



Castilleja

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In this issue:

Relicts and Refugia	1
Floristic Diversity of Wyoming Counties	3
Botanical Novitiates Find Botanical Novelty	4
Critical Habitat for the Colorado Butterfly Plant	5
Requiem for a Lawnmower – review.	6
Rocky Mountain Natural History – review	7
Whitebark Pine - excerpt.	8
<i>Cynoglossum boreale</i> – addition to the state flora	9
Raising Livestock and Lowering Carbon Dioxide	10
Scholarship Announcement	11
Natives vs. Imposters.	12

Relicts and Refugia

By Bonnie Heidel

For all of the breath-taking alpine topography of the Medicine Bow Range, some of its heart-thumping botany lies low across rolling expanses. Three years and three stages of peatland research have documented vast montane fen systems in the Medicine Bow Range, refugia for eleven rare Wyoming vascular plant species of concern including five relict species previously unknown from southern Wyoming.

Peatland rare species are disjunct or peripheral as they are present in Wyoming, denizens of high latitudes, not state and regional endemics that are the focus of most Wyoming Natural Diversity Database botany research. However, review of the Wyoming plant species of concern list in 2002 compared against regional peatland floras indicated that



Above: *Eriophorum gracile* (slender cotton-grass) is circumboreal, with outlying distribution in northwestern Wyoming, the Medicine Bow Range and South Park in Colorado
By B. Heidel

peatlands harbor close to 10% of the rare Wyoming plant species of concern.

Botanists took a plunge into peatlands with pilot site surveys on the Medicine Bow and the Shoshone national forests to compile a working list of peatland rare species, flora, and vegetation at a small number of known or inferred peatland study sites (Heidel and Laursen 2003 a, b; Mellmann-Brown 2004).

Results pointed to ... (continued on p. 9)

WNPS NEWS –

2005 Scholarship announcement! See p. 11
Fieldtrip photographs: See p. 7

2005 Wyoming Plant Conference

Initial plans are brewing for a 2005 Wyoming Plant Conference next spring, jointly hosted by Wyoming Native Plant Society (WNPS) and Wyoming Technical Rare Plant Committee, as well as prospective institution and agency partners. WNPS members who might be interested in helping organize such an event are invited to send their names, contact information, and interest, whether in helping develop the programs, local arrangements, special events, partnerships or publicity; via the WNPS homepage or 766-3020.

By-Laws Brainstorm

-Look for a vote by WNPS members on By-Laws amendments in the upcoming December issue of *Castilleja*. Amendments are under consideration to create a life membership category and put the WNPS membership year, Board term of office, and fiscal year in line with one another. WNPS members who might be interested in helping draft or review By-Laws amendments are invited to send their names and contact information via the WNPS homepage or 766-3020.

Nominations sought: Members interested in running for the 2005 WNPS Board are encouraged to contact Jean Daly, President, or Bonnie Heidel, Editor (see contact information, below). Officer terms run for one year. Board members-at-large serve for two years. The ballot comes in December.

Wyoming Native Plant Society
P.O. Box 2500, Laramie, WY 82073

WNPS Board

President: Jean Daly (Big Horn) 674-9728
Vice President: Melanie Arnett (Laramie) 742-0988
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(Joan Lucas, Treasurer)
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82833 (Jean Daly, Treasurer)
Webmaster-Tessa Dutcher (tessad@uwyo.edu)

Native Plant Partners: The Board of the Wyoming Native Plant Society moved to join the ranks of native plant societies across the country in the Native Plant Conservation Campaign. This national network of affiliated native plant societies, botanical gardens, and other plant conservation organizations is dedicated to information exchange and advocating for native plant species and community conservation through:

- ? increased funding and support for plant science research and education,
- ? use of local native plants in restoration,
- ? prevention and control of infestation by invasive exotic plants
- ? improved staffing and funding for Federal botany programs, and
- ? stronger Federal laws for conservation of native plants and ecosystems

Additional information is posted at: <http://cnps.org/NPCC>

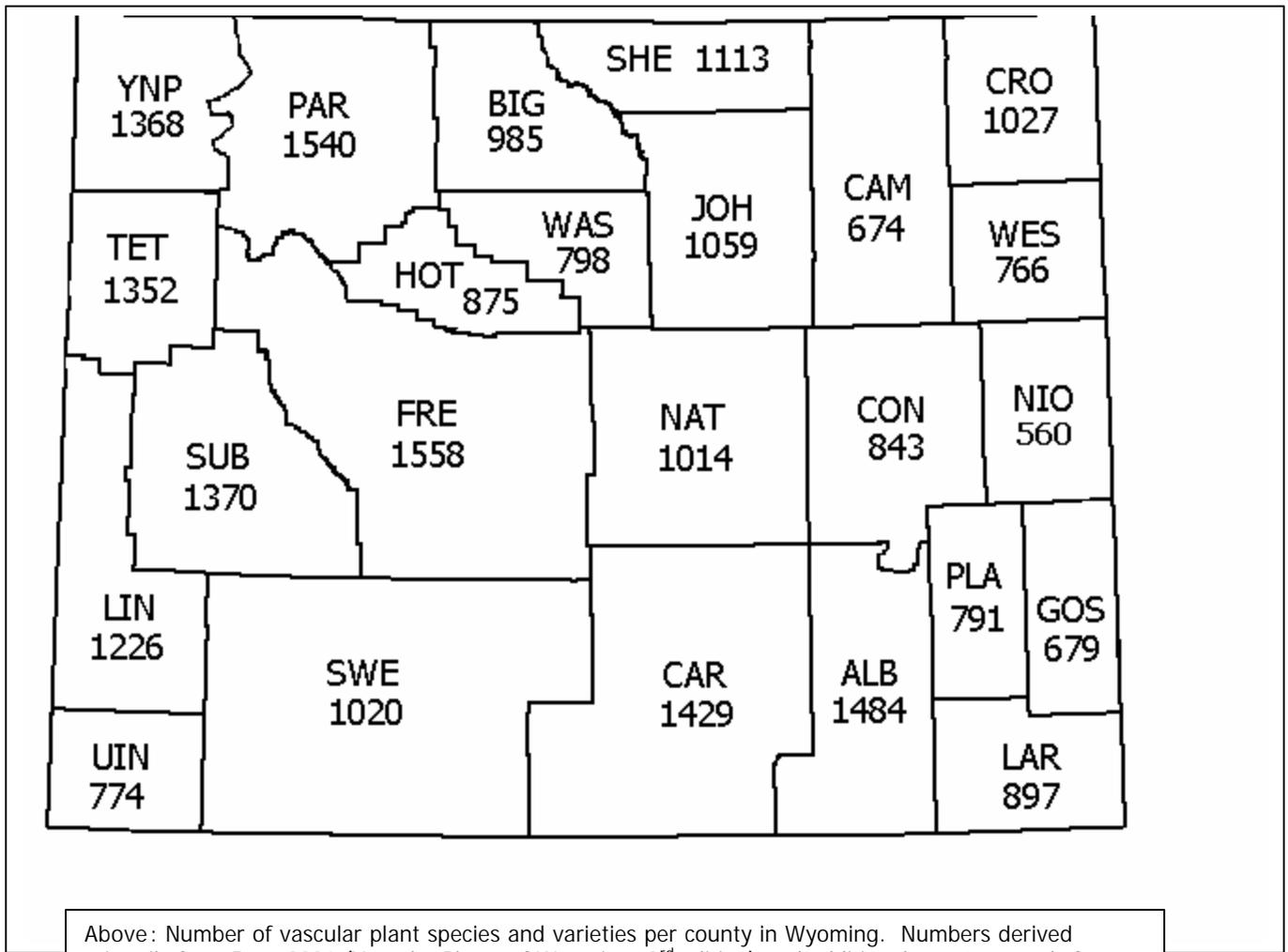
Contributors to this issue include: Tyler Abbott, Jane Dorn, Walter Fertig, Bonnie Heidel, and Hollis Marriott.

Treasurer's Report: Balance as of 7 September 2004: General Fund \$890.28; Student Scholarship Fund: \$149.00; Total funds \$1,039.28

New Members: Please welcome the following new members and subscribers to WNPS: Ben Chesebro, Laramie; McCracken Research Library - Buffalo Bill Historical Center, Cody; Karen Ferguson, Buffalo; Alison & Dick Jones, Wilson; Yelena Kosovich, Irkutsk, Russia; Phil & Martha Roberts, Red Lodge, Montana; Rik Smith, Laramie.

Meeting announcement: Intermountain Native Plant Summit III, regarding native plant propagation and restoration research. Nov. 3-5 at Boise State University, Boise, ID. Includes presentations, a germplasm workshop, forums, and poster displays. There is no registration fee but pre-registration is encouraged. For a copy of the program, to pre-register and get hotel information, contact: dale.nielson@usu.edu .

The next newsletter deadline is 19 November.



Above: Number of vascular plant species and varieties per county in Wyoming. Numbers derived primarily from Dorn 2001 (Vascular Plants of Wyoming, 3rd edition) and additional county records for Teton County (Stuart Markow), Lincoln County (Clay Kyte & Walter Fertig) and Yellowstone NP (Jennifer Whipple) and statewide from Bonnie Heidel and others.

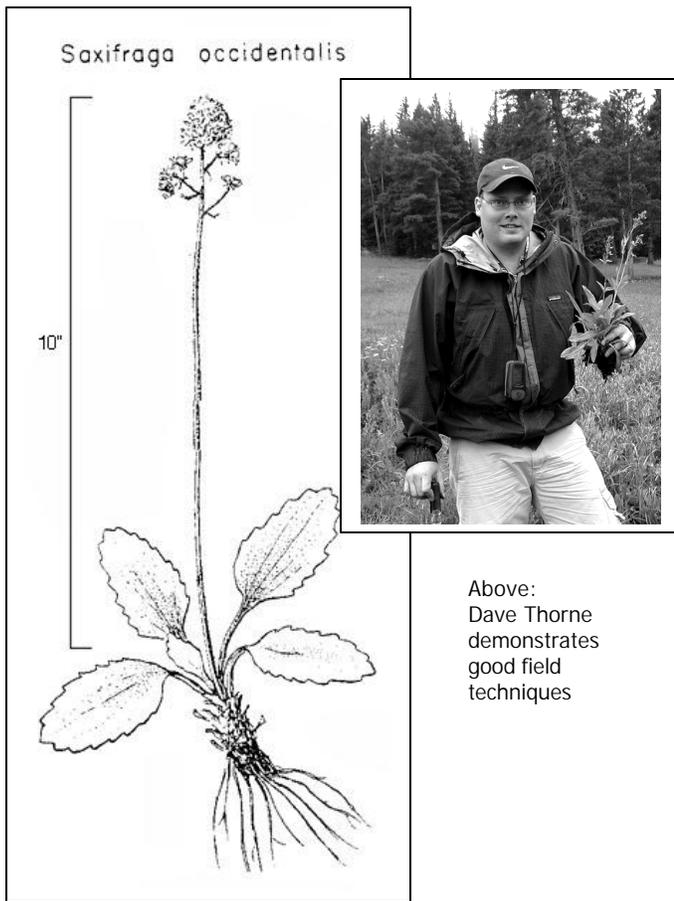
Floristic Diversity of Wyoming Counties

By Walter Fertig

Although defined using political (and often geometric) principles rather than biological criteria, counties can provide a convenient framework for quantifying distribution patterns of Wyoming's vascular plant flora. Of Wyoming's 23 counties, Fremont has the highest species richness with 1558 taxa, or about 55% of all vascular plant taxa found in the state. Fremont County's high diversity can be attributed to a wide mix of habitats, ranging from high peaks of the Wind River and Absaroka ranges to desert basins and rich wetlands along the Wind and Sweetwater rivers. Park County is a close second to Fremont, with 1540 taxa (54.8% of the state flora), though it should be noted that these figures do not include the portion of the county contained within Yellowstone National Park. If considered as a county-equivalent, Yellowstone would rank 6th in the state with 1368 taxa, just

ahead of the other county it encompasses, Teton County. Overall, species richness is greatest in those counties with high mountain ranges and lowest in the counties of the Great Plains.

If total area of the county is considered, however, Albany County emerges as the state's winner for vascular plant richness. At 11,160 km², Albany is half the size of Fremont County and 2/3 the size of Park County, but based on the number of species per log (area), Albany comes out highest, followed by Park, and then Fremont (Yellowstone NP emerges in fourth place under these criteria). Alas, poor Goshen, Campbell, and Niobrara counties still have the smallest floras no matter how you slice it. (Editor's note: See articles on pp. 1, 4, and 9 about species additions that bolster the Albany County lead, and boost the Crook County tally... and the state flora.)



From: Hitchcock, C.L. and A. Cronquist. 1961. Pt. 3. Saxifragaceae to Ericaceae. In: C.L. Hitchcock, A. Cronquist, M. Ownbey, and J.W. Thomas. Vascular Plants of the Pacific Northwest. University of Washington Publication in Biology.

Botanical Novitiates Find Botanical Novelty

By Hollis Marriott

Another wet summer in southeast Wyoming produced wonderful opportunities for field botanists this year. Visiting friends marveled at the wildflower shows in montane meadows and alpine fellfields of the Medicine Bow Mountains. I had enjoyable excursions scouting out field trip possibilities for the University of Wyoming summer field botany course. And students admitted that all that time spent learning plant families and how to use dichotomous keys was worth it -- when they discovered a new record for the Medicine Bow Mountains at the base of the high peaks of the Snowy Range.

Saxifraga occidentalis, the western saxifrage, was previously known from Wyoming but had not been reported for the Medicine Bow Mountains. The closest known locations are in the Laramie Range about 60 miles to the east,

found during floristic inventory by Barb Packer in the late 1990s. It also grows in the Black Hills (WY and SD), the Sweetwater Rocks area, on Casper Mountain and in the mountain ranges of northwest Wyoming. The full range of the species extends from Alaska and western Canada south through the Pacific Northwest and Rocky Mountains into New Mexico.

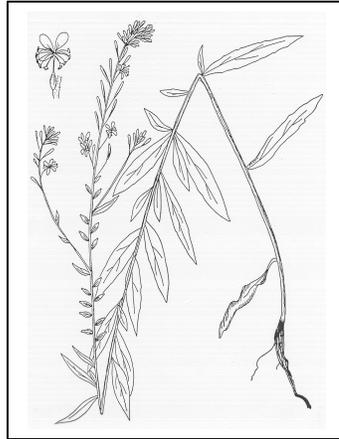
True to its name, *Saxifraga occidentalis* is a lover of rocky sites. "Saxifraga" is derived from the Latin *saxum*, a rock, and *frango*, to break; members of this genus are also known as breakstones or rockfoils. The name may also refer to the use of saxifrages by herbalists in treating "stones" of the urinary tract. The second part of the scientific name, "occidentalis," means western. For some mysterious reason, this species is listed as Alberta saxifrage in the USDA Plants Database, considered by some to be the final word on common names. Western saxifrage is obviously more appropriate, based on translation of the scientific name as well as distribution of the species.

Like many saxifrages, *Saxifraga occidentalis* has a scapose growth form, with a cluster of basal leaves and a leafless flowering stem, usually less than 25 cm tall. Flowers are white, small (petals less than 3.5 mm long), and variously arranged -- from open branched inflorescences to compact clusters. Inflorescence type has been used to distinguish varieties within the species, but with only limited success due to significant regional variability. Material from the Medicine Bow Mountains fits *var. occidentalis*, with rather small and compact clusters of flowers.

Botany 4640 students Ben Pieper and Dave Thorne collected the western saxifrage not far from US Highway 130 near Snowy Range Pass. It was growing on an interesting moist microsite on a west-facing slope just below the ridgecrest, causing us to scratch our heads as to the source of the water ... seepage through buried talus? There were several tiny pondlets nearby. This area has been botanized since Aven Nelson's first years in Wyoming, so why a new find? Is this saxifrage a recent arrival or was it overlooked in the past? My guess is that areas like the Snowy Range are so complex in terms of microsite diversity that it takes a lot of searching to hit all distinct plant habitats. This probably will *not* be the last botanical discovery for the Range.

Critical Habitat and Conservation Agreements Under Consideration for the Colorado Butterfly Plant

By Tyler Abbott,
U. S. Fish & Wildlife Service
- Wyoming Field Office



Right:
Gaura neomexicana ssp.
coloradensis
By Walter Fertig

The Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*) is a short lived perennial herb adapted to early to mid-succession riparian habitat. This species is a regional endemic restricted to approximately 1,700 acres of habitat in Laramie County in Wyoming, western Kimball County in Nebraska, and Weld County in Colorado. The Colorado butterfly plant is currently listed as federally threatened through its entire range. Of the known populations, the vast majority occur on private lands managed primarily for agriculture. Haying and mowing at certain times of the year, water development, land conversion for cultivation, competition with exotic plants, non-selective use of herbicides, and loss of habitat to urban development are the main threats to these populations.

On August 6, 2004, the U.S. Fish and Wildlife Service (Service) published in the Federal Register a proposal to designate critical habitat for the Colorado butterfly plant on approximately 8,486 acres along 113 stream miles. The Endangered Species Act requires that the Service designate critical habitat for species when they are listed, or soon thereafter. Critical habitat refers to specific geographic areas that are essential for the conservation of the species and that may require special management considerations. Designating an area as critical habitat does not affect land ownership or set up a preserve or refuge. Critical habitat only affects actions or activities where there is Federal involvement (Federal actions, funding, permits, or authorizations).

Designating critical habitat is one mechanism for providing habitat protection for the Colorado butterfly plant. However, working cooperatively with private landowners to protect habitat for the plant through conservation agreements is the Service's preferred approach to protecting this species on private lands. The Service has been working with the Wyoming Stockgrowers Association, the Wyoming Association of Conservation Districts, the Wyoming Department of Agriculture, the Natural Resources Conservation Service in Wyoming and Nebraska, the City of Fort Collins in Colorado, and the City of Cheyenne in Wyoming, to develop conservation agreements with willing landowners to provide for its conservation.

These agreements will include specific on-the-ground actions to alleviate threats to the species, and allow the Service access to private land for annual monitoring of populations. These agreements enable the Service to take an adaptive management approach to evaluate success of management actions undertaken, and they facilitate the collection of data needed for future recovery of the species. If adequate protection is provided to the Colorado butterfly plant through a conservation agreement with a landowner, the Service will exclude that parcel of land from critical habitat. Currently, one such agreement is in place, and several more are in the process of being completed.

The first step in evaluating the conservation needs of the Colorado butterfly plant is to monitor current status of the species throughout its known range of occurrence. Thanks to willing landowners the Service, with the help of Dr. Don Hazlett, was able to survey 80 percent of the Colorado butterfly plant's known range of occurrence during the summer of 2004. Information collected during these surveys, in addition to previous survey data provided by Wyoming Natural Diversity Database and the Colorado Natural Heritage Program, provides the baseline data used for development of conservation agreements. The Service looks forward to continuing to work with landowners to complete a number of conservation agreements prior to the finalization of critical habitat by the end of this year. With the help of Wyoming landowners, the Colorado butterfly plant could become the first federally listed plant species in the state to be de-listed.

Requiem for a Lawnmower - Gardening in a Warmer, Drier World, 2nd Edition,

by Sally Wasowski & Andy Wasowski, 2004.
Taylor Trade Publishing. Paper, 211 pages.

Reviewed by Jane Dorn

It is not easy to promote the use of native plants for landscapes without sounding dogmatic, but the Wasowskis have written a book that does just that. Each chapter of this easy-to-read book combines humor, anecdotes and sound advice to gardeners to advance the concepts and practices of landscaping with native plants. The Wasowskis have deliberately written this book with a minimum of technical terms, scientific names and professional jargon which tend to scare readers away from some books on this topic. While the Wasowskis have lived in and frequently written about Texas gardening, this book presents sound landscaping principals that can be applied to any part of the country, including Wyoming and the Rocky Mountains.

For anyone who has ever had to speak before an audience about landscaping with native plants, this book should be required reading. The major anti-native plants arguments and misconceptions are addressed, so that, after reading Wasowskis' book, you too can easily refute these cherished notions without starting a riot. For example, if you find a gardener who really loves non-native plants like roses or petunias, the Wasowskis point out that local natives will mix well into the more traditional landscape, and that using natives doesn't necessarily mean "100 percent native." Or, when you hear someone equate xeriscaping with expanses of gravel and cactus, you would be able to point out it really means balancing plant selection with available natural moisture and that native plants have already figured out that trick without human help. Even the 'weed laws' issue is addressed with good advice on how to approach the touchy issue of neighbors who view your naturalistic plantings as a weed patch.

The title chapter *Requiem for a Lawnmower*, is obviously a plea to stop scheduling summer weekends around municipal watering restrictions, mowing, weeding, and fertilizing the non-native, monoculture called a

lawn and create a landscape that might include native grasses and is adapted to local conditions. As Sally points out, "because we weren't spending inordinate amounts of time doing [lawn] maintenance, we were free to simply enjoy our garden."



It is easy to talk about use of native plants for landscaping, but as this reviewer can personally testify, much harder to put into practice if one depends on the offerings of the traditional nurseries. The Wasowskis point out in their chapter *Our Unsung Horticultural Heroes*, there may be tougher ways to make a living than growing native plants for nursery stock, but not many. This is one area where native plant supporters can make a difference. Encourage local nurseries to stock natives, then buy those natives. Ask for other natives. Encourage your gardening friends to purchase and use native plants from local nurseries. Encourage nursery owners to participate in native plant activities. Be generous with your knowledge of native plant culture.

The book is set up in seven sections with a total of 48 chapters. Each chapter is a short, stand-alone essay which creates easy pick-and-choose reading. It would be a good addition to any public library. If you are already a convert to the landscaping -with-natives philosophy, you might want to add this non-technical book to your own library as an excellent first book to loan to doubters and possible converts, and a good refresher when you need to communicate with native-plants-won't-work gardeners.

Rocky Mountain Natural History – Grand Teton to Jasper, by Daniel Mathews, 2003. Raven Editions, Portland, OR, 2003. 656 pp.

Reviewed by Walter Fertig

The only thing I enjoy as much as a rousing day exploring nature in the out-of-doors is reading about the natural history and lore of the plants, animals, and environment that I enjoy in person. Much to my wife's lament (though she knew full well of my affliction and married me anyway), I must have just about every popular field guide to trees, wildflowers, birds, reptiles, fish, rocks, and bugs in print, as well as most of the current and classical technical manuals. While all these books have their practical uses and charms, it is hard to lug more than one or two on a long field outing, and, frankly, most are not very scintillating reading for cold wintry days when I'm spending more time inside than out.

So I'm always very pleased to find a book like Dan Mathews' *Rocky Mountain Natural History – Grand Teton to Jasper*. This pocket-sized book covers the entire gamut of Rocky Mountain critters and landscapes, from rocks, minerals, and climate to insects, birds, mammals, fish, herptiles, fungi, ferns, mosses, and flowering plants. Of course no one book can cover every single species in these diverse groups (and still be portable), so instead the author focuses on the most common and typical forms. Mathews' writing goes well beyond the terse descriptions of standard guides (though these are included too) to discuss the biology, ecology, and history of his subjects in pleasurable and fact-filled prose. Thus *Rocky Mountain Natural History* is a field guide

writing that just happens to also have handsome meant to be read and enjoyed as good nature line drawings, color photos, and descriptive text on hundreds of biological topics and species.

My favorite sections of the book are the frequent sidebars on a variety of topics, ranging from contemporary ecological theory to musings on weeds and whirling disease, biographies of leading naturalists of the 18th and 19th centuries, Indian folklore, and animal behavior. Additional supplemental information is provided in the appendices, including the most informed critique of the state of taxonomy that I've read by a non-taxonomist.

Rocky Mountain Natural History specifically covers only the northwest corner of Wyoming – from the Absarokas and Wind Rivers to Grand Teton and Yellowstone national parks. Most of the book addresses the northern Rockies of Canada, western Montana, northern Idaho, northeastern Washington, and the Wallows of eastern Oregon. Many species are included that won't be found in Wyoming, but it is never bad to expand one's horizons and learn about new areas. The quality of the photos is first rate, though unfortunately most are quite small to save space. The line drawings are also mostly excellent, especially the timeless art of the late Jeanne Janish (from the *Vascular Plants of the Pacific Northwest* series) and some illustrations attributed to Willis "*Jepson Manual*" Jepson (who I had no idea was such an accomplished artist).

Reading Mathews' book is a lot like having an entertaining naturalist along for a hike. Other field guides and manuals will still have a place in my knapsack, but none of these can rival *Rocky Mountain Natural History* for sheer variety of natural history factoids and wit.

(Editor's note: See the next page for an excerpt!)



Above: In June, Wyoming Native Plant Society and Buffalo Bill Museum conducted a Heart Mountain hike.



Above: The hike offered a rousing day exploring and swapping botanical lore. Photos by Nathan Bender. Buffalo Bill Museum

Whitebark Pine

By Daniel Mathews

With their broad crowns and tufted, paler foliage, whitebark pines are easy to tell from the other high-country conifers.

They're easy to tell even in death. If you find yourself in a subalpine forest with large, bleached, forked and crooked dead tree trunks towering over young spruces and firs, this was once a fine whitebark pine grove. We're in the midst of a catastrophic decline of whitebark and limber pines throughout most of our region. It seems to be caused by both introduced blister rust and the ramifications of fire suppression; fire tends to control the pines' worst enemies and competitors. The worst native enemies are dwarf-mistletoe and bark beetles. Fire suppression allows overly dense stands of lodgepole pine to stagnate; these attract epidemics of bark beetles, which head upslope looking for other pines after they overpopulate their lodgepole resource. They prefer bigger whitebarks, with bark thick enough to protect and nourish their larvae. Most "ghost forests" of whitebark pine were killed by blister rust, but in the area from the Sawtooths to the Bitterroots (which may be too dry for blister rust) bark beetles are the culprits.

While studying whitebark mortality in the Salmon River area, Dana Perkins found some magnificent survivors. The oldest is 1270 years old – placing whitebark pine eleventh on the longest-lived tree species list – and the biggest is 8¾ feet in diameter [2.6 m]. Fires initiated fine stands of whitebarks in Montana's Mission and Whitefish Ranges, but blister rust killed most of those.

Growth form varies with elevation. In the alpine zone, whitebark pine grows as krummholz (dense prostrate shrubs). It's a major component of krummholz patches especially in the Wind River, Wyoming, and Salt River Ranges. At its lowest elevations it may grow straight and single-stemmed, resembling lodgepole pine. Whitebark pines are shade-intolerant and fairly fire-resistant, especially on high sites where they are widely spaced and the undergrowth is low. Fire suppression has tipped the scales in favor of the competition – spruce and fir – and the pine's enemies have piled on, greatly accelerating the decline. Once pines are gone from a stand even blister rust-tolerant ones won't be able to retake much lost ground until a fire takes out the forest. Pines have failed to return to much of the great 1910 burn in northern Idaho, possibly because blister rust was already making pine nuts scarce in that area.

Normally, whitebark pines reseed into large burns much faster than other trees, because whitebark pine nuts travel on adopted wings. Their own undersized wings remain stuck to the cone scales while the cones remain stuck to the branch. Fat, heavy and wingless, the seeds wouldn't go far in the wind even if the cone did open, but they fly as far as fourteen miles in the beaks of Clark's nutcrackers. Whitebark pine seedlings grow from caches buried and then forgotten by these birds, who prefer to cache seeds in bare or burned areas, enabling whitebarks to broadly recolonize large burns where wind-disseminated trees can only crawl back, generation by generation, from the green periphery.

Nutcrackers cache up to 15 pine nuts together. Several may germinate and grow as a clump. Diana Tomback investigated whether the multi-stemmed form typical of whitebarks is genetic or a result of clumped seedlings fusing as they grow up. The answer: both, in roughly equal numbers. You can't tell fusers from clones visually.

In another study, she found that patches of whitebark krummholz destroyed by a fire were replanted by nutcrackers within a few years. Krummholz whitebarks don't produce cones (they're too stressed) so there would be no other way for the species to get established on sites where it can't grow erect.

Many characteristics of whitebarks and their Eurasian relatives apparently co-evolved with nutcrackers and *their* relatives, having no obvious adaptive value other than to accommodate these birds. Cones are borne on vertical branches near the top of the tree, making them easy for birds to see and work on. Nutcrackers came to North America from Asia only two million years ago, likely bringing whitebark pine's ancestors with them.

They may even help save the species from blister rust. The fungus kills trees from the top down, eliminating cone and seed production early. In heavily infected stands, nutcrackers are thus forced to find the small percentage of whitebarks with rust-resistant genes. Unfortunately, these desperately hungry nutcrackers will most likely eat a much higher proportion of seeds they collect than normally, but those that they do plant will be selected for resistant genes. We have to hope there are still enough nutcrackers around to take care of the replanting when fires, sooner or later, provide the seedbeds.

Though long overlooked by forest researchers because of their low commercial value, whitebarks are extraordinarily valuable to wildlife. Grouse find their dense crowns cozy in winter. Red squirrels and both black and grizzly bears eat tons of pine nuts. Bears get them by robbing squirrel middens. Blister rust became widespread in the Yellowstone ecosystem only in the 1990s but it's already seen as a serious threat to grizzly recovery there.

Excerpted with permission from *Rocky Mountain Natural History – Grand Teton to Jasper*. Raven Editions, Portland OR, 2003.

Addition to the Flora of Wyoming:

Cynoglossum boreale

Cynoglossum boreale (northern wild comfrey) CROOK COUNTY: *Cynoglossum boreale* is now known from the Black Hills of Wyoming (Tatina et al. 2004). It was discovered in northern and east-central parts of the Bear Lodge Mountains during 2002 plant surveys and documented from 37 locales.

Cynoglossum boreale is a perennial that grows up to 0.5 m tall in open coniferous and deciduous forests of the Black Hills between 1200 and 1500 m. It is native to boreal forests of Canada and hardwood forests of the northeastern United States. All of the Wyoming locales where it was documented showed signs of disturbance associated with logging or grazing, and the authors present this addition to the Wyoming flora as reinforcing an earlier hypothesis (Larson and Johnson 1995) that *C. boreale* migrated or was introduced recently to the Black Hills and is becoming more widely established.

What is a native species? A USDA definition is widely-used: "A plant that lives or

grows naturally in a particular region without direct or indirect human intervention." The possibility that *Cynoglossum boreale* has spread or was originally introduced in Wyoming by human intervention is inferred by its habitat affinities and the timing of discovery after extensive floristic work had already been conducted (Marriott 1985).

The characteristics of *Cynoglossum boreale* that distinguish it from *C. officinale* include its blue corolla, obovoid nutlets, and absence of leaves on the flowering stem.

Literature cited

Larson, G.E. and J.R. Johnson. 1995. New vascular plant records for the Black Hills of South Dakota and Wyoming. *Prairie Naturalist* 27:115-121.
 Marriott, H. 1985. Flora of the northwestern Black Hills, Crook and Weston counties, Wyoming. M.S. Thesis. University of Wyoming, Laramie.
 Tatina, R., V. Coenen, N. Tashe, K. Barton, C. Dockrill, A. Joynt, and B. Leopky. 2004. First record of northern wild comfrey from Wyoming. *Prairie Naturalist* 36: 125-126.

Table 1. New additions to the southern Wyoming flora on peatlands of the Medicine Bow Range

Relicts and Refugia – continued from p. 1

a need for baseline systematic inventory. The second stage of peatland inventory spanned four large landscapes on the Medicine Bow National Forest that represent about 10% of the national forest. Digitized soils mapping, National Wetland Inventory mapping, and color aerial photographs were used to survey all large areas of the two soils units containing organic soils. One hundred fifty-six fen sites were ground-truthed and digitized. They are located primarily in drainageway settings, and to a lesser extent, in glacial kettles (Heidel and Thurston 2004).

Finally, intensive documentation of fen vegetation and flora were conducted at a set of sites representing the array of fens this last summer (Heidel and Jones in preparation). The flora includes five new additions to the southern Wyoming flora (Table 1), and they are rare and localized compared to the extensive fen habitat.

SCIENTIFIC NAME	COMMON NAME	NEAREST WY LOCALES	NEAREST CO LOCALES (from Weber and Wittmann 2001)
<i>Carex leptalea</i>	Bristly-stalk sedge	Absaroka, Beartooth and Teton ranges	Colorado Springs, Tarryall Range
<i>Eriophorum gracile</i>	Slender cotton-grass	Beartooth Range, Jackson Hole	South Park
<i>Muhlenbergia glomerata</i>	Marsh muhly	Absaroka Range, Black Hills, Jackson Hole, Upper Green River	Absent
<i>Sparganium natans</i>	Small bur-reed	Absaroka, Beartooth, Yellowstone Plateau, Jackson Hole, Wind River ranges	At scattered subalpine locales
<i>Trichophorum pumilum</i> (<i>Scirpus pumilus</i>)	Pygmy bulrush	Absaroka and Gros Ventre ranges and Jackson Hole	South Park

Relicts and Refugia – continued from p. 9

The Medicine Bow peatland flora also includes two species once known from a few Medicine Bow Range locales, including *Carex paupercula* (*Carex magellanica*; Bog sedge) and *Epilobium oregonense* (Oregon willow-herb) that have been documented to be widespread in the Range. The bryophyte flora was also investigated.

Fens on the Medicine Bow Range represent more than odd vestiges of northern plant distributions; they are a major slice of Medicine Bow Range wetland vascular plant species and habitat diversity. Furthermore, they comprise a high proportion of net wetland acreage and significant total landscape area, spanning over 1% of the entire landscape of the two largest study areas. The largest fen site was 89.4 acres, and the longest fen site was 1.5 miles in length.

The fens may also be important in regional water cycles. A hydrological study at the “Elk Creek study bog” suggested it functioned like a sponge at the head of a drainageway, providing slow, stable water release. Its subsurface peat was 80-85% water by volume, with hydraulic conductivity averaging a sluggish 0.0239 cm per day (Sturges 1967). Yet this same fen readily returned water to the atmosphere, like an evapotranspiration “pump” (Sturges 1968).

Medicine Bow refugia and relicts lie in secret no longer, but they still hold puzzles to their past, present and future.

REFUGIA are natural habitats that have remained stable over time, and are more restricted in the present than they were in the geological past. *RELICTS* are species or vegetation stands that had more widespread distribution in the geological past than in the present, persisting in a given area. *FEN* is a type of peatland, i.e., wetland where organic matter accumulates under saturated conditions, and that receives significant inputs of water and dissolved solids from a mineral source rather than solely from the atmosphere.

Acknowledgements This work was conducted through challenge cost-share project agreements between Medicine Bow National Forest and Wyoming Natural Diversity Database.

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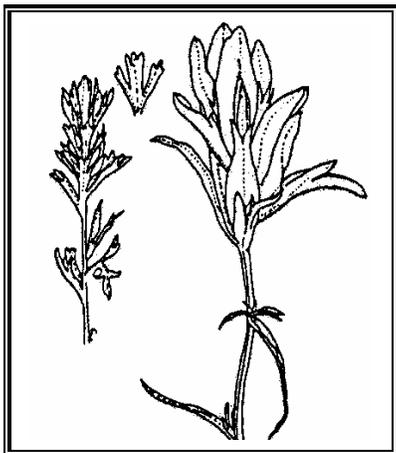
Raising Livestock and Lowering Carbon Dioxide

A prospective new economic enterprise is proposed for private grazing lands in Wyoming – sequestering “carbon credits” in rangeland soils (Campbell et al. 2004). The premise is that carbon credits can be created by adopting range management practices that store carbon compounds faster than current practices, and that new storage capacity can be evaluated economically and sold.

The carbon storage potential and costs of seeding alfalfa, thinning sagebrush, mineral block placement, and dispersing range utilization thru water developments were compared individually and collectively. Planting alfalfa showed the largest increase in carbon storage, but mineral block placement was the most cost-effective approach to creating carbon credits. Private grazing lands in the U.S. are said to hold the capacity to store additional carbon equivalent to about 5% of the total U.S. emissions of carbon dioxide, so the researchers concluded that carbon credits hold promise in raising livestock and lowering carbon dioxide in Wyoming.

Literature cited

- Campbell, S., S. Mooney, J.P. Hewlett, D.J. Menkhaus, and G.F. Vance. 2004. Can ranchers slow climate change? *Rangelands* 26: 16-22.



Wyoming Native Plant Society
2005 Botany Research Scholarship

Applications are due by 28 January 2005.

Scholarships will be awarded in March, 2005.

Electronic copies of the scholarship application are also posted on the WNPS homepage at:
www.uwyo.edu/wyndd/wnps/wnps_home.htm

The Wyoming Native Plant Society was established in 1981 for the purpose of encouraging appreciation and knowledge of the native flora of Wyoming. Towards this end, the Society has promoted research on native plants and habitats in Wyoming through its annual scholarship program. One to three scholarships in the amounts of \$300-500 are awarded each year to undergraduate or graduate students conducting research in Wyoming. Projects may address any aspect of vascular and nonvascular botany, including taxonomy, ecology, genetics, plant geography, range science, population biology, physiology, palaeontology, and mycology.

2005 Student Scholarship Application

Name _____

Address _____

School _____

Department Advisor _____

Project Title _____

Research Goals and Objectives _____

Summary of Project: On 1-2 separate pages, please include introductory information, methods, and budget information that state the intended purpose of the funding in overall project plans.

Please send completed applications to:

Wyoming Native Plant Society
PO Box 2500
Laramie, WY 82073

Deadline for applications: 28 January 2005.

Gardeners' Guide: Natives vs. Imposters

Fall is a great time to plant trees, shrubs and many perennials. But have you ever visited the garden center and wondered which plants were native and good for wildlife, and which ones were problematic invasive exotics?

The talented staff at eNature and National Wildlife Federation have created a new field guide to native and invasive plants. Unlike other native/invasive guides, this guide focuses on plants that are commonly found at garden centers or in plant catalogs so it's relevant to the home gardener.

The plant guides are searchable by state and the native list can then be sub-divided according to plant type (for example, evergreen shrubs, wildflowers, vines or aquatic plants). Each plant has a color photo and a full field guide description as well.

This guide is going to be an invaluable resource to anyone wanting to garden in an environmentally-friendly way and is a much needed resource to backyard wildlife habitat enthusiasts. Check it out!
http://enature.com/native_invasive/natives.asp.

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 or renew, return this form to:

Wyoming Native Plant Society
P.O. Box 2500
Laramie, WY 82073

Name: _____

Address: _____

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



**Wyoming Native Plant
Society**
P.O. Box 2500
Laramie, WY 82073