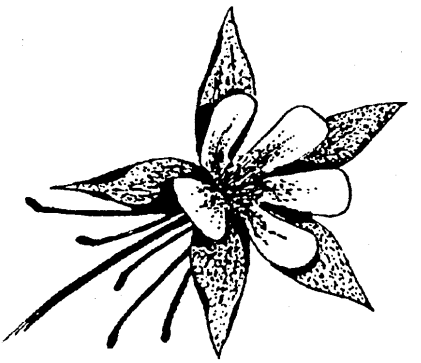
Aquilegia



Newsletter of the Colorado Native Plant Society

". . . dedicated to the appreciation and conservation of the Colorado native flora"

Volume 14, Number 5 **September/October 1990**

The Search for Rare Plants

Bill Jennings

There have been some recent developments in the search for rare plants in Colorado:

Physaria bellii Mulligan (Brassicaceae)

I examined an interesting specimen of *Physaria bellii* in the herbarium of the Missouri Botanical Garden during a recent visit there. The label reads: "Shaly slides, Cheyenne Mountain, Colorado Springs, June 22, 1912, J.R. Churchill, s.n. [in fruit; identified by collector as *P. didymocarpa*; annotated by Rollins as *P. bellii*; MO accession number 1051945]"

The location description as "shaly slides" precludes the specimen from being taken on the upper reaches of Cheyenne Mountain, which is granite, and suggests it was taken on the outcrops of sedimentary rocks at the base of the mountain. I suggest that if the herbarium label is correct, the locality may be along what is now Colo. Hwy. 115 where there is an outcrop of the Niobrara Formation, as shown on the Colorado State Geologic Map.

The outcrop was checked May 16th, but no species of *Physaria* was found there. This site is about 2 miles south of the big beetle statue that advertises the May Museum. Dr. William A. Weber examined the *Physaria* specimens at Colorado College, but did not find any *P. bellii* specimens from El Paso County. Thus, this old collection is the only known specimen of this species from El Paso County. Nevertheless, any limy shales in the area should be checked for the existence of the twinpod, otherwise limited to Jefferson, Boulder, and Larimer Counties.

Aletes humilis Coulter & Rose (Apiaceae)

A new site was verified May 6th, adjacent to the Larry Smeins property on private and National Forest land. 389 plants were counted on a flat rock promontory and on west/northwest/north-facing slopes of an unnamed hill. Permission from landowner Smeins, who provided photographs of the plants last year, was granted to visit the site. There are now 7 known populations of this rare parsley, limited to Larimer and Boulder Counties.

— continued on page 7

Inside . . .

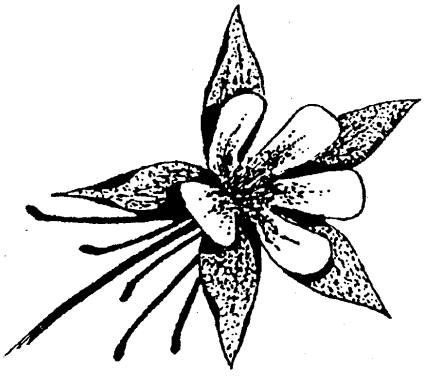
President's Message

When CONPS was incorporated in 1976, its primary mission was to "encourage the appreciation and conservation of native plants and vegetation of Colorado . . .". The Society has accomplished a great deal toward this objective, but it is an ongoing process. The general public still lacks an understanding of how plants are an integral part of our everyday lives. Because the public's vision is myopic, individual species and entire plant communities are still being disrupted and/or eliminated without reckoning.

As an educational organization, the Colorado Native Plant Society, and its individual members, must work continually toward increasing public awareness and concern for the natural environment, and heighten the level of responsibility for native plants and plant communities. Many people, even those sensitive to other environmental concerns, are ignorant of the threats to our state and regional floras. By working together, and by aligning ourselves with appropriate organizations, we can help ensure broader interest in the preservation of Colorado's remaining native vegetation.

The Society has a great deal to contribute to this effort. As your new president, I look forward to continuing the many tasks CONPS has already undertaken, and to working toward a greater role to accomplish these primary goals. I appreciate the opportunity to work with all of you in the year ahead.

— Gayle Weinstein, President



Aquilegia is printed on

100% Recycled Paper

Aquilegia

Aquilegia is published six times per year by the Colorado Native Plant Society. This newsletter is available to members of the Society, and others with an interest in native plants. Contact the Society for subscription information.

Articles from *Aquilegia* may be used by other native plant societies if fully cited to author and attributed to *Aquilegia*.

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 comprised of plant enthusiasts, both professional and non-professional.

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

Schedule of Membership Fees

Life	$250.00
Family or Dual	$ 12.00
Supporting	$ 50.00
Individual	$ 8.00
Organization	$ 25.00
Student or Senior	$ 4.00

Membership Renewals/Information

Please direct all membership applications, renewals and address changes to the Membership chairperson, in care of the Society's mailing address.

Please direct all other inquiries regarding the Society to the Secretary in care of the Society's mailing address.

Newsletter Contributions

Please direct all contributions to the newsletter to:

Peter Root
4915 West 31st Avenue
Denver, CO 80212

Deadlines for newsletter materials are February 15, April 15, June 15, August 15, October 15 and December 15.

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Publicity	Elizabeth Otto	567-2384
Workshops	Bill Jennings	666-8348

Welcome to New Board Members and Officers

At the Society's Annual Meeting September 8th, the following Board members were elected (or re-elected) for terms ending in 1992:

Peter Hensen, Denver
Betsy Neely, Boulder
Velma Richards, Englewood
Sally White, Morrison
Jan Wingate, Denver

Officers chosen for the Society in 1991 are:

Gayle Weinstein, President
Jim Borland, Vice-president
Rob Udall, Secretary
Myrna P. Steinkamp, Treasurer

The next board meeting will be held October 27th at 1:30 PM at Gayle Weinstein's home. ♣

Beyond Earth Day

A conference sponsored by the Colorado Alliance for Environmental Education (CAEE) will be held October 26th and 27th. **Earth Day to Earth Decade: from Dreams to Action** includes speakers, exhibits, and break-out sessions considering issues of environment and economics, educational partnerships between business and government, computers and the media in environmental education (EE), urban EE and minority involvement, curriculum ideas and action plans.

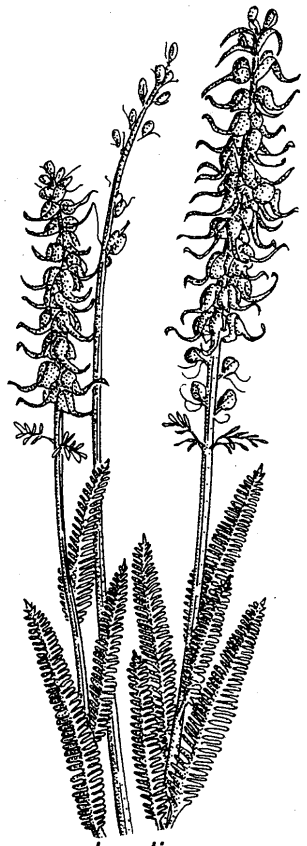
Conference registration fee of $85 includes CAEE membership and three meals. Registration for CAEE members is $70.

The conference will be held at the Sheraton Denver Tech Center at I-25 and Belleview. Special rates for lodging at the Sheraton are available. Contact Don Hollums at 866-6787 for registration or additional information. ♣

New Wilderness Book

Colorado — Our Wilderness Future presents proposed additions to our wilderness system in full color photographs, and text explaining why these areas should become part of the National Wilderness Preservation System. This soft-cover book is printed on recycled paper and includes a map of 20 proposed wilderness areas and 28 existing wilderness areas in Colorado.

By special arrangement, sales of this book will benefit the Colorado Environmental Coalition. Thus your purchase will make you better informed, while helping protect Colorado's natural environment. Copies of the wilderness book may be ordered directly from CEC for $12.95 each plus tax and mailing. Contact CEC at (303)837-8701, or stop by their office at 777 Grant St. Suite 606 (Mon-Fri, 9AM to 5PM) to pick up a copy. ♣



Pedicularis groenlandica
Elephantella
Illustration by Kris Meiring

New Wetland Plant Book

The Environmental Protection Agency has recently published a wetland plant identification guide that will be helpful for plant enthusiasts and others interested in our watery habitats. With descriptive text by Dr. David Cooper, and B/W illustrations by Kris Meiring, **A Handbook of Wetland Plants in the Rocky Mountain Region** portrays taxa commonly found in Colorado wetlands. Distinguishing characteristics of large genera such as *Carex* and *Salix* are represented using a species or two; many other identifications reach the level of individual species.

For each plant presented, synonomy, identification, ecology, geographic distribution, and wetland ranking (e.g. obligate, facultative, upland) are discussed opposite the full-page illustration. Similar and related species are mentioned to help avoid confusion.

The **Handbook** is available without charge from the EPA Region VIII office in Denver. Contact Charlynn Boddie (303/294-1118) to obtain copies.

Those actively involved in wetlands protection may also want to ask for copies of another booklet by Dr. Cooper: **A Citizen's Guide to Wetland Protection,** which reviews the Section 404 permit process, and other wetlands preservation issues. This publication also provides a brief overview of wetland types found in the Rocky Mountain region, and the ecological and hydrological functions wetlands perform. ♣

CONPS Workshops for 1990 – 1991

Bill Jennings

The Colorado Native Plant Society workshop series was established with the objective of having something to do during the winter when field trips are impossible. Since the first workshop in January 1985, 38 have been held.

Our concept of a workshop means bringing together plant lovers and a well-informed instructor who has photographs, herbarium specimens and live plants for the attendees to study hands-on, with opportunities for one-on-one interaction with the instructor as well as lectures to the group as a whole. No special skills or requirements, other than a love of plants and a desire to learn, are necessary for attending a workshop. Even though the descriptions may make these workshops sound highly technical, the case is exactly the opposite. The objective is to demystify plant identification and to allow the confused but sincere plant lover to better enjoy and understand our native plants.

Registration for Workshops

Enrollment in workshops is always limited, usually due to room constraints, so you must register in advance. Contact CONPS workshop coordinator for registration and workshop information: **Bill Jennings, PO Box 952, Louisville, CO 80027; phone 303-666-8348.** Be sure to include your mailing address and phone number if you mail in your registration. Registrants will be notified by mail about two weeks prior to the workshop regarding final location, time, lunch, suggested references, etc.

Please register promptly, as workshops tend to fill up fast. However, cancellations sometimes create openings, so you might want to check with Bill up to the night before the workshop if you want to try to register at the last minute.

Unless otherwise noted, the fee for **each** full-day workshop is $8 for members and $16 for non-members. If you plan to attend more than one workshop per year as a non-member, it is cheaper to join CONPS as an individual member ($8 per year) and come to workshops as a member. Please hold payments until the day of the workshop.

It takes considerable time and effort for the instructors to plan and develop workshops and field trips. Please let us know how you like the workshops and field trips offered by CONPS. We need your suggestions for other workshops and trips, as well as your feedback on whether you found them informative and exciting or dull and uninteresting. We need to know whether we are serving you, our members, the way you wish.

CONPS Workshops for 1990 – 1991

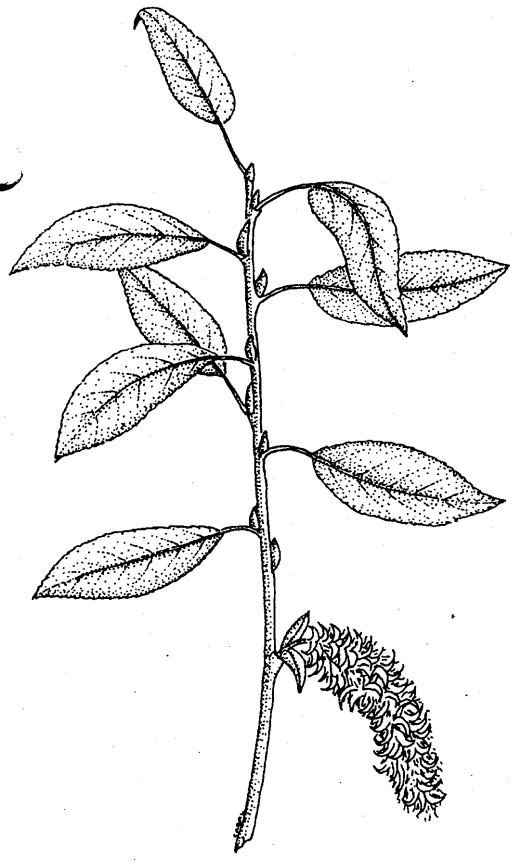
Ericads: the Heath and Related Families
Saturday, November 3, 1990

Leader: Bill Jennings

The Phlox family workshop originally scheduled for this date has been cancelled as Dr. Dieter Wilken is unable to return from California. In its place, Bill Jennings will present a workshop on the Heath, Pyrola, and Monotropa families in Colorado.

There are 19 Colorado species in these three families. The most problematic genera are *Vaccinium, Arctostaphylos*, and *Pyrola*. Photos, specimens, and keys will be available for participants to view and study. If you registered for Phlox, you are now registered for this workshop.

To be held at Denver Botanic Gardens.



Willows: Genus Salix
Saturday, December 8, 1990

Leader: Dr. David Cooper

Dr. Cooper has been studying the wetland plants of Colorado or many years and has discovered numerous significant new populations in a variety of plant families. This workshop, the third in Dr. Cooper's series focusing on wetland plants, will cover the willows (prior workshops were on *Carex* and *Juncus*).

Willows can be difficult to identify because flowering catkins, fruiting catkins, and leaves appear at different times, and all are often needed for final identification.

To be held at Colorado School of Mines.

Grasses of the Eastern Colorado Plains
Saturday, January 12, 1991

Leader: Dr. Alan Carpenter

Grasses are avoided by wildflower lovers because the flowers are not photogenic and the terminology used for floral parts is unique. However, considering both their economic and ecological significance, all Colorado botanists should have a working knowledge of the grasses.

Dr. Carpenter will help us understand the species in this important family that are found on the eastern plains. This workshop complements our prior workshops on common grasses and high-altitude grasses.

To be held at the Foothills Nature Center, Boulder.

. . . and More Workshops

Hawaiian Ferns and Fern Allies
Saturday, February 9, 1991

Leader: Dr. Tom Ranker

If you ever wanted to go to Hawaii, now is your chance (sort of). Dr. Tom Ranker, curator of botany at the University of Colorado and successor to Dr. William Weber, is fresh from Hawaii and will introduce us to the Hawaiian flora, with an emphasis on the ferns and fern allies.

He will discuss the colonization, speciation, and evolution of Hawaiian pteridophytes; fern genetics and mating systems; and how the study of these plants relates to conservation biology of Hawaii's endangered flora. Specimens and keys for the ferns will be provided.

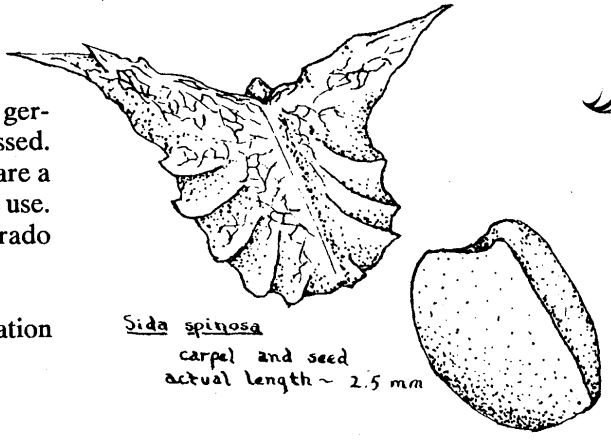
To be held at the Foothills Nature Center, Boulder.

Identification of the Seeds of Weedy Plant Species
Saturday, March 2, 1991

Leader: Dr. Arnold Larsen

As a follow-up to the topic of our annual meeting (Barbarians at the Gate: Exotic and Weedy Plants of Colorado), Dr. Arnold Larsen, president of Front Range Seed Analysts, will present this unique workshop on identification of the seeds of weedy plant species. He will explain the process of collecting, identifying, cleaning, and storing seeds. Viability testing and pre-germination and germination processes will be discussed. He will help each participant prepare a seed reference collection for future use. A study guide to the seeds of Colorado will be available for purchase.

To be held in Fort Collins at a location to be determined.

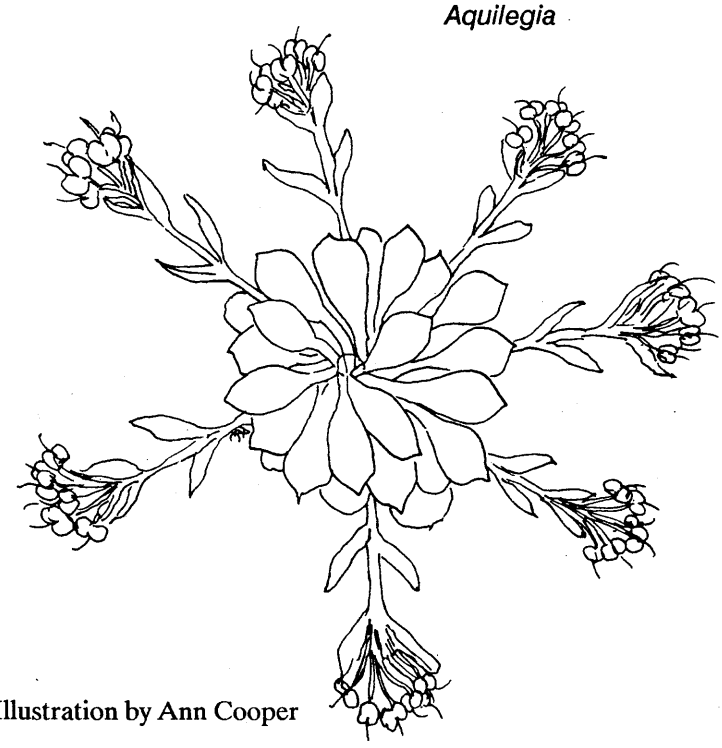


Mentzelias: the Blazing Stars
Saturday, March 23, 1991

Leader: Dr. Barry Prigge

The Native Plant Society is proud to be able to bring Dr. Prigge to Colorado for this workshop. He is affiliated with the University of California at Los Angeles, where his primary research has been the annual species of *Mentzelia* from the American southwest. He will bring us up-to-date on research in the genus in general, and will also cover the Mentzelias of Colorado. Specimens to examine or dissect, keys, photos, and references will be provided.

To be held at Denver Botanic Gardens.



Physaria bellii
Bell's Twinpod
Illustration by Ann Cooper

Echinocereus reichenbachii (Terscheck) Haage f. (Cactaceae)

This cactus is rarely collected in Colorado; there are less than ten sites shown in Benson's **Cacti of the United States and Canada**. On May 16th, Dexter Hess and I visited the Graves ranch southwest of Timpas, Otero County, and found the cactus in three locations. We saw almost 200 plants in bud, some close to bloom. Dexter Hess knows of some more sites in the La Junta area. Because of their difficulty in collection and preparation, specimens of cacti are often underrepresented in herbaria.

Fritillaria pudica (Pursh) Sprengel (Liliaceae)

This little lily has been located four times in Colorado in Moffat County. Botanical artist Carolyn Crawford found it in very late bloom May 27th northwest of Stuntz Reservoir on Blue Mountain. This is the site collected by Harrington and others May 16, 1948, but not revisited since then. The locality is in a sagebrush field that is heavily grazed. Any plants in the open were broken and trampled; best plants were found way back under sagebrush plants where they could not be trampled. No plants had set fruit, even though about 25 had flowered. Another 50 or so were seen in leaf. Plants were about 3 inches tall.

Spiranthes diluvialis Sheviak (Orchidaceae)

The "*Spiranthes porrifolia*, Camp Harding, near Pikes Peak" specimen referred to by Rydberg in his 1906 **Flora of Colorado** has finally been located in the herbarium of the New York Botanical Garden. Dr. Weber requested a loan of the specimen and Dr. Weber and I examined it on May 29th. We both agree it is *S. diluvialis*, and it was annotated as such. This places *Spiranthes diluvialis* definitely in El Paso County.

Camp Harding was a guest ranch located near the Broadmoor in southwest suburban Colorado Springs. Most likely the plant was collected along Cheyenne Canyon or Bear Creek, however much of the area is built up and the site is likely destroyed. The specimen was collected August 3, 1896 by A.A. Butler and likely given to E.A. Bessey, as his label, with his name crossed out, is on the specimen. The specimen was annotated as *S. porrifolia*, probably by Rydberg, but the annotator did not leave his name. There is a single plant on the sheet; it is 35.5 cm tall, bears no leaves and has fewer than 10 flowers. The inflorescence is only about 4 cm long.

Lomatium concinnum (Osterhout) Mathias (Apiaceae)

There is an interesting specimen in the herbarium of the Missouri Botanical Garden.

> Cimarron [Montrose County], June 6, 1901, 6900 feet, C.F. Baker 22 [mostly in fruit; annotated as *L. concinnum* by Mildred Mathias, 1939].

Although no other specimens of *L. concinnum* have been taken near Cimarron, the elevation given is correct for the town and Mancos Shale underlies the area. West slope botanists should seek this rare parsley.

Hypoxis hirsuta (L.) Coville (Liliaceae)

There are two interesting specimens of this rare member of the lily family at the Missouri Botanical Garden.

> Wet Mountain Valley [Custer County], 1872, T.S. Brandegee 7939 or B-4856 [both numbers on label], from the herbarium of J.H. Redfield. [MO accession number 880452; identified by the collector as *H. juncea* and cited as such by Coulter and Porter, 1874, **A Synopsis of the Flora of Colorado**; annotated as *Hypoxis hirsuta* by A. Herndon, Fairchild Tropical Garden, 12/14/88]

> Denver, June 5, 1893, Schneck s.n. [identified by the collector as *H. juncea*; annotated early on as *H. hirsuta* and cited as such by Brackett, **Revision of the American Species of Hypoxis** Rhodora v. 25, p. 127, 1923; annotated as *H. hirsuta* by A. Herndon, Fairchild Tropical Garden 12/14/88]

This plant has been collected in Colorado only a few times and is to be sought in moist, grassy streamsides or wet meadows. Not seen in Colorado since 1959. ♣

The Prairie Garden, Part IV: Planting Wildflowers

Rick Brune

Diverse, healthy prairies may contain fifteen or more species per square yard. We are often not aware of this diversity because all of the species do not bloom or even grow at the same time. To recreate this variety in a prairie garden would require considerable time and numerous plants. However, the effect of a prairie can be achieved in a few years if we concentrate on planting the showiest wildflowers and those that reproduce readily by seed or rhizomes.

Several approaches to planting wildflowers in your prairie are possible. Except for a few short-lived species such as gaillardia (*Gaillardia pinnatifida*) and tansy aster (*Machaeranthera tanacetifolia*) which produce abundant seed, it is a waste of your hard-earned seed to broadcast it along with the grass seed. I usually start wildflower seed in pots to get the maximum number of seedlings by controlling watering, temperature, and weeds.

The following planting methods and combinations thereof work well for small prairie recreations:

Method 1: Unknown, Moderate, or Severe Weed Problem

If weeds may be a problem, spending a year on weed control after planting grasses *before* planting wildflowers will be most rewarding. The second year, prairie grasses will crowd out most annual weeds, allowing you to concentrate on adding wildflowers or shrubs. The main disadvantages of this method are that it requires watering many individual wildflower plants, and that competition for light and moisture is intense.

When planting during the second and later years, first use all of the available bare areas where weeds prevented the establishment of grasses in earlier years. Bare areas six inches or more in diameter will allow plants to get established rapidly with minimal competition from existing grasses. Clipping grasses within a 12-inch circle to one inch in height will help reduce competition for light. Most bare areas this size will fill in with grasses by the end of the second year. During this period, I sometimes find it helpful to remove encroaching buffalo-grass (*Buchlöe dactyloides*) stolons from areas where wildflowers are planted.

Eventually blue grama (*Bouteloua gracilis*) and buffalo-grass will form a thick sod which is extremely difficult to plant in. When this happens, use a narrow spade to remove plugs of sod about six inches in diameter and six inches deep to provide a space to plant. Replace this soil with similar soil from elsewhere in your yard. Do not add compost, peat, or fertilizer – doing so will produce a lush, fast-growing plant lacking hardiness. A few species don't grow well in heavy clay. For them I amend some soil with 50% or more (by volume) 3/4-inch top-size gravel.

Method 2: Minimal Weeds

With minimal weed problems, planting as many wildflowers as possible when you seed the grasses will produce the quickest bloom on your prairie. The big advantages to this method are that everything can be watered at once, and competition from grass is initially low. The disadvantage is that your only weed control option will be hand-weeding. It is possible to mow weeds above the height of the wildflowers but if you have enough weeds to require mowing, your flowers are being crowded out.

Using this method, wildflower plants are placed in the ground *after* the area is seeded with grass and rolled but before any watering is done. Don't worry about walking on the newly seeded area to plant but try not to stir up the seedbed except where you plant. If grass doesn't germinate within a three- or four-inch radius of your plant, that's great. It will

– continued on page 11

Blanket Flower
Gaillardia aristata

Illustration by Ann Cooper

quickly fill in and the wildflower will have less competition in the meantime.

Because grasses provide so much initial competition, eliminating grass seed from the area of a new plant will speed establishment. Before seeding grasses, try laying out 6-inch diameter pieces of cardboard or the bottoms of tin cans to keep broadcast grass seed off selected areas of soil. After rolling the seedbed, remove these covers as you plant the wildflowers in seed-free soil.

Planting

Our experiences with flower and vegetable gardens teach us to set out plants when they reach a nice size in 2 1/4-inch pots, 6-packs, etc. For years I have grown wildflowers and transplanted the seedlings to pots, let them grow another six weeks or so, then finally planted them in the garden. Why? From habit! This habit, I am discovering, wastes a lot of time and energy. The reason we transplant our tomatoes, peppers, and others is that they are frost-sensitive plants with long growing seasons. We protect them and lengthen their growing season by keeping them indoors in larger and larger pots. Natives apparently don't need this babying and, of course, why should they?

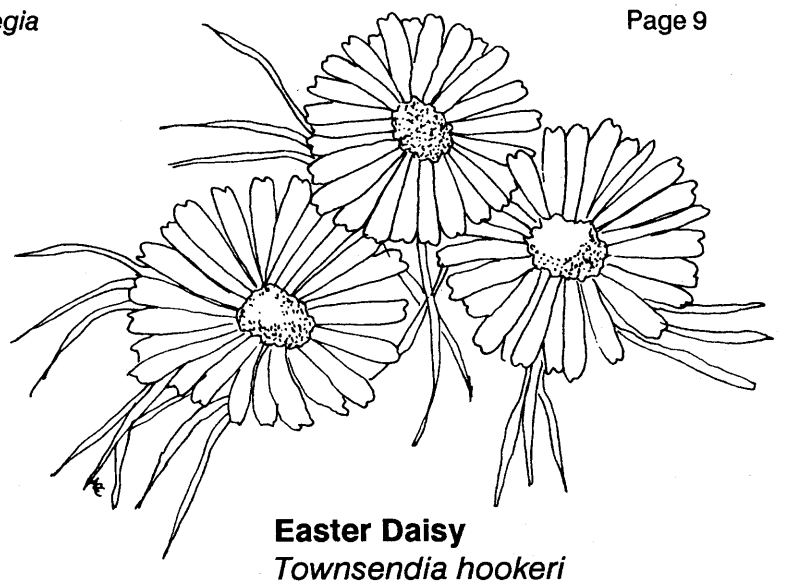
Native prairie species can be transplanted directly from the seed flat to the garden when quite small if kept watered. Gayfeather (*Liatris punctata*) transplants directly while still at the cotyledon-leaf stage with nearly 100% survival. White-flowered penstemon (*Penstemon albidus*) and narrow-leaved penstemon (*P. angustifolius*) can be directly transplanted when they have two pairs of stem leaves. Prairie coneflower (*Ratibida columnifera*), easter daisy (*Townsendia exscapa* and *T. grandiflora*), evening-primrose (*Oenothera caespitosa*), spreading wild buckwheat (*Eriogonum effusum*) and others also can be directly transplanted to the garden without problems.

Direct transplanting offers other advantages in addition to saving labor. Many prairie species have deep, relatively straight taproots. When grown in a pot, this taproot becomes coiled like a spring. After planting, forces induced by freezing and thawing can uncoil the taproot, allowing the plant to be frost-heaved from the ground. By directly transplanting, the taproot grows as a straight anchor into the soil and heaving is nearly eliminated.

Direct transplanting also means plants get into the ground earlier and become drought tolerant sooner. They also get the advantage of early spring moisture. When planting this way, I insert a 1 inch wide by 12 inch long piece of cedar shingle next to the plant and incline it slightly to provide a bit of sun and hail protection.

Direct Seeding

Although broadcast seeding of wildflower seed is wasteful, direct seeding of appropriately scarified or stratified seed is not. Try planting labeled groups of several seeds based on expected germination rates. This works especially well when weed problems are minimal (Method 2). For example, planting scarified seed of groundplum (*Astragalus crassicarpus*) in groups of two or three with three inches between seeds will usually result in at least one healthy plant. Drummond's milkvetch (*Astragalus drummondii*) doesn't survive for me when transplanted, but with direct seeding about two out of three seeds produce plants. Silky sophora (*Sophora sericea*, now *Vixibia sericea*) produces a plant from nearly every seed. Slim-flowered scurfpea (*Psoralea tenuiflora*) also establishes well this way. Direct seeding works best with larger seeds, especially legumes, that have high germination rates. Very small seeds will require thinning and this may result in wasted seedlings.



Easter Daisy
Townsendia hookeri

Illustration by Ann Cooper

Transplanting

Two species common in shortgrass prairies are copper mallow (*Sphaeralcea coccinea*) and scarlet gaura (*Gaura coccinea*). Both are difficult to grow from seed in any quantity. Fortunately, both survive abuse and can be collected from areas about to be destroyed by development.

Copper mallow, an abundant colorful wildflower and nutritious forage plant, is one of the most drought-resistant flowers on the prairie. Scarlet gaura produces numerous small, fragrant flowers that open white but turn reddish-pink when exposed to sunlight. Rhizomes of both species can be collected and planted immediately in your developing prairie. It is important to water them all season long in their first year. Although neither will show much if any new top growth, roots and rhizomes will be advancing underground. Usually all of the gaura and about 50% of the copper mallow will survive.

Other rhizomatous species which can be rescued by transplanting include bush peavine (*Lathyrus eucosmus*) and probably other *Lathyrus* species, prairie milkweed (*Asclepias pumila*), and Britton's skullcap (*Scutellaria brittonii*).

I prefer planting bare rhizomes as this eliminates the possible introduction of unwanted species such as quackgrass

– continued on page 11

A Colorado Specialty — Ambrosia linearis

Jim Locklear

It may be surprising to find a rare plant in a genus known for its weeds, but such is the case of *Ambrosia linearis*. Kin to the widespread ragweeds, this interesting plant is known only from the high plains of eastern Colorado.

Ambrosia linearis was first collected in 1893 near the town of Calhan in El Paso County. From then until 1989, when a survey was undertaken for the U.S. Fish and Wildlife Service, only seven other locations for this species were known. It has now been collected from a total of 29 locations in El Paso, Kiowa, Lincoln, and Elbert counties.

The past infrequency of collections was a puzzle to Willard W. Payne, a student of the genus *Ambrosia*, who wrote in 1964 that *A. linearis* was a "very distinctive species, inexplicably rarely collected." The early lack of collections was probably due to two factors. First, *A. linearis* occurs in a sparsely populated area which has received little attention from professional botanists over the years. Second, until the 1989 survey, very little was known about the ecology of this plant, making it difficult to know where to search for it.

Field work in 1989 revealed *A. linearis* to be a plant of seasonally moist habitats within the shortgrass prairie region of east-central Colorado. In natural settings it is most frequently encountered in association with intermittent streams and about the margins of intermittent ponds or 'playas'. This species has also taken to roadside ditches, where it may occur in large, vigorous stands.

Most of the streams of the semi-arid high plains remain dry throughout much of the year, only carrying water after periods of significant rainfall. Erosion along the course of these streams has formed terraces just above the main streambed. It is here that *A. linearis* is sometimes found. Good examples of this habitat, with relatively large populations of *A. linearis*, occur along Pond and Dead Horse Creeks in southwestern Lincoln County. Smaller populations occur at a few sites along Black Squirrel Creek in El Paso County.

Playas are an interesting phenomenon of the high plains. These intermittent bodies of water occur on large upland flats. The clayey soils of these shallow basins have low permeability, allowing water to stand for a period of time following rains. In normal years playas go through a cycle of filling and drying, making them a dynamic environment. Playas are especially common on the level high plains of the Texas panhandle.

A. linearis occasionally occurs about the margins of playas where it appears to occupy a zone between the blue grama and buffalograss to the outside and the more mesic vegetation toward the center of the basin. This type of habitat is abundant in southwestern Lincoln County in an area drained by Pond Creek, Dead Horse Creek, and Steele Fork, all tributaries of Horse Creek.

In addition to these natural occurrences, *A. linearis* is known from a number of roadside populations. Indeed, half of the newly discovered sites for this species are roadside locations. Often these occur adjacent to natural habitat where *A. linearis* populations are present. Occasionally, however, roadside populations occur when there is no *A. linearis* present adjacent to the road. Several populations occur along the "Ramah Highway", south of Ramah in El Paso County between highways 24 and 94.

While the ecology of *A. linearis* is interesting, its restricted distribution is even more intriguing. There are eight species of *Ambrosia* occurring on the plains of eastern Colorado. All of these, except *A. linearis*, have ranges extending outside of Colorado; many are widespread in the Great Plains and some even occur throughout much of the U.S. The distribution of *A. linearis* is extremely limited compared to that of the other species. In fact, *A. linearis* appears to have one of the most restricted distribu-

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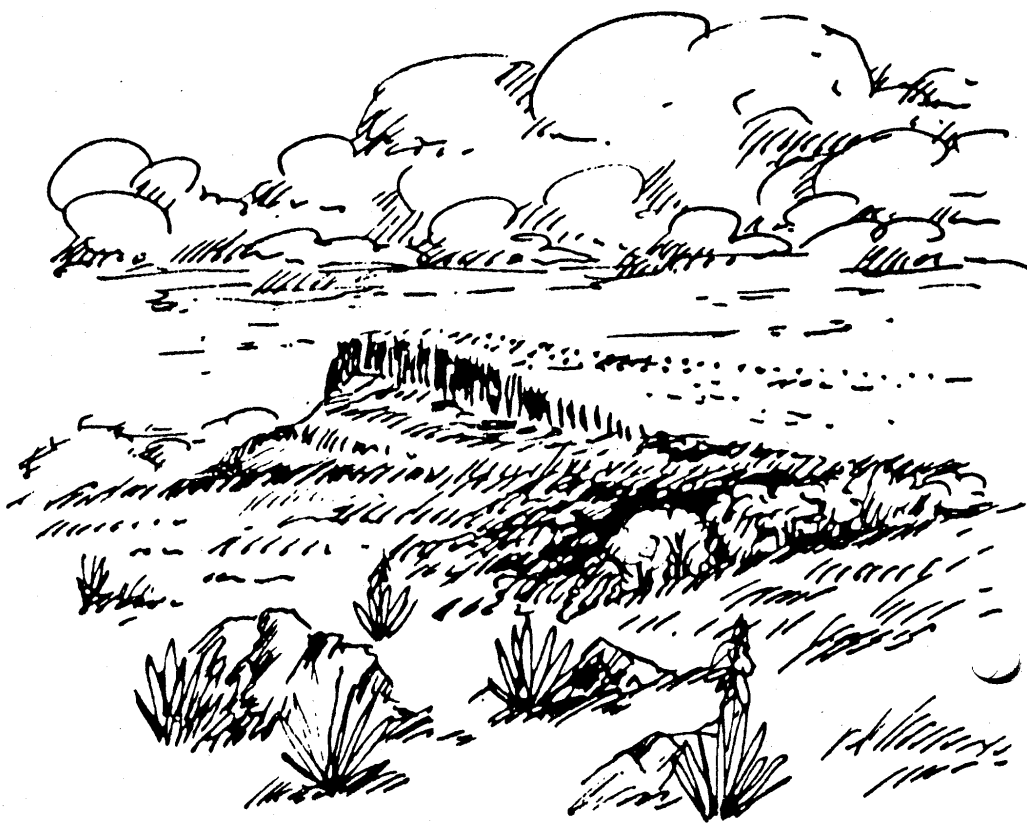

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tions of any member of the genus *Ambrosia*, with the possible exceptions of certain species in Baja California, Mexico.

Ambrosia linearis is presently known with certainty from El Paso, Kiowa and Lincoln counties. Although more apparent in the field than on maps, the range of *A. linearis* coincides with something of an 'island' within the plains of eastern Colorado. The sandsage prairie habitat associated with Rush Creek and Big Sandy Creek seems to form the eastern and northeastern boundaries of this species' range. The same sort of habitat to the west of Black Squirrel Creek appears to function as the western boundary. The Arkansas River valley forms the southern boundary, and the divide between the South Platte and Arkansas rivers (Palmer Ridge) is the northern limit.

Only one collection of *A. linearis* is known from outside this area. In 1935 this species was collected "on a roadside near Elbert" in Elbert County. This locality is puzzling because typical *A. linearis* habitat appears to be lacking in the area around Elbert, and an occurrence here would represent the only site for this species north of the South Platte/Arkansas divide. Recent search of the area around Elbert and a number of likely sites elsewhere along and north of the divide have failed to turn up *A. linearis*.

Although *A. linearis* is a rare plant, it does not appear to face any serious threats to its survival. It is restricted in overall distribution, but is more common within its range than previously thought, and further search will probably locate additional populations. No grazing of this plant by either domestic livestock or wildlife has been observed and, if *A. linearis* habitat is properly managed as rangeland, there is probably little present or future threat to this species. Conversion of native grassland to cultivated crops would adversely affect natural populations, especially those associated with playas.

Efforts to protect the habitat of *A. linearis* will not be helped by the common names that are sometimes used for this plant. 'Plains ragweed' and 'streaked ragweed' have been suggested, but mustering support for the protection of a 'ragweed' could prove difficult. The name 'bursage' might be substituted to avoid the negative connotations of 'ragweed'. Bursage was the common name of plants in the genus *Franseria*, which included *A. linearis* until Payne combined *Franseria* with *Ambrosia*. The name "Colorado bursage" would reflect the fact that this unique plant is found only in Colorado.

Ambrosia linearis is not the easiest plant to spot in the field the first time, but once seen its distinctive traits become apparent. Good illustrations of this species can be found in the recently published **Rare Plants of Colorado.** It is not the most beautiful plant in the flora of the shortgrass prairie, but it is certainly one of the most interesting. ♣

Prairie Garden,

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(*Agropyron repens*), western wheatgrass (*A. smithii*), and seeds of exotic weeds. When transplanting rhizomes, use a one gallon plastic bottle filled with water, with a pinhole in one corner to provide a day-long drip to keep rhizomes moist. This technique also works well with other species sensitive to drying out. Drip bottles can also be used to provide slow deep watering for individual plants during establishment.

Watering and Plant Establishment

Wildflowers planted at the same time as the grasses will generally do well with the water regime described for grasses during the first year (see Part III, vol. 14, no. 4). During the second year, plants should be watered enough to prevent them from becoming dormant. Clipping back grasses the second year will speed establishment of wildflowers by reducing competition. Most plants should survive the third year with the possibility of needing one or two deep waterings if it is unusually dry. Although drought-induced dormancy is normal on the prairie, during the first two or three years it is difficult to tell this from death until it is too late!

A good general rule to judge establishment is that a plant that exceeds the grasses in height can compete for light and moisture. A rule of thumb used in prairie restorations in the midwest is that a plant having three or more stems can compete on its own. ♣

Next Issue: Plant Selection

Astragalus tridactylicus

Calendar Overview

Additional information about calendar items will be found throughout this issue.

1990 Workshops

November 3rd — **Ericads: the Heaths**
Bill Jennings

December 8th — **Salix: the Willows**
David Cooper

January 12th — **Eastern Plains Grasses**
Leader: Alan Carpenter

February 9th — **Hawaiian Ferns**
Leader: Tom Ranker

March 2nd — **Weedy Plant Seeds**
Leader: Arnold Larsen

March 23rd — **The Mentzelias**
Leader: Barry Prigge

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