

## A TAXONOMIC CONSPECTUS OF NORTH AMERICAN *DELPHINIUM*

Michael J. Warnock

Department of Biological Sciences, Texas Regional Institute for Environmental Studies, Sam Houston State University, Huntsville, Texas 77341 U.S.A.

### ABSTRACT

A summary of subsectional groupings in North American *Delphinium* is provided. Nomenclatural adjustments are made so that the names can be used in the upcoming Volume 3 of *The Flora of North America* (Morin *et al.*). Six new taxa are described and three new combinations are made. Also included are a key to subsections of *Delphinium* in North America and keys to species within subsections.

KEY WORDS: *Delphinium*, Ranunculaceae, North America, taxonomy, nomenclature

### INTRODUCTION

The forthcoming Volume 3 of *The Flora of North America* (Morin *et al.*) includes the treatment of *Delphinium*. A total of 61 species are recognized in that treatment. These are distributed among ten subsections. With the exception of subsection *Elata* (not native to North America), all of these subsections belong to section *Delphinastrum* of subgenus *Delphinium* (*sensu* Warnock 1993). Six new taxa (two subsections, two species, and two subspecies) are described. In addition, three new combinations are formed. A generic description is included in order to provide context for the subsectional and species descriptions. Several descriptive terms are used in somewhat unusual senses in descriptions. These terms are defined in a brief glossary.

A key to subsections of North American *Delphinium* is presented, as are keys to North American species within subsections, and keys to subspecies for species with newly recognized subspecies. Keys found herein differ somewhat from those to be published in *The Flora of North America*. Differences between the alternate keys are due to inclusion here of some nonmorphological key characteristics (not allowed in the flora format) and reordering of some key characters in multicharacter couplets. Order of characters within multicharacter couplets here is based on effectiveness of separation (most effective character first), while that in the flora is determined by ease of observation (most easily observed first). Since many of the phylogenetically most useful characters are not always observable on all specimens, all keys resort at least in part, to artificial means for separation of taxa.



*DELPHINIUM* L., *Species Plantarum* 530. 1753.

Perennial herbs, synoecious, protandrous. Roots usually coarsely parted, each with threadlike divisions distally (root sizes in descriptions refer to coarse parts and do not include threadlike extensions). Stems erect, usually unbranched below inflorescences. Leaves cauline and/or basal, alternate, simple, petioled. Blades round to pentagonal or reniform, basal usually larger than cauline; blades palmately lobed  $\pm$  to petiole; lobes  $\pm$  mucronate, entire except sometimes apically crenate or lacerate, lobes of basal leaves wider and fewer in number than those of cauline leaves; petioles gradually to abruptly shorter upward on stem. Bracts (attached to peduncle) absent or leaflike. Inflorescences dense or open, terminal, 2-100+ flowered racemes, 5-40+ cm long; lateral branches usually absent, if present, then shorter than central; bracteoles (attached to pedicels) subopposite to subalternate. Flowers zygomorphic; sepals 5, usually bluish or purplish, white flowered individuals occur sporadically and usually rarely in most taxa), distinct, 4  $\pm$  ovate to fusiform, upper 1 forms a hollow spur, simple white hairs may occur where sepals are exposed in bud; petals 4, distinct; upper 2 prolonged into spurs, enclosed in upper sepal, mostly white, sometimes colored on exposed surfaces, 12-30 mm long, not clawed, nectar bearing tissues inside narrow cone forming terminus of spurs, nectary scale absent; lower 2 petals clawed, distinct, claws and blades usually  $\pm$  perpendicular; claws usually white,  $\pm$  strap shaped, 3-8 mm long, sometimes with an enation near the base; blades colored  $\pm$  like sepals,  $\pm$  ovate,  $\pm$  divided from terminus, usually with curled hairs on adaxial blade surface; stamens 25-40, base expanded, staminodia absent; carpels 3(-5), distinct, ovules 8-20 per locule; style narrowly beaked. Fruits follicles, 3(-5), sessile,  $\pm$  curved-cylindric, veins prominent or not, styles not greatly modified, glabrous. Seeds dark brown to black although often appearing white because of air in seed coat cells, rectangular to crescent shaped, often  $\pm$  rough surfaced; cells usually elongate; cell margins usually smooth.  $x = 8$ .

Ca. 300 species, North Temperate and Arctic, subtropical and Eastern Hemisphere tropical in mountains; 61 species in Western Hemisphere north of México, another eight in México.

Isolating mechanisms in *Delphinium* appear to be primarily ecological, geographic, and/or temporal. Where these distinctions are disrupted, introgression often occurs. Natural hybridization occurs regularly among certain taxa, particularly in areas of disturbance (*i.e.*, roadcuts, drainage ditches, clearcuts, etc.). The more common and easily recognized hybrids are included in the keys.

Unless otherwise noted, descriptions and key leads refer to (and work best with) fresh material. Some features may be significantly altered by pressing, but can usually be determined with a certain amount of effort and experience, even from herbarium sheets.

GLOSSARY TO TERMS AS USED IN KEYS AND DESCRIPTIONS  
(For those used in a less than typical sense)

arched pubescence-composed of hairs more than 1 mm long, curved to complete more than 180° of arc along length of hair.

ascending pedicels/petioles-diverging from vertical at an angle of less than 40°.



- curled pubescence-composed of hairs more than 1 mm long, curved to complete more than 360° of arc along length of hair; found only on blade of lower petals.
- dense inflorescence-at least some flowers in fresh material touch one another on the same branch (vs. open inflorescence).
- enlarged buds-stem buds at least 3 mm long that form on rootstocks as much as one year before elongation; these are white and easily seen in fresh material, but dark and shriveled when dried.
- glandular pubescence-composed of hairs swollen in lower 1/3 to 1/2.
- leaf lobe-a lobe with defining clefts at least 80% as deep as radius of leaf blade.
- long pubescence-composed of hairs more than 1 mm long, usually perpendicular to surface where attached.
- open inflorescence-flowers on a single branch do not touch one another in fresh material (vs. dense inflorescence).
- seed coat cells elongate-cells having the shape of a tapered cylinder.
- seed coat cells short or blocky-cells having a shape  $\pm$  proportional to a brick.
- sepals erect-sepals point forward,  $\pm$  extending axis of spur.
- sepals reflexed-sepals fold backward, along axis of spur.
- sepals spreading-sepals oriented  $\pm$  perpendicular to spur, each sepal usually  $\pm$  cupped, calyx thus forming a bowl shape.
- simple pubescence-composed of hairs less than 1 mm long, often appressed on surface.
- smooth cell margins-long edges of seed coat cells  $\pm$  parallel opposite margins of the same cell with no significant curves (vs. undulate cell margins).
- spreading pedicels/petioles-diverging from vertical at an angle of more than 40°.
- undulate cell margins-edges of seed coat cells meander and interlock with margins of adjoining cells (vs. smooth cell margins).

The following key distinguishes subsections of *Delphinium* found in North America. Order of treatment of subsections is based on presumed relationships (artificially linearized) based on morphological and physiological features.

#### KEY TO SUBSECTIONS OF NORTH AMERICAN *DELPHINIUM*

1. Roots very easily separated from stems, if not extracted with a digging tool, roots typically break cleanly from stems and are completely absent from herbarium specimens; inflorescences usually at least 3  $\times$  wider at base than apex..... 2
2. Primary root segments  $\pm$  succulent, usually brittle; roots with a single primary segment (cornlike), or branched from within 1 cm of stem attachment. .... 10. *Delphinium* subsect. *Grumosa*
2. Primary root segments dry, braided, tough; major root branches usually at least 1 cm from stem attachment. .... 3
3. Fruits spreading; seeds ringed at chalazal end; inflorescences seldom more than 3  $\times$  longer than wide. .... 9. *Delphinium* subsect. *Bicoloria*
3. Fruits erect; seeds not ringed at chalazal end; inflorescences seldom less than 3  $\times$  longer than wide. .... 5. *Delphinium* subsect. *Subscaposa*
1. Roots not easily separable from stems, if not extracted with a digging tool, roots typically break raggedly, leaving a portion attached to the lower stems,  $\pm$  intact roots sometimes extracted from the ground simply by pulling the stems;



- inflorescences usually less than 3 × as wide at base than apex. Specimens completely lacking roots should be keyed here..... 4
4. Large (more than 3 mm long) buds present at anthesis on rootcrowns (one or more typically will be found at the base of specimens pulled from the ground); roots more than 20 cm long (often more than 50 cm long), rarely more than fragments of roots associated with herbarium specimens; stems usually 2 or more per root, more than 1 m tall (exceptional plants may be less than 0.5 m tall); basal leaves and lower stem leaves absent at anthesis; midstem leaves 5 or 7 lobed..... 5
5. Lower petal blades less than 20% the length of lateral sepals; sepals never red or yellow..... 1. *Delphinium* subsect. *Elata*
5. Lower petal blades more than 20% the length of lateral sepals, or sepals red or yellow..... 6
6. Lower internodes similar in length to those of midstems; largest leaves found near midstems, gradually reduced upward; bracts (if present) similar to and gradually smaller than leaves. .... 2. *Delphinium* subsect. *Exaltata*
6. Lower internodes much shorter than those of midstems; largest leaves found near base of stems (sometimes absent at anthesis), often abruptly reduced upward; bracts (if present) markedly smaller and fewer lobed than leaves..... 7
7. Inflorescences ± pyramidal; pedicels more than 2 cm long..... 3. *Delphinium* subsect. *Wislizenana*
7. Inflorescences cylindric; pedicels less than 2 cm long..... 8
8. Seed coat cells more than 3 × as long as wide; pedicels ascending... 4. *Delphinium* subsect. *Multiplex*
8. Seed coat cells less than 3 × as long as wide; pedicels spreading to ascending..... 3. *Delphinium* subsect. *Wislizenana*
4. Large buds absent at anthesis from rootcrowns; roots usually less than 20 cm long (or completely absent from specimens), substantial portions of root often present on herbarium specimens; stems 1 per root, less than 1 m tall (exceptional plants may be more than 2 m tall); basal leaves and/or lower stem leaves often present at anthesis; midstem leaves 3 to many lobed. .... 9
9. Seeds adorned with wavy ridges visible without magnification; pedicels appressed-ascending; inflorescences symmetrical; plants not usually found in damp meadows or on stream banks..... 7. *Delphinium* subsect. *Virescens*
9. Seeds lacking wavy ridges (but may have other protrusions from surface) visible without magnification; if pedicels appressed-ascending (rarely occurs), then inflorescences secund and/or plants found in damp meadows or on stream banks..... 10
10. Inflorescence rachis to midpedicel angles less than 30°; spurs often intersect inflorescence rachis. .... 11
11. Stems less than 60(-80) cm tall; pedicels closely ascending inflorescence rachis (straight); spurs often intersect inflorescence rachis..... 6. *Delphinium* subsect. *Depauperata*
11. Stems rarely less than 60 cm tall, if shorter, then pedicels remotely ascending (sigmoid); spurs sometimes intersect inflorescence rachis... 4. *Delphinium* subsect. *Multiplex*
10. Inflorescence rachis to midpedicel angles more than 30°; spurs rarely intersect inflorescence rachis (except sometimes near tips of spurs)..... 12



12. Lower internodes similar in length to those of midstems; basal rosettes absent; leaves monomorphic; largest leaves found near midstems, gradually reduced upward; bracts (if present) similar to and gradually smaller than leaves. .... 2. *Delphinium* subsect. *Exaltata*
12. Lower internodes much shorter than those of midstems; basal rosettes (often absent at anthesis) formed 3-28 weeks before stem elongation; leaves  $\pm$  dimorphic (rosette leaves with fewer and wider lobes than cauline leaves); largest leaves found near base of stem (sometimes absent at anthesis), often abruptly reduced upward; bracts (if present) markedly smaller and fewer lobed than leaves. .... 13
13. Roots completely absent from specimens containing stem base. .... 14
14. Fruits erect; seeds not ringed at chalazal end; inflorescences usually at least 4  $\times$  as long as wide. .... 5. *Delphinium* subsect. *Subscaposa*
14. Fruits spreading; seeds ringed at chalazal end; inflorescences seldom more than 4  $\times$  as long as wide. .... 15
15. Sepals red or yellow. .... 9. *Delphinium* subsect. *Bicoloria*
15. Sepals blue, purple, white, or pink. .... 16
16. Lowest pedicel less than 1/4 inflorescence length. .... 10. *Delphinium* subsect. *Grumosa*
16. Lowest pedicel at least 1/4 inflorescence length. .... 17
17. Seed coat cell surfaces roughened. .... 10. *Delphinium* subsect. *Grumosa*
17. Seed coat cell surfaces smooth. .... 18
18. Inflorescences at least 3  $\times$  longer than wide. .... 10. *Delphinium* subsect. *Grumosa*
18. Inflorescences less than 3  $\times$  longer than wide. .... 19
19. Lateral sepals usually spreading (reflexed only in *D. antoninum* which has succulent leaves). .... 9. *Delphinium* subsect. *Bicoloria*
19. Lateral sepals reflexed (succulent leaves never present). .... 10. *Delphinium* subsect. *Grumosa*
13. Roots (at least a vestige) present on specimens containing stem base or stem base not included in specimen. .... 20
20. Fruits spreading; seeds ringed at chalazal end. .... 21
21. Primary root segments  $\pm$  succulent, usually brittle; roots with a single primary segment (cornlike), or branched from within 1 cm of stem attachment. .... 10. *Delphinium* subsect. *Grumosa*
21. Primary root segments usually dry, braided, tough; major root branches usually at least 1 cm from stem attachment. .... 9. *Delphinium* subsect. *Bicoloria*
20. Fruits erect; seeds not ringed at chalazal end. .... 22
22. Roots  $\pm$  succulent, not braided, usually less than 10 cm long, thin threadlike segments restricted to major segment termini. .... 23
23. Pedicels appressed-ascending. .... 7. *Delphinium* subsect. *Virescens*
23. Pedicels spreading to ascending, but never appressed-ascending. .... 8. *Delphinium* subsect. *Echinata*
22. Roots dry, braided, usually more than 10 cm long, thin threadlike segments apparent nearly entire length, or stem base is not present on specimen. .... 24
24. Inflorescences  $\pm$  pyramidal; pedicels more than 3 cm long. .... 25



- 25. Sepals red..... 3. *Delphinium* subsect. *Wislizenana*
- 25. Sepals blue, white, or yellow.....
- .....5. *Delphinium* subsect. *Subscaposa*
- 24. Inflorescences cylindric; pedicels less than 3 cm long.....26
- 26. Lowest bracts similar to (smaller than) leaves.....
- ..... 2. *Delphinium* subsect. *Exaltata*
- 26. Lowest bracts distinctly smaller and fewer lobed than leaves, or absent. ....27
- 27. Seed coat cells more than 3 × longer than wide. ....
- ..... 4. *Delphinium* subsect. *Multiplex*
- 27. Seed coat cells less than 3 × longer than wide.....28
- 28. Lower portions of stems pubescent with straight hairs; glandular hairs absent from pedicels; flowering commencing after 1 July (except *D. geyeri*)..... 3. *Delphinium* subsect. *Wislizenana*
- 28. Lower portions of stems glabrous or pubescent with arched hairs; glandular hairs present or absent on pedicels; flowering completed by 1 July. ....
- .....5. *Delphinium* subsect. *Subscaposa*

1. *Delphinium* subsect. *Eлата* W.T. Wang, Acta Bot. Sinica 10(2):81. 1962. TYPE: *Delphinium elatum* L.

Roots 2-5 dm long, twisted fibrous, dry, 5-11 branched; stem buds enlarged, usually present throughout dormant season. Stems 2-8 per root, 7-22 dm tall, usually unbranched, elongation commences within 2 weeks of leaf initiation; base not narrowed, firmly attached to root. Leaves cauline, blade shape and lobing similar throughout, largest at or slightly below middle of stem, gradually reduced into bracts; petioles ascending. Inflorescences narrowly pyramidal to cylindric, 20-100 flowered, usually 3-8 flowers/5 cm, ± dense; pedicels spreading-ascending, usually less than 3 cm long. Bracts ± similar to leaves but smaller. Fruits erect. Seeds rectangular to crescent shaped, 1.5-3.5 mm long × 1.2-2.5 mm wide, not ringed at chalazal end, wing margined; seed coats sometimes with small irregular waves; cells elongate; cell margins smooth. Flowering March to November, more than eight weeks after snowmelt.

As circumscribed by Wang (1962), the subsection includes approximately 30 species. One of these (*Delphinium elatum*) is commonly cultivated in North America. As a perennial, *D. elatum* commonly persists for years near deserted homesites in the cooler parts (Canada, northern United States, Rocky Mountains) of North America, but is less common and normally grown as a garden annual in warmer areas (Florida, Texas).

2. *Delphinium* subsect. *Exaltata* N.I. Malyutin, Bot. Zhurn. (Moscow and Leningrad) 72(5):688. 1987. TYPE: *Delphinium exaltatum* W.T. Aiton.

Roots 1-8 dm long, twisted fibrous, dry, 4-15 branched; stem buds enlarged, usually present throughout dormant season. Stems (1-)3-8(-19) per root, (1-)8-15(-30) dm tall, usually unbranched, elongation commences within 2 weeks of leaf initiation; base not narrowed, firmly attached to root. Leaves cauline, blade shape



and lobing similar throughout, largest at or slightly below middle of stem, gradually reduced into bracts; petioles  $\pm$  ascending. Inflorescences cylindric (greatly shortened in some), (15-)25-90(-200+) flowered, usually 5-10 flowers/5 cm,  $\pm$  dense; pedicels  $\pm$  spreading, usually less than 2 cm long. Bracts  $\pm$  similar to leaves but smaller. Fruits erect. Seeds rectangular to crescent shaped, 1.5-3.5 mm long  $\times$  1.2-2.5 mm wide, not ringed at chalazal end, wing margined or not; seed coat cells  $\pm$  aggregated into small irregular waves or ripples; cells elongate; cell margins smooth. Flowering in late June-October, more than eight weeks after snowmelt.

Species 14+; twelve species in North America north of México, an additional one in México, and at least one and probably more in Asia. *Delphinium brachycentrum* Ledeb. is found on both sides of the Bering Sea.

Members of *Delphinium* subsect. *Exaltata* are characteristically found in areas of high altitude and/or latitude in which length of growing season is uncertain due to temperature and snowpack conditions. In most plants, growth continues until a killing freeze at the end of summer.

Members of *Delphinium* subsect. *Exaltata* are the typical "tall larkspurs" of poisonous plant literature. Their abundance on some ranges, combined with their large size and toxicity make them significant sources of livestock poisoning. Several of the species (*D. andesicola* Ewan, *D. californicum* Torrey & A. Gray, *D. glaucum* S. Wats., *D. novomexicanum* Wooton, *D. robustum* Rydb., *D. sapellonis* Tidestr., and the Mexican *D. valens* Standl.) in this subsection form a tightly knit group in which the degree of difference between members of the group and patterns of variation within the members appear largely determined by the degree and length of isolation in the various mountain ranges where the plants are found.

#### KEY TO SPECIES OF *DELPHINIUM* SUBSECT. *EXALTATA*

1. Leaves present on lower 20% of stems at anthesis..... 2
  2. Lateral sepals acute at apex; Alaska, Yukon, N.W.T.; elevation under 2000 m. .  
.....*D. brachycentrum*
  2. Lateral sepals rounded at apex; Colorado, New Mexico; elevation above 2000 m..... 3
    3. Stems less than 30 cm tall; plants of alpine regions.....*D. alpestre* Rydb.
    3. Stems more than (45-)70 cm tall; plants of subalpine and below.....  
.....*D. ramosum* Rydb.
1. Leaves absent from lower 20% of stems at anthesis..... 4
  4. Sepals brownish or yellowish..... 5
    5. Buds brownish or yellowish; sepals becoming progressively more brown or yellow with age.....*D. sapellonis*
    5. Buds purple; at least some sepals fading to brown while on the plant. ....  
.....*D. novomexicanum*
  4. Sepals blue or purple (rarely white or pink) not brownish or yellowish..... 6
    6. Hairs in inflorescences glandular..... 7
      7. Inflorescences more than 3  $\times$  longer than broad. ....  
.....*D. barbeyi*  $\times$  *D. glaucum* (= *D.*  $\times$  *occidentale*)
      7. Inflorescences less than 3  $\times$  longer than broad....*D. barbeyi* (Huth) Huth
    6. Hairs in inflorescences (if present) not glandular..... 8
      8. Midcauline leaf lobes less than 3  $\times$  as long as wide. .... 9
        9. Sepals bluish to light lavender; 3-7 leaf lobes; east of the Great Plains. .  
.....*D. exaltatum*



9. Sepals lavender to white; 3-15 leaf lobes; coastal California. ....  
 ..... *D. californicum* Torrey & A. Gray
8. Midcauline leaf lobes more than 3 × as long as wide (neither east of the  
 Great Plains nor coastal California)..... 10
10. Leaves laciniate, lobe tips acuminate..... 11
11. Spurs blunt tipped; Arizona. .... *D. andesicola*
11. Spurs pointed; New Mexico, Colorado..... 12
12. Sepals dark blue; northern New Mexico, southern Colorado...  
 ..... *D. robustum*
12. Sepals purple; southern New Mexico..... *D. novomexicanum*
10. Leaves seldom laciniate, lobe tips not acuminate..... 13
13. Entire plant finely, evenly puberulent. .... *D. ramosum*
13. Entire plant glabrous, or if pubescent, then only in inflorescences.  
 ..... 14
14. Rarely more than 25 flowers per plant; plants of shallow rocky  
 soil on steep slopes; sepals blue; Idaho, Montana, Wyoming. .  
 ..... *D. glaucescens* Rydb.
14. Rarely fewer than 25 flowers per plant; plants from deeper  
 soils on usually gentler slopes; sepals purple, lavender, or  
 white; widespread..... *D. glaucum*
3. *Delphinium* subsect. *Wislizenana* M.J. Warnock, Madroño 31(4):243. 1984.  
 TYPE: *Delphinium wislizeni* Engelm.

Roots (0.5-)1.5-2.4(-8.0) dm long, twisted fibrous, dry to fleshy, 3-8 branched; enlarged stem buds usually absent during dormant season. Stems 1(-4) per root, (3-) 5-9(-12) dm tall, usually unbranched, elongation delayed 2-10 weeks after leaf initiation; base usually not narrowed, firmly attached to root. Leaves basal and cauline, largest near base of stem, usually abruptly smaller on upper stems; basal leaf blades more rounded and with fewer, wider lobes than cauline leaves; lower petioles spreading, cauline ascending. Inflorescences cylindric to narrowly pyramidal, (4-)6-20(-50) flowered, open to dense, usually 2-9 flowers/5 cm; pedicels spreading to ascending, often more than 2 cm long. Bracts usually smaller and fewer lobed than leaves. Fruits erect. Seeds rectangular to crescent shaped, 2.0-3.5 mm long × 1.3-2.5 mm wide, not ringed on chalazal end, wing margined or not; seed coats ± covered with small irregular waves; cells short, margins usually smooth. Flowering late May to October, more than eight weeks after snowmelt.

Species twelve; five species in North America (north of México), seven more (*Delphinium bicornutum* Hemsl., *D. calcar-equis* Gentry, *D. pedatisectum* Hemsl. *D. subscandens* Ewan, *D. tenuisectum* Greene, *D. viride* Standl., and *D. wislizeni*) in México. *Delphinium cardinale* Hook. and *D. scopulorum* A. Gray grow on both sides of the México/United States border.

*Delphinium* subsect. *Wislizenana* comprises a group of species found in the mountains of México and mountains of the dry regions of the western United States. Their growth and reproductive success tends to be limited by dependence on summer rains (and stored moisture from snowmelt) rather than controlled by freezing temperatures as in *D.* subsect. *Exaltata*.



KEY TO SPECIES OF *DELPHINIUM* SUBSECT. *WISLIZENANA*

1. Sepals red. .... *D. cardinale*
1. Sepals bluish or purplish, not red (rarely white, extremely rarely pink). .... 2
  2. Flowers  $\pm$  bright blue, sepals with a lighter median line abaxially; leaves light green, veins obscure; leaf lobe apex gradually tapering to a point. .... 3
  3. Flowering in mid to late summer; leaves sparsely pubescent; stems more than (40-)60 cm tall. .... *D. stachydeum* (A. Gray) Tidestr.
  3. Flowering early to mid summer; leaves densely pubescent; stems less than 60(-80) cm tall. .... *D. geyeri* Greene
  2. Flowers not bright blue (or if bright blue, then lower stems glabrous), sepal color  $\pm$  uniform; leaves dark green (at least adaxially), veins prominent; leaf lobe apex abrupt (although usually mucronate). .... 4
  4. Midstems and leaves pubescent; sepals bluish purple. .... *D. geraniifolium* Rydb.
  4. Midstems and leaves glabrous to subglabrous; sepals bright blue. .... *D. scopulorum*
4. *Delphinium* subsect. *Multiplex* M.J. Warnock, subsect. nov. TYPE: *Delphinium multiplex* (Ewan) C.L. Hitchc. in C.L. Hitchc. et al.

*Delphinio* subsect. *Exaltatae* N.I. Malyutin similis sed differt foliis amplicissimis prope basim caulium (vs. prope midcaulem) et foliis caulinis abrupte (vs. gradatim) sursum deminutis. *Delphinio* subsect. *Wislizenanae* M.J. Warnock similis sed differt caulibus elongatis 1-3 hebdomades (vs. 2-10 hebdomades) post initio foliorum et gemmis caulinis dormientibus auctis plerumque praesentibus (vs. plerumque absentibus in statu dormienti).

Roots (0.5-)1.0-4.0(-5.0) dm long, twisted fibrous, dry to fleshy, 2-6 branched; stem buds enlarged, sometimes present during dormant season. Stems 1-4(-8) per root, (1-)2-7(-12) dm tall, usually unbranched, elongation delayed 1-3 weeks after leaf initiation; base usually not narrowed, firmly attached to root. Leaves basal and cauline, largest near base of stem, usually abruptly smaller on upper stem; basal leaf blades more rounded and with fewer, wider lobes than cauline leaves; lower petioles  $\pm$  spreading, cauline ascending. Inflorescences cylindric, (2-)6-15(-60) flowered, dense to open, usually 3-12 flowers/5 cm; pedicels ascending, usually less than 2 cm long. Bracts usually markedly smaller and fewer lobed than leaves. Fruits erect. Seeds rectangular to crescent shaped, 1.8-3.0 mm long  $\times$  1.3-2.5 mm wide, not ringed at chalazal end, wing margined or not; seed coat cells  $\pm$  aggregated into small irregular waves or ripples; cells elongate, margins smooth. Flowering June to August, more than six weeks after snowmelt.

As currently circumscribed, *Delphinium* subsect. *Multiplex* contains four species, all of which are endemic to North America. *Delphinium* subsect. *Multiplex* is most closely related to subsect. *Wislizenana*, but may be distinguished by the shorter time from growth initiation to stem elongation and usual presence of enlarged stem buds during the dormant season. *Delphinium* subsect. *Multiplex* is morphologically similar to subsect. *Exaltata*, but can be separated on the basis of location of largest leaves near base of stem and abrupt reduction in leaf size upward on stems of subsect. *Multiplex*. In subsect. *Exaltata* the largest leaves near midstem and gradually reduced in size upward on stems.



Species of *Delphinium* subsect. *Multiplex* are found in the mountains of the western United States, where they grow and flower in midsummer in sites provided with moisture originating as snowmelt from the previous winter. Their growing season is typically limited more often by reduction in available moisture later in the year than by freezing temperatures.

#### KEY TO SPECIES OF *DELPHINIUM* SUBSECT. *MULTIPLEX*

1. Sepals yellow or yellowish. .... *D. viridescens* Leiberg
1. Sepals bluish or purplish, not yellow or yellowish (sometimes white or lavender)..  
..... 2
2. Green leaves usually absent from lower 20% of stem at anthesis. ... *D. multiplex*
2. Green leaves present in lower 20% of stem at anthesis. .... 3
3. Bracteoles less than 4 mm long; spurs 9-12 mm long; pedicels 0.3-1.5(-2.5) cm long; sepals white to light blue. ....  
..... *D. inopinum* (Jeps) F.H. Lewis & Epling
3. Bracteoles more than 4 mm long; spurs 11-22 mm long; pedicels 1-4(-15) cm long; sepals dark blue..... *D. polycladon* Eastw.

5. *Delphinium* subsect. *Subscaposa* Ewan, Bull. Torrey Bot. Club 63:330. 1936.  
LECTOTYPE (here designated): *Delphinium scaposum* Greene.

Ewan (1936) based *Delphinium* subsect. *Subscaposa* on Huth's (1895) description of *Delphinium* tribus *Subscaposa*. Since Huth's combination is invalid (use of tribus as an infrageneric category), Ewan was not required to parenthetically cite Huth. However, since Huth's combination was effectively published and Ewan directly referred to it in his recognition of *D.* subsect. *Subscaposa*, Huth's Latin description of the taxon serves for nomenclatural purposes. Unfortunately, neither Huth nor Ewan designated a type for *Subscaposa*. Nor did Ewan (1942) mention a type in a subsequent treatment of *D.* subsect. *Subscaposa*. The current choice was made from among those taxa included by both previous workers.

Roots (0.4-)1-3(-4) dm long, fibrous, twisted, dry, 3-8(-12) branched; stem buds minute. Stems 1(-3) per root, (2-)6-11(-17) dm tall, unbranched, elongation delayed 4-10 weeks after leaf initiation; bases often narrowed, firmly attached to root. Leaves basal and cauline, largest near base of stem, often abruptly smaller on upper stem; basal leaf blades more rounded and with fewer, wider lobes than cauline leaves; lower petioles spreading, cauline ascending. Inflorescences cylindric to narrowly pyramidal,  $\pm$  open, (4-)6-25(-90) flowered, usually 4-8 flowers/5 cm; pedicels spreading to ascending, usually less than 2 cm long. Bracts markedly smaller and fewer lobed than leaves. Fruits erect. Seeds rectangular to crescent shaped, 1.3-3.3 mm long  $\times$  1.1-2.3 mm wide, not ringed on chalazal end,  $\pm$  wing margined, seed coats usually lacking waves (present only in *Delphinium purpusii* Brandege); cells usually blocky, cell margins undulate or smooth. Flowering March to June, more than six weeks after snowmelt.

Species ten or more; ten in North America including México, possibly others in Asia. *Delphinium parishii* and *D. parryi* range into México in northern Baja California.

*Delphinium* subsect. *Subscaposa* is comprised of medium sized plants that depend on winter or spring rainfall (snowfall) for growth and reproduction. The



plants often overwinter as a basal rosette, with stem elongation beginning at onset of warm weather in the spring. The growing season for these plants may be cut short by lack of moisture. The plants typically remain dormant throughout the summer and autumn months.

### KEY TO SPECIES OF SUBSECTION *SUBSCAPOSA*

1. Pedicels with yellowish glandular hairs (at least apically); sepals reflexed..... 2
  2. Sepals blue (white). ..... *D. lineapetalum* Ewan
  2. Sepals rose to pinkish or yellow..... 3
    3. Flowers rose to pinkish..... *D. purpusii*
    3. Flowers yellow..... *D. xantholeucum* Piper
1. Pedicels lacking yellowish glandular hairs; sepals spreading or reflexed. .... 4
  4. Cells of seed coats with undulate margins visible at 10 $\times$ ; mature fruits usually less than 3  $\times$  as long as wide; plants of desert, grassland (sometimes with scattered trees) or shrubland..... 5
    5. Sepals rarely reflexed; stems more than (50-)60 cm tall--sepals white to light pink to very light blue, plants from grasslands, open woods..... *D. gypsophilum* Ewan
    5. Sepals (especially laterals) usually reflexed; stems less than 60(-100) cm. ... 6
      6. Plants of very alkaline, fine grained soils; lower petals white (contrasted with blue sepals)--lobe present at junction of blade and claw of lower petals. .... *D. recurvatum* Greene
      6. Plants of various soils, but not very alkaline, often coarse grained; lower petals concolorous with sepals (blue or white)..... *D. parishii* A. Gray
  4. Cells of seed coats with smooth margins visible at 10 $\times$ ; mature fruits usually more than 3  $\times$  as long as wide; plants of chaparral, woodlands and forest (rare in shrubland)..... 7
    7. Sepals strongly reflexed..... *D. lineapetalum*
    7. Sepals not strongly reflexed..... 8
      8. Green leaves usually absent from lower 20% of stems at anthesis, if present, then lower stems and/or petioles covered with short, arched hairs. .... 9
        9. Lower leaf lobes less than 5 mm wide or plants from less than 10 km inland or less than 400 m elevation..... *D. parryi* A. Gray
        9. Lower leaf lobes 5 or more mm wide and plants from more than 10 km inland and more than 400 m elevation. .... *D. umbraculorum*  $\times$  *D. parryi*
  8. Green leaves usually present in lower 20% of stems at anthesis; lower stems and petioles glabrous to subglabrous (straight hairs). .... 10
    10. Lower leaf lobes less than 4 mm wide..... *D. andersonii* A. Gray
    10. Lower leaf lobes more than 4 mm wide. .... 11
      11. Cauline leaves gradually smaller and more common than basal leaves..... *D. umbraculorum* F.H. Lewis & Epling
      11. Cauline leaves abruptly smaller and rarer than basal leaves. .... *D. scaposum*



7. *Delphinium* subsect. *Depauperata* M.J. Warnock, *subsect. nov.* TYPE: *Delphinium depauperatum* Nutt.

*Delphinio* subsect. *Virescens* M.J. Warnock similis sed differt radicibus fibrosis (vs. fasciculatis) et paginis seminum exasperatis (vs. undulatis). *Delphinio* subsect. *Multiplex* M.J. Warnock similis sed differt plantis minoribus, radicibus dormientibus auctis absentibus (vs. praesentibus, et caulibus elongatis 2-8 hebdomades (vs. 1-3 hebdomades) post initio foliorum.

Roots 0.2-1.0(-1.5) dm long, twisted fibrous, dry to fleshy, 2-8 branched; stem buds minute. Stems 1(-2) per root, usually unbranched, elongation delayed 2-8 weeks after leaf initiation; base usually not narrowed, firmly attached to root. Leaves basal and cauline, largest near base of stem, usually abruptly smaller on upper stem; basal leaf blades more rounded and with fewer, wider lobes than cauline leaves; lower petioles  $\pm$  spreading, cauline ascending. Inflorescences cylindric, dense to open, usually 1-10 flowers/5 cm; pedicels ascending, usually less than 2 cm long. Bracts markedly smaller and fewer lobed than leaves. Fruits erect. Seeds rectangular to crescent shaped, 1.3-2.3 mm long  $\times$  0.8-1.4 mm wide, not ringed on chalazal end,  $\pm$  wing margined; seed coats lack waves; cells elongate, margins smooth. Flowering May to July, more than six weeks after snowmelt.

As currently circumscribed, *Delphinium* subsect. *Depauperata* consists of three species, all endemic to North America. Specimens of several Asian species have been seen, and these may fit within *D.* subsect. *Depauperata*, but further study is required to make that determination.

*Delphinium* subsect. *Depauperata* appears most closely related to *D.* subsect. *Multiplex*. Plants of the former are much smaller and tend to flower earlier than those of the latter. *Delphinium* subsect. *Depauperata* is superficially similar to *D.* subsect. *Virescens*. Several of the more easily seen distinguishing features are enumerated in the diagnosis.

Species of *Delphinium* subsect. *Depauperata* depend on winter rains and melt from winter snows to support their growth and reproduction. Once that moisture is depleted, the plants become dormant until moisture again becomes available during the following growing season. The plants form a rosette early in the growing season, with stem elongation commencing sometime later.

#### KEY TO SPECIES OF *DELPHINIUM* SUBSECT. *DEPAUPERATA*

1. Margins of basal leaf measured less than 1 cm from blade base, demarcate less than 90° of arc when leaf is laid flat; sepal spurs oriented at an angle of 30-45° to the inflorescence axis.....*D. uliginosum* Curran
1. Margins of basal leaf measured less than 1 cm from blade base, demarcate considerably more than 90° of arc when leaf is laid flat; sepal spurs oriented at an angle near 90° to inflorescence axis. .... 2
2. Cauline leaf blades (at least most of them) exceeding the internodes, basal leaves absent at anthesis, 6 or more cauline leaves present at anthesis.....*D. distichum* Geyer



2. Cauline leaf blades much shorter than internodes, basal leaves usually present at anthesis, 5 or fewer cauline leaves present at anthesis. ....*D. depauperatum*

7. *Delphinium* subsect. *Virescens* M.J. Warnock, *nom. nov.* Based on: *Delphinium* species group *Caroliniana* Rydb., *Fl. Rocky Mts.* 308. 1917. Non *Delphinium* subsect. *Caroliniana* N.I. Malyutin (*nom. invalid.*--later homonym), Bot. Zhurn. (Moscow and Leningrad) 72(5):691. 1987. LECTOTYPE (here designated): *Delphinium virescens* Nutt.

A summary nomenclatural history of this subsection is appropriate to explain the current interpretation. Rydberg (1917, *in clave*) published *Delphinium* [sp. group]I. *Caroliniana* with neither rank nor type designated. Two species (*D. penardii* Huth and *D. virescens*) were included in the group. According to nomenclatural practice applicable to 1917, this constituted valid publication. Malyutin (1987) described *Delphinium* subsect. *Caroliniana* as a new subsection with *D. carolinianum* Walter (as "*D. carolineanum*") as the type, and included *D. penardii* and *D. virescens* within the subsection (these not treated as components or synonyms of *D. carolinianum* as in the present treatment). Malyutin did not reference Rydberg's earlier combination for *Caroliniana* even though he did use as a basionym for another new combination in the same paper, one of Rydberg's other combinations from the same key in which Rydberg published the *Caroliniana* combination. Since the *International Code of Botanical Nomenclature* ([ICBN] Greuter *et al.* 1994) requires that a lectotype be chosen for Rydberg's combination from among the species explicitly included, and since *D. carolinianum* is not among them, Rydberg's and Malyutin's combinations based on usage of the epithet *Caroliniana* are heterotypic. In such an instance, according to the ICBN (Art. 53.5), Malyutin's *Delphinium* subsect. *Caroliniana* is considered to be a later homonym of Rydberg's *Delphinium* [sp. group]I. *Caroliniana*. In order to minimize future confusion, the new name selected for the currently recognized taxon is derived from the epithet for the lectotype.

Roots, 0.3-0.8(-1.5) dm long, fusiform, fascicled,  $\pm$  fleshy, 2-8 branched; stem buds minute. Stems 1(-2) per root, (1.5-)4.0-9.0(-15.0) dm tall, usually unbranched, elongation delayed 4-16 weeks after leaf initiation; base not narrowed, firmly attached to root. Leaves basal and cauline, largest near base of stems, others often abruptly smaller on upper stems; basal petioles spreading, cauline petioles ascending; basal leaf blades more rounded and with fewer, wider lobes than cauline leaves. Inflorescences cylindric, (4-)6-35(-98) flowered,  $\pm$  dense, usually with 3-8 flowers /5 cm; pedicels appressed ascending, usually less than 2 cm long. Bracts markedly smaller and fewer lobed than leaves. Fruits erect. Seeds crescent shaped to obpyramidal, 1.5-2.5 mm long  $\times$  0.8-1.8 mm wide, not ringed at chalazal end, not wing margined; seed coats with prominent multicellular wavy ridges; surface cells  $\pm$  blocky, margins straight. Flowering February to July, more than six weeks after snowmelt.

Three species, endemic to North America (including northern México). Each of the three species (only subsp. *vimineum* in *Delphinium carolinianum*) occur on both sides of the México/United States border. No apparent close relatives outside North America.

The nearest relative of *Delphinium* subsect. *Virescens* within North America appears to be *D.* subsect. *Echinata*. While these two subsections are similar in many respects, the seeds of *D.* subsect. *Virescens* are distinctive.



*Delphinium* subsect. *Virescens* is comprised of medium sized plants that depend on spring rainfall for growth and reproduction. The plants often overwinter as a basal rosette, with stem elongation beginning at onset of warm weather in the spring. The growing season for these plants may be cut short by lack of moisture, or may be extended into summer by greater than normal rainfall. The plants typically remain dormant throughout the summer and autumn months.

#### KEY TO SPECIES OF *DELPHINIUM* SUBSECT. *VIRESCENS*

1. Sepals light lavender, reflexed; leaves grayish pubescent with short hairs..... *D. wootonii* Rydb.
  1. Sepals white to blue, or if lavender, then not reflexed and leaves not grayish pubescent. .... 2
  2. Plants with a combination of midcauline leaf blades round with at least 7 lobes more than 30% the length of longest lobe; sepals blue; petiole immediately below inflorescence at least 1 cm long..... *D. madreense* S. Wats.
  2. Plants deviating in at least one feature from the combination of midcauline leaf blades round with at least 7 lobes more than 30% the length of longest lobe; sepals blue; petiole immediately below inflorescence at least 1 cm long..... *D. carolinianum*
8. *Delphinium* subsect. *Echinata* (Ewan) N.I. Malyutin, Bot. Zhurn. (Moscow and Leningrad) 72(5):689. 1987. BASIONYM: *Delphinium* series *Echinatae* Ewan, Bull. Torrey Bot. Club 69(2):139. 1942. TYPE: *Delphinium hansenii* (E. Greene) E. Greene.

Roots 0.3-0.8(-3.0) dm long, fascicled, dry to fleshy, 3-9(-20) branched; stem buds minute. Stems 1(-3) per root, (2-)6-11(-17) dm tall, unbranched, elongation delayed 4-10 weeks after leaf initiation; base usually not narrowed, firmly attached to root. Leaves basal and cauline, largest near bases of stems, often abruptly smaller on upper stem; basal leaf blades more rounded and with fewer, wider lobes than cauline leaves. Inflorescences cylindric, (4-)6-25(-90) flowered, dense to open, usually 2-11 flowers/5 cm; pedicels ascending, usually less than 2 cm long. Bracts markedly smaller and fewer lobed than leaves. Fruits erect. Seeds  $\pm$  rectangular, 1.5-2.5 mm long  $\times$  0.8-1.5 mm wide, not ringed at chalazal end,  $\pm$  wing margined; seed coats not wavelike (may have elongate prism shaped processes); cells  $\pm$  blocky, margins smooth or undulate. Flowering March to early July, more than six weeks after snowmelt.

Species four; endemic to western North America. Similar in most features to *Delphinium* subsect. *Virescens*. See discussion under that subsection for differentiating characteristics.

*Delphinium* subsect. *Echinata* is comprised of medium sized plants that depend on winter rainfall for growth and reproduction. The plants overwinter as a basal rosette, with stem elongation beginning at onset of warm weather in the spring. The growing season for these plants may be cut short by lack of moisture. The plants remain dormant throughout the summer and autumn months.



KEY TO SPECIES OF *DELPHINIUM* SUBSECT. *ECHINATA*

1. Lower petioles glabrous to puberulent with short (less than 0.5 mm long) appressed and/or curved hairs..... 2
    2. Plants atypical in sepal color and/or stem pubescence for the population in which they occur, stem bases puberulent with short curved hairs; stem bases often reddish. .... *D. hesperium* subsp. *pallescent* × *D. parryi*
    2. Plants typical in sepal color and stem pubescence for the population in which they occur, stem base glabrous to pubescent with short straight hairs..... *D. hesperium* A. Gray
  1. Lower petioles pubescent with long (more than 0.5 mm long), straight, spreading hairs. .... 3
    3. Seeds echinate, appearing fuzzy to the naked eye; lateral sepals 13 mm long or shorter; usually more than 12 flowers on main inflorescence branch. .... *D. hansenii* (Greene) Greene
    3. Seeds not echinate, surface appearing ± smooth to the naked eye; lateral sepals 10 mm long or longer; usually fewer than 12 flowers on main inflorescence branch..... 4
      4. Stem bases longitudinally ridged..... *D. hesperium*
      4. Stem bases not longitudinally ridged. .... 5
        5. Margins of lower petals glabrous; bracteoles usually 7 mm or more from sepals; sepal spurs often downcurved for more than 3 mm at apex. .... *D. hutchinsoniae* Ewan
        5. Margins of lower petals ciliate; bracteoles usually 7 mm or less from sepals; sepal spurs straight or downcurved for less than 3 mm at apex.... *D. variegatum* Torrey & A. Gray
9. *Delphinium* subsect. *Bicoloria* (Rydb.) N.I. Malyutin, Bot. Zhurn. (Moscow and Leningrad) 72(5):687. 1987. BASIONYM: *Delphinium* species group *Bicoloria* Rydb., *Fl. Rocky Mts.* 309. 1917. TYPE: *Delphinium bicolor* Nutt.

In the original publication of *Delphinium* subsect. *Bicoloria*, Malyutin cites the basionym as *D. sect. Bicoloria* Rydb., *Key Rocky Mount. Fl.*: 93. 1919. Even though Malyutin cited the second edition of Rydberg's work and Rydberg designated no taxonomic ranks for his infrageneric categories, these should be considered as bibliographic errors according to the current *ICBN* (Geuter *et al.* 1994).

Roots (0.5-)1.0-3.0(-4.0) dm long, diffuse fibrous, ± braided, dry, 2-9 branched; stem buds minute. Stems 1(-2) per root, (1-)2-4(-9) dm tall, usually unbranched, elongation delayed 2-6(-10) weeks after leaf initiation; base ± narrowed, ± tenuously attached to root. Leaves basal and cauline, round, shape and lobing similar throughout, largest near bases of stems, often abruptly smaller on upper stems; lower petioles spreading, cauline ascending. Inflorescences ± pyramidal, (2-)6-15(-40) flowered, open, usually 2-6 flowers/5 cm; pedicels spreading, usually more than 1.5 cm long. Bracts markedly smaller and fewer lobed than leaves. Fruits spreading. Seeds obpyramidal 1.6-2.9 mm long × 0.7-1.9 mm wide, ± ringed at chalazal end, usually wing margined; seed coats lack waves; cells elongate; cell margins smooth. Flowering May to August or within six weeks after snowmelt.



Species six; six species endemic to North America. *Delphinium* subsect. *Bicoloria* comprises a group of small spring flowering species, several of which are included in the group of "low larkspurs" from poisonous plant literature.

Species of *Delphinium* subsect. *Bicoloria* depend primarily on moisture from winter snows and rains to support their growth and reproduction. Once that moisture is depleted, the plants become dormant until the following growing season when either rains begin to fall or snow begins to melt.

The most consistent feature to differentiate *Delphinium* subsect. *Bicoloria* from *D.* subsect. *Grumosa* is the long fibrous root structure found in species of the former vs. the shorter more fascicled root structure of the latter.

#### KEY TO SPECIES OF *DELPHINIUM* SUBSECT. *BICOLORIA*

1. Sepals red or yellow. .... 2
  2. Sepals red, reddish or orange, not bright yellow. ....
    - ..... *D. nudicaule* Torrey & A. Gray
  2. Sepals yellow, not red. .... *D. luteum* A. Heller
1. Sepals usually bluish, not red or yellow (sometimes maroon, white, or pink)..... 3
  3. Flowers with maroon sepals; plants usually distinctly different individuals within populations and often with some degree of infertility..... 4
    4. Leaf segments more than 5, 5 mm or less wide. ....
      - ..... *D. nudicaule* × *D. depauperatum*
    4. Leaf segments 5 or fewer, more than 5 mm wide..... 5
      5. Lower stems pubescent. .... *D. nudicaule* × *D. decorum*
      5. Lower stems glabrous..... *D. nudicaule* × *D. patens*
  3. Flowers with blue or pink (not maroon) sepals; plants usually similar to other individuals in the population, usually fully fertile. .... 6
    6. Leaves mostly above lower 1/3 of stem; flowers usually more than 15/main inflorescence axis. .... *D. troliifolium* × *D. nudicaule*
    6. Leaves mostly in lower 1/3 of stem; flowers usually fewer than 20/main inflorescence axis. .... 7
      7. Sepals pinkish; plants usually distinctly different individuals within populations and often with some degree of infertility. .... 8
        8. Plants in populations with red flowers; usually below 1500 m elevation..... *D. nudicaule* × *D. troliifolium*
        8. Plants in populations with blue flowers; usually above 1500 m elevation..... *D. antoninum* × *D. nudicaule*
  7. Sepals blue; plants usually similar to other individuals within populations and fully fertile..... 9
    9. Leaves ± succulent; clustered on lower 1/2 of stems..... 10
      10. Lateral sepals reflexed..... *D. antoninum* Eastw.
      10. Lateral sepals spreading..... *D. glareosum* Greene
    9. Leaves not succulent; clustered on lower 1/2 of stem or not. .... 11
      11. Lower petal blade clefts less than 1/3 blade lengths. .... *D. bicolor*
      11. Lower petal blade clefts more than 1/3 blade lengths.....
        - ..... *D. basalticum* M.J. Warnock

*Delphinium bicolor* Nutt., J. Acad. Nat. Sci. Philadelphia 7:10. 1834. TYPE: UNITED STATES. Montana: on dry hills, near Flathead or Sailish River,



towards the south sources of the Columbia, 24 Apr 1833, *N.B. Wyeth s.n.* (P!); Isotypes: K!, NY!, PH!.

Stems 1-4(-7) dm tall; base often anthocyanous, glabrous to puberulent. Leaves mostly in lower 1/3 of stem, round, glabrous to puberulent; basal (0-)2-7 at anthesis, sometimes anthocyanous abaxially, 2-4 cm long  $\times$  4-7 cm wide, petioles spreading, 4-8 cm long, glabrous to puberulent, 5-11 lobed, lobes 1-8 mm wide; cauline 3-6 at anthesis, 1-4 cm long  $\times$  1.5-7.0 cm wide, petioles ascending, 0.3-5.0 cm long, 3-19 lobed, lobes 1-3 mm wide. Inflorescences 3-12(-22) flowered, 5-17 cm long, open, 2-6 flowers/5 cm, usually unbranched; pedicels 1-4(-8) cm long,  $\pm$  puberulent. Bracteoles subopposite, 2-7(-17) mm from flowers, 4-6(-8) mm long, green, sometimes white margined, lanceolate, puberulent. Sepals dark blue, puberulent, laterals usually spreading, 16-21 mm long  $\times$  6-12 mm wide, spurs straight to gently decurved, elevated 0-40° above horizontal, 13-23 mm long. Lower petal blades covering stamens, 7-12 mm long, clefts 0.1-3.0 mm deep; hairs sparse, short, most numerous on inner lobes below junction of blade and claw, white or yellow. Fruits (12-)16-22 mm long, 4.0-4.5  $\times$  as long as wide, usually puberulent. Seeds obpyramidal, 1.8-2.2 mm long  $\times$  0.7-1.2 mm wide, ringed at chalazal end,  $\pm$  wing margined; cells elongate, surfaces  $\pm$  smooth, shiny; cell margins smooth.

1. Sepals (especially in fresh material) dark blue to purple; plants from nonlimestone derived soils; lower petal clefts 2 mm deep or less. .... *D. bicolor* subsp. *bicolor*
1. Sepals (especially in fresh material) bright dark blue; plants from limestone derived soil; lower petal clefts at least 2 mm deep. .... *D. bicolor* subsp. *calicicola*

*Delphinium bicolor* Nutt. subsp. *bicolor*

*Delphinium bicolor* Nutt., J. Acad. Sci. Philadelphia 7:10. 1834. TYPE: UNITED STATES. Montana: on dry hills, near Flathead or Sailish River, towards the south sources of the Columbia, 24 Apr 1833, *N.B. Wyeth s.n.* (P!); Isotypes: K!, NY!, PH!. *Plectrornis bicolor* (Nutt.) Lunnell, Amer. Midl. Naturalist 4:362. 1916. - Flathead larkspur

*Delphinium bicolor* Nutt. var. *montanense* Rydb., Mem. New York Bot. Gard. 1:157. 1900. LECTOTYPE (Ewan 1945, p. 123): UNITED STATES. Montana: Powell Co., Deer Lodge, 1888, *F.W. Traphagen s.n.* (NY!); Isotype: PH!. *Delphinium bicolor* Nutt. forma *montanense* (Rydb.) Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:123. 1945. *Plectrornis bicolor* (Nutt.) Lunnell var. *montanense* (Rydb.) Lunnell, Amer. Midl. Naturalist 4:362. 1916.

*Delphinium nuttallianum* Pritz. in Walp. var. *pilosa* C.L. Hitchc. in C.L. Hitchc. et al., Vasc. Pl. Pacific NW 2:359. 1964. TYPE: UNITED STATES. Idaho: Lemhi Co., 7 mi E of Tendoy along Lemhi Pass Rd., near old mine tailings, 1 Jul 1957, *C.L. Hitchcock & C.V. Muhlick* 21274 (WTU!).

*Delphinium bicolor* Nutt. forma *devriesii* B. Boivin, Nat. Can. 94:653. 1967. HOLOTYPE: CANADA. Alberta: S of Elkwater Lake Provincial Park, *B. DeVries* 3182 (DAO).

Stems 1-4(-7) dm tall; base often anthocyanous, glabrous to puberulent. Leaves mostly in lower 1/3 of stem, round, glabrous to puberulent; basal (0-)2-7 at anthesis, sometimes anthocyanous abaxially, 2-4 cm long  $\times$  4-7 cm wide, petioles spreading,



4-8 cm long, glabrous to puberulent, 5-11 lobed, lobes 1-8 mm wide; cauline 3-6 at anthesis, 1-4 cm long  $\times$  1.5-7.0 cm wide, petioles ascending, 0.3-5.0 cm long, 3-19 lobed, lobes 1-3 mm wide. Inflorescences 3-12(-22) flowered, 5-17 cm long, open, 2-6 flowers/5 cm, usually unbranched; pedicels 1-4(-8) cm long,  $\pm$  puberulent. Bracteoles subopposite, 2-7(-17) mm from flowers, 4-6(-8) mm long, green, sometimes white margined, lanceolate, puberulent. Sepals dark blue to purplish, puberulent, laterals usually spreading, 16-21 mm long  $\times$  6-11 mm wide, spurs straight to gently decurved, elevated 0-40° above horizontal, 13-18 mm long. Lower petal blades covering stamens, 7-12 mm long, clefts 0.1-2.0 mm deep; hairs sparse, short, most numerous on inner lobes below junction of blade and claw, usually white. Fruits (12-)16-22 mm long, 4.0-4.5  $\times$  as long as wide, usually puberulent.

Flowering late spring to early summer. Dry meadow edges, sage scrub; 600-3100 m elevation; southern Alberta, southeastern British Columbia, southwestern Saskatchewan, Idaho, Montana, northwestern Nebraska, western North Dakota, western South Dakota, and northern Wyoming.

*Delphinium bicolor* is closely related to *D. glareosum* but differs in its more narrowly lobed cauline leaves, shallower lower petal clefts, narrower fruits, earlier flowering, geographic distribution, and lower mean elevation of populations. Rydberg's *D. bicolor* var. *montanense* tends to have more pubescence and larger flowers, but it is otherwise typical and apparently fully intergradient with *D. bicolor* subsp. *bicolor*. Often referred to as one of the "low larkspurs" in poisonous plant literature, the plant is abundant on some ranges and produces some livestock poisoning.

***Delphinium bicolor* Nutt. subsp. *calcicola* M.J. Warnock & Vanderhorst, subsp. nov.** TYPE: UNITED STATES. Montana: Stillwater Co., top of hill, grassland, calcareous soils, 16.5 mi S Jct. Bridger Creek Road and I-90 on Bridger Creek Road, 13 Jun 1983, M.J. Warnock 2819 (SHST!); Isotypes: to be distributed.

*Delphinio bicolori* Nutt. subsp. *bicolori* similis sed differt sepalis obscuro-cyaneis (vs. obscuro-indigoticis vel purpurascensibus) 16-21 mm longis  $\times$  9-12 mm latis (vs. 16-21 mm longis  $\times$  6-11 mm latis), calcaribus sepalorum 15-23 mm longis (vs. 13-18 mm longis), petalis inferi lamina fissa 2 mm vel plus in profunditate (vs. minus quam 2 mm in profunditate), et trichomatibus plerumque flavis (vs. plerumque albis).

Stems 1-3 dm tall; base often anthocyanous, glabrous to subglabrous. Leaves mostly in lower 1/3 of stem, round, glabrous to puberulent; basal 2-5 at anthesis, sometimes anthocyanous abaxially, 1.5-3.5 cm long  $\times$  2.5-4.5 cm wide, petioles spreading, 4-8 cm long, glabrous to puberulent, 5-11 lobed, lobes 1-4 mm wide; cauline 3-6 at anthesis, 1-3 cm long  $\times$  1.5-4.0 cm wide, petioles ascending, 0.3-5.0 cm long, 3-19 lobed, lobes 1-3 mm wide. Inflorescences 3-12 flowered, 5-13 cm long, open, 2-6 flowers/5 cm, usually unbranched; pedicels 1-4 cm long,  $\pm$  puberulent. Bracteoles subopposite, 2-5 mm from flowers, 4-6 mm long, green, lanceolate, puberulent. Sepals dark blue, puberulent, laterals usually spreading, 16-21 mm long  $\times$  9-12 mm wide, spurs straight, elevated 10-40° above horizontal, 15-23 mm long. Lower petal blades covering stamens, 7-12 mm long, clefts 2-3 mm deep; hairs sparse, short, most numerous on inner lobes below junction of blade and



claw, usually yellow. Fruits 16-20 mm long, 4.0-4.5 × as long as wide, usually puberulent.

Flowering late spring to early summer (although usually somewhat later than the type subspecies where they are sympatric). Shortgrass prairie and grassy sagebrush on limestone outcrops (typically found in soils containing stones or large rocks at the surface); 1300-2100 m elevation; Montana.

In the field, *Delphinium bicolor* subsp. *calicicola* is readily distinguished from *D. bicolor* subsp. *bicolor* on the basis of its brighter colored, slightly larger flowers, and its edaphic preference. However, these differences are often not readily apparent from herbarium specimens. Specimens of this taxon misidentified as *D. geyeri* account for most reports of that species from Montana.

***Delphinium basalticum*** M.J. Warnock, *spec. nov.* TYPE: UNITED STATES. Oregon: Multnomah Co., steep N facing slope, basalt substrate, S of road, 0.1 mi W Oneonta Gorge on Old Columbia Highway, Mt. Hood National Forest, 22 May 1990, M.J. Warnock 8528 (SHST!); Isotypes: to be distributed. - Columbia Gorge larkspur

*Delphinio glareoso* E. Greene similis sed differt caulibus ac petiolis inferis plusminusve puberulis (vs. glabris vel glaucis), calcaribus sepalorum 14-18 mm longis (vs. 16-20 mm longis), petali inferi lamina fissa 4-5 mm in profunditate (vs. 2-4 mm in profunditate), et fructibus 3.5-4.0 plo longioribus quam latioribus (vs. 2.5-3.0 plo longioribus quam latioribus).

Stems 1 per root, 2.0-5.0(-6.5) dm tall, unbranched, elongation delayed 2-8 weeks after leaf initiation; base often anthocyanous, puberulent. Leaves basal and cauline, round, subglabrous; basal 1-4 at anthesis, green, darker adaxially, 4-6 cm long × 6-9 cm wide, 5-15 lobed, lobes 3-15 mm wide, petioles spreading, 9-15 cm long, subglabrous; cauline 2-5 at anthesis, 2-5 cm long × 5-8 cm wide, 7-19 lobed, lobes 1-12 mm wide, petioles 0-12 cm long, ascending. Inflorescences (2-)6-16(-26) flowered, pyramidal, 8-22(-35) cm long, open, 2-5 flowers/5 cm, usually branched; pedicels spreading, 2-7 cm long, subglabrous. Bracts trifid to multifid, 1.5-5.0 cm long. Bracteoles subopposite, 4-12 mm from flowers, 3-7 mm long, green, linear, subglabrous. Sepals dark blue, subglabrous, laterals spreading, 15-21 mm long × 7-10 mm wide, spur straight to decurved, elevated 30-45° above horizontal, 14-18 mm long. Lower petal blades slightly elevated, ± exposing stamens, 7-9 mm long, clefts 4-5 mm deep; hairs centered and most common on inner lobe above cleft apex, yellow to white. Fruits spreading, 12-17 mm long, 3.5-4.0 × as long as wide, glabrous. Seeds obpyramidal, 2.2-2.5 mm long × 1.5-1.9 mm wide, ringed at chalazal end, ± wing margined; cells elongate, margins smooth, surfaces smooth, shiny.  $n = 8$  (Sutherland 1967 [as *D. trolliifolium*]).

Flowering in spring (early summer). Basaltic cliff faces, north and east facing slopes at the foot of cliffs; 200-500 m elevation; northwestern Oregon and southwestern Washington.

Most closely related to *Delphinium glareosum*, *D. basalticum* is distinguished by its lack of fleshy leaves, and absence of basal leaves at anthesis. Hybrids with *D. trolliifolium* A. Gray are known.



10. *Delphinium* subsect. *Grumosa* (N.I. Malyutin) M.J. Warnock, *comb. nov.*  
 BASIONYM: *Delphinium* sect. *Grumosa* N.I. Malyutin, Bot. Zhurn. (Moscow  
 and Leningrad) 72(5):689. 1987. TYPE: *Delphinium menziesii* DC.

Roots 0.2-0.7(-1.6) dm long, cormlike to fascicled or fibrous,  $\pm$  fleshy, 1-5(-9) branched; stem buds minute. Stems 1(-2) per root, (1-)2-4(-9) dm tall, usually unbranched, elongation delayed 2-10 weeks after leaf initiation; base narrowed, tenuously attached to root. Leaves basal and cauline, shape and lobing similar throughout, largest leaves near base of stem, usually gradually smaller on upper stems; lower petioles spreading, cauline ascending. Inflorescences  $\pm$  pyramidal, (2-) 6-15(-40) flowered, open, usually 2-6 flowers/5 cm; pedicels spreading, usually more than 1.5 cm long. Bracts markedly smaller and fewer lobed than leaves. Fruits  $\pm$  spreading. Seeds obpyramidal, 1.5-2.7 mm long  $\times$  0.7-2.0 mm wide, ringed at chalazal end, wing margined or not; seed coats usually lacking waves; cells elongate, margins smooth. Flowering March to early July, or within six weeks after snowmelt.

Species thirteen or more; thirteen in North America, possibly others in Asia.

Most similar to *Delphinium* subsect. *Bicoloria*, *D.* subsect. *Grumosa* has roots cormlike to fascicled or fibrous (vs. twisted fibrous), 0.2-0.7(-1.6) dm long, (vs. [0.5]1.0-3.0[-4.0] dm long). *Delphinium* subsect. *Grumosa* is an extremely difficult complex, with many variations in a number of morphological traits. Philosophical extremes in taxonomic approach to the complex are represented by the work of Sutherland (1967) in which the species recognized are large agglomerations, and that of Rydberg (1917) in which species epithets are used for some edaphic variants. The complex has been and continues to be a major source of confusion for identification of *Delphinium* in North America. Most of what are referred to as "low larkspurs" in poisonous plant literature refer to members of this subsection.

*Delphinium* subsect. *Grumosa* comprises a group of small spring flowering species. These species depend primarily on moisture from winter snows and rains to support their growth and reproduction. Once that moisture is depleted, the plants become dormant until the following growing season when either rains begin to fall or snow begins to melt.

#### KEY TO SPECIES OF *DELPHINIUM* SUBSECT. *GRUMOSA*

1. Sepals ochroleucous or pink, if white then white in most members of the population..... 2
2. Flowers with no trace of pink or lavender..... 3
  3. Spurs less than 12 mm long; sepals spreading to erect; lower petals usually blue or purple..... *D. nuttallii* A. Gray
  3. Spurs more than 11 mm long; sepals widely spreading; lower petals usually yellow..... 4
  4. Stems less than 60 cm tall; widest leaf lobe less than 1 cm wide.....  
*D. menziesii*
  4. Stems more than 60 cm tall; widest leaf lobe more than 1 cm wide.....  
*D. menziesii*  $\times$  *D. trolliifolium* = *D.*  $\times$  *pavonaceum* Ewan
2. Flowers (especially sepal spur) with some element of pink or lavender..... 5
  5. Stems less than 50(-70) cm tall; plants in population of individuals many of which have similar sepal color..... 6
  6. Seeds with nipple-like hairs on surface; east of the Great Plains.....



- .....*D. tricornes* Michx.
6. Seeds lacking nipple-like hairs; west of the Great Plains. ....  
.....*D. nuttallianum* Torrey & A. Gray
5. Stems more than (40-)50 cm tall; plants with sepal color dissimilar from that of most other individuals in the population. .... 7
7. Plants in populations with red flowers. ....*D. nudicaule* × *D. trolliiifolium*
7. Plants in populations with blue flowers. ....*D. trolliiifolium* × *D. nudicaule*
1. Sepals bluish, not ochroleucus, if white, then only as sporadic individuals in a population (sometimes maroon or purple). .... 8
8. Flowers with maroon sepals; plants usually distinctly different individuals within populations and often with some degree of infertility. .... 9
9. Lower stems puberulent. ....*D. nudicaule* × *D. decorum*
9. Lower stems glabrous. ....*D. nudicaule* × *D. patens*
8. Flowers blue or bluish purple, rarely white or purple sepals; plants usually similar to other individuals in the population, usually fully fertile. .... 10
10. Leaves mostly above lower 1/3 of stem at anthesis; flowers usually more than 15/main inflorescence axis. .... 11
11. Inflorescences as wide as long or nearly so; Arkansas. ....  
.....*D. newtonianum* Dw. Moore
11. Inflorescences at least twice as long as wide; west of the Great Plains. .... 12
12. Sepals light blue (or pinkish). ....*D. trolliiifolium* × *D. nudicaule*
12. Sepals dark blue to purplish blue. .... 13
13. Lobes of midstem leaves more than 6 mm wide; stems more than (40-)60 cm tall. .... 14
14. Leaf margins crenate. ....*D. bakeri* Ewan
14. Leaf margins ± incised. ....*D. trolliiifolium*
13. Lobes of midstem leaves less than 6 mm wide; stems less than 60(-90) cm tall. .... 15
15. Sepals bluish purple and often fading in press. ....*D. nuttallii*
15. Sepals dark deep blue and retaining color in press. .... 16
16. Lower petals white, yellowish, or tan; lower petal blade clefts no more than 1/3 blade length. ....  
.....*D. sutherlandii* M.J. Warnock
16. Lower petals blue to purple; lower petal blade clefts at least 1/3 blade length. ....*D. nuttallianum*
10. Leaves mostly in lower 1/3 of stems; flowers often fewer than 20/main inflorescence axis. .... 17
17. Sepals dark blue-purple (± drab), often partly fading in press (especially veins, giving sepals of dried specimens a mottled appearance), distinctly puberulent externally, usually not reflexed; lower stems pubescent. .... 18
18. Seeds with nipple-like hairs; at least 2/3 of leaves above lower 1/4 of stems; stems more than (4.5-)6.0 dm tall. ....*D. alabamicum* Kral
18. Seeds lacking nipple-like hairs; at least 1/3 of leaves above lower 1/4 of stems; stems less than 6.0(-8.5) dm tall. .... 19
19. Lower petal blade clefts at least 1/3 blade lengths. ....  
.....*D. decorum* Fisch. & C.A. Mey.
19. Lower petal blade clefts no more than 1/4 blade lengths. ....  
.....*D. menziesii*



17. Sepals bright blue or purple (not drab blue-purple), usually retaining color in press, usually glabrous, often reflexed; if sepals drab blue-purple, puberulent and not reflexed, then lower stems subglabrous to glabrous.....20
20. Lateral sepals strongly reflexed; leaves with usually 5 or fewer lobes extending 60% to petiole (if more than 5, then pedicels puberulent), lobes often more than 7 mm wide.....21
21. Angle between pedicel and rachis nearly 90°; leaf lobes distinctly wedge shaped, widest in distal 1/3.....*D. gracilentum* Greene
21. Angle between pedicel and rachis usually less than 70°; leaf lobes seldom wedge shaped, widest near midpoint.....*D. patens* Benth.
20. Lateral sepals not reflexed or only weakly so; leaves with more than 5 lobes extending more than 60% to petiole, lobes less than 7 mm wide.....22
22. Cauline leaves 2 or fewer and less than 1/2 the size of lower leaves; stems glaucous.....*D. treleasei* Bush
22. Cauline leaves 3 or more and similar in size to lower leaves; stems often glabrous but not glaucous.....23
23. Inflorescences (in normally developed plants) at least 3 × as long as wide; lower petals tan or yellowish, at least 8 mm long.....*D. sutherlandii*
23. Inflorescences (in normally developed plants) less than 3 × as long as wide; lower petals blue (except sometimes in white flowered plants), 3-7(-11) mm long.....24
24. Seeds with nipple-like hairs on surface; east of the Great Plains.....*D. tricornis*
24. Seeds lacking nipple-like hairs; west of the Great Plains.....*D. nuttallianum*

*Delphinium menziesii* DC., *Syst. Nat.* 1:355. 1818. TYPE: [UNITED STATES. Washington:] Nova Georgia, A. *Menzies* s.n. (Banks Herbarium); Isotype: BM!.

Roots 0.3-0.6(-1.0) dm long. Stems 1(-3) per root, (1.0-)3.5-7.0(-8.5) dm tall, unbranched, elongation delayed 4-8 weeks after leaf initiation; bases often anthocyanous, puberulent. Leaves basal and cauline, round, puberulent; basal 0-4 at anthesis, sometimes anthocyanous abaxially, (1.5-)2.5-5.0 cm long × 4-9 cm wide, 5-12 lobed, lobes 2-15 mm wide, petioles spreading, 6-11 cm long, puberulent; cauline 3-7(-10) at anthesis, 2-4 cm long × 3-8 cm wide, 7-18 lobed, lobes 1-10 mm wide, petioles ascending, 0.5-9.0 cm long. Inflorescences 3-15(-43) flowered, pyramidal to narrowly pyramidal, 8-20(-41) cm long, open, 1-4 flowers/5 cm, branched or not; pedicels spreading, 1.5-4.0(-7.0) cm long, (glandular) puberulent. Bracts trifid to multifid, 1-4 cm long. Bracteoles subopposite, 8-10(-24) mm from flowers, 4-6(-9) mm long, green to blue, linear, puberulent. Sepals bluish purple or ochroleucous, puberulent, laterals spreading, (11-)13-20 mm long × 5-11 mm wide, spurs straight, elevated less than 30° above horizontal, 11-17 mm long. Lower petal



blades  $\pm$  covering stamens, 8-12 mm long, clefts 0.2-2.5 mm deep; hairs sparse, well dispersed, but centered and most common near junction of blade and claw above cleft apex, white or blue. Fruits spreading, 11-17 mm long, 3.5-4.0  $\times$  as long as wide, puberulent. Seeds obpyramidal, 1.8-2.2 mm long  $\times$  1.0-1.3 mm wide, ringed at chalazal end, wing margined, waves lacking; cells elongate, surfaces smooth, shiny, cell margins smooth.

*Delphinium menziesii* is often confused with *D. nuttallii*, but may be distinguished by consistently larger flowers and usually fewer flowers per plant in the former than the latter. Interestingly, each species produces both blue-purple and ochroleucous flower colors in separate populations.

1. Sepals blue to purple.....*D. menziesii* subsp. *menziesii*  
 1. Sepals ochroleucous to white..... *D. menziesii* subsp. *pallidum*

*Delphinium menziesii* DC. subsp. *menziesii*

*Delphinium menziesii* DC., *Syst. Nat.* 1:355. 1818. TYPE: [UNITED STATES. Washington:] Nova Georgia, A. Menzies s.n. (Banks Herbarium); Isotype:

BM!. *Delphinium tricornis* Michx. var.  $\gamma$  *menziesii* (DC.) Huth, *Helios* 10(12):37. 1893. *Delphinium tricornis* Michx. subsp. *menziesii* (DC.) Huth, *Bot. Jahrb. Syst.* 20:343. 1895. *Delphinastrum menziesii* (DC.) Nieuwl., *Amer. Midl. Naturalist* 3:172. 1914.

*Delphinium tuberosum* Menzies in Hook., *Fl. Bor. Amer.* 1:25. 1840 *nomen invalidum* (not accepted when published). Non *Delphinium tuberosum* Aucher ex Boiss., *Ann. Sci. Nat.*, ser. II 16:370. 1841.

*Delphinium pauperculum* Greene, *Pittonia* 1:284. 1889. LECTOTYPE (Ewan 1945, p. 106): UNITED STATES. Washington: near the sea coast, Jul 1888, M.A. Knapp s.n. (ND-G!).

*Delphinium oreganum* Howell, *Fl. NW Amer.* 1:22. 1897. TYPE: UNITED STATES. Oregon: near brooks, Willamette Valley, Jun 1882, T. Howell s.n. (ORE).

*Delphinium chilliwacense* Greene, *The Ottawa Naturalist* 16:36. 1902. LECTOTYPE (Ewan 1945, p. 105): CANADA. British Columbia: dry rocky banks, Chilliwack Valley, lower Fraser River Valley, 49-49° 10' N, 121° 25' to 122° W, 19 Jun 1901, J.M. Macoun 33573 (ND-G 3277!).

*Delphinium menziesii* DC. subsp. *pyramidalis* Ewan, *Univ. Colorado Stud.*, ser. D, *Phys. Sci.* 2:107. 1945. TYPE: UNITED STATES. Oregon: Benton Co., Corvallis, 6 May 1916, H.C. Gilbert 1133 (OSC 4151!); Isotypes: NDA, NO!, OSC!. *Delphinium menziesii* DC. var. *pyramidale* (Ewan) C.L. Hitchc. in C.L. Hitchc. et al., *Vasc. Pl. Pacific NW* 2:355. 1964.

Stems 1(-3) per root, (1.0-)3.5-7.0(-8.5) dm tall, unbranched, elongation delayed 4-8 weeks after leaf initiation; bases often anthocyanous, puberulent. Leaves basal and cauline, round, puberulent; basal 0-4 at anthesis, sometimes anthocyanous abaxially, (1.5-)2.5-5.0 cm long  $\times$  4-9 cm wide, 5-12 lobed, lobes 2-15 mm wide, petioles spreading, 6-11 cm long, puberulent; cauline 3-7(-10) at anthesis, 2-4 cm long  $\times$  3-8 cm wide, 7-18 lobed, lobes 1-10 mm wide, petioles ascending, 0.5-9.0 cm long. Inflorescences 3-15(-43) flowered, pyramidal to narrowly pyramidal, 8-20(-41) cm long, open, 1-4 flowers/5 cm, branched or not; pedicels spreading, 1.5-4.0(-7.0) cm long, (glandular) puberulent. Bracts trifid to multifid, 1-4 cm long.



Bracteoles subopposite, 8-10(-24) mm from flowers, 4-6(-9) mm long, green to blue, linear, puberulent. Sepals bluish purple, puberulent, laterals spreading, (11-) 13-20 mm long  $\times$  5-11 mm wide, spurs straight, elevated less than  $30^\circ$  above horizontal, 11-17 mm long. Lower petal blades  $\pm$  covering stamens, 8-12 mm long, clefts 0.2-2.5 mm deep; hairs sparse, well dispersed, but centered and most common near junction of blade and claw above cleft apex, white or blue. Fruits spreading, 11-17 mm long, 3.5-4.0  $\times$  as long as wide, puberulent. Seeds obpyramidal, 1.8-2.2 mm long  $\times$  1.0-1.3 mm wide, ringed at chalazal end, wing margined, waves lacking; cells elongate, surfaces smooth, shiny, cell margins smooth.  $2n = 16$  (Lewis *et al.* 1951).

Flowering in spring. Meadows, open woodlands; 0-1000 m elevation; southwestern British Columbia, western Oregon, and western Washington. Hybrids are known with *Delphinium trolliifolium* and *D. nuttallii*.

***Delphinium menziesii* DC. subsp. *pallidum* M.J. Warnock, *subspec. nov.***

TYPE: UNITED STATES. Oregon: Benton Co., open fields, 12 mi S of Corvallis, 0.5 mi. W of Bruce's Corner, 20 May 1953, A.N. Steward 6351 (US!); Isotypes: ASU!, ISC!, NY(2)!, OSC(3)!, UBC(2)!, UCD!, WS, WTU. - White flowered Menzies' larkspur

*Delphinio menziesii* DC. subsp. *menziesii* similis sed differt caulibus 5-7 dm longis (vs. 3.5-7.0 dm longis), sepalis albis vel ochroleucis 15-20 mm latis  $\times$  7-11 mm longis (vs. 13-20 mm latis  $\times$  11-17 mm longis), et calcaribus 11-15 mm longis (vs. 11-17 mm longis).

Stems 1 per root, 5-7 dm tall, unbranched, elongation delayed 4-8 weeks after leaf initiation; bases often anthocyanous, puberulent. Leaves basal and cauline, round, puberulent; basal 0-4 at anthesis, sometimes anthocyanous abaxially, (1.5-) 2.5-5.0 cm long  $\times$  4-9 cm wide, 5-12 lobed, lobes 2-15 mm wide, petioles spreading, 6-11 cm long, puberulent; cauline 3-7(-10) at anthesis, 2-4 cm long  $\times$  3-8 cm wide, 7-18 lobed, lobes 1-10 mm wide, petioles ascending, 0.5-9.0 cm long. Inflorescences 3-15(-32) flowered, pyramidal to narrowly pyramidal, 8-20(-34) cm long, open, 1-4 flowers/5 cm, branched or not; pedicels spreading, 1.5-4.0(-6.0) cm long, glandular puberulent. Bracts trifid to multifid, 1-4 cm long. Bracteoles subopposite, 8-12 mm from flowers, 4-6 mm long, green, linear, puberulent. Sepals white to ochroleucous, puberulent, laterals spreading, 15-20 mm long  $\times$  7-11 mm wide, spurs straight, elevated less than  $30^\circ$  above horizontal, 11-15 mm long. Lower petal blades  $\pm$  covering stamens, 8-12 mm long, clefts 0.2-2.5 mm deep; hairs sparse, well dispersed, but centered and most common near junction of blade and claw above cleft apex, white or blue. Fruits spreading, 11-17 mm long, 3.5-4.0  $\times$  as long as wide, puberulent. Seeds obpyramidal, 1.8-2.2 mm long  $\times$  1.0-1.3 mm wide, ringed at chalazal end, wing margined, waves lacking; cells elongate, surfaces smooth, shiny, cell margins smooth.  $n = 8$  (Sutherland 1967).

Flowering in spring. Meadows, open woodlands; 50-100 m elevation; western Oregon. Hybrids are known with *Delphinium trolliifolium* and have been named *D. x pavonaceum*.



*Delphinium sutherlandii* M.J. Warnock, *spec. nov.* TYPE: UNITED STATES. Washington: Pend O'Reille Co., nearly level soil, fencerow, moist grassland, E of road, 1.2 mi N Jct. Rt. 20 and Rt. 211 on Rt. 20, 14 Jun 1984, M.J. Warnock 3525 (SHST); Isotypes: to be distributed.

*Delphinio menziesii* DC. similis sed differt basibus caulium ac petiolis inferis glabris (vs. puberulis), petali inferi lamina fissa 2-4 mm in profunditate (vs. 0.2-2.5 mm in profunditate), et folliculis 4.5-5.2plo longioribus quam latoribus (vs. 3.5-4.0plo longioribus quam latoribus).

Stems 1 per root, (1.5-)3.0-7.0 dm tall, unbranched, elongation delayed 2-8 weeks after leaf initiation; bases often anthocyanous, glabrous. Leaves basal and cauline, round, subglabrous; basal 0-2 at anthesis, green, darker adaxially, 3-7(-10) cm long  $\times$  6-13(-18) cm wide, 5-11(-17) lobed, lobes 3-9(-15) mm wide, petioles spreading to ascending, 8-14 cm long, glabrous; cauline 3-7 at anthesis, 1.5-7.0(-9.0) cm long  $\times$  3-13(-16) cm wide, 5-21 lobed, lobes 0.5-6.0(-10.0) mm wide; petioles ascending, 0.4-12.0 cm long. Inflorescences (2-)11-26(-37) flowered, narrowly pyramidal, (4-)12-26(-42) cm long, open, 4-6 flowers/5 cm, branched or not; pedicels spreading, 1-3 cm long, puberulent. Bracts simple to pentafiled, 1-4 cm long. Bracteoles subopposite, 2-7 mm from flowers, 3-5 mm long, green to blue, linear lanceolate, puberulent. Sepals dark blue, puberulent, laterals spreading, 14-20 mm long  $\times$  5-10 mm wide, spurs gently decurved, elevated 0-20° above horizontal, 14-18 mm long. Lower petal blades slightly elevated,  $\pm$  covering stamens, 8-12 mm long, clefts 2-4 mm deep; hairs short, sparse, most common just below junction of blade and claw, slightly offset to inner lobes, white. Fruits  $\pm$  spreading, (13-)18-25 mm long, 4.5-5.2  $\times$  as long as wide, puberulent. Seeds obpyramidal, 1.3-1.7 mm long  $\times$  0.7-1.0 mm wide, ringed at chalazal end, lacking waves, winged on one margin; cells elongate, surfaces roughened, shiny, cell margins smooth.  $n = 8$  (Ornduff 1957 [as *Delphinium nuttallianum*]).

Flowering in spring. Dry meadows, rock outcrops, open conifer woods; 400-800 m elevation; southwestern Alberta, northern Idaho, western Montana, eastern Washington.

*Delphinium nuttallii* A. Gray, Bot. Gaz. (Crawfordsville) 12(3):54. 1887. TYPE: UNITED STATES. Columbia Plains, T. Nuttall s.n. (GH!); Isotypes: BM!, K!, NY!.

Roots 0.3-0.6(-1.0) dm long,  $\pm$  fleshy. Stems 1 per root, 2-6(-9) dm tall, elongation delayed 2-8 weeks after leaf initiation; bases usually anthocyanous, pubescent. Leaves mostly in lower 1/2 of stem, round to reniform, pubescent; basal 0-2 at anthesis, green on both surfaces, 2.5-8.0 cm long  $\times$  5-14 cm wide, 5-12 lobed, lobes 4-7 mm wide, petioles spreading, 6-19 cm long, puberulent; cauline 3-10 at anthesis, 2-6 cm long  $\times$  3-8 cm wide, 7-18 lobed, lobes 1-5 mm wide; petioles ascending, 0.3-12.0 cm long. Inflorescences 5-25(-40) flowered, narrowly pyramidal, 9-20(-40) cm long, open, 3-7 flowers/5 cm, unbranched; pedicels spreading, 1.5-4.0(-9.0) cm long, puberulent. Bracts simple to pentafiled, 0.5-2.0 cm long. Bracteoles subopposite, 2-3 mm from flowers, 4-6 mm long, green, linear, puberulent. Sepals bluish purple to ochroleucous, puberulent, laterals  $\pm$  spreading, 8-11 mm long  $\times$  3-6 mm wide, spurs straight, slightly elevated, 9-13 mm long.



Lower petal blades  $\pm$  covering stamens, 4-6 mm long, clefts 0.5-2.0 mm deep; hairs well dispersed, most common near margins and cleft apex, white to yellow or blue. Fruits  $\pm$  spreading, 10-14(-18) mm long, 3.5-4.0  $\times$  as long as wide, pubescent. Seeds obpyramidal, 1.5-2.0 mm long  $\times$  1.0-1.5 mm wide, ringed at chalazal end, lacking waves, wing margined; cells elongate, surfaces smooth, cell margins smooth.

*Delphinium nuttallii* is often confused with *D. menziesii*, but may be distinguished by consistently smaller flowers and usually more flowers per plant in the former than the latter. Interestingly, each species produces both blue-purple and ochroleucous flowers in separate populations.

1. Sepals blue or bluish purple; spurs 10 mm or more long. .... *D. nuttallii* subsp. *nuttallii*
1. Sepals white or light yellow; spurs 10 mm or less long. .... *D. nuttallii* subsp. *ochroleucum*

*Delphinium nuttallii* A. Gray subsp. *nuttallii*

*Delphinium nuttallii* A. Gray, Bot. Gaz. (Crawfordsville) 12(3):54. 1887. TYPE: UNITED STATES. Columbia Plains, T. Nuttall s.n. (GH!); Isotypes: BM!, K!, NY!. *Delphinium exaltatum* W.T. Aiton  $\epsilon$  *nuttallii* (A. Gray) Huth, Helios 10:36. 1893. *Delphinium bicolor* Nutt. var. *nuttallii* (A. Gray) Huth, Bot. Jahrb. Syst. 20:345. 1895. *Delphinium columbianum* Greene, Erythea 2:193. 1894. *Delphinium columbianum* was published as a *nomen novum* because *Delphinium nuttallii* was interpreted as a later homonym for *Delphinium nuttallianum* Torrey & A. Gray. - Nuttall's larkspur.

Stems 1 per root, 4-7 dm tall, elongation delayed 2-8 weeks after leaf initiation; bases usually anthocyanous, pubescent. Leaves mostly in lower 1/2 of stem, round to reniform, pubescent; basal 0-2 at anthesis, green on both surfaces, 2.5-8.0 cm long  $\times$  5-14 cm wide, 5-12 lobed, lobes 4-7 mm wide, petioles spreading, 6-19 cm long, puberulent; cauline 3-10 at anthesis, 2-6 cm long  $\times$  3-8 cm wide, 7-18 lobed, lobes 1-5 mm wide; petioles ascending, 0.3-12.0 cm long. Inflorescences 5-25(-40) flowered, narrowly pyramidal, 9-20(-40) cm long, open, 3-7 flowers/5 cm, unbranched; pedicels spreading, 1.5-4.0(-9.0) cm long, puberulent. Bracts simple to pentafid, 0.5-2.0 cm long. Bracteoles subopposite, 2-3 mm from flowers, 4-6 mm long, green, linear, puberulent. Sepals bluish purple to ochroleucous, puberulent, laterals  $\pm$  spreading, 8-11 mm long  $\times$  3-6 mm wide, spurs straight, slightly elevated, 9-13 mm long. Lower petal blades  $\pm$  covering stamens, 4.0-6.5 mm long, clefts 0.5-2.0 mm deep; hairs well dispersed, most common near margins and cleft apex, white to yellow or blue. Fruits  $\pm$  spreading, 10-14(-18) mm long, 3.5-4.0  $\times$  as long as wide, pubescent.  $n = 8$  (Sutherland 1967).

Flowering in late spring to early summer. Rock outcrops, rocky meadows; 20-300 m elevation; northwestern Oregon and southwestern Washington.

*Delphinium nuttallii* A. Gray subsp. *ochroleucum* (Nutt.) M.J. Warnock, comb. nov. BASIONYM: *Delphinium menziesii* DC. [var.]  $\beta$  *ochroleucum* Nutt. in Torrey & A. Gray, Fl. N. Amer. 1:31. 1838. TYPE: UNITED STATES. Oregon: open prairies and along the banks of the Wahlamet [sic], [1834], T. Nuttall s.n. (GH!); Isotypes: BM!, K(2)!, NY!. - light yellow flowered larkspur.



- Delphinium leucophaeum* Greene, Erythea 3:118. 1895. TYPE: UNITED STATES. Oregon: 1882, T.S. Brandegee s.n. (CAS!); Isotype: BM!.  
*Delphinium nuttallii* A. Gray var. *leucophaeum* (Greene) K.C. Davis, Minnesota Bot. Stud. 2:450. 1900. *Delphinastrum leucophaeum* (Greene) Nieuwl., Amer. Midl. Naturalist 3:1172. 1914.  
*Delphinium willametense* Suksd., Deutsch. Bot. Monatsch. 16:210. 1898. LECTOTYPE (Ewan 1945, p. 110): UNITED STATES. Oregon: Clackamas Co., auf feuchten Plätzen, oft im Gebusch, bei Milwaukie am Willamette Flusse, 16 Jul 1893, W.N. Suksdorf 2225 (WS); Isolectotypes: F!, MIN!, MO!, ND-G!, NY!, P(2)!, UC(2)!, US!.

Stems 1 per root, 3-6 dm tall, unbranched; base anthocyanous,  $\pm$  long puberulent. Leaves mostly in lower 1/2 of stems, round to reniform, puberulent especially abaxially; basal 0-2 at anthesis, green, 2.5-6.0 cm long  $\times$  5-11 cm wide, petioles spreading, 6-13 cm long, long puberulent, 5-12 lobed, lobes 4-7 mm wide; cauline 3-9 at anthesis, 2-5 cm long  $\times$  3-8 cm wide, 7-18 lobed, lobes 1.5-5.0 mm wide, petioles 0.3-7.0 cm long, ascending. Inflorescences 5-12(-33) flowered, narrow pyramidal, 9-20(-29) cm long, open, 3-7 flowers/5 cm, unbranched; pedicels spreading to ascending, 1.5-4.0(-6.0) cm long, puberulent. Bracts simple to pentafid, 0.5-2.0 cm long. Bracteoles subopposite, 2-8(-14) mm from flowers, 3-5 mm long, green, lanceolate to linear, puberulent. Sepals ochroleucous to white, puberulent, laterals  $\pm$  spreading, 10-16 mm long  $\times$  5-7 mm wide, spurs straight, 9-11 mm long. Lower petal blades  $\pm$  covering stamens, 4-6 mm long, clefts 1-2 mm deep; hairs sparse or common, centered and most dense below junction of blade and claw, yellow or white. Fruits  $\pm$  spreading, 5-14(-18) mm long, puberulent, 3.5-4.0  $\times$  as long as wide.  $n = 8$  (Sutherland 1967).

Flowering in late spring. Rock outcrops, rocky meadows; 50-100 m elevation; northwestern Oregon.

The range of morphological features of *Delphinium nuttallii* subsp. *ochroleucum* is almost completely encompassed within *D. nuttallii* subsp. *nuttallii*. Sepal color is the only feature consistently separating the two subspecies. Were it not for the fact that a given population typically contains plants of only one flower color, a rank of forma would be more appropriate.

#### ACKNOWLEDGMENTS

Dr. Guy Nesom and Dr. John Strother made helpful comments on the manuscript. Dr. Nesom provided the Latin diagnoses. I thank them both for their assistance.

#### LITERATURE CITED

- Boissier, P.E. 1841. *Plantae Aucherianae orientalis enumeratae cum novarum specierum descriptione*. Ann. Sci. Nat., ser. II 16:347-377.  
 Boivin, P. 1967. Enumeration des plantes du Canada VII--Resume statistique et regions adjacentes. Nat. Can. 94:625-655.  
 Candolle, A.P. de, 1818. *Delphinium* in *Regni Vegetabilis Systema Naturale*. Treuttel & Wurtz, Paris. 1:340-364.



- Davis, K.C. 1900. Native and garden delphiniums of North America. *Minnesota Bot. Stud.* 2:431-457.
- Ewan, J.A. 1936. The genus *Delphinium* in North America: series *Pelligerae* of subsection *Subscaposa*, and miscellaneous noteworthy species. *Bull. Torrey Bot. Club* 63:327-342.
- Ewan, J.A. 1942. The genus *Delphinium* in North America: series *Echinatae* of subsection *Subscaposa*, and miscellaneous noteworthy species. *Bull. Torrey Bot. Club* 69:137-150.
- Ewan, J.A. 1945. A synopsis of the North American species of *Delphinium*. *Univ. Colorado Stud., ser. D, Phys. Sci.* 2:55-244.
- Gray, A. 1887. *Delphinium*, an attempt to distinguish the North American species. *Bot. Gaz. (Crawfordsville)* 12(3):49-54.
- Greene, E.L. 1881. New species of plants from New Mexico. *Bot. Gaz. (Crawfordsville)* 6(1):156-158.
- Greene, E.L. 1889. New or noteworthy species--IV. *Pittonia* 1:280-287.
- Greene, E.L. 1894. Corrections in nomenclature--V. *Erythea* 2:192-194.
- Greene, E.L. 1895. Novitates occidentales--XV. *Erythea* 3:118-121.
- Greene, E.L. 1902. New northwestern plants. *The Ottawa Naturalist* 16(2):35-39.
- Greuter, W., J. McNeill, *et al.* 1994. *International Code of Botanical Nomenclature* (Tokyo Code). *Regnum Vegetabile* vol. 131. Koeltz Scientific Books, Königstein, Germany.
- Hitchcock, C.L., A. Cronquist, M. Ownbey, & J.W. Thompson. 1964. *Delphinium* in *Vascular Pl. of the Pacific Northwest*. 2:346-366. University of Washington Press, Seattle, Washington.
- Hooker, W.J. 1840. *Delphinium* in *Flora Boreali Americana* 1:25. Henry G. Bohn, London, Great Britain.
- Howell, T. 1897. *Delphinium* in *A Flora of Northwest America* 1:22-25. Portland, Oregon.
- Huth, E.L. 1893. Die *Delphinium*-Arten der Vereinigten Staaten von Nord-Amerika. *Helios* 10(12):27-39.
- Huth, E.L. 1895. Monographie der Gattung *Delphinium*. *Bot. Jahrb. Syst.* 20:322-499.
- Lewis, H., C. Epling, G.A.L. Mehlquist, & C.C. Wyckoff. 1951. Chromosome numbers of Californian *Delphinium* and their geographical occurrence. *Ann. Missouri Bot. Gard.* 38:101-117.
- Linnaeus, C. 1753. *Species Plantarum*. Stockholm, Sweden.
- Lunnell, J. 1916. *Delphinium* in Vascular plants of North Dakota. *Amer. Midl. Naturalist* 4:361-362.
- Malyutin, N.I. 1987. The system of the genus *Delphinium* (Ranunculaceae) based on the morphological features of seeds. *Bot. Zhurn. (Moscow and Leningrad)* 72(5):683-693.
- Nieuwland, J.A. 1914. Critical notes on new and old genera of plants--I. *Amer. Midl. Naturalist* 3:170-173.
- Nuttall, T. 1834. A catalogue of a collection of plants made chiefly in the valleys of the Rocky Mountains or northern Andes towards the sources of the Columbia River by Nathaniel B. Wyeth and described by T. Nuttall. *J. Nat. Sci. Philadelphia* 7:1-60.
- Ornduff, R. 1957. Documented chromosome numbers of plants. *Madroño* 14:111-112.
- Rydberg, P.A. 1900. *Delphinium* in Catalogue of the flora of Montana and Yellowstone National Park. *Mem. New York Bot. Gard.* 1:154-157.



- Rydberg, P.A. 1917. *Flora of the Rocky Mountains and Adjacent Plains*.  
Published by the author, New York, New York.
- Suksdorf, W.N. 1898. Washingtonische pflanzen. Deutsch Bot. Monatsch.  
16(11):209-212.
- Sutherland, D.M. 1967. A taxonomic revision of the low larkspurs of the Pacific  
Northwest. PhD. dissertation, University of Washington, Seattle, Washington.
- Torrey, J. & A. Gray. 1838. *Delphinium* in *Flora of North America*. vol. 1. Wiley  
& Putnam, New York, New York.
- Wang, W.T. 1962. Acta Bot. Sinica 10(2):59-89.
- Warnock, M.J. 1993. (1070) Proposal to conserve 2539 *Delphinium* L.  
(Ranunculaceae) with a conserved type. Taxon 42:453-456.





Warnock, Michael J. 1995. "A taxonomic conspectus of North American Delphinium." *Phytologia* 78, 73–101. <https://doi.org/10.5962/bhl.part.1924>.

**View This Item Online:** <https://www.biodiversitylibrary.org/item/47154>

**DOI:** <https://doi.org/10.5962/bhl.part.1924>

**Permalink:** <https://www.biodiversitylibrary.org/partpdf/1924>

#### **Holding Institution**

New York Botanical Garden, LuEsther T. Mertz Library

#### **Sponsored by**

The LuEsther T Mertz Library, the New York Botanical Garden

#### **Copyright & Reuse**

Copyright Status: In copyright. Digitized with the permission of the rights holder.

Rights Holder: Phytologia

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.