

Dichotomous Key to the Members of the Onagraceae Family
Found in the Gothic Area

Field Botany Project, Rocky Mountain Biological Laboratory
Instructor: George Weiblen

By Deb Bartholomew
(Collaborating with Courtney Gomola)

Introduction

The Onagraceae Family of plants is the Evening Primrose Family. There are four genera with fifteen individual species of this family that have been found in the vicinity of Rocky Mountain Biological Laboratory in Gothic, Colorado. The four genera found in the Gothic area are the *Epilobium*, *Oenothera*, *Chamerion*, and *Gayophytum*. This project focuses on the identification of the individual species found in the Gothic area.

Methods

In order to identify species, we needed to create a key. Two types of keys are generally used to identify plant species. With an interactive key the user can select many choices which all add up to a clear identification. Using a dichotomous key is like traveling on a road with many forks: each successive decision between two choices eliminates selections until only one species is left. The decision to make a dichotomous key instead of an interactive key was based on the fact that we did not have sufficient time to gather the amount of information needed and to create the online interface required for a good interactive key.

We created our species list for the Gothic area based on information found in *Vascular Plants of the Gothic Area*, Third edition, by Barbara A. Frase and Paul Buck, published in 2007 by Rocky Mountain Biological Laboratory. I was responsible to provide the key that would deal with the genera *Oenothera*,

Chamerion, and *Gayophytum*. I used the descriptions provided on the The Jepson Online Interchange, a resource developed by the University of California at Berkeley. See the following website: <http://ucjeps.berkeley.edu/interchange/>. I also used information from *Colorado Flora: Western Slope*, Third edition, by William A. Weber and Ronald C. Wittman, published in 2001 by University Press of Colorado. Courtney used other resources to create the part of the key that would deal with the genus *Epilobium*. Listing specific dividing characteristics, we created a dichotomous key to identify each separate species. Photographs were used to complete the final product. Courtney then placed the information from the finished key into the website <http://fm1.fieldmuseum.org/keystonature/rmbll/>.

I also collected and labeled herbarium specimens for the following species: *Gayophytum ramosissimum*, *Gayophytum diffusum*, *Oenothera elata*, and *Chamerion angustifolium*.

Results

Our final product is entitled *Dichotomous Key to the Members of the Onagraceae Family Found in the Gothic, Colorado Area*, and is appended to the end of this report. This key successfully identifies the species of this family that are found near the Rocky Mountain Biological Laboratory in Gothic, Colorado.

Discussion

Our key seems to work fairly well. The class tested it with several species, both freshly collected plants and dried herbarium specimens. There were a few difficulties, most notably in the petal length used to determine the difference between *Oenothera villosa* and *Oenothera elata*. From all the information available to us, we were unable to make any changes in the key that would make

these two easier to tell apart. They are very similar. The *Gayophytum* species are very difficult to tell apart, as well.

In checking some of the specimens in the Rocky Mountain Biological Laboratory herbarium, we found discrepancies in the labeling of some of the specimens when we checked them against reliable online resources. It appears that there may be some errors in identification. This complicated the matter of checking our key. This suggests that it may be appropriate to have the herbarium specimens re-examined and verified by a botanist who is an expert in Colorado flora.

If we had had more time for our project, it would have been nice if we could have collected more specimens ourselves to use both in building our key and also in checking it. However, I am fairly confident that the sources used are reliable, and that the dichotomous key we created is accurate and workable.

Dichotomous Key to the Members of the Onagraceae Family Found in the Gothic, Colorado Area

Compiled by Courtney Gomola and Deb Bartholomew
Field Botany Class, RMBL, Summer 2009

ONAGRACEAE FAMILY

The Onagraceae Family of plants is the Evening Primrose Family. There are four genera with fifteen individual species of this family that have been found in the vicinity of Rocky Mountain Biological Laboratory in Gothic, Colorado. The evening primroses are not related to true primroses. Their floral formula is unique: 4 sepals, 4 petals, 8 stamens, and 4 united carpels in an inferior ovary. Because of their parts in fours, care must be taken not confuse them with the mustards. The four genera found in the Gothic area are the *Epilobium*, *Chamerion*, *Gayophytum*, and *Oenothera*.

1. A. Ovary has 4 locules.....2
- B. Ovary has 2 locules.....11
2. A. Radial or bilateral flowers open in the day, stigmas spherical or club-like.....3
- B. Radial flowers generally opening in the evening, deeply lobed stigmas, anthers attached at middle.....12

3. *Epilobium*

Annual to sub-shrub plant with generally opposite fine-toothed leaves with obscure veins. Inflorescence generally a raceme with bracts, flowers with radial or bilateral symmetry with straight cylindric to club-like fruit and seeds generally in 1 row per chamber with white, deciduous hair-tuft.

- A. Smaller flowers with notched petals, hypanthium prolonged past ovary.....4
- B. Larger flowers with long entire petals, hypanthium not prolonged past ovary.....14
4. A. Annual plant, with alternate leaves, seed has tuft of pale yellow hairs at tip, stems peeling.....*Epilobium brachycarpum* C. Presl

A common annual plant in dry open woodlands, grasslands and roadsides below 3300 m. 20-200cm in height, glabrous and peeling below, generally glandular-hairy above. Linear to narrowly elliptical



leaves 10-50mm, acuminate and generally folded along midrib. White to rose-purple petals with stamens $\leq$ to pistil, fruits glabrous or glandular.

- B. Perennial plants, mostly opposite leaves, stems not peeling.....5
- 5. A. Plants in clumps.....6
- B. Plants not in clumps, erect stems.....7
- 6. A. Inflorescence nodding in bud, lines of hair down 2 raised ridges along stem, red sepals, seeds 1 mm long.....*Epilobium anagallidifolium* Lam.

Perennial plant found in moist alpine slopes, meadows and stream banks at elevations between 2100-3700m. Less than 20cm height. Leaves <2 cm long, basal leaves spoon-shaped to oblong, glabrous; upper leaves elliptic to lanceolate, petiole 1-6mm. Pink to rose-purple petals, subglabrous fruit 17-36mm. Hairs persistent on seeds.



- B. Inflorescence erect in bud, seeds 1.5 – 2 mm long.....*Epilobium clavatum* Trel.

Perennial plant found on subalpine scree and rocky stream banks at elevations between 1200-3600m. Less than 22cm height. Leaves 12-28mm long, more or less elliptic to ovate, obtuse to subacute, petiole 0-3mm. Hypanthium 0.6-2mm. Sepals 2.5-4.5mm. Petals 3.5-6mm, pink to rose-purple. Stigma widely club-like. Fruit 20-40mm, generally sparsely hairy with pedicel 2-18mm. Seeds 1.5-2.1mm, papillate.



- 7. A. Leaves >5 cm long, plants up to 100cm tall, pink or white petals, found in montane zones.....*Epilobium ciliatum* (Lehm.) Dorn

Perennial plant abundant in disturbed area, moist meadows, stream banks and roadsides at elevations less than 4100m. Loosely clumped plants <190 cm, basal rosettes or fleshy bulbles with narrowly lanceolate to ovate leaves (1-15cm) and conspicuous veins. Inflorescence is densely strigose and generally



glandular with white to rose-purple petals on flower. Stigmas club or head-like; hairy fruit. Seeds are ridged.

B. Leaves <5cm long, plants <30 cm tall, found in montane and subalpine zones.....8

8. A. Leaves not clasping stem, winged petioles, petals all white or with pink tips (turn pink after pollination), found in boreal and montane zone.....
.....*Epilobium lactiflorum* Haussk.

Perennial plant generally clumped 15-50cm high found in moist meadows, stream banks and talus at elevations 1400-3300 m with short, leafy stolons. Leaves are narrowly ovate-narrowly lanceolate, obtuse to acute and have winged petioles. Glandular inflorescence is nodding to erect, flowers with white/pink petals. Hairy fruit with netted seed.



B. Not as described above, petals not usually white.....9

9. A. Leaf elliptic to ovate with rounded base, grows from fleshy, scaly, underground shoots, found in moist meadows and stream sides.....
.....*Epilobium saximontanum* Haussk.

Perennial plant <60cm found at elevations 1400-3500m. Has subsessile, generally clasping leaves and a glandular hypanthium. White/pink petals with hairy fruit and low-papillate seeds.



B. Leaves lanceolate to ovate, obtuse to acute, pedicels >5mm.....10

10. A. More or less nodding inflorescence, white petals, lanceolate often irregularly dentate leaves, turions present.....*Epilobium hallianum* Haussk.

Erect, perennial plant growing up to 60cm in height at moist meadows and stream banks at elevations 600-3200m. Small winter bulblets found underground. Ovate leaves on lower stem and lanceolate leaves higher up, obtuse to subacute. Inflorescence a nodding raceme of glandular flowers with white to pink petals, sometimes hairy fruit with papillate seeds.



B. Leaves entire or with few shallow teeth, magenta petals, stems with 4 or glabrous leaves, turions absent.....*Epilobium hornemannii* Rchb.

Perennial plant, 10-45cm in height found loosely clumped in moist meadows and streambanks at 1500-3400m. Short, leafy stolons, leaves lanceolate to ovate (narrower above) 15-55mm, generally glabrous, obtuse to acute. Glandular inflorescence with white/pink to rose/purple petals, hairy fruit with papillate seeds.

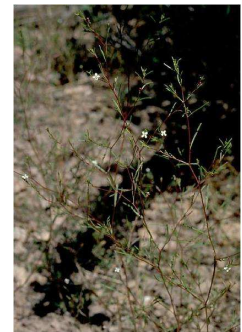


11. *Gayophytum*

Annual plants with generally erect stems. Leaves are cauline, alternate (or lowest subopposite), entire, and narrow-lanceolate. Flowers are axillary and are white, fading pink. Hypanthium is inconspicuous. Sepals 4, staying fused in 2's or coming free; petals 4; and stamens 8, those opposite the sepals being larger. Ovary chambers 2. Stigma generally does not extend beyond the anthers, and is generally touching them. Fruit is a capsule with 4 valves, generally coming free.

11. A. Petals 0.7 - 1.5 mm, ovary glabrous or puberulent.....
.....*Gayophytum ramosissimum* Torr. & A. Gray

Plant herbage is more or less glabrous. Stem is less than 50 cm, branching throughout, forked except at the base. Leaves 1 - 4 cm, much reduced above. First flower in inflorescence is 5 - 15 nodes above the base. Fruit is 3 - 9 mm and slightly knobby. Habitat: sagebrush scrub.



B. Petals 1.2 - 7 mm, ovary hairy.....*Gayophytum diffusum* Torr. & A. Gray

Stem is less than 60 cm, may branch at base or not, is generally forked above. Leaves 1 - 6 cm, generally reduced above. First flower in inflorescence is 1 - 20 nodes above the base. Fruit is 3 - 15 mm and slightly to very knobby. Common. Habitat: open montane forest, sagebrush scrub.



12. **Oenothera**

Perennial or biennial plants. Leaves alternate and generally lanceolate. Flowers yellow and generally opening at dusk. Flowers have radial symmetry. Sepals 4, and reflexed; petals 4, with notched tips; stamens 8, with anthers attached at middle. Ovary chambers 4.

12. A. Plant stemless; leaves irregularly-pinnately-lobed in basal rosette.....
.....*Oenothera flava* (A. Nelson) Garrett

Perennial plant with a fleshy taproot. Hairs glandular and generally minutely strigose. Leaves oblanceolate and somewhat fleshy. Flowers are axillary. Hypanthium 24 – 80 mm. Sepals 10 – 34 mm, with free tips in bud. Petals 10 – 30 mm. Fruit 10 – 40 mm long and 4 – 7 mm wide, narrowly elliptic, with wings 2 – 6 mm wide. Habitat: drying depressions, streambanks, generally clay soils, sagebrush scrub to pinyon/juniper woodland.



- B. Plant with stem; leaves cauline.....13

13. A. Sepals 9-18mm, often reddish; petals 7-20 mm.....*Oenothera villosa* Thunb.

Biennial plant, rosetted, minutely strigose, and especially in inflorescence also glandular. Hairs also long and spreading, generally with red, blister-like bases. Stem erect, 5 – 20 dm. Cauline leaves 10 – 30 cm, entire or minutely dentate. Inflorescence is a spike, open and few-flowered. Hypanthium 25 – 40 mm. Sepals have free tips in bud 0.5 – 2.5 mm. Fruit 20 – 35 mm long and 4 – 7 mm wide, narrowly lanceolate and more or less straight. Habitat: moist openings in forests.



- B. Sepals 27 – 48 mm; petals 25 – 52 mm.....*Oenothera elata* Kunth

Biennial or short-lived perennial, densely minutely strigose, and especially in inflorescence also glandular. Hairs also long, appressed to spreading, sometimes with red, blister-like bases. Stem erect, 4 – 25 dm. Cauline leaves 4 – 25 cm, dentate to subentire. Inflorescence is a spike. Hypanthium 20 – 48 mm. Sepals have free tips in bud 1 – 7 mm. Fruit 20 – 65 mm long



and 4 – 7 mm wide, narrowly lanceolate and more or less straight. Habitat: moist places.

14. **Chamerion**

Perennial plants. Leaves alternate, finetoothed, and lanceolate. Flowers pink to purple. Inflorescence is a raceme with bracts. Sepals 4, and are erect; petals 4; stamens 8 with anthers attached at middle. Ovary chambers 4. Fruit straight and cylindric.

14. A. Plant 30 – 300 cm tall; racemes elongate, many-flowered, not leafy; style longer than the stamens.....*Chamerion angustifolium* L.

A strongly colonial plant, more or less glabrous to densely strigose above. Leaves are 15 – 200 mm, with more or less conspicuous veins and the midrib strigose below. Leaf petioles are 2 – 7 mm. The inflorescence is dense, generally canescent. Flower nodes in bud. Sepals are 7 – 16 mm; petals are 10 – 25 mm and entire. Stamens are shorter than the pistil, maturing before the stigma. Pollen is bluish gray, shed singly. Stigma is 4-lobed. Fruit is 40 – 100 mm, gray-hairy, with a pedicel of 7 – 20 mm. Common. Habitat: open places, gravel bars, roadsides, especially after fires.



B. Plant 5 – 40 cm tall; racemes few-flowered, leafy; style shorter than the stamens.....*Chamerion latifolium* L. Holub

Plant is clumped from a woody caudex, more or less glabrous to densely strigose. Leaves are 10 – 100 mm, widely lanceolate, and can be glabrous or hairy on margins and veins. Leaf petioles are 0 – 3 mm. The inflorescence is more or less strigose. Flower nodes in bud. Sepals are 10 – 24 mm; petals are 13 – 32 mm and entire. Stamens are shorter than the pistil, maturing before the stigma. Pollen is grayish, shed singly. Stigma is 4-lobed. Fruit is 30 – 105 mm, subglabrous to gray-hairy, with a pedicel of 5 – 18 mm. Habitat: gravel bars, talus slopes, glacial outwashes.



Works Cited:

Species Names for the Gothic Area:

Frase, Barbara A. and Paul Buck. 2007. *Vascular Plants of the Gothic Area*. Third edition. Rocky Mountain Biological Laboratory. 28 pp.

Family Descriptions:

Weber, William A. and Ronald C. Wittman. 2001. Colorado Flora: Western Slope. Third edition. University Press of Colorado, Niwot, CO. 488 pp.

Genus and Species Descriptions:

Website of The Jepson Online Interchange, University of California at Berkeley:
<http://ucjeps.berkeley.edu/interchange/>.

Photo Credits:

Gayophytum ramosissimum taken by W. L. Wagner, available on the website of the Smithsonian National Museum of Natural History: <http://botany.si.edu/onagraceae/>.

Epilobium hallianum taken by Doreen L. Smith, available on the CalFlora website
http://calphotos.berkeley.edu/cgi/img_query?enlarge=0000+0000+1108+1647

Epilobium clavatum taken by Susan McDougall, available on the website of the USDA Natural Resources Conservation Service: <http://plants.usda.gov/>.

All other photos taken by Mel Harte, available on the Rocky Mountain Biological Laboratory website: <http://rmbi.org/herbarium/index1.html>.