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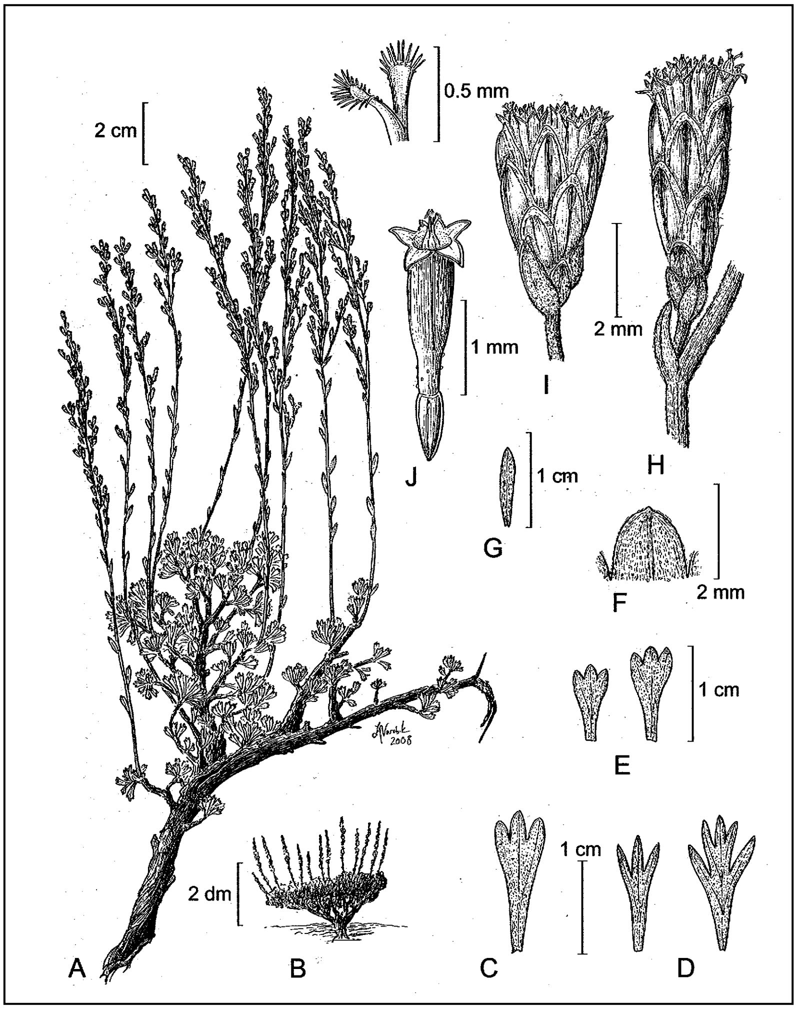

Above: *Artemisia nova.* Illustration by Linda Vorobik. From: Shultz, Leila M. 2009. Monograph of *Artemisia* Subgenus Tridentatae (Asteraceae-Anthemideae). Volume 89 : 1-131. Systematic Botany Monographs. [Reprinted with permission of the American Society of Plant Taxonomists and of the Author.]

Inserts: A. Branch with leafy and flowering shoots. B. Habit. C-D. Ephemeral leaves E. Persistent leaves. F. Detail of leaf tip. G. Inflorescence leaf. H-I. Capitulum. J. Florets and cypsela; detail showing style branches.

In this issue:

Sagebrush Evergreens

Evergreen-leaved sagebrush species prevail across Wyoming uplands, producing perennial leaves that elongate throughout the growing season and overwinter. Among them are our common species like Black sagebrush (*Artemisia nova*), Big sagebrush (*Artemisia tridentata*) and Dwarf sagebrush (*A. arbuscula*). The small perennial leaves grow in tight clumps on vegetative stems and are they are the ones used in taxonomic keys (Shultz 2009). Also produced are ephemeral leaves that emerge in early spring on vegetative shoots and readily elongate; and later, flowering stem leaves.

Announcement:
A new illustrated treatise on woody *Artemesia* is already in its first reprinting. Additional copies of Volume 89, the Monograph of *Artemisia* Subgenus Tridentatae (Asteraceae), are available for $20.00 (must be pre-paid; no discounts). Price includes shipping (U.S.). Send orders to: Systematic Botany Monographs, University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, MI 48108-2287; citing the volume and quantity. Anyone who uses "Sagebrush in Wyoming" (Beetle and Johnson 1982) or the three new *Flora of North America* volumes that treat the Aster family (2006) will find this a welcome addition.

WNPS News

Mark Your Calendars!!
June 18-20 will be the 2010 Annual Meeting of Wyoming Native Plant Society, held at Belvoir Ranch, with side trips to Pole Mountain and to the High Plains Research Station. Belvoir Ranch was recently acquired by the City of Cheyenne, the largest piece of public land in Laramie County. This event also marks our first annual meeting in Laramie County! See the May newsletter for the full itinerary.
Questions? – call Ann Boelter or Bonnie Heidel.

Please renew for 2010 if you haven't already *and* cast your by-laws vote on-line or by mail. See www.uwyo.edu/wyndd/wnps .

New Members: Please welcome the following new member to WNPS: Marti Aitken (Walden, CO).

Treasurer's Report: Balance as of 18 Feb 2010 - $1,910 in the Markow Scholarship Fund plus $1,991.38 in general funds, for a total of $3,901.38

Contributors to this Issue: Ann Boelter, Bonnie Heidel, Jim Zier.

The next newsletter deadline is 15 April 2010.

This newsletter is printed on 100% post-consumer recycled paper.

NRCS Interactive PLANTS Identification Key
If you've never identified a plant in your life, or are stumped about that "weed" growing in back of the house, this electronic key is for you. The key lets you select multiple characteristics simultaneously (a polyclave key) to minimize the number of steps it takes to identify a plant. It is a national tool that currently enables users to quickly narrow down options to a particular state for select groups like grasses and legumes.

The PLANTS identification key can be used on-line or downloaded (http://npdc.usda.gov/technical/plantid_wetland_mono. html.) It is linked directly to the PLANTS database of the Natural Resources Conservation Service. Data for this key were compiled by Dr. David Bogler of the Missouri Botanical Garden. It is the latest addition to Wyoming plant identification references posted on the Wyoming Native Plant Society homepage.

Reference
USDA NRCS. 2008. PLANTS Identification. Posted electronically at: http://npdc.usda.gov/technical/plantid_wetland_mono.html

Wyoming Native Plant Society
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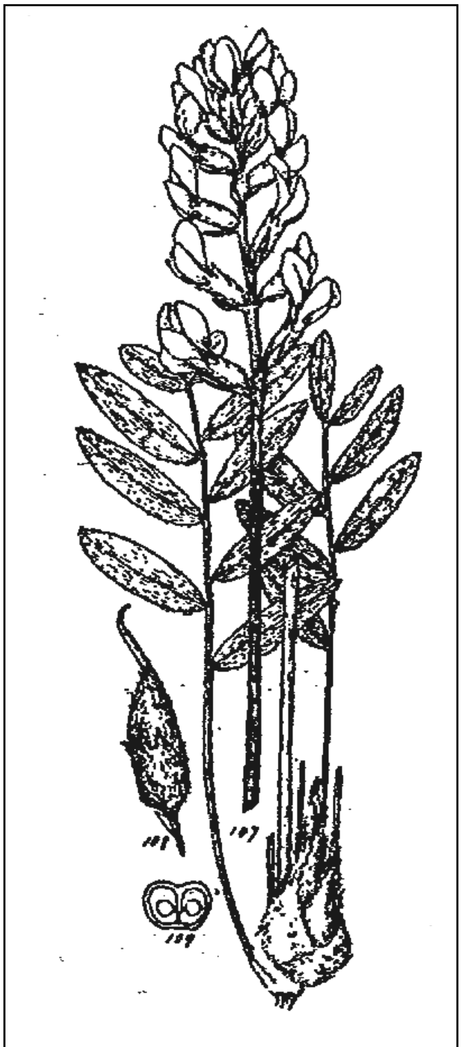
Locoism as a Team Effort



White locoweed (*Oxytropis sericea*) is featured prominently in the first publication on poisonous plants of Wyoming (Beath 1921) and more recently in *Weeds of the West* (Whitson et al. 2000). It is a native perennial legume present in nearly all counties of the state and responsible for livestock poisoning across the state and western North America. The poisoning associated with locoweed affects the nervous system, potentially causing "crazy behavior" that can be fatal in livestock, hence the name locoweed (*loco* – "crazy", in Spanish).

Livestock poisoning by White locoweed is attributed to the alkaloid swainsonine. It was originally thought that the alkaloid was directly produced by White locoweed. White locoweed and other papilionaceous legumes respond to low soil nitrogen by forming root nodules where *Rhizobium* bacteria fix nitrogen that becomes available to the plant. Only recently have root nodule levels and nitrogen fixation levels in White locoweed plants been linked to increases in swainsonine concentrations. It turns out that the real producer of swainsonine is an endophytic fungus, *Embellisia* sp. White locoweed appears to operate "fungal farms" for its own defense, in a three-way pact of cooperation linking levels of nodulation, nitrogen fixation and swainsonine production (Barillas et al. 2007). BH

Left: *Oxytropis sericea*
syn. *Spiezia lambertii* var. *sericea* (Nutt.) Ryd.
From: Rydberg, P.A. 1921. Flora of Nebraska: Part 21. Rosales. University of Nebraska – Lincoln.

References

Barillas, J.R., M.W. Paschke, M.H. Ralphs, and R.D. Child. 2007. White locoweed toxicity is facilitated by a fungal endophyte and nitrogen-fixing bacteria. Ecology 88(7): 1850-1856.

Beath, O.A. 1921. Poisonous plants of Wyoming. Wyoming Extension Service Circular 37. Wyoming Agricultural Experiment Station, Laramie, WY.

Whitson, T.D., L.C. Burrill, S.A. Dewey, D.W. Cudney, B.E. Nelson, R.D. Lee, and R. Parker. 2000, 9th ed. Weeds of the West. The Western Society of Weed Science in cooperation with the Western United States Land Grant Universities Cooperative Extension Services and the University of Wyoming, Laramie, WY.

Native Seed Collection Opportunities (Intern and Contract) with Wyoming BLM in 2010

The Wyoming Bureau of Land Management still has funding and opportunities for Interns with their Native Plant Materials Development Program (http://www.blm.gov/wy/st/en/programs/plant_conservation.html) and for contractor assistance collecting seed in north-central Wyoming. Inquiries may be directed to Adrienne Pilmanis at 307-775-6035 or by email (Adrienne_Pilmanis@blm.gov).

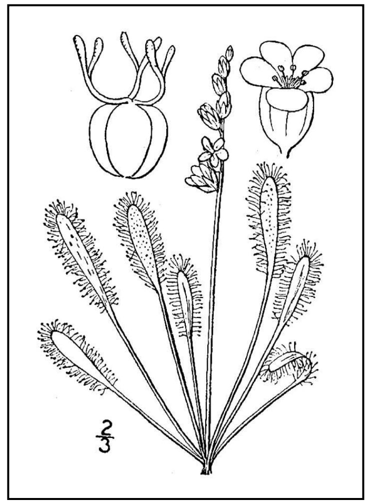
The Bighorn Peatland Chronicles

By Jim Zier

Montane peatlands are hidden jewels that can be found in many of Wyoming's mountain ranges. Peatlands are common across the northern boreal latitudes, but in the Rocky Mountains peatlands occur as scattered and often isolated habitats. Peatlands are a unique kind of wetland where plants grow on substrates consisting of the partially decomposed corpses of plants that lived there previously. These organic soils (peat) form under stable, saturated water regimes where anoxic conditions prevail and decomposition and nutrient cycling are limited. Peatlands are thus closely tied to local hydrological conditions that can be influenced by both climate fluctuation and disturbance.

Northern boreal peatlands have been shown to be self-perpetuating and self-stabilizing to a certain degree, and have recently been referred to as "complex adaptive systems." The physical properties of peat impart a sponge-like behavior to the peatland, stabilizing hydrological change (Belyea and Baird 2006). But peatlands are also known to suddenly shift from one community structure to another in response to disturbance or climatic change. For example, an environment dominated by submerged and floating-leaved aquatics may suddenly shift to a community dominated by sedges and even woody shrubs or trees, then perhaps shift back to an aquatic community thousands of years later.

Understanding long-term vegetation dynamics and the nature of sudden changes in montane peatlands is the focus of my research in the Bighorn Mountains. The majority of my sites are basin peatlands associated with the glacial kettle topography of the area. However, there are also good examples of flow-through patterned peatlands similar to those characteristic of boreal regions. Many peatlands in this area have impressively deep peat sediments that can exceed 10 meters. Radiocarbon dates from the bottom of cores indicate that these wetlands began accumulating sediments between 11,000 and 12,000 years ago in the wake of glacial retreat. Today, these are rich and unique sites floristically, containing at least five sensitive vascular plant species designated by the U.S. Forest Service Rocky Mountain Region. They include: lesser panicled sedge (*Carex diandra*), English sundew (*Drosera anglica*), slender cottongrass (*Eriophorum gracile*), Chamisso's cottongrass (*Eriophorum chamissonis*), and lesser bladderwort (*Utricularia minor*). My collections of the first three species represent new records for the Bighorns.



Drosera anglica. From: Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 2: 204. Courtesy of Kentucky Native Plant Society. Scanned by Omnitek Inc.

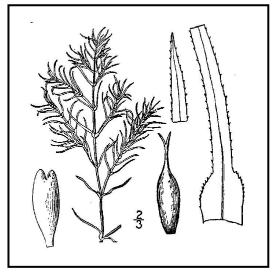
One of the cool things about peatlands is they record their own histories. If you collect a sediment core from a peatland, you obtain a record of the organisms that occupied that spot through time. Macrofossils, in the form of seeds, roots, and vascular and bryophyte plant remains are preserved in the sediments. Insect remains are also common. A systematic detailed analysis of macrofossils allows one to gain insights into a peatlands developmental history.

Collecting cores from a peatland can be adventurous, particularly from thin floating mats that extend over deep water. My coring barrel once hit a beaver lodge buried several meters below a floating mat. As I tried to push through the beaver lodge the floating mat sank deeper and deeper, until I was obliged to abandon the effort, standing as I was in thigh deep water. The peat surface directly above the old beaver lodge was elevated above the surrounding mat creating a drier micro-environment. It seemed at the time an ideal place to set-up a coring rig. Judging by the depth of burial, the old beaver lodge must have been at least 2000 years old, yet the peatland surface was still being influenced by its entombed presence.

Above: Jim Zier (right) and Rusty Sayer (left) collecting a core in the Bighorn Mountains.

I collected sediment cores along transects across several peatlands in the Bighorn Mountains, described them in the field and hauled them back to the lab for a variety of analysis. Along the length of each core, 10 cm by 1 cm "cookies" are cut at regular intervals. Samples are then sieved and picked for macrofossils. Macrofossils of vascular plants and bryophytes are identified and supporting data collected, such as loss on ignition a measure of the amount of organic matter in the peat, and bulk density an indication of peat composition. Radiocarbon dates are used to constrain the timing of ecological events.

The histories of these peatlands show different patterns of change emerging at different time scales. For example, at millennial scales there are periods of remarkable stability that can last for thousands of years followed by an abrupt change in community structure. These are high magnitude low frequency events that are easily seen in a core when collected, as sharp boundaries between darker muddier sediments and lighter colored fibrous peat. The darker sediments are often populated with macrofossils from aquatic plants such as yellow pond-lily (*Nuphar lutea*), floating pondweed (*Potamogeton natans*), bulrushes (*Scirpus spp*), and interestingly nodding waternymph (*Najas flexilis*), a species presently not documented as occurring in Wyoming. Although nodding waternymph apparently went extinct at my sites around 7000 years ago, Wyoming botanists should be on the lookout for this annual aquatic species.



Najas flexilis. From: Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 1: 90. Courtesy of Kentucky Native Plant Society. Scanned by Omnitek Inc..

At centennial or even decadal time scales low magnitude high frequency changes occur. For example, the relative abundance of bryophytes versus vascular plant remains fluctuates back and forth. Species often turn over regularly, but there may be longer periods of time when one species dominates the record. Sometimes the record is rich in macrofossils, but sometimes not. Woody remains can be abundant, then absent, then reappear. The amount of charcoal incorporated in the sediments fluctuates back and forth, perhaps indicating periodic upland fires (although fires seem to be uncommon on the actual peatland surface). Determining whether or not these shifts in species composition are a result of changes in hydrology, succession, or a byproduct of the sampling technique is a challenging task.

Thus, peatlands chronicle their own history but interpreting the story is not always easy. Processing and analysis of sediment cores is very time intensive. The sediment cores provide a very rich data set temporally but are limited spatially. I am left scrutinizing 10 cm core segments collected from a much larger peatland. Additionally, various plant species have characteristics that might increase or decrease the probability of being preserved in the peat. For example, an under-represented species might have originally consisted of many individuals but reproduced vegetatively, or had a high germination rate so that few seeds got incorporated into the peat, or its seeds just do not preserve well. An over-represented species might have originally consisted of only a few individuals but produced large quantities of seeds that dispersed and preserved well. Nodding waternymph (*Najas flexilis*) may be a good example of an over-represented species.

To assess the relationships between the macrofossil assemblages preserved in the peat and the plant communities in which they came from I have launched a taphonomic study. Taphonomy (from the Greek "Taphos" literally meaning "study of the grave") is the study of how organisms may or may not get preserved or fossilized in sediments in order to better understand biases in a fossil record. Surprisingly, there have been few efforts to investigate taphonomic relationships with regard to peatland macrofossils. My study will compare the characteristics of modern peatland plant communities with representation in the top 5 cm of peat, and will help resolve how distance and abundance might influence representation in a core sample. These efforts should increase my ability to interpret past peatland response to environmental change and determine which changes occurring in a core are meaningful and which are not.

Wyoming's peatlands are fascinating systems to explore and study. These habitats are biodiversity hotspots that harbor a disproportionate number of rare plant taxa relative to the small area they occupy. Peatlands are also important hydrological features on the landscape, acting like sponges that hold large quantities of water. We are fortunate indeed to have these beautiful wetlands. Peatlands also record their own histories and by learning to better interpret their story we can improve our understanding of these unique and valuable ecosystems.

I thank the WNPS for financial support of this research through the 2008 Markow Scholarship.

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Program in Ecology and Department of Botany
University of Wyoming

Botanist's Bookshelf – Natives of Yore

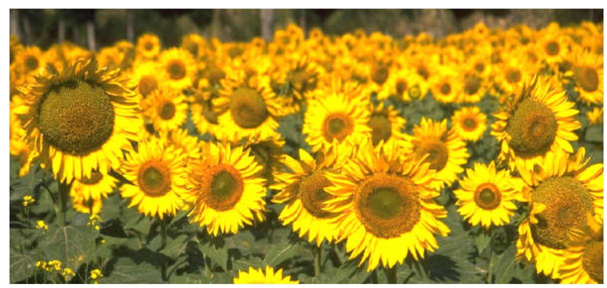
Top 100 food plants: The world's most important culinary crops. By E. Small. 2009. NRC Press, Ottawa, Ontario, Canada. 656 pp. ISBN-13 978-0-660-198798-2 [soft cover] Price: US $34.95 From: http://pubs.nrc-cnrc.gc.ca/eng/books/books/9780660198583.html

Review by Bonnie Heidel

This book presents the top culinary hits of the Plant Kingdom in a seamless treatise on agriculture, anthropology, botany, and nutrition, … with a dash of Betty Crocker thrown in.

What does a book about food plants of the world have to do with native Wyoming plants? There is exactly one entry for a native Wyoming plant, Common sunflower (*Helianthus annuus*). The 99 other plants are non-natives, many of which can be found in Wyoming fields, gardens and grocery stores. It is good to be reminded of our skewed alliances in the Plant Kingdom. The roster-of-100 represents the species- or species-groups that comprise 90% of the plant food supply within every country of the world.

The book abstract declares that all categories of food plants are covered, including cereals, oilseeds, fruits, nuts, vegetables, legumes, herbs, spices, beverage plants and sources of industrial food extracts. With all due respect to culinary breadth, what I found most intriguing is that every effort is made to recount the origins of crop plants as native plants in the wild.



Think of this as 100 short stories. Time and again, the reader is reminded that fact can be more amazing than fiction. The text is fluid, the headings are simple, the illustrations exquisite, and the research and citations are robust. This literary fare can be browsed by anyone to their personal taste and it makes a valuable library reference.

Domesticated varieties of Common sunflowers arose around 1000 BC within the area marked by the United States, but domesticated sunflower seeds were recently found in Mexico from 5000 BC, suggesting it arose independently even earlier. So… how did Russia become the world's leading producer of a North American crop by the mid-19th Century? Foods that were rich in oil were prohibited by the Holy Orthodox Church of Russia during Lent and Advent. But the sunflower was not on the banned list. Hence, sunflower oil production soared in Russia. Common sunflower wasn't "discovered" in U.S. agriculture until the 1940's… and only recently arrived back in Wyoming as a crop plant.

THAT WHICH DOES NOT KILL YOU MAKES YOU STRONGER

(Adapted from Conservation Maven, Research Briefs, review by R. Goldstein, Jan 19, 2010 http://www.conservationmaven.com/)

…Could Nietzsche have been referring to Wyoming native grasses? Over the past few years, University of Wyoming restoration ecologists have made a surprising discovery - the invasion of exotic plants may enhance the competitive ability of native species when later faced with new exotic invasive plants (Ferrero-Serrano et al. 2009).

In the wake of noxious weed invasions, some native grasses persist within communities dominated by exotics, though the influence of this exposure on native populations is poorly understood. Selection for traits contributing to competitive ability may lead to native plant individuals that are more resilient in the presence of exotic invaders. In this way, long-term coexistence with an exotic may confer competitive advantages to "experienced survivors" and be potentially beneficial to restoration.

Populations of a cool-season grass, needle-and-thread (*Hesperostipa comata*) and a warm season, alkali sacaton (*Sporobolus airoides*) were collected from sites invaded by Russian knapweed (*Acroptolon repens; syn. Centaurea repens*) and from adjacent non-invaded sites to assess their relative competitive ability when grown in the greenhouse with a new exotic species, Canada thistle (*Cirsium arvense*). "Experienced" *S. airoides* and *H. comata* (from within *A. repens* invasions) generally appeared better able to tolerate the presence of *C. arvense* in terms of biomass and other standards.

The authors conclude: "The ability to compete with new invaders may be driven by general competitive traits rather than species-specific coevolutionary trajectories. Irrespective of competitive mechanisms, the conservation of native species populations within weed invasions may provide an important restoration tool by retaining unique components of native gene pools selected by competitive interactions with exotics."

One basic question is whether the grasses from invaded sites truly have a genetic-based competitive advantage or whether other factors might be at play. For example, the study authors concede that differences in soil microbial communities from invaded sites may confer advantages to native plants from those areas compared to non-invaded settings.

Another question is whether restoration practitioners can actually take advantage of whatever competitive advantages do exist. The authors note that seed suppliers are reluctant to use native sources from invaded sites because they want to minimize contamination of the supply with non-native seeds that can often be small and hard to detect.

Reference

Ferrero-Serrano, A., Hild, A., & Mealor, B. 2009. Can Invasive Species Enhance Competitive Ability and Restoration Potential in Native Grass Populations? *Restoration Ecology* .1-7.

Wyoming Reclamation & Restoration Symposium: Successes and Challenges

April 6-7, 2010
Hilton Garden Inn & UW Conference Center in Laramie, WY

The Wyoming Reclamation and Restoration Symposium is the first meeting of its kind in Wyoming, for all professionals involved in Land Reclamation and Restoration. The symposium will feature speakers from land reclamation and restoration contractors, seed and plant materials producers, resource extraction industries such as mining and oil and gas producers, pipeline and power transmission line installers, wind energy producers, highway construction contractors, and regulatory agencies. The symposium goal is to provide a forum for discussing recent advances and current challenges in Wyoming, sharing ideas among practitioners in our field. There will be a poster session during the Reception on Tuesday evening. For registration information, go to: http://www.uwyo.edu/wrrc-symposium/ or call: 307-766-3576.

Upcoming Events

Wyoming Reclamation / Restoration Symposium*, April 6-7, 2010, Laramie, WY. Sponsored by University of Wyoming. Contact: www.uwyo.edu/wrrc-symposium .

2nd Annual Native Plant Species Seminar, April 27, 2010 at Teton Science School, Jackson, WY. - co-sponsored by Teton Conservation District and Teton Science School. Contact: www.tetonconservation.org .

National Native Seed Conference, May 17-21, Snowbird, UT – Cosponsored by Bureau of Land Management and Institute for Applied Ecology. Contact: www.nativeseed.info/

American Penstemon Society Meeting, June 4-6, Craig, CO. Contact: www.apsdev.org/welcome.html .

2010 Wyoming Native Plant Society Meeting*, June 18-20, Cheyenne, WY. See May newsletter and check www.uwyo.edu/wyndd/wnps.

**See this issue for additional details.*

Wyoming Native Plant Society
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Wyoming Native Plant Society is a non-profit organization established in 1981, 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. To join or renew, return this form to:

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

Name: ____________________________________

Address: __________________________________

____

Email: ____________________________________

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__Renewing members, check here if this is an address change.