

Friends of the Herbarium

**Biological Sciences Herbarium
California State University, Chico**

Newsletter

Vol. 8 Nos. 1 & 2

October 2002

Friends of the Biological Sciences Herbarium

Annual Meeting

November 2, 2002

**Special Presentation
by Connie Millar**

**“Climate Change As An Ecosystem Architect:
Implications to Rare Plant Ecology, Conservation,
and Restoration”**

*** see insert for details ***



Articles:

page 2 — Workshop list.

page 3 — A new species of *Eleocharis* (Cyperaceae) for Plumas County!

page 5 — A Moonwort sort of Summer.

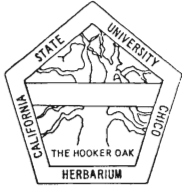
page 5 — Moonworts (*Botrychium* — Ophioglossaceae) on the Plumas National Forest.

page 7 — Putative Hybridization of *Juglans hindsii* in Riparian Forests of Northern California.

MESSAGE FROM THE BOARD

The Board of Directors would like to invite you to the eighth Annual Meeting of the Friends of the Biological Sciences Herbarium on November 2. Once again, we have arranged for a renowned scientist to give a Special Presentation at the meeting. Dr. Connie Millar is a research geneticist at the Institute of Forest Genetics of the U.S. Forest Service Pacific Southwest Research Station in Berkeley. For more information about Dr. Millar and her publications and research interests, go to www.psw.fs.fed.us/ifg/Staff/millar.htm. And be sure to join us for the reception immediately preceding the Annual Meeting, for snacks, drinks, and good company. See you there!





Friends of the Herbarium

The **Friends of the Biological Sciences Herbarium**, California State University, Chico, was formed to help maintain the high quality of work that has been known to be associated with the herbarium. The primary purpose of the group is to provide community support for the herbarium. This includes raising funds for items that are not covered under the University budget. Scientific and academic pursuits are the focus of the group. The Friends also offers low cost workshops and classes on various botanical topics.

The Friends of the Biological Sciences Herbarium operates under the auspices of the California State University, Chico, and enjoys non-profit status and has access to the use of University classrooms and equipment.

Memberships are renewed on May 1 of each year.

BOARD OF DIRECTORS

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Newsletter

Volume 8 Numbers 1 & 2

The Newsletter is published three times per year (June, October, and February) by the **Friends of the Biological Sciences Herbarium**, California State University, Chico. Subscription is free with membership. Submissions on herbarium related topics are welcome.

UPCOMING WORKSHOPS

FALL 2002 THROUGH SPRING 2003

SPONSORED BY

FRIENDS OF THE BIOLOGICAL SCIENCES HERBARIUM

California State University, Chico

October 19, 2002

Elevation Transect of the Soils in Butte County, California.

Andrew Conlin

See details at www.csuchico.edu/biol/Herb/Events.html

November 16, 2002

Introduction to NEPA/CEQA for Botanists.

Linnea Hanson & Jenny Marr

See details at www.csuchico.edu/biol/Herb/Events.html

February 8, 2003

Identification of *Arctostaphylos* species in northern California.

Kristina Schierenbeck

March 29, 2003

Introduction to Flowering Plant Identification, Terminology, and Techniques for Beginners.

John Dittes

April 12, 2003

Identification of Plants from Vernal Pools and Other Seasonal Wetlands.

John Dittes & Josephine Guardino

April 26, 2003

Botanical Illustration.

Judy McCrary

May 3, 2003

Introduction to Keying the Fabaceae.

John Dittes & Josephine Guardino

Watch for a mailing in December with details about these upcoming workshops or check our website at www.csuchico.edu/biol/Herb/Events.html

ARTICLES NEEDED

The Friends of the Herbarium welcomes, and actively seeks, articles from you, the readers, for this newsletter. Topics can include herbarium-related subjects, field collecting excursions, taxonomic issues, updates, and problems, and etc.



ERRATA

Due to a numbering error in Volume 7, there will be no issue Number 3 to that volume. Issue Number 1 should have been Numbers 1 & 2, and Number 2 should have read Number 3. My apologies for the error. —Ed. !

A new species of *Eleocharis* (Cyperaceae) for Plumas County!

by Lawrence Janeway

Last year a new species of *Eleocharis* was described from Plumas County! This new species, *Eleocharis torticulmis* S. G. Smith (*Novon* 11: 249-254. 2001.), is known only from the Butterfly Valley Botanical Area, and one other small meadow, near Quincy. Because I helped the process by collecting the specimens that became the type collection, made ecological observations, and searched for other locations of the species, I will share with you some of the background leading up to the description of this species.

In 1999, Dr. S. Galen Smith, professor emeritus at the University of Wisconsin at Whitewater, obtained loans of specimens of various species of *Eleocharis* from the major United States herbaria, including those at University of California, Berkeley (UC/JEPS), and California Academy of Sciences (CAS/DS). This was part of Dr. Smith's preparation of a treatment of *Eleocharis* for the Flora of North America project (which should be available, as Volume 23 which treats all of the Cyperaceae, early next year). The collections from CAS, with duplicates at the New York Botanical Garden (NY), included several specimens from Butterfly Valley labeled *Eleocharis suksdorfiana* (which we know from "The Jepson Manual" and "Selected Plants of Northern California and Adjacent Nevada" as *Eleocharis pauciflora*), that were considerably different from that species and any other species. These plants were striking in that they had very flat culms that seemed to be spirally

twisted, plus other less obvious characters. The specimens were collected in 1966 by Walter & Irja Knight and John Thomas Howell when they were preparing their "A Vegetation Survey of the Butterfly Botanical Area, California" (*Wasmann Journal of Biology* 28: 1-16. 1970.). Although most of the specimens were



Spikelet and top of culm

too incomplete to show the characters necessary for writing up a new species – most are missing rhizomes, culm bases, achenes, and/or inflorescences – Dr. Smith suspected right away that he had something new. He then, at the suggestion of Dr. Barbara Erter, collections manager at UC/JEPS, obtained a loan of *Eleocharis* specimens from the Chico State Herbarium (CHSC), in hopes of seeing more, and more complete, collections. But there were no specimens of this different taxon at CHSC! So, in early 2000, he called and e-mailed me and Rob Schlising to try to get someone to go to Butterfly Valley

later in the year to make new and more complete collections. I passed the information on to several area botanists. On 21 May, Lowell Ahart got to Butterfly Valley with a group preparing for a later field trip, and though there wasn't time for serious collecting, he still managed to collect some of this unusual *Eleocharis* (Ahart 8383 – paratype). Then on 17 June, Jim Battagin, local botanist and consultant who lives near the Botanical Area, collected more of the *Eleocharis* (Battagin s.n. – paratype). These collections were a little early in the season for the mature achenes that are needed for part of the identification, and Dr. Smith still needed

more detailed information about the micro-habitat of the species at Butterfly Valley. Plus he needed a collection with enough material that duplicates could be distributed to several other herbaria. So on 3 July Barbara Castro and I headed there to collect plants and gather the needed information. We collected enough material for complete specimens for several herbaria (*Janeway & Castro* 6874 – holotype and isotypes), recorded detailed ecological information, and took photographs. On our way out of the Butterfly Valley Botanical Area, we took a long, winding dirt road to the northwest, and as we passed a small meadow not far from Butterfly Valley we got out to look, and even though it wasn't as wet as Butterfly Valley we found the *Eleocharis* there also (*Janeway & Castro* 6876 – paratype).

With all of that collecting and gathering of information, Dr. Smith had enough information to write up the new species, which he called *Eleocharis torticulmis* (*torti* = twisted, and *culmis* = stalk, or more specifically the specialized stem of grasses, sedges, and rushes), for publication. However, it would still be good to know how widely distributed the species is. So later in July I spent a day visiting all of the known Darlingtonia sites on the Plumas National Forest (since *Eleocharis torticulmis* is growing around and somewhat in the Darlingtonia that Butterfly Valley is so famous for), and then spent another day visiting similarly soggy



Culm - flat and twisted

Eleocharis Continued on page 4

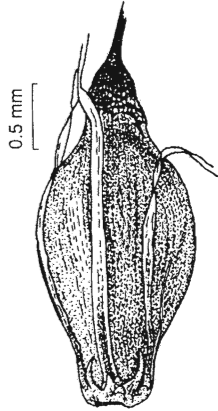
Continued from page 3

Eleocharis

meadows a little farther away. Lowell Ahart, meanwhile, visited numerous meadows on the west slope of the northern Sierra Nevada collecting *Eleocharis* whenever he found it. However, none of these searches turned up any more *Eleocharis torticulmis*. So, as it is known today, there are only two locations for this new *Eleocharis*! All of the collections of other species of *Eleocharis* weren't in vain, however. Because of the quality and completeness of these new collections, Dr. Smith was able to clarify some of his understandings of some other species and their distributions in northern California.

I will add one more note about *Eleocharis torticulmis* at Butterfly Valley, and how there are still undescribed species literally under the noses of California botanists. When I arrived at Butterfly Valley to look for this plant, I walked from the dirt road down into the wet "grassy" area bordering the area of Darlingtonia and sundew plants – which is the same thing that botanists and other lovers of carnivorous plants have been doing for years – looked down and exclaimed "my god, it's all over the place!!!" What I found was that in the wet areas bordering the Darlingtonia plants, *Eleocharis torticulmis* and *Rhynchospora capitellata* co-dominate, with only minor amounts of *Juncus oxymeris*, *Hastingsia alba*, and other more common meadow species. The reason that the *Eleocharis* stood out and was so obvious, is that it has culms that are very flat, mostly 2-2.5 millimeters wide, and spirally twisted – really an unusual plant, and an unusual *Eleocharis*. They aren't short either, being 2-4 decimeters tall – I didn't even have to bend over to recognize

them! Now some of you might say "of course no one has noticed this before, it's a sedge, and an *Eleocharis* to boot." But those of you who know me know that I'm always on the look-out for sedges to collect and identify (though *Carex* is where I've spent most of my sedging time). I have been to Butterfly Valley quite a



Achene, with stamen filaments and very short perianth bristles

few times over the years, and have even gone there specifically to photograph and collect *Rhynchospora capitellata* (and the *Rhynchospora alba* that grows in the Darlingtonia). And I did photograph and collect the *Rhynchospora* where I now know it co-dominates with the *Eleocharis*. So how could I be down on my hands and knees digging *Rhynchospora* out of the ground without seeing

the very unusual *Eleocharis*??? So how many other unusual-looking undescribed species are under our noses as we go about our botanical business? In a recent article (*Annals of the Missouri Botanical Garden* 87: 81-109, 2000.), Barbara Ertter cites unpublished work by Dean Taylor noting that from 1968 to 1986 an average of 11 taxa per year were newly described from California, and that in extrapolating this data he expects that there is a minimum of 300 undescribed vascular plant taxa in California as of 1998. Dr. Ertter then extrapolated this data to all of North America and expects at least 1800 undescribed vascular plant taxa! So get out there botanizing, and make more collections. This is the only way that these undescribed species are going to come to be recognized.

NEXT ISSUE: The same article in which *Eleocharis torticulmis* is described also presents a revised understanding of what "The Jepson Man-

ual" and "Selected Plants of Northern California and Adjacent Nevada" present as *E. pauciflora*. Instead of *E. pauciflora*, Dr. Smith recognizes four species in North America: *E. quinqueflora* (F. X. Hartmann) O. Schwarz, *E. suksdorfiana* Beauverd, *E. bernardina* (Munz & I. M. Johnston) Munz & I. M. Johnston, and *E. torticulmis* S. G. Smith. All four of these species occur in California, and all but *E. bernardina* occur in our area of northern California. This and other changes in our California understanding of *Eleocharis* will appear in Volume 23 of *Flora of North America*. I will attempt to explain a little about this in the next newsletter.

Type specimen – The single collection on which the description associated with the original publication of a name was based.

Holotype – The sole specimen either used by or designated by an author as the nomenclatural type of a species when the author first publishes the description. Whenever a new taxon is described it is now imperative both to designate a holotype and state where it is deposited. Duplicates are known as isotypes.

Paratype – A specimen other than the holotype or isotypes cited in the original publication of the name of a taxon. Although of little significance nomenclaturally, paratypes are of considerable importance to the taxonomist, who may not be able to see other type material of a particular taxon.

Definitions are more or less from "The Penguin Dictionary of Botany."

The illustrations of Eleocharis torticulmis used in this article are from the Novon article cited above, as drawn by Elizabeth Zimmerman. Novon, A Journal for Botanical Nomenclature is published by the Missouri Botanical Garden. For more information about Missouri Botanical Garden publications, visit their web site at www.mobot.org/mbgpress.

A Moonwort sort of Summer

by Lowell Ahart

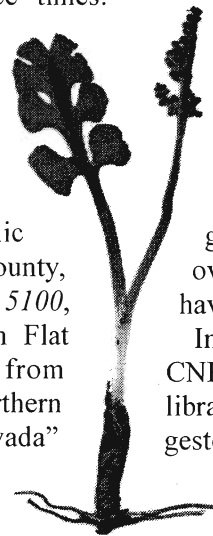
The first moonwort I remember seeing was along Willow Creek in Tehama County. Tim Devine led a field trip to the creek and showed us where they were hiding. In 1985 and 1986 Tim had collected 67 moonworts along Jones Creek and Willow Creek. They were sent to W. H. Wagner, at the University of Michigan in Ann Arbor, who identified five different species: 7 plants were *Botrychium ascendens* (upswept moonwort), 9 were *Botrychium crenulatum* (scalloped moonwort), 34 were *Botrychium minganense* (Mingan moonwort), 16 were *Botrychium montanum* (western goblin), and 1 was *Botrychium simplex* var. *compositum* (Yosemite moonwort). This information is from the "Manual of the Vascular Plants of Butte County, California," by Vernon H. Oswald (1994).

Later, while collecting with Vern Oswald, we found *Botrychium simplex* var. *compositum* three times: Plumas County, Oswald & Ahart 5768, "edge of unnamed lake near Hay Meadow;" Plumas County, Oswald & Ahart 5786, "edge of Little Willow lake in Lassen Volcanic National Park;" Sierra County, Oswald, Ahart & Devine 5100, "seepy meadow at Cornish Flat Campground." Details from "Selected Plants of Northern California and Adjacent Nevada" by Vernon H. Oswald (2002).

Since all of Tim Devine's collections were sent to Wagner and no duplicates were returned for the Chico State Herbarium (CHSC), Vern

asked me to go to Willow Creek and collect some samples of the other species for the Herbarium. In 1994 I did as Vern suggested and spent the best part of a day along Willow Creek and only found a single plant of *Botrychium crenulatum* (Ahart 7516). I have looked in many good habitats for *Botrychium* over the years since then and have found no more.

In the early part of 2002, at a CNPS plant meeting at the Chico library, Josephine Guardino suggested that we go on a field trip with John Dittes and study plants. I told her I thought it was a good idea and we should get a date set. On 24 May 2002 I again met Josephine and John at the Herbarium at



Botrychium from Ahart 9721, about 90% size

Ahart Continued on page 6

Moonworts (*Botrychium* — Ophioglossaceae) on the Plumas National Forest

by Linnea Hanson, Forest Botanist

Moonworts have been of interest on the Plumas National Forest since the early 1990s. Botanists working on the Plumas at the time visited the botrychiums along Willow Creek, near Jonesville in upper Butte County, to get to know what they look like and how difficult they are to find. We also found one occurrence of *Botrychium simplex* north of Little Grass Valley Reservoir, in Plumas County, at that time.

Botrychiums have become of interest again lately. At the U. S. Forest Service Pacific Southwest Region botany meeting in 2000, Don Farrar from Iowa State University in Ames, Iowa came to talk about botrychiums. He gave a very interesting talk about the biology of the moonworts. For instance, about 30% of the moonwort plants don't produce above-ground fertile and sterile

fronds each year. Also, they easily hybridize, and the hybrids then combine. So, there are diploid and tetraploid species, which helps explain why identification of species within the group is rather confusing. Don has used isozymes to differentiate between the different species and has figured out which diploid species have combined to make the tetraploid species.

In the summer of 2001 the botanists of the Plumas N.F. again visited Willow Creek, with the botanists from the Lassen N.F., to again get a good idea of what the botrychiums look like and how hard they are to find. We also visited the *Botrychium simplex* occurrence north of Little Grass Valley Reservoir. We sent 10 samples of the plants at that site to Don Farrar who said that it is an unusual *Botrychium simplex* (Hanson,

C. Bishop, J. Bishop, Nielsen 465). It looks like these plants more easily fit the description of *Botrychium simplex* var. *compositum*. John Dittes and Josephine Guardino, conducting a botany survey that year for the Humbug Defensible Fuel Profile Zone under contract, found a single botrychium plant in a meadow near Smith Peak, in eastern Plumas County. John called this single plant *Botrychium crenulatum*.

As part of the implementation of the Sierra Nevada Forest Plan Amendment Environmental Impact Statement, the U.S. Forest Service Pacific Southwest Region is currently emphasizing several regionally significant groups of plants. These include *Botrychium* species, Sierran ferns, and *Cypripedium* species. To help the Forest Service better under-

Hanson Continued on page 6

Continued from page 5

Hanson

stand the moonworts, Don Farrar and Cindy Johnson-Groh from Gustavus Adolphus College in St. Peters, Minnesota planned to visit the botrychiums at Willow Creek this past summer and we planned a regional field workshop to visit this site. John Dittes, conducting a botany survey with Josephine Guardino for the Watdog Defensible Fuel Profile Zone under contract, informed me that he and Lowell Ahart found botrychiums in meadows near Tamarack Flat [see the adjacent article by Lowell Ahart]. There were more moonworts in these meadows than we had ever seen! At the time we thought we had several different species of *Botrychium* growing together in these meadows.

It was decided to move the regional workshop to the Plumas N.F. from the Lassen N.F. so that these meadows could be visited. On the first day of the workshop, both Don and Cindy talked about their work on botrychiums. Don talked about the taxonomy of the group and Cindy talked about the life history. We were able to key the many samples of the different species that they had collected during their trips in the west this summer. This was invaluable to be able to look at fresh specimens.

On the second day of the workshop, we visited the meadows around Tamarack Flat and everyone was able to see the abundant number and variability of botrychium plants in these meadows. However, Don decided these were all *Botrychium simplex* var. *compositum* rather than numerous different species of *Botrychium* as we had originally thought. We also visited the meadow north of Little Grass Valley Reservoir and Don was amazed at the number and size of the plants in that meadow, too. He collected specimens at both sites to take back to Iowa State to study.

A smaller group of botanists along with Don and Cindy visited Willow Creek the following day and found several species of botrychium. There aren't as many plants as years ago along Willow Creek. Don thinks that the undercutting of the creek has changed the habitat along the creek so not as many botrychium plants can grow in that area. Don and Cindy also visited the botrychiums in the Smith Peak area that day and decided that these are *Botrychium minganense* instead of *Botrychium crenulatum*. Numerous more botrychium plants were found in the meadow this past summer by the botanists on the Plumas N.F.

There are two other known botrychium occurrences on the Plumas N.F. that Don and Cindy weren't able to visit. Several botrychium plants were found by Brian Elliott, botanist on the Plumas N.F., in a small meadow south of Lake Almanor. These will need to be identified to species this next field season. And Lowell Ahart found botrychiums in a meadow in the Granite Basin area south of Bucks Lake. These will also need further identification.

Moonworts are a very interesting group of plants to study. They are very small, and thus are hard to find and identify. It is a group that many botanists are interested in lately, to understand how to find them, identify them, and hopefully conserve them for future generations to enjoy.

The cited collection is deposited in the Plumas National Forest Herbarium in Oroville, CA.

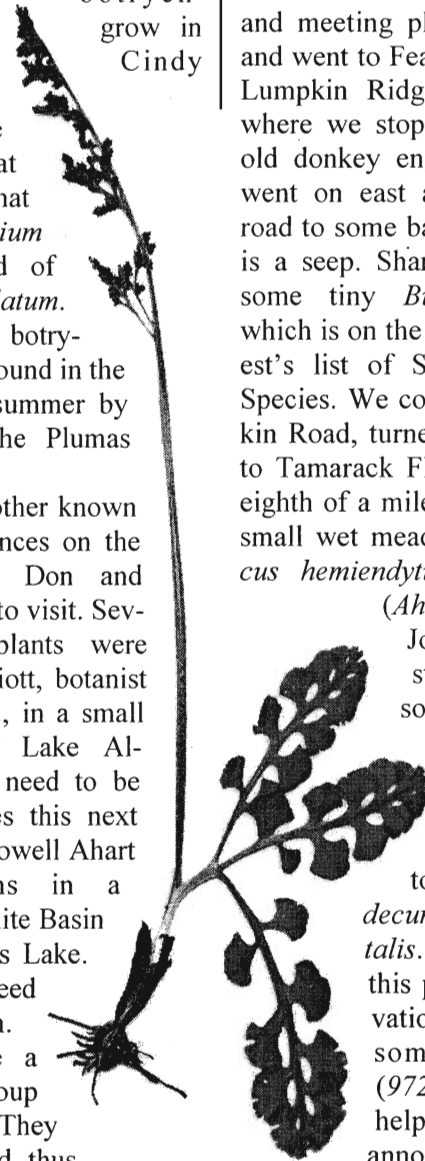
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Ahart

Chico State. Again a trip was suggested and John promised to call. Josephine and John are doing forest surveys for sensitive plants on contract with the Plumas National Forest. John called soon after and we set 17 June 2002 in Oroville as the time and meeting place. John and I met and went to Feather Falls, then on up Lumpkin Ridge to near Camp 18 where we stopped and admired the old donkey engine skids. Then we went on east and followed a poor road to some bare basalt where there is a seep. Sharp eyed John spotted some tiny *Bulbostylis capillaris*, which is on the Plumas National Forest's list of Special Interest Plant Species. We continued on up Lumpkin Road, turned west onto the road to Tamarack Flat, and in about one eighth of a mile stopped to inspect a small wet meadow. I collected *Juncus hemiendytus* var. *hemiendytus* (Ahart & Dittes 9722).

John was by a small streamlet and spotted some small white flowers. He was not familiar with the plant and showed it to me. I told him it was *Sagina decumbens* ssp. *occidentalis*. Since I had not seen this plant at this high elevation I began collecting some for vouchers (9723). John was busy helping collect when he announced that he had found a *Botrychium* by where his hand was collecting the *Sagina*. The botrychiums were very small and inconspicuous, and on looking around we found about twenty plants along the mossy banks of the small streamlet. I carefully collected some plants (9721). We then continued west

Ahart Continued on page 7



Botrychium from Ahart 9864, about 75% size

Putative Hybridization of *Juglans hindsii* in Riparian Forests of Northern California

A project by 2002 Jim Jokerst Field Botany Award winner Paul Kirk

Background

Hybridization between a native and a non-native plant species is one possible mechanism leading to the development of an invasive species. By understanding this process, scientists can provide information to restoration managers striving to enhance structural diversity and increase refugia for resident fauna and migratory birds.

The northern California black walnut, *Juglans hindsii*, is a historically narrow endemic species now widely naturalized in riparian areas of northern California. It can hybridize with four non-native *Juglans* taxa introduced into California as rootstock for English walnut (*J. regia*) orchards, and yield fertile offspring. Prior to 1850, *J. hindsii* was reported in only three counties to the north and east of San Francisco Bay. Since the introduction of non-native rootstock *Juglans*, putative "*J. hindsii*" now excludes all other woody vegetation in some riparian areas. However, the extent to which these are hybrids, and the impact of hybridization on its spread, is unknown.

I chose this project in that it has an immediate application to the field of riparian restoration and utilizes

molecular methods, which are currently employed in almost all fields of biological research. For my Master's thesis, I will determine hybridization of riparian "*J. hindsii*," using DNA fingerprints of the six possible parents: *J. regia*, *J. californica*, *J. major*, *J. microcarpa*, *J. nigra* and authentic *J. hindsii*. I hypothesize that riparian "*J. hindsii*" is a hybrid with a genotype dominated by *J. hindsii*, *J. nigra* and *J. regia* due to past horticultural and agricultural practices.

Methods and Materials

I am collecting 20 leaf samples per population from ten distinct riparian populations of "*Juglans hindsii*" between Colusa and Red Bluff, California, and from "parental" populations in Kentucky, Arizona and Southern California. Additionally, I am collecting leaves for all possible parental taxa from the or-

chards at the USDA Germplasm Center in Winters.

For fingerprinting, I will selectively amplify the internal transcribed spacer (ITS) region of the ribosomal RNA gene (rDNA) with the polymerase chain reaction (PCR). I then will generate random fragment length polymorphisms (RFLPs), which are used to determine genetic variation within and amongst populations. The ITS region of rDNA is a proven

tool for studying angiosperm phylogeny and detecting hybridization.

Timeline

I collected a total of 400 fresh leaf samples in 2001. This year I have extracted genomic DNA from 320 of the individuals and will finish the remainder by the end of May 2002. I plan to complete the DNA fingerprinting by the end of August and finish my thesis this fall.



Continued from page 6

Ahart

along the road to Tamarack Flat and at a small meadow on the south side of the road stopped again. We had *Botrychium* on our minds, and soon under a willow shrub John spotted some more. We then looked over most of the meadow and in just a few areas found hundreds of *Botrychium* fronds. Many of the fronds were quite large and conspicuous. I made more collections (9727 and 9728). At present there are seven known wet areas that support *Botrychium*.

Now, what species of *Botrychium* do we have? I have put on my labels *Botrychium simplex* var. *compositum*. The reasons for this are difficult for me to explain and I may be wrong! But this is what I am up against. The first vouchered collection has plants that would key nicely to *B. crenulatum*, but in the fragment packet are two plants very much the same but tending to be 1 - 1½ pinnate. So, if plants are 1½ pinnate they don't key to *Botrychium crenulatum*. The only other place to go in the key is back to *Botrychium sim-*

plex var. *compositum*. I am using the keys in "Selected Plants of Northern California and Adjacent Nevada" by Vernon H. Oswald (2002). In the other meadows the *Botrychium* plants are very variable in size and I tend to collect large plants. Thus at the start very small plants were poorly represented. As I struggled with what to call the plants I found more sites and carefully vouchered each site (26 June on my own - collections 9785 and 9796, 2 July with John Dittes and Josephine

Ahart Continued on back page

Yes! I would like to join!

____ Student \$5.00
____ Individual \$10.00
____ Contributing \$25.00
____ Sustaining \$100.00
____ Lifetime \$1,000.00
____ Donation \$ _____

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Continued from page 7

Ahart

Guardino – 9834 and 9835, 18 July again by myself – 9836, 9863, 9864, 9866, 9866, 9866A, 9866B, 9873, and 22 July out collecting with my brother -- 9921). Most plants at a site were fairly uniform, but one site, along a small branch of Fall Creek, had some plants that might key to *Botrychium minganense*. There was

all kinds of variation, so much so that I simply called all of my collections *Botrychium simplex* var. *compositum*.

All of the collections noted above have been deposited in the Herbarium of California State University, Chico (CHSC). Duplicates of some collections will be sent to Barbara Ertter, collections manager of the herbaria at the University of California, Berkeley (UC/JEPS). ☺

Friends of the Biological Sciences Herbarium

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Chico, CA 95929-0515

(530) 898-5381

ADDRESS SERVICE REQUESTED

EVERYONE IS INVITED

**Friends of the Biological Sciences Herbarium
California State University, Chico**

Annual Meeting

4:00 pm Saturday

☞ **November 2, 2002** ☞

Holt Hall Room 170

Reception at 3:00 pm

Holt Hall Room 129

☞ ☞ ☞

Jim Jokerst Field Botany Award

Presentation by the 2002 Award recipient:

Paul Kirk: "Putative Hybridization of *Juglans hindsii* in Riparian Forests of Northern California"

☞ ☞ ☞

Special Presentation at 4:30 pm

"Climate Change As An Ecosystem Architect:

Implications to Rare Plant Ecology, Conservation, and Restoration."

by **Connie Millar**

U.S. Forest Service

Pacific Southwest Research Station

The natural process of climate change has been largely ignored in our attempts to understand and manage natural resources, much as the importance of fire was ignored during the last 50-100 years. But recent research has revealed that climate fluctuations occur more frequently, regularly, and abruptly than previously thought and also have a more significant impact on vegetation. Within the 90,000-year glacial periods and the warmer 10,000-year periods between them occur periods of less dramatic climate change lasting on the order of 1000 years. And within those 1000-year periods are yet smaller cycles lasting just years or decades. All of these climate cycles are accompanied by measurable changes in vegetation that have implications for conservation and restorations.

Dr. Connie Millar, a research geneticist with the U.S. Forest Service Pacific Southwest Research Station, is a leading researcher in the fields of paleoecology and climate change. She will discuss her current studies of climate change and their important implications for plant conservation and resource management.

EVERYONE IS INVITED

PLEASE JOIN US

PLEASE JOIN US