



Castilleja

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Prehistorically Correct Menus

By Richard Adams and Rhoda Schantz

(Editor's note: The following is excerpted from "Nuts and Roots: the staples of prehistoric cuisine in the Greater Yellowstone Ecosystem," which appeared in Reflections, the annual journal of the College of Agriculture and Natural Resources, University of Wyoming; posted at: http://multimedia.uwyo.edu/UWAG_STREAM/Reflections2010/index.html).

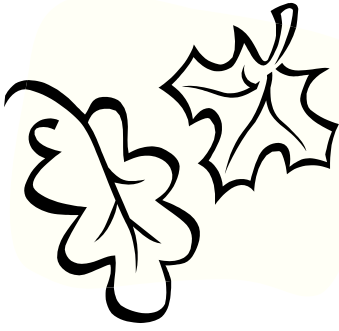
The archeology of prehistoric hunters in Wyoming is well-known thanks to the work of George Frison (University of Wyoming), but he says that survival would not have been possible if gathered food products had been subtracted from the diet of prehistoric hunters-gatherers. Anthropology doctoral candidate Richard Adams is studying the gathering part of the hunter-gatherer equation of prehistoric people in the Greater Yellowstone Ecosystem, shedding new light on the prehistoric significance of plants in the diet.

Curious about the nutrient value of gathered foods, Adams approached Family and Consumer Sciences Associate Professor Rhoda Schantz. Her research interests were piqued by a desire to be informed about Wyoming foods. Schantz and Adams chose to focus on a few gathered nuts and roots that, because of first-hand accounts by Euro-American eyewitnesses, were suspected of being dietary staples: whitebark pine nuts (*Pinus albicaulis*), biscuitroots (*Lomatium* spp., *Cymopterus* spp.), and sego lilies (*Calochortus*



Above: Sego lily (*Calochortus nuttallii*). From: Britton, N.L., and A. Brown. 1913. *An Illustrated Flora of the Northern United States, Canada and the British Possessions*. Vol. 1: 508. Courtesy of Kentucky Native Plant Society. Insert: Sego lily bulbs, by Richard Adams.

spp.). Pine nuts were known to be the winter staple in prehistoric diets of other Shoshone Indians who lived in California and Nevada. Meriwether Lewis described the first specimens of biscuitroots and their importance to Shoshone and Flathead Indians. They are some of the first plants to grow in the spring, and they can be harvested by the bushel in good years. The harvest season in Wyoming begins with the first biscuitroot appearing before the snow has completely melted in mid-March and lasts until mid-October when the last of the pine nuts are collected. (Continued, p. 7)



WNPS News

Castilleja - at Your Fingertips: All issues of *Castilleja* going back to Volume 1 in 1981 are now available online at the Wyoming Native Plant Society homepage (www.uwyo.edu/wyndd/wnps/), along with a partial index of articles (1981-2000). Scanning of early issues was kindly provided by Walter Fertig. Printed copies are also archived in the University of Wyoming (Laramie) and the Draper Museum, part of the Buffalo Bill Museum (Cody), in addition to the Society set of newsletters kept by the editor.

New Members: Please welcome the following new members to WNPS: Bob Means, Cheyenne; Jennifer Walker, Buffalo; and Brianna Wright, Laramie.

Call for Candidates: A 2010 nomination committee will be established to fill WNPS positions. Interested? Contact Lynn Moore.

Treasurer's Report: Balance as of 24 Sept - Scholarship = \$1,617.50; General = \$2,130.62; Total = \$3,748.12

2011 Markow Scholarship announcement: Online soon and in the next issue.

Please RENEW! If "2009" is printed after your name on the mailing label, your membership is not current. Membership follows the calendar year but retro- and advance-renewals are welcome all year! Contact Ann Boelter if you have any questions.

Contributors to this Issue: Richard Adams, Ann Boelter, Janet Britt, Cass D'Alaija, Bonnie Heidel, Robert Means, Steve O'Kane, Daniel Schlaepfer, Larry Schmidt, and Rhoda Schantz.

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Vegetation/Climate Change Workshop

The University of Wyoming will be hosting a workshop on November 19th in Laramie, entitled "Living on the Edge: Integrating Science into the Management of Range-Margin Species." The workshop is sponsored by the Wyoming Bureau of Land Management and the Wyoming Chapters of the Society of American Foresters.

This is a one day workshop focusing on the ecology and climatic conditions that control species ranges, climatic modeling and the integration of science into management decisions. Lands in Wyoming include multiple species that are at the edge of their range. Both the changing climate and our management decisions will play an important role in future of these species.

The case study presented in this workshop to illustrate the range-margin species is that of ponderosa pine expansion in the Big Horn Basin. It is based on the work of University of Wyoming Ph. D. candidate Mark Lesser from the Botany Department.

There is no cost to attend this workshop, but registration is required. To register and for further information, please go to the workshop website at <https://sites.google.com/site/rangemarginworkshop/>.

RM



2010 Meeting Highlights

Prolific flowering greeted WNPS members at the 2010 Wyoming Native Plant Society Annual Meeting, 18-20 June in a whirlwind exploration of Belvoir Ranch, owned by the City of Cheyenne and the Big Hole rim, under easement by The Nature Conservancy. We were joined by the Wyoming

Chapter of The Nature Conservancy, and privileged to be one of the biggest groups to visit. It was preceded by a serene evening hike at Vedauwoo, and followed by a potluck gathering, and a peek at the "control panels" of the prairie ecosystem at the USDA High Plains Research Center the next day. The event also marked the first time we have held our annual meeting in Laramie County! A huge **thanks** to all!



(Plant photos - upper left and clockwise):
Townsendia grandiflora, by Daniel Schlaepfer
Zigadenus venosus, by Daniel Schlaepfer
Scutellaria brittonii, by Janet Britt
Castilleja sessiliflora, by Daniel Schlaepfer
 WNPS people at Belvoir Ranch (above, below), by Ann Boelter



The running checklist of plants observed at Belvoir Ranch is now posted on the WNPS homepage. The list and many photos have also been provided to the City.

***Physaria* species of Wyoming: Part 1. Plant Taxonomy in Action**

By Bonnie Heidel¹ and Steve L. O'Kane, Jr.²

Plant taxonomy is product and process, as epitomized in the recent *Flora of North America* (FNA) treatment of *Physaria* (Brassicaceae; O'Kane 2010). It may seem that every action verb in the taxonomic lexicon was enlisted, resulting in a reference looking unfamiliar to users of Dorn (2001).

Central to the new FNA treatment is the merging of most of the species of the genus *Lesquerella* (bladderpods) into a much enlarged *Physaria* (the double-bladderpods, or twinpods), transferring all Wyoming species (see Dorn 2001) and most of the rest of the North American species of *Lesquerella* to *Physaria*. Molecular data show that the smaller genus *Physaria* is nested within and evolved more than once from the larger *Lesquerella* (Al-Shehbaz and O'Kane 2002, Bailey *et al.* 2006). Furthermore, as stated by Al-Shehbaz and O'Kane (2002), "*Lesquerella* and *Physaria* are indistinguishable in basically every morphological aspect, including leaf morphology trichome type, inflorescence, flower color, fruiting pedicels, and all aspects of seed-coat sculpture and embryo type." In fact, the only morphological feature separating the two traditionally-recognized genera, in Wyoming, but not elsewhere, is the doubly inflated fruits of *Physaria* in the traditional sense.

Evolutionary origins and the much larger size of *Lesquerella* would have presupposed a merger of *Physaria* into *Lesquerella*, as proposed by O'Kane *et al.* (1999) to the Committee for Spermatophyta (a permanent committee set up to implement the International Code of Botanical Nomenclature). However, the proposal was rejected so the older of the two genus names, *Physaria*, took priority. Unfortunately for all users, this necessitated a massive transfer of species names from *Lesquerella* to *Physaria*.

Interestingly, in years past both *Lesquerella* and *Physaria* were once included in the unrelated Old World genus *Vesicaria*. In 1848, Asa Gray

raised the rank of the New World double-fruited species of *Physaria* from a section within *Vesicaria* to a separate genus. In 1888, Sereno Watson created the genus *Lesquerella* for species of *Vesicaria* with uninflated, non-double fruits and transferred most of the remaining New World species to *Lesquerella* (references in Rollins 1993).

The first monograph of *Lesquerella* was by Edwin Payson, a University of Wyoming graduate, who wrote his eloquent monograph while on a fellowship at the Missouri Botanical Garden (Payson 1922). He was the first to articulate parallels and recognized "bridges" between *Lesquerella* and *Physaria*. The second, equally monumental monograph to wrestle with the large and difficult genus *Lesquerella* was by Reed Rollins, Harvard University botanist who hailed from Lyman, Wyoming (Rollins and Shaw 1973). Earlier Rollins (1950) had noted: "The evidence now assembled shows a continuous morphological gradation from the genus *Physaria* into *Lesquerella*." Rollins (1993) in his *magnum opus*, *The Brassicaceae of North America*, further addressed the genus pair, culminating years of earlier work (Rollins 1939a, b).

If Aven Nelson were inspecting the recent FNA treatment of *Physaria*, would he recognize the outcome? He most certainly would, for taxonomists never obliterate the work of others, but immortalize and build upon it. The *Physaria* species he described are unchanged. One of the *Lesquerella* species he described, subsumed under the name *Lesquerella alpina* (Nutt.) Wats., is split out and reinstated by O'Kane (2010). Nelson was mentor to Edwin Payson, and inspiration to Reed Rollins, who heard him speaking when Rollins was a boy. Moreover, Nelson was a proponent of logical taxonomic rules and processes, and was among the first American authors to publish a flora (Coulter and Nelson 1909) in keeping with the revisionary "Vienna" International Code of Botanical Nomenclature of 1905.

An overview of the *Physaria* treatment in FNA (O'Kane 2010) is easier for contemporary Wyoming botanists to understand when compared directly to Dorn's (2001) treatment in the state flora. Table 1 presents a side-by-side comparison of the two treatments. Of the *Physaria* species named for eminent botanists in the current treatment, we can all take pride that Wyoming botanists are well-represented: *Physaria dornii*, *P. nelsonii*, *P. carinata* subsp. *paysonii*, and *P.*

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reediana (applying the first name of Reed Rollins because his surname had already been applied in naming another species). Thus brings to an end a taxonomic conundrum, and a new chapter in the *Physaria* saga.

A second article will follow with a key to all of the Physaria in Wyoming - stay tuned!

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Table 1. Comparison of the *Lesquerella* and *Physaria* nomenclature in Dorn (2001) with that of O'Kane (2010)

Dorn (2001)	O'Kane (2010)	Change
Not present	<i>Physaria pachyphylla</i>	Newly described from the Pryor Mtns area of Montana (and Wyoming)
<i>Lesquerella alpina</i>		Transferred to <i>Physaria</i> and split into the four species below
	<i>Physaria curvipes</i>	Reinstatement and transfer of <i>Lesquerella curvipes</i> to <i>Physaria</i>
	<i>Physaria reediana</i>	Reinstatement, transfer to <i>Physaria</i> and renaming of <i>Lesquerella alpina</i> var. <i>laevis</i> [<i>L. condensata</i> var. <i>laevis</i>]
	<i>Physaria spatulata</i>	Reinstatement and transfer of <i>Lesquerella spatulata</i> to <i>Physaria</i>
	<i>Physaria subumbellata</i>	Reinstatement and transfer of <i>Lesquerella subumbellata</i> to <i>Physaria</i>
<i>Lesquerella arenosa</i> var. <i>arenosa</i>	<i>Physaria arenosa</i> ssp. <i>arenosa</i>	Transferred to <i>Physaria</i> and rank changed from var. to ssp.
<i>Lesquerella arenosa</i> var. <i>argillosa</i>	<i>Physaria arenosa</i> ssp. <i>argillosa</i>	Transferred to <i>Physaria</i> and rank changed from var. to ssp.
<i>Lesquerella carinata</i>	<i>Physaria carinata</i> ssp. <i>carinata</i>	Transferred to <i>Physaria</i> and combined with <i>Lesquerella carinata</i> var. <i>languida</i> at the rank of ssp.
<i>Lesquerella condensata</i>	<i>Physaria nelsonii</i>	Reinstatement, transfer to <i>Physaria</i> , and renaming of <i>Lesquerella condensata</i> [<i>L. alpina</i> var. <i>condensata</i>]
<i>Lesquerella fremontii</i>	<i>Physaria fremontii</i>	Transferred to <i>Physaria</i>
<i>Lesquerella ludoviciana</i>	<i>Physaria ludoviciana</i>	Transferred to <i>Physaria</i>
<i>Lesquerella macrocarpa</i>	<i>Physaria macrocarpa</i>	Transferred to <i>Physaria</i>
<i>Lesquerella montana</i>	<i>Physaria montana</i>	Transferred to <i>Physaria</i>
<i>Lesquerella multiceps</i>	<i>Physaria multiceps</i>	Transferred to <i>Physaria</i>
<i>Lesquerella parvula</i>	<i>Physaria parvula</i>	Transferred to <i>Physaria</i>
<i>Lesquerella paysonii</i>	<i>Physaria carinata</i> ssp. <i>paysonii</i>	Transferred to <i>Physaria</i> and rank changed from species to ssp.
<i>Lesquerella prostrata</i>	<i>Physaria prostrate</i>	Transferred to <i>Physaria</i>
<i>Physaria acutifolia</i>	<i>Physaria acutifolia</i>	None
<i>Physaria brassicoides</i>	<i>Physaria brassicoides</i>	None
<i>Physaria congesta</i>	<i>Physaria congesta</i>	None
<i>Physaria didymocarpa</i> [var. <i>didymocarpa</i>]	<i>Physaria didymocarpa</i> ssp. <i>didymocarpa</i>	Rank changed from var. to ssp.
<i>Physaria dornii</i>	<i>Physaria dornii</i>	None
<i>Physaria eburniflora</i>	<i>Physaria eburniflora</i>	None
<i>Physaria integrifolia</i>	<i>Physaria integrifolia</i>	None
<i>Physaria lanata</i>	<i>Physaria didymocarpa</i> ssp. <i>lanata</i>	Rank changed from species to ssp.
<i>Physaria saximontana</i> [var. <i>saximontana</i>]	<i>Physaria saximontana</i> ssp. <i>saximontana</i>	Rank changed from var. to ssp.
<i>Physaria vitulifera</i>	Not recognized as occurring in Wyoming	Probably not existing in Wyoming and known only from Colorado

A Look at Land-Based Botany in Wyoming

By Cass D'Alaija

A national press release posted by the Botanic Gardens Conservation International in August 2010 unveiled a first-of-its-kind review of the nation's capacity to maintain or expand core botanical work essential for managing land, teaching future generations, and contributing to the overall future of scientific discovery, human well-being, and sustainability (posted at: www.bgci.org/usa/bcap). Fourteen far-reaching recommendations arose from the analyses.

How did it play out in Wyoming? It didn't, so the Wyoming Native Plant Society will reprint recommendations starting with Recommendation 9: "The nation's five federal land management agencies^{3*} should increase the number of trained, full-time botanists on staff. At minimum, each agency should have at least ... one full-time botanist with appropriate training on staff at all regional, state, and field offices." To determine where Wyoming stands, we performed a rigorous analysis of land-based botany in the state.

Table 1. Plant people within land-managing agencies of Wyoming

Agency	No. of people in land agency + in Wyoming Native Plant Society**	No. of primary land-managing offices for WY	Mean no. of plant people per office	Land area in Wyoming (miles ²)	Mean density of plant people per 10,000 miles ² of public land
BLM	7	11	0.6	28,711	2.4
USFS	9 (3 based in-state)	9	1.0	14,434	6.2 (2.1 in-state)
NPS	3	2	1.5	3,739	8
USFWS	0	0	0	145	0
DOD	0	1	0	9	0
State agencies	1	4 (separate agencies)	0.25	6,039	1.6

³ The five main federal land-managing agencies in the U.S. include: Bureau of Land Management (BLM), Department of Defense (DOD), National Park Service (NPS), US Forest Service (USFS), and US Fish and Wildlife Service (USFWS), which are collectively responsible for managing nearly 1/3 of the nation's landmass. (Federal plus state lands total 54.6% of Wyoming landmass). Public land acreage are based on 1995 data compiled in all states by the National Wilderness Institute (<http://www.nwi.org/Maps/LandChart.html>).

Using the only dataset at our disposal, the membership list, and minor assumptions on interpreting this dataset⁵, we have determined the average density of plant people per office and per 10,000 mile² affiliated with land-managing agencies in Wyoming - see Table 1. ...For good measure, we threw in state land managing agencies collectively, and also normalized results by determining density of plant people.

By this analysis and set of assumptions, less than half of the federal agencies in Wyoming have achieved minimal numbers of plant people per office. We have also documented that agency plant people are rare in Wyoming and the state has many square miles of room for increases in its plant people population. *Clearly, we are justified in regarding those members who work on public lands - and all members - as priceless.*

 **If you are aware of any agency plant people who are NOT members of Wyoming Native Plant Society, we would love to toss results out the window. Please give them the WNPS homepage link for membership information.

⁵ Assumption 1. We do not have a way to determine full-time botanist-equivalents, so we refer to our target as "plant people" and assume that an employee probably performs some form of plant work in their respective land-managing agency position if they are interested enough in plants to belong to Wyoming Native Plant Society. The specific botany duties may be associated with Botanist and Ecologist positions, as well as with positions responsible for range, forestry, reclamation, sensitive species, weeds, natural history interpretation, soils, wildlife habitat, or else overseeing such work. Assumption 2. The author knows everyone on the membership list who meets the Assumption 1 criterion. Assumption 3. Everyone meeting the Assumption 1 criterion is also current in renewing their WNPS membership.

Gold Standards of the Plant Kingdom Go Online

By Larry Schmidt, Associate Librarian

(Editor's note: The following article is excerpted from "Andrew W. Mellon grant funds digitization of plant collection," which appeared in the Fall 2010 issue of "Check it Out," a newsletter for patrons of University of Wyoming Libraries.)

University of Wyoming Libraries and the Rocky Mountain Herbarium (RM) are participating in the Global Plants Initiative (GPI) funded by the Andrew W. Mellon Foundation. A grant of \$126,000 supports the database creation, digital imaging, file export, and quality control for type specimens in the RM. These are plant specimens cited in a publication in which a species, subspecies or variety is described as new to science. The GPI Partners (herbaria and museums) are in the process of imaging all plant types (vascular plants, bryophytes, algae, and fungi) worldwide.

The goal is to build a comprehensive research tool that can be accessed online by students and the scientific community. Given the fragility of many of the specimens, this remote access to the digital versions greatly facilitates the use of these materials by all. University of Wyoming has free access to the site until the project is complete – it will then be available by subscription from JSTOR Plants (accessible at <http://plants.jstor.org>).

A herbarium is analogous to a library, but instead of books, it houses high quality, carefully prepared plant specimens for scientific research. In recent years, herbaria have been involved in the creation of databases containing information on specimen labels. This includes locality and habitat where collected, collector, and date. Herbarium collections are important to science as each specimen contains a wealth of information from morphological and anatomical features and their variation to DNA that can be extracted and sequenced. A type specimen is important to research as it serves as the basis of a scientific name (Figure 1).



Prehistorically Correct Menus, continued, from p. 1

Starting late March and armed with a prehistorically-correct digging stick made from a 65-cm length of juniper and whittled to a point at one end and fitted with a T-shaped handle at the other that is similar in appearance to museum specimens, Adams dug root crops in the Laramie Range and in the Shirley and Great Divide basins keeping track of the harvest rate, or how many

UW Libraries and the RM are partners in this digitization project. RM Curator Ron Hartman and RM Manager Ernie Nelson provide expertise on the collection and help determine nomenclatural citations. UW Librarian Larry Schmidt oversees imaging and quality control. The RM website (accessible at www.rmh.uwyo.edu/index.php) is supported in partnership by the UW Libraries' Systems Department and former UW graduate student Ben Legler (University of Washington - Burke Museum).



Figure 1. A scanned image of the type specimen for *Erythronium obtusatum*, collected by Aven Nelson in 1899, later synonymized with *E. grandiflorum*. (Image courtesy of RM and UW Libraries).

Libraries have been in the organization, archiving, and long-term storage of traditional print materials for years. More recently they have been building digital collections as well. We are looking forward to further expanding our collections by providing the University with our unique skills in the organization and display of virtual collections.



roots can be dug in a given time. Multiplying harvest rate by the caloric value of the harvested food provides the return rate (kilocalories/hour). But the caloric value of many prehistorically gathered foods had not yet been determined. With laboratory time donated by the Family and Consumer Sciences, Schantz conducted proximate analyses of whitebark pine nuts and root plants. In a proximate analysis, (continued, p. 8)

Prehistorically Correct Menus, continued from p. 7.
the food value (calories) and composition (carbohydrate, protein, ash, and moisture content) of foods are determined. These values are the building blocks of dietary analyses.

...After calculating several return rates, the researchers combined their data with the return rates of other edible species gleaned from published sources and then averaged the sample. ...Preliminary results show the average return rate for gathered vegetable foods in Wyoming is about 1,000 kcal/hour, which means that, in just one eight-hour day in the summer, a prehistoric gatherer could collect enough vegetable food to feed four to six people. Schantz and Adams determined if one gatherer focused only on the most caloric and easily harvested foods, a woman could accumulate enough surplus over the course of a harvest season to feed a family of four for half the year. The conclusion that prehistoric Shoshone women could work for seven months... and then feed their families for the next several months with stored nuts and roots may seem startling to modern Americans working long hours just to make ends meet every month.

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: _____

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- \$7.50 Regular Membership
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(\$7.50 goes to the Markow Scholarship Fund)

Check one:

- New member
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