

A revised *Flora of the Pacific Northwest*: Taxonomic implications Washington's flora

(or, why accept all those annoying name changes?)



~~*Lewisia tweedyi*~~
(*Portulacaceae*)

Lewisiopsis tweedyi
(*Montiaceae*)



~~*Disporum hookeri*~~ *Prosartes hookeri*

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The Revised Flora

ALISMATACEAE Water-plantain Family

Fls gen ♂♂ but sometimes ♂♀, umbellate, racemose, or pan, reg; sepals 3, greenish, gen persistent; petals 3, white to pink or purple, deciduous (rarely lacking); stamens 6-30; pistils gen several- ∞ , distinct or ∞ connate basally, style persistent, often beaklike; ovary 1-2-seeded, fr gen an achene, occ semihiscent; per (ours), aquatic, mostly scapose herbs with erect to floating or submerged lvs gen sheathing at base. Sterile specimens identified as *Baldellia ranunculoides* (*Echinodorus* s.) from Hicks Lake, Thurston Co, WA, are of uncertain placement but may be a *Sagittaria* sp.



- 1a Pistils spirally arranged in a globose mass; stamens (7-15-30; fls gen ♂♂, lvs often sagittate or hastate) **Sagittaria**
 1b Pistils in 1 wheel, stamens gen 6(9); fls ♂♂; lvs neither sagittate nor hastate
 2a Petals incised-fimbriate, anthers ca 2 mm, achenes fused at base with the beak subequal to body, forming a starlike pattern **Damasium**
 2b Petals subentire; anthers < 1 mm; achenes not fused, not beaked, forming a ring **Alisma**

Alisma L. Water-plantain

Fls pan; pan hrs whorled; stamens 6(9), opp petals; pistils (5)10-25, style subterminal, short (ca 1 mm in ours), ovary 1-celled and 1-ovuled; fr achene, strongly compressed, with 1-2 grooves on outer face; per, scapose, aquatic or palustrine, cosmose herbs. (Gr name for a water plant).



- 1a lf bls broadly lanceolate to ovate, 1.5-3 x as long as wide, rounded to nearly cordate at base, petals 1.5-2 x length of sepals
 2a Style 0.6-1.5 mm, > ovary at anthesis, anthers narrowly ellipsoid; petals gen pink to purple; marshy areas and lakeshores, common in Old World, rarely intro to N Am, in our area occ in sw BC and w WA; European w. **1. A. plantago-aquatica** L.
 2b Style 0.4-0.6 mm, < or = ovary at anthesis; anthers broadly ovoid to narrowly ellipsoid, petals white or only slightly pinkish; marshy areas and lake shores, sometimes largely submerged; s BC s to CA, AZ, CO, s to Nova Scotia, MD, NY, and ME, n w. (A. breviflora, A. plantago-aquatica var. novicanum) **2. A. triviale** Pursh.
 1b lf bls linear to lanceolate, mostly much > 3 x as long as wide, narrowly tapered at base and tip, petals < or = 2 x length of sepals
 2a Style scarcely 0.5 mm, much < ovary at anthesis, gen curved to at least 1/2 turn; anthers ca 2 x as long as broad; petals gen white, < to slightly > than sepals; achenes with (1)2 grooves; lf bls narrowly lanceolate or spatulate to linear, 2-7 = 0.5-2(-3) cm; infl = to slightly > lvs; marshes and edges of lakes and ponds, occ almost completely submerged; s BC s to n CA, NM, and s to n N Am; Old World, rare w. (A. graveolens, A. sp. var. angustatum) **3. A. gramineum** Omel.
 3b Style 0.4-0.9 mm, nearly = ovary at anthesis, slightly curved, anthers gen > 2 x as long as broad; petals gen pink- or purple-tinged, ca 2 x length of sepals; achenes with 1(2) grooves; lf bls lanceolate, 1.0-2.0 x 2-4 cm; infl much > lvs; marshy areas, Eurasian, intro to sw BC, w OR, and n CA, lanceol w. **4. A. lanceolatum** With.

Damasium Miller Fringed or Star Water-plantain; *Damasium*

Fls ♂♂; umbellate or pan, rather showy; petals white to pink, incised-fimbriate, spreading; deciduous; stamens 6, opp sepals; pistils (6)9-15, in 1 wheel, radiating in a starlike pattern; fr achene, 1-seeded; per, scapose herb with long-petioled lvs. (Ancient Gr name.)



- D. californicum** Torr. ex Benth. Fl mostly 2-4(-6) dm; lvs erect to floating, clustered on a short rhizome, ca = infl, bl linear-oblong, lanceolate, rounded to subcordate at base, 3-9 cm; infl a simple axill umbel or a 2-4-whorled pan; pods 2-8 cm, spreading to recurved; sepals 4-5 mm, petals 6-10 mm; filaments flattened-deltoid, anthers linear, 2-3 mm, twisting after dehiscence; achenes flattened, divergent, strongly ribbed on each margin and depressed between, body 3-5.5 mm, beak 1-6 mm, sloughs, marshy fields, and ditches; Klickitat Co, WA, to c CA, sw ID, and w NV (Lilium c., Mchhaerocarpus s.).

Sagittaria L. Arrowhead

Fls in whorls of gen 3 in a simple, bectate raceme or occ br panicle, lower ones gen ♂ (♂♂), upper ones ♂, or sometimes all either ♂ or ♀; sepals persistent; petals white, longer than the sepals, gen withering-persistent; stamens 7-30; pistils ∞ , spirally arranged, receptacle a globose; achenes laterally flattened and gen wing-margined, short-beaked; scapose, per, palustrine to aquatic herbs, gen rhizomatous and often tuber-bearing; lvs mostly sheathing, long-petioled, bls hastate or sagittate to lanceolate or linear, at least some lvs (in submerged pls sometimes all) bladeless, elongate, and broadly to very narrowly subulate. (L. sagitta, arrow, referring to shape of lf bls.) Several spp. are sometimes planted for waterfowl forage as they produce large, starchy, edible tubers (called "wapato" by Native Americans).

- An inventory of native and naturalized plants in our area.
- An identification manual.
- A guide to current names and classifications.
- Basic info for each taxon (e.g., morphology, habitat, distribution).

Promotes the adoption of current knowledge.

Floras are dynamic

- Ongoing field work continues to add to our baseline knowledge of which species occur within the region and where.
- Additional exotic taxa continue to be found in our area.
- New species continue to be described, even here in the PNW.
- Taxonomy is not a static science. Classifications change as new information comes to light. DNA-based phylogenies have resulted in numerous changes, especially at the ranks of family and genus.
- Changes in classification usually result in name changes.

Floras are dynamic

Why can't scientific names remain unchanged?

Scientific names serve dual purposes:

1. as aids for memory and communication.
2. to convey information about classifications and relationships (in this sense, names are hypotheses subject to revision).

These two functions (communication & classification) may appear to be at odds with each other. But are they?

New classifications (and resulting name changes) represent refined hypotheses that allow more accurate communication.

Luzula campestris?

Luzula comosa var. *comosa*

Luzula comosa var. *laxa*

Luzula cascadiensis

Luzula macrantha

Luzula multiflora

Luzula subsessilis

True *Luzula campestris*, an aggressive lawn weed from Europe:



Changes to the Flora

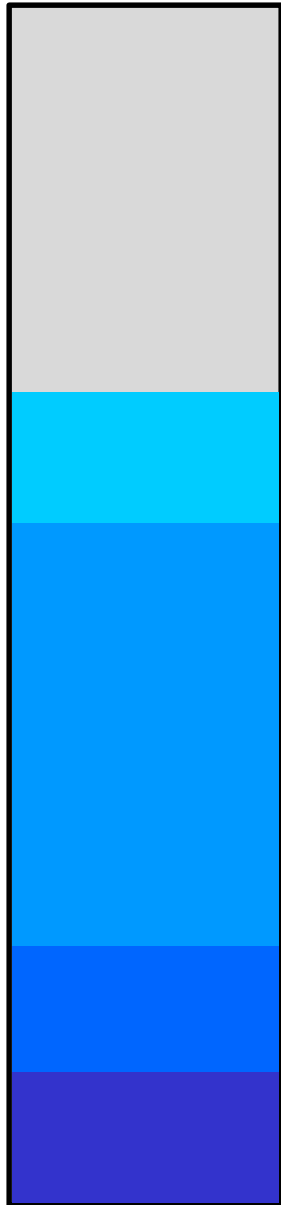
40+ years of accumulated changes to our flora:

	1973 Flora	Revised Flora	# Added	% Increase
Families	131	159	28	21.4%
Genera	836	1,145	309	37%
Species	3,659	4,946	1,287	35.2%
Infraspecies	1,429	1,402	-27	-1.9%
Terminal Taxa	4,415	5,505	1,090	24.7%
Native Terminal Taxa	3,661	4,032	371	10.1%
Exotic Terminal Taxa	754	1,432	678	89.9%

- Over 1,000 taxa are not included in the 1973 Flora.
- 40% of taxa in 1973 Flora are affected by nomenclatural changes.

836

Changes to genera in the 1973 Flora:



269 genera with no changes (32%)

91 with name changes to some of taxa

294 with increase/decrease in # of taxa

90 with some taxa transferred to other genera

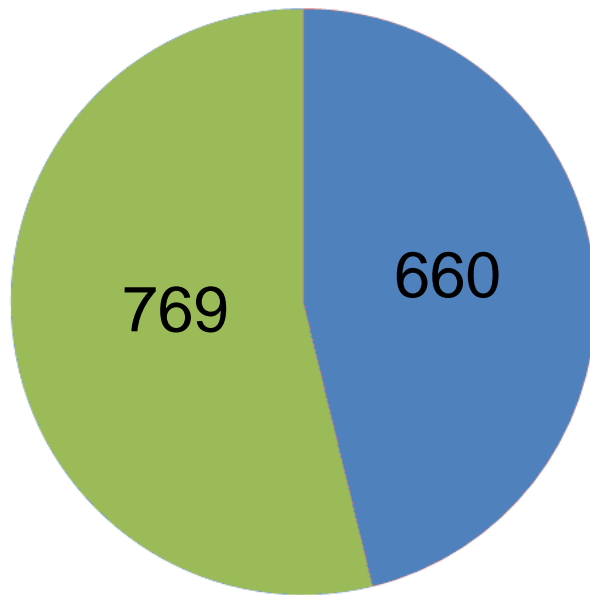
92 with all taxa transferred to other genera

Changes to the Flora

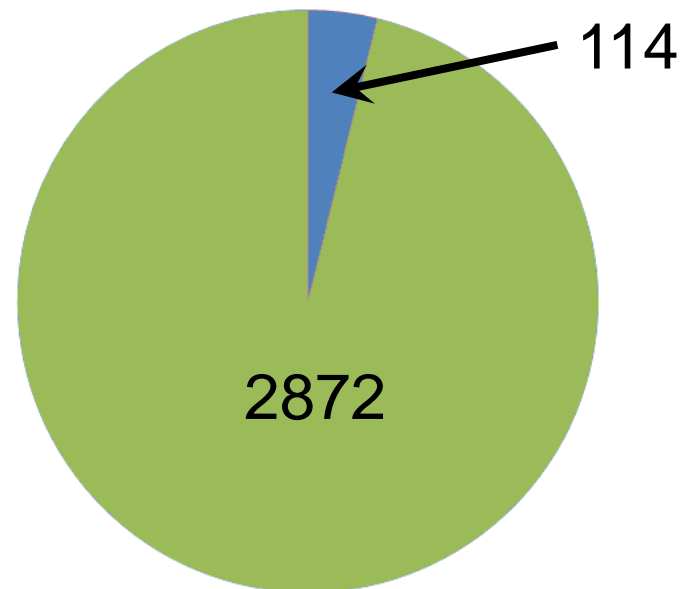
Hitchcock's taxonomic philosophy:

“The concepts of species and other taxa is conservative, both from the standpoint of the number of groups recognized and from the standpoint of following historical practice in doubtful cases.”

- from Volume 5 of the full Flora.



■ Stay Infraspecies
■ Raised to species



■ Stay species
■ Reduced to infraspecies

Changes to the Flora

Hitchcock's taxonomic philosophy:

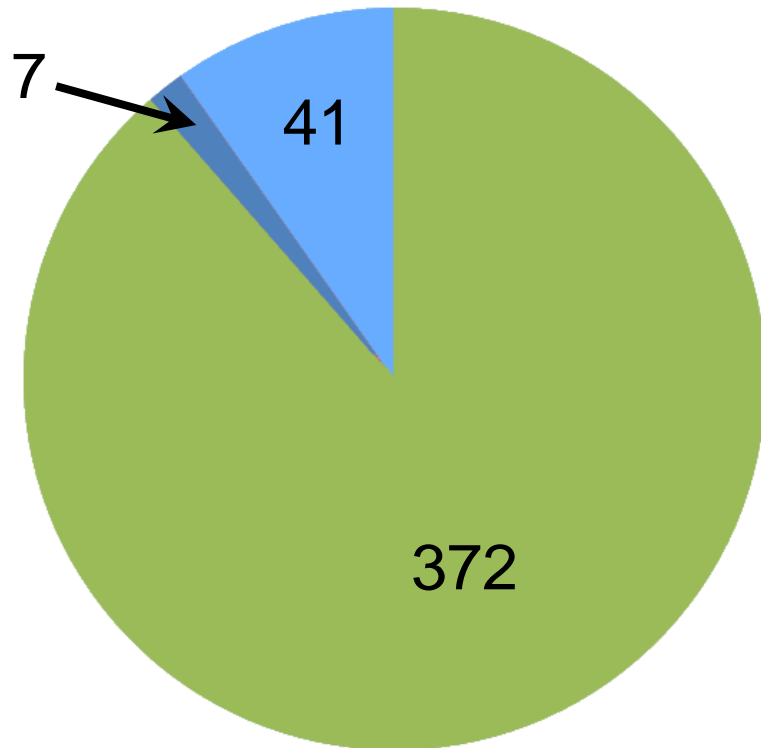
“A great many of the binomials proposed in the past as representing distinct species prove, on reconsideration with more ample material and in the light of modern biological knowledge, to be wholly without foundation.” (Volume 5)

However, molecular studies and other taxonomic revisions have revalidated and “resurrected” many of those old names.

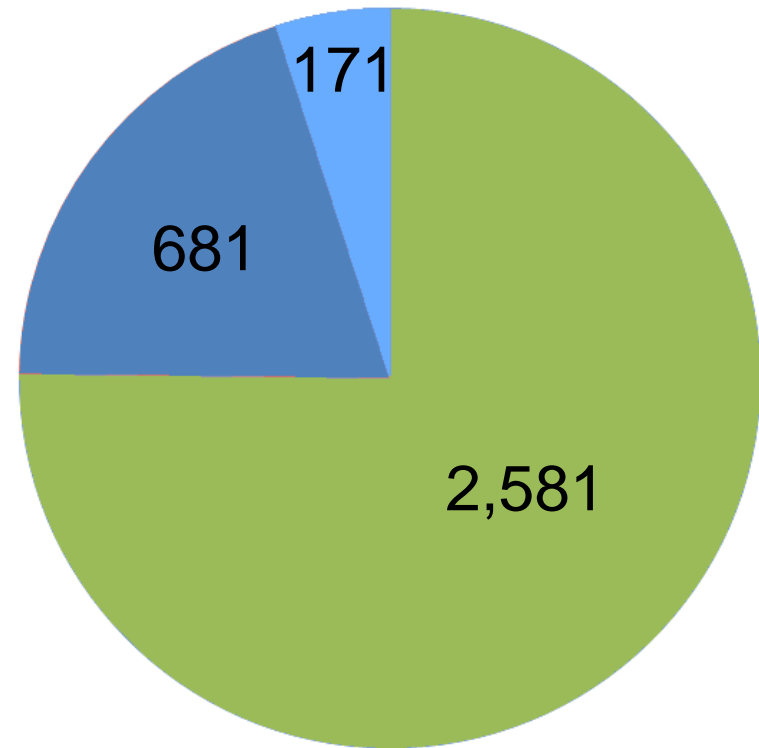
Changes to the Flora

Publication dates for added taxa and nomenclatural changes:

Genera:



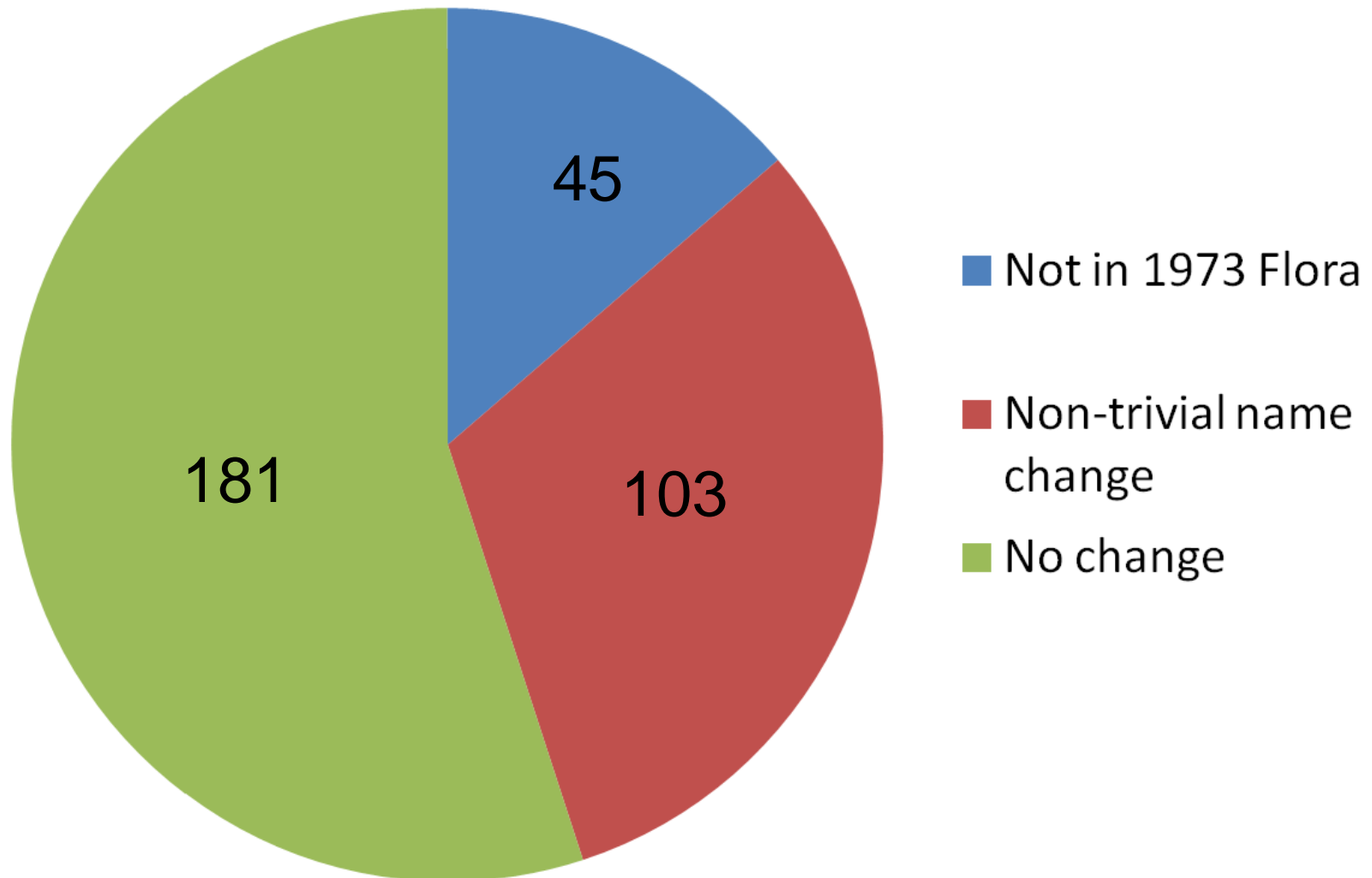
Species & Infraspecies:



- Published before 1973
- New Combination published on/after 1973
- New Name published on/after 1973

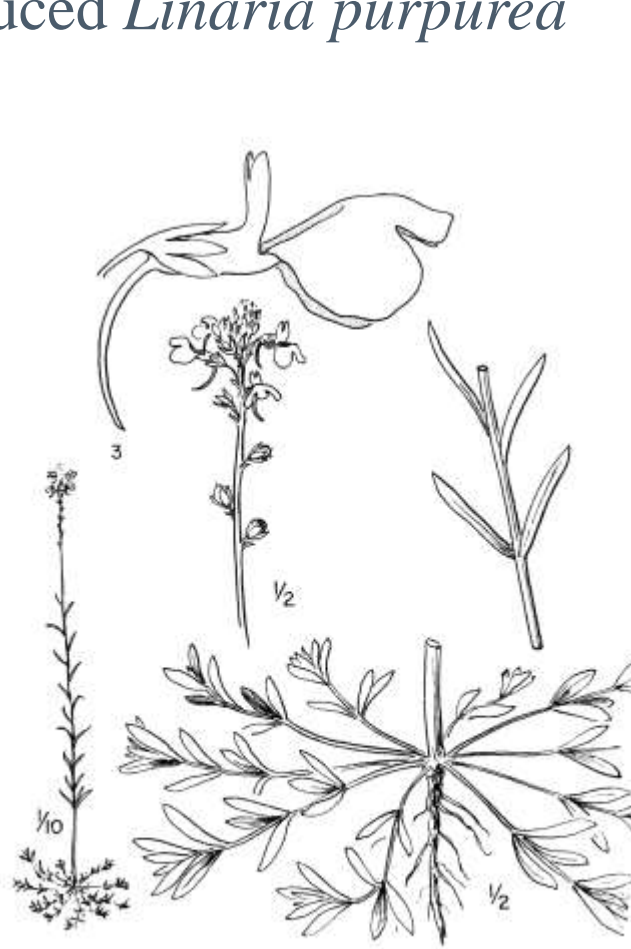
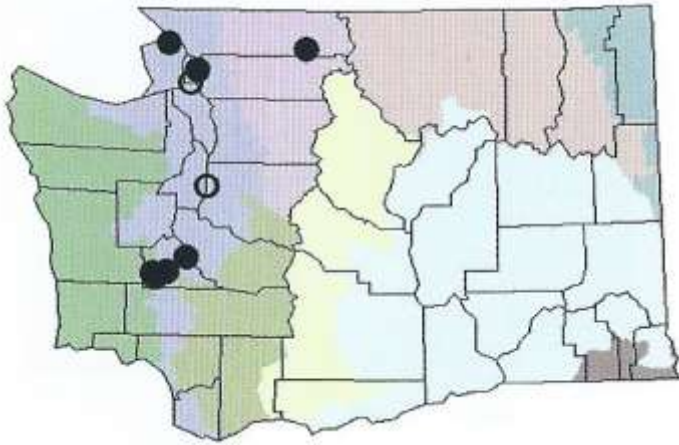
Rare Plants and Noxious Weeds

Washington Natural Heritage Program Rare Plant List



Rare Plants and Noxious Weeds

Confusing rare *Nuttallanthus texanus*
with introduced *Linaria purpurea*



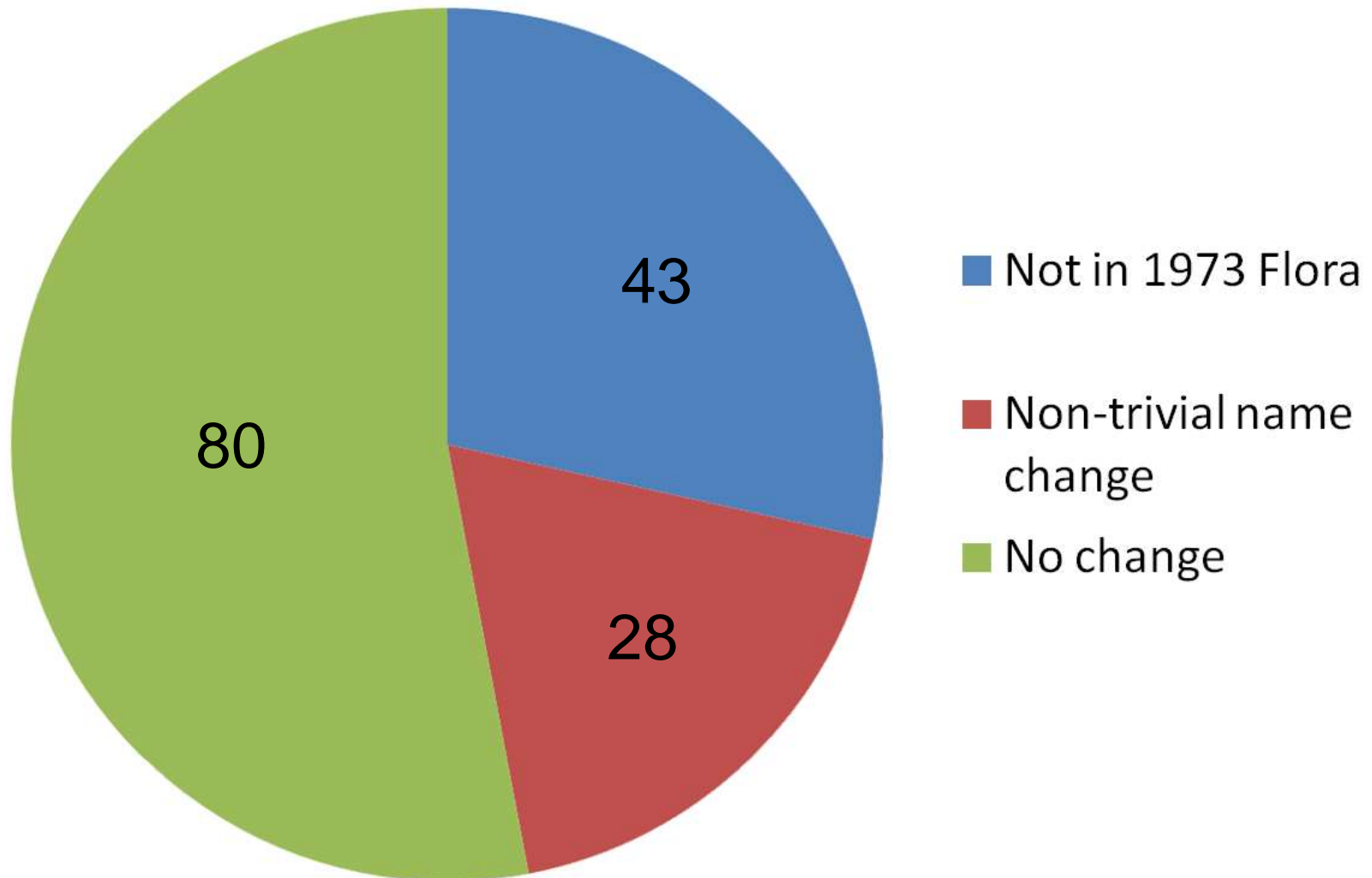
Linaria canadensis var. *texana*



Linaria purpurea

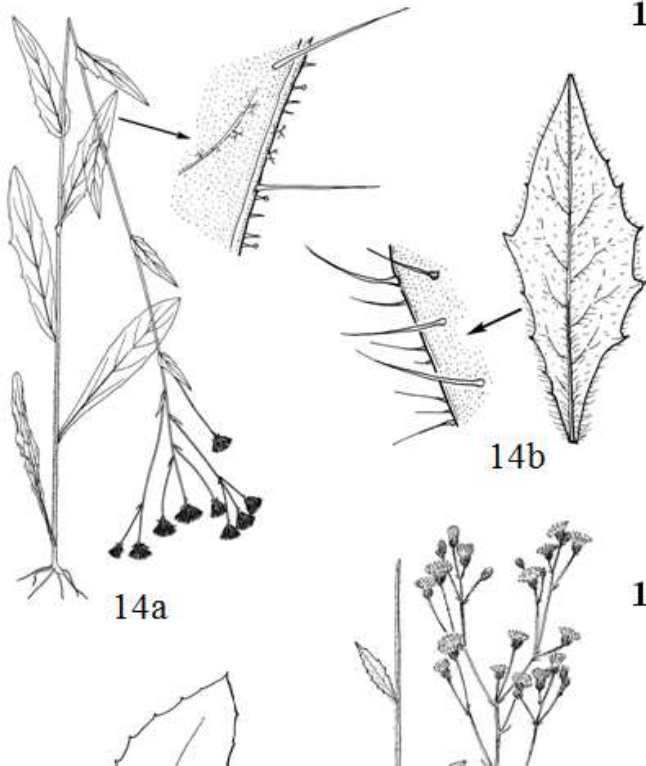
Rare Plants and Noxious Weeds

Washington Noxious Weed List



Rare Plants and Noxious Weeds

Native vs. exotic *Hieracium*



13a Basal and lower st lvs gen absent or withered when in fl ; middle and upper st lvs sessile; native or intro spp.

14a Lf margins gen minutely inrolled, scab with short (0.1–0.2 mm), stiff, triangular hairs, if elongate hairs present these gen not swollen at the base; upper st and peduncles stellate, not glandular; middle and upper phyllaries not stellate, gen glab, rarely slightly glandular or long-hairy; open for, stream banks, meadows, rocky slopes, shores, roadsides; native AK s to n OR, e to Atl; Eurasia; narrow-ldd h. (*H. canadense*)

11 *H. umbellatum* L.

14b Lf margins gen flat, scab and also with elongate hairs swollen at base; upper st and peduncles gen stellate and short-glandular; middle and upper phyllaries gen glandular, or stellate and glandular, occ long-hairy; roadsides, sandy fields, disturbed ground; intro s BC to WA, e N Am; native to Europe; Savoy h.

12 *H. sabaudum* L.

13b Basal and lower st lvs present and green when in fl, with long petioles; middle and upper st lvs petioled; intro spp.

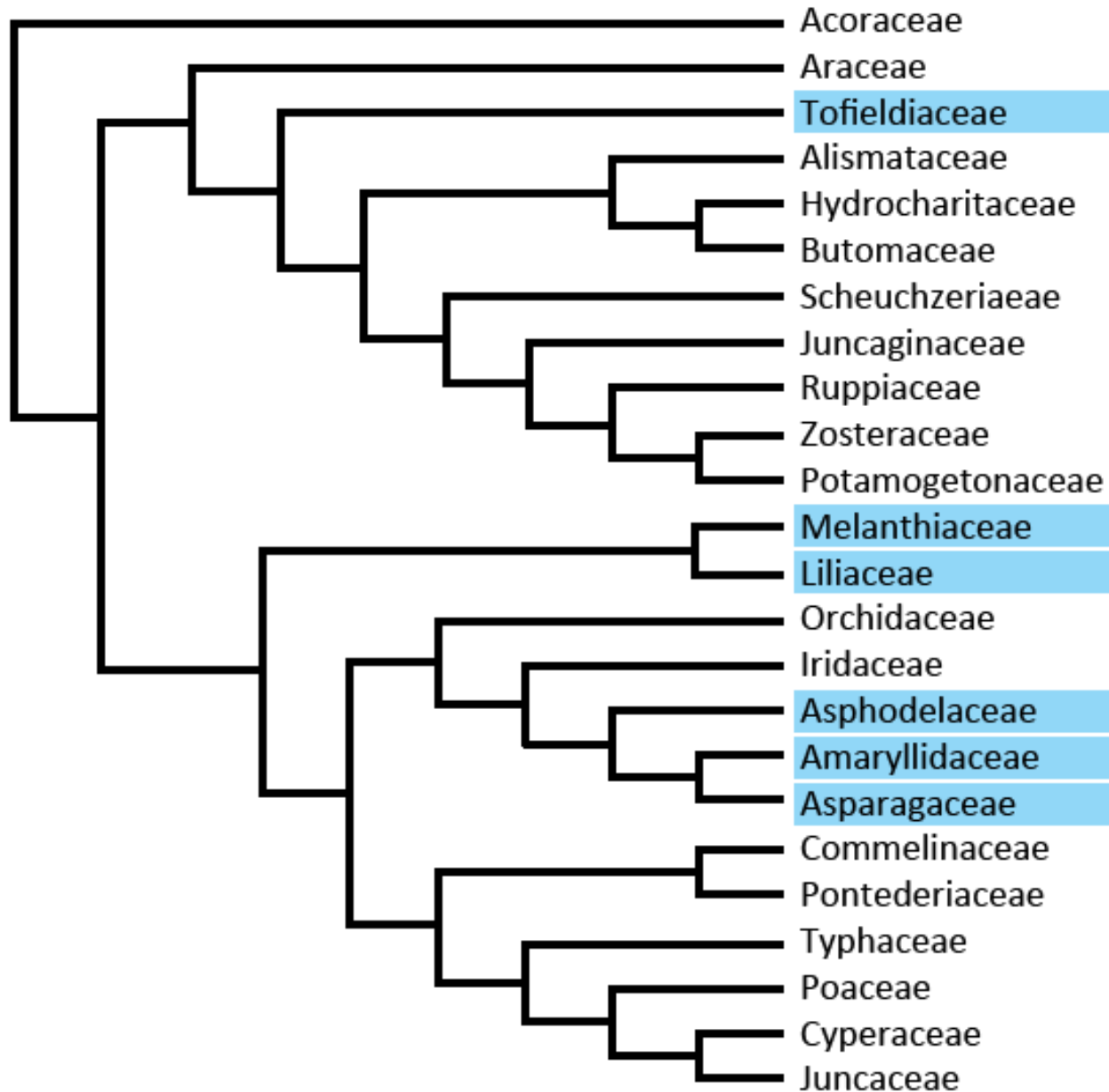
15a Basal and lower st lf blades rounded, truncate or cordate at base, sharply differentiated from petiole; roadsides, open for, disturbed ground, railroads; intro s BC s to n OR e N Am; native to Europe; wall

DNA-based Disintegrations

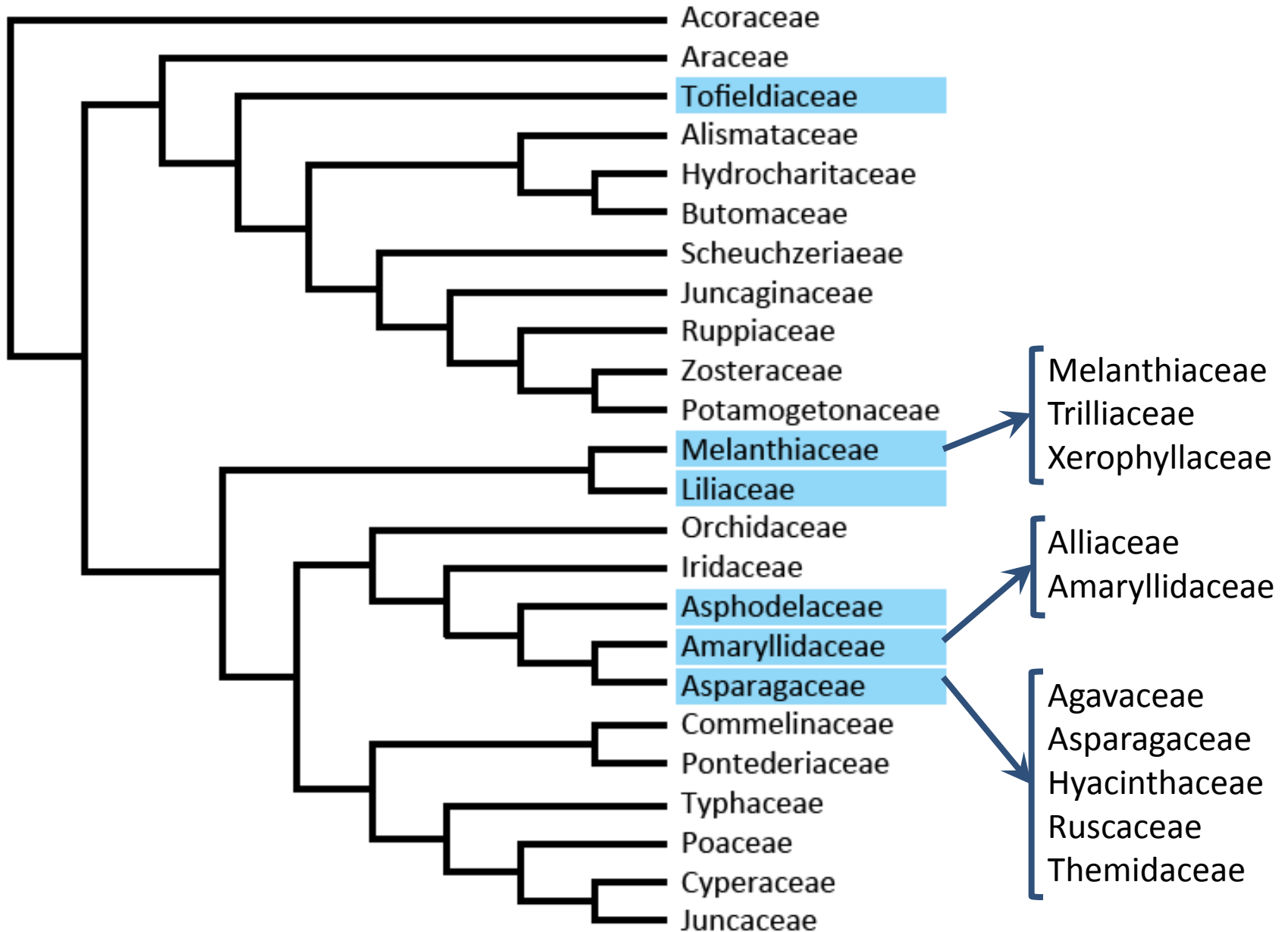


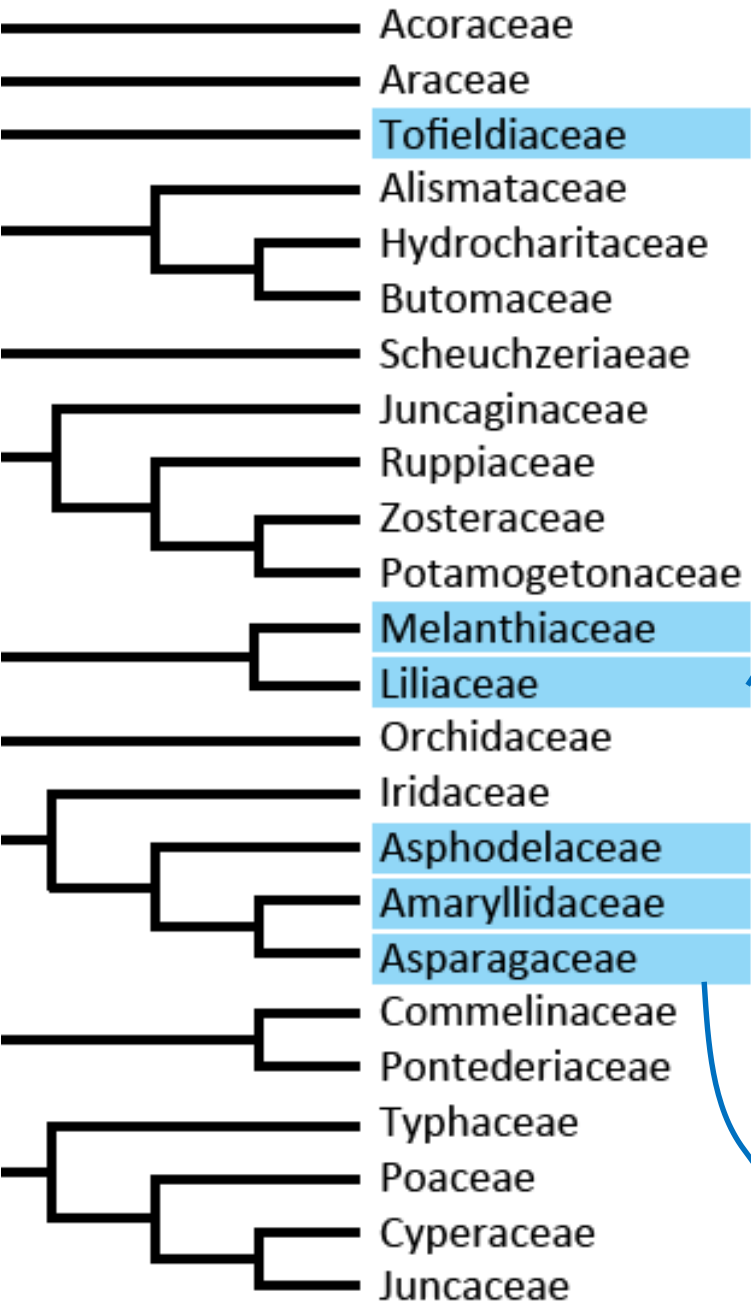
Chenopodium chenopodioides

Disintegration of Liliaceae



Disintegration of Liliaceae

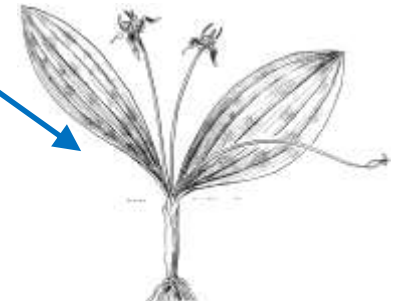




Disporum hookeri
Prosartes hookeri



Disporum sessile
[Colchicaceae]
Photo: Wikimedia



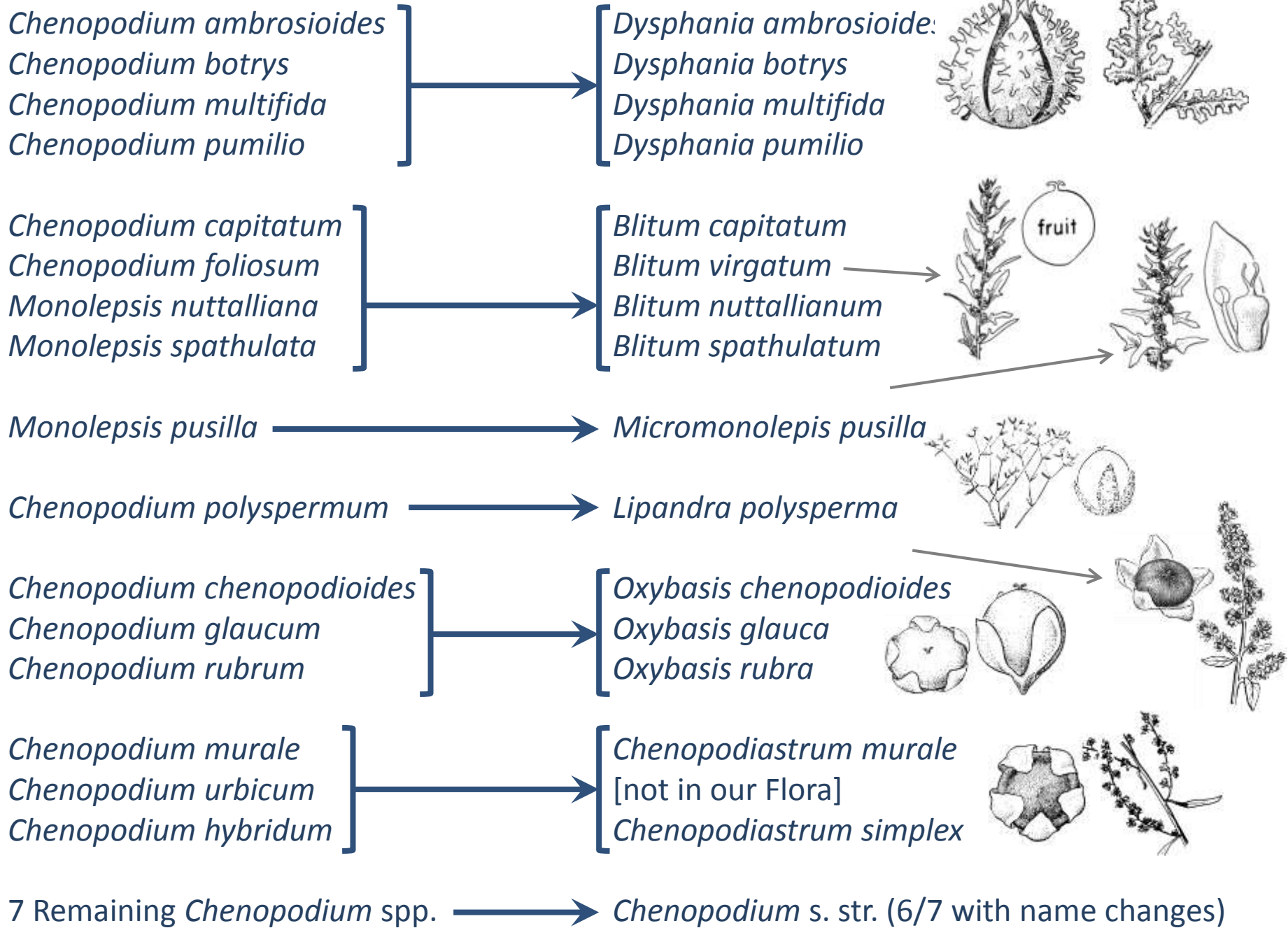
Scoliopus hallii



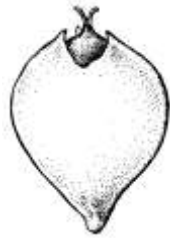
Streptopus amplexicaulis



Polygonatum multiflorum
Photo: Wikimedia



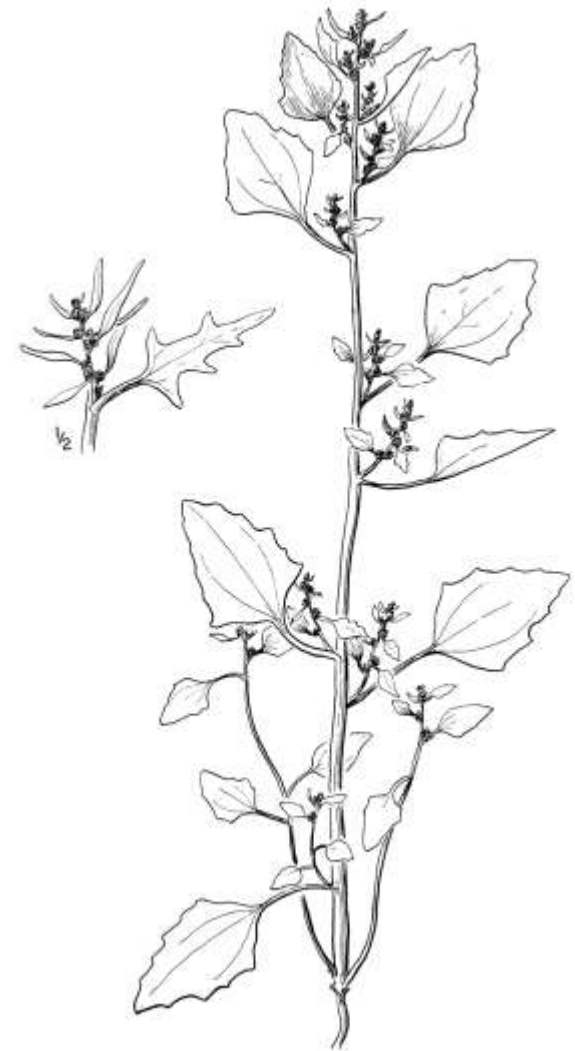
Disintegration of *Chenopodium*



Oxybasis chenopodioides



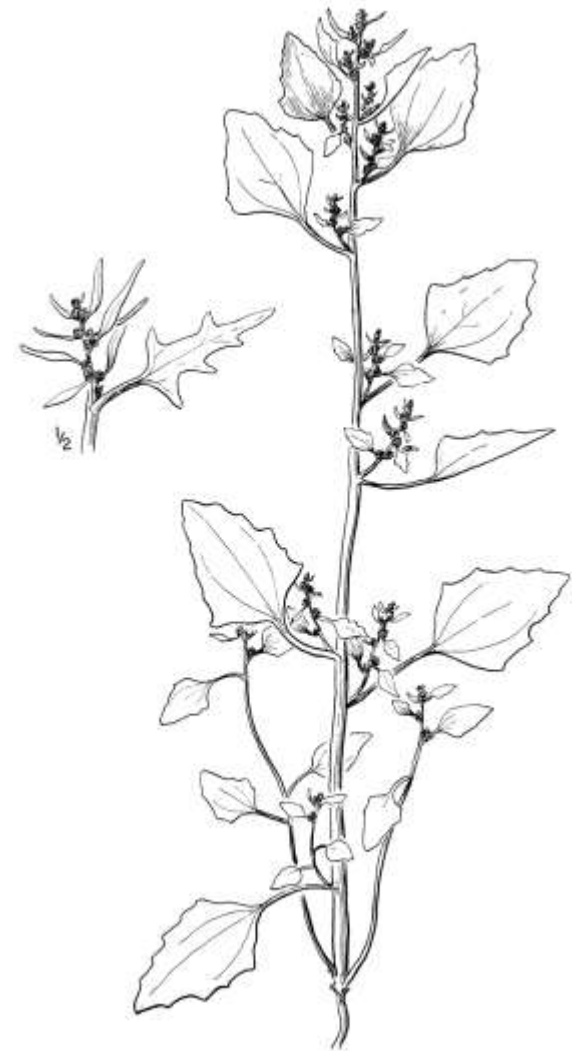
~~*Chenopodium chenopodioides*~~
Oxybasis macrosperma (= *C. macrospermum*)



Chenopodium rubrum var. *rubrum*

Disintegration of *Chenopodium*

Oxybasis rubra var. *rubra*



~~*Chenopodium rubrum* var. *rubrum*~~
Oxybasis macrosperma?

“Further study needed”

- A primary goal of the Flora is to bring current knowledge together into a single accessible resource.
- However, our collective knowledge continues to change.
- Some genera and species in our area remain poorly understood; some have not yet been investigated using molecular methods.
- In a very real sense, the new Flora will be outdated the moment it is published.
- In some cases, all we can do is say “further study needed”

“Further study needed”

“A new Flora does not necessarily result in an easier or simpler identification process, nor does it necessarily result in cleaner and more clearcut taxonomic classifications. While greater clarification of concepts and diagnostic characters may be achieved for some groups, there are many cases where further study reveals greater patterns of complexity that may be difficult to represent as discrete taxa.”

- from the 1st Edition of the Jepson Manual, 1993.

Examples: *Antennaria*, *Delphinium*, *Grindelia*, *Lupinus*

Counter-examples: *Astragalus*, *Botrychium*, *Lomatium*

Pedicularis pulchella from Wenatchee Mountains

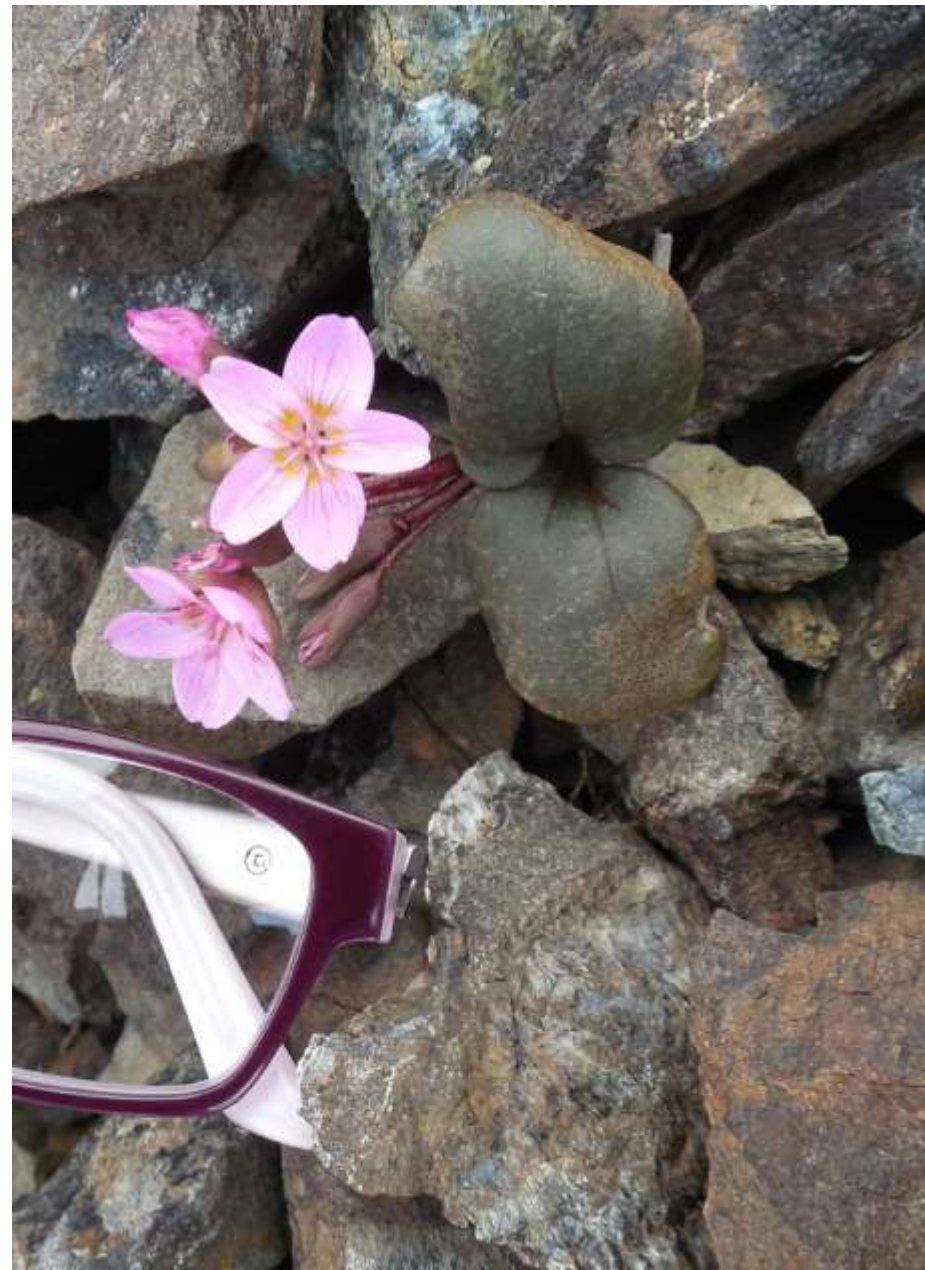
Wenatchee Mts (Arnett 2008-17):



A specimen from Montana:



Claytonia umbellata from Wenatchee Mountains



Astragalus sp. from northeast
Olympic Mountains.

An undescribed species?



“Further study needed”

Taxa that may remain unnamed even as the Flora goes to press



Botrychium 'viride'



Botrychium 'furculatum'



Lomatium 'argentophyllus'

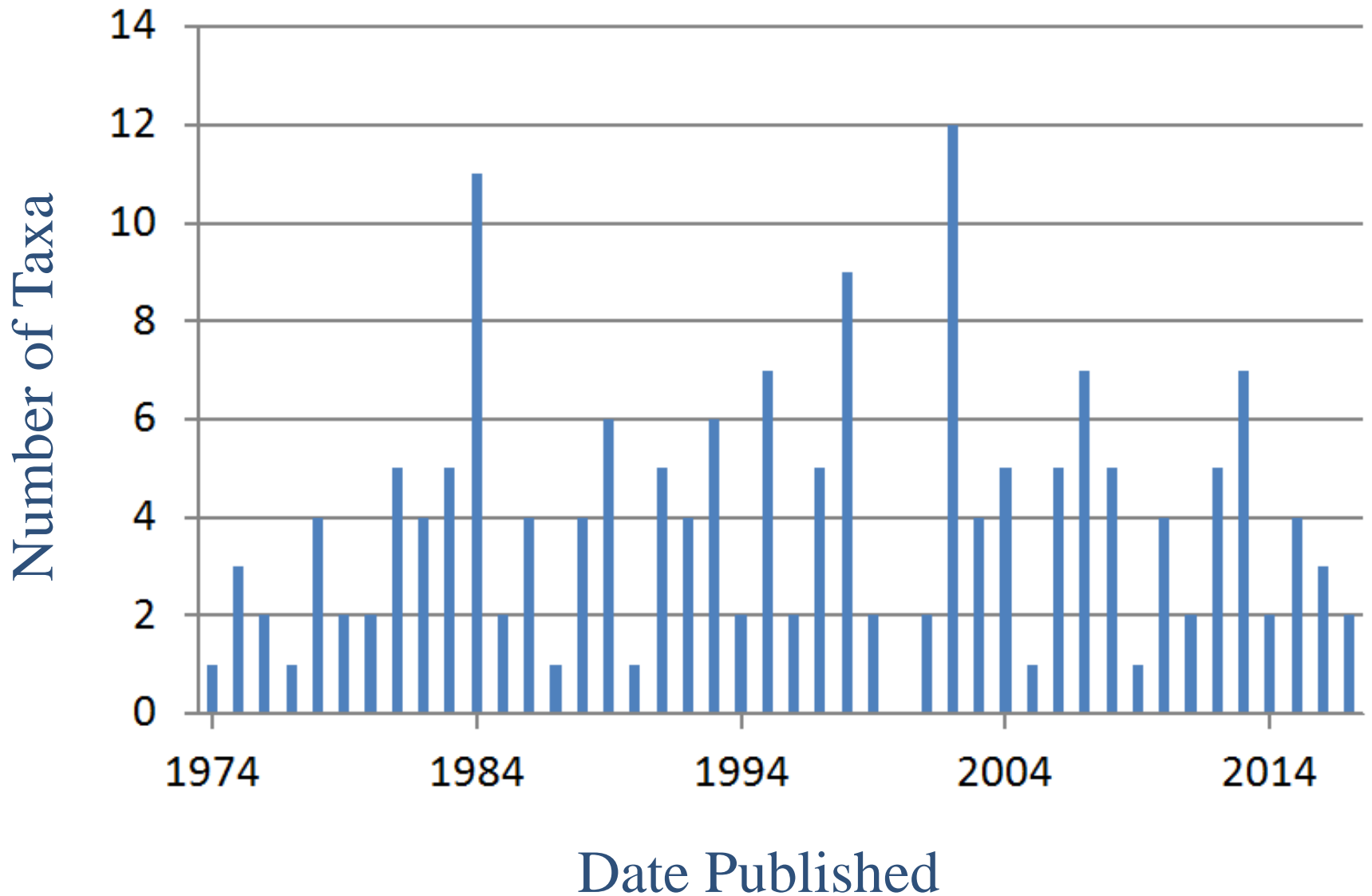


Oreocarya 'montana'
(SDSU20708)



Physaria 'andersonii'
(Mark Darrach)

Species published as new to science in Flora area after 1973:



Impacts of a new Flora

- Provides a new baseline inventory of which taxa occur in our area.
- Aids conservation and restoration work, land management decisions, weed control, ecological studies, floristic studies, and other types of research.
- Improves our ability to accurately communicate information about the plants of Washington.
- Will influence the names used in field guides, pamphlets, web sites, and other resources, thereby reaching people who never use the book itself.
- Provides an up-to-date starting point for anyone seeking to learn plant families and scientific names, and will make it easier for the rest of us to “relearn” the flora.



Sabulina basaltica, Olympic Mts.



Sabulina sororia, Twin Sisters Range.