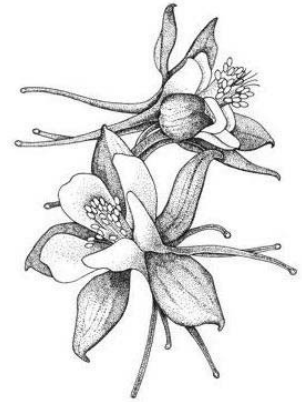


# Aquilegia

Newsletter of the Colorado Native Plant Society



“... dedicated to the appreciation and conservation of the Colorado native flora”

## Updated generic keys of Poaceae for Southern Rocky Mountain Region, Part 2: *Poa* L.

by Neil Snow

This is the second in a series of articles that provides updated dichotomous keys for some of the larger and more ecologically common genera of grasses in the Southern Rocky Mountain Region.

Comprehensive keys and descriptions of *Poa* were published recently in *Flora of North America* (Vol. 24). The FNA treatment was written by Dr. Robert J. Soreng of the United States National Herbarium (Smithsonian Institution), who has extensive experience with the genus in North America and other parts of the world.

The following dichotomous key, based largely on Soreng's treatment in FNA, separates the 25 known species for our region, which include several subspecies, and one species expected to be found in our region (*P. bolanderi*). Its preparation was necessary to re-key material at the University of Northern Colorado Herbarium (GREE) for the production of an interactive key to *Poaceae* (Snow, in prep.). Keys for taxa occurring in Wyoming (Dorn 2001) were also consulted for this treatment.

This key requires that the user not confuse hairs arising from the callus -- the thickened tissue upon which the floret is borne -- with those on the base of the lemma. All measurements refer to length, unless indicated otherwise. Lemnata lengths always refer to the lowermost lemma. As with nearly all keys that include grasses, users must correctly determine the presence or absence of rhizomes. To help assure this, grasses always should be collected with plenty of material from the base and root crown, as rhizomes of some species can be short or relatively inconspicuous.

### ACKNOWLEDGEMENTS

I thank Rob Soreng for annotating many GREE *Poa* specimens in 1999. Many *Poa* specimens at GREE were gifts from Ron Hartman (RM). Support to work on *Poaceae* in summer of 2007 was provided by the National Science Foundation (DBI-0237149) to N. Snow.

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“Poaceae” continues on page 2

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## Key to Species of *Poa*

1. Plants annual .....	2
1. Plants perennial.....	5
2. Culms bulbous at base; spikelets often viviparous.....	<i>Poa bulbosa</i> L.
2. Culms lacking bulbs at base; spikelets not viviparous.....	3
3. Callus glabrous, lacking arachnose hairs.....	<i>P. annua</i> L.
3. Callus at least sparsely webbed.....	4
4. Lower glume much shorter than upper glume.....	<i>P. bolanderi</i> Vasey (expected to enter southwestern CO from UT)
4. Glumes subequal.....	<i>P. bigelovii</i> Vasey & Scribn.
5. Rhizomes present (often inconspicuous in <i>P. tracyi</i> and <i>P. fendleriana</i> ).....	6
5. Rhizomes absent.....	19
6. Culms strongly flattened.....	<i>P. compressa</i> L.
6. Culms more or less round.....	7
7. Plants shortly rhizomatous, rhizomes inconspicuous or easily overlooked (sometimes not evident on herbarium specimens).....	8
7. Plants with prominent rhizomes (although they may be slender or infrequent) .....	10
8. Callus webbed with arachnose hairs.....	<i>P. tracyi</i> Vasey
8. Callus glabrous.....	9
9. Ligules of middle stem leaves 0.2-1.2(1.5) mm, apex truncate to obtuse.....	<i>P. fendleriana</i> (Steud.) Vasey subsp. <i>fendleriana</i>
9. Ligules of middle stem leaves (1.5)1.8-18 mm, apex obtuse to acuminate.....	..... <i>P. fendleriana</i> subsp. <i>longiligula</i> (Scribn. & Williams) Soreng
10 (7). Callus glabrous (or rarely webbed in <i>P. arida</i> ).....	11
10. Callus hairy (sometimes scantily so).....	15
11. Lower leaf sheaths with minute, retrorse (downward pointing) hairs.....	<i>P. wheeleri</i> Vasey
11. Lower leaf sheaths glabrous to hairy but lacking minute, retrorse hairs.....	12
12. Panicle branches contracted, mostly steeply ascending to erect.....	<i>P. arida</i> Vasey
12. Panicle branches divergent to ascending, but not all (or nearly all) steeply ascending to erect.....	13
13. Branches at base of panicle 1/4 - 1/2 the length of panicle; panicles erect, branches relatively stout; palea sometimes glabrous .....	<i>P. arctica</i> R. Br. subsp. <i>aperta</i> (Scribn. & Merr.) Soreng
13. Branches at base of panicle 2/5 - 3/5 the length of panicle; panicles lax to erect, branches slender, flexuous to somewhat stout and straight; palea always hairy.....	14
14. Ligules (1)2-4 mm; callus glabrous (do not confuse with base of lemma).....	<i>P. arctica</i> subsp. <i>arctica</i>
14. Ligules (2)3-7 mm; callus webbed.....	<i>P. arctica</i> subsp. <i>grayana</i> (Vasey) Á. Löve, D. Löve & B. M. Kapoor
15 (10). Intercostal region (area between nerves) of palea narrow, glabrous or sparsely hispidulous; ligules mostly shorter than 2 mm; glumes narrowly ovate to ovate; lateral veins of lemma (between midvein and marginal veins) usually glabrous.....	16
15. Intercostal region of palea broad, usually at least sparsely puberulent (rarely glabrous); ligules mostly longer than 2 mm; glumes ovate to broadly ovate; lateral veins of lemma usually hairy (with hairs typically shorter than those of midvein and marginal veins).....	18
16. Panicle branches more or less scabrous.....	<i>P. pratensis</i> L. subsp. <i>pratensis</i>
16. Panicle branches more or less smooth.....	17
17. Upper surface of leaf blades often at least sparsely hairy; plants occurring to upper montane (below subalpine or higher) .....	<i>P. pratensis</i> subsp. <i>agassizensis</i> (B. Boivin & D. Löve) Roy L. Taylor & MacBryde
17. Upper surface of leaf blades usually glabrous; plants of alpine regions.....	<i>P. pratensis</i> subsp. <i>alpigena</i> (Lindm.) Hiitonon
18 (15). Callus webbed, often copiously.....	<i>P. arctica</i> subsp. <i>arctica</i>
18. Callus glabrous, or if webbed then hairs less than 1/4 length of lemma.....	<i>P. arctica</i> subsp. <i>aperta</i>
19 (5). Arachnose hairs present on callus or base of lemma (sometimes sparsely so in <i>P. interior</i> and <i>P. abbreviata</i> ).....	20
19. Arachnose hairs absent, although lemma or callus sometimes hairy.....	29
20. Lower leaf sheaths with short, retrorse (downward pointing) hairs.....	21
20. Lower leaf sheaths glabrous or hairy but lacking short retrorse hairs.....	22

21. Spikelets 3.5 mm or shorter; anthers 1.3-2 mm.....	<i>P. trivialis</i> L.
21. Spikelets mostly 4 mm or longer; anthers 0.3-1 mm.....	<i>P. occidentalis</i> Vasey
22. Panicle apex nodding; branches open, flexuous.....	23
22. Panicle apex mostly erect; branches open or closed but not flexuous.....	25
23. Lower panicle branches distinctly reflexed; lemmas ovate.....	<i>P. reflexa</i> Vasey & Scribn.
23. Lower panicle branches spreading but not reflexed; lemmas ovate to narrowly ovate.....	24
24. Panicles 5-15 cm, branches 1-3(5) per node; florets 3-7.....	<i>P. leptocoma</i> Trin.
24. Panicles (6)12-40 cm, branches 2-7 per node; florets 2-5.....	<i>P. occidentalis</i> Vasey
25 (22). Spikelets flattened (glumes and lemmas with distinct keels); plants of alpine or subalpine.....	26
25. Spikelets more or less rounded on back; plants mostly lower than subalpine.....	27
26. Lemma apex beveled to somewhat truncate; culms 8-35 cm; panicle branches 1.5 cm or less; leaf sheaths closed for less than 1/3 of their length; basal branching mostly all or mainly intravaginal.....	
.....	<i>P. abbreviata</i> subsp. <i>pattersonii</i> (Vasey) A. Löve, D. Löve, & B. M. Kapoor
26. Lemma apex acute; culms 5-15(20) cm; panicle branches 1-3(4) cm; leaf sheaths closed for more than 1/3 of their length; basal branching mostly extravaginal or mostly pseudovaginal (not easily distinguished from the previous taxon).....	<i>P. laxa</i> Haenke subsp. <i>banffiana</i> Soreng
27 (25). Spikelets 6-10 mm; lemmas 4-6 mm; rachilla internodes 1.2-2 mm.....	<i>P. stenantha</i> Trin.
27. Spikelets 3-6 mm; lemmas 2-4 mm; rachilla internodes less than 1 mm.....	28
28. Plants caespitose, 5-50(80) cm; ligule 0.5-1.5 mm; lemma 2.4-4 mm; callus hairs normally less than half the length of lemma.....	<i>P. interior</i> Rydb.
28. Plants frequently stoloniferous, 25-120 cm; ligule 1.5-6 mm; lemma 2-3 mm; callus hairs normally at least half the length of lemma.....	<i>P. palustris</i> L.
29 (19). Lemmas glabrous, or sometimes uniformly puberulent (short-hairy).....	30
29. Lemmas conspicuously hairy on marginal nerves and/or midvein; if pubescent between veins then hairs shorter than those on nerves..	34
30. Culms mostly 10 cm or less (will apply also to alpine specimens of <i>P. glauca</i> subsp. <i>rupicola</i> ); lemmas 2.5-3 mm.....	<i>P. lettermanii</i> Vasey
30. Culms mostly 10 cm or more; lemmas 3 mm or longer.....	31
31. Spikelets rounded.....	32
31. Spikelets distinctly compressed (distal portions of glumes and or lemmas keeled).....	33
32. Lemmas mostly glabrous or the veins sometimes sparsely hairy near base; leaves firm to slightly lax.....	
.....	<i>P. secunda</i> J. Presl var. <i>juncifolia</i> (Scribn.) Soreng
32. Lemmas sparsely to densely hairy in basal 2/3; leaves withering with age.....	<i>P. secunda</i> subsp. <i>secunda</i>
33. Panicle branches glabrous to slightly scabrous; stem blades more than 1.5 mm wide, often flat; lemma and callus sometimes sparsely short-hairy; flowers pistillate.....	<i>P. cusickii</i> subsp. <i>epilis</i> (Scribn.) C. L. Hitchc.
33. Panicle branches moderately to strongly scabrous; stem blades less than 1.5 mm wide, usually involute; lemma and callus glabrous; flowers bisexual.....	<i>P. cusickii</i> subsp. <i>pallida</i> (Soreng) Dorn
34 (29). Callus with arachnose hairs.....	35
34. Callus glabrous.....	36
35. Plants mostly less than 15 cm; ligules sparsely to densely scabrous; anthers 1.2-2.5 mm.....	<i>P. glauca</i> Vahl subsp. <i>glauca</i>
35. Plants mostly greater than 15 cm; ligules glabrous; anthers 0.6-1.2(1.8) mm.....	<i>P. abbreviata</i> subsp. <i>pattersonii</i>
36. Panicle broad at base, some branches divergent to reflexed.....	<i>P. alpina</i> L.
36. Panicle narrow at base, all (or most) branches ascending to nearly erect.....	37
37. Lemmas 4-6 mm; anthers mostly 0.1-0.2 mm (rarely 2-3 mm); plants green; basal branching intravaginal; sheaths closed for 1/4 to 3/4 of their length; blades mostly less than 1 mm wide when fresh.....	<i>P. x nematophylla</i> Rydb.
37. Lemmas 2.5-4 mm; anthers 1.2-2.5 mm; plants usually glaucous; basal branching all (or nearly so) extravaginal; sheaths closed for 1/10 to 1/5 of their length; blades mostly > 1 mm wide when fresh.....	<i>P. glauca</i> subsp. <i>rupicola</i> (Nash) W. A. Weber

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# 2008 Field Trips

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## Denver Botanic Gardens

Saturday, May 17, 2008

Last summer a handful of CoNPS members strolled through Denver Botanic Gardens (DBG) at the tail end of the spring flowering season. The variety of native plants habitats and gardens were so various and appealing that many expressed an interest in the Gardens earlier in the season: here is YOUR chance to see the largest variety of Rocky Mountain and Great Plains' plants in cultivation anywhere (we think!) at their height of spring bloom. **Panayoti Kelaidis**, Director of Outreach at DBG, will lead us through dozens of outstanding gardens, many of which feature Colorado native plants to exclusion: expect to see a wide spectrum of penstemons and columbines, of course, but there is likely to be everything from broomrape (*Orobanche*) in a trough garden to obscure *Astragalus* in the native dryland gardens. This is a magical time of year at the Gardens... don't miss this walk! Contact: Panayoti Kelaidis at KelaidiP@botanicgardens.org, or 720-865-3604.

## Diversity of Lichens Under Foot and Overhead

Sunday, May 18, 2008

9:00 AM

**Ann Henson** will lead this field trip exploring a small world of wonderful colors and textures that is often noticed, but not "seen"! We will find the basic types of lichens in several different environments. Learn a little about the life styles of the likable lichens, including sex and the single lichen. Your next brown bag consumed while perched on a rock will be just a little more interesting. Expect moderate walking at multiple sites. Bring hand lens and lunch, we will be out all day. Meet in Lyons (15 minutes north of Boulder) at Bohn Park, located off of 2nd Avenue south of Hwy. 36 ( Main St.). We will then carpool. This is limited to 12 people. Please contact Ann Henson at 2henson@kwabena.us or 303-772-8962.

## Discover a living, green pharmacy up North Crestone Canyon

Sunday, June 8, 2008

10:00 AM

Anti-biotics, anti-microbials, anti-virals, all without the side effects of prescription medication, are to be found all around you. Ethnobotany is the way different cultures use plants, whether for medicinal, tools, or food. Find out about the wealth we have in our own back yards. Meet at the North Crestone trailhead, where we should return around 1:00 pm. Bring water, bug repellent, and a sack lunch. For more information or directions to the North Crestone trailhead, call **Linda Spade** at 719-256-5083 or [biscuit\\_root@yahoo.com](mailto:biscuit_root@yahoo.com).

## Two Buttes, Prowers County

Saturday, June 28, 2008

Colorado Natural Areas Program (CNAP) staff will lead a trip to Two Buttes, a distinct landform on the eastern slope. Two Buttes has a population of the rare *Frasera coloradensis* (Colorado Gentian). This area was partially surveyed in 2007, when several occurrences were found. However, before designating this private property a state Natural Area, CNAP needs complete rare plant mapping to assure protection of this rare wildflower. Help map this beautiful Colorado endemic and check out the flora in this rarely visited part of the state. Contact **Brian Kurzel** at 303-866-3203 ext. 301 or [brian.kurzel@state.co.us](mailto:brian.kurzel@state.co.us).

## Mount Goliath Natural Area Service Day & Tour

Friday, July 11, 2008

Join Denver Botanic Gardens staff as they continue their efforts to revegetate and restore high altitude ecosystems at the Dos Chappel Nature Center on Mt. Goliath. This is an opportunity to spend some time in beautiful subalpine and alpine environments, while providing much-needed service to restore the pristine nature of this site. Included in this trip will be a tour of the Nature Center and a guided hike along the interpretive trail. Contact **Mark Fusco** at [fuscom@botanicgardens.org](mailto:fuscom@botanicgardens.org), or 720-865-3586.



Akene  
(<http://etc.usf.edu/clipart>)

## Fens of South Park, Park County

Saturday, July 12

Join **Steve Yarbrough** for another full day of exploring fen wetlands of South Park. The trip will begin with a hoped for stop at Fremont Fen, if permission is granted by the landowner. We will spend much of the rest of the day in and around High Creek Fen, an important Colorado Natural Area and Nature Conservancy property. The day will feature many rare plants including *Primula egalikensis*, *Carex scirpoidea*, *Carex livida*, *Trichophorum punilium*, *Packeria pauciflora*, *Ptilagrostis porteri*, *Sisyrinchium pallidum*, and *Salix candida*. There will be discussion of fen hydrogeology, soils, chemistry, and conservation issues. Additional fens may be visited in the area if time allows and if there is significant interest. To register, contact Steve Yarbrough at 303-250-5542 or [westerneecological@msn.com](mailto:westerneecological@msn.com).

# 2008 Field Trips

## Rocky Mountain National Park

Saturday, August 2, 2008

We will meet at the Rocky Mountain National Park Visitor Center west of Estes Park (Hwy. 36), on the east slope of the Park. This trip, led by **Steve Yarborough**, will be similar to a trip CONPS sponsored in July 2006. We will work with a Rocky Mountain National Park Service restoration biologist to assist the park in a restoration project involving native plants. The trip will also offer a chance to see the Park's greenhouse, and nursery, and discuss the exotic plant program. More information and details about this trip can be obtained from Steve Yarbrough at 303-250-5542 or [westernecological@msn.com](mailto:westernecological@msn.com).

## Geneva Basin Iron Fen

Saturday, August 9, 2008

7:00 AM

Geneva Basin Iron Fen is a Colorado Natural Area, preserved for its rare community type (an iron fen), unusual geologic processes (formation of limonite), and rare plant species (*Sphagnum girgensohnii*). It is located near the continental divide west of Guanella Pass, two hours from Denver. The last five miles are 4-wheel drive road. There are six separate fen sites, but all are located within a mile. In the iron fens, there is mostly sphagnum moss, with other mosses and sedges. There are many small, braided, shallow stream channels. The elevation is 11,000 feet, so it is common to have afternoon shower storms. This trip is limited to 12. Please bring waterproof boots that can take walking in 4" to 6" of water, jacket and raincoat. Meet in the REI parking lot at 5375 S. Wadsworth Blvd, about 1/2 block south of Belleview Ave., on the west side of Wadsworth in Lakewood. For more information, contact **Dave Bathke** at 303-232-1865 or [dibathke@juno.com](mailto:dibathke@juno.com).

## Rough Creek Iron Fen Research

August 16th - 17th, 2008


**Janet Potter** and **Gay Austin** will lead a backpacking trip five miles into the Rough Creek Iron Fen in the LaGarita Wilderness to look for rare plants, mosses, and lichens! Contact Janet Potter at [potter523lake@yahoo.com](mailto:potter523lake@yahoo.com) or Gay Austin at [austinaceae@frontier.net](mailto:austinaceae@frontier.net) or 970-641-6264 for more information and registration.

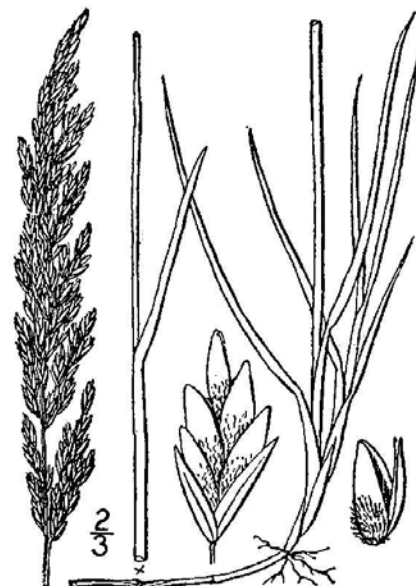
*Poa arida*  
USDA-NRCS PLANTS Database /  
Britton, N.L., and A. Brown. 1913.  
An illustrated flora of the northern  
United States, Canada and the  
British Possessions. Vol. 1: 260.

## Native Seed Collections with Wildlands Restoration Volunteers (WRV)

Multiple dates and times to be announced.

Many land restoration projects depend on precious hand collected native seed because purchased seeds are either unavailable, too expensive, or not an acceptable match to the local native species ecotypes. WRV will collect native seed on at least nine dates between June and October: eight evening projects and one full-day project are planned. During these seed collection sessions, volunteers will hand collect a variety of species, including grasses, sedges, and some wildflowers and other forbs. These seeds will be multiplied agriculturally by an inter-government agency partnership. This process increases (100 or 1000 fold) the amount of locally adapted grass seed that is available for revegetation projects on local public lands. Seed collection is more than a series of volunteer projects. It's a program to develop a pipeline for gathering, multiplying, and distributing native seed for important restoration projects. Between 25 and 40 volunteers are needed per event. Please check [conps/boulder.org](http://conps/boulder.org) and [wlrw.org](http://wlrw.org) for updates. Contact **John Giordanengo** (Projects Director) at [john@wlrw.org](mailto:john@wlrw.org) or 303-543-1411; let him know you are with CONPS.

More field trips may be organized, so check [www.conps.org](http://www.conps.org) for updates. 



# Branching Out

## Phyllotaxis

by Dick Yeatts

Upon reading the interesting and timely article by Leo Bruederle (Vol. 31 No. 4 *Aquilegia* Winter 2007) his use of the words “phyllotaxis,” “alternate,” and “opposite” in the same sentence caught my attention. **Phyllotaxis** (literally “leaf arrangement”) has come to refer to the full three-dimensional description of the structural morphology of plants, from root tip to flowering stalk. The terms “alternate” and “opposite” come from viewing a plant on a herbarium sheet. Taxonomists, it seems, tend to describe plants more superficially.

In temperate climes, branching (of leaves, stems, etc.) is usually one of two types: **spiral** or **decussate**. In spiral phyllotaxis (usually described as alternate) branching follows a helical pattern with an approximately constant angle (**divergence**) between successive branches. For a remarkable number of taxa (close to 90 percent), the divergence is close to the “golden angle,” approximately 137.5°. In decussate phyllotaxis, (usually described as opposite), two branches occur at a node, across the stem from one another, with successive pairs at a right angle to one another. Think of *Penstemon* or *Shepherdia*. (Decussate, literally “cross-shaped,” refers to the appearance of the branches when viewed down the stem.)

As Leo points out, “phyllotaxis provides one of the most useful characters for the identification of plants...”. Decussate phyllotaxis is easily noted, thus particularly diagnostic. But the specifics of spiral phyllotaxis can also be important. To develop this point I must digress...

For those of us who are interested in the mathematics, it is important to realize that phyllotaxis is born of **Fibonacci numbers** and bred of simple arithmetic. (Fibonacci



Fibonacci numbers in plant branching. (www.goldennumber.net)

numbers form the sequence 1, 1, 2, 3, 5, 8, 13, etc. in which each number is the sum of the preceding two numbers, starting with the pair of ones.) What is amazing is that most divergences are related to the fractions formed of alternate Fibonacci numbers: that is 1/2, 1/3, 2/5, 3/8, 5/13, etc. Now, 1/2 implies a divergence of 180°, with branches occurring in a plane alternately across the stem; **distichous** is the technical term. For example, consider the leaflets relative to the rachis on *Fabaceae*. And 1/3 implies an angle of 120°; consider the three-fold symmetry of *Liliaceae*.

In the field, it's easy to determine the divergence. Select two branches (or two leaves along a branch or two leaflets along a rachis) growing in the same direction. Count the number of branches from one to the other (skipping the starting branch), call that number N; also note the number of revolutions around the stem from start to finish, call this M. The fraction is M/N (called the **phyllotactic ratio**) times 360° is the divergence.

The higher Fibonacci fractions 2/5, 3/8, 5/13, etc. can also be diagnostic. Most Rosaceae, for example, are characterized by the fraction 2/5; many *Salicaceae* by

3/8. Such fractions must be thought of as population averages and not individual characters. From my experience, phyllotactic ratios greater than 3/8 cannot be reliably measured in the field. In general, one must always seek new growth for measurement, because environmental effects quickly confound genetic tendencies. Indeed, microscopic examination of plant initials (newly differentiated plant parts containing just a few cells) exhibit incipient branching at near mathematical precision.

It is important to understand that as the phyllotactic ratios get higher and higher, their values gets closer and closer to the golden ratio. For comparison, the phyllotactic ratio 3/8 corresponds to a divergence of  $3/8 \times 360^\circ = 135^\circ$ , and  $5/13 \times 360^\circ = 138.5^\circ$ .

Golden Ratio $(3-\sqrt{5})/2!$ Golden angle $(3-\sqrt{5})/2 \times 360^\circ \approx 137.5^\circ$
--

The observant reader may have noted that decussate branching implies a divergence of 90°, thus the phyllotactic ratio 1/4. But 4 is not a Fibonacci number. Indeed, many non-Fibonacci phyllotaxes have been observed. Tropical plants, in particular, are extremely variable.

Generally speaking, the term for “number of branches at a node” is **jugacy**, a word derived from “paired at a yoke, like oxen.” Decussate branching is called dijugate; three branches at a node is trijugate. *Galium triflorum*, for example, is hexajugate.

My own studies find that in many species (e.g. *Yucca glauca* and *Verbascum thapsus*), the divergence is preserved throughout all above-ground parts up through the inflorescence. One can argue that golden angle phyllotaxis is favored, evolutionarily,

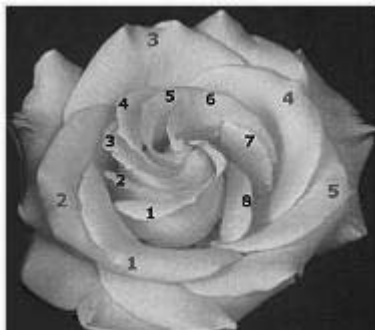
# BOOK REVIEW

by Jan Loechell Turner

*Bringing Nature Home: How Native Plants Sustain Wildlife in Our Gardens.* By Douglas Tallamy. Portland, OR: Timber Press, 2007.

because that divergence offers maximum separation of branches; the evolutionary truth of this is not proven. Furthermore, no evolutionary advantage has been proposed for decussate branching. It must be realized that any particular character need not provide survival selective advantage, but be merely an artifact of other characters that do offer evolutionary advantage.

For field identification, phyllotaxis must be considered just another tool. For those of us with a mathematical bend, looking at the quantitative aspects of plant morphology, especially the three-dimensional structure of plants, provides an exciting prospect, or at least another way to enjoy plants.



Fibonacci numbers are also noticeable in flowers. (www.golden-numbers.net)

For those who want more...

The text *Phyllotaxis* by Roger V. Jean, Cambridge University Press, 1994, is the bible; albeit heavy on the math. *On Growth and Form* by d'Arcy W. Thompson, Dover Publications, 1992, (originally published by Cambridge Press, 1942) is a classic, but somewhat out-dated. Chapters on phyllotaxis can be found in nearly every book devoted to Fibonacci numbers and the golden ratio; there are many, many of these; check any library, the internet, or Amazon.com. *Fascinating Fibonacci* by Trudi H. Garland, Dale Seymour Publications, 1987, is written for school kids, but covers all aspects of "Fibonacci" in an easily accessible manner. *Plant Form* by Adrian D. Bell, Oxford University Press, 1991, is an excellent illustrated guide to flowering plant morphology.

Dick Yeatts is a CONPS member. He can be contacted at 1395 Nile Street, Golden, CO 80401.



Although written by a scientist (Tallamy is Professor and Chair of the Department of Entomology at the University of Delaware, Newark), *Bringing Nature Home* is written in a popular style that will appeal to both gardeners and scientists.

This is an ideal book for native plant lovers who value interesting facts and statistics to support their arguments for the importance of native plants in the garden. Tallamy demonstrates the impact our gardening choices can have on the survival of insects and wildlife. He is a strong advocate for the important role our yards can play in sustaining biodiversity and creating important habitats for native plants and animals. Although this book is not specifically about native plants in Colorado, the message in this book is applicable anywhere. Tallamy warns that unless we restore our yards to a more native-friendly and nature-friendly environment, the future of biodiversity in our country is bleak.

Topics covered in the book include the importance of suburban gardens to the ecosystem, why insects can't eat alien plants, and the native gardening needs of birds, butterflies, and other wildlife. Although the book is geared to gardeners of the mid-Atlantic region, the concepts addressed apply to all gardeners and some of the plant genera discussed occur in our region. One chapter, "What does bird food look like?," is devoted to insects representing a number of different orders and families and contains a large collection of color photographs of the insects. A fascinating table in the book, "Hosting capacity of alien plants introduced to North America," contrasts the number of herbivores supported in the land of origin or homeland to those supported in North America. Examples include *Clematis vitalba* (40 species in its homeland, one species in North America), *Opuntia ficus-indica* (16 in its homeland, no species in North America), and *Phragmites australis* (170 in its homeland and only five species in North America).

Tallamy's philosophy is that by understanding nature, we can better appreciate it and the interconnections of plants, animals, and the environment. *Bringing Nature Home* is based on scientific research and contains an extensive list of references.

Jan Loechell Turner works at Regis University and is the CONPS Research Grants Committee Chair and Co-President. Jan is also our source for great book reviews.



Do you buy from Amazon?

Don't forget that the Colorado Native Plant Society will receive 7% of your purchase price IF YOU ENTER AMAZON THROUGH THE CONPS WEB SITE BOOKSTORE: [www.conps.org/bookstore.html](http://www.conps.org/bookstore.html).

# WHO'S IN THAT NAME?

William Weber

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by Al Schneider

Throughout 2008, *Aquilegia* will publish "A Discussion with Dr. William Weber." If you have further questions, contact Al Schneider at [webmaster@conps.org](mailto:webmaster@conps.org). Dr. Weber will answer your questions on the CoNPS website Botanical News page.

**Dr. Weber, why did you choose botany rather than history or zoology, for example, as your field of greatest interest?**

I became a naturalist at the age of four or five, when, as a sickly child suffering from an enlarged heart, rheumatic fever, la grippe, lice, and prone to accidents, I was restricted to playing indoors on the floor with Lincoln Logs and tin soldiers. I had as my chief reading the wonderful *Book of Knowledge* bookshelf. Seeing I was in trouble, my cousin F. Martin Brown, a self-made naturalist who eventually became a specialist in butterflies and professor at Fountain Valley School near Colorado Springs, gave me a small German tubular microscope and showed me how to make hay infusions to study submicroscopic aquatic animals, and he gave me some of his microscope slides of insect structures.

In the early thirties I was introduced simultaneously to ornithology and botany. The advent of field study of birds brought lasting friendships with a young Roger Peterson and other members of the Bronx County Bird Club, coinciding with my introduction to botany by a Venezuelan friend, Jose Antonio Jove (trees and shrubs in winter condition) and a mentor, Helene Lunt, of the New York Botanical Garden, plus the unwitting gift of a *Gray's Manual of Botany* by a

high school teacher, Mr. Mortenson, who had to buy the book in college, but never cracked it. I chose botany because I could not afford to go to Cornell, the only university that featured ornithology.

I had lots of mentors. They included my high school teachers, Grace Esternaux and Alma Ericson. Mrs. Ethel Timonier, who lived in a next-door apartment, took me to



Photo by Jan Turner  
Beaded lanyard by Betty Schneider  
Knowing smile by Bill Weber

the American Museum on Saturdays where I had the run of the place. Years later I learned that she was editor of the *Museum Novitates*. I was also invited to meetings of the New York Linnean Society, and got to know and to listen to lectures from all of the famous zoological personalities of the time, especially Ernst Mayr and Bill Vogt. I started the Sialis Bird Club in 1931; there are four of us left, all still avid birders! We were mentors to each other!

**What do you feel were the seminal moments in your life?** Of course, meeting Sammie in a bird study class at Iowa State in 1938. Everything else developed through the course of our marriage of over 50 years, and our children have been a real blessing. The really seminal moment, apart from all of the mentors that provided others, was the day when my high school German teacher, Fräulein Stamm, assigned me a pen pal in Holstein. We were matched because our fathers were both pharmacists. He belonged to the Hitler Jugend, but this was never discussed, since at the time it was regarded as a sort of Boy Scouts. My knowledge of reading and writing the old German Script led directly to my graduate work at Pullman, Washington, where my job was to transcribe, decipher the field notebooks, and type labels of about 40,000 specimens of Wilhelm N. Suksdorf, the most important of all plant collectors in Washington.

[Editor's Note: The following is from a biography of Suksdorf published in 1998 by Rhoda Love and presently being reprinted in the Botanical Electronic Newsletter (<http://www.ou.edu/cas/botany-micro/ben/>)]

"In the early 1940s [a young Masters student, William A. Weber, was assigned] the task of determining Suksdorf's [collecting] sites and itineraries. Weber did a splendid job which should be applauded now and forever by anyone concerned with the flora of Washington. [He] combined the skills of a



detective [and] cryptographer.... The result is that we now know the locations of virtually all of Suksdorf's sites.... Weber provided a chronological day by day itinerary of all of Suksdorf's collecting forays in Iowa, California, Washington, Oregon, and Montana... from 1872 to 1929. Weber's was a singular and very important achievement”.

### How has your understanding of Colorado botany been influenced by your studies of world botany?

When I began to study lichens, I recognized that many of our species seemed to be identical to those collected in the Gobi Desert by the great explorer Sven Hedin. My need to compare these with his collections at Uppsala took me to Europe in 1957. There I got to know Professors Hulten, Rolf Santesson, Hugo Magnusson, and Einar DuRietz, all of whom influenced my world view of flowering plant, lichen, and bryophyte distribution. My transfer in 1962 from the Biology Department to the Museum freed me to travel to many parts of the world, where I was invited by scientists who needed my expertise. And of course, my rediscovery of the Middle Asiatic Colorado floristic elements noted by J.D. Hooker in 1877 led to two field seasons in the Altai Mountains of southern Siberia. [See Bill Weber's "Middle Asian Element in the Southern Rocky Mountain Flora of the Western United States" on-line at <http://spot.colorado.edu/~weberw/phyto.pdf> ]

[As I had recognized the similarities among world populations of lichen, so] I had similar experiences with the vascular flora. *Stellaria irrigua*, common on talus slopes in southwestern Colorado and northern New Mexico, was described from the Altai Mountains of southern Siberia (and is still known from there only by the type collection!). The genus *Ptilagrostis*, in South Park, was represented in Altai as well, by our own species, *P. porteri*.

I spent two summers in the Altai collecting with Russian botanists and made many more discoveries. Our own common *Artemisia frigida* is the most common species in Altai, and we share many species of *Carex* with the Russians. *Angelica ampla*, a southern Rocky Mountain endemic, is in the Altai under the name of *Angelica decurrens*. *Claytonia megarhiza* has a counterpart in Altai, *Claytonia joanneana*; *Primula parryi* has a counterpart there, *Primula altaica*. *Eriophorum altaicum* of the Altai occurs in the San Juans. And *Thalictrum heliophilum*, described as a new species from Anvkil Point, is the Linnean species, *Thalictrum foetidum*, which is common in the Altai on limestone talus. If you look up the species on Google images you can see the actual specimen described by Linnaeus. But this *Thalictrum* is not an introduced weed, but a Tertiary relict!

Among the mosses, *Oreas martiana* is common in the Indian Peaks area, but extremely rare and scattered in Alaska, Greenland, and the Alps. *Catascopium nigratum* is mostly Arctic, but reaches its southern limits on both continents, jumping to Colorado and western China. *Anoetangium handelii* was described in 1913 from Turkish Kurdistan. *Didymodon anserinocapitatus* was described only recently in 1981 from Yunnan, China. Both occur in the Hall Ranch Open Space. *Orthotrichum hallii*, described from Colorado, occurs in the Tien Shan.

The lichens have a similar history, with species too numerous to mention. *Candelariella spraguei* was thought to be a Colorado endemic, but has now been found in Tien Shan. *Gypso-*

*placa macrophylla* is restricted to gypsum in western Colorado and Utah, but was described from China. And *Alloce-traria stracheyi*, extremely rare in our alpine areas, was first described from the Himalaya. Incidentally, Mr. Strachey visited Colorado in 1887 with Gray and J.D. Hooker!

In short, our Middle Asiatic element is simply a high altitude and desert component of the famous Arcto-Tertiary Flora introduced by Asa Gray himself. But he did not know about this component, while Hooker, who was here with Gray for five days, was overwhelmed by the "Asian-ness," since he knew the Middle Asian flora intimately!

*Bill is revising his Colorado Floras and welcomes comments on past editions. Send to [bill.weber@colorado.edu](mailto:bill.weber@colorado.edu).*



*Primula parryi*  
Margaret Williams @ USDA-NRCS PLANTS Database

# CONSERVATION CORNER

## “Rare Plant Initiative: Saving Colorado's Wildflowers” Taking Plant Conservation to a New Level

The Colorado Rare Plant Initiative (RPI), a partnership with representatives from 14 federal and state agencies, institutions, and non-profit organizations, has been formed to take conservation of native rare plants in Colorado to a new level. The formation of this initiative will help in reducing redundancy of efforts by various agencies by developing a coordinated strategy, prioritizing needs, and taking action to address increasing threats to native rare plants. This project will focus on long-term on-the-ground conservation of the most imperiled plant species on both private and public lands across Colorado.

Over 75% of Colorado’s imperiled species are plants. The Colorado Natural Heritage Program (CNHP) tracks over 500 plant species. At least 115 plant species are critically imperiled or imperiled in Colorado (G1-G2), and another 109 are vulnerable to extinction (G3). The majority of these species are poorly conserved. Fifty-three of these are endemic to the state, occurring nowhere else in the world. The graph below (provided by CNHP) shows a comparison of listed and unlisted globally imperiled species in Colorado.

Threats to Colorado’s rare plant species are at an all time high. Fragmentation and loss of habitat is one of the primary threats to plant species and their habitats; Colorado's natural ecosystems are being developed at a rapid rate. Imminent threats, such as residential and commercial development, energy development, motor-

ized recreation, and invasive species, are increasingly impacting Colorado’s native plant species. Climate change poses an even greater threat. The Colorado Rare Plant Initiative was formed to address these conservation needs.

The vision of the RPI is to conserve Colorado’s most imperiled native plant species and their habitats for future generations’ enjoyment, and benefit through a collaborative partnership effort with public and private landowners. Specific goals are to:

1. establish a coordinated statewide plant conservation program supported by a broad group of partners and decision-makers;
2. work with land management agencies to secure on-the-ground protection for rare plant species and their habitats through education, analysis of threats, and development of solutions to accommodate multiple land use objectives;
3. work with willing private landowners to secure on-the-ground protection for rare plant species and their habitats through cooperative, voluntary, and incentive-based actions;
4. create and maintain long-term funding mechanisms that support rare plant conservation and research.

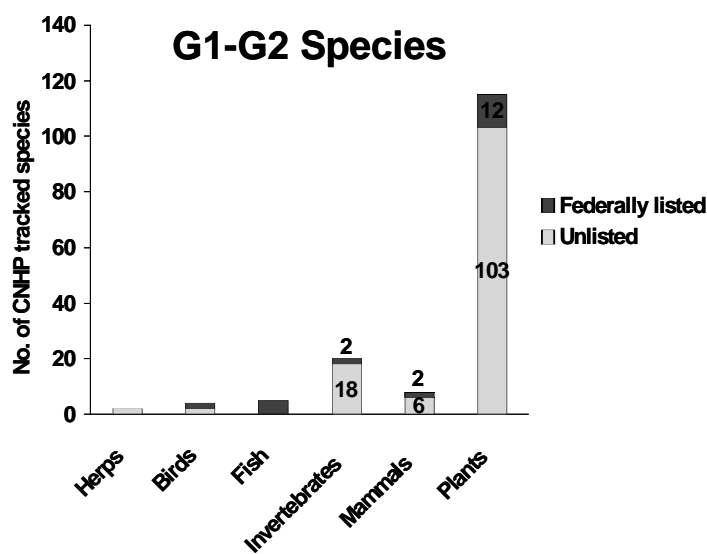
With the help of funding from the National Fish and Wildlife Foundation (NFWF) and matching grants from the Colorado Native Plant Society and other partner organizations the following work plan has been formed to achieve the goals of this initiative.

### Phase 1: Strategy and Prioritization

- o Develop collaborative statewide plant conservation strategy with partners.
- o Develop methods and products to prioritize plants needing conservation action.
- o Develop statewide list of priority species/sites needing conservation action.
- o Initiate development of best management practices.

### Phase 2: Action Plans and Initiate Protection

- o Develop five rapid action plans for priority landscapes supporting imperiled plants with partners.
- o Gather information for priority parcels .
- o Initiate protection for 3-5 highest priority species on private lands needing conservation action.
- o Develop template for best management practices.




Over 75% of Colorado’s imperiled species are plants.

### Phase 3: Best Management Practices and Outreach

- o Develop best management practices for two imperiled plants near Debeque.
- o Develop outreach plan and materials.
- o Disseminate materials and obtain external support for statewide plant conservation.
- o Complete NFWF final report.

Initiative partners met October 26, 2007 to address team structure and priority actions, and identify next steps. Strategy and priority action teams have been formed. The strategy team will develop a statewide plant conservation strategy to conserve Colorado's imperiled plant species, addressing methods to reach key audiences, particularly decision makers, and address legislative and funding needs. The priority action team will identify plant species conservation needs and prioritize future work. The next meeting is scheduled for April 16.

The key partners of this initiative are: Betty Ford Alpine Gardens, Bureau of Land Management, Center for Native Ecosystems, Colorado Department of Agriculture, Colorado Department of Transportation, Colorado Natural Areas Program, Colorado Natural Heritage Program, Colorado Native Plant Society, Colorado Open Lands, Denver Botanic Gardens, The Nature Conservancy, University of Colorado Denver Biology Department, University of Colorado Herbarium, US Fish and Wildlife Service, and US Forest Service. Other groups are welcome and encouraged to participate in this important and exciting effort!

For more information about the Colorado Rare Plant Initiative, please contact Betsy Neely (Senior Conservation Planner, The Nature Conservancy) at [bneely@tnc.org](mailto:bneely@tnc.org) or 720-974-7015 or Susan Spackman Panjabi (Botanist, Colorado Natural Heritage Program) at [spack@lamar.colostate.edu](mailto:spack@lamar.colostate.edu) or 970-491-2992. 



# CONPS Members' Survey: Preliminary Results

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by Charlie and Jan Turner

In December and early January, paper copies of the CONPS members' survey were mailed to members and an online version was made available on the CONPS website ([www.conps.org](http://www.conps.org)), with a link to the survey at the top of the home page. The response has been outstanding. Over 30% of members had responded by mid-January, which is high. We would like to share with Society members a summary of the initial results of the survey.

Opportunities to learn about native plants and field trips are especially valued by members. Friendship with people of similar interests, local and state meetings that include speakers and presentations, and opportunities to learn about gardening with native plants are also considered important.

The *Aquilegia* newsletter is highly valued, with 98% of members reading it. Features of the newsletter that are most enjoyed by its readers are articles, scheduling of upcoming chapter events, and book reviews. Over 66% of members use the web site, with chapter activities and information about native plants being most valued. Plant lists, Colorado botanical news, and the online bookstore were also popular.

In describing their interest in native plants, the highest percentage of members (85%) responded that they are interested in the relationship of plants, animals, insects, and the environment. A high percentage of CONPS members are hikers, a large number like to read about native plants, and many consider themselves environmentalists and conservationists.

Seventy-five percent of members want CONPS to offer guides to gardening with local native plants and 52% would like to have plant sales.

Many survey participants filled out the comments sections and suggestions included requests for more field trips, garden tours, less technical workshops and field trips, and more native plant gardening information.

Although 86% of members felt that they were welcomed into the Society, 14% did not. There were some excellent suggestions to improve this including introductions at meetings, name tags, a welcome gift (flower photo), list of people in their area, and mentors. One of our top priorities will be to make sure everyone feels welcomed.

Survey results are providing valuable information that will help the Directors, Chapter Presidents, and Committee Chairs to make decisions in accord with the opinions expressed by members. Thank you to everyone who has taken time to complete the survey. A more comprehensive summary of the survey results will be published in the next issue of *Aquilegia*.

Charlie and Jan Turner are Co-Presidents of the CONPS.



# Society Announcements

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## Education and Outreach Opportunity

Echter's Greenhouse, Garden Center, Nursery and Patio and the CONPS Education and Outreach Committee invite members to attend Echter's 12th Annual Spring Gardening Echxpo on March 7-9, 2008. Echter's Echxpo, the largest gardening event of its kind in Colorado, is designed to educate and entertain the entire family! Seminars and demonstrations provide a wealth of gardening "know-how," information and inspiration from experts in all areas of gardening.

CONPS will again be on-hand to educate Echter's customers on Colorado's native flora and our society. This is a great opportunity to share your passion by enlightening others on the wonders of native plants. Please contact Megan Bowes at 303-561-4883 or bowesm@boulder-colorado.gov if you'd like to volunteer for the CONPS booth ... or just stop by and enjoy the seminars and demonstrations!

## 2008 Annual Meeting Montrose, Colorado

Reserve September 5-7, 2008 to attend the Annual Meeting of the Society. Friday the 5th is the rare plants day, Friday evening will be a welcome reception, Saturday the 6th will be presentations focusing on the meeting theme of "Flora of the Adobe Hills." Sunday will be devoted to field trips. Meeting details will be in the next *Aquilegia* and will be adapted on the CONPS web page as they become available.

## CONPS Needs

Computers, printers, monitors, or scanners. If someone has one of the above items to donate, please contact Jan or Charlie Turner at [turner@rabbitbrushpublishing.com](mailto:turner@rabbitbrushpublishing.com) or 720-497-1093.

## Key to the *Potentillas* of Colorado

Oftentimes in the course of preparing workshops, the presenters develop their own keys for the particular plant group. The key developed by Richard Scully for the recent *Potentilla* workshop is now posted as a pdf file on the CONPS web site. A link to the key can be found in several places: "What's New," "Plant Lists and Keys," or "Workshops."

## Research Grants Committee is pleased to announce the grant recipients for 2007

### STEINKAMP AWARDS

Carol English, University of Colorado Denver. Pollination biology and population genetics study of the rare Colorado endemic, *Penstemon degeneri*. Steinkamp \$1,000.

Denise Wilson, University of Colorado at Denver. *Epipactis gigantea* - a pollination study. Steinkamp \$500

### MARR AWARDS

Diana Jolles, Ohio State University, Columbus. The biogeography and phylogenetics of the *Pyrola picta* species complex. Marr \$800.

Katie M. Becklin, University of Missouri Columbia. Do mycorrhizal associations affect the invasibility of alpine willow communities? Marr \$1,000.

## Web Site

Be sure to check the "Botanical News" page at [www.conps.org](http://www.conps.org) for daily news, information and updates about botanical research, jobs, new books, conferences, endangered species actions, etc. Chapter activities are also listed on each chapter's web page.

Webmaster, Al Schneider, is soliciting volunteer(s) to give a few hours a year adding to lists of botanical books to the "Bookstore" web page, submitting botanical news for posting on the "Botanical News" page, and sending in their favorite botanical links for publication on the "Links" page. Contact Al at 970-882-4647 or [webmaster@conps.org](mailto:webmaster@conps.org) for details.

## Society Award Nominations

The Board of Directors of the Colorado Native Plant Society presents awards to those who have contributed to Colorado botany and to the Colorado Native Plant Society. The Board of Directors is now soliciting additional nominations for these awards. See details about the awards on our web site at: [www.conps.org/botanical\\_news.html](http://www.conps.org/botanical_news.html). Email nominations to Vice-President Al Schneider at [webmaster@conps.org](mailto:webmaster@conps.org).

## Eighteenth High Altitude Revegetation Workshop

Fort Collins March 4-6, 2008 sponsored by CSU and High Altitude Revegetation Committee More information call 970 491-7501 or <http://www.highaltitudereveg.org/>

# 2007 Donors

Annette Miller	Janet Klemperer
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Jackson Dennis	Tamara Naumann
James Dryer	Tim Hogan
James Trammell	Trudy Joy Eldridge
Jan Turner	Warren Hern

## 2007 Donations

John Marr Fund	\$1,177.00
Myrna P. Steinkamp Fund	\$5,275.00
General Contributions Fund	\$698.00
Total	\$7,150.00

# Chapter Announcements

## Boulder Chapter

Boulder Chapter meetings are typically held on the second Thursday of each month (Autumn through Spring) at 7:00 PM. Meet at the Community Room in the center of the REI Store at 1789 28th Street, between Canyon and Pearl, in Boulder. For more information, visit [www.conps.org](http://www.conps.org) or contact Chapter President Deby Stabler at 303-902-4679 or [debystabler@yahoo.com](mailto:debystabler@yahoo.com). Help make 2008 zero waste and bring your own cup and plate.

**March 13 Ten Years of Restoring Boulder's Wildlands**

**April 10 Rare Plant Initiative: Saving Colorado's Wildflowers**

**May 8 Native Plant Hike and Picnic**

## Metro-Denver Chapter

Monthly meetings of the Metro-Denver Chapter are typically held on the fourth Tuesday of the month (October through May) at 7:00 PM. Meet in the Waring House, just south of the main entrance to the Denver Botanic Garden. For more information, visit [www.conps.org](http://www.conps.org) or contact Chapter Co-Presidents Megan Bowes and Vickey Trammell at [vickey4conps@hotmail.com](mailto:vickey4conps@hotmail.com) or 303-795-5843.

**February 26 Colorado Native Plant Master Program**

**March 25 Successes & Challenges of High Altitude Revegetation**

**April 22 Colorado's High Botanical Peaks**

**May 27 Chapter Field Trip**

## Northern Colorado Chapter

Northern Chapter meetings are typically held the first Wednesday of the month (Oct- April) at 7:00 PM. Meet at the Gardens on Spring Creek, 2145 Centre Ave., Fort Collins Prior to meetings, members meet at 5:30 PM for dinner with the speaker at Café Vino, 1200 S College Ave. Please join us. For more information, visit [www.conps.org](http://www.conps.org) or contact Chapter President Denise Culver at 970-491-2998 or [Denise.Culver@colostate.edu](mailto:Denise.Culver@colostate.edu).

**March 13\* Colorado Bark Beetle Interactions with Their Host  
Trees and Birds (\*Thursday)**

**April 2 America's Lost Landscape: The Tallgrass  
Prairie**

## Southeast Chapter

Activities for the Southeast Chapter are scheduled throughout the year and are often held in Colorado Springs at the Beidleman Environmental Center on Caramillo Street, north of Uintah, off Chestnut. For more information, visit [www.conps.org](http://www.conps.org); or contact Liz Klein at 719-635-5927 or [elizaklein@gmail.com](mailto:elizaklein@gmail.com), Elsie Pope at 719-596-4901, or Doris Drisgill at 719-578-1091 or 719-322-3902. The Chapter is recruiting for the office of President.

"Chapter Announcements" continues on page 17

# A Fifteen Year Inventory of Vascular Plants in Golden Gate Canyon State

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By Stanley Smookler and Linda Senser

GGCSP lies within the Front Range, 13 miles west of Golden via Golden Gate Canyon Road. With an area greater than 14,000 acres, GGCSP is the second largest park in the Colorado State Park system. The Park straddles two counties, Jefferson and Gilpin.

From 1991 to 2006, Stephen B. Austin,\* the authors, and others have been conducting a vascular-plant survey of Golden Gate Canyon State Park (GGCSP). Surveys were run along park trails, roads, drainages, and occasionally cross-country using map and compass. Initially we documented plant-collection site locations by township, range and section, and later (after 2004), recorded UTM coordinates at each site, using a GPS recorder. In 1994, the Green Ranch extension was added to the park and the plant surveys were extended there. However, we confine our discussion to survey results documented within the original borders of GGCSP.

Collected plant specimens were pressed, dried, labeled, and stored in an herbarium established at the Park Visitors Center. Duplicate collections were deposited in the Kathryn Kalmbach Herbarium (KHD) at the Denver Botanic Gardens. Occasionally, unusual specimens were placed at the University of Colorado Herbarium (COLO). Nomenclature followed Weber and Wittman (2001).

Through 2006, 593 species representing 338 genera and 85 families were collected in both GGCSP and in its Green Ranch extension. The most well represented plant families included: Asteraceae with 100 species and 50 genera, Poaceae with 78 species and 39 genera, Brassicaceae with 32 species and 24 genera, Scrophulariaceae with 26 species and nine genera, and Fabaceae with 25 species and 11 genera.

## Geography (GGCSP, 1996)

GGCSP lies within the southwest section of the South Platte River watershed. Ralston Creek flows east through the Park from its source, three miles west of the Park on Fairburn Mountain. Tributaries to Ralston Creek, which lie within the borders of GGCSP include Deer Creek confined to the northeast tier of the Park and the intermittent Nott Creek, draining the northeast section from Forgotten Valley Pond to Windy Peak. The north-facing slopes of Centralia Mountain south of Ralston Creek are drained intermittently by Sawmill Gulch. In the western section of the Park, drainage from Tremont Mountain and Dude's Fishing Hole

flows southward into Ralston Creek (See map next page).

Park elevations vary from less than 7600 ft. in the eastern section to 10,388 ft. atop Tremont Mountain. Other high areas in the Park include the lower slopes of Thorodin Mountain (10,000 ft.) along the northwest-Park border, Centralia Mountain at 9795 ft., Ralston Roost at 9339 ft, Promontory Ridge with an average elevation of 9500 ft, and City Lights Ridge at 8680 ft.

## Geology (GGCSP, 1996)

The Precambrian-aged Boulder Creek batholith intrusion is the major rock unit in the Park. Consisting largely of granodiorite, it is exposed in northwestern, western, and southern sections of the Park. Another intrusion from the Cretaceous era deposited quartz monzonite in a narrow belt running through the center of the Park, directed northeast to southwest into the upper reaches of the Green Ranch. The remaining surface rocks are metamorphosed gneisses and quartzite, mainly concentrated in the eastern end of the Park and in the Green Ranch.

## Botany

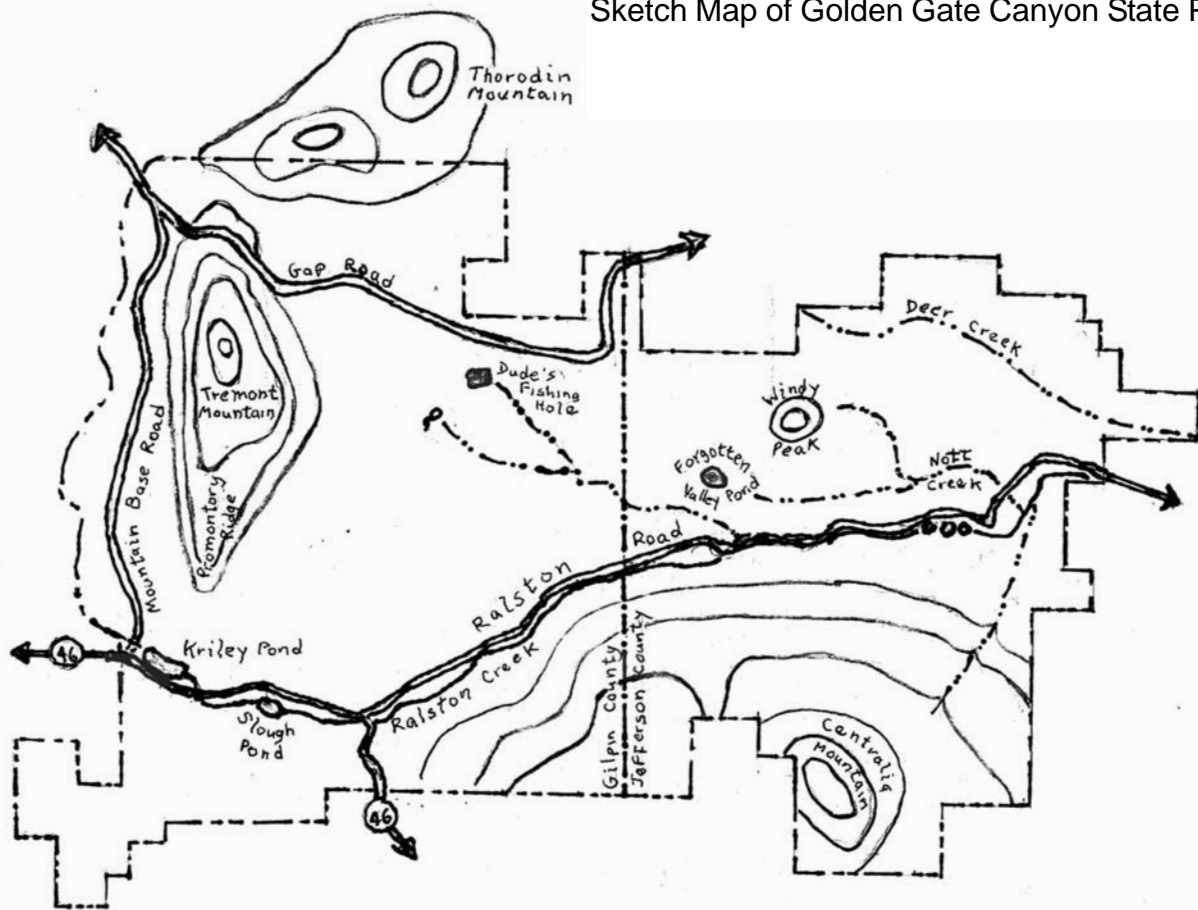
The floristic patterns within the Park are related to the elevation range, vegetative zones, and geography. We summarize the botany of GGCSP by examining eight geographic zones.

**North-facing slopes of Centralia Mountain in the southern section of the Park.** These slopes bear the montane communities of lodgepole pine and douglas fir, with Engelmann spruce occurring at elevations above 9000 ft. Along the gulches draining the slopes, we found night enchantress (*Circaea alpinum*) and lady fern (*Anthyrium filix-femina* var. *cyclosporum*).

**East-end of the Park north of Ralston Creek, where elevations range from less than 7600 ft to greater than 7900 ft.** Many of the plants here belong to the Foothill zone: *Amelanchier alnifolia*, *Populus deltoides*, *Cercocarpus montanus*, *Rhus aromatica* subsp. *trilobata*. *Populus deltoides* was discovered in the Park in 1998 and collected in 1999. Only two were known to exist within the Park, and these were winter killed in 2003. The specimens collected for the Park herbarium are missing, but duplicate specimens are available at KHD.

**Hills lying North of Ralston Creek within the montane zone (above 8000 ft) .** South-facing slopes comprised ponderosa pine, Rocky Mountain juniper, and common juniper, with the usual

## Sketch Map of Golden Gate Canyon State Park



montane flowering species, i.e., *Erigeron vetensis*, *Geranium caespitosum*, *Senecio integerrimus*, *Erysimum capitatum*, *Lupinus argenteus*, and *Thermopsis divaricarpum*.

North-facing slopes were dominated by dense stands of *Pinus contorta* (lodgepole pine), with the ground beneath usually barren. But in more open areas, clearings, and along trails associated with these stands, we found the orchids *Calypso bulbosa* and *Corallorhiza maculata*, and the composites *Arnica cordifolia* and *Packera werneriiifolia*.

Riparian zones along intermittent drainages include the following species: *Alnus incana*, *Dodecatheon pulchellum*, *Heracleum sphondylium* subsp. *montanum*, *Coeloglossum viride*, *Epilobium ciliata*, and *Mertensia ciliata*.

**Northeast corner of the Park drained by Deer Creek.** The riparian ecosystem along Deer Creek features plants found nowhere else in the Park. Herbaceous plants include: *Agrimonia striata*, *Lactuca biennis*, *Aralia nudicaulus*, and *Pteridium aquilinum* subsp. *lanuginosum*. Trees and shrubs include: *Corylus cornuta*, *Crataegus ethrypoda*, and *Populus balsamifera*. NOTE: *P. balsamifera* was recently discovered growing near Nott Creek.

**Ponds: Kriley Pond.** *Halapestes cymbalaria* and *Limosella aquatica* were found in aquatic- and wet-pond shores. *Oenothera nutallii* was found along the dry-pond shores. **Forgotten Valley Pond.** *Batrachium trichophyllum*, *Spiranthes romanzoffiana*, *Hippuris vulgaris*, and *Arnica rydbergii* were documented in aquatic habitat and mesic-pond shores. **Dude's Fishing Hole Area.** This aquatic habitat include *Batrachium circinatum*, and *Ranunculus hyperboreus* subsp. *intertextus*. **Kriley Pond-Ralston Creek-Slough Pond Complex.** *Astragalus eucosmus*, and *Epilobium leptophyllum* was found in the riparian habitat.

**Montane wetlands above 9000 ft in the west section of GGCSP.** Forbs include: *Bistorta bistortoides*, *Ranunculus eschscholtzii*, *Clementsia rhodantha*, and *Ranunculus reptans*. Shrubs include: *Betula glandulosa*, *Salix brachycarpa*, and *Salix planifolia*.

**Drainage on northwest slope of Tremont Mountain from Gap Road northward.** Along this drainage we found orchid *Lysiella obtusata*, Thimbleberry (*Rubacer parviflorum*), and Rhubarb (*Rheum rhaiponticum*).

"Golden Gate" continued on page 16

“Golden Gate” continued from page 15

**Mesic-Hilly area north of Kriley Pond.** This geographic zone is of special interest, as several populations of unusual species occur in close proximity to the Blue Grouse trail: *Besseyia plantaginea*, *Eriogonum flavum* subsp. *chloranthum*, and *Aster alpinus* var. *vierhapperri*. Examination of COLO records shows that *B. plantaginea* occurs in scattered locations on the eastern slope from the plains bordering the foothills into the mountain areas. It ranges from Larimer County in the north to Las Animas and Huerfano counties to the south. The nearest population to that of GGCSP occurs in Jefferson and Boulder Counties at the base of the foothills between Coal Creek Canyon and El Dorado Springs. The nearest mountain location is in the Tarryall Mountains 50 miles southwest of Denver. *Eriogonum flavum* subsp. *chloranthum* is heretofore known mainly from the northeast plains and on the continental divide in Colorado (Weber and Wittman, 2001). *Aster alpinus* var. *vierhapperri* is very rare in Colorado. Four previous Colorado collections were made from populations above treeline (Moore & Friedly, n.d.). Those plants grow on open tundra and are dwarfed. In contrast the GGCSP population occurs at an elevation of 8500 ft, and the plant habit is a robust 8-10 inches high. Furthermore, there is a sharp difference in habitat, with the GGCSP plants growing beneath stands of aspen and ponderosa pine.

Finally, we note some additional observations concerning the flora in GGCSP:

There are 25 species and subspecies of willows that are native to Colorado, and eleven of those have been found in GGCSP. We have already noted the presence of two willows, *Salix brachycarpa* and *S. planifolia* in the upper montane wetlands of GGCSP. A third willow species occurring in the Park is *S. scouleriana*, a dry-land willow. The eight remaining species grow along the riparian zone bordering Ralston Creek: *Salix amygdaloides*, *S. exigua*, *S. lucida* subsp. *caudata*, *S. bebbiana*, *S. irrorata*, *S. monticola*, *S. drummondiana*, and *S. ligulifolia*.

White monkshood (*Aconitum columbianum* forma *ochroleucum*), an anomaly according to Weber and Whittman (2001), occurs as a sporadic mutant in normal populations of the blue monkshood. The latter typically has dark blue purple flowers; however, we found that the white form is more common in the Park than the blue. Furthermore, when the blue monkshood is found, its flowers are lighter and softer blue in color. Indeed, in one drainage area on Centralia Mountain, we found significantly more blue monkshood growing with the white. Coexisting with this population were apparently hybrid forms bearing flowers with many intermediate color variations.

An unusual flowering event in 1999 was the sudden appearance of *Bidens tenuisecta* (beggar's tick). It was found in abundance on dry roadside from Nott Creek to one mile eastward along Ralston Road. Prior to 1999 and since 2000, it had not been seen.

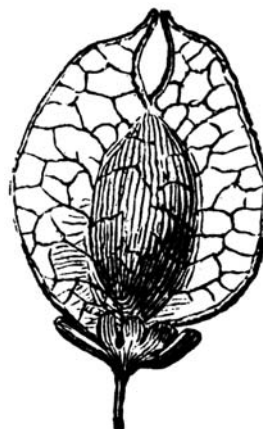
From our 15-year inventory in GGCSP, we have been astonished by the diverse ecosystems and the incredible number of, and sometimes unusual, plant species found there. And yet the Green Ranch displays a different set of diverse habitats that have yielded plant species that so far have not been duplicated in GGCSP.

The following species have only been found at the Green Ranch: *Arnica chamissonis*, *Chondrophylla prostrata*, *Packera pseudaurea*, *Stellaria crassifolia*, *Aster foliaceus*, *Cylactis pubescens*, *Poa glauca* subsp. *rupicola*, *Symphocarpus rotundifolius*, *Campanula Parryi*, *Gnaphalium palustre*, *Physallis hederifolia*, *Trimorpha lonchophylla*, *Cardamine cordifolia*, *Ligusticum tenuifolium*, *Pseudognaphalium viscosum*, *Carex aquatilis*, *Lomatogonum rotatum*, *Schizachne purpurascens*, *Carex bella*, *Opuntia polycantha*, and *Stellaria calycanthum*.

#### REFERENCES

- Weber, W. A., and R. 2001. Whittman. *Colorado Flora: Eastern Slope*, 3rd Edition.  
Golden Gate Canyon State Park Management Plan - Draft, July 1996.  
Moore, L., and S. Friedly. 2006. *Aster alpinus* var. *vierhapperi*, A Technical Conservation Assessment, USDA Forest Service, Rocky Mountain Region, Species Conservation Project.

Stanley Smookler and Linda Sensor are members of the Colorado Native Plant Society. Thanks to Steve Austin who retired in 1995 but continued to maintain the computerized plant list of GGCSP until 2004. 🐝



Samara of American elm  
Asa Gray, *The Elements of Botany for Beginners and for Schools* (New York, Cincinnati, Chicago: American Book Co., 1887). Clipart courtesy FCIT, <http://etc.usf.edu/clipart>



# Chapter Announcements

## Plateau Chapter

Chapter activities are scheduled throughout the year. For more information, visit [www.conps.org](http://www.conps.org) or contact Chapter President Jeanne Wenger at 970-256-9227 or [stweandjaw@acsol.net](mailto:stweandjaw@acsol.net). The Chapter is recruiting for the office of President.

- March 29** Likeable, Loveable Lichens Field Trip
- April 19-20** Wildflower Identification
- May 10-11** Gateway/Sinbad Valley
- June 28** Sheep Mountain from Cimmaron Creek Field Trip
- July TBA date** *Draba* Field Trip
- Aug 23** Grand Mesa Fens

## San Luis Valley Chapter

Chapter activities are scheduled throughout the year. For more information, visit [www.conps.org](http://www.conps.org) or contact Chapter President Cindy (Chinle) Beaver at 719-256-5291 or [beaver@fairpoint.net](mailto:beaver@fairpoint.net)

- March 9** TBA
- June 8** North Crestone Canyon Field Trip
- June 28** Wolf Creak Pass to San Luis Valley Field Trip
- July 27** Alamosa Canyon and Summitville Field Trip
- August 16** Sedges Educational Program

## Southwest Chapter

The Southwest Chapter explores, preserves, and enjoys the flora of the Four Corners area through activities that are scheduled throughout the year. We welcome new ideas for field trips, activities, and programs, and we especially welcome new members

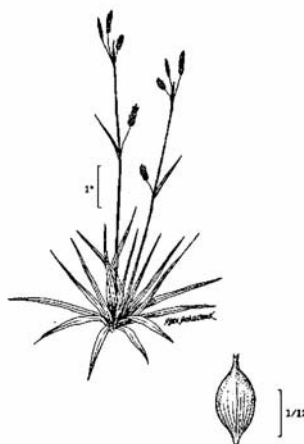
from Colorado, New Mexico, Arizona, and Utah. For more information, visit [www.conps.org](http://www.conps.org) or contact Chapter President Al Schneider at 970-882-4647 or [webmaster@conps.org](mailto:webmaster@conps.org).

- April 19-20** Introduction to Wildflower Identification

## Joint Events with the Plateau Chapter

- May 4** Field trip to El Malpais
- May 7** Wildflower slide show
- June 20-21** Introduction to Wildflower Identification Workshop
- July 27** Riparian, alpine, revegetation, Summitville

**Chapter Correspondence**  
 For email notification of chapter activities, contact your chapter president.



*Carex capillaris*  
 USDA-NRCS PLANTS Database / USDA NRCS. Wetland flora: Field office illustrated guide to plant species. USDA Natural Resources Conservation Service.

# Welcome New Members

- |                              |                                |                      |                     |
|------------------------------|--------------------------------|----------------------|---------------------|
| Maureen Arthur               | Michael Gellner                | Marilyn Loser        | Mike Schiebolt      |
| Michele Bailey               | Kim & Rick Heiss               | Terry Lukas          | Linda Schmidt       |
| Lauren Barringer             | Courtney James                 | Becky Macknight      | Dave Scott          |
| Glen Bean                    | Dan Johnson                    | Carron Meaney        | Paul Selby          |
| Martha Beck                  | Mike Britten & Therese Johnson | Linda E. O'Banion    | Steve Setzer        |
| Danielle Cassidy             | Panayoti Kelaidis              | Maureen O'Shea Stone | Rick Shory          |
| Donna Clark                  | Mike Kirkpatrick               | Patricia M. Ploegsma | Jean Stevenson      |
| Bill Daniels                 | Peter D. Kleinman              | Jacalyn Raehl        | Lynn Strosburg      |
| Amber Davis                  | Bernadette Kuhn                | Pamela L. Regensberg | Genevieve Walden    |
| Susan J. Dunn                | Frank Morse & Daniela Kuper    | Maria Richmond       | Robert Weaver       |
| Lise Mahnke & Mary Fairbanks | Martha J. Long                 | Lawrence H. Robins   | Crystal Yates-White |

# BOOK REVIEW

by Jan Loechell Turner

*Northern Colorado Plants: A Field Guide to the Flora of the Northern Front Range Urban Corridor* by Alix Gadd. Windsor, CO: Travertine Press, 2007.

With the proliferation of independently published books, readers are provided with a variety from which to choose. If the author is not a noted botanist, such as William Weber, it is important that the author has the plant identifications verified by an authoritative source, such as botanists at the University of Colorado or Denver Botanic Gardens. Tim Hogan and Nan Lederer of the CU Herbarium and Dave Steingraeber of Colorado State University Biology Department verified identifications in Gadd's book. Scientific names are from Weber and Wittman's *Colorado Flora: Eastern Slope* 3rd edition.


*Northern Colorado Plants* is a non-technical photographic guide that will be of interest to plant lovers in the Greeley-Fort Collins-Loveland area. Books that cover a limited geographic area serve an important purpose for beginning botanists and non-botanists, since they narrow the number of possible plant identification choices that confront the user, making the process less overwhelming.

In Gadd's book, plants are grouped into three sections: horse-tails, grasses, and grass-like plants; herbaceous plants with colored flowers; trees and shrubs. Within each section, plants are

arranged alphabetically by family, genus, and species, except the herbaceous plants, which are grouped first by flower color, and then by family, genus, and species. Many books ignore grasses, so it is a real plus that they are included in this book.

Color photographs (3.25" x 2") of four plants are found on a page, with written information about the plants on the facing page. One color photo of each plant is included, so for plum there is a photo of a branch with flowers, but no photo of the entire tree. Entries for each plant include: common and scientific name, family, native or introduced, annual or perennial, and bloom season. Some descriptive information is included and the habitat is noted. The size of the plant/flower is not always given.

Gadd, who lives in Windsor, Colorado, is a person who is passionate about the plants of her area. She has observed development that is eliminating areas with native plants and indicates prominently whether each plant is native or introduced. Alix Gadd has a B.A. in biology from Colorado College and a M.S. in ecology from Colorado State University. The book is available from Barnes and Noble Bookstores and from Travertine Press mail@travertinepress.com (the website is www.travertinepress.com).

Jan Loechell Turner is at Regis University and is the CONPS Research Grants Committee Chair and Co-President. Jan is also our source for great book reviews. 

## Aquilegia

### Newsletter of the Colorado Native Plant Society

*Aquilegia* is published four or more times per year by the Colorado Native Plant Society. This newsletter is available to members of the Society and to others with an interest in native plants. Articles for *Aquilegia* may be used by other native plant societies or non-profit groups, if fully cited to author and attributed to *Aquilegia*.

Articles from 500 to 2000 words in length are welcome. Previously published articles submitted for reprinting require permission. Digital photographs or line drawings are also solicited. Please include author's name and address, although anonymity may be requested. Articles must be submitted electronically. Articles and other contributions may be edited.

Please direct all contributions to the newsletter to:

Leo P. Bruederle  
leo.bruederle@cudenver.edu  
University of Colorado Denver



# Colorado Native Plant Society



The Colorado Native Plant Society is a non-profit organization dedicated to the appreciation and conservation of the Colorado native flora. Membership is open to all with an interest in our native plants, and is composed of plant enthusiasts both professional and non-professional.

Please join us in helping to encourage interest in enjoying and protecting Colorado's native plants. The Society sponsors field trips, workshops, and other activities through local chapters and statewide. Contact the Society, a chapter representative, or committee chair for more information.

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Vacant

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\_\_\_\_\_ San Luis Valley \_\_\_\_\_ Southeast \_\_\_\_\_ Southwest

## DONATION

\$ \_\_\_\_\_ General Fund

Endowments in support of small grants-in-aid of research:

\$ \_\_\_\_\_ John Marr Fund: research on the biology and natural history of Colorado native plants.

\$ \_\_\_\_\_ Myrna P. Steinkamp Memorial Fund: research and other activities that will benefit the rare plants of Colorado.

Mail to: Eric Lane, PO Box 200, Ft. Collins, CO 80522

DUES AND CONTRIBUTIONS ARE TAX-DEDUCTIBLE

## MEMBERSHIP CLASS

Dues cover a 12-month period

\_\_\_ Individual, \$20.00

\_\_\_ Family/dual, \$30.00

\_\_\_ Senior, \$12.00

\_\_\_ Student, \$12.00

\_\_\_ Organization, \$30.00

\_\_\_ Supporting, \$50.00

\_\_\_ Lifetime, \$300.00

# CALENDAR 2008

## SOCIETY FIELD TRIPS

May 17	Denver Botanic Gardens
May 18	Diversity of Lichens
June 8	North Crestone Canyon
June 28	Wolf Creek Pass to San Luis Valley Floor
June 28	Two Buttes
July 11	Mount Goliath Natural Area
July 12	Fens of South Park
August 2	Rocky Mountain National Park
August 9	Geneva Basin Iron Fen
August 16-17	Rough Creek Iron Fen

## SOCIETY WORKSHOPS

February 9, 10	Mints of Colorado
April 12, 13	Penstemon
May 3, 4	Plant Terminology
June 27, 28, 29	Carex

## BOARD MEETINGS

February 9	9:00 AM	Boulder Open Space Office
April 5	9:00 AM	TBA
July 19	9:00 AM	TBA
Sept 5	6:00 PM	Montrose
Nov. 15	9:00 AM	TBA

See <http://www.conps.org/conps.html> for details.

TIME SENSITIVE MATERIAL