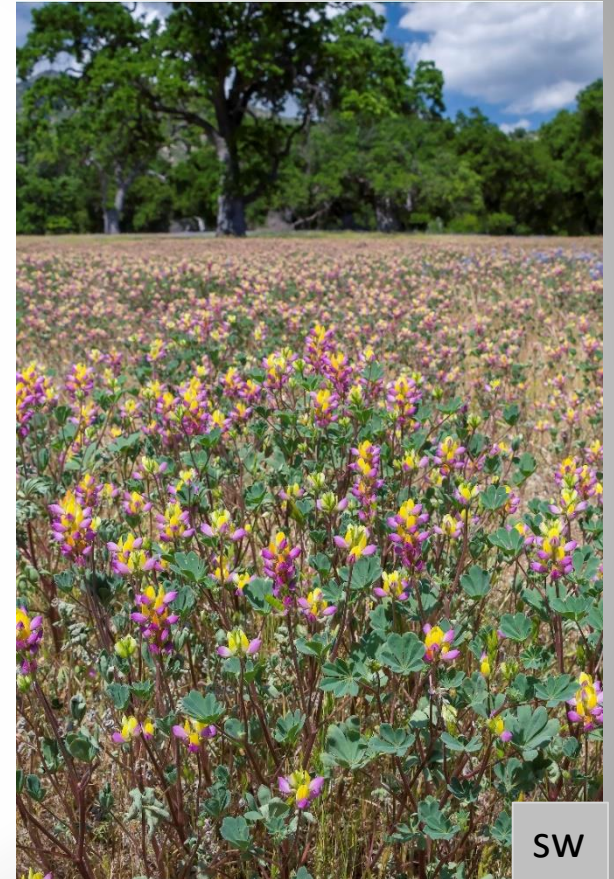


Adventures with *Lupinus*, from Populations to Publications



DKY Annual
Meeting
Dec. 12th
2021
Teresa
Sholars



Lupinus albifrons var.
austromontanus

Lupinus stiversii

Lupinus arboreus thesis work 1986



Common garden experiments with *Lupinus arboreus*, *L. rivularis*, *L. littoralis*



I have learned a lot
teaching Lupine classes
To Botanists

My strategy for the last 35 years has been seeing taxa in the field, visiting herbaria; using CCH, SEINet, etc

- Wading thru the nomenclatural and circumscription confusion that exist within *Lupinus*
- Writing keys and descriptions that try to differentiate taxa



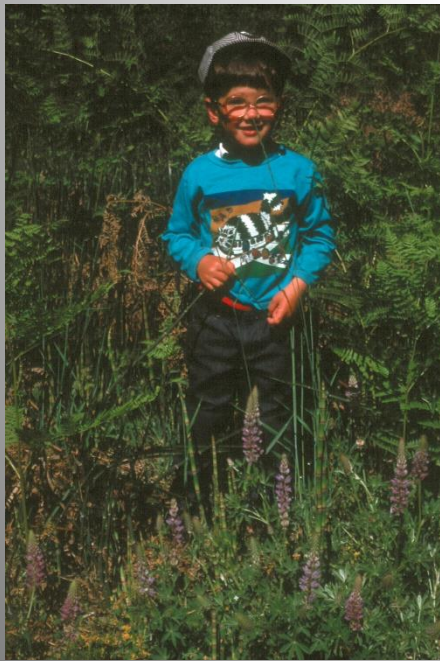
Field work started 1987



1987
Death
Valley



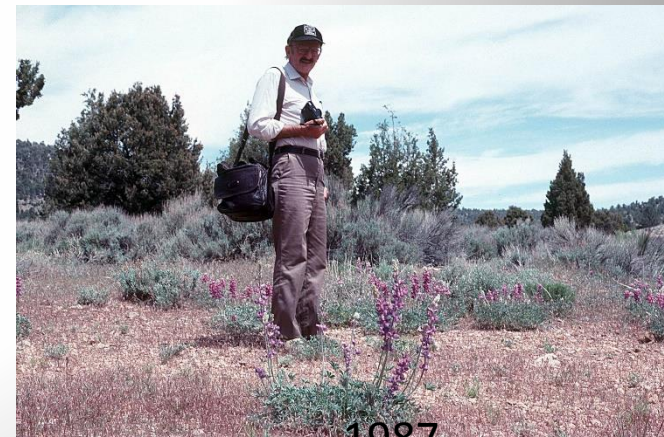
1987



1989



1994 Yosemite
L. latifolius



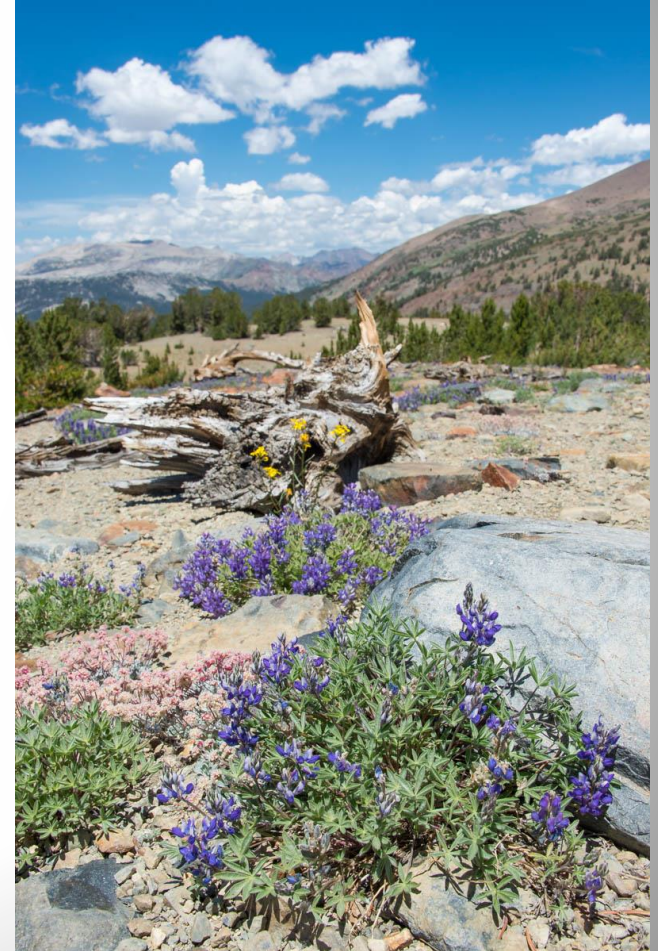
1987
L. Albifrons var.
austromontanus

A wonderful opportunity to go to all types of habitats!

L. albifrons var.
albifrons



L. littoralis



L. lepidus var. *ramosus*

Alpine, riparian, desert



L. polyphyllus
var. saxosus



L. polyphyllus
var. polyphyllus

L. excubitus

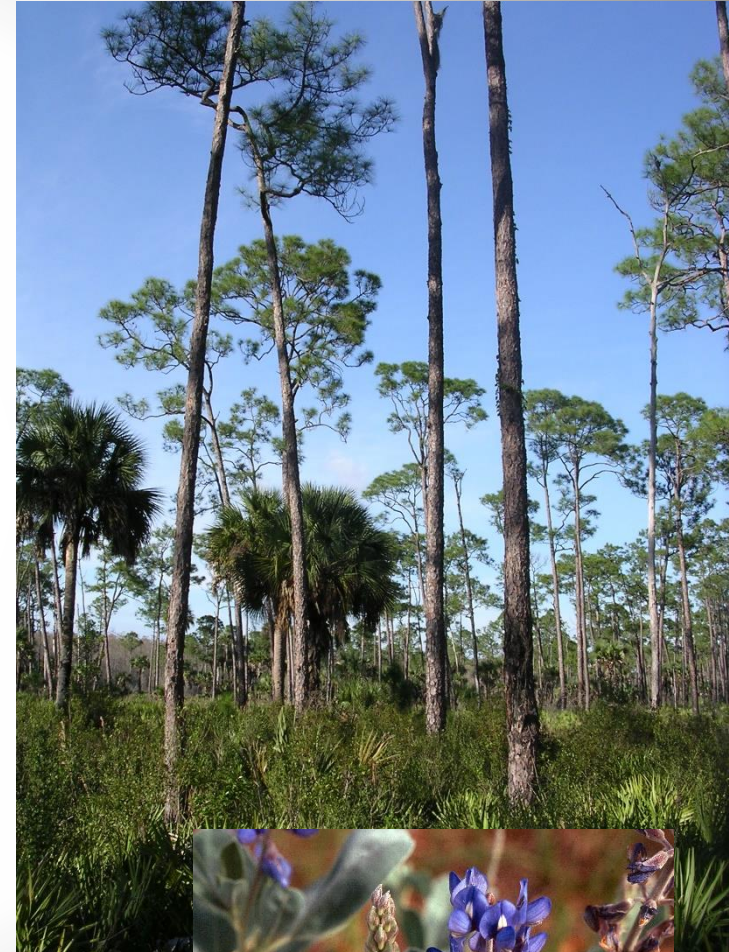
Redwoods Nat. Park to central Sierra to Santa Monica Mts



New York to Florida



L. perennis



L. diffusus

Intermountain to the west



Warner Mts 2007
L. polyphyllus var. *saxosus*



2009 Oregon
L. polyphyllus



Alpine meadows to ocean bluff



L. gracilentus

♥ Max to Lupin



L. bicolor



L. magnificus



L. constancei

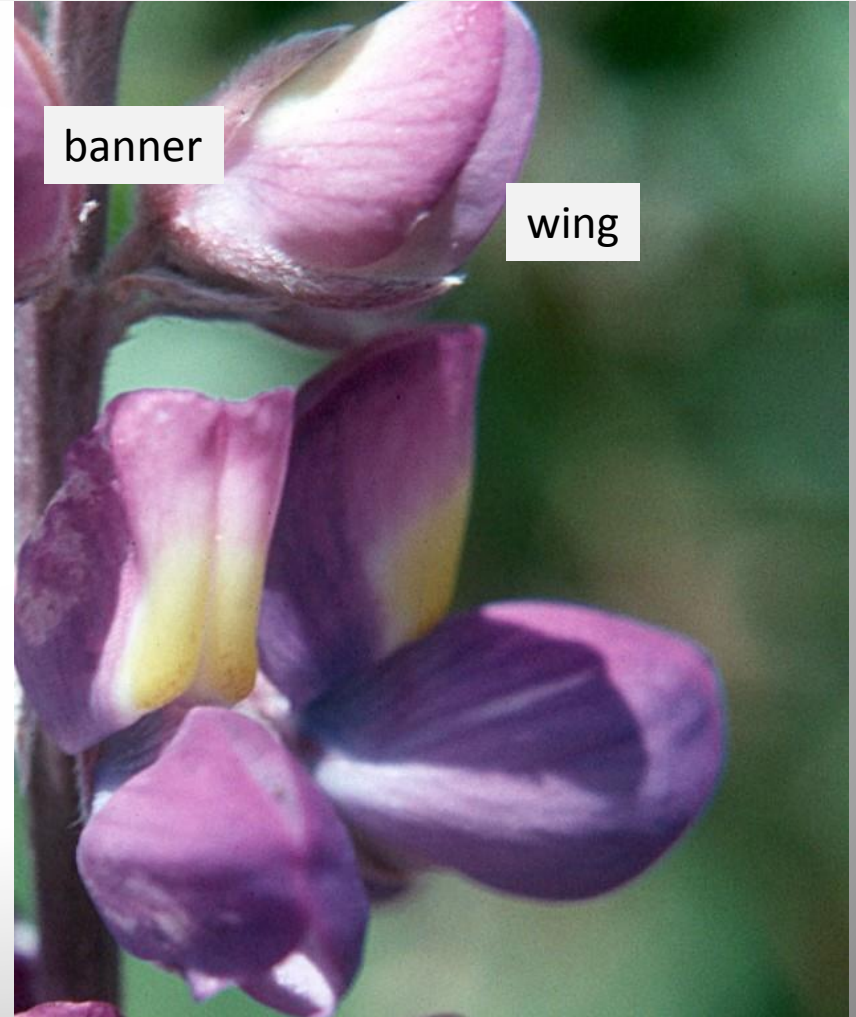
- There is one thing that most people agree with and that is what is in the genus *Lupinus*
- A great genus! The boundaries between species are another matter

The genus characters are clear



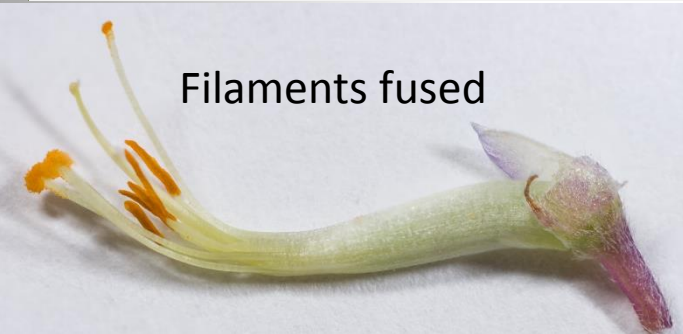
Leaf palmately compound (3-17 leaflets)

Upper petal (banner) outside lateral one (wing) in bud



banner

wing



Filaments fused

5 long with short anthers
5 short with long anthers

keel



Some characters that help delineate

Lupine taxa

- Hair on banner back, keel, wing
- Leaf hair on surfaces
- Persistence of flower bracts
- Position of leaves (cauline or clustered at base)
- Annual perennial, shrub, perennial herb, erect, decumbent, low growing



L. polyphyllus var. *saxosus*

Current thoughts

- *Lupinus* is a recent genus undergoing adaptive radiation
- Gene flow is taking place between Lupine taxa
- Molecular and morphological evidence don't always track, probably because of reticular evolution, resulting in more of a gray, rather than a black and white taxonomy



L. albus var. *collinus*

L. a. austromontanus

L. albus albus douglasii

L. a. abramsii

Nomenclature background

(according to the ICBN)

The Integrated Taxonomic Information System has 1,010 names for Lupines (and it does not have them all)

- **Basionym** means the 'original name'.
- **Synonym** is an alternate name for the circumscription, position, and rank of a taxon
- It is always "a **synonym** of the accepted scientific name", but **which name is accepted depends on the taxonomic interpretation of the author**
- There are so many names for *Lupinus* and so much variation, it is difficult to circumscribe the species boundaries.



L. polyphyllus var. *saxosus*

Circumscription is difficult, made problematic by the vast number of species recognized then lumped and split in various ways by different taxonomists.



L. arboreus



L. longifolius



L. littoralis

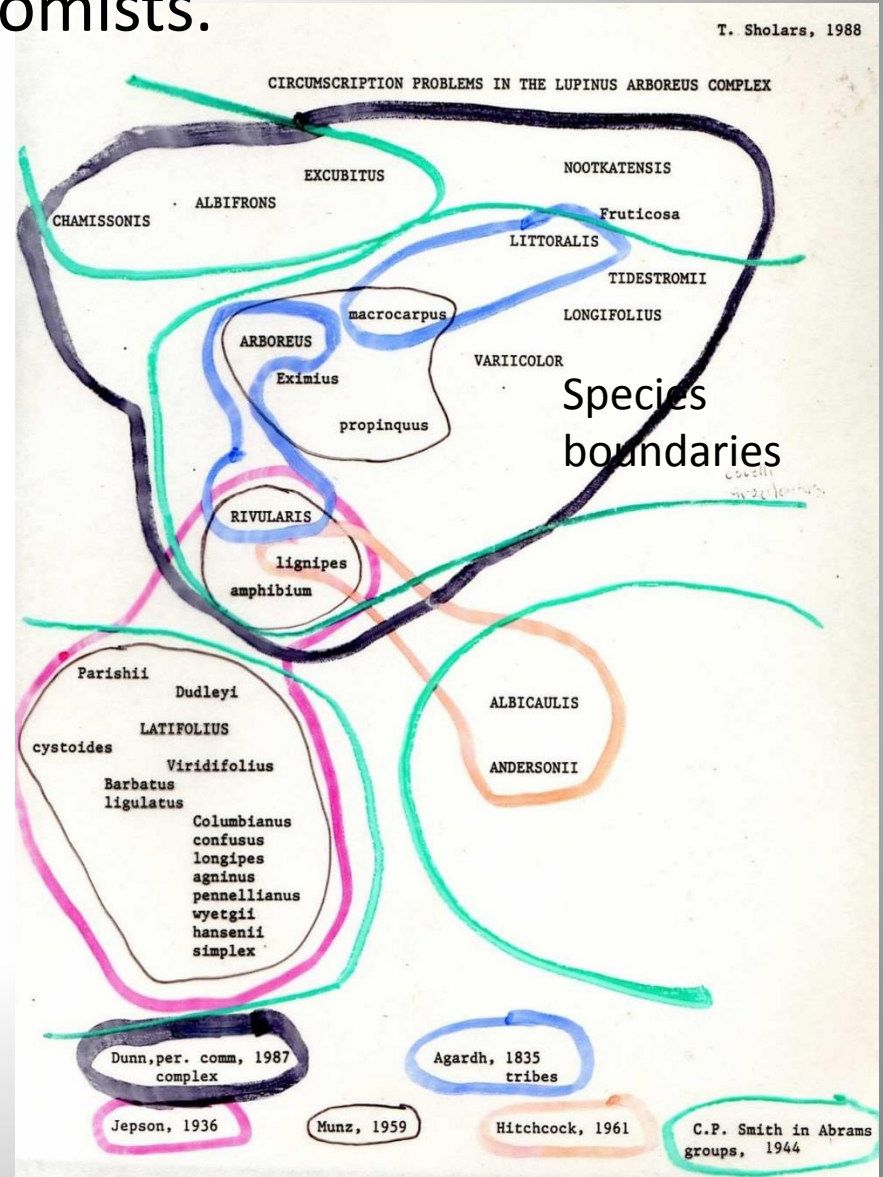


L. rivularis

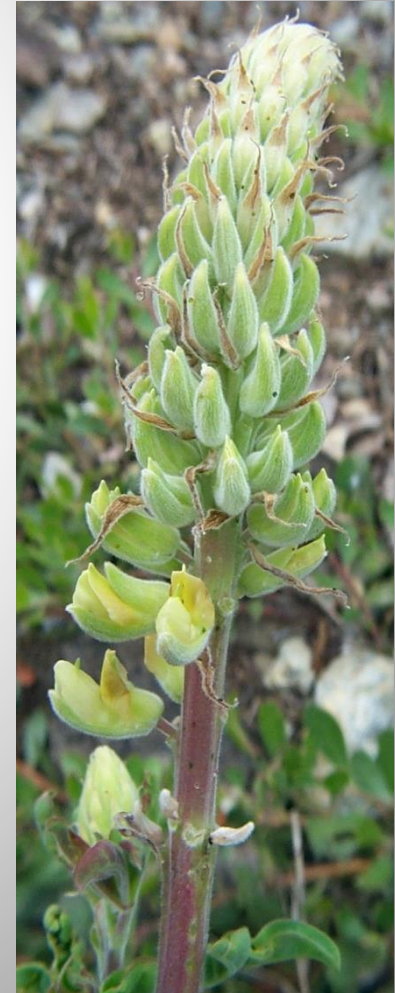
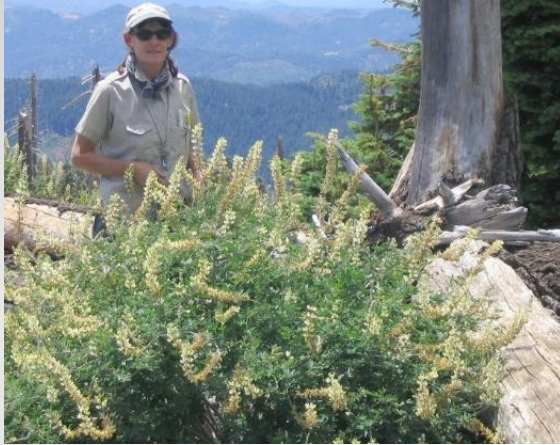


L. latifolius

T. Sholars, 1988



There is sure to be a name out there



Lupinus elmeri Greene (*Pittonia* 3:159 (1897))

When I “rediscovered” this plant on South Fork Mt., I thought it was a new species. No surprise that it had already been named.

2020 New treatment in Jepson e flora: 113 taxa

1. *Lupinus adsurgens*
2. *L. affinis*
3. *L. albicaulis*
4. *L. albifrons*
5. ***Lupinus albifrons* var. *albifrons***
6. ***Lupinus albifrons* var. *abramsii***
7. ***Lupinus albifrons* var. *austromontanus***
8. ***Lupinus albifrons* var. *collinus***
9. ***Lupinus albifrons* var. *douglasii***
10. ***Lupinus albifrons* var. *hallii***
11. ***Lupinus albifrons* var. *medius***
12. ***Lupinus albifrons* var. *johnstonii***
13. *L. andersonii*
14. *L. angustiflorus*
15. *L. antoninus* (Anthony Peak Lupine)
16. *L. apertus*
17. *L. arboreus* (Yellow Bush Lupine)
18. *L. arbustus* (Spur Lupine)
19. *L. argenteus*
20. **var. *argenteus***
21. **var. *heteranthus***
22. **var. *meionanthus***
23. **var. *montigenus***
24. **var. *palmeri***
25. *L. arizonicus* (Arizona Lupine)
26. *L. benthamii* (Spider Lupine)
27. *L. bicolor* (Miniature Lupine)
28. *L. brevicaulis* (Sand Lupine)
29. *L. breweri*
30. **var. *breweri***
31. **var. *bryoides***
32. **var. *grandiflorus***
33. *L. cervinus* (Santa Lucia Lupine)
34. *L. chamissonis*
35. *L. citrinus*
36. **var. *citrinus* (Orange Lupine)**
37. **var. *deflexus* (Mariposa Lupine)**
38. *L. concinnus* (Bajada Lupine)
39. *L. constancei* (The Lassics Lupine)
40. *L. covillei*
41. *L. croceus*
42. *L. dalesiae* (Quincy Lupine)
43. *L. duranii* (Mono Lake Lupine)
44. *L. elatus* (Silky Lupine)
45. *L. elmeri*
46. *L. excubitus*
47. *L. flavoculatus*
48. *L. formosus*
49. **var. *formosus***
50. **var. *robustus***
51. *L. fulcratus*
52. *L. gracilentus* (Slender Lupine)
53. *L. grayi*
54. *L. guadalupensis* (Guadalupe Lupine)
55. *L. hirsutissimus* (Stinging Lupine)
56. *L. hyacinthinus*
57. *L. lapidicola* Mount Eddy Lupine)
58. *L. latifolius*
- var *barbatus* now under *viridifolius***
- var *columbianus* lumped under var. *latifolius***
59. **var. *dudleyi***
60. **var. *latifolius***
61. **var. *parishii***
62. **var. *viridifolius***
63. *L. lepidus* (var. *lepidus* not Ca)
64. **var *aridus* added**
65. **var. *confertus***
66. **var. *culbertsonii***
67. **var. *lobbii***
68. **var. *ramosus***
69. **var. *sellulus***
70. **var. *utahensis* (Stemless Lupine)**
71. *L. leucophyllus* Velvet Lupine
72. *L. littoralis*
73. **L. l. var. *littoralis***
74. **L. l. var. *varicolor* circumscription)**
75. *L. longifolius*
76. *L. ludovicianus*
77. *L. luteolus* (Butter Lupine)
78. *L. magnificus*
79. **var. *glarecola***
80. **L. *magnificus* var. *hesperius* (added)**
81. **var. *magnificus***
82. *L. microcarpus* (Chick Lupine)
83. **var. *densiflorus***
84. **var. *horizontalis***
85. **var. *microcarpus***
86. *L. milo-bakeri* (Milo Baker's Lupine)
87. *L. nanus* (Sky Lupine)
88. *L. nevadensis* (Nevada Lupine)
89. *L. nipomoensis* (Nipomo Mesa Lupine)
90. *L. obtusilobus*
91. *L. odoratus* (Mojave Lupine)
92. *L. onustus*
93. *L. pachylobus* (Big Pod Lupine)
94. *L. padre-crowleyi*
95. *L. peirsonii* (Peirson's Lupine)
96. *L. polyphyllus*
97. **L. *polyphyllus* var. *polyphyllus* (var *pallidipes* here)**
86. **var. *burkei***
87. **var. *humicola* (L. *holmgrenianus*)**
88. **var. *saxosus* (L. *saxosus*) different circumscription)**
89. *L. pratensis*
90. *L. pusillus* var. *intermontanus*)
91. *L. rivularis*
92. *L. sericatus* (Cobb Mountain Lupine)
93. *L. shockleyi* (Desert Lupine)
94. *L. sparsiflorus* (Coulter's Lupine)
95. *L. spectabilis* (Shaggyhair Lupine)
96. *L. stiversii* (Harlequin Lupine)
97. *L. succulentus* (Arroyo Lupine)
98. *L. tidestromii* (Tidestrom's Lupine)
99. *L. tracyi* (Tracy's Lupine)
100. *L. truncatus*
101. *L. uncialis* (Lilliput Lupine)

70 species; 43 var.
14 changes

> 352 synonyms)



L. ludovicianus

Flora North America

88 species

147 taxa

59 perennial
species

108 taxa Sholars

28 taxa not in Ca

1. 31. *Lupinus adsurgens*
2. 32. *Lupinus albicaulis*
3. 33. *Lupinus albifrons*
4. **var. albifrons**
5. **var. abramsii**
6. **var. austromontanus**
7. **var. collinus**
8. **var. douglasii**
9. **var. hallii**
10. **var. medius**
11. **var. johnstonii**
12. 34. *Lupinus andersonii*
13. 35. *Lupinus angustiflorus*
14. 36. *Lupinus antoninus*
15. 37. *Lupinus apertus*
16. 38. *Lupinus arboreus*
17. 39. *Lupinus arbustus*
18. 40. *Lupinus arcticus*
19. 41. *Lupinus argenteus*
20. *Var argenteus*
21. **Var. argentatus**
22. **argophyllus**
23. **fulvomaculatus**
24. **heteranthus**
25. **hillii**
26. **holosericeus**
27. **meionanthus**
28. **moabensis**
29. **montigenus**
30. **palmeri**
31. **parviflorus**
32. **rubricaulis**
33. **utahensis**
34. 43. *Lupinus breweri*
35. 44. *Lupinus cervinus*
36. 45. *Lupinus chamissonis*
37. 46. *Lupinus constancei*
38. 47. *Lupinus covillei*
39. 48. *Lupinus croceus*
40. 49. *Lupinus dalesiae*

41. 50. *Lupinus diffusus*
42. 51. *Lupinus duranii*
43. 52. *Lupinus elatus*
44. 53. *Lupinus elmeri*
45. 54. *Lupinus excubitus*
46. 55. *Lupinus formosus*
47. **var. formosus**
48. **var. robustus**
49. 56. *Lupinus fulcratus*
50. 57. *Lupinus gracilentus*
51. 58. *Lupinus grayi*
52. 59. *Lupinus huachucanus*
53. 60. *Lupinus hyacinthinus*
54. 61. *Lupinus kuschei*
55. 62. *Lupinus lapidicola*
56. 63. *Lupinus latifolius*
57. *Var. dudlei*
58. *Var latifolius*
59. *Var. parishii*
60. *Var. subalpinus*
61. *Var viridifolius*
62. 64. *Lupinus lepidus*
63. **aridus**
64. **ashlandensis**
65. **confertus**
66. **culbertsonii**
67. **cusickii**
68. *lepidus*
69. **lobbii**
70. **ramosus**
71. **sellulus**
72. **utahensis**
73. 65. *Lupinus leucophyllus*
74. 66. *Lupinus littoralis*
75. 67. *Lupinus longifolius*
76. 68. *Lupinus ludovicianus*
77. 69. *Lupinus magnificus*
78. 70. *Lupinus neomexicanus*
79. 71. *Lupinus nevadensis*

80. 72. *Lupinus nootkatensis*
81. *Var nootkatensis*
82. *Var fruticosus*
83. 73. *Lupinus obtusilobus*
84. 74. *Lupinus onustus*
85. 75. *Lupinus oreganus*
86. 76. *Lupinus padre-crowleyi*
87. 77. *Lupinus peirsonii*
88. 78. *Lupinus perennis*
89. 79. *Lupinus polyphyllus*
90. **var. ammophilus**
91. **var. burkei**
92. **var. humicola**
93. **var. polyphyllus**
94. **var. prunophilus**
95. *var. saxosus*
96. 80. *Lupinus pratensis*
97. 81. *Lupinus rivularis*
98. 82. *Lupinus sabinianus*
99. 82. *Lupinus sericatus*
100. 83. *Lupinus sericeus*
101. 84. *Lupinus sierrae-blancae*
102. 85. *Lupinus sulphureus*
103. 86. *Lupinus tidestromii*
104. 87. *Lupinus tracyi*
105. 88. *Lupinus villosus*
106. 89. *Lupinus westianus*
107. *var aridorum*
108. *var westianus*



L. latifolius

Crosspollination between sympatric Lupines has contributed to diversity

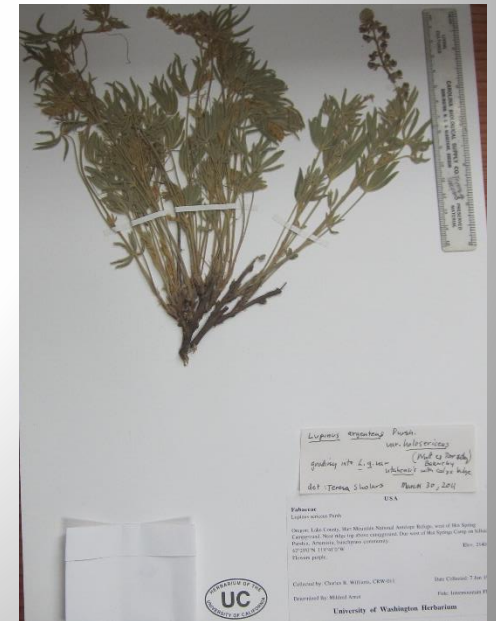
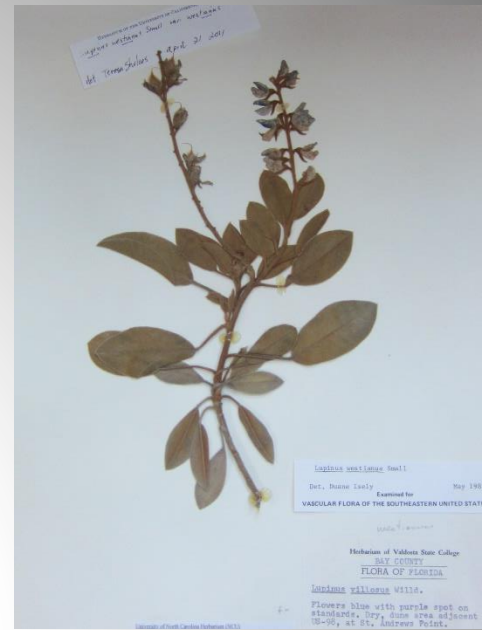
- Generally bumblebee pollinated
- Lupines lack nectar



Photo R LaValley

Herbarium work

- Visits to
- New York Botanical Garden herbarium
- Smithsonian
- College of Idaho
- UC Berkely Davis, Irvine, Riverside
- CSU Humboldt, Sonoma
- Cal Academy of Sciences
- RSA



Pima Co., Arizona, USA

R-338850

Lupinus huachucanus Jones

Pinkish marley soil, boulders, oak,
pine, juniper and yucca community.
Madera Canyon, 4 mi. SSE of
Contential.

K.H. Thorne

8259

18 Mar. 1991

4

HERBARIUM OF BRIGHAM YOUNG UNIVERSITY
PROVO, UTAH

EX HERB. GRAY.

SOUTH CAROLINA

Charleston County

Lupinus diffusus Nutt.

Pine barren, 2 miles west of U.S. Route 17, near the south bank of

SANTEE RIVER

R.K. GODFREY and R.M. TRYON, JR., No. 1102

Aug. 4, 1939

HERBARIUM OF THE UNIVERSITY OF CALIFORNIA, BERKELEY

Lupinus sulphureus Dougl.

var. *subsaccatus* (Suksd) Hitch

Det.

Lorenz Sholars

Date

Jan 22 1997

5036

WASHINGTON'S FLORA
KLICKITAT COUNTY

Lupinus bingenensis Suksdorf sp. nov.

Dry hillside at Bingen.

WILHELM SUKSDORF.

24. Apr., 12. June 1905.

COLORADO STATE UNIVERSITY HERBARIUM

Flora of: ARIZONA

Lupinus lemmonii Smith

Corollas bluish; perennial to 0.5 meters tall;
on steep, rocky N-facing slope with *Rhus*
choriophylla, *Arctostaphylos pungens* and
Pinus discolor.

COCHISE COUNTY: Halfmoon Valley, 0.5 mile E
of divide between Halfmoon Valley and High
Lonesome Canyon. T21S R29E S3 N1/2

5700 feet

18 May 1985

D. H. Wilken & R. Fletcher 14384

Annotated by:

Lupinus *sub arcticus*
O. B. D. num

Date: 1969

HERBARIUM OF THE UNIVERSITY OF CALIFORNIA

ALASKA

Lupinus arcticus Wats.?

Stems 1-2 feet tall, several from a tap-
root, arising underground. Common in
openings.

Subalpine *Salix pulchra*-*Betula* scrub on
Pedro Dome, 2 miles west of Cleary Summit,
20 miles north of Fairbanks via Steese
Highway. Altitude 2600 feet.

Galen Smith 1816

22 June 1953

Research on type specimens

- *Lupinus rivularis* Dougl. Bot. Reg. 19 : pl. 1595.

1833 TYPE LOCALITY : " Native of California .

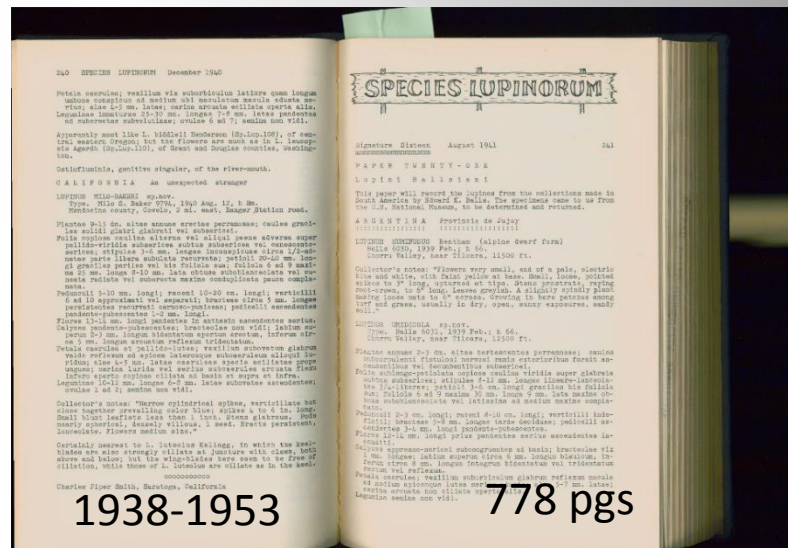
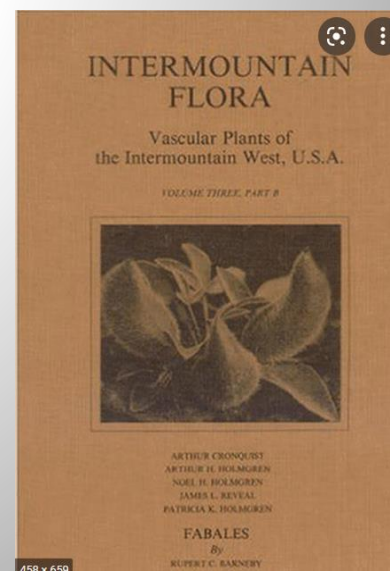
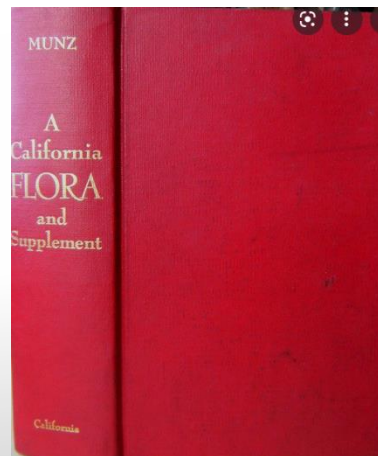


6. **LUPINUS CHAMISSONIS** Esch. Mem. Acad. Petersb. 10: 288. 1826.

Type locality: "in Novae Californiae arenosis." This was probably collected at San Francisco.



Research: old monographs, floras to efloras

1996 international symposium on Lupins



Publications

THE SYSTEMATICS OF PERENNIAL *LUPINUS* IN NORTH AMERICA*

Teresa A. Sholars

Biology Department, College of the Redwoods, 1211 Del Mar Drive, Fort Bragg, California, 95437 tsholars@mcn.org

World wide more than 1500 Lupines have been described. Two major factors have contributed to the confusion surrounding the systematics of the genus *Lupinus*. First, the natural outcrossing ability of especially perennial *Lupinus* leading to gradations in characters used for species delineation. Second, the differences in circumscription parameters used by various taxonomists. A key will be presented here that separates perennial North American Lupines into complexes of highly similar species. Morphological features will be identified that are used to separate species into complexes.

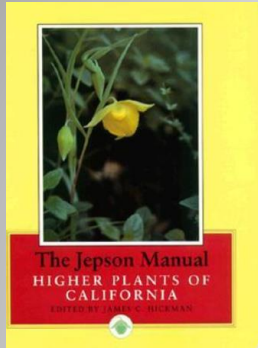
A species consists of one or more populations of individuals that can interbreed under natural conditions and produce fertile offspring, and that are reproductively isolated from other such populations. (Starr, 1995) This classical definition of a species becomes obscure when applied to Lupines because many of the perennials freely outcross, creating many intermediates. Another factor that contributes to the confusion surrounding the systematics of the genus *Lupinus* is that taxonomists have circumscribed the boundaries between the different species using inconsistent characters and varying criteria. They have lumped and split the same groups in many different ways.

The taxonomist that writes the basic descriptions and keys to local, regional and are floras have a special challenge in front of them. They have to write a key that works relatively well. They have to circumscribe species in a coherent way so that the descriptions reflect what is actually seen in the field. They have to collect and synthesize synonym of basionyms since 1753. These names must be able to be correlated to all past floras. And lastly (and certainly not the least important scientifically but practically speaking the least "relevant") they have to name and circumscribe species that reflect phylogeny. Or at least aren't in conflict with phylogenetic evidence. This is the job of the so called "alpha taxonomist".

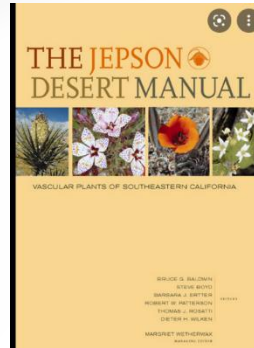
There are two important strategies to make keys work. One is to find a morphological character that is not too variable nor ambiguous. The other is to find ecological characters like distinct habitats that can separate the taxa. Often the characters that we use to make keys have nothing to do with phylogeny. They most often are a combination of characters chosen because they work.

* Proceedings of the 8th International Lupin conference, May 11-16th, 1996, Asilomar, Ca. 1999. International Lupin Association, Lincoln University, Canterbury, New Zealand

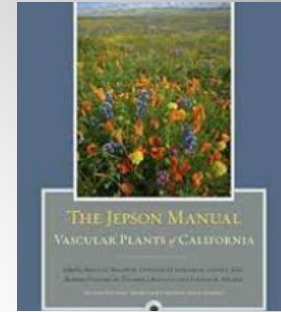
The Jepson Manuals



1993



2002



2012

The screenshot shows the Jepson eFlora website interface. At the top is a blue header with 'The Jepson Herbarium University of California, Berkeley' and the herbarium logo. Below the header is a navigation menu with links: Home, About, Research, Databases, eFloras, Education & Outreach, Archives, Contact, and Donate. The main content area is titled 'Jepson eFlora: Taxon page' and 'Vascular Plants of California'. It includes a key to families and a grid of letters for navigation. The current taxon is 'Lupinus LUPINE'. Below this, there are links for 'Higher Taxonomy', 'Family: Fabaceae (Leguminosae)', 'View Description', and 'Dichotomous Key'. The 'Lupinus' section contains detailed text on habit, inflorescence, flowers, fruit, seed, species in genus, etymology, toxicity, and references. The 'Jepson eFlora Authors' and 'References' are also listed at the bottom.

Eflora
Revised
2020

Contact/Feedback

Citation for this treatment: Teresa Sholars (perennials, annuals in part) & Rhonda Riggins (annuals in part) 2020, *Lupinus*, in Jepson Flora Project (eds.) *Jepson eFlora*, Revision 8, https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=9370, accessed on December 05, 2021.

Citation for the whole project: Jepson Flora Project (eds.) 2021, *Jepson eFlora*, <https://ucjeps.berkeley.edu/eflora/>, accessed on December 05, 2021.

Lupinus circumscription challenges,
indiscriminate outcrossing, and sheer
numbers of taxa create the nightmare

known as *Lupinus*



1990



2008



1987

Northern California Botanists Symposium 2020
Teresa Sholars

Professor Emeritus of Biology, College of the Redwoods
Adjunct Professor and Herbarium Curator, Mendocino College Coast Campus
Fort Bragg, Ca.

Flora of North America 2022

In press

Lupinus • FABACEAE

193

53. LUPINUS Linnacus, Sp. Pl. 2: 721. 1753; Gen. Pl. ed. 5, 322. 1754 • Lupine, bluebonnet [Derivation uncertain; Latin *lupinus*, wolf, or *lupe*, sadness, and *imus*, possession, perhaps alluding either to plants supposedly overrunning the ground as an animal might or to harsh taste of seeds causing facial contortion]

Teresa Sholars

Rhonda Riggins

Herbs, annual, biennial, or perennial, shrubs, or subshrubs, unarmed; usually from taproots or woody crowns, rarely rhizomes. Cotyledons usually deciduous, usually petiolate. Stems erect to decumbent or prostrate, branched or unbranched, usually pubescent, sometimes glabrous. Leaves alternate, usually palmately compound, rarely 3-foliolate or unifoliolate, usually cauline, sometimes crowded near base or basal; stipules present, setaceous, adnate to petiole; petiole; leaflets (1 or 3) 4–11(–17), stipels absent, blade margins entire, surfaces glabrous or pubescent. Inflorescences 3–100+ flowered, terminal, racemes, erect, rarely axillary and reduced to 1 or 2 flowers, flowers spirally arranged or whorled; bracts present, persistent or deciduous. Flowers papilionaceous, chasmogamous; calyx bilabiate, lobes connate, entire or toothed, usually with appendages (often inconspicuous) between lobes; corolla usually blue to purple, sometimes white, yellow, pink or rose; banner with central groove, sides reflexed; wings connivent at tips, corrugated; keel usually attenuate; stamens 10, monadelphous; anthers basifixed, dimorphic, alternately long on short filaments, short on long filaments; style brushy. Fruits legumes, sessile, straight, laterally compressed, usually oblong, splitting along both margins, valves usually twisted after dehiscence, usually pubescent, rarely glabrous. Seeds (1 or) 2–12, usually smooth, rarely ridged or tuberculate, spheric, lentiform, or angulate. $x = 6$.

Species ca. 270 (88 in the flora): North America, Mexico, South America, Europe (Mediterranean), Africa; introduced in Asia (China), s Africa, Atlantic Islands (Iceland), Pacific Islands (New Zealand), Australia.

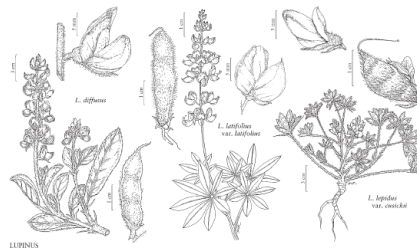
Most species of *Lupinus* occur in western North America and western South America. C. P. Smith (1944, 1938–1953) assigned North American lupines to subg. *Lupinus* and subg. *Platycarpus*. S. Watson based on cotyledon structure (sessile versus petiolate) and 22 groups based on life span, flower arrangement, keel ciliation, and banner and wing pubescence, as well as some vegetative features.

The taxonomy of *Lupinus* is complicated. Thousands of names have been coined for lupines; circumscription is difficult, made problematic by the vast number of species recognized, then lumped and split in various ways by different taxonomists. Some authors (for example, D. B. Dunn 1955, 1959) discussed widespread hybridization in the genus. Some studies have indicated that gene flow and introgression through outcrossing in perennial species does occur (A. Liston et al. 1995). Perennial species have shown a preponderance of interbreeding groups that have resulted in gradients of characters.

Self-pollination is known to occur in annual species of *Lupinus*, which has resulted in the establishment of localized variants that have been recognized as distinct species. For example, *L. affinis*, *L. guadalupensis*, and *L. spectabilis* could easily be regarded as localized variants of *L. nanus*.

Phylogenetic analyses of molecular data for *Lupinus* included 50 North American species (C. S. Drummond et al. 2012). The species were assigned to three infrageneric lineages. One lineage included two species from Florida that have unifoliolate leaves and $2n = 52$. The second lineage included two $2n = 36$ annual species from Texas that corresponds to group Subcarnosi

228 FABACEAE • *Lupinus*



57. *Lupinus huachucae* M. E. Jones, Cont. W. Bot. 12: 10. 1908 • Huachuca Mountain lupine

Lupinus platypholus M. E. Jones
Herbs, perennial (often with annual aspect), 0.1–2 dm, conspicuously pilose, from taproot. Cotyledons deciduous, petiolate. Stems prostrate to decumbent, clustered, aculecent or short-spreading and unbranched. Leaves mostly near base, in a rosette; stipules 4–10 mm; petiole 1.9–cm; leaflets 5–7 (or 8), blades 10–55 × 4–12 mm, adaxial surface greenish, surfaces copiously villous-hirsute with long, spreading hairs, abaxially more dense. Peduncles 3–4.5 cm; bracts deciduous, 4–8 mm. Racemes 6–23 cm; flowers spirally arranged. Pedicels 1–4 mm. Flowers 7–13 mm; calyx bialve or spur 1–1 mm, lobes entire, 5–7.5 mm; corolla violet-blue, banner yellow toward center, tip of keel purple, wings yellow toward center; banner gibbous abaxially, upper keel margins ciliate to densely ciliate. Legumes 1.5–2 cm, hispid. Seeds 3–5, dark with light spots.

Flowering: Mar–May. Desert mountains, pine woodlands, canyons along trails of conservation concern; 1500–2000–2100 m; Ariz., Mexico (Chihuahua, Durango, Sonora).

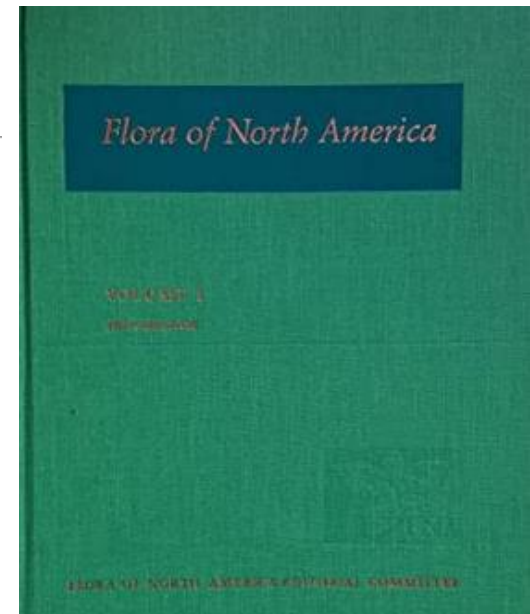
- Lupinus huachucae* occurs in the Santa Rita Mountains in Santa Cruz County, Chiricahua and Huachuca mountains in Cochise County, and in Pima County.

Lupinus huachucae somewhat resembles *L. concinnus* but is readily distinguished by its spreading habit, racemes surpassing the foliage, violet-blue corollas, and ciliate keel. *Lupinus concinnus* is an annual with a more erect habit, pink corollas, and a non-ciliate keel.

58. *Lupinus byacinthinus* Greene, Leaf. Bot. Oberl. Cr. 2: 85. 1910

Lupinus albicandis Douglas var. *byacinthinus* (Greene) Jepson; *L. andersonii* S. Watson var. *sublinearis* C. P. Smith; *L. formosus* Greene var. *byacinthinus* (Greene) C. P. Smith

Herbs, perennial, 4–10 dm, gray becoming green, sparsely hairy. Cotyledons deciduous, petiolate. Stems erect, unbranched or branched distally. Leaves cauline; stipules not leaflike, green to silvery, 5–16 mm; petiole 3–6 cm; leaflets 7–12, blades 30–80 × 4–8 mm, adaxial surface sparsely pubescent. Peduncles 3–12 cm; bracts deciduous, 5–9 mm. Racemes 4–22 cm; flowers a whorl. Pedicels 2–6 mm. Flowers 13–16 mm; calyx



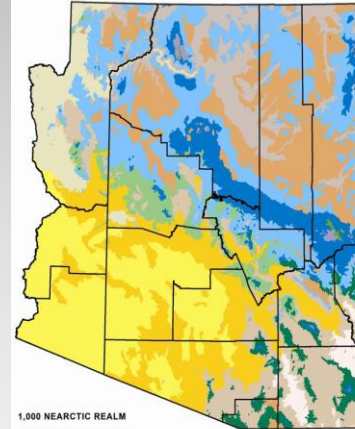
Legumes of Arizona- an Illustrated Flora and Reference

Galleys coming soon



BIOTIC COMMUNITIES OF ARIZONA

David E. Brown, Thomas C. Brennan, and Andrew T. Holycross



1,000 NEARCTIC REALM		3,000 NEOTROPICAL REALM	
5.111 ARCTIC AND ALPINE TUNDRAS	143 WARM TEMPERATE GRASSLANDS	141.1 Lowland Grassland	164 TROPICAL-SUBTROPICAL DESERTLANDS
101 BOREAL AND SUBALPINE FORESTS AND WOOLLANDS	143.1 Warm Temperate Grassland	162 COLD TEMPERATE DESERTLANDS	
101.1 Rocky Mountains and Great Basin Alpine Tundra	143.2 Cold Temperate Grassland	162.1 Cold Temperate Desertland	
101.2 Rocky Mountains and Great Basin Subalpine Conifer Forest	143.3 Warm Temperate Grassland	162.2 Warm Temperate Desertland	
102 COLD TEMPERATE FORESTS AND WOOLLANDS	143.4 Warm Temperate Grassland	162.3 Warm Temperate Desertland	
102.1 Rocky Mountain Western Conifer Forest	143.5 Warm Temperate Grassland	162.4 Warm Temperate Desertland	
102.2 Great Basin Conifer Woodland	143.6 Warm Temperate Grassland	162.5 Warm Temperate Desertland	
102.3 Warm Temperate Forest and Woodland	143.7 Warm Temperate Grassland	162.6 Warm Temperate Desertland	
103 WARM TEMPERATE FORESTS AND WOOLLANDS	143.8 Warm Temperate Grassland	162.7 Warm Temperate Desertland	
103.1 Madroño Evergreen Forest and Woodland	143.9 Warm Temperate Grassland	162.8 Warm Temperate Desertland	
103.2 Warm Temperate Scrublands	143.10 Warm Temperate Grassland	162.9 Warm Temperate Desertland	
103.3 Submediterranean Shrubland	144 PFLOR. TEMPERATE ARABIS ALBA		

LUPINUS Linnaeus. Sp. Pl. 2: 721. 1753. * [derivation uncertain; Latin *lupinus*, wolf, or *lupe*, sadness, and *inus*, possession, perhaps alluding either to plants supposedly overrunning the ground as an animal might or to harsh taste of seeds causing facial contortion] LUPINE, BLUEBONNET; *LUPINO*

Teresa Sholars

Herbs, annual, biennial, or perennial, [shrubs, or subshrubs], unarmed; usually from taproots or woody crowns, rarely rhizomes. **Cotyledons** usually deciduous, usually petiolate but can be sessile fused into a cup or disk. **Stems** erect to decumbent or prostrate, usually pubescent, sometimes glabrous. **Leaves** alternate, usually palmately compound, [rarely 3-foliolate or unifoliolate], usually cauline, sometimes crowded near base, rarely sometimes basal; stipules present, bristle-like, fused to petiole; petiolate. **Leaflets** [(1 or 3)] 5--11(--17), stipels absent, blade margins

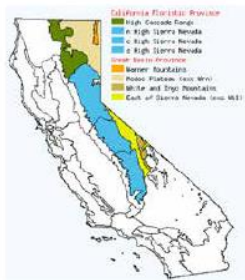
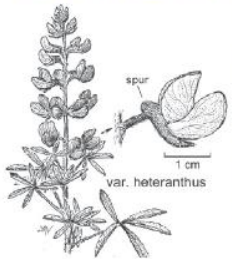
Lupines of California

Teresa Sholars text

Stewart Wilson photography

SILVERY LUPINE

Lupinus argenteus var. *heteranthus*



HABIT: perennial herb

LEAVES: leaves at base, some stem leaves

FLOWER: 8–14 mm; calyx spur, 1–2 mm; petals violet or blue to white, banner back silky, wings glabrous

DISTINGUISHING CHARACTERISTICS: calyx spur prominent, hairy banner back, wings not hairy

FLOWERING TIME: May–Sep

HABITAT, ELEVATION: Dry, open slopes, sagebrush scrub, pinyon/juniper woodland; 1000–3000m

DISTRIBUTION: CaRH, SNH, GB; to Oregon, Idaho, Utah

NOTES: Differs from *L. arbustus* in lacking hair on the wings of the corolla.

Will be published by CNPS

LILLIPUT LUPINE

Lupinus uncialis



HABIT: Annual, 0.1–0.2 dm, hairy; stems very short, densely tufted, branched

LEAVES: Leaflets (3)5, upper surface long hairy

FLOWER: 4–5 mm; bicolored, banner white, wings and keel purplish, keel glabrous

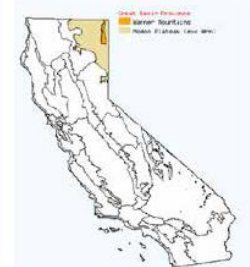
DISTINGUISHING CHARACTERISTICS: Tiny tufted hairy annual

FLOWERING TIME: May–June

HABITAT, ELEVATION: Open areas, barrens, talus in sagebrush and pinyon-juniper woodlands, on limestone, rhyolite, volcanic gravels; sagebrush scrub, pinyon juniper woodland, 1300–1600 m

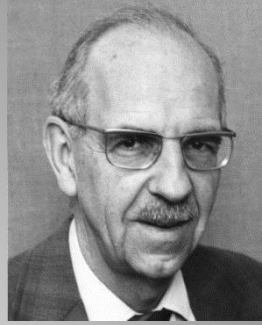
DISTRIBUTION: Modoc Plateau; Oregon, Idaho, Nevada

NOTES: Of conservation concern



In progress

Thank you posthumously

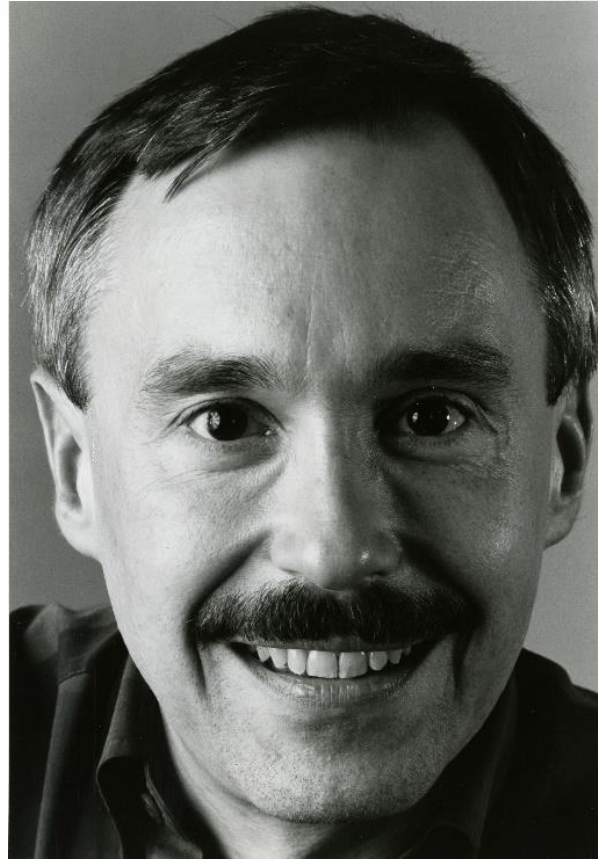


Lincoln Constance

Images courtesy of the University
and Jepson Herbaria



Ledyard Stebbins



Jim Hickman who got me into this mess

Larry Heckard

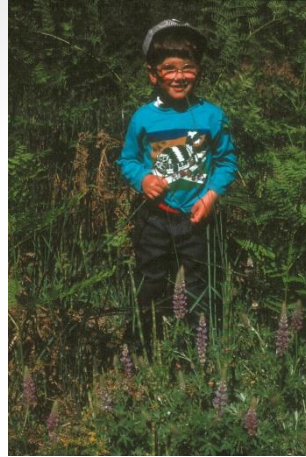
L. albifrons var. *austromontanus*

The mentors who had faith in me and gave me advice



My teachers and mentors at Berkeley who taught me the complexities of sorting out nomenclatural messes and circumscription challenges: Barbara Ertter, John Strother (all interpretations and possible errors are mine alone).

Thanks to my kids for their support for me as a Botanist and Mom



1986, the year I began my studies on *Lupinus*

today