



# Castilleja

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In this issue:	
WNPS News . . . . .	2
Field Trip Reports . . . . .	2
Some Late Cretaceous Conifers of Wyoming . .	4
Noteworthy Discoveries . . . . .	7
Beating Around the Bush, Jr. . . . .	8
In Quotes . . . . .	8

**Fossil Leaf from Late Cretaceous deposits at Big Cedar Ridge** in the southeastern Bighorn Basin, south of Tensleep, Wyoming. This remarkable fossil site contains over 80 species of ferns, monocots, dicots, and conifers (see article on page 4) and provides a window on a vastly different flora of Wyoming 65-75 million years ago. The identification of such fossils is made difficult by uncertainties about their relationship to modern families and genera. This leaf has been interpreted as an ancient maple (*Acer cretaceum*), or possibly a gooseberry, raspberry, or some other "rosaceous" species. Illustration by Gretchen Hurley.



## WNPS NEWS

**2000 Annual Meeting:** The Society's annual meeting was held in the parking lot of the Shirley Basin rest area on 17 June. Bad weather prior to the meeting may have kept the crowd small (6 members and 2 dogs were in attendance), but those who did come were greeted to wonderful, warm, sunny summer conditions. Prior to botanizing, we conducted a brief business meeting, in which the results of the Society's elections were announced (thankfully there were no write-in votes for Ross Perot this year). Those elected for the 2000/2001 term were: President – Amy Roderick Taylor (formerly of Laramie, but now from Crested Butte, CO), Vice President – Joy Handley (Laramie), Secretary/Treasurer – Walter Fertig (Laramie), 2-year board member – Jim Ozenberger (Jackson). Steve Laster remains as the carry-over Board member. Thanks were extended to out-going officers Laura Welp and Nina Haas for their stellar contributions to the club.

Meeting attendees voted on two sites for next year's field trips. The Bighorn Range was selected for the annual meeting/field trip (tentatively scheduled for next June) and the Sierra Madre was chosen for a second trip in July. Look for more details on these outings in a future issue of the newsletter.

In one other item of business, it was announced that the Society has officially been granted non-profit tax exempt status by the IRS. Thanks go to former Board Member Nina Haas for tracking down and filling out numerous governmental forms and Charmaine Delmatier for getting the process initiated during her term as President. WF

**Y2K + 1 Student Scholarship:** Thanks to generous contributions by WNPS members, the society's annual student scholarship is available once again for qualified junior college or university undergraduate or graduate students. One to three scholarships will be awarded in the amount of \$300-500. Interested students should contact the Secretary of the Society for an application form. Applications are due by 12 February 2001. Winners will be announced by the Board in March.

**New Members:** Please welcome the following new and returning members of WNPS: Gay Austin (Gunnison, CO), Biodiversity Associates (Laramie), Elaine Ebbert (Piedmont, SD), Donald Garvin (Oklahoma City, OK), Jacqueline Hauptman (Rapid City, SD), Jean Jorgensen (Jackson), Barbara Love (Worland), Jacob Smith (Boulder, CO), Joe Vukelich (Cody), and Linda Zierer (Sturgis, SD).

**We're looking for new members:** Do you know someone who would be interested in joining WNPS?

Send their name or encourage them to contact the Society for a complimentary newsletter.

**Attention Readers:** We are always looking for articles and illustrations for the newsletter. Items for the December issue are needed by 11 December 2000.

**Treasurer's Report:** Balance as of 17 October 2000: General Fund \$698.58; 2000-2001 Student Scholarship Fund \$527.50; Total funds: \$1226.08

Wyoming Native Plant Society  
PO Box 3452, Laramie, WY 82071

President: Amy Roderick Taylor (Crested Butte, CO)  
Vice President: Joy Handley (Laramie)  
Secretary-Treasurer: Walter Fertig (Laramie)  
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Contributors to this issue: John Baxter, Jane Dorn, Robert Dorn (RD), Walter Fertig (WF), Gretchen Hurley.

## Field Trip Reports

**Annual Meeting – Shirley Basin/Shirley Mountains:** Following a brief business meeting (discussed above), the group proceeded to Chalk Mountain, a prominent, whitish limey-sandstone butte on the west rim of the Shirley Basin as it drops into Bates Hole. Fortunately the road was dry (it had been raining and snowing the previous week), and we were able to attain the bench-like summit with ease. We were greeted by a tremendous show of blooming wildflowers, many of which were ground-hugging cushion species. Among the notable finds was Laramie false sagebrush (*Sphaeromeria simplex*) growing in thin chalky soils intermixed with its more widespread cousin, Capitate false sagebrush (*S. capitata*). Laramie false sagebrush is restricted to southeastern Wyoming, and was once thought to occur only on the outskirts of an active limestone quarry in Laramie. In the past 5 years, nearly a dozen new populations have been discovered along the western foothills of the Laramie Range and mesas in the Shirley Basin. These populations are often quite large, so *S. simplex* is no longer as critically endangered as once thought. Other uncommon plants we observed on the top of Chalk Butte included Daggett rockcress (*Arabis pendulina* var. *russeola*), Nuttall's Easter-daisy (*Townsendia nuttallii*), Tufted cryptantha (*Cryptantha caespitosa*), Mat buckwheat (*Eriogonum acaule*), Alpine fever-few (*Parthenium alpinum*), and Fuzzytongue penstemon (*Penstemon eriantherus*).



Above: Laramie false sagebrush (*Sphaeromeria simplex*)  
By Jane Dorn.

Following a picnic lunch among the wildflowers on the atypically-calm rim of the Butte, we then traveled across the Shirley Basin to the Petrified Forest on the east edge of the Shirley Basin. Geology-savvy Nina Haas pointed out the large stumps and fragments of fossilized tree trunks that litter the rolling hills of this site east of the old uranium mine. We also encountered living plants, including Bitterroot (*Lewisia rediviva*), Bun milkvetch (*Astragalus simplicifolius*), Mountain phlox (*Phlox multiflora*), and the graceful Larch-leaved penstemon (*Penstemon laricifolius*).

Those who wished to camp continued on to the Shirley Mountains for the evening. Our campsite featured a montane colony of Laramie false sagebrush on reddish soils amid outcrops of gray dolomite, as well as the white-flowered Brandegee's Jacob's-ladder (*Polemonium brandegei*) on a shady cliff. A hen blue grouse with a dozen precocious chicks were also camped at our site.

The following morning we visited additional sites on the summit of the Shirley Mountains, observing more Laramie false sagebrush growing with larkspur (*Delphinium nuttallianum*), a patch of yellow-flowered Desert paintbrush (*Castilleja angustifolia* var. *dubia*), Scribner's fleabane (*Erigeron ochroleucus* var. *scribneri*), Three-tip sagebrush (*Artemisia tripartita*), and Glabrous beardtongue (*Penstemon glaber*). By noon, it was time to depart, but not before observing the flowering display of pink-flowered pincushion cacti (*Coryphantha vivipara*) in the sagebrush.

**Black Hills:** The Black Hills field trip began on Friday, July 21, with a rain-shortened hike along the trails of Devils Tower led by Hollis Marriott. Fortunately the weather cleared for those plant enthusiasts from WNPS and the Great Plains Native Plant Society who chose to

camp at the Monument amid Plains cottonwoods, Green ash, and Box-elder along the banks of the mighty Belle Fourche River.

The next morning, the campers left for the Sundance Rest Area to convene with late arrivals. In all, a group of over 25 people and 3 dogs were on hand. Led by the intrepid Marriott, an extensive car pool proceeded to Beulah, and on to the Dugout Gulch Special Botanical Area on Black Hills National Forest. At the trailhead Marriott explained how the Native Plant Society had helped bring attention to this interesting botanical site in the mid 1980s, when the area was slated for logging. Along the trail we encountered stands of Bur oak (*Quercus macrocarpa*) and Hop-hornbeam (*Ostrya virginiana*), an uncommon species in Wyoming. Other interesting finds included Canadian enchanter's nightshade (*Circaea lutetiana*), Fennel-leaved giant hyssop (*Agastache foeniculaceum*), and Marbleseed (*Onosmodium molle*).

From Dugout Gulch, we traveled to Spearfish Canyon for lunch at the cabin of Elaine Ebbert amid a grove of White spruce (*Picea glauca*). We then proceeded along back roads to the Black Fox Iron Bog, stopping once to admire wetland plants along a roadside cold-water spring. The iron bog is located just outside Black Fox Campground within a moist forest of White spruce, Bog birch, and *Sphagnum* moss. The site is rich in uncommon and disjunct fungi, lichens, and vascular plants, including the Spurred gentian (*Halenia deflexa*), Dwarf blackberry (*Rubus pubescens*), and Bunchberry (*Cornus canadensis*).

That evening we camped at the empty Moon Campground and were treated to after-dinner music courtesy of the Hollis Marriott Trio (Hollis on fiddle, Beth Burkhart on guitar, and the WNPS Secretary/Treasurer banging a stick with nailed-on beer caps).

On Sunday morning Jim Johnson led us on a short hike through one of the remnant high elevation grasslands on the South Dakota side of the Hills. Though we were unable to find the elusive grass *Sporobolus heterolepis*, we did enjoy a good show of wildflowers, including the bizarre, giant-headed Drummond's thistle (*Cirsium drummondii*).

Our last stop of the weekend was a visit to the "granite core" of the Black Hills in search of spleenworts. We were joined by legendary Black Hills mountaineers Jan and Herb Conn. The Conns led the group on a faint trail to the base of a granite outcrop containing 3 taxa of *Asplenium*: the grass-like Forked spleenwort (*A. septentrionale*), the pinnately-divided Maidenhair spleenwort (*A. trichomanes*), and a hybrid between the two species (*A. x alternifolium*). Hollis Marriott and the Conns discovered the hybrid fern while climbing in the area in 1998. Although common in Europe, the hybrid has only been documented sporadically in the United States, and the Black Hills population is nearly 2000 km west of the nearest known location. WF

# SOME LATE CRETACEOUS NATIVE CONIFERS OF WYOMING

Text, photos, and pen & ink illustrations  
by Gretchen L. Hurley  
356 Nostrum Road, Thermopolis, Wyoming

Wyoming is populated with many different types of conifers today – pines, spruces, firs, and junipers. So it was many millions of years ago as well. In fact, conifers, along with ferns, have been present in the North American flora since about the Pennsylvanian Period of the Paleozoic Era – some 310 million years ago. This article will present information about some of the conifer fossils found in late Cretaceous rocks of Wyoming, in other words, in rocks ranging in age from 65-75 million years ago (mya).

According to Arnold (1947), conifers or evergreens are defined as woody, naked-seeded plants with leaves generally like needles or scales. “Most of their fructifications are unisexual cone-like inflorescences in which the seeds are born on spirally arranged hard and woody cone scales”. The pollen is produced in pollen sacs attached to the lower surface of stamens, and in spiral sequences on the axis of the staminate cone.

The first conifers are seen in the fossil record about Pennsylvanian time, with species diversity peaking in early Cretaceous time (~ 130 mya) (Arnold, 1947). Since then, conifers have held their own as a dominant part of the flora, although some types are in a decline, namely the sequoias and some of the cypress.

Try to imagine a scene in northwestern Wyoming about 72 mya – late Cretaceous time. You are standing in what is to become the southeastern Bighorn Basin, southwest of Tensleep. If you look towards the east, you will see, instead of the Bighorn mountains of today, a coastal upland and a shimmering seaway - the famous inland seaway of middle to late Cretaceous time. You are, therefore, just a few feet higher than sea level. Fern meadows dominate the ancient landscape, with occasional palms, subtropical conifers and flowering plants seen as well. Marshes and swamps dot the terrain in scattered small basins. Meandering rivers carry water sluggishly east towards the seaway, and duck bill dinosaurs drink languidly in the afternoon air. A warm gentle breeze moves through the ferns, and the sun filters down through hot, hazy skies.

Rather suddenly, the wind picks up. A moderate seismic shock rattles through the fern meadow, and the duckbills scatter in panic. The river nearby starts to turn color with a grayish silt, and a small hill nearby collapses into the river during the temblor. This landslide causes the river to back up behind it, while the inflow increases from some distant storm’s rainfall. More and more ash is blown over the meadow and washed in by the river, which continues to pond behind the temporary dam. In a matter of two hours, the fern meadow with its palms

and conifers is halfway submerged beneath this ashy deluge. After the first two hours, the river begins to bring in a thick, ashy sludge, more full of sediment than water. This gray slurry also backs up behind the temporary dam, further trapping the flora in mud to a depth of 12-15 feet. A volcano has erupted somewhere in Montana or Idaho, and its ash has been washed and blown east by the winds and waters of the storm. The sediments trapped behind the dam are preserved by later layers of river and marsh sediment. They are buried and pressurized, hardened into a mudstone, and later uplifted gently as the Bighorn mountains formed about 60 mya during the Laramide Orogeny. With uplift, erosion begins to remove the layers above the fern meadow, eventually revealing a strip of it in outcrop – an area known today as Big Cedar Ridge. Entombed within the ashy mudstone, are museum quality fossils of palms, ferns, conifers and angiosperms.

This site was discovered in 1990 by Dr. Scott Wing of the Smithsonian Institution. Dr. Wing and his team of paleobotanists have discovered dozens of new species in the ancient fossils of the fern meadow, 9% of which were conifers (Wing et al, 1993). Fossil remains found here include twigs, foliage, seeds, cones, cone scales and petrified wood. This site is located on land administered by the Bureau of Land Management, and is used today by the public for research and educational purposes.

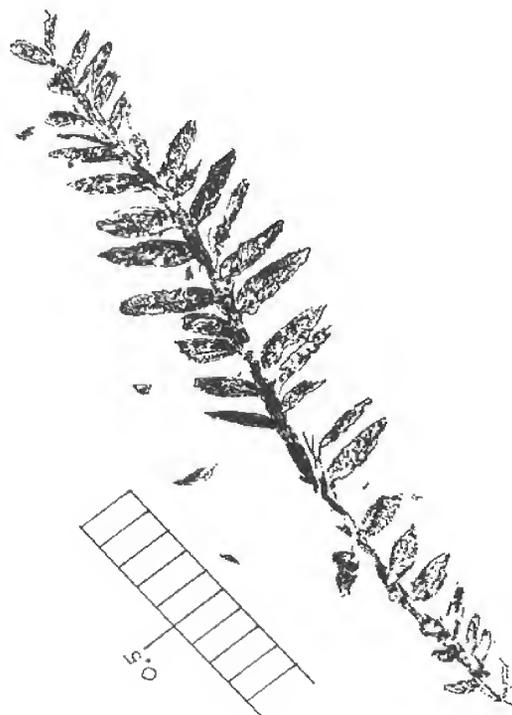


FIGURE 1. *Parataxodium* sp. – Big Cedar Ridge, Wyoming; Meeteetse Formation, Late Cretaceous

Some of the 72 million year old conifers found at this site, as well as in other parts of Wyoming include the

following families and genera, further discussed below:

Family Taxodiaceae – *Parataxodium*, *Glyptostrobus europaeus*

Family Araucariaceae – *Araucarites longifolia*

Family Cupressaceae – *Juniperus* (or a relative of *Juniperus*)

1. Family Taxodiaceae – the Redwood Family (includes redwoods and bald cypresses)

Yes - redwoods are native to Wyoming – late Cretaceous Wyoming, that is. Two types of conifers belonging to this family have been found at Big Cedar Ridge. *Parataxodium* (Fig. 1) is related to today's two species of bald cypresses, which occur only in the southeastern U.S. and parts of Mexico. *Glyptostrobus europaeus* (Fig. 2) has one modern day counterpart found along the coast of southeastern China, where it has been found since Pliocene time (~5 mya). Bald cypresses and dawn redwoods, along with larch trees, are two of the very few conifers that shed their leaves each year.



FIGURE 2. *Glyptostrobus europaeus*, Big Cedar Ridge, Wyoming; Meeteetse Formation, Late Cretaceous

2. Family Araucariaceae – “Norfolk Island Pines and Monkey Puzzle” trees

Fossils of *Araucarites longifolia* (Fig. 3 and 3a) are very common at Big Cedar Ridge, both in the ash-slurry layer, and in the river channel sandstone that overlies it. It is related to today's Norfolk Island Pine (*A. excelsa*), which is a native of Norfolk Island – the northernmost of the New Zealand group, and commonly used as an indoor ornamental (Fig. 4). It is also related to today's “Monkey Puzzle tree” (*A. imbricata*), which is native to South America, but also found as far north as Scotland and along the west coast of North America today. The name *Araucarites* is commonly used for leafy shoots, twigs, cones and cone scales. Another species, *A. hatcheri*, has also been described in Wyoming.



FIGURE 3. *Araucarites longifolia*, Big Cedar Ridge, Wyoming; Meeteetse Formation, Late Cretaceous



FIGURE 3a. Photo of fossilized *Araucarites longifolia* leaves from Big Cedar Ridge



FIGURE 4. *Araucaria excelsa*, “Norfolk Island Pine”; Walmart, USA; Cretaceous to Recent

## 2. Family Cupressaceae – Cedars, Cypress and Junipers

This family includes some of the very common conifers of ancient and modern times. All members of this family have scale-like foliage on flattened or rounded branches, as opposed to needles. A “juniper-like” relative was found at Big Cedar Ridge (Fig. 5). *Juniperus* has been found frequently in eastern and western North America in rocks of Tertiary age (2-66 mya) and may not have been well established in Wyoming during the late Cretaceous period. Of course, junipers are abundant in Wyoming today. The Rocky Mountain juniper (*Juniperus scopulorum*), Utah juniper

(*J. osteosperma*) and Common juniper (*J. communis*) are found throughout most areas of Wyoming. The Cretaceous age specimen seen here may resemble today’s Common juniper. They favor dry, rocky upland soils. Interestingly, many outcrops of sandy Cretaceous rock in Wyoming today sport dense juniper growth in the rocky soils that form above the outcrops.

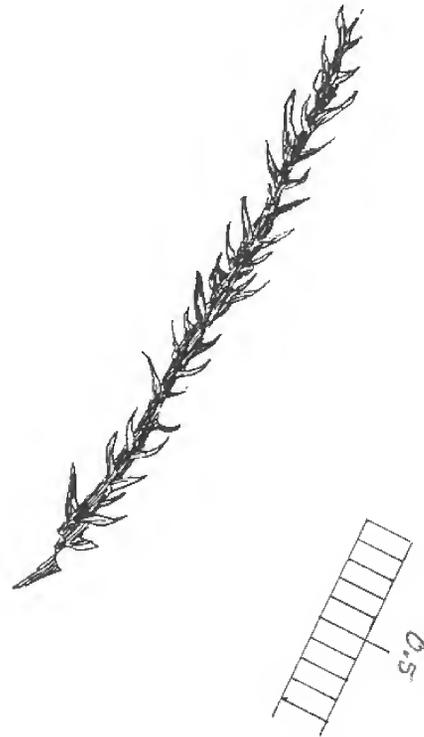


FIGURE 5. “Juniper-like” fossil, Big Cedar Ridge, Wyoming; Meeteetse Formation, Late Cretaceous

These are just four types of conifers that have been found in late Cretaceous-age rocks in Wyoming. Pines, spruces and firs show up later in the fossil record. Many more types no doubt existed – but they are waiting to be discovered beneath ash flows, flood deposits or coal beds.

### References:

- Arnold, C.A. 1947. An Introduction to Paleobotany, McGraw-Hill Book Company, New York and London.
- Brockman, C. F. 1968. Trees of North America – a Guide to Field Identification, Golden Press, New York.
- Tidwell, W. D., 1975. Common Fossil Plants of Western North America, Brigham Young University Press, Provo, Utah.
- Wing, S. L., Hickey, L. J., and Swisher, C.C. 1993. Implications of an Exceptional Fossil Flora for late Cretaceous Vegetation, unpublished report.

## Noteworthy Collections from Wyoming

**New Plant Records for Wyoming.** The following Species (all non-native to Wyoming) have been newly documented in the state in the last year:

***Cotoneaster acutifolia*** (Sharpleaf cotoneaster).

Laura Welp and I discovered this shrubby member of the Rose family growing in a rocky canyon in the foothills of the Laramie Range, just outside of Laramie in August 1999. Although grown as an ornamental in town, this individual had clearly not been planted by humans, but probably had been dispersed by birds. Since then, we have found another small patch of this species that has escaped at the edge of town. Sharpleaf cotoneaster is a deciduous shrub with leathery, elliptic leaves that are dull-green above and pale below, numerous whitish or pink-petaled flowers, and black fruits that resemble tiny apples. It is native to China, but is widely cultivated in the western US.

***Penstemon palmeri* var. *palmeri*** (Palmer's penstemon). In the summer of 2000, I noticed a tall, glaucous-stemmed, pink-flowered forb growing in ledges in the red sandstone cliffs of Telephone Canyon while doing about 80 mph on Interstate 80 just east of Laramie. Suspecting something unusual, Laura Welp and I returned later, feigned car trouble, and pulled off the freeway to investigate. The plant turned out to be Palmer's penstemon, a species native to pinyon-juniper, Ponderosa pine, and desert shrub communities of southern Utah, Nevada, California, and Arizona. According to Ernie Nelson, this species was probably included in the seed mix used to revegetate the highway margin following road construction in the canyon over the last 3-4 years. It is now spreading beyond the road's edge into the red sandstone cliffs along a 1-mile stretch of highway. Palmer's penstemon is easily recognized by its large, inflated, lavender-pinkish corolla and spiny-edged, sessile, opposite, upper leaves. According to the *Intermountain Flora*, this plant has also become established along I-80 near Mountain Home, Idaho.

***Suaeda linifolia*** (Flax-leaved sea-blite). Jim Glennon of the BLM Rock Springs Field Office and I discovered this tall, green, slender-leaved annual chenopod along the banks of the Blacks Fork River in Sweetwater County in September 1999. Back at the Rocky Mountain Herbarium, Bob Dorn and I puzzled over the specimen, which clearly did not fit any known Wyoming species. Suspecting it might be an introduction from Russia, we sent a duplicate of the specimen to Noel Holmgren of the New York Botanical Garden for determination. Holmgren identified the plant as *Suaeda linifolia*, a native of central Asia and Siberia. According to Jochen Schenk of Duke University, an authority on the genus, *S. linifolia* was previously known only from NE Nevada, where it was first collected in

1985. Flax-leaved sea-blite has stems to 75 cm tall and small clusters of green, petal-less flowers borne on the petioles of slender, leaf-like bracts. Jim Glennon and I found the plant to be locally abundant in 1999 on clay terraces in greasewood/flax-leaved rabbitbrush communities. The population has a high potential to spread to similar habitats in southwest Wyoming riparian areas. WF

**Constance's spring-parsley (*Cymopterus constancei*) a new species for the West.** Ron Hartman, curator of the Rocky Mountain Herbarium, first became aware of this undescribed member of the parsley family (Apiaceae) in the early 1970s while still a graduate student studying chromosome numbers of western umbels. The species remained unnamed for a number of years while Hartman, his students at the Rocky Mountain Herbarium, and other workers assembled over 80 collections from Wyoming, western Colorado, eastern Utah, and northern New Mexico. In a recent issue of the journal *Brittonia*, Hartman named this plant *Cymopterus constancei* in honor of Dr. Lincoln Constance of the University of California, Berkeley, a long-time student of the Apiaceae. Constance's spring-parsley is a short-stemmed, thick-rooted perennial with fern-like foliage, clusters of tiny, white flowers, and wing-margined fruits. It can be distinguished from *C. bulbosus* by its oval, short-stalked fruits and mostly 3-5 veined white bractlets at the base of each fruit cluster. In Wyoming, it commonly occurs in sagebrush grasslands on eroded hillsides or barren clay slopes in the Bighorn, Wind River, Great Divide, and Green River basins. Unlike many newly described plants, *C. constancei* is fairly abundant, although it is probably undersampled due to its early Spring phenology. WF

**New Host Records of Wyoming Rust Fungi.** The following species of rust fungi have recently been discovered in the state or documented on new host plants:

***Puccinia yosemitana*** on Opal phlox (*Phlox opalensis*), near Cedar Mountain, west of Flaming Gorge Reservoir, collected by Walter Fertig

***Puccinia similis*** on Porter's sagebrush (*Artemisia porteri*), in badlands between Riverton and Sweetwater Station, collected by John Baxter.

***Uromyces giganteus*** on Winterfat (*Krascheninnikovia lanata*), hills west of Guernsey, collected by John Baxter.

***Puccinia xanthii*** on *Iva xanthifolia*, near Sybille Creek, southwest of Wheatland, collected by John Baxter. JB

**The Wyoming Native Plant Society**, established in 1981, is a non-profit organization dedicated to encouraging the appreciation and conservation of the native flora and plant communities of Wyoming. The Society promotes education and research on native plants of the state through its newsletter, field trips, and annual student scholarship award. Membership is open to individuals, families, or organizations with an interest in Wyoming's flora. Members receive *Castilleja*, the Society's quarterly newsletter, and may take part in all of the Society's programs and projects, including the annual meeting/field trip held each summer. Dues are \$7.50 annually.

To join the Wyoming Native Plant Society, return the membership form below to:

Wyoming Native Plant Society  
 PO Box 3452  
 Laramie, WY 82071

Name:

Address:

- \$7.50 Regular Membership
- \$15.00 Scholarship Supporting Member  
 (\$7.50 goes to the annual scholarship fund)



Wyoming Native Plant Society  
 PO Box 3452  
 Laramie, WY 82071

## Beating Around the Bush, Jr.

By John "Barney" Baxter

The Texas state shrub is the dubya bush,  
 Wyoming's state shrub is the skunkbush, *Rhus*  
 Although poison ivy is its closest sister  
 The leaves of the skunkbush won't give you a blister

The berries are used to make very good tea,  
 A nourishing drink for Dick Cheney and me.

**In Quotes:** More quotes from the writings of early botanist/explorers in the west, for whom species have been named. RD

E. L. Greene, Botanist

*Chrysothamnus Greenei*

Rambles of a Botanist in Wyoming Territory. Amer. Nat. 8:32. 1874. June 20, 1872

"It is now about noonday, and we are but ten miles from Cheyenne. There is plenty of time for a botanist to reach the city before night, and so we beg of our conductor the privilege of making the remainder of the journey on foot; for these bluffs and table-lands are now gorgeous with flowers of many colors, and we are impatient to see what they are. The whistle sounds, and the train slackens speed, until the leap may be made with safety, and we alight."