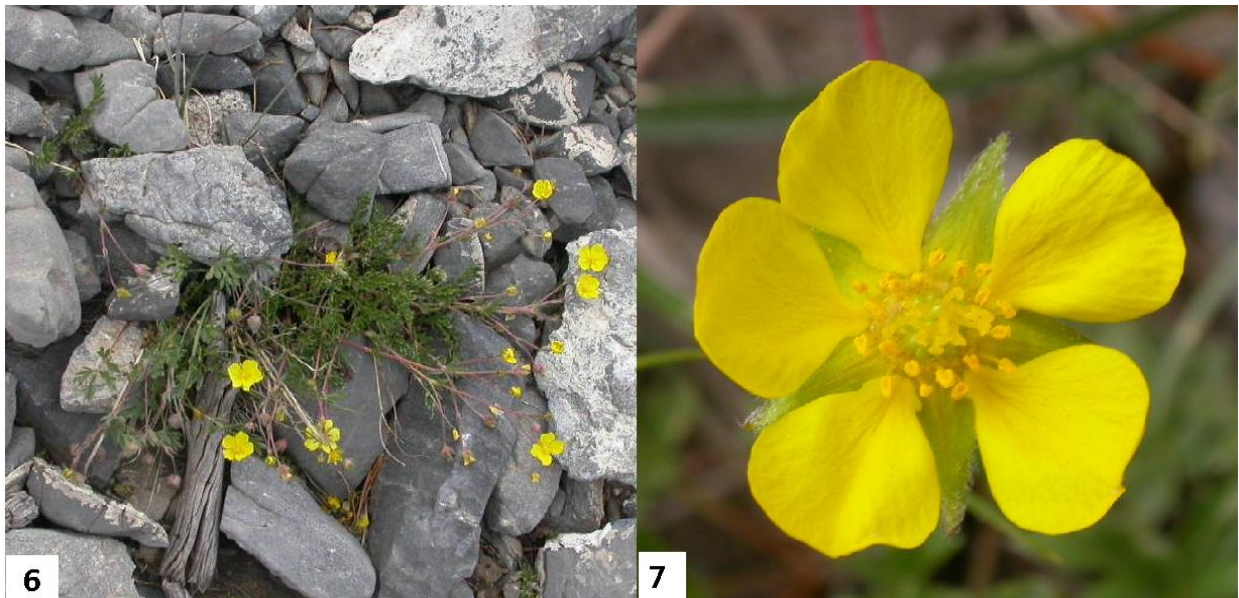


Figure 2. Habitat of *Ertter & Woodruff 19193* (Continental Divide, Carbon Co., Wyoming).

Figure 3. Habitat of *Ertter et al. 19617* (Mt. Borah, Custer Co., Idaho).



Figures 4 & 5. Habit of *Potentilla transitoria* from the Continental Divide, Carbon Co., Wyoming. Figure 4. Typical plant at locality of *Ertter & Woodruff 19193*. Figure 5. Particularly large dense plant at type locality, with hori-hori for scale (*Ertter & Woodruff 19196*).



Figures 6 & 7. Habit (Figure 6) and flower (Figure 7) of typical plants at location of *Ertter et al. 19617* (Mt. Borah, Custer Co., Idaho).

Etymology. The name alludes to the transitional status of the new species between *Potentilla* sect. *Multijugae* and sect. *Concinnae*, and also to the Continental Divide, along which the type collection and several other significant populations occur. "Great Divide cinquefoil is proposed as the common name in English."

As circumscribed here, *Potentilla transitoria* occurs primarily on carbonate substrates (Figs. 2–3) at moderate to high elevations from east-central Idaho and adjacent Montana, south to the Raft River Mountains of Utah, and southeast to Carbon Co., Wyoming, and Moffat Co., Colorado. The

majority of currently known collections are from the White Knob, Lost River, Lemhi, Beaverhead, and Tendoy mountains of Idaho and Montana; other collections are from widely scattered population clusters or isolated occurrences. Unsurprisingly, the population clusters in different geographic areas tend to differ slightly from one another, even though the overall similarities suffice to include them all in a single, albeit variable, species. For example, the average number of leaflets per leaf is 5 (i.e., 2 per side) in most populations, but populations in Sublette Co., Wyoming, and Uintah Co., Utah, are more likely to have 7 leaflets per leaf (i.e., 3 per side). These population clusters nevertheless share sufficient morphological and ecological similarities, which differ from other species of *Potentilla*, to justify inclusion in a single species.

Whether the collections cited above accurately reflect the actual distribution of *Potentilla transitoria* remains to be determined; there could easily be intervening populations waiting to be documented and/or correctly identified. Most collecting opportunities and in-person herbarium visits by the first author during the period when this species was among those being actively studied were concentrated in the Pacific Northwest. Fieldwork in Wyoming has been scanty, and recent collections in the Rocky Mountain Herbarium (RM) in particular probably include some unrecognized *P. transitoria* specimens. At the same time, it is always possible that the proposed taxonomic hypothesis (which is what all species fundamentally represent) turns out to be inaccurate, and that different population clusters instead resulted from independent hybrid events, possibly involving different ancestral species. Whatever future research might determine, the name *P. transitoria* is now available for a large number of populations from primarily calcareous substrates in the Middle Rocky Mountains with comparable morphology, which have defied placement in species recognized in recent floras (i.e., Ertter et al. 2015; Holmgren 1997).

Several collections, and the first author's personal field experience, confirm that *Potentilla transitoria* can form mixed populations, and possible hybrid swarms, with *P. ovina* and/or *P. multisecta*. This is a primary reason why the type was chosen from the population cluster at the southeast edge of the species' range where there was no indication of either *P. ovina* or *P. multisecta* occurring nearby, or possible hybridization taking place. In addition, the plants at this locality had a particularly distinctive compact morphology that differed noticeably from either of the two other species. Even in areas where putative hybridization and/or backcrossing is occurring, however, most populations are nevertheless clearly one species or the other, at least when examined *in situ*.

As already indicated, nearly 100 separate collections were examined for this study, but only half were included within the current circumscription of *Potentilla transitoria*. Several other collections were considered for inclusion within *P. transitoria* but omitted from the representative specimens, specifically from northwestern Wyoming, northern Nevada, and other parts of Utah. Some may eventually be best accommodated within *P. transitoria*, but others could potentially be sporadic hybrids from a variety of possible parents that happen to replicate *transitoria* morphology. The remainder included a few specimens assigned to *P. ovina*, *P. multisecta*, and other species, but the majority consisted of problematic material that could not readily be accommodated within a particular species. Whether these represent sporadic hybrids, evolution in action, inadequate collections, or some other explanation is uncertain, but this situation is by no means uncommon in *Potentilla* from western North America.

Conservation status. The cited specimens are representative rather than exhaustive, and they are based on a relatively conservative circumscription of *Potentilla transitoria*. It is nevertheless evident that *P. transitoria* qualifies for some level of conservation status at least in Colorado, Montana, and Utah. The situation is less clear-cut in Idaho and Wyoming, where there are numerous documented populations occurring across a relatively large geographic area. Ranking will depend on analyses within each state, coupled with targeted fieldwork on this previously overlooked species.

Preliminary molecular phylogenetic analysis

Numerous studies have now clarified the backbone for *Potentilla* phylogeny, at least regarding the relationships of anything that has ever been included in the genus sensu lato (e.g., Eriksson et al. 1998, 2003; Dobeš & Paule 2010; Feng et al. 2017). However, these global-level analyses have cast little light on finer-level relationships involving the majority of the species of *Potentilla* sensu stricto, in particular those comprising the *Potentilla* core group sensu Dobeš & Paule (2010). Rather than interpreting the widespread discordance between morphologically based taxa and molecular based phylogenies in *Potentilla* as an automatic indictment of otherwise well-defined traditional taxa, we see the discordance as evidence of intriguing underlying processes deserving of further investigation. Along with a few other collaborators (e.g., Alexa DiNicola at WIS), we have accordingly taken an alternative approach — i.e., focusing on more regionally and morphologically defined groups in an attempt to tease out meaningful phylogenetic signal from what may be a morass of reticulating noise.

One of these thus-far unpublished studies was triggered by work on a conservation assessment of *Potentilla basaltica* Tiehm & Ertter by the second author (Guilliams & Perkins 2010). The objective of the resultant molecular phylogenetic study (Guilliams and Ertter, unpublished data) was to infer phylogenetic relationships in *Potentilla* sects. *Concinnae*, *Multijugae*, and *Subviscosae* (as per Ertter et al. 2015), and to that end it included several samples of *P. transitoria*, *P. ovina*, and *P. multisecta*. A full description of this study is beyond the scope of the current paper, which is intended to be the proposal of a new species based primarily on morphological and ecogeographic data. A brief synopsis is nevertheless included here due to the intriguing nature of the results relevant to *P. transitoria* and morphologically comparable sympatric species.

Figure 8 presents a preliminary phylogenetic tree resulting from Bayesian analysis of DNA sequence data (ITS & ETS regions of the nuclear ribosomal DNA) in BEAST v.1.10.4 under a GTR model. Numbers on branches are Bayesian posterior probabilities greater than 0.6. The majority of branches in the tree have been collapsed to emphasize relationships relevant to the present paper. Taxon name, vouchers, abbreviated localities, and date of collection for samples retained in Figure 8 are provided in Table 2.

Three samples of *P. transitoria* were included in the phylogenetic analysis: *Ertter 19195* from Carbon Co., Wyoming; *Ertter 19614* and *Ertter 19617* from Custer Co., Idaho. Two of these samples — one from Idaho and the other from Wyoming (used here as the type of *P. transitoria*) — formed a clade with maximum statistical support (posterior probability = 1), in spite of the populations being at opposite ends of the species' geographic range. The other Idaho sample was paired with a putative topotype of *P. monidensis* A. Nels. (discussed further below) with strong support (posterior probability = 0.99). These two-species clades were placed together with other samples of *Potentilla*, but most relationships in this larger clade were weakly supported.

Figure 8. Preliminary phylogenetic tree resulting from Bayesian analysis of DNA sequence data (ITS & ETS regions) in BEAST v.1.10.4 under GTR model, with majority of branches of tree collapsed to emphasize relationships relevant to *Potentilla transitoria*. Numbers on branches are Bayesian posterior probabilities greater than 0.6.

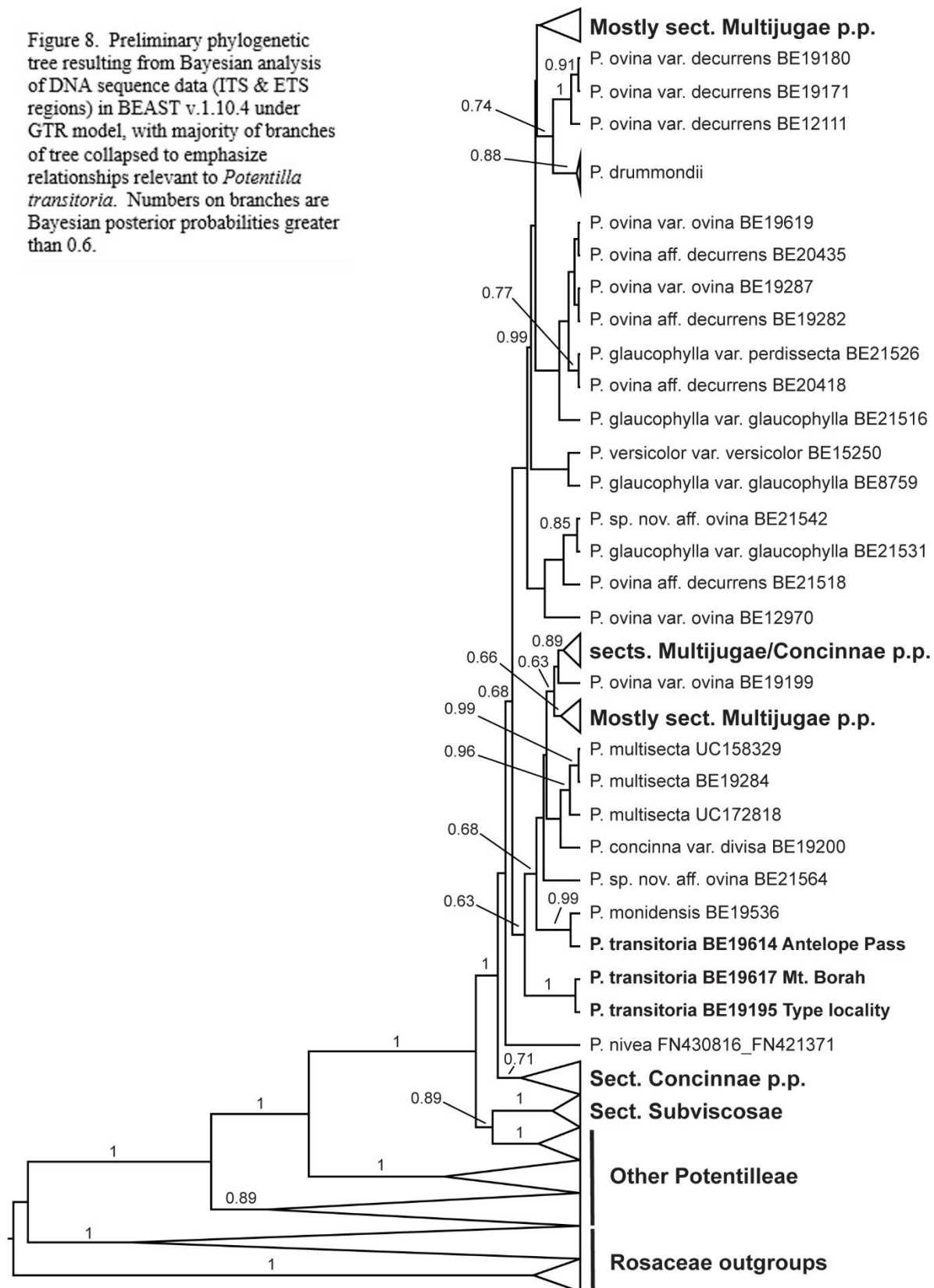


Table 2. Taxon name, vouchers, abbreviated localities, and date of collection for samples shown in Fig. 8. Most vouchers are collections by the first author, with the first set to be accessioned into UC. Co-collectors are not indicated.

Name	Voucher	State-County	Locality	Lat/Long	Date
<i>P. concinna</i> var. <i>divisa</i>	BE19200	UT: Box Elder Co.	Raft River Mts	41.92 -113.45	5-Jul-2008
<i>P. glaucophylla</i> var. <i>glaucophylla</i>	BE21516	WY: Park Co.	Beartooth Plateau	44.97 -109.46	26-Jul-2013
<i>P. glaucophylla</i> var. <i>glaucophylla</i>	BE21531	WY: Park Co.	Beartooth Plateau	44.98 -109.45	28-Jul-2013
<i>P. glaucophylla</i> var. <i>glaucophylla</i>	BE8759	ID: Valley Co.	Black Tip N of McCall	45.15 -116.08	26-Jul-1989
<i>P. glaucophylla</i> var. <i>perdissecta</i>	BE21526	WY: Park Co.	Clay Butte	44.95 -109.63	27-Jul-2013
<i>P. monidensis</i> (topotype)	BE19536	MT: Beaverhead Co.	2 mi E of Monida	44.58 -112.29	26-Jun-2009
<i>P. multisecta</i>	BE19284	NV: White Pine Co.	N Schell Pk	39.42 -114.62	1-Aug-2008
<i>P. multisecta</i>	UC1583290 Holmgren 10268	NV: Elko Co.	head of Brown Creek	40.25 -115.56	28-Aug-2008
<i>P. multisecta</i>	UC1728181 Holmgren 10810	UT: Juab Co.	Deep Cr Mts	39.88 -114.01	6-Jun-1985
<i>P. ovina</i> aff. <i>decurrens</i>	BE19282	NV: White Pine Co.	N Schell Peak	39.42 -114.62	1-Aug-2008
<i>P. ovina</i> aff. <i>decurrens</i>	BE20418	NV: Elko Co.	Ruby Mts.	40.63 -115.39	30-Jul-2010
<i>P. ovina</i> aff. <i>decurrens</i>	BE20435	NV: White Pine Co.	Wheeler Peak	39.00 - 114.32	2-Aug-2010
<i>P. ovina</i> aff. <i>decurrens</i>	BE21518	MT: Carbon Co.	Beartooth Plateau	45.01 -109.41	26-Jul-2013
<i>P. ovina</i> var. <i>decurrens</i>	BE12111	WY: Albany Co.	Snowy Range	41.38 -106.25	25-Jul-1993
<i>P. ovina</i> var. <i>decurrens</i>	BE19171	UT: Uintah Co.	Uintah Mts.	40.70 -109.58	28-Jun-2008
<i>P. ovina</i> var. <i>decurrens</i>	BE19180	UT: Uintah Co.	Diamond Mtn.	40.72 -109.46	29-Jun-2008
<i>P. ovina</i> var. <i>ovina</i>	BE12970	ID: Custer Co.	Railroad Ridge	44.14 -114.59	2-Aug-1994
<i>P. ovina</i> var. <i>ovina</i>	BE19199	UT: Box Elder Co.	Raft River Mts.	41.92 -113.45	5-Jul-2008
<i>P. ovina</i> var. <i>ovina</i>	BE19287	NV: White Pine Co.	N Schell Peak	39.42 -114.61	1-Aug-2008

<i>P. ovina</i> var. <i>ovina</i>	BE19619	ID: Custer Co.	Mt. Borah	44.13 -113.81	11-Jul- 2009
<i>P. sp.nov. aff. ovina</i>	BE21542	WY: Park Co.	Dead Indian Pass	44.72 -109.38	29-Jul- 2013
<i>P. sp.nov. aff. ovina</i>	BE21564	WY: Park Co.	Absaroka Mts.	43.93 -109.28	30-Jul- 2013
<i>P. transitoria</i>	BE19614	ID: Custer Co.	Antelope Pass	43.77 -113.76	10-Jul- 2009
<i>P. transitoria</i>	BE19617	ID: Custer Co.	Mt. Borah	44.13 -113.81	11-Jul- 2009
<i>P. transitoria</i> (type)	BE19195	WY: Carbon Co.	Continental Divide	41.40 -107.24	3-Jul- 2008
<i>P. versicolor</i> var. <i>versicolor</i>	BE15250	OR: Harney Co.	Steens Mtn.	42.67 -118.57	15-Aug- 1996

Comparison with and notes on morphologically similar sympatric species

As already noted, previous collections of *Potentilla transitoria* have mostly been identified as *P. ovina* var. *ovina* (sect. *Multijugae*), *P. multisecta* (sect. *Concinnae*), or *P. glaucophylla* var. *perdissecta* (sect. *Graciles*). Primary differences are summarized in Table 1, and a key to distinguish the four taxa is provided below. Other disparate taxa in which this overlooked species has been shoehorned include several varieties of *P. concinna* Richardson (sect. *Concinnae*), *P. macounii* Rydb. (sect. *Concinnae*), *P. plattensis* Nutt. (sect. *Multijugae*), *P. breweri* S. Wats. (sect. *Multijugae*), *P. effusa* Douglas ex Lehm. var. *rupinicola* (Oster.) Th. Wolf. (sect. *Leucophyllae*), *P. rubricaulis* Lehm. (sect. *Rubricaulis*), and unresolved elements in sect. *Subjugae*. Most of these differ in key diagnostic characters such as style type and leaf tomentum, as per Ertter et al. 2015, which also provides the nomenclature used here.

KEY TO MORPHOLOGICALLY SIMILAR SYMPATRIC TAXA

1. Leaves pinnate, leaflets 7–13 on distal $\pm \frac{1}{2}$ ($-\frac{2}{3}$) of leaf axis — petiole hairs ± 1 (–2) mm long; widespread **Potentilla ovina** var. **ovina**
1. Leaves palmate to subpinnate, leaflets (3–)5(–7) on apex to $\frac{1}{2}$ of leaf axis.
 2. Leaves subpalmate to subpinnate, leaflets on $\frac{1}{4}$ – $\frac{1}{2}$ (or less) of leaf axis; petiole hairs (1–)1.5–3 mm long — stems decumbent becoming prostrate; pedicels \pm recurved in fruit **Potentilla transitoria**
 2. Leaves palmate to subpalmate, leaflets on apex (to $\frac{1}{5}$) of leaf axis; petiole hairs absent or 1–1.5(–2) mm long
 3. Stems prostrate, 1–2(–3) times leaf length; petioles hairy; pedicels recurved in fruit; mostly on calcareous mountains of ne Great Basin **Potentilla multisecta**
 3. Stems (decumbent) \pm ascending to erect, (1.5–)2–3(–4) times leaf length; petioles (except outermost) usually glabrous (except in central Montana); pedicels straight (to recurved) in fruit; Rocky Mts from s Canada to n Utah and w Wyoming **Potentilla glaucophylla** var. **perdissecta**

In order to evaluate the circumscription of *Potentilla transitoria*, this study also involved a closer evaluation of taxonomic and geographic boundaries of the three morphologically similar sympatric species. We are accordingly taking this opportunity to summarize key findings, with attention to possible conservation status. Full locality information on cited specimens can be obtained from the Consortium of Pacific Northwest Herbaria (www.pnwherbaria.org/index.php) or the Rocky Mountain Herbarium database (<http://rmh.uwo.edu/data/search.php>).

1) *Potentilla ovina* (sect. *Multijugae*)

Potentilla ovina var. *ovina* (Fig. 9) has a very similar gestalt to *P. transitoria*, distinguished primarily by the former's unequivocally pinnate leaves with 3–6 (vs. 2–3) pairs of lateral leaflets on half or more (vs. less than half) of the leaf axis (i.e., blade equaling or longer than petiole). Plants of *P. ovina* var. *ovina* are also often larger and laxer, with shorter petiole hairs on average (i.e., 1–2 mm vs. 1.5–3 mm). Intermingled populations of the two taxa are not uncommon, especially in the mountains of east central Idaho, and morphologically intermediate specimens can be found in such situations. The majority of populations can nevertheless be readily categorized as one species or the other, though hybridization and introgression are certainly possible. The type of *P. monidensis* (MT: Madison Co., Monida, *Nelson & Nelson 5414*), which is on the Continental Divide in the general geographic region where both *P. ovina* var. *ovina* and *P. transitoria* are relatively common, is a prime example. Plants in the type collection of *P. monidensis* have leaflet dissection closer to *P. ovina* var. *ovina*, but the most morphologically comparable possible topotype (*Ertter 19536*) came out on a strongly supported branch (posterior probability = 0.99) with one of the samples of *P. transitoria* in the molecular phylogenetic analysis (Fig. 8).

Two varieties of *Potentilla ovina* were recognized in the treatment of the genus for Flora of North America (Ertter et al. 2015), differing in leaflet dissection and hairiness. The typical variety *ovina* has the more deeply incised, hairier leaflets (i.e., similar to those of *P. transitoria*); it occurs primarily in the Rocky Mountains from southern Canada to Colorado. The variety encompasses enough variation that further research is in order; of particular interest are relatively large, green plants with more open inflorescences that are centered in Yellowstone National Park, including the type of *P. wyomingensis* A. Nels. The nominal variety barely enters Oregon as a depauperate form in the Wallowa Mountains and occurs in Nevada only in the Schell Creek Range.

Although var. *decurrens* (S. Wats.) Welsh & Johnst., which has more shallowly few-toothed leaflets, has been provisionally included in *Potentilla ovina*, similarities also exist with both *P. drummondii* Lehm. and *P. glaucophylla*, both placed by Ertter et al. (2015) in sect. *Graciles*. Additional variation provisionally included in var. *decurrens* remains in need of further study, in particular a depauperate form centered in the mountains of the western Great Basin. At least two collections examined during the course of the current study might represent this depauperate form in Idaho: *Wellner 3682* (ID, SRP) from Clark County and *Moseley 2079* (ID) from Lemhi County.

The *Potentilla ovina* complex also includes a handful of collections from the St. Elias Mountains in southwestern Yukon and adjacent Alaska that evidently represent an undescribed taxon, and a yet unplaced form in the southern Canadian Rockies. The first author was hoping to do fieldwork on the most accessible population of the former during a bioblitz of Kluane National Park in 2017, but unfavorable weather conditions prevented the helicopter from landing at the site. There is also a possible undescribed taxon intermediate between *P. ovina* and *P. subjuga* Rydb. (sect. *Subjugae*) in the Absaroka Mountains of Wyoming,

With a key exception, the seven samples of *Potentilla ovina* sensu lato included in the molecular phylogenetic analysis are seemingly scattered at random on poorly supported branches in the resultant tree, possibly indicating gene flow with co-occurring species (Fig. 8). The exception consists of the three samples representing archetypal var. *decurrens* from the Uinta Mountains of Utah and Snowy Mountains of Wyoming, which comprise a strongly supported clade (posterior probability = 1). In contrast, the three samples of the possible new taxon from the Absaroka Mountains (only two shown in Fig. 8) are widely scattered, though no more so than samples of var. *ovina*.



Figure 9. Habit of *Potentilla ovina* var. *ovina* from Rendezvous Mtn., Teton Co., Wyoming (Ertter 22410).

Figure 10. Habit of *Potentilla multisecta* from Skull Canyon, Clark Co., Idaho (photo by M. Darrach, 2021).

2) *Potentilla multisecta* (sect. *Concinnae*)

Potentilla multisecta (Fig. 10) is provisionally placed in sect. *Concinnae* along with the rare endemics *P. johnstonii* Soják (Quinn Canyon Range, Nevada) and *P. sierrae-blancæ* Wooton & Rydberg (White Mountains, New Mexico) on the basis of their primarily palmate leaves, in spite of not having the tomentum that is otherwise characteristic of the section, in particular on the proximal leaflet surfaces (Ertter et al. 2015). When subpalmate leaves are present in *P. multisecta*, they are often on plants with otherwise palmate leaves, and/or the proximal leaflets are separated from the others by only 1–2 mm of rachis; in contrast, leaves of *P. transitoria* are consistently subpalmate to pinnate, with the proximal leaflets separated from the others by (1–)2–5(–10) mm of rachis. *Potentilla multisecta* also tends to differ from *P. transitoria* in its longer petioles with shorter hairs, longer leaflet teeth or lobes, and longer, more strongly recurved pedicels (Table 1). The three samples of *P. multisecta* included in the phylogenetic analysis form a clade with strong support (posterior probability = 0.96; Fig. 8).

As circumscribed in the treatment of *Potentilla* for Flora of North America (Ertter et al. 2015), the distribution of *P. multisecta* is centered in northeastern Nevada and northwestern Utah, with noteworthy variation among some populations. The treatment also provisionally included populations in eastern Idaho, southwestern Montana, and western Wyoming that were not included in *P. multisecta* in Intermountain Flora (Holmgren 1997). In the process of determining the circumscription of *P. transitoria*, only a handful of collections were confirmed as *P. multisecta* from these more northern states; they are discussed here.

In Idaho, the only confirmed extant population is in Skull Canyon, Beaverhead Range, Clark Co., which was vouchered as *Henderson 3171* (ID) in 1976. It was fortuitously rediscovered and photographed by Mark Darrach and Rose Lehman in 2021, and both voucher and photos fit unambiguously in *Potentilla multisecta*. In contrast, a somewhat more problematic population from Garden Creek near Challis is currently based only on a single historical collection (*Work 518*, USFS in RM), evading the first author's attempt to relocate it in 2009. Another possibly relevant collection is *Ertter et al. 19621* (ID, SRP, UC), one of a series of collections documenting variation in the complex along the trail to Mount Borah in the Lost River Range in 2009. Most subpopulations were either *P. transitoria*, *P. ovina* var. *ovina*, or ambiguously intermediate, but *19621* was instead intermediate

between *P. transitoria* and *P. multisecta*, approaching the latter in having subpalmate leaves with long slender lobes and relatively long, strongly recurved pedicels.

Support for the presence of this species in Wyoming and Montana is more ambiguous. Two collections from Wyoming were determined to be best placed in *Potentilla multisecta*, but both are somewhat anomalous. An 1897 collection by Aven Nelson from “So. Wyo.” (RM) has leaflets with oblanceolate lobes, while Fertig 8891 (RM) from Gypsum Mountain in the Wind River Range consists of relatively depauperate plants with stubby leaflets. In Montana, most of the candidate collections are closer to *P. glaucophylla* var. *perdissecta* or other species, but a single plant on Lesica 6769 (MONTU) from Beaverhead County, which otherwise consists of *P. transitoria*, is apparently “good” *multisecta*. This suggests a mixed population, and possibly other populations of *P. multisecta* in the general area.

According to NatureServe (<https://explorer.natureserve.org/>; accessed 7 Dec 2023), *Potentilla multisecta* is globally vulnerable (G3), with state/provincial-level rankings of vulnerable (S3) in Nevada, imperiled (S2) in Utah, Montana, and Alberta, and critically imperiled (S1) in Wyoming. The species should be added to the rare plant list for Idaho as S1, with an effort to locate more populations; more research is also needed to determine the actual status of *P. multisecta* in both Wyoming and Montana. The purported presence of the species in Alberta is suspect and should be re-evaluated.

3) *Potentilla glaucophylla* var. *perdissecta* (sect. *Graciles*)

As recognized in Flora of North America (Ertter et al. 2015), *Potentilla glaucophylla* var. *perdissecta* is a relatively poorly known taxon occurring primarily at high elevations in the Rocky Mountains in extreme southwestern Alberta, eastern Idaho, western Montana, and western Wyoming, especially in and around Yellowstone National Park. Previous reports from Washington are based on misidentified specimens (D. Giblin, pers. comm. 2023). At least one collection from British Columbia has now been determined as var. *perdissecta* by the first author (Goat Creek Mtn., 27 mi N of Natal, Elk River Valley, [collector illegible] 2272, UC), but others from British Columbia and elsewhere in Alberta are unconfirmed. According to Holmgren (1997), “[*P. glaucophylla* var. *perdissecta*] has been reported from the Uinta Mountains, but the report may have been based on what appears to be a hybrid between *P. diversifolia* and *P. ovina*. This hybrid combination looks suspiciously similar to *P. multisecta* of the eastern Great Basin.”

Var. *perdissecta* differs from the widespread var. *glaucophylla* in having the leaflets more deeply incised ($\frac{3}{4}$ or more to midvein) into linear to narrowly oblong teeth or lobes (vs. $\frac{1}{3}$ – $\frac{1}{2}$ to midvein into broadly lanceolate teeth). Plants of var. *perdissecta* also tend to be shorter, and leaves are more likely to be both subpalmate and palmate, and possibly not as consistently glaucous. The varieties are not treated as distinct in the current edition of Flora of the Pacific Northwest (Hitchcock et al. 2018).

Because *Potentilla transitoria*, *P. glaucophylla* var. *perdissecta*, and *P. multisecta* can all have subpalmate leaves, it is often challenging to tell the taxa apart where the species overlap. As is the case in *P. multisecta*, when subpalmate leaves are present in *P. glaucophylla* var. *perdissecta* they are often on plants or in populations with otherwise palmate leaves, whereas leaves of *P. transitoria* are consistently subpalmate to subpinnate. *Potentilla glaucophylla* var. *perdissecta* also tends to have stems more upright (usually ascending to erect, vs. prostrate to decumbent) and longer in relation to the basal leaves (usually at least twice as long vs. less than twice as long) in comparison to the other two species. In addition, petioles of *P. glaucophylla* var. *perdissecta* are usually glabrous (except on the outermost basal leaves) and pedicels are generally straight in fruit.

In Figure 8, the single sample of *Potentilla glaucophylla* var. *perdissecta* included in the phylogenetic analysis nests in a poorly supported clade with several samples from the *P. ovina* complex. The three samples of var. *glaucophylla* are scattered elsewhere, with moderate support at best.

According to NatureServe, *Potentilla glaucophylla* var. *perdissecta* is vulnerable (S3) in Wyoming, apparently secure in British Columbia, and unranked in Alberta, Idaho, Montana, and Washington. As previously noted, the reports of var. *perdissecta* in Washington were based on misidentifications and the species was accordingly removed from the state's rare plant list in 2019 (D. Gilbin, pers. comm. Dec 2019). Most reports from British Columbia and Alberta should also be re-evaluated, though possibly coupled with a revision of varietal circumscriptions. Whether or not var. *perdissecta* merits special conservation status in Idaho and Montana remains to be determined, ideally in combination with more fieldwork in the remote areas where the variety is most common.

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LITERATURE CITED

- Dobeš, C. and J. Paule. 2010. A comprehensive chloroplast DNA-based phylogeny of the genus *Potentilla* (Rosaceae): Implications for its geographic origin, phylogeography and generic circumscription. *Molec. Phylogen. Evol.* 56: 156–175.
- Eriksson, T., M.J. Donoghue, and M.S. Hibbs. 1998. Phylogenetic analysis of *Potentilla* using DNA sequences of nuclear ribosomal internal transcribed spacers (ITS), and implications for the classification of Rosoideae (Rosaceae). *Pl. Syst. Evol.* 211: 155–179.
- Eriksson, T., M.S. Hibbs, A.D. Yoder, C.F. Delwiche, and M.J. Donoghue. 2003. The phylogeny of Rosoideae (Rosaceae) based on sequences of the internal transcribed spacers (ITS) of nuclear ribosomal DNA and the trnL/F region of chloroplast DNA. *Int. J. Pl. Sci.* 164: 197–211.
- Erter, B., R. Elven, J.L. Reveal, and D.F. Murray. 2015 [2014]. *Potentilla* (Rosaceae). Pp. 121–218, in *Flora of North America North of Mexico*, Vol. 9. Oxford Univ. Press, New York and Oxford.
- Feng, T., M.J. Moore, J. Li, and H. Wang. 2017. Phylogenetic study of the tribe Potentilleae (Rosaceae), with further insight into the disintegration of *Sibbaldia*. *J. Syst. Evol.* 55(3): 177–191.
- Guillems, C.M. and J. Perkins. 2010. Conservation assessment for Black Rock potentilla (*Potentilla basaltica* Rosaceae). Prepared for the USDA Forest Service, Southwest Region.
- Hitchcock, C.L. and A. Cronquist — D.E. Giblin, B.S. Legler, P.F. Zika, and R.G. Olmstead (eds.). 2018. *Flora of the Pacific Northwest: An Illustrated Manual*. Univ. of Washington Press, Seattle.
- Holmgren, N.H. 1997. Rosaceae. Pp. 64–158, in A. Cronquist, N.H. Holmgren, and P.K. Holmgren. *Vascular Plants of the Intermountain West*, Vol. 3, Part A. New York Botanical Garden, Bronx.