



Concepts of genera and species in monkeyflowers

Guy Nesom, 20 June 2014

[GOOGLE "monkeyflower concepts" for pdf]

"Using names in the genus *Mimulus*"

March 2014

(GOOGLE 'using names in Mimulus')

RECENT TAXONOMIC LITERATURE FOR ERYTHRANTHE
7 June 2014

Phrymaceae

Barke, W.R., G.L. Nesom, P.M. Beardsley, and N.S. Fraga. 2012. A taxonomic conspectus of Phrymaceae: A narrowed circumscription for *Mimulus*, new and resurrected genera, and new names and combinations. *Phytoneuron* 2012-39: 1-60.

Nesom, G.L. 2012. Plesiomamy, a term contrasting with heterogamy. *Phytoneuron* 2012-46: 1-2.

Erythranthe sect. Achlyopitheca

Nesom, G.L. 2012. Taxonomic summary of *Erythranthe* sect. *Achlyopitheca* (Phrymaceae). *Phytoneuron* 2012-42: 1-4.

Erythranthe sect. Erythranthe

Nesom, G.L. 2014. Taxonomy of *Erythranthe* sect. *Erythranthe* (Phrymaceae). *Phytoneuron* 2014-31: 1-41.

Erythranthe sect. Mimulosma

Nesom, G.L. 2012. Taxonomy of *Erythranthe* sect. *Mimulosma* (Phrymaceae). *Phytoneuron* 2012-41: 1-36.

Nesom, G.L. 2012. Notes on *Erythranthe orizabae* (Phrymaceae). *Phytoneuron* 2012-43: 1-4.

Nesom, G.L. 2013. Two new species of *Erythranthe* sect. *Mimulosma* (Phrymaceae) from California. *Phytoneuron* 2013-43: 1-10.

Nesom, G.L. 2013. New distribution records for *Erythranthe* (Phrymaceae). *Phytoneuron* 2013-67: 1-15.

Erythranthe sect. Paradaantha

Fraga N.S. 2012. A revision of *Erythranthe monticola* and *Erythranthe palmieri* (Phrymaceae), with descriptions of five species from California and Nevada, USA. *Aliso* 30: 49-68.

Erythranthe sect. Simiola (1990-present)

Beardsley, P.M., S.E. Schoenig, J.B. Whittall, R.G. Olmstead. 2004. Patterns of evolution in western North American *Mimulus* (Phrymaceae). *Amer. J. Bot.* 91: 474-489.

Benedict, B.G., J.L. Modlikzewski, A.L. Sweigart, N.H. Martin, F.R. Ganders, and J.H. Willis. 2012. *Mimulus zookerensis* (Phrymaceae), a new

allootetraploid species derived from *Mimulus guttatus* and *Mimulus nasutus*. *Madroño* 59: 29-43.

Koopman, K.R., R. Beringen, F.P.L. Collas, J. Matthews, B. Odé, R. Pot, L.B. Sparrius, J.L.C.H. van Valkenburg, L.N.H. Verbrugge, and R.S.E.W. Leuven. 2012. Knowledge document for risk analysis of the non-native Monkeyflower (*Mimulus guttatus*) in the Netherlands. Netherlands Food and Consumer Product Safety Authority, Ministry of Economic Affairs, Agriculture and Innovation. <http://www.g-bank.eu/Plants/ControlSheets/KD_Mimulus_final20120921.pdf>

Modlikzewski, J.L. and J.H. Willis. 2012. Allootetraploid *Mimulus zookerensis* are highly interfertile despite independent origins. *Molec. Ecol.* 21: 5280-5298.

Moody, A., P.K. Diggle, and D.A. Steingraeber. 1999. Developmental analysis of the evolutionary origin of vegetative propagules in *Mimulus geminiparus* (Scrophulariaceae). *Amer. J. Bot.* 86: 1512-1522.

Nesom, G.L. 2012. Taxonomy of *Erythranthe* sect. *Simiola* (Phrymaceae) in the USA and Mexico. *Phytoneuron* 2012-40: 1-123.

Nesom, G.L. 2013. New distribution records for *Erythranthe* (Phrymaceae). *Phytoneuron* 2013-67: 1-15.

Nesom, G.L. 2013. Observations on habit and duration in populations of *Erythranthe micropetala* and *E. guttatus* (Phrymaceae). *Phytoneuron* 2013-68: 1-8.

Nesom, G.L. 2013. The taxonomic status of *Mimulus zookerensis* (Phrymaceae) and comments on related aspects of biology in species of *Erythranthe*. *Phytoneuron* 2013-69: 1-18.

Nesom, G.L. 2013. A new species of *Erythranthe* sect. *Simiola* (Phrymaceae) from California serpentine. *Phytoneuron*: 70: 1-6.

Nesom, G.L. 2013. *Mimulus filicifolius* joins *Erythranthe* (Phrymaceae). *Phytoneuron* 2013-80: 1-2.

Nesom, G.L. 2013. Review: Brandvain, Kenney, Flagel, Coop, and Sweigart. "Speciation and introgression between *Mimulus nasutus* and *Mimulus guttatus*." *Phytoneuron* 2013-97: 1-9.

Posto, A.L. and L.A. Pritchard. 2003. The evolutionary and taxonomic implications of RAPD data on the genetic relationships of *Mimulus michiganensis* (comb. et stat. nov.: Scrophulariaceae). *Syst. Bot.* 28: 172-178.

Sexton, J.P., K.G. Ferris, and S.E. Schoenig. 2013. The fern-leaved monkeyflower (Phrymaceae), a new species from the northern Sierra Nevada of California. *Madroño* 60: 236-242.

Vallejo-Marin, M. 2012. *Mimulus peregrinus* (Phrymaceae): A new British allopolyploid species. *Phytotaxa* 14: 1-14.

Vallejo-Marin, M. and G.C. Lye. 2013. Hybridisation and genetic diversity in introduced *Mimulus* (Phrymaceae). *Heredity* 110: 111-122.

Verloove, P. 2013. *Erythranthe guttatus*. Manual of the Alien Plants of Belgium. National Botanic Garden of Belgium.

<<http://alienplantsbelgium.be/content/erythranthe-guttata>>

Vickery, R.K. 1990. Close correspondence of allozyme groups to geographic races in the *Mimulus gualanensis* complex (Scrophulariaceae). *Syst. Bot.* 15: 481-496.

Vickery, R.K. 1995. Speciation by aneuploidy and polyploidy in *Mimulus* (Scrophulariaceae). *Great Basin Naturalist* 55: 174-176.

Vickery, R.K. 1997. A systematic study of the *Mimulus virens* complex (Scrophulariaceae: *Mimulus* section *Simiolus*), including *M. yecorensis* and *M. minutiflorus*, new species from western Mexico. *Madroño* 44: 384-399.

von Bohlen, C. 1991. Nota sobre el género *Mimulus* L. (Scrophulariaceae). *Gayana, Bot.* 43: 119-120.

von Bohlen, C. 1995. *Mimulus crinitus* A.L. Grant (Scrophulariaceae: Gratiolales), transferred from section *Simiolus* Greene to section *Paradaantha*.

A.L. Grant. *Gayana, Bot.* 52: 1-5.

von Bohlen, C. 1995. El género *Mimulus* L. (Scrophulariaceae) en Chile. *Gayana, Bot.* 52: 7-28.

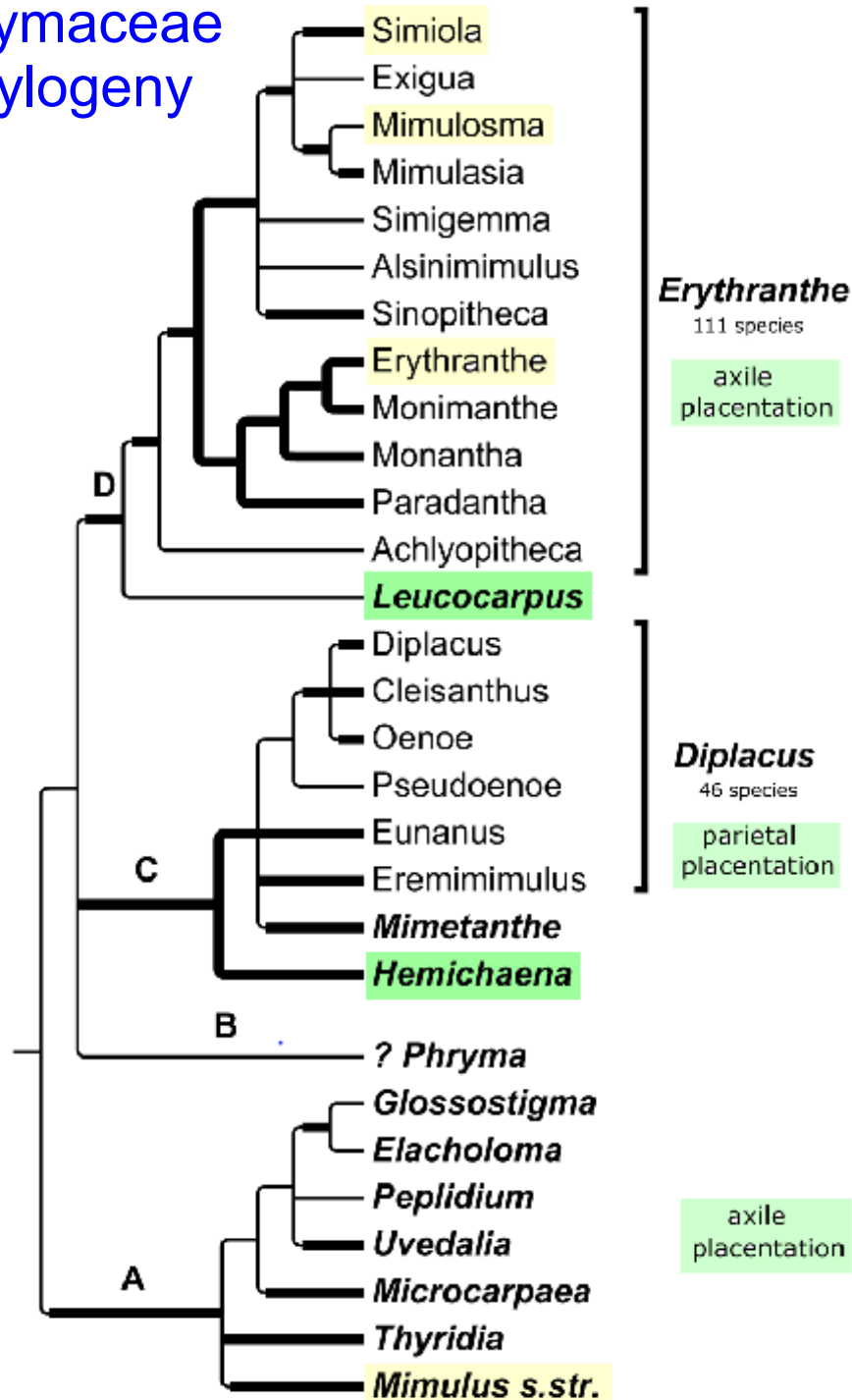
Watson J.M. and C. von Bohlen. 2000. Plant portraits: 400. *Mimulus nasutus* Scrophulariaceae. *Curtis's Bot. Mag.* 17: 195-201.

Erythranthe sect. Sinopitheca

Nesom, G.L. 2012. *Erythranthe sinuata* (Phrymaceae), a new species from Yunnan, China. *Phytoneuron* 2012-44: 1-3.

Recent taxonomic literature for *Erythranthe* (GOOGLE 'recent literature Erythranthe')

Phrymaceae phylogeny





Leucocarpus frutescens

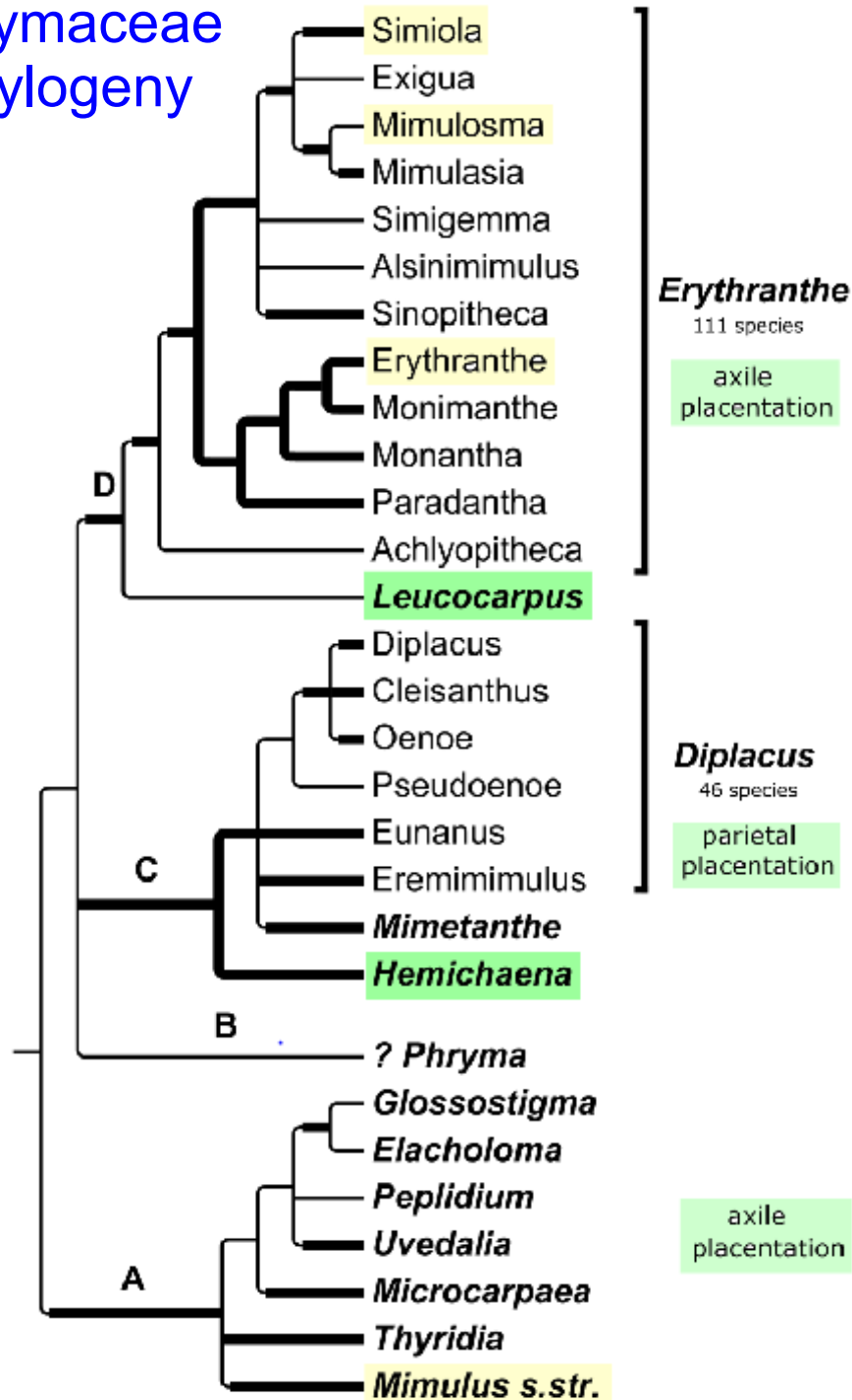


Leucocarpus frutescens



Hemichaena fruticosa

Phrymaceae phylogeny



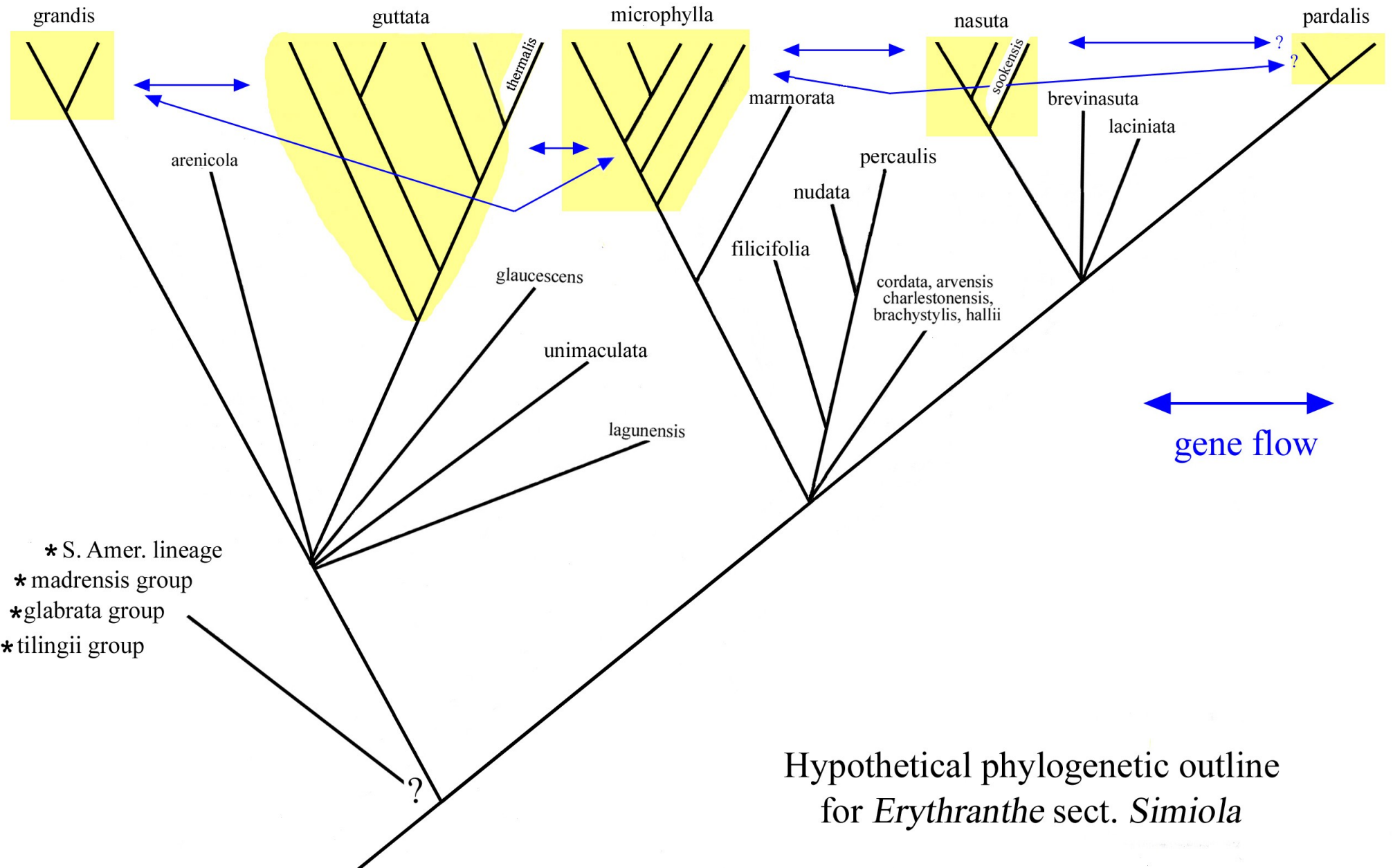
Mimulus species

**Discrete morpho-geographic entities (species)
are the
characteristic products of evolution
in most plant groups***

The efficacy of reproductive isolation.

In some groups, *Mimulus* included, a few of the species may be highly variable, much more so than the others, but most species tend to be consistent in morphology.

*personal observation, unpublished



Hypothetical phylogenetic outline
for *Erythranthe* sect. *Simiola*

Informal infrasectional classification of sect. *Simiola* (41 species)

1. **Madrensis group**

Subgroup A (*E. madrensis*, *E. pallens*, *E. calciphila*^{*A}, *E. pennellii*, *E. visibilis*^{*A}). Perennial or annual; calyces 5-lobed or mostly 3-lobed; flowers small (allogamous or autogamous); western Mexico into southwestern USA. $x = 16$.

Subgroup B (*E. chinatiensis*^{*}, *E. dentiloba*, *E. parvula*^{*}). Perennial, mat-forming; calyces 5-lobed or with tendency toward 3-lobed; flowers relatively small, allogamous or autogamous; corolla lobes lacinate to fimbriate; southwestern USA and northwestern Mexico. $x = 16$.

2. **Glabrata group**

(*E. glabrata*, *E. michiganensis*, *E. geyeri*^{*}, *E. regni*^{*A}, *E. inamoena*^{*}). Perennial and annual, rhizomatous or rooting at proximal nodes, fibrous-rooted in *E. regni*; calyces not closing; flowers small and autogamous or (*E. michiganensis*) larger, chasmogamous and allogamous; central USA, Mexico, and South America. $x = 15$.

3. **Tilingii group**

Subgroup A (*E. tilingii*, *E. minor*, *E. caespitosa*, *E. corallina*, *E. utahensis*). Perennial; flowers large, chasmogamous and allogamous; filiform rhizomes profusely produced; mostly high elevation (except for *E. utahensis*); western USA. $x = 12?$, 14, 15.

Subgroup B (*E. decora*, *E. scouleri*). Perennial; flowers large; rhizomes numerous; leaf margins closely toothed; styles densely hairy; Washington and Oregon. $x = ?$

4. **Guttata group**

(*E. guttata*, *E. grandis*, *E. lagunensis*^A, *E. unimaculata*^A, *E. thermalis*^{*A}, *E. arenicola*^A). Perennial and annual; leaves oblong or elliptic to obovate, margins remotely toothed; flowers relatively large and chasmogamous and allogamous; western USA and northwestern Mexico. $x = 14$.

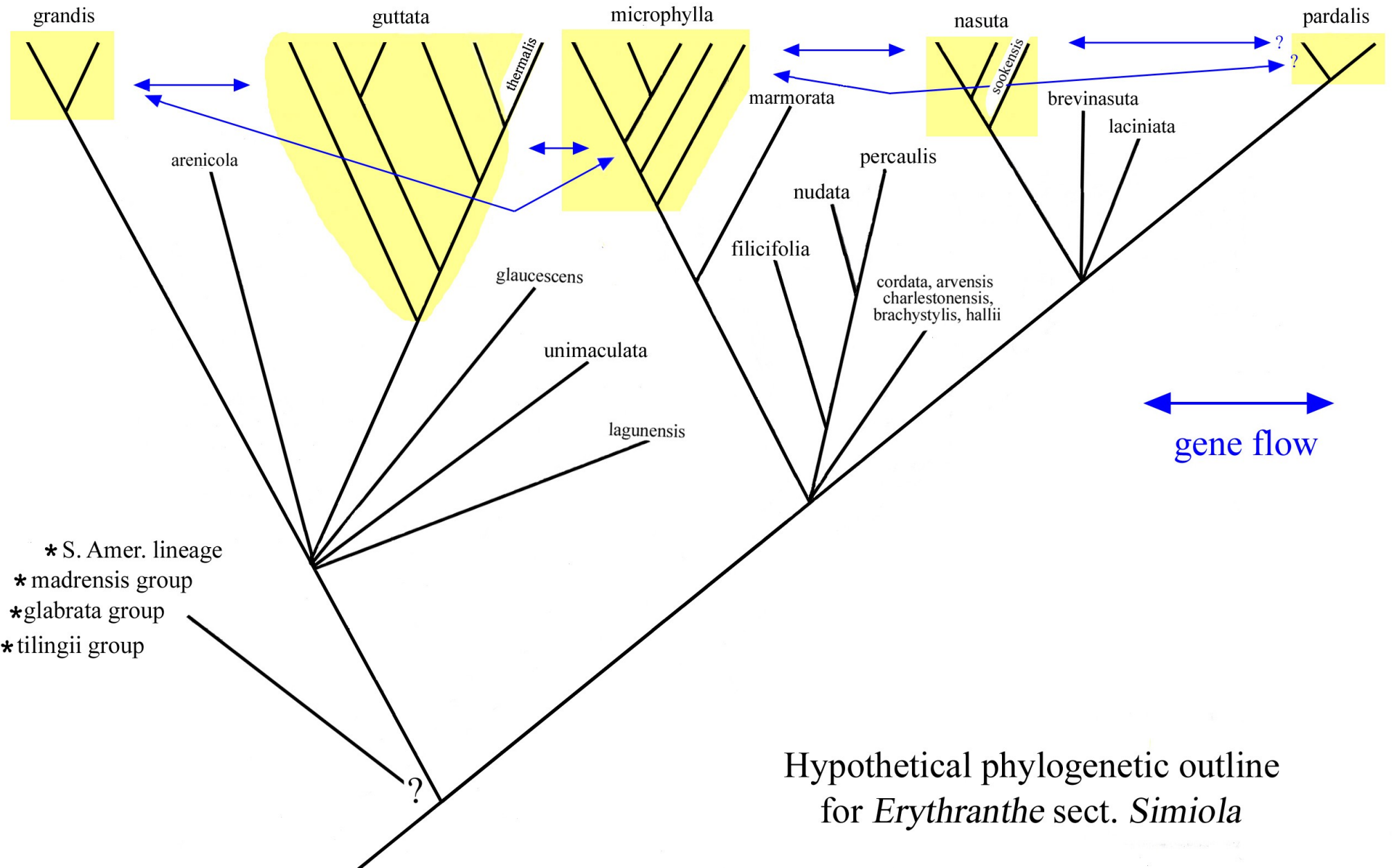
5. **Microphylla group**

Subgroup A (*E. microphylla*^A, *E. glaucescens*^A, *E. marmorata*^A, *E. nudata*^A, *E. filicifolia*, *E. percaulis*). Annual; flowers large or variable in size, chasmogamous and allogamous; basal and proximal cauline leaves often purplish on one or both surfaces; central California northward. $x = 14$.

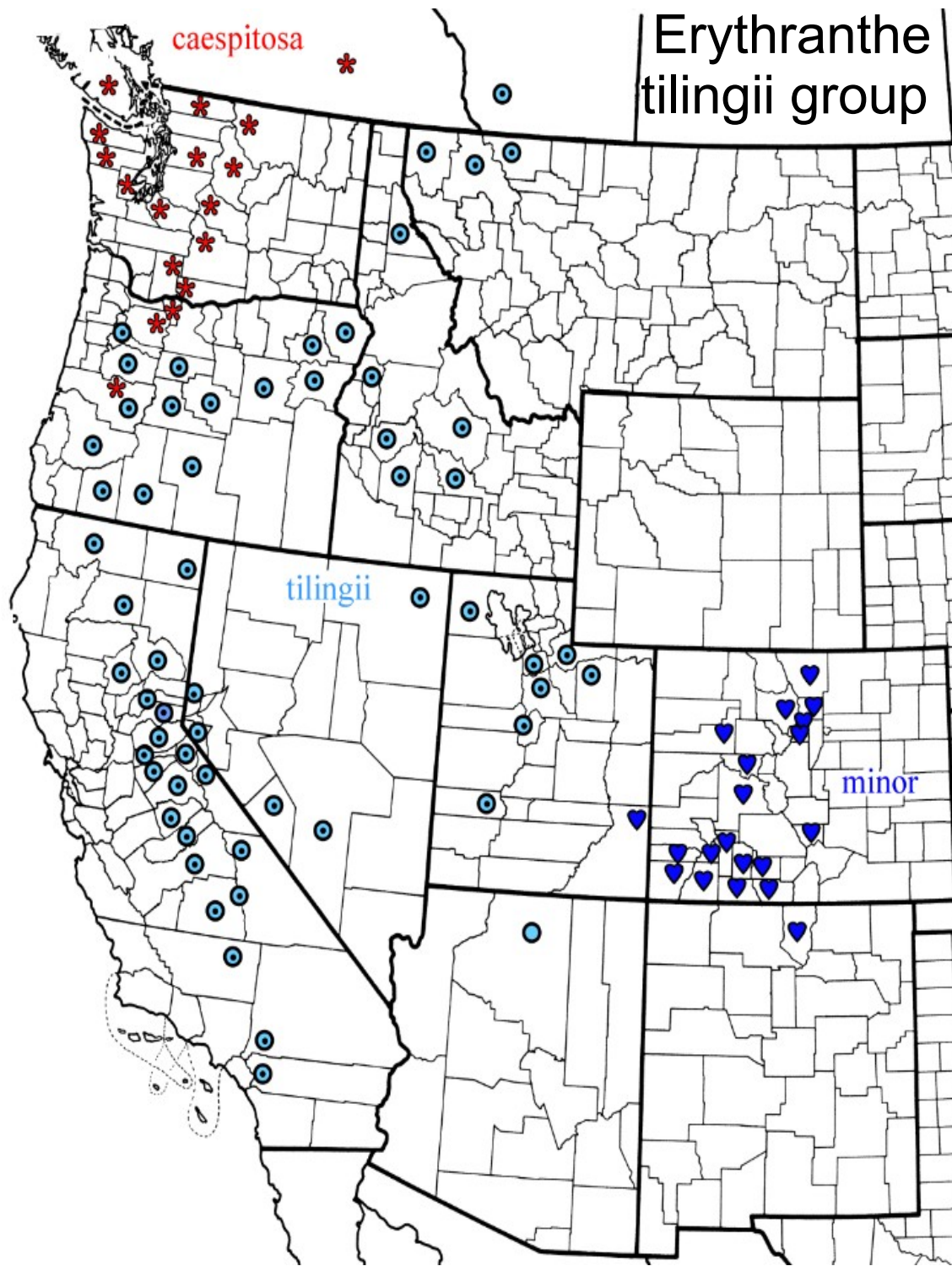
Subgroup B (*E. nasuta*^{*A}, *E. brevinasuta*^{*A}, *E. laciniata*^{*A}, *E. pardalis*^{*A}). Annual; flowers small (cleistogamous or slightly open, autogamous; basal and proximal cauline leaves often purplish (*E. nasuta*, *E. laciniata*); flowers often produced at all nodes, proximal to distal; Sierra Nevada of USA (*E. laciniata*, *E. pardalis*) and broader (*E. nasuta*). $x = 14$. Perhaps arbitrarily separated from subgroup C.

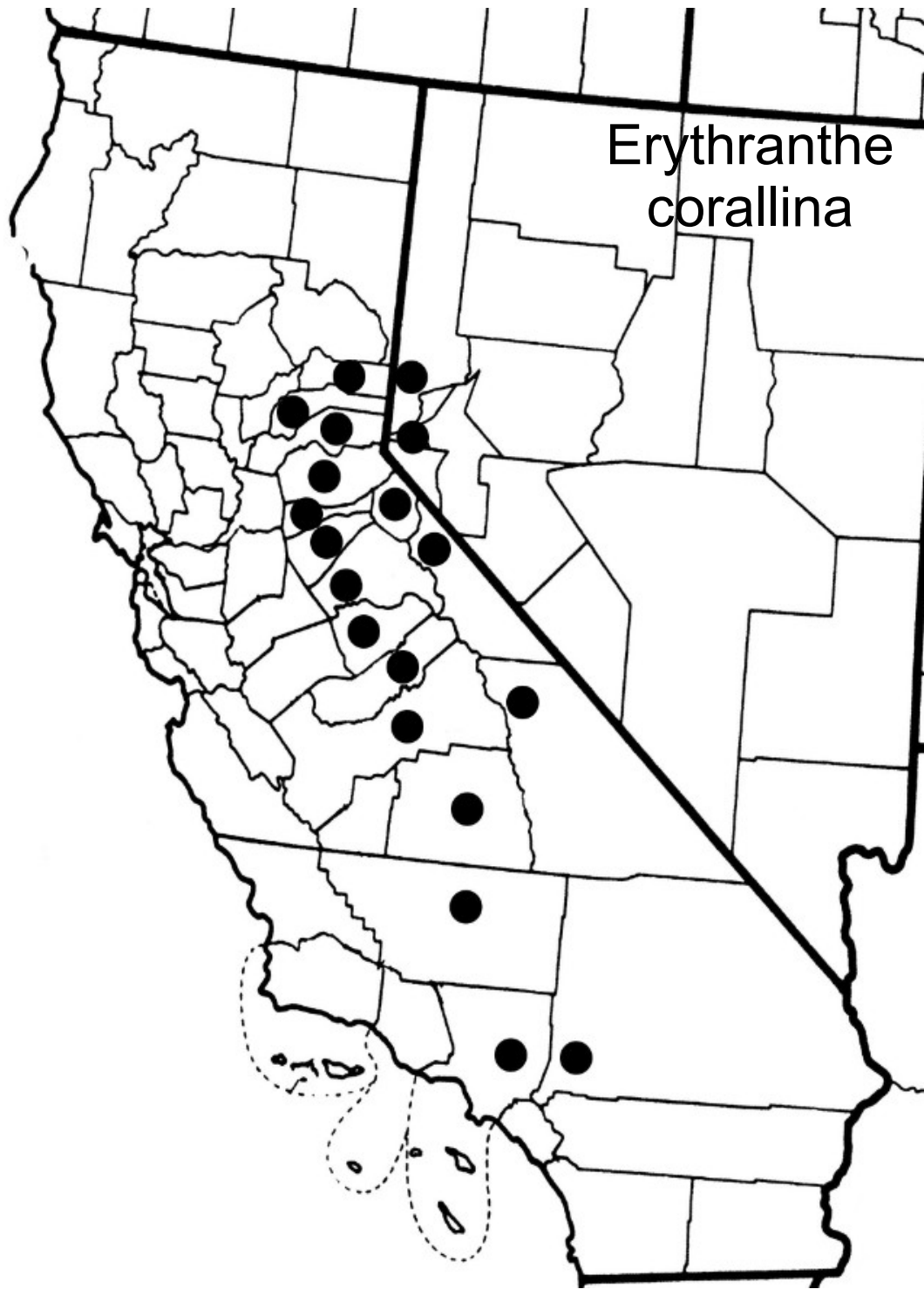
Subgroup C (*E. arvensis*^{*A}, *E. brachystylis*^{*A}, *E. charlestonensis*^{*A}, *E. cordata*^{*A}, *E. hallii*). Annual, sometimes rooting at lower nodes; flowers often cleistogamous, all autogamous, produced from distal nodes; western USA. $x = 14, 15, 16$.

Plants are allogamous and perennial unless otherwise noted: * = autogamous; A = annual duration.

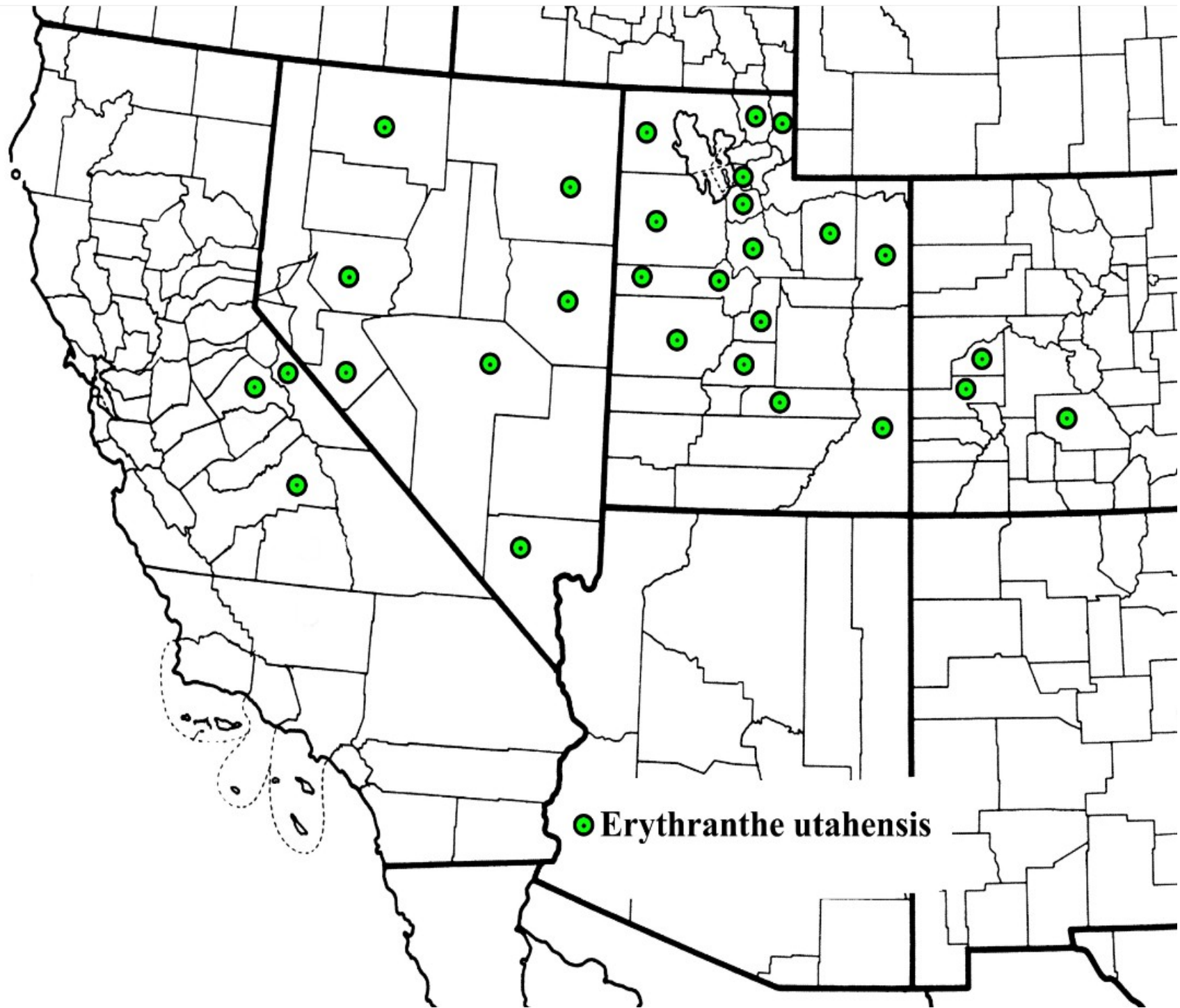


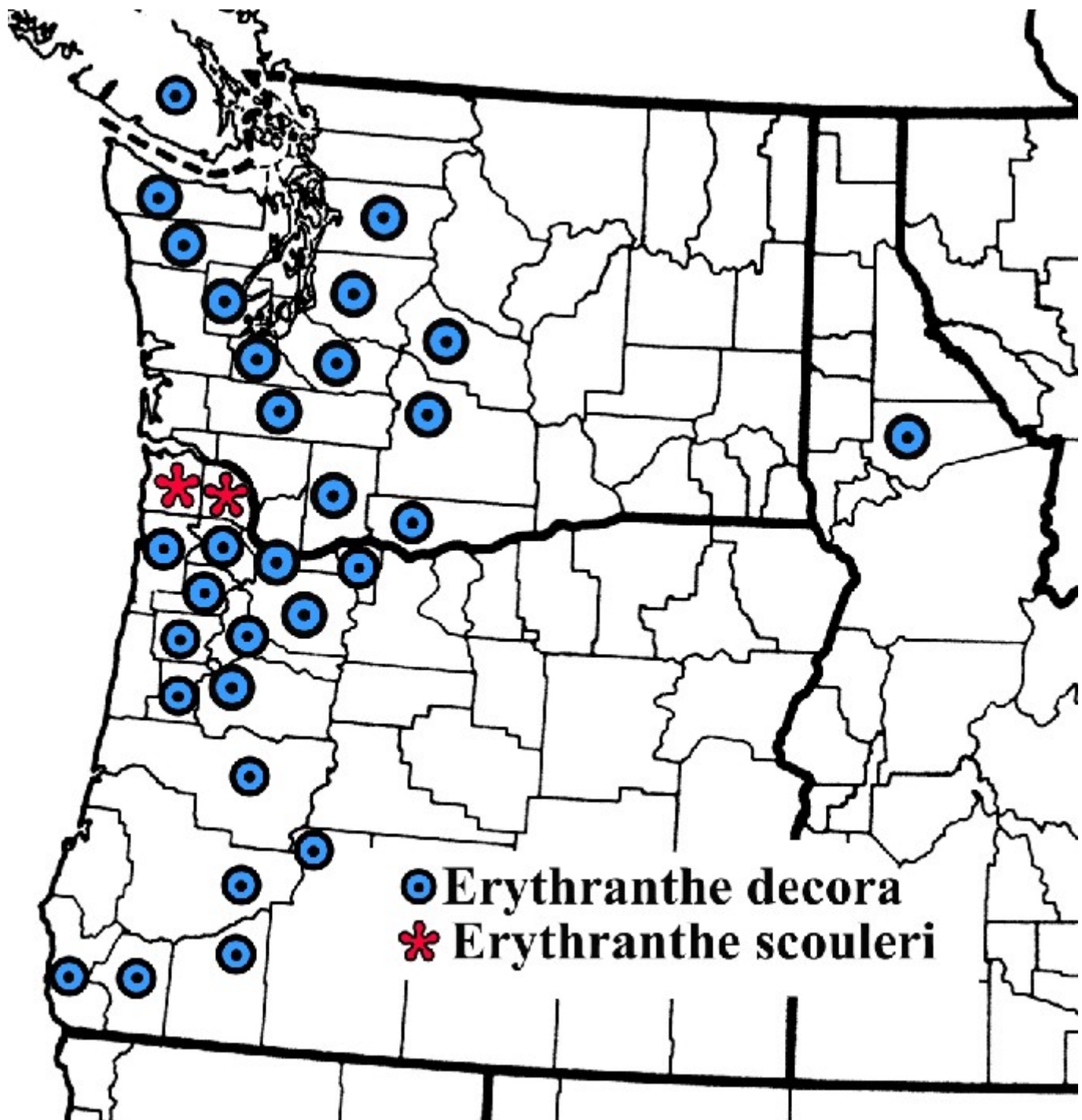
Hypothetical phylogenetic outline for *Erythranthe* sect. *Simiola*





*Erythranthe
corallina*







Erythranthe tilingii, Nevada



Erythranthe
minor,
Colorado



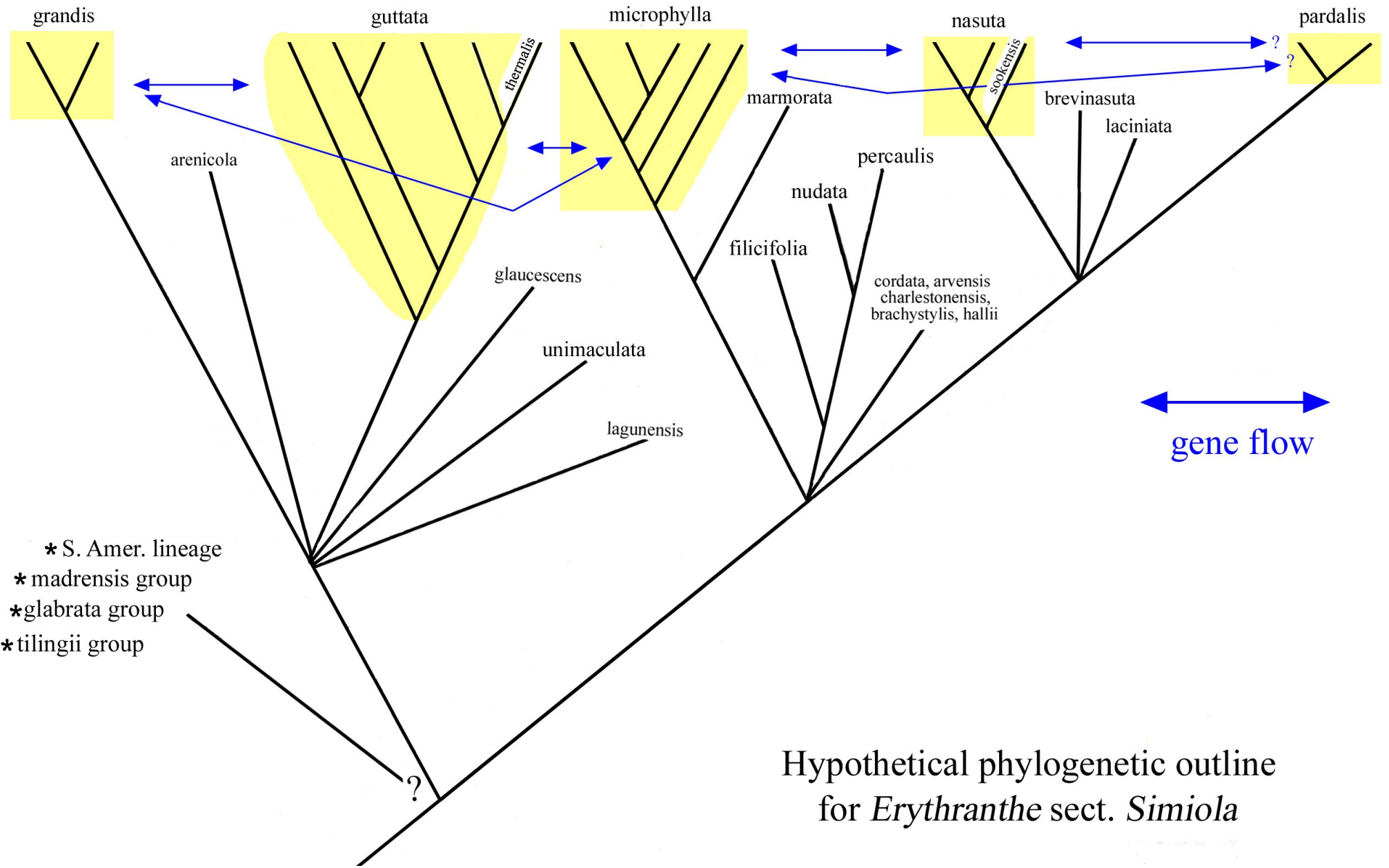
Erythranthe caespitosa, Oregon



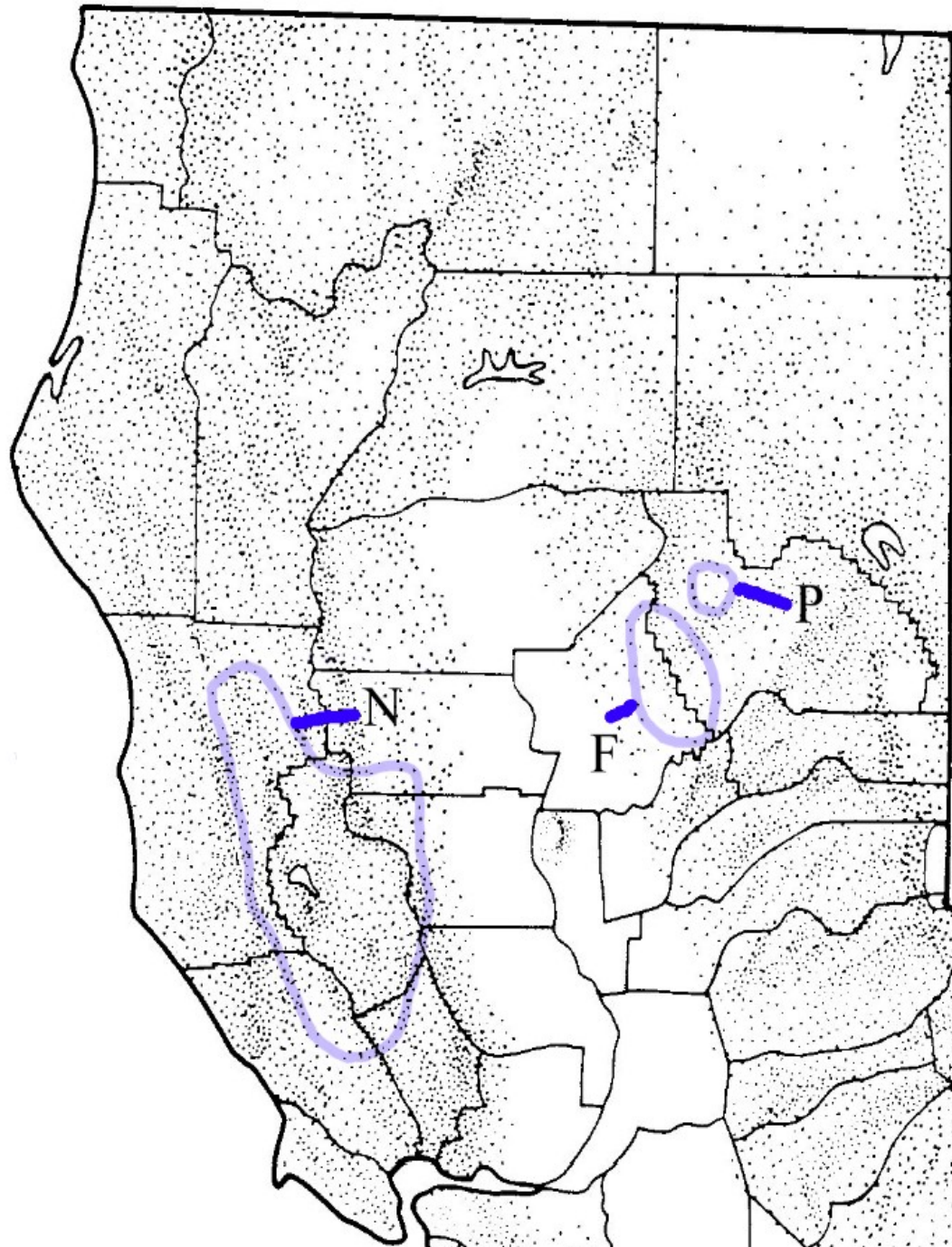
Erythranthe caespitosa, Washington



Erythranthe corallina
California



Hypothetical phylogenetic outline
for *Erythranthe* sect. *Simiola*



N = nudata F = filicifolia P = percaulis

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- 6 dupes according to
Howell's notebook

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Plants of the Sierra Nevada, California
53705
Mimulus guttatus Fisch. ex DC.
det. C. Best 1981

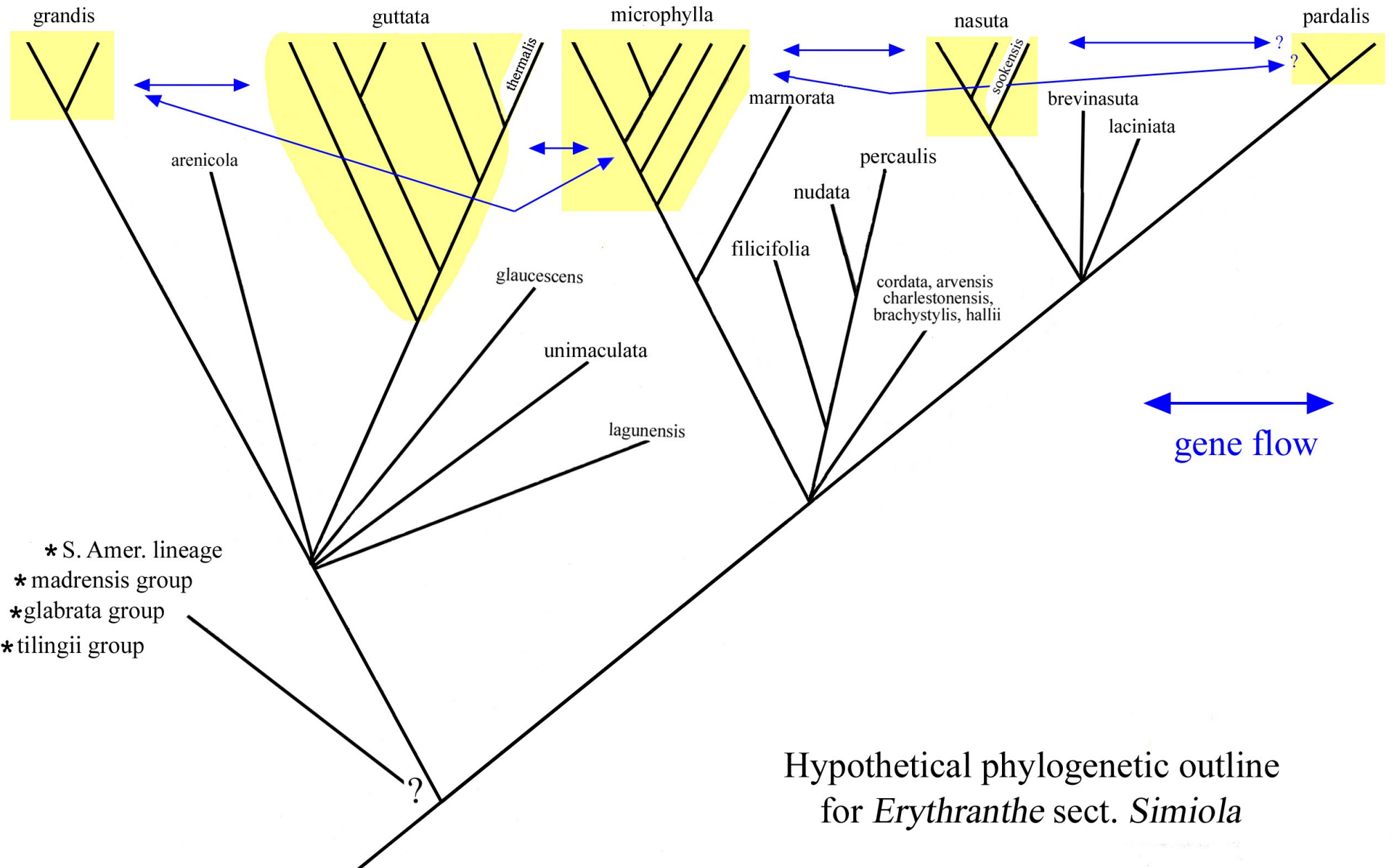
53705. CALIFORNIA ACADEMY OF SCIENCES
Plants of the Sierra Nevada, California
Mimulus ? geminatus

Serpentine Canyon about 3 miles east of
Rich Bar, East Branch North Fork Feather
River, el. ca. 2800 ft., Plumas County.

John Thomas Howell
H. Keith Wagnon

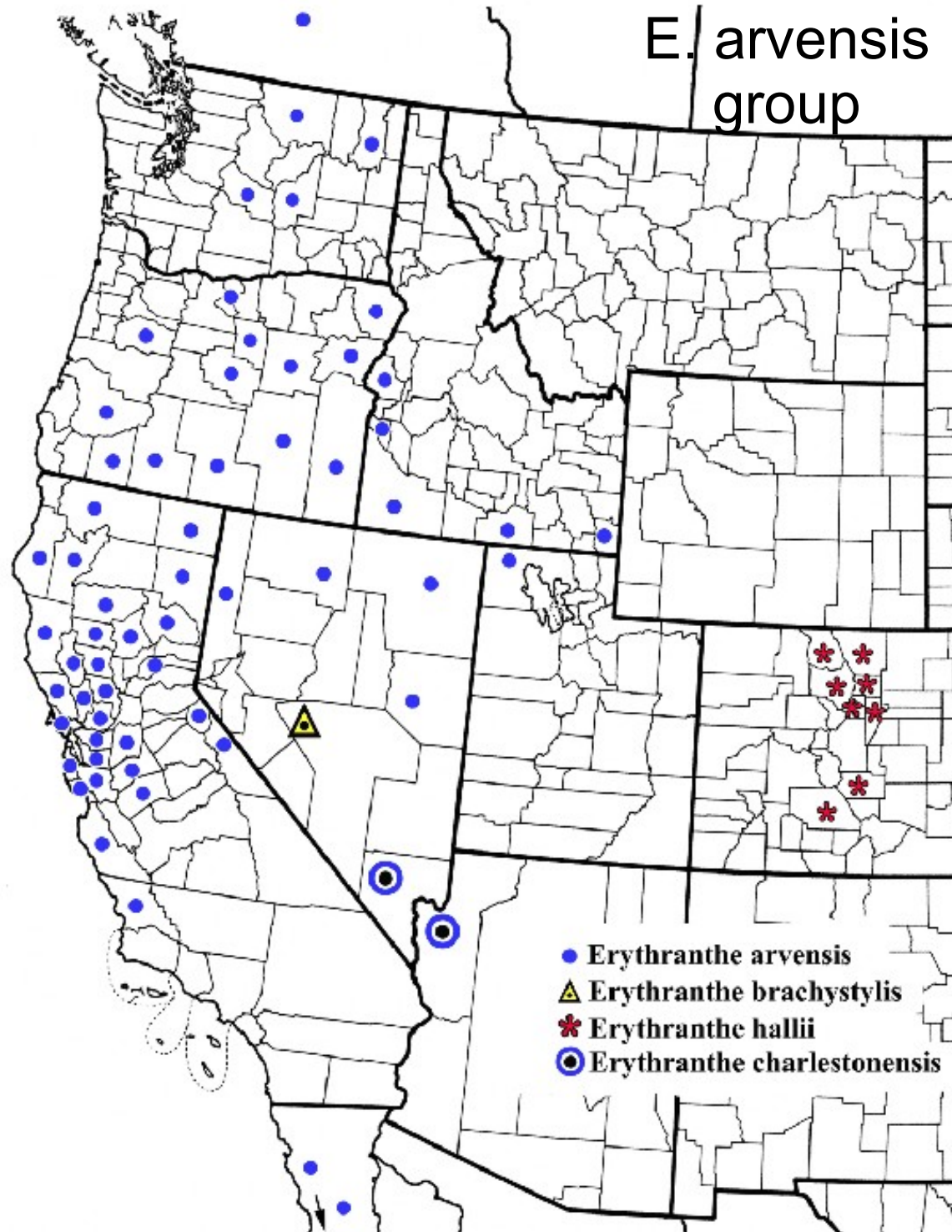
May 28, 1980

Erythranthe
percaulis



Hypothetical phylogenetic outline for *Erythranthe* sect. *Simiola*

E. arvensis
group





Type.
Mimulus brachystylis Edw. C. Evans

Erythranthe brachystylis

CONSPICUOUS REMAINING PROBLEMS IN SECT. *SIMIOLA* TAXONOMY

* **Variable species, possibly/probably with discrete sub-entities**

- *E. guttata*, *E. grandis*, *E. microphylla*, *E. nasuta*

- *E. tilingii*

- *E. glabrata* and *E. geyeri*

* **Status (= reality):** *E. arenicola*, *E. brachystylis*, *E. scouleri*

* **Chromosome numbers**

E. corallina (re: $2n = 48, 56$); *E. guttata* ($2n = 28, 56$); *E. nasuta* ($2n = 28, 26$);
E. utahensis ($2n = 28, 30$)

* **Further major herbarium surveys**

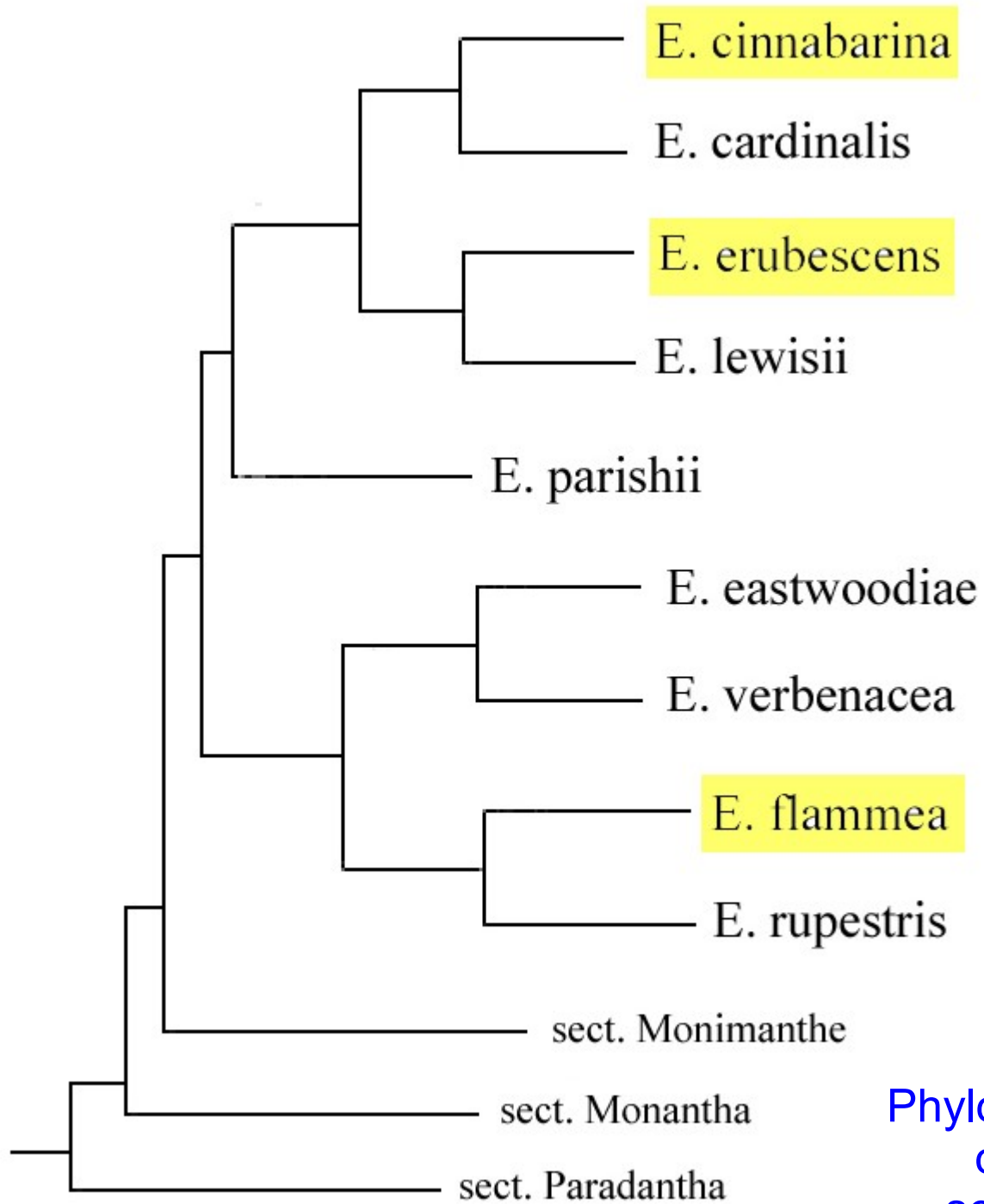
Baja California collections: SD, UCR

Washington state collections: WTU, WS

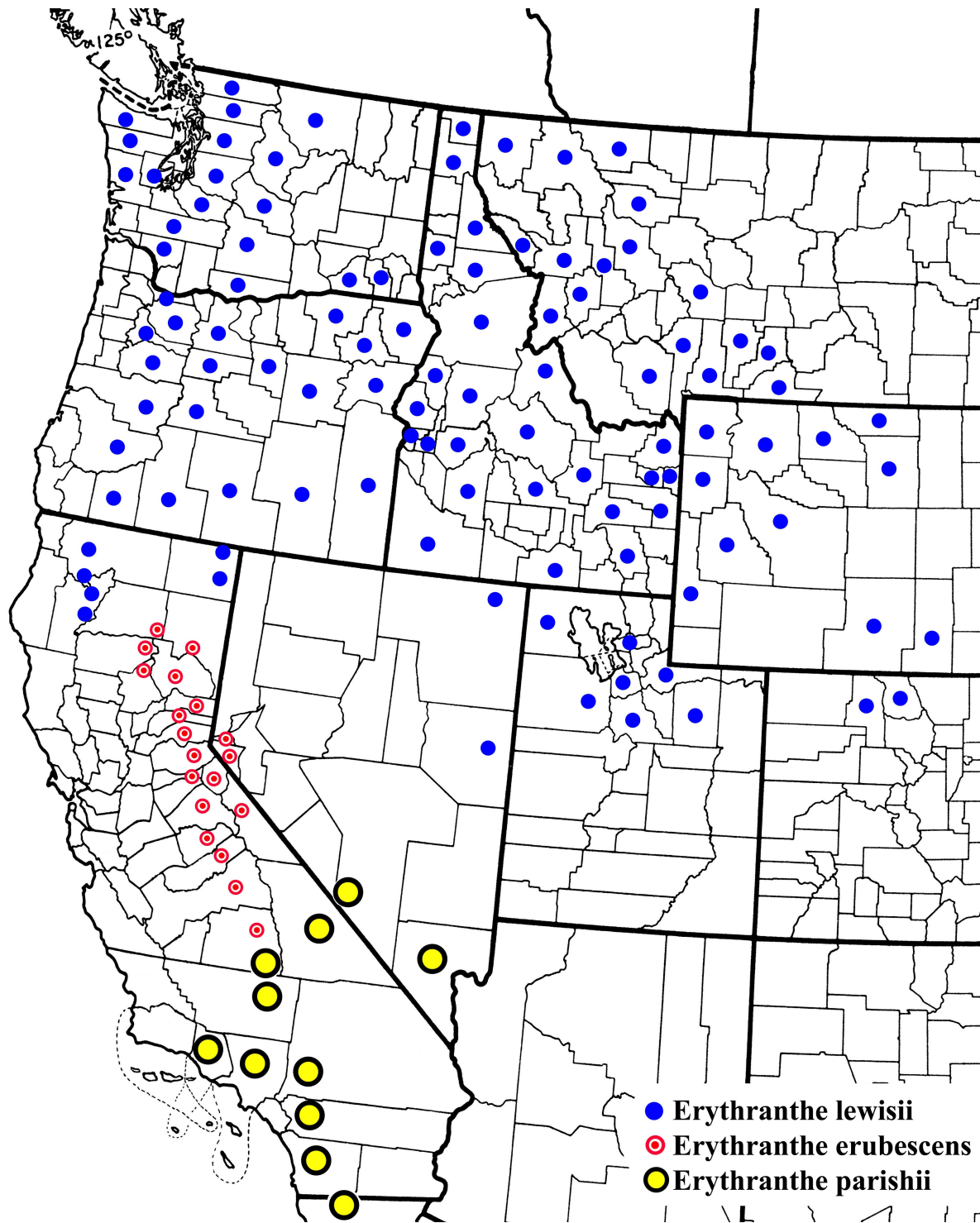
then also these: ASU, BRY, NY, PH, RM, US, UTC

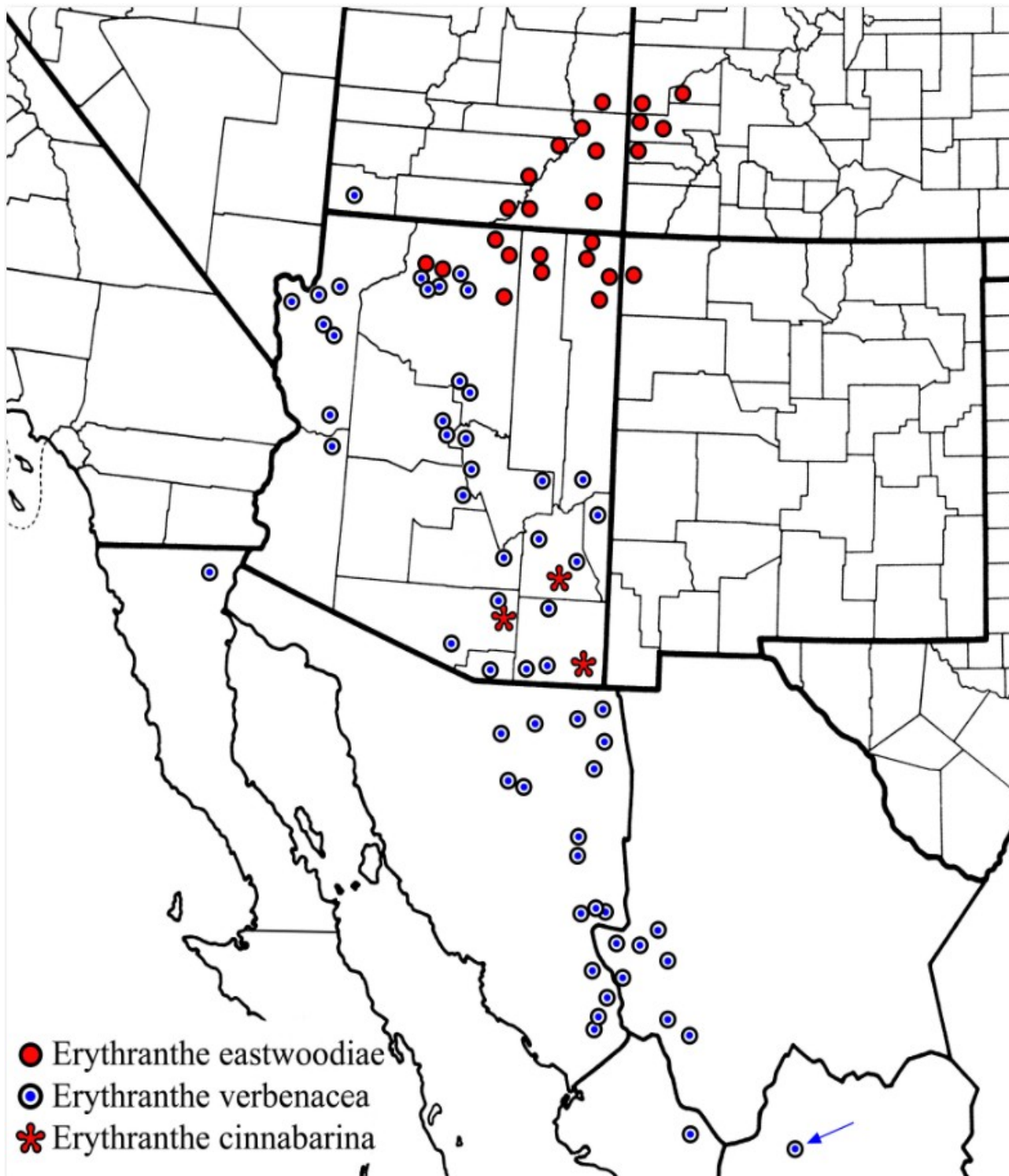
* **Taxonomy of South American species**

* **DNA-based phylogenetic hypothesis**

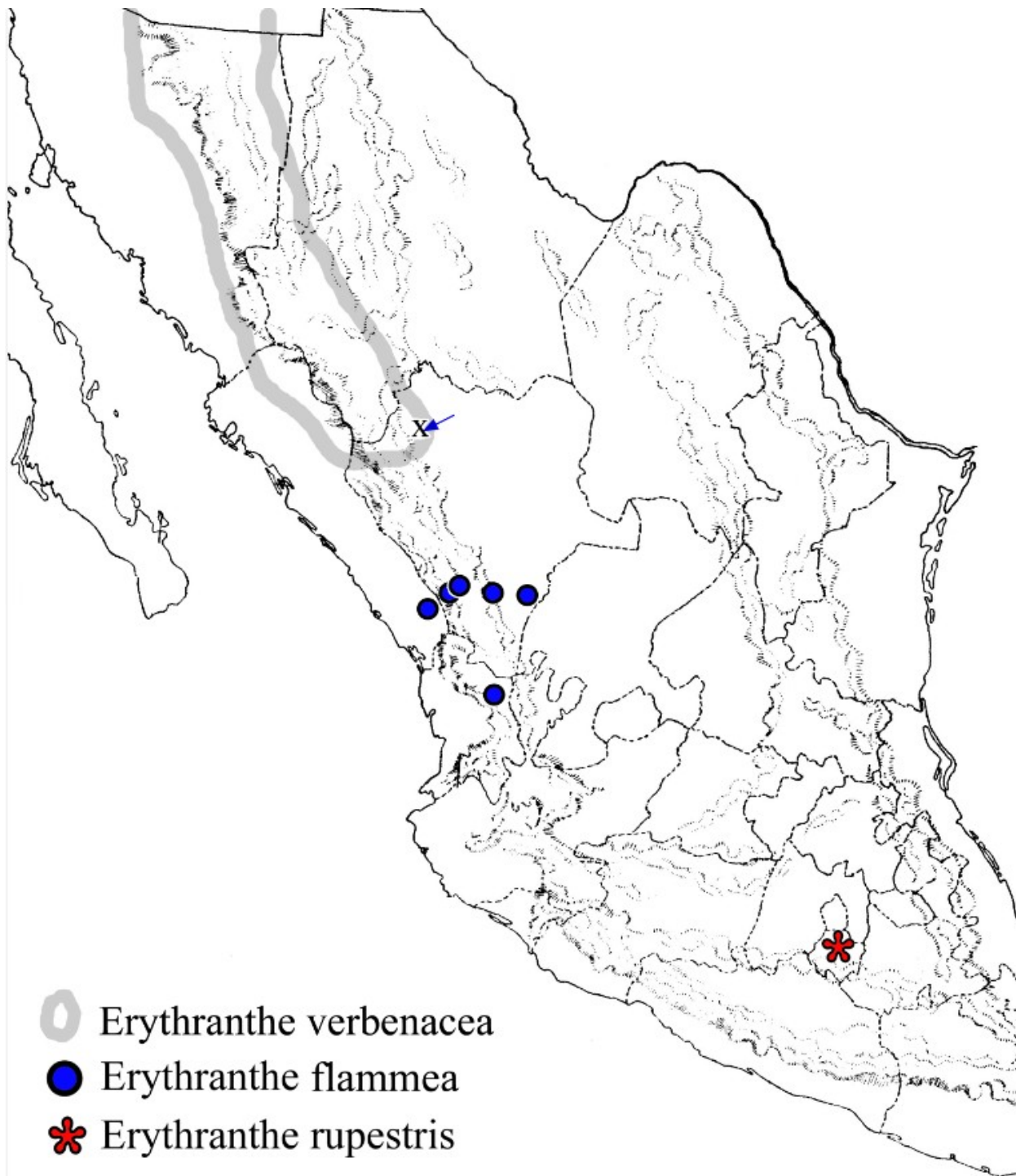


Phylogeny
of
sect.
Erythranthe



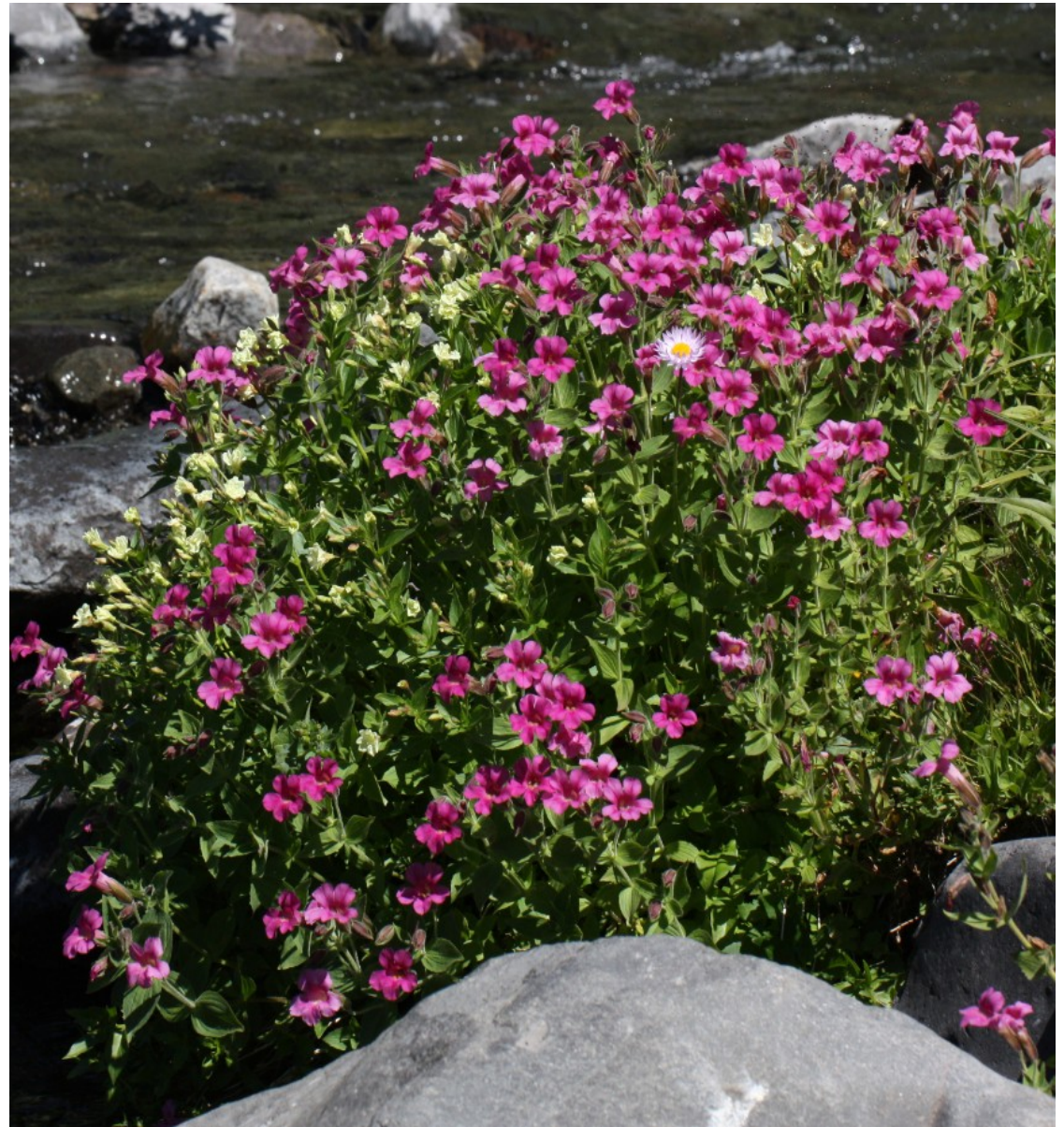


- *Erythranthe eastwoodiae*
- *Erythranthe verbenacea*
- * *Erythranthe cinnabarina*





Erythranthe erubescens
Alpine Co., California



Erythranthe lewisii
Pierce Co. Washington



Erythranthe cinnabarina Graham Co. Arizona



Erythranthe cardinalis Siskiyou Co., California



Erythranthe flammea, Durango