Sego Lily

Newsletter of the Utah Native Plant Society

VOL. 23 No. 1 Jan/Feb 2000

CALENDAR OF EVENTS

Tuesday, January 18 6:00 PM	Board of Directors Meeting, USFS Shrub Laboratory, 1325 East 820 North, Provo
Tuesday, January 25 6-9 PM	Workshop: Working with Asteraceae, Dr. Susan Meyer, U of U Talmadge Bldg.*
Wednesday, January 26 6:30 PM, 7:00 Program	Mountain Chapter meeting. Park City Library. 1255 Park Avenue. Room 209. Balancing the Art and Science of Revegetation., Mindy Wheeler. Contact Abby Moore (435) 649-8859, balsamorhiza@hotmail.com for more information
Saturday Feb. 12 and 19	Native Plant Propagation Workshops. Morning in Provo on the 19th and afternoon in Salt Lake on the 19th.*
Tuesday, Feb. 22 6-9 PM	Workshop: The Poaceae, Dr Kimball Harper, U of U Talmadge Bldg.*
Tuesday March 21 6-9 PM	Workshop: Introduction to the genus Carex. Sherel Goodrich. U of U Talmadge Bldg.*

* Please look inside for more information on registration. Feel free to post this notice*

Discovering Relatives in the Flowering Plant Family Tree

by Barry A. Palevitz

Charles Darwin's frustration with the evolutionary origin of flowering plants--he called it "an abominable mystery"--stood for more than a century, as hypotheses, like flowers, bloomed and faded. Botanists even argued over whether ancestors of the 250,000 flowering plants, or angiosperms, were tender herbs or woody, like shrubs. Now they may be writing the final chapters of Darwin's whodunit, not with the traditional phrases of fossils and plant anatomy, but with the letters and words of gene sequences.

Botanists have been particularly eager to learn more about the lowest branches of the angiosperm evolutionary tree--the plants that, having diverged first, are closest to the group's progenitors. But "as recently as the beginning of this year, people were viewing this as a difficult problem that might be intractable," says Douglas Soltis of the School of Biological Sciences at Washington State University in Pullman. Now, "within the space of a few months, several labs using different approaches have shown the same thing." Adds Jeffrey Palmer of the department of biology, Indiana University in Bloomington, "It took so long to get this far and now, boom, we're here."

So why the sudden progress? What made the difference?

Botanists traditionally relied on fossils together with plant anatomy and physiology to infer evolutionary history. For example, they used to think magnolias were primitive based on flower structure. But the value of structural information is limited by the number of characters you can define--perhaps a few score--so plant biologists turned to comparative gene sequences for more definitive data. A gene contains thousands of characters in the form of nucleotides.

At first botanists used single genes, including the chloroplast-based rbcL and a nuclear gene encoding the 18S RNA of cytoplasmic ribosomes (18S rDNA), to construct evolutionary trees. Researchers realized, however, that in constructing such trees, or phylogenies, more sequences translate into even greater resolution and confidence, so they pooled data from multiple genes. With so much data, "support for the first branches becomes extraordinarily high," says Soltis, who with wife Pamela Soltis advocated combining sequences two years ago.[1] "There's simply more statistical power in the results," adds Richard Olmstead of the department of botany, University of Washington in Seattle.

Olmstead stresses another important ingredient for success: a federally funded consortium called the Green Plant Phylogeny Research Coordination Group. The group's members reported their results at last summer's International Botanical Congress in St. Louis. "There's been a lot of sharing of data, sources, and materials," notes Olmstead, adding, "The grant helped stimulate things. It fostered collegiality and cooperation in a way that is too rare in science today." That doesn't mean there's no competition--the teams are racing to get their work into print.

Phytochrome Illuminates the Problem

First to the finish line, barely, were Sarah Mathews and postdoctoral mentor Michael Donoghue of Harvard University's department of organismic and evolutionary biology. The duo sequenced two genes for phytochrome, a protein plants use to change their growth and development in response to light.[2] Phytochrome is encoded by a family of genes, two of which, PHYA and PHYC, probably arose by gene duplication with the first angiosperms. By comparing PHYA and PHYC sequences in various plants, Mathews and Donoghue constructed phylogenies for each gene, the most parsimonious or frugal of which turned out to be remarkably similar. Mathews and Donoghue then pooled data from both genes to produce a consensus tree.

The results were striking--a single species, the New Caledonian shrub Amborella, turned out to be sister to all other angiosperms. In other words, Amborella's ancestors diverged very early from all current flowering plants. Next to diverge were the water lilies, then an Australian vine called Austrobaileya, followed by more familiar species such as magnolia, pepper, and grasses.

It's not that Amborella was a surprise--botanists had their suspicions, especially from the Soltises' earlier work[1]--"but there was no clear signal ... the data were equivocal," says Mathews. Now we know that "Amborella is the most primitive flowering plant with PHYA and PHYC."

But Claude dePamphilis, associate professor in the department of biology, Pennsylvania State University, is circumspect: "It depends on at what point the phytochrome gene duplication really occurred." His own data on mitochondrial genes turned up the same three lower branches, but don't distinguish which came first. Still, dePamphilis is upbeat: "It's a very important result, and a novel and informative way to find the root of the tree."

More Gene Sequences, More Support

Close on the Harvard team's footsteps were the Soltises, who participated in two studies comparing nuclear, chloroplast, and mitochondrial genes in a large sample of plants. With Mark Chase of the Royal Botanic Gardens at Kew, United Kingdom, they surveyed more than 550 angiosperms for two chloroplast genes (including rbcL) and 18S rDNA--nearly 5,000 nucleotides per species all told.[3] A second analysis led by Yin-long Qiu of the Institute of Systematic Botany, University of Zurich, used fewer species but concentrated on the lower branches of the tree, adding two mitochondrial genes to increase resolution.[4] In the resulting trees, Amborella once again branched first, followed by water lilies. Austrobaileya came next, in a group that also included Illicium and Schisandra, shrubs, and woody vines from East Asia and the southeastern United States.

In a study soon to appear in Current Biology, Palmer, together with Christopher Parkinson and

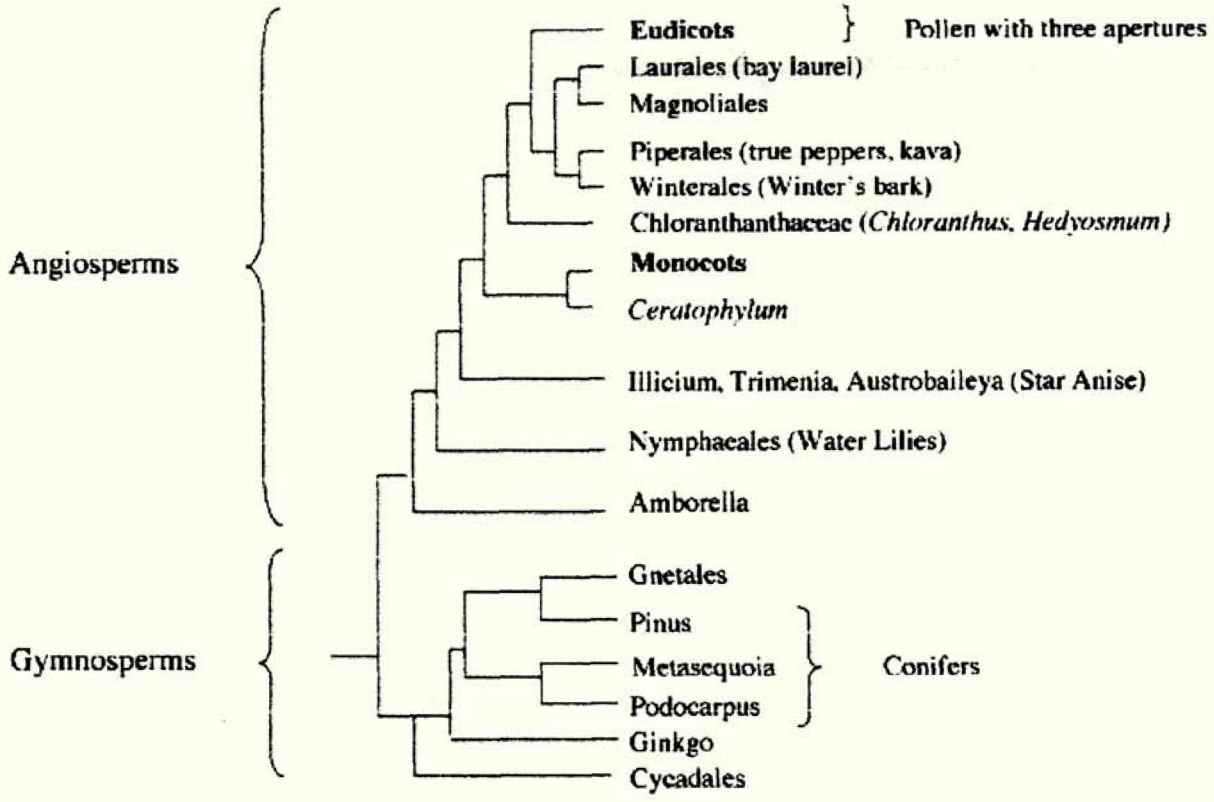
Keith Adams, reached the same conclusion about the tree's lower branches by combining sequences from three mitochondrial genes, rbcL, and 18S rDNA.[5] Still, Palmer defers to Olmstead for the definitive answer--"he has the most nucleotides and the most resolution." Olmstead's laboratory examined nearly 15,000 nucleotides in 17 slowly evolving chloroplast genes, including rbcL, concentrating on 40-50 species in lower branches of the tree. The results were the same--Amborella is the first branch. Olmstead hopes to publish in the near future.

Obviously, the strategy of combining multiple sequences paid off in remarkable agreement--at least for now.

Questions Remain

Not everything is settled, of course. One of the biggest problems is the monocots, a large group that includes grains such as rice and maize. In the Mathews/Donoghue scheme, monocots cluster with eudicots such as columbine, but in the Soltises' tree they're more related to the magnolias. "Monocot placement is one of the next big challenges," opines Palmer. The solution is probably more sequences from more species.

Another big challenge is the seed plants, the next taxonomic level down the plant kingdom encompassing angiosperms and gymnosperms, including cycads and conifers like pine. Gymnosperm ancestry is contentious--that's why the Soltises, Palmer, and dePamphilis expanded their efforts to include more plants, and publications are already in the works. Qiu's team provided the first published hint that surprises are in store--the Gnetales, which include a strange Namibian desert plant called Welwitschia and were once thought to be angiosperm allies, now seem to fall with conifers.



Summary of the relationships among major plant groups determined by molecular methods. This is a consensus from the papers referenced, adapted by L. Meyer from a figure by Paul Kenrick, Nature 402:358-9. 25 November 1999. Note that dicotyledons are not a discrete group within angiosperms. Also note that the break between angiosperms and gymnosperms is earlier than in most phylogenies.

New Inferences

Phylogenetic trees are not an end in themselves--biologists use them to make further predictions. Looking at the growth habit of plants on the lower branches of their tree, Mathews and Donoghue think the first angiosperms may have been woody. That's because Amborella and Austrobaileya are woody shrubs and vines. What's more, wide water-conducting conduits called vessels dominate angiosperm wood. Since Amborella lacks vessels, dePamphilis thinks the new trees can illuminate "at what point the genetic basis for the formation of vessels appeared."

The lower branches of the tree are not species rich (Amborella is alone in its own family), so flowering plants may not have diversified right away, according to Mathews and Donoghue. Palmer and coworkers aren't so sure--Amborella and Austrobaileya may be survivors of once rich families that are mostly extinct. DePamphilis agrees: "They're likely to be only a small portion of what was around at the time."

Angiosperms quickly dominated the plant kingdom because of their yin-yang relationship with animal pollinators, especially insects, which promotes cross pollination and genetic diversity--at least, that's been the party line.[6] But Mathews and Donoghue wonder if their rapid diversification came after a switch to an herblike habit, which is probably what happened to the water lilies. "We can now test if there's a cause and effect relationship between herbiness and angiosperm diversity," hopes Mathews. Palmer is still cautious: "There have been a lot of transitions [between woody and herbaceous forms], and multiple in both directions, so we have to be careful."

Palmer's group sees another use for more accurate trees--interpreting the fossil record. Many of the earliest identifiable angiosperm fossils seem to be magnoliids and date to 120-130 million years ago. Since the magnolias are higher up on the new phylogenetic trees, the first angiosperms closest to Amborella and water lilies must have appeared earlier. Paleontologists are sure to be out hunting, if not now then soon.

Reprinted with permission from The Scientist, Volume 13, #24, p 11-12, December 6, 1999
Barry A. Palevitz (palevitz@botany.dogwood.uga.edu) is a contributing editor for The Scientist.

References:

1. D.E. Soltis et al., "Angiosperm phylogeny inferred from 18S ribosomal DNA sequences," Annals of the Missouri Botanical Garden, 84:1-49, 1997.
2. S. Mathews and M.J. Donoghue, "The root of angiosperm phylogeny inferred from duplicate phytochrome genes," Science, 286:947-50, Oct. 29, 1999.
3. P.S. Soltis et al., "Angiosperm phylogeny inferred from multiple genes as a tool for comparative biology," Nature, 402:402-4, Nov. 25, 1999.
4. Y.-L. Qiu et al., "Evidence of the earliest angiosperms from mitochondrial, plastid and nuclear genomes," Nature, 402:404-7, Nov. 25, 1999.
5. C.L. Parkinson et al., "Multigene analyses identify the three earliest lineages of extant flowering plants," Current Biology, in press, 1999.
6. P.R. Crane et al., "The origin and early diversification of angiosperms," Nature, 374:27 33, 1995.

Two Reports from Utah scientists

By Therese Meyer

Two recent items in the journal, *Science*, both written by scientists from Utah, suggest important conservation implications for our native plants.

What Causes Species Extinctions?

The first, in the November 5, 1999 issue (vol. 286 no. 5442), by Gary E. Belovsky, et. al. at Utah State University, titled: "Experimental Studies of Extinction Dynamics" describes a series of experiments conducted over four years in which brine shrimp were grown in the laboratory under various conditions of resource (food) availability and population numbers. Although they used brine shrimp, studies such as this provide useful models that can be applied to other organisms and ecosystems. Belovsky discovered that extinction was most highly related to the resource availability and wide fluctuation in resource availability and overcrowding caused the most rapid extinction. Small initial population size was not as important, because even low numbers of individuals quickly reproduced to fill the available environment. Competition between members of the population caused nonlinear fluctuations in the population size,

and this was a major contributor to extinction, particularly during sudden reductions in resources. Belovsky extended the findings to conservation planning: "conservationists need to preserve areas that either provide a species with as large a [resource supply] as possible or enhance an area's [resource supply] by management actions. Overcrowding may be an underappreciated transient extinction threat as habitats are destroyed and as individuals populating destroyed areas migrate into remaining habitat fragments and increase population densities there."

Loss of Traditional Knowledge of Plants

The second article, an essay by Paul A. Cox, recently of Brigham Young University, currently Director of the National Tropical Botanical Garden in Hawaii and Florida, can be found in the Jan. 7, 2000 issue of Science (vol.287 no. 5450). Titled "Will Tribal Knowledge Survive the Millennium?" Cox examined the accelerating loss of plant species around the world, and the loss of traditional herbal knowledge as elders among the indigenous groups die. He cited the Gosiute tribe of western Utah and eastern Nevada as an example of this loss: fluent speakers of the language number fewer than 20, and among those few resides most of the plant-based herbal knowledge of the region. Many of these people are elders who experienced an extraordinary childhood as hunter-gatherers in the Great Basin. Far from feeling deprived, they recall a rich life tracking the seasons of the diverse plants of the high deserts. Roots, tubers and insects of many species provided a "moveable feast." Unfortunately, most of the younger generation of Gosiutes seems to prefer watching television to listening to stories about the old way of life. In another example, Cox described an herbal healer in Western Samoa who showed him how to make a tea of the stem wood of the *mamala* tree to treat hepatitis. When the plant, *Homalanthus nutans*, was tested in the laboratory at the U.S. National Cancer Institute, it was found to contain a compound called prostratin, that was active against a very different virus, the human immunodeficiency virus type I. Although this drug has not yet been clinically tested or developed by a drug company, it holds promise as a treatment for AIDS. In one of the first formal legal recognitions of indigenous intellectual property rights, the U.S. government has guaranteed that, should the drug come to market, half of all income will be returned to the people of Samoa. Soon after Dr. Cox collected the plant, *H. nutans*, loggers began to clear the forest where it grows. The people of the healer's village were being forced to sell the forest to pay for a new school. Dr. Cox helped organize an international fundraiser that enabled the villagers to pay for the school while preserving the forest. Many other forests have not been rescued from the saw and bulldozer, and according to the International Union for the Conservation of Nature, currently 12.5% of all known plant species are threatened with immediate extinction. Cox cited Hawaii's situation in which one-half of the indigenous flora is threatened with immediate extinction, 89 of which have fewer than 20 individuals remaining. Should we be alarmed by these facts, considering that in 1994, a pharmacologist in the U.S. had identified over 119 plant-derived substances that are used globally as drugs? And that many more prescription drugs sold in the U.S. are derived from or modeled after naturally occurring plant compounds, including reserpine, digitalis, and vincristine? Cox lauded recent advances in technology that enable us to evaluate potential uses of plant compounds as medicines, but more importantly, he urged increased respect for the value of indigenous plant knowledge, and increased advocacy for plant conservation.

FIVE RECENT BOOKS ON PENSTEMON
By Bill King, Salt Lake City.

Penstemon have traditionally been used in the perennial garden and smaller ones in the rock garden but increasing interest in the use of native plants, especially those with low water requirements, has in recent years rekindled enthusiasm of gardeners for the genus Penstemon with its beautiful flowers. As a consequence five books on penstemon have been published in the last three years, these books are the subject of this review. Each of these books has information that might be of value to those growing plants as well as those who need to identify penstemon in the field or garden.

The genus Penstemon is the largest genus of flowering plants restricted to North America with some 272 species and about 386 native varieties. Penstemons grow in 49 of our 50 states, the exception being Hawaii. Utah has more species of penstemon than any other state with some 69 known species (Welsh "A Utah Flora" 1993) and is considered by many to be near the center of their ecological evolution. Almost everywhere you go in Utah, with the exception of the salt flats, you will find two or three or more species of penstemon within a five mile radius which have adapted to the

local environment. Nearly 20 of the Utah penstemon are endemic and grow only within the Utah state borders. Some of these are quite rare and are on some sensitive species lists but none of the Utah ones is federally listed as threatened or endangered.

Last year we were asked to help identify some penstemons that had been planted from seed at the arboretum but the names had been lost. We begged off, knowing that with so many species it would be almost impossible unless we got lucky. But now with the help of a new book just published (1999) by Robin and Kenneth Lodewick entitled *Key to the Genus Penstemon* (see end of article for details) the task would be far less difficult. The key is really two keys, a descriptive key with many details written by Robin and a quick key written by Kenneth using one liners. The keys are easy to use provided you have an older flower, a ten power lens and a metric ruler. Simple instructions on how to use the key and a glossary make the key useable by anyone with a little practice. The genus is primarily broken down on the basis of differences in flower parts, especially the anthers. But many additional details are given including size, leaf shape and geographical location. The Lodewicks characterize themselves as amateur botanists but each has spent more than 30 years studying penstemon. This is not their first work on penstemon but rather the culmination of a series of publications they have put out in connection with the American Penstemon Society. This concise paperback book, which is small enough to put in the back pack, contains only a few line drawings but will be very useful to anyone trying to identify species in the field or in the garden. It will be especially useful in areas where a good current local flora isn't available, like in Nevada.

While the Lodewick's book contains little information on growing penstemon in the garden, a new book just published (1999) by Robert Nold, *Penstemons*, covers almost every detail of gardening with penstemon including cultivation, planting, transplanting, propagation, diseases and even a chapter on hybrids. The book also has much information on the nomenclature of penstemon and division of the genus into subgenus and section, this may be of interest to botanists. Nold gardens in Lakewood, Colorado and has grown over 200 penstemon species and has formed an opinion as to the garden worthiness of most of them. The heart of the book is descriptions of each penstemon species. Much of this information comes from his own gardening experience, but Nold has gone far beyond that, he has made a scholarly review of the penstemon literature including the writings of Pennell, Keck, Straw, Crosswhite, N. Holmgren, and others. Nold gives the height, geographic distribution, habitat, leaf and flower structure, varieties, relationship to other penstemon, blooming time and even in some cases medicinal uses for each species. He also has a chapter on closely related genera such as *Chelone* and *Nothochelone*

With so many penstemon species there are many similarities between species and as a consequence not all the names and relationships between species, subspecies or varieties have been sorted out yet, even by the professionals, but on over 90% of the names there is general agreement. Nold makes a few changes here and there in his book demoting some species to varieties and elevating some to species. These might be a stimulus for further discussion. Regarding Utah species, he tends to follow Elizabeth Neese's 1987 penstemon section of the *Utah Flora* and ignore Stan Welsh's 1993 revision of Neese's work. Thus Nold does not accept *Penstemon compactus* as a species but rather it's *Penstemon cyananthus* var. *compactus*. Some of the descriptions for Utah penstemon could be better. For example, Nold has the height of *P. platyphyllus* at about 10 inches when in fact it sometimes grows knee high in the Wasatch front canyons. Some of the geographic distributions could be more discerning. Nold lists *P.sepalulus* as "found in essentially the same place as *P. platyphyllus*" when the only place that P. sepalulus distribution overlaps along the Wasatch front is in American Fork Canyon, *P. sepalulus* growing from there south and *P. platyphyllus* growing to the north.

One of the problems Nold discusses in many places in the book is the reputation of penstemon as being short lived and blooming to death during the first few years in the garden. Nold notes differences in life span between penstemon species. He advises not to be overly kind to penstemon remembering where they grow in the wild. Too much organic matter, or for that matter too much water after blooming, can cause their premature death. Nold also advises not letting them go to seed as a means to prolong life. The book is nicely laid out, and a dozen of the most beautiful penstemon paintings, by his wife Cindy Nelson-Nold, grace the pages. In addition 42 color photographic plates selected from among the best are included. Nold's wonderful dry sense of humor spices up the reading. The book has a good index, suggested further readings and a great bibliography. It is an ideal resource to select new penstemon species for your garden. About the only thing that Nold does not have in his book is a key

for the genus, but the Lodewick book should make a nice companion although there are slight differences in nomenclature.

The Gardener's Guide to growing Penstemons by David Way and Peter James (1998) also contains a wealth of information on penstemon in the garden, albeit, from an English gardener's point of view. Way is a trained horticulturist and James does genetic research on plants. The book contains chapters on cultivation, propagation, pests, diseases and disorders. It also has an excellent chapter on the history of botanical discovery of the genus penstemon. But the core of this book is the many wonderful hybrid penstemon that have been developed in the last 150 years in Europe. You will find many clear photos and descriptions of such hybrids as P.'Hidcote Pink' and P.'Sour Grapes' which you will either be intrigued by or repelled by, depending on your point of view.

The book has a chapter that surveys species penstemon but is not as comprehensive as Nold's. It also has many appendices in the back which may be of use to you. They include a species checklist, a list of penstemon by color, a list of species by habitat, a list of nurseries, gardens and related organizations. But the most useful appendix is a flow chart of penstemon relationships showing how the genus is broken down into subgenus, section and subsection. The book has a good index but is clearly designed for gardeners only, as it does not contain any references or bibliography.

Penstemons: The Beautiful Beardtongues of New Mexico is the title of a short book written by Jean Heflin in 1997. It is an updated version to an earlier field guide to New Mexico penstemon that she wrote with Erma Pilz. Although only 50 pages, it is very comprehensive. There are 74 great color plates of the 41 New Mexico species by her husband Bill Heflin. Close-ups as well as habitat shots give you a good idea of how and where they grow. Line drawings by DeWitt Ivey of almost every species are also included and add to the picture.

This book could be used as a field guide in New Mexico and will also be of use in adjacent states; fourteen of the species grow in Utah. For each species in the book about a page is devoted to nomenclature (including scientific references and type locations), geographic distribution and habitat as well as height, growth habit and the structure of flowers and leaves. The status of rare species is discussed. At the end of the book a page is given on growing penstemons in the garden. The book is indexed by both Latin and common names and references for further reading are given.

A regional view of penstemon is presented by Dee Strickler in his 1997 book entitled *Northwest Penstemons*. This book primarily covers penstemon in the states of Washington, Oregon, Idaho and Montana, but will be useful in adjacent states and provinces. Of the 80 species discussed, 19 grow in Utah. Dr. Strickler is a wood scientist with a keen interest in wildflowers and photography, this is his fifth book on western flowers. He traveled 60,000 miles over four summers to find and photograph all of the penstemons of the Northwest. The book has a key for Northwest species, but most of the book is devoted to describing the 80 species in a systematic fashion. He includes penstemon relative *Nothochelone nemorosa* among the 80. For each species he discusses the name derivation, stems, leaves, inflorescence, calyx, corolla, stamens, staminode, blooming time, habitat and range. His words are supplemented with at least one photo of each species, a line drawing by Anne Morley and a distribution map which are all very helpful. Many of the photos are close-ups which give great detail of the flower parts but little idea of the overall plant or habitat. Botanical words are defined in a word glossary and an illustrated glossary. The book is indexed and selected references are given. While this book contains no information on gardening it will be of great value to those studying Northwest penstemon.

The five books reviewed here are like the penstemons they discuss, each has its own little niche and each is useful in its own way. The authors, all confirmed "penstemaniacs" and connected to the American Penstemon Society are to be congratulated, for together these books represent a great step forward in bringing useful information on penstemons to the public. Parts of the books may also be of interest to professionals. While descriptions and keys are given for all the species, there are still some 100 native species (many of which are from Utah) for which photos are not presented. What would be nice, for some future book, is a color encyclopedia of the entire genus.

Reprinted from the January 2000 newsletter of the Western Rock Garden Society, with permission.

Heflin, Jean. 1997. Penstemons The Beautiful Beardtongues of New Mexico Albuquerque, New Mexico: Jackrabbit Press, 8.75 by 7.25 inches, 50 pages, $20.00.

UNPS SEGO LILY
c/o Jo Stolhand
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, UT 84152-0041

Return Service Requested

Non-Profit Org.
U.S. Postage
PAID
Salt Lake City, Utah
PERMIT No. 327

Lodewick, Robin and Kenneth. 1999. Key to the Genus Penstemon and its related Genera in the Tribe Cheloneae (Scrophulariaceae) Self Published, 2526 University St., Eugene, Oregon 97403: 8.37 by 5.5 inches, 136 pages, about $10.00.

Nold, Robert. 1999. Penstemons Portland, Oregon: Timber Press, 9.25 by 6.25 inches, 259 pages, $29.95.

Strickler, Dee. 1997. Northwest Penstemons. Columbia Falls, Montana: The Flower Press, 9.25 by 6.25 inches, 191 pages, $29.95.

Way, David and James, Peter. 1998. The Gardeners Guide to Growing Penstemons Portland, Oregon: Timber Press, 9.75 by 7.25 inches, 160 pages, $29.95.

American Penstemon Society, C/O Ann Bartlett, 1569 South Holland Court, Lakewood, Colorado 80232, $10.00 per year.

For more information about the Utah Native Plant Society please feel free to call:

Bill King	582-0432
Jo Stolhand	521-0069
Susan Garvin (Utah Valley Chapter)	377-5717
Larry and Therese Meyer	272-3275

Membership Application

❒ New Member ❒ Renewal ❒ Gift

Name _____

Street _____

City/State _____

Zip _____ Phone (____) ____-_____

e-Mail _____

If Gift, From: _____

Check Membership Category Desired

❒ Student	$6.00
❒ Senior	$10.00
❒ Individual	$12.00
❒ Household	$20.00
❒ Sustaining	$35.00
❒ Supporting Organization	$50.00
❒ Corporate	$250.00 and up
❒ Lifetime	$250.00

❒ Please send a complimentary copy of the **Sego Lily** to the above individual.

Please enclose a check, payable to **Utah Native Plant Society,** and send it to:

Membership
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, Utah 84152-0041

If you prefer not to cut this out of your **Sego Lily**, feel free to copy the membership form or simply write the the information down and send it with payment and category of membership.

Sego Lily
Newsletter of the Utah Native Plant Society

VOL. 23 No. 2 Mar/Apr 2000

CALENDAR OF EVENTS

Saturday, April 15, 9-3	Sego Lily Salvage; Help dig, take some home. Santaquin offramp, east side frontage road near TrueValue hardware store
Wednesday, April 19th, 5 pm	Weeding Party, Rock Canyon Heritage Garden, Provo
Saturday, April 29th, 8:30 am	Planting Party and Field trip, Price Heritage Garden and San Rafael Swell. Help plant the biggest Heritage Garden yet! The garden is on 3rd So. 1/2 block from Carbon (the second Price exit). Call Celeste Kennard (377-5918) for car pool info, leaving Provo at 8:30.
Friday, May 5th, 6-9 pm	Utah Valley Chapter Meeting and election, Mont L. Bean Museum, BYU. Program on Heritage Gardens by Susan Meyer and UVSC wetlands restoration by Rene van Buren
Saturday, May 13th, 10-3	Weed identification workshop with Steve Dewey. Details soon.
Saturday, May 20th, 8:30-3	Rock Canyon Nature Day; Celebrate Wildflowers
Tuesday, May 23rd, 6 pm	Board of Directors, Provo, Shrub Lab, 735 N. 500 East

Rock Canyon Ecological Restoration Project: Progress Update

Phil Allen, President Utah Valley Chapter

As the Utah County Chapter of the Utah Native Plant Society nears completion of Year One on this project, we here summarize our progress to date associated with this activity.

Rock Canyon is a heavily used area on the urban-national forest interface in the Wasatch Mountains immediately east of Provo, Utah. It consists of a relatively wide, level canyon-mouth area some ten acres in extent, as well as a steep, narrow canyon and associated watershed to the east. Historically, the canyon has been used for many human activities, including livestock grazing, water harvesting, and mining. In recent years, its principal users have been hikers, mountain bikers, and climbers. Provo City uses water from the watershed and has reservoir and chlorination facilities in the canyon. Until recently, access to the narrow part of the canyon was largely unrestricted, resulting in serious degradation of plant communities in the canyon-mouth area. The construction of a formal trailhead approximately one half-mile west of the beginning of the narrow stretch has virtually

eliminated further impacts from motorized vehicular traffic. It has also made the canyon more attractive for hikers, resulting in increased use.

The decision to target Rock Canyon for ecological restoration came about due to several independent activities that converged early in 1999:

1) The Rock Canyon Preservation Alliance, a grassroots organization of community-activists, had preserved the canyon from development. This included raising over $1.5 million to purchase land and establish park facilities (restrooms, pavilion, signs). While the group felt a strong desire that the area be managed as a natural park they lacked the expertise to bring this about.

2) The U.S. Forest Service Shrub Sciences Laboratory, a research facility, increasingly recognized the importance of outreach and technology transfer activities. This has been one impetus in supporting personnel involvement (primarily Susan Meyer and Susan Garvin, active UNPS members) in the Heritage Garden Program, the Native Plant Propagation Workshops, and the Utah Native Plant Forum held in 1997.

3) Managers in Provo City Parks observed the successful Heritage Garden at Wasatch Elementary in Provo (established spring 1998) and actively solicited the Native Plant Society to establish a Heritage Garden at Rock Canyon Trailhead Park. We planted the first phase of this garden in spring 1999.

4) We have studied seed germination of native plants for 16 years, and published the results in a wide variety of scientific journals. However, we became increasingly concerned that the public is largely ignorant of the continuing decline in native plant habitat along the Wasatch Front and elsewhere in the Intermountain Region. We realized that we were in a position to make use of the knowledge we had generated to actively involve the citizens of the Wasatch Front in ecological restoration of the wild lands virtually in their back yard. We plan to apply the principles of ecological restoration to replace the degraded, weedy vegetation of the canyon mouth with high diversity native plant communities that resemble pre-settlement vegetation in the area as closely as possible. We are carrying out this research and demonstration project with the objective of developing a model for restoration of foothill shrub-steppe and mountain-brush plant communities. This project includes a research component that involves testing different restoration methodologies. It also provides an area where the practicality and effectiveness of ecological restoration can be evaluated and demonstrated

Our approach to this restoration project is intensive. We are using container transplants produced from locally collected ecotypes as the principal method of introducing new plants, supplemented by direct seeding, especially for species not easily greenhouse propagated. Because the woody overstory in the mountain brush segment of the habitat is largely intact, we are concentrating on herbaceous understory species. In the sagebrush steppe segment of the habitat, both shrubs and understory species are being planted.

We are currently engaged in the first phase of the planting, in a one-acre area behind the existing Heritage Garden. We are using local citizen volunteers to plant about 8,000 transplants belonging to ten species native to the canyon. Our first planting day, Saturday, March 4, involved 160 volunteers and received excellent coverage by the local press. A follow-up planting was held Saturday, March 11. We are encouraged by the success of this first effort, and are planning to produce approximately ten thousand additional transplants to be planted in the mouth of Rock Canyon this coming fall.

Even though our restoration project is only in its initial stages, we are already being approached by citizens who would like to see this kind of activity in other canyon mouths along the Wasatch Front. We are hoping to integrate our efforts with efforts of those working on the establishment of the Bonneville Shoreline Trail. We would like to develop a protocol for controlling weeds and restoring native plant communities all along the trail, which will stretch from Brigham City on the north to Santaquin on the south, and which will intersect with canyon mouths all along the Wasatch Front. If you are interested in participating in an expansion of these restoration efforts, please contact us at unps@xmission.com.

Molecular Phylogeny Made Ridiculously Simple
Or
How and Why Plants are Named Based on DNA Sequences

By Larry Meyer

Since Lineaus and Darwin, there has been an effort to categorize all life according to natural patterns. Anyone can tell asters are more closely related to each other than to other plants, and the same holds

true for peas, ferns, and mushrooms — those are the easy distinctions. As species diverged from each other, those with the most traits in common are those that evolutionarily separated most recently. This relationship is recognized in nomenclature and in the phylogenetic trees demonstrating the time course of evolution.

Unfortunately, it is not always easy to determine the relative importance of different traits. In species which are obviously closely related, is leaf width or presence of serrations indicative of a more diverse relationship? Often the new discovery of an intermediate will suggest an evolutionary pathway and lead to recategorization and renaming of a familiar plant. It would seem that this could be an almost never-ending process (or argument)— until organization based on DNA sequence was developed.

DNA was proven to be the stuff of heredity by the simple experiment of changing a trait in an organism using DNA alone. The first 75 years of the twentieth century was filled with discoveries demonstrating the importance of the sequence of DNA, the method of its replication and its structure. About 25 years ago, several different techniques came together which allowed the direct sequencing of large sections of DNA. Over the last 5 years this has been automated and has become routine. These techniques, summarized below, along with the ability of computers to process the data derived from these studies, allow the creation of unambiguous phylogenetic trees. From a practical point of view, this should finally end the annoying reorganization and renaming of plants. One name learned will be enough.

The Tools of DNA Research

All the experimental methods take advantage of two types of handy tools. First, enzyme systems from a wide variety of organisms have been identified, purified and now mass-produced. Individually, these are enzymes which might copy DNA, clip it in a specific spot, hook it back together, or allow it to spin. They are used by the organisms (mostly bacteria) for basic life functions or defense. We have isolated them and sell them, just as you can buy cane sugar, cornstarch or meat tenderizer. (Meat tenderizer is an enzyme that breaks down proteins and is derived from papayas; tenderizing is obviously not its original purpose). In a similar way we have co-opted enzymes a bacteria uses to defend against viruses, a restriction enzyme, and sell it to cut DNA in a sequence specific way.

The second tool is the unique physical structure of DNA (Deoxyribonucleic acid). It is a very long molecule made of two strands, stuck together like Velcro. Each strand is made of 4 types of bases, abbreviated A, T, C and G. Pieces of these are copied to RNA and in most cases the information is used to make an amino acid sequence, a protein. Each amino acid unit of a protein is specified by three bases of DNA. This may seem like a limited language, but can (and does) contain all the information necessary for life. Think of the number of possibilities of just a string of 10 bases — there are 4^{10} sequence possibilities, or roughly 1 million. The Velcro effect is caused by each molecule sticking to the opposite (or complimentary) strand, again in a sequence specific manner. A binds to T, and G to C only. Given a single strand and the right conditions, an enzyme, a polymerase, will build the complimentary strand for you and this happens every time a cell divides. To get started the enzyme needs a bit of matching DNA, called a primer. Primers are short pieces (usually 10 or so bases) of single stranded DNA made to match a specific

sequence. This can bind and determine exactly where the polymerase starts copying.

These long strands of DNA can be melted apart by heat, then they find each other and stick back together when cooled. Each sequence will only stick to its exact pair, finding the one match in millions specifically, given the right conditions. Despite sequence differences, the strands can be handled just like big chemicals. One very useful trick is to push them through a gel with an electric current (electrophoresis). This can separate chopped up DNA based on size exactly and with amazing resolution. A molecule with 198 bases will move a little faster than one with 199 every time. A mix of DNA molecules from 100 to 800 bases can be ordered exactly by electrophoresis, or pieces with 2000 bases can be separated from those with 2100, even in a crude mix such as ground up leaves, digested with some bacterial enzyme, like meat tenderizer on a chuck roast. Even after such electrophoresis, molecules will stick back together and a previously isolated bit (a probe) can be used to identify a given gene in a crude mix of chopped DNA.

How DNA Sequencing Works:

With the tools discussed above an individual bit of DNA can be copied a millions of times and sequenced with a few days lab work. First, DNA is extracted from a plant using fairly routine chemicals. In practice, a dozen or more can be processed at once in a couple of days. The tissue doesn't need to be fresh. DNA that's good enough can usually be extracted even from old herbarium specimens. For the next step, it just takes one molecule with the intact sequence of the bit to be analyzed.

The whole DNA isn't be sequenced at once, just one bit, usually 200-800 bases in length. First that bit is copied many times. Primers, (short bits of DNA with sequences that match the plants sequence and which are purchased just like any other chemical) are added, along with nucleotides and an enzyme that copies DNA (a polymerase that needs a primer to start). The primers are chosen so they are complimentary to sequences 200-800 bases apart on opposite (complimentary) strands. The polymerase is isolated from bacteria that grow in hot springs and is stable to boiling temperatures. Next the mix is boiled to melt the two DNA strands apart, then cooled. The short bits of DNA (primers) bind their sequence faster than the original opposite strand (they are big and slow and each has a fast little primer binding to it, getting in the way). The enzymes go to work, one on each strand, starting with the primer and runing down making two double stranded copies of DNA for each one that was there before. But this happens only to the sequence between the two primers (you do have to know something about the sequence to get that part right but there are a lot of tricks — I'm trying to summarize). Now the mix is again heated and cooled, and it's repeated, giving four copies, then again. This may sound tedious, and it was initially, but there are machines, thermocyclers, which routinely run 24 to 96 samples simultaneously with cycle times of 30 to 180 seconds. After 20 cycles you would have 1,000,000 copies for each one in the initial mix, another 10 cycles and you have a billion. This is the process called the polymerase chain reaction or PCR.

Next the job is to sequence the fragment just mass-produced. Again enzymes from bacteria are used, along with some handy chemicals and physical properties. Four separate reactions are run, each with a slug of the piece made by PCR, a polymerase

(the enzyme that copies the DNA) and nucleotides, but each has a little bit of a poison that ends the reaction at a specific nucleotide (A, G, C and T). Just enough is added to cause the strand to stop about 1 in 100 times. After incubating the soup for a few minutes there is a mix of reaction products. Some are short, but in each reaction the short chains end only in the nucleotide for which the poison was added. By separating these using electrophoresis the sequence can be directly read off the gel. In practice, this is now automated and machines can run a few dozen samples simultaneously, get 500 to 800 bases of sequence for each, continue to reload and automatically run all night, and electronically send the sequence out. This mass scale sequencing is what is making the genome project (sequencing the whole set of human chromosomes) possible.

Why DNA Sequence is an Accurate Gauge of Evolution and Relationships.

While it's a guess as to whether flower structure or leaf structure should be more important in determining species relatedness in each case, DNA is universal. Using sequences from many plants (or any organism) the steps taken to get from one sequence to a closely related sequence can be individually analyzed. The likelihood of each type mutation (DNA sequence change) is known. Using a series of sequences from a variety of species, a graphic tree can be made with the fewest numbers of mutations, the most parsimonious, to explain the observed differences. This can be compared to other trees — it is always possible that a sequence mutated one way, then went back. But the actual likelihood of these different possibilities can be closely estimated since the probability of a mutation can be measured. In general, there is enough information that one tree, leading to a phylogenetic relationship and family and genus name, can be established with a known likelihood of many millions to one or more over all other possibilities.

One need not guess the relative importance of a trait such as petal length, number, or plant height. Each of these is an expression of a gene or genes in that plant, and the gene in turn is a long DNA sequence. One mutation (a single base change) might inactivate a gene entirely resulting in a major change in the appearance of a plant. Other mutations, such as those between genes or in the third codon position, are silent; the change makes no difference to the plant. Consequently DNA is the most accurate gauge of mutation accumulation, and thus evolutionary distance and elapsed time since divergence of species.

Using different primers, several different sequences of DNA can be amplified and sequenced. This can aid in conformation, but can provide different information as well. Not all DNA is equal from the standpoint of mutations. Cytoplasmic DNA (such as chloroplast and mitochondrial DNA's) mutates more rapidly and is usually maternally inherited (see Sego Lily 11/99). Some chromosomal DNA codes for sequences not transcribed and mutates relatively quickly as well. In contrast, DNA coding for important cellular components collects mutations more slowly (it actually mutates at the same rate, mutations are simply selected against). For example, there is only a single amino acid difference between the cytochrome C of a pea and a horse, a highly conserved gene. Finally mutations in the third nucleotide of a codon (representing one amino acid) are much more common than those in the first two positions, since a change in the third nucleotide usually doesn't result in a change in the amino acid. These differences can be used to build a kind of clock into the system. Chloroplast genes can highlight difference between closely related species,

or even different populations of one species. Mutations in coding sequences can give large structure to relationships between families (as seen in Sego Lily 1/00). A further trick is that pollen (and sperm) usually contains no cytoplasmic DNA, so chloroplasts can be used to study maternal inheritance. The same is true of humans, where population migration has been studied using the rapidly mutating but maternally inherited mitochondrial genome.

Other methods based on DNA sequence are also in use, most with abbreviations or acronyms such as RFLPs, RAPIDs and VNTRs. These are based on similar technology, and use the ability of an enzyme to cut DNA in a sequence specific fragment to detect a single mutation. These were developed before the ability to mass-sequence DNA. They have the advantage that they directly detect mutations, but cannot always tell what the mutation is. Moreover, just as with electrophoresis of plant tissue to detect isozymes, a common early method used to help in phylogenetic organization, most mutations which occur will not be detected by such a system. As sequencing technology becomes widely available, these methods will become less frequently used.

We will see increasing use of DNA based methods so get used to it. Several recent pieces in the Sego lily have used these techniques, and I hope future articles will as well. Understanding the rational and methods of DNA based analysis may help understand the results. Finally the good news for those who just want to learn plant names, this should represent the last cycle of change.

The Dark Side of the Sun

Skin Cancer Is on the Rise, and Gardeners Are at Risk

Sun Safety Guide

Although we gardeners have no control over any hereditary predisposition to skin cancer that we may have, we certainly can decrease our risk by taking a variety of protective measures. Following is a common-sense guide to sun safety for gardeners everywhere.

• **Limit your exposure to the sun**. Garden before 10 a.m. or after 3 p.m. when the solar radiation is less intense, or confine your mid-day chores to the shady areas of your yard.

• **Wear protective, tightly woven clothing** with high collars and long sleeves and legs. Surprisingly, ordinary clothing offers very little protection from the sun; a T-shirt, for example, has an SPF (sun protection factor) of 6 to 9, which drops to 3 if the shirt gets wet. A safer choice is a long-sleeved shirt made of a dark, tightly woven fabric; if you can see light coming through the fabric, then harmful UV rays can get through, too.

Some companies now offer clothing with high SPF protection built into the fabric. For example, Sun Precautions, Inc., of Everett, Washington, makes the Solumbra line of clothing with SPF ratings of 30 or more (see "Resources" box). The company's mail-order catalog includes hats, gloves, shirts, jackets, pants, and skirts for adults, and a line of colorful clothing for toddlers and children. The patented lightweight fabric used in the Solumbra line protects against both types of damaging ultraviolet radiation, UVA and UVB, and received the American Academy of Dermatology's first annual Golden Triangle Award.

• **Wear a hat** with a wide rim that completely shades your face and the back of your neck.

• **Wear UV-blocking sun glasses**. Chronic sun exposure is directly related to a large proportion of the more than one million cataracts removed yearly in the United States, according to the Skin Cancer Foundation Journal.

• **Before going out into the garden, apply a water-resistant sunscreen** and lip balm with a minimum SPF of 15. Apply them 20 minutes before

heading outside so that they have time to sink into your skin. Reapply regularly and liberally.

Until recently, most sunscreens offered little or no protection against UVA radiation, which like UVB has been strongly linked to skin cancer. Look for products that contain UVA-filtering ingredients like titanium dioxide, avobenzone (also called Parsol 1789), and oxybenzone. Also check for Z-Cote, a transparent reformulation of zinc oxide (a highly effective UVA block), which is that attractive white paste lifeguards often put on their schnozzles.

• **Check your medicine.** Some medications increase sensitivity to the sun. If you are taking such a medication, you should be extra vigilant about your exposure to the sun.

• **Examine yourself regularly** for signs of skin cancer. Basal cell carcinomas often begin as small bumps or nodules, with a rolled border and indentation in the center. They can be shiny and taut or scarlike, and pearly or translucent red, pink, or white. Squamous cell carcinomas often appear as red, irregularly edged scaly patches on areas of the skin already showing signs of damage, such as the face, mouth, and ears. They may bleed and grow rapidly. Melanomas often start in or near a mole or other dark spot on the skin. They are brown, tan, or black, usually have an uneven border, and are often larger than common moles. Don't hesitate to see your dermatologist about any questionable bump on your skin.

• **Be sure to protect your children.** Sun damage that can lead to skin cancer often occurs at an early age. Children are especially as risk because they are outdoors more than adults.

We gardeners must come to terms with the fact that the same sun that makes our gardens bloom can be hazardous to our health. Choosing our gardening times wisely, wearing protective clothing, and applying a sun block should become as habitual as brushing our teeth.

Resources

Skin Cancer Foundation, Suite 1403, 245 Fifth Avenue, New York, NY 10016; (800) SKIN490.

This nonprofit organization provides information on the prevention, early Detection, and treatment of skin cancer. Send a stamped, self-addressed envelope.

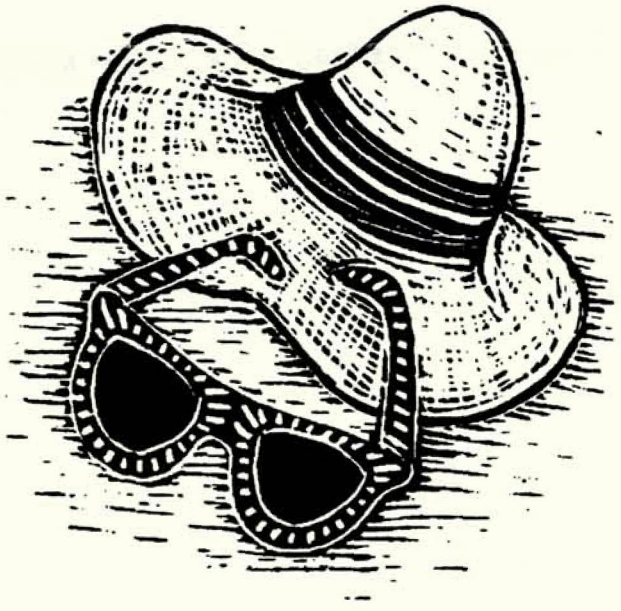
American Academy of Dermatology, P.O. Box 4014, Schaumburg, IL 60168; (847) 330-0230 (www.add.org).

This organization of doctors who specialize in diagnosing and treating skin problems provides free booklets on skin cancer and can refer you to dermatologists in your area.

Sun Precautions, 2815 Wetmore Avenue, Everett, WA 98201; (800) 882-7860

Makers of a line of protective clothing with SPFs of 30 and higher. Call for their 40-page catalog.

From Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, NY 11225, (718) 623-7200. With Permission.



UNPS SEGO LILY
c/o Jo Stolhand
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, UT 84152-0041

Return Service Requested

Non-Profit Org.
U.S. Postage
PAID
Salt Lake City, Utah
PERMIT No. 327

UNPS is On Line

The UNPS web site is up and running! We have registered the domain UNPS.org and our web site is at www.unps.org. Our e-mail address is unps@xmission.com. We have big plans for our web pages, but limited time. We will continue to update and expand as we can. We will try to keep a current list of planned activities and meetings.

We thank X-Mission for substancial support of our web service. They have donated not just to us, but to many Utah non-profits. Their home page is www.xmission.com. Thanks!

For more information about the Utah Native Plant Society please feel free to call:

Bill King	582-0432
Jo Stolhand	521-0069
Susan Garvin (Utah Valley Chapter)	377-5717
Larry and Therese Meyer	272-3275

Membership Application

❒ New Member ❒ Renewal ❒ Gift

Name _____

Street _____

City/State _____

Zip _____ Phone (____) ____-_____

e-Mail _____

If Gift, From: _____

Check Membership Category Desired

❒ Student	$6.00
❒ Senior	$10.00
❒ Individual	$12.00
❒ Household	$20.00
❒ Sustaining	$35.00
❒ Supporting Organization	$50.00
❒ Corporate	$250.00 and up
❒ Lifetime	$250.00

❒ Please send a complimentary copy of the **Sego Lily** to the above individual.

Please enclose a check, payable to **Utah Native Plant Society,** and send it to:

Membership
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, Utah 84152-0041

If you prefer not to cut this out of your **Sego Lily**, feel free to copy the membership form or simply write the the information down and send it with payment and category of membership.

VOL. 23 No. 3 **May/June 2000**

CALENDAR OF EVENTS

Friday, July 28, 8:00 am	Dr. Harper will lead a walk to follow up on his Poaceae workshop. Meet at the southeast corner of the Widtsoe building (Biology) on the BYU campus to carpool to a field trip to the High Uintas. You do not need to have gone to the workshop to enjoy the hike. Bring water, lunch, sunscreen and sensible shoes.
Tuesday, Aug 1, 6:00 pm	UNPS Board of Directors Meeting, Therese and Larry Meyer's House 2931 Tolcate Lane, Holladay, 272-3275.

For up-to-date activity information check our web site:
WWW.UNPS.ORG

TWO UTAH PLANTS PROPOSED FOR FEDERAL PROTECTION

In response to a 6-2-99 petition from the Center for Biological Diversity and the Southern Utah Wilderness Alliance (SUWA), the U.S. Fish & Wildlife Service (on 4-12-00) proposed to list Holmgren's milkvetch (*Astragulus holmgreniorum* Barneby) and the Shivwit's milkvetch (*Astragulus ampullarioides* Welsh) as federally endangered species. Both species occur near St. George, UT and neighboring Mohave County, AZ. They are threatened by the rapid development around St. George, cattle grazing, and off-road vehicles.

Holmgren's milkvetch occurs in just three areas within a 7-10 mile radius to the south, west and northeast of St. George. The majority of its range is within Washington County, UT, but it also occurs in Mohave County, AZ. Only 5,000 individual plants remain. Shivwits milkvetch occurs in just 5 sites in Washington County, west and northeast of St. George and on and near the Shivwits Indian Reservation. There are only about 2,000 individuals left.

The Center's endangered species protection program has created a web of protected species and ecosystems across the West. 119 species have been listed, and 4 have been proposed for threatened or endangered status; over 2,000 miles of rivers and 730,000 acres of land have been designated as critical habitat; and over 55 million acres of land and 800 miles of river have been proposed as critical habitat. Another 37 species and critical habitat designations are in litigation, under court order, or awaiting petition findings.

From the *Center for Biological Diversity*

Ed. Note -

For the official listing see:
Federal Register: April 12, 2000 (Volume 65, Number 71) Page 19728-19734
From the Federal Register Online via GPO Access
wais.access.gpo.gov

Endangered and Threatened Wildlife and Plants; Final Rule to List *Astragalus desereticus* (Deseret milk-vetch) as Threatened

AGENCY: Fish and Wildlife Service, Interior.
ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), determine the plant species, Astragalus desereticus (Deseret milk-vetch), to be a threatened species under the authority of the Endangered Species Act of 1973, as amended (Act). Astragalus desereticus, considered extinct until its rediscovery in 1981, exists in one small population in Utah County, Utah. Threats to the plant include residential development, highway widening, livestock grazing and trampling, and other impacts to its limited habitat. This plant receives no protection under State or local laws or regulations. This rule implements Federal protection provided by the Act for this plant.

EFFECTIVE DATE: November 19, 1999.
DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
50 CFR Part 17
RIN 1018-AE57

Chapter News

Mountain Chapter plans to go on one walk per month during the summer. The next hike is planned tentatively for Saturday, June 17. Contact Abby Moore for dates and locations: email: balsamorhiza@hotmail.com , telephone: (435) 649-8859. Mountain Chapter has a Heritage Garden in planning. Maria Barnt (Parks and Rec., Park City Garden Club) spoke recently at a chapter meeting on the subject of Heritage Gardens. Organizers are currently mapping the area and working out details with Park City.

Utah Valley Chapter continues with the Heritage Garden projects around the state. There are now five gardens, and possibly two others to be planted this summer. Organizers have announced a relative moratorium on new gardens, not for lack of need or interest, but because they are currently stretched too thinly to keep up with expansion. Other chapters interested in the Heritage Garden concept are certainly welcome to implement them (see note below). No formal activities are planned for awhile, as organizers are busy with summer research work. Also from Utah Valley Chapter: member Bitsy Shultz has drawn a series of native plant images for students to color as a fun and informative aid in a

Heritage Garden, on a nature hike, or in the classroom. The book is not yet in production, but Bitsy hopes it will answer a need, particularly with instructors in environmental curriculum. Utah Valley Chapter: Phil Allen (Pres.) (801)-378-2421 (work), email: Phil_Allen@byu.edu .

Price Chapter: A new Heritage Garden was recently planted in Price, that incorporated five native plant community ecological types: Grasses, Desert Garden, Penstemon Garden, Mountain Garden and Sagebrush Flat. Mike Hubbard, Price Chapter President, organized the project. Design and implementation was helped by technical assistance from the experienced members of the Utah Valley Chapter. Price chapter members and citizens planted the garden. Price City provided the land and financial support for drip irrigation. Plants (1500 of them, many donated) were produced by a variety of people and organizations: UNPS members, USDA Forest Service Shrub Lab in Provo, Thanksgiving Point Production Greenhouses, The Center for Greenhouses, Wasatch Elementary School in Provo (home to the first Heritage Garden), and the City of Price. UNPS will help with signage and interpretive pamphlets. Chapter President: Mike Hubbard: (435) 637-4834) email: mhubbard@castlenet.com .

Central Utah Chapter: Janett Warner is gathering interested persons to form a chapter focused in central Utah: the towns and bourgs in the vicinity of Richfield, Escalante, Koosharem, Hanksville, etc. Contact: Janett Warner: (435) 527-1234, Wildland Nursery, 550 North Hwy. 89, Joseph, UT 84739, email: janettw@hubwest.com

Dixie Chapter: UNPS members in the St. George area interested in forming a chapter: please contact: Anton Brent Gehring, PO Box 790157 Virgin, Utah 84779 (435)-635-7085. To form a chapter, ten or more interested members must sign a letter indicating intent (see note below regarding forming new chapters).

Salt Lake Chapter: All are welcome to go on a walk lead by Dr. Harper to go with his *Poaceae* workshop: Friday, July 28, 8:00 AM. Meet at the south east corner of the Widtsoe building (Biology) on the BYU campus for a field trip to the High Uintas.
Mindy Wheeler organized a fantastic series of native plant identification workshops for the chapter that have come off very well thus far. They covered *Asteraceae* (Dr. Susan Meyer), *Poaceae* (Dr. Kimball Harper), *Carex* (Sherel Goodrich), and Weeds (Dr. Steve Dewey). There is still one possible workshop in planning *Astragalus*. Thank you to all the speakers and to Mindy for organizing the workshops. Also in the planning stages: a guest speaker from the University of Utah Biology department, Dr. Denis Bramble, on his family's experiences over the past ten years restoring native vegetation on their mountain rangeland in southern Utah. **Details** to be announced.

Cache Chapter: No news from this chapter; there is a need for someone up north to organize some activities for the chapter.

UNPS general news:

The Grants in Aid Committee and the UNPS Board of Directors have decided to fund several projects benefiting native plants. Among these are:
1) A study attempting to identify the plants contained in a 400-year-old Native American herbal bundle discovered at an archaeological site in southern Utah. Merry Harrison, a trained, clinical herbalist and owner of Millcreek Herbs, is

conducting the study and will report to our membership at the conclusion of her work: $1000.
2) A study of invasive plant species' interactions with native species on Antelope Island. University of Utah student, Angie Battazzo, has been working with the State and Park personnel on the island for over a year mapping vegetation: our grant targets a specific question of competition. $500 initially, $500 more pending need.
3) Signage for Heritage Garden at Wasatch Elem. School in Provo: $300.
4) Funding for printing proceedings of the Third Southwestern Rare and Endangered Plant Conference, Sept. 25-29, Flagstaff AZ: $500.
5) Matching funds to a Bureau of Reclamation cost share grant for the Rock Canyon Heritage Garden and revegetation project: $500.

Heritage Gardens Plans:
The Utah Valley Chapter produced a wonderful Heritage Garden at Wasatch Elementary and the written plans and protocols are available. The Price Chapter's new garden's plans and protocols are also available. Contact the Chapters: Utah Valley: Susan Meyer: semeyer@sisna.com (801) 423-2603, Price: Mike Hubbard: (435) 637-4834) email: mhubbard@castlenet.com or state office: Therese Meyer (801) 272-3275 email: tmeyer@lgcy.com for information.

New Chapter Formation
Ten or more members in a region may sign a letter indicating intent to form a chapter. The central organization provides $200 basic per chapter per year, plus, if more than 10 members paid dues by Jan. 1, $2.00 per member per year returned to chapter for mailings, etc.

BIODIVERSITY: U.S. Has More Species Than Previously Thought

The United States is home to more than 200,000 plant and animal species, twice as many as previously thought, according to a study to be released today by the Nature Conservancy. The report's finding is an "unexpected piece of good news," experts said. But the report also notes that about one third of the species living in the United States are imperiled to some degree. The five-year analysis, compiled using 25 years of data collected by the Nature Conservancy's Natural Heritage Network, found that the country is home to about 10 percent of the known species on Earth. The United States ranks at or near the top among nations in its variety of mammals, freshwater fishes, salamanders, snails and crayfishes. The study also found that the United States contains 21 of the world's 28 different types of ecological regions -- a greater variety than any other country. The Nature Conservancy is also expected to announce that it is undertaking a five-year, $1 billion program to protect U.S. wilderness.

The study is the most complete inventory of America's plants and animals to date. More than 200,000 native plants and animals — double the previous estimate — were documented. The study also reveals the United States is one of the most ecologically diverse countries in the world. It is home to 10 percent of all species found on Earth. Every year, some 30 previously unknown species of flowering plants are found in the country, according to the study.

That's the good news. The bad news is included in other key findings in the study:
• As much as a third of the nation's species are at risk and at least 500 species are extinct or missing. This ringed-map turtle, a

rare freshwater species, is at risk due to degraded and polluted rivers, streams and lakes.

• The single biggest threat to species survival is habitat loss. Nearly 60 percent of America's landscape is already severely altered.

Despite these trends, there is time to protect the country's natural heritage, the study notes. Scientists are buoyed by the fact that the United States has a greater diversity of major ecosystems, from prairies to tundras to forests to deserts, than any other country in the world.

"The good news is Americans enjoy an incredibly rich natural heritage, from rare fish surviving in desert oases, to the world's tallest trees — California's coastal redwoods — to Hawaii's honeycreepers, colorful birds whose evolutionary story rivals that of the famous Darwin's finches," noted Bruce Stein, lead author of the report. "The bad news is that Americans risk losing much of the wealth if current trends continue." The bristlecone pine is one of the world's oldest living trees; some growth dates back nearly 5,000 years. The United States is second only to China in diversity of conifers and related plants.

The study indicates biodiversity "hot spots" — areas where unique species are in danger. They include the San Francisco Bay area, Southern California (including Death Valley), the southern Appalachian Mountains and the Florida Panhandle. The report is the result of 25 years of research by the conservancy's Natural Heritage network, a program in all 50 United States. The Natural Heritage program maintains a database that contains scientific information about species across the country.

From The Nature Conservancy

LIVESTOCK A MAJOR CAUSE OF WEED INVASIONS

The Oregon Natural Desert Association has released a new report demonstrating that cattle and sheep grazing is one of the major causes of rapidly exploding populations of introduced weedy species throughout grasslands, shrublands, and woodlands west of the Rocky Mountains. The report, "Livestock Grazing and Weed Invasions in the Arid West", was written by ONDA staff ecologist and grassland expert Joy Belsky, Ph.D., and Jon Gelbard, a graduate student at the University of California at Davis.

The spread of nonindigenous plant species, also referred to as alien, introduced, and exotic weeds, throughout arid and semi-arid regions of the West is one of the greatest threats facing the region's native species and ecosystems. Weeds outcompete native species, reduce biodiversity, increase fire frequency, increase soil erosion, and degrade wildlife habitat. Long-term monitoring suggests that these weed-dominated plant communities may never recover.

Important alien weed species in the West are cheatgrass, medusahead, yellow starthistle, and leafy spurge. With continued grazing, these weeds form monocultures that are biological deserts.

A copy of the report is available at www.onda.org or 503-228-9720.

Meeting Notice

Third Southwestern Rare and Endangered Plant Conference at Northern Arizona University, Flagstaff Arizona, September 25-28, 2000. Sponsored by The Arboretum at Flagstaff and U.S. Fish and Wildlife Service.

UNPS SEGO LILY
c/o Jo Stolhand
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, UT 84152-0041

Return Service Requested

Non-Profit Org.
U.S. Postage
PAID
Salt Lake City, Utah
PERMIT No. 327

Correction:

The Sego Lily volume number was inadvertantly and incorrectly advanced in September/October 1999. The Volumes labeled Vol. 23:5 and 23:6 from 1999 should have been labled 22:5 and 22:6. Similarly the issues from 2000 which have been labeled 24:1 and 24:2 should have been 23:1 and 23:2 respectively. This issue is correctly numbered as 23:3. I regret any confusion and appreciate the careful reading of those that notified me.

For more information about the Utah Native Plant Society please feel free to call:

Bill King	582-0432
Jo Stolhand	521-0069
Susan Garvin (Utah Valley Chapter)	377-5717
Larry and Therese Meyer	272-3275

Or check our website:

www.unps.org

Or write to unps@xmission.com

Membership Application

❒ New Member ❒ Renewal ❒ Gift

Name _____

Street _____

City/State _____

Zip _____ Phone (____) ____-_____

e-Mail _____

If Gift, From: _____

Check Membership Category Desired

❒ Student	$6.00
❒ Senior	$10.00
❒ Individual	$12.00
❒ Household	$20.00
❒ Sustaining	$35.00
❒ Supporting Organization	$50.00
❒ Corporate	$250.00 and up
❒ Lifetime	$250.00

❒ Please send a complimentary copy of the **Sego Lily** to the above individual.

Please enclose a check, payable to **Utah Native Plant Society,** and send it to:

Membership
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, Utah 84152-0041

If you prefer not to cut this out of your **Sego Lily**, feel free to copy the membership form or simply write the the information down and send it with payment and category of membership.

Sego Lily

Newsletter of the Utah Native Plant Society

VOL. 23 No. 4 **July/Aug 2000**

CALENDAR OF EVENTS

Saturday, September 16, 9:00 a.m.	Hike to the Big Tree; See the largest White Fir (*Abies concolor)* in North America, and appreciate why the state tree should be the Utah White Fir, and not that other tree; Moderate 3-hour round trip starts at the Loafer Canyon Summer Home Area east of Salem. Wear hiking boots, and bring water and snacks/lunch. Call Susan Meyer (377-5717) for details.
Friday, August 25th, 1-4 p.m and Saturday, August 26th, 10 a.m.- 12 p.m	Waterwise and Wonderful: TreeUtah, Red Butte Garden, the Utah Department of Natural Resources and the Utah Native Plant Society would like to invite you to a free presentation: "Waterwise and Wonderful: A Slide-Illustrated Introduction to Xeriscape" with Jim Knopf. A second presentation will be held Saturday, in the classroom at Red Butte Garden, 300 Wakara Way. See page 7 for more information
UEA Weekend	Three-day field trip to Toroweap Overlook on the Grand Canyon. (Yes, it is Arizona, but we're broad-minded); Come see a place that still feels pristine, and learn a lot of plant ecology along the way. Look for details on the website in a few weeks, or call Phil Allen (378-2421) for more information.

Now We Are Ten:
Utah Heritage Garden Update

By Susan Meyer
Horticulture Chair, Utah Native Plant Society

In this millenial year we have seen a doubling in the size of the Utah Heritage Garden Program, with the planting of five new gardens varying in size from a few planter boxes to over 6,000 square feet. We planted our first garden outside the Wasatch Front area, and obtained a $15,000 grant from the Bureau of Reclamation to help with signage and interpretive material. We hosted our second series of Native Plant Propagation Workshops in February 2000, attended by over sixty enthusiastic native plant gardeners. And we posted information about the Utah Heritage Garden Program as well as instructional materials and plant photos from the propagation workshops on the new UNPS website. We plan to augment these web materials soon, so keep an eye on the Heritage Garden pages of the website (www.unps.org).

The flagship garden of the program is at Wasatch Elementary School, 1080 North 900 East in Provo. This 2700-square-foot garden was planted in June 1998 and is getting better every year. Third grade teacher Darrin Johnson is taking good care of the garden as well as teaching generations of third graders to grow and value native plants. He has obtained grant funding from several sources to expand the program to involve more teachers at his school, as well as offering workshops for other teachers throughout the state on growing natives in the classroom. Darrin also built garden benches, beautiful wooden signs, and a rustic box for garden maps. For more information about the garden, contact him at 371-2234.

At the request of Wasatch Elementary teachers, garden designer Bitsy Schultz spent this spring preparing coloring book pages for many of the plants in the garden. These pages will soon be posted to the UNPS website where they can be downloaded and used by teachers and anyone else with an interest. We are also considering publishing a hardcopy version.

Inspired by our success at Wasatch, we planted four new Heritage Gardens in 1999. Marcene Younker at the University of Utah Grounds Department persuaded her bosses to let her plant a Heritage Garden in one of the circle beds on the Mallway. This 1000-square-foot garden is located just north of the new Gymnastics Gymnasium at the east-end of campus. The garden recently received its new signage, including a lovely etched stone sign featuring the Utah Ladyfinger Milkvetch logo. This garden is professionally maintained and always looks good. For more information call Marcene at 581-3078 or e her at: myounker@campplan.utah.edu.

We also installed a mini-garden at the Animal Park at Thanksgiving Point in Lehi in 1999. The objective was to provide the Environmental Ed staff there with a small piece of native environment to use in instructing the thousands of schoolchildren who take part annually. This garden consists of 300 square feet around a flagpole in the middle of a bluegrass lawn, and consequently features mainly water-loving species. It has signage and an interpretive pamphlet. For more information about this garden, call TP Environmental Education Director Carolyn Bayliss at 768-4940.

Our third garden project in 1999 was at the Rock Canyon Trailhead Park in Provo, at the east end of 2300 North, east of the LDS temple. The garden is located just north of the trailhead parking lot and features some fine landscape rock placed by our partners at Provo City Parks and Rec as well as dozens of plant species native to the Wasatch Front. It currently occupies about 1500 square feet but is scheduled to grow considerably in coming years. For more information call Phil Allen at 378-2421.

The native shrub planting at Ensign Elementary School, 12th Avenue and L Street in Salt Lake, has been in place since the school was built over twenty years ago. It was donated by Native Plants Incorporated to help the school stabilize the quarry hill to the north of the building. It now boasts handsome, specimen-sized curlleaf mountain mahogany, cliffrose, and squawbush, among many others. Last year, hill guardian Ann Kelsey, whose children attended Ensign, got together with us to talk about supplementing the shrub plantings with more of a native understory. We waited patiently for rain last fall so we could do our planting--and it never rained. Finally in November we planted anyway, and used water from a kind across-the-street neighbor to give the plants a good start. We had more of a weed problem than we reckoned on, so at present this garden is still nascent. We plan to plant again this fall. The Ensign Heritage Garden is in much need of additional "Gardenin'Angels" to help with planting and maintenance. The garden is on a hill with great public visibility from both a path system and the school parking lot, and we are hoping to get more people involved in this very satisfying activity. For more information, contact Ann Kelsey at 581-6520 or kelsey@umnh.utah.edu.

In July 1999, the Center for Water Efficient Landscaping at USU in Logan sponsored a Native Plant Horticulture Symposium, where I gave a presentation on the Heritage Garden Program. One of the many fruitful contacts made at this meeting was with Lyle Bauer, who works for the Parks Department in Price. He was interested in a xeriscape native plant garden, so we hooked him up with the Price Chapter of UNPS, and after much frenzied garden designing, plant-growing and site prep, on April 29 the Price Heritage Garden was planted. Several Utah Valley Chapter members were on hand to help, as well as the Price Chapter and people from the community. We got the 6500-square-foot garden planted in a few hours. Lyle has been watering faithfully but appropriately sparingly and members of the Price Chapter have been holding once-a- week weeding parties. The garden looks great, and next spring, it is going to blow the minds of the local citizenry. It is located just off Carbon Avenue (second Price Exit). Turn left at the exit and proceed about four blocks, past an old school, and turn right on 3rd South. The garden is in the middle of the first block on the right hand side,

behind the old school. We plan a big open house for the one-year anniversary, and will have signage and interpretive materials in place, so put it on your calendar early! For more information about this garden, contact Mike Hubbard at 435-637-4834 or mhubbard@castlenet.com.

In early May perhaps the smallest of the Utah Heritage Gardens was planted in a series of planter boxes in the Atrium at Jackson Elementary School in Salt Lake. This garden features mostly plants that can tolerate some shade, but we are being somewhat experimental. Students at the school helped plant the garden as a break in the standardized testing period. The school is located at 750 West 200 North, a couple of blocks north of the famed Red Iguana restaurant. For more information contact Sharon Kottler-Decker at 533-0271.

We also planted a small Heritage Garden at the Layton Heritage Museum in Layton in May 2000. This 800-square-foot garden will be used in conjunction with educational programs at the museum, located at 403 Wasatch Drive in Layton. Contact Bill Sanders, Museum Director, at 546-8579 for more information. Bill reports that he has already had many positive comments on the garden.

Garden Number Nine was planted in mid-June at the Benson Grist Mill Historic Site, a county park north of Tooele, with the help of Paula Mohadjer and friends from Red Butte Garden. This 1000-square-foot planting represents the first phase of the garden and could blossom into a full-scale restoration. The millsite is on a stream (of course) that could greatly benefit from the attentions of native plant lovers. To get to this garden, take the Tooele offramp from I-80 and turn west onto the Grantsville Highway. The 150-year-old Mill is just a few hundred yards west of the junction on the right hand (north) side. We are especially interested in getting some Tooele County "Gardenin' Angels" to help with the maintenance of this garden. For more information, contact call Museum Director Marilyn Shields at 435-882-7137.

The tenth Utah Heritage Garden was planted in July-August by members of the Mountain Chapter at the city park in Park City This garden is a part of the city's xeriscape demonstration area. Plants for the garden were grown mostly by chapter members, several of whom took part in our propagation workshops last February. This year's 600-square-foot planting represents the first phase of a 1800-square-foot Heritage Garden. Contact Abby Moore (435-649-8859; balsamorhiza@hotmail.com) for more information.

We are exhilarated with the success of the Heritage Garden Program and would like to see it continue to grow. In this second phase of expansion we would like to play more of an advisory role rather than being so directly involved with the hands-on aspects. We would like to organize our members to continue to grow plants for the program as well as to help with gardens in their communities. UNPS will be able to help prospective garden managers obtain plants, and will help with site plans, species selection, and signage and interpretive material. But we will no longer be able to be directly involved with planting and maintenance of new gardens. The program has outgrown our ability to be personally involved with every garden.

We would like to thank the following people and organizations for plants and growing facilities: Janett Warner and Wildland Nursery (www.wildlandnursery.com), Brent Collett and the Thanksgiving Point Production Greenhouses, the USFS Shrub Sciences Laboratory in Provo, Roger Kjelgren and the Center for Water Efficient Landscaping at USU, and Mr. Johnson's Third Grade Class, Wasatch Elementary School.

We are preparing a guidebook for prospective Heritage Garden managers, to be posted on the UNPS website and also available in hardcopy on request. We welcome ideas for new Heritage Gardens, as well as offers to help with existing gardens and any feedback that you have to give. Contact me at 423-2603 or at semeyer@sisna.com.

Shamans vs. Synthetics
Ethnobotany vies to prove its worth in drug discovery

By Steve Bunk

In his new book, Medicine Quest,[1] ethnobotanist Mark J. Plotkin describes a plant that forest dwellers in Suriname, on the northern coast of South America, call nekoe. They crush its stems and sprinkle them on streams to stun fish. The local Maroons, who are descendants of 17th century slaves of the Dutch, claim that tapirs eat nekoe and defecate in streams, then feed on fish that rise to the surface. Plotkin, a Smithsonian Institution research associate and president of the nonprofit Amazon Conservation Team in Arlington, Va., found no corroboration of this observation from Amerindians, who have inhabited the jungle far longer than Maroons. Although he leaves open the question of whether humans learned of the plant's effect on fish from

tapirs, the story exemplifies the detective aspects of his calling.

Once a largely taxonomic exercise, ethnobotany — the study of plant use by local populations — has become a multifaceted discipline that includes a role in the discovery and development of drugs based on plant material. Ethnobotany's emphasis on people also makes it a conservator of traditional knowledge and culture, wellsprings of scientific information that have less-immediate economic value. Its challenge is to secure a funding niche against the competition of synthetic methods of drug discovery, particularly those that employ combinatorial chemistry and genetics.

Of 119 drugs still extracted from higher plants, about 74 percent were discovered by chemists who were attempting to identify substances responsible for the plants' medical uses in humans.[2] Moreover, there are at least 250,000 species of higher plants, and those 119 drugs come from fewer than 90 species. Add to this the virtually untapped resources of marine flora and fauna, terrestrial animals, and microorganisms on land and sea, and you have immeasurable potential for new medications.

Even so, Virginia Polytechnic Institute and State University chemistry professor David G. Kingston comments, "I think it's fair to say competition for the dollar is more severe now than it was five or 10 years ago." Kingston is principal investigator of a long-running medical plant research project in Suriname. Initial funding from 1993-98 was extended to 2003, under a program sponsored by the National Institutes of Health, the National Science Foundation, and the U.S. Agency for International Development.

Multiple Gods

Those agencies have sponsored similar projects in a half-dozen countries, and there are other cases of such research, involving various groups worldwide. Protecting biodiverse regions, creating sustainable economic development, transferring technology, and sharing profits with source countries all may be objectives of these arrangements. One example is an agreement between privately owned Medichem Research of Lemont, Ill., and the Malaysian state of Sarawak to develop anti-AIDS drugs from Calanolides, compounds of the coumarin class found in two species of Calophyllum trees. The joint venture includes a 50-50 stake in all intellectual properties that may arise, plus provision by Medichem of technical expertise, research facilities, and training opportunities to Sarawak scientists.[3]

Kingston says of the Suriname work, "A few of the compounds are still being evaluated by [project partner] Bristol-Myers Squibb, but at this point, my hunch is that none of them will go into production as a drug. On the plus side ... I think it's an economical way for them to get new extracts." Then he adds, "The problem is, it's economical for BMS only because we've got government funding for the collection work."

Two types of collection are being done. Ethnobotanical methods of interviewing traditional healers or shamans are employed under the auspices of Conservation International (CI), a nongovernmental agency based in Washington, D.C. Publicly traded Shaman Pharmaceuticals, San Francisco, which sends botanists and physicians into the field, has perfected this technique in recent years. The more conventional method is bioprospecting, the "random" collection of species with no basis for plant selection, which scientists from the Missouri Botanical Garden of St. Louis conduct in Suriname.

Kingston's team has found little difference in the percentage of bioactive compound "hits" in plants gathered by either method, but he adds, "A lot depends on what you're looking for." For instance, among more than 3,000 plant extracts tested during the project, Virginia Tech screened a dozen known to be locally used for treating malaria. They yielded a bioactive hit rate of 70 percent.

Few Hits

"One of the problems is that discovery rates are so low, it's tough to make statistical comparisons between ethnobotanical methods versus random, high-throughput screening," notes James S. Miller, curator and head of applied research at Missouri Botanical Garden. "The Taxols and vincristines are the Holy Grails, and they're not likely to be found often."

Taxol (paclitaxel, Bristol-Myers Squibb), which treats breast and ovarian cancer, was isolated from yew trees (*Taxus brevifolia*) growing in Washington. The leaves of another yew species (*T. baccata*) have been used in Asiatic Indian medicine for "cancer" treatment.[4] Vincristine (Oncovin, Eli Lilly and Co.) was isolated from the Madagascan rosy periwinkle (*Cantharanthus roseus*), along with another alkaloid, vinblastine (Velban, Eli Lilly and Co.). Several cultures used the plant for diabetes, but the two drugs now fight various tumors.

"Bioprospecting has put a value on studying the forest and a value on traditional knowledge that wasn't there," says Lisa M. Famolare, CI's director of the Guianas Regional Program, which includes Suriname. Yet her business dealings with pharmaceutical companies leave her uncertain whether most of them favor natural product research or synthetic methods in drug development. "In our negotiations, we always get mixed messages."

In the case of the Suriname joint venture, she and colleagues negotiated for years, particularly between the corporate and private sectors, to establish trusting relationships. Last April, CI announced a $15 million endowment from several donors to plan and manage protected areas equaling almost 15 percent of Suriname, which retains more than 90 percent of its original forests.

Looking Far Ahead

Suriname and other countries have realized in recent years that sharing income with their overseas partners from plant collection and subsequent drug development is a long-term goal. In the meantime, ecotourism will be an important part of this new management plan.

Kim Wright, vice president of infectious disease chemistry at Bristol-Myers Squibb's Pharmaceutical Research Institute in Wallingford, Conn., terms the Suriname project "interesting" but acknowledges, "It hasn't led to anything that we would call a developmental candidate." Nevertheless, the company's natural product-based success with Taxol and subsequent promising leads have encouraged continued inclusion of plant materials in its screens, particularly for cancer and infectious disease treatments.

"Is it cost effective?" Wright ponders. "The industry is split — it's hard to say, maybe 50-50 — as to whether natural products research is worth doing." But because of the potential to develop semisynthetic drugs based on compounds found in nature, he believes "natural products could have something of a rebirth."

The value of plant research to drug discovery indeed seems to lie primarily in its ability to uncover novel and complex chemical structures with bioactivity that can serve as scaffolds for building drugs synthetically. Plotkin declares, "Look at Taxol: It has nine chirals in the structure. There isn't a chemist alive who would dream that up."

David J. Newman is a biological chemist in the natural products branch of the National Cancer Institute's developmental therapeutics program, which discovered and initially developed Taxol. He says, "The chances of a natural product ever being a drug again are pretty slim, but the chances of it being a backbone are quite high." For example, parts of a natural structure unessential to the targeted bioactivity may be eliminated, resulting in "synthetics with a natural-product grandfather."

Asserts Newman: "Combinatorial chemistry *de novo* is a bust. Combinatorial chemistry around an active structure is superb." He and colleagues predict that novel bioactive structures will be created synthetically by drawing on genetic information to assemble hybrid biosynthetic pathways from different organisms, a "combinatorial biosynthesis."[4]

Moreover, the development of new screens means that activity can be found in plant material that appeared to be inert under earlier screens. NCI's Natural Products Repository, containing thousands of samples available to outside researchers, is being retested with various new assays. "People are finding bioactive materials in there, and it's the big pharmaceutical companies that are using them," Newman reveals.

He thinks there's a place for ethnobotany in drug discovery. "If you have an overt disease in an indigenous people and

you can see it is being ameliorated, there's no question that this could be an ethnobotanical lead." Plants used by traditional healers to treat fungal infections or suppurating wounds or as abortifacients or contraceptives are all examples of such potential, he says. "But for diseases that are covert, forget it."

Alice M. Clark, director of the National Center for Natural Products Research at the University of Mississippi, is uncertain about the advantages of drug discovery by ethnobotany compared to other methods. "I'm not sure there's been the kind of analysis that could be done," she says. "Certainly, there is evidence that ethnobotany is a successful strategy. Whether it's more or less successful than other strategies ... we have to let the test of time determine that."

"The key point is, we have greater efficiency when we go about this in a multidisciplinary way," she adds. Her center's approach is unique among academic institutions in that it emphasizes the potential agricultural and pharmaceutical applications of bioactive natural products and includes a commitment to eventual commercialization. For example, small plots of medicinal plants are being cultivated to begin determining agronomic practices that will lead to high-quality, reproducible plant material. The center also utilizes an array of bioassays to identify lead compounds for treating various diseases. The most advanced lead thus far is an optimized analogue of an antimalarial agent based on a natural product, for which primate studies are being mounted.

"It's important to remind everyone, scientists and the public alike, that both the positive and negative properties of a compound are related to its chemical structure, and not to its source," Clark notes. "The chemicals we get from nature are still chemicals."

Steve Bunk (sbunk@uswest.net) is a contributing editor for *The Scientist*.

Reprinted with permission from *The Scientist*, 14[14]:8, Jul. 10, 2000. This article is available on the web through the web site of *The Scientist*: http://www.the-scientist.com/yr2000/jul/bunk_p8_000710.html.

References

1. M.J. Plotkin, Medicine Quest, New York, Viking, 2000.

2. N.R. Farnsworth, "The role of ethnopharmacology in drug development," Ciba Foundation Symposia, 154:2-11, 1990.

3. K. ten Kate, A. Wells, "Benefit-sharing case study," submission to the Executive Secretary of the Convention on Biological Diversity by the Royal Botanic Gardens, Kew, 1998.

4. D.J. Newman et al., "The influence of natural products upon drug discovery," Natural Product Reports, 17: 215-34, May 23, 2000.

USDA Helps Restore Land Burned in Los Alamos Fire

EarthVision Environmental News

The US Department of Agriculture has seeded 20,000 acres of the most environmentally sensitive land burned in the Los Alamos area from the Cerro Grande Fire in New Mexico in an attempt to restore the vegetation destroyed by the fire and protect the land with ground cover. The seeding, which was performed from the air, was a cooperative effort performed under the Emergency Watershed Protection (EWP) program said Agriculture Secretary Dan Glickman. USDA's Natural Resources Conservation Service provided $1.2 million in technical and financial assistance, including 750,000 pounds of native grass and small grain seeds, while the Forest Service provided a helicopter and five planes for the seeding.

The effects of the Cerro Grande Fire, which burned 47,650 acres, have increased the potential for storm flow runoff and flooding, particularly in severely burned watersheds. In addition to the aerial seeding effort, more than 250 volunteers from the community have been working to break up the now hydrophobic soil - soil that won't take up water because it is so severely burned. Volunteer crews also are joining several hundred firefighters in rehabilitation activities, including raking, seeding, mulching, placement of log erosion barriers, hazard tree removal and road rehabilitation.

NRCS has also set up a disaster assistance center in Los Alamos to help private landowners, Indian Pueblos, and local governments affected by four major fires, which occurred in the last five weeks. Engineers and conservationists are available to provide technical assistance on erosion control measures and types of vegetation that can be used to

reduce soil erosion and flooding in the aftermath of the fires. The Cerro Grande EWP response team is also conducting workshops on these measures as well as assisting landowners on a walk-in basis at the center.

Waterwise and Wonderful

TreeUtah, Red Butte Garden, the Utah Department of Natural Resources and the Utah Native Plant Society would like to invite you to a free presentation: "Waterwise and Wonderful: A Slide-Illustrated Introduction to Xeriscape" with Jim Knopf, Xeriscape Design Specialist.
Friday, August 25th, 1-4 p.m. at the Utah Department of Natural Resources, 1594 W North Temple

A second presentation will be held Saturday, August 26th, 10 a.m.- 12 p.m. in the classroom at Red Butte Garden, 300 Wakara Way (From downtown head east on 400 South, travel east across 1300 East, and stay on 400 South as it becomes Foothill Drive. Turn left on Wakara Way into Research Park and follow it to the Cottam Visitor Center.)

Friday's presentation at DNR will include Fred Liljegren, Bureau of Reclamation--"Maintenance Issues with Local Waterwise Landscapes" and Roger Kjelgren, Department of Plants and Soils, Utah State University--"Low Water Use Landscapes: Thinking Your Way Through It"

What is Xeriscape and Why does it Matter?

Xeriscapes are landscapes that contain native and carefully-chosen non-native plants that require relatively little watering. Presenter Jim Knopf will demonstrate how Xeriscapes not only conserve our threatened water resources, but also cost less to build and to maintain than "traditional" landscapes.

Mr. Knopf will elaborate on the most important principle of waterwise landscaping: grouping plants of similar water needs together. He will provide examples of successful Xeriscape landscapes in locations such as Colorado, Utah, Arizona, New Mexico, and California. The presentation will make it clear that--despite common misperceptions--Xeriscapes do NOT have to look like deserts. Many are quite lush! Mr. Knopf will explain how by using turf-types such as Buffalograss and Tall Fescue, even lawns can make up parts of a waterwise landscape design: Xeriscape does not mean lawnless--just less lawn.

Because Utah is the second driest state in the nation, is #1 in per capita water use, and has a rapidly growing population, Xeriscape will be critical to our sustainable future. In cities like Las Vegas, the situation has become so serious that water departments are actually paying people to replace their water-hungry lawns with Xeriscapes.

Keynote speaker Jim Knopf is a landscape architect specializing in Rocky Mountain Xeriscape design and a consultant to regional water boards. He lives in Boulder, Colorado, and lectures and teaches classes on Xeriscaping throughout the Rocky Mountain Region. He is the author of The Xeriscape Flower Gardener and Waterwise Landscaping with Trees, Shrubs, and Vines. For information about these books, visit http://www.bookmasters.com/marktplc/00458.htm. Books will be available for purchase at the presentation.

Jim also happens to be a very funny and engaging speaker (think Click and Clack on "Car Talk") so his Waterwise Landscaping presentation is guaranteed to be anything but "dry!"

For Friday's presentation at DNR, speakers Fred Liljegren and Roger Kjelgren will provide local expertise and address important local developments in waterwise landscaping. Mr. Liljegren will discuss waterwise landscape maintenance issues and Mr. Kjelgren will relate recent research with native plants. They will be available to answer your questions about the latest issues surrounding Xeriscape in the state of Utah.

This opportunity to address points and issues and to ask questions will be invaluable. We urge you not to pass up this unique opportunity. Admission to both presentations is free. A regular admission charge applies to visit the gardens at Red Butte.

Please arrive early. Seating is limited and available on a first come, first served basis. If you can make it to the Friday presentation at DNR, we recommend you go to that one because it has twice as much room as the Red Butte Garden classroom. If you have any questions, please contact Alf Seegert at TreeUtah, 364-2122, or email TreeUtah at treeutah@treelink.org.

UNPS SEGO LILY
c/o Jo Stolhand
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, UT 84152-0041

Return Service Requested

Non-Profit Org.
U.S. Postage
PAID
Salt Lake City, Utah
PERMIT No. 327

TreeUtah would like to acknowledge those sponsors who have made this event possible: Red Butte Garden and Arboretum, Utah Department of Natural Resources, Utah Native Plant Society, Bureau of Reclamation, Carol R. Johnson Associates Department of Natural Resources, Division of Water Resources, Department of Environmental Quality, Landmark Design, Larry Collinwood University of Utah -- Facilities Planning --Buildings and Grounds, Utah Community Forest Council, Utah Nursery and Landscape Association, Utah Society for Environmental Education, Utah State University -- Center for Water Efficient Landscaping -- Department of Plants and Soils, Wasatch Shadows Nursery, West Jordan City Wildland Nursery, Zoo Arts and Parks.

For more information about the Utah Native Plant Society please feel free to call:

Bill King	582-0432
Jo Stolhand	521-0069
Susan Garvin (Utah Valley Chapter)	377-5717
Larry and Therese Meyer	272-3275

Or visit our web site at www.unps.org.

Membership Application

❒ New Member ❒ Renewal ❒ Gift

Name _____

Street _____

City/State _____

Zip _____ Phone (____) ____-_____

e-Mail _____

If Gift, From: _____

Check Membership Category Desired

❒ Student	$6.00
❒ Senior	$10.00
❒ Individual	$12.00
❒ Household	$20.00
❒ Sustaining	$35.00
❒ Supporting Organization	$50.00
❒ Corporate	$250.00 and up
❒ Lifetime	$250.00

❒ Please send a complimentary copy of the **Sego Lily** to the above individual.

Please enclose a check, payable to **Utah Native Plant Society,** and send it to:
Membership
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, Utah 84152-0041

If you prefer not to cut this out of your **Sego Lily**, feel free to copy the membership form or simply write the the information down and send it with payment and category of membership.

Sego Lily

Newsletter of the Utah Native Plant Society

VOL. 23 No. 5 **Sept/Oct 2000**

CALENDAR OF EVENTS

Monday, October 16, 7:00 PM	Talk: Butterfly/Plant Relationships in Utah (Basic & Special), Clyde Gillette, Park City Library, room 209, 1255 Park Avenue, Park City. Contact Abby Moore (435) 649-8859 for more information.
Friday, October 20, 6:00 PM potluck 7:00 PM program	**ANNUAL MEETING and NEW WORLD POTLUCK at the Surgarhouse Garden Center.** See page 7 for details. Elaine York and Merry Harrison will be addressing aspects of historical medicinal uses of native plants
Friday, November 10, 7:00 PM	Panayoti Kelaidis, Famed Rock Garden & Plant Expert to Speak at Red Butte Garden. For more information contact: Cynthia Lyman at (801) 581-4938, and see page 6

Check our webpage at www.unps.org
Thanks to XMission for sponsoring our web page.

Native Plant: Medicine and Poison

By Therese and Larry Meyer

False Hellebore, or Corn Lily (*Veratrum californicum* Durand) is an almost ubiquitous plant in Utah, California, and other western states. It is in the Lily Family and is poisonous to both livestock and humans. Although *The Jepson Manual* refers to the alkaloids in *Veratrum* as being used medicinally, most commentaries on the plant refer to its poisonous aspects. According to Welsh *et al.* in *A Utah Flora*: "consumption of this plant by pregnant sheep results in abortion or production of monstrosities." The plant is typically found in meadows and along stream banks in aspen, mixed

conifer and spruce-fir communities between 1830 and 3115 meters (6000 to10,000 feet) elevation. The lily contains the compound cyclopamine, which, when consumed by pregnant sheep, can cause abnormalities in their embryos. These abnormalities often take the form of cyclopia, in which the eyes are fused into one central structure and the remaining facial features and brain are rudimentary. Cyclopia can be caused by genetic defects or by environmental factors. Epidemiological study of sheep herds in Western North America revealed a high incidence of cyclopia in herds that had consumed Corn Lily. A compound in the Corn Lily was then identified that caused the deformities, called cyclopamine. Although cyclopamine had no effect on adult sheep, it consistently caused a cyclops defect in lambs of ewes that fed on False Hellebore.

Perhaps fulfilling the *Jepson* comment on medicinal use, a recent paper in the British journal, *Nature*, describes the results of an investigation into a possible cancer treatment from *Veratrum*. The authors showed they could block the growth of cells like those of basal cell carcinoma, the most common skin cancer. The rationale for the use goes back to basic research on malformed fruit flies, *Drosophila melanogaster*, and on a rare genetic trait in humans that causes both birth defects and hundreds of basal cell skin cancers, Gorlin Syndrome. A single signaling pathway is responsible for the defect in flies and humans, and is disrupted in most skin cancers as well. As with many molecular pathways, the components have curious names: Sonic Hedgehog for the extracellular signal, Patched and Smoothened for the membrane receptors, and Gli for the nuclear activator. Patched mutations cause human Gorlin Syndrome, and Smoothened mutations cause holoprosencephaly (a human cyclops mutation). Most human basal cell cancers have either Patched or Sonic Hedgehog mutations that cause their initiation. The compound from *Veratrum californicum*, cyclopamine, blocks the signal somewhere between Patched-Smoothened at the cell surface, and Gli in the nucleus.

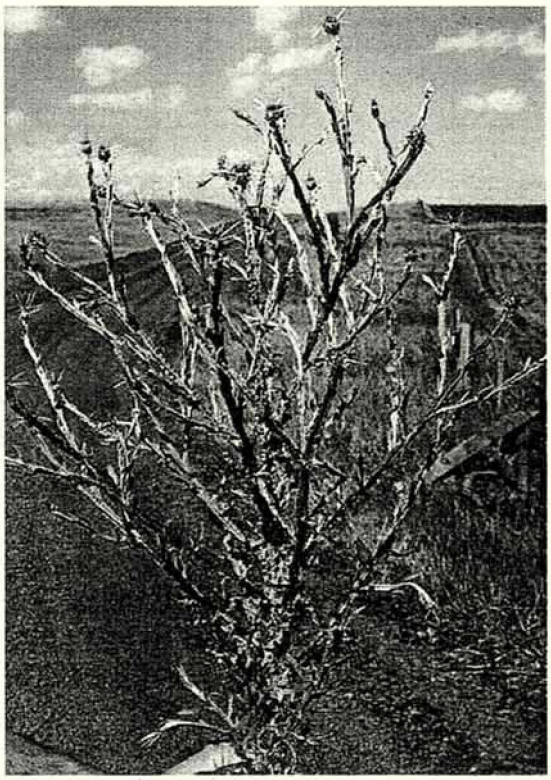
It is too early to know if cyclopamine will work clinically to cure basal cell cancers. It is possible that it could be applied topically, or a derivative compound might work. Most cancers rapidly develop additional mutations to support their growth. It is unclear if blocking the initiation step will stop the growth, or if it would regrow if the application were stopped. Many times when growth of cancer cells is specifically blocked, programmed cell death is initiated, a process called apoptosis, so there is reason to hope. Several labs are actively pursuing cyclopamine as a treatment for basal cell cancer, and it seems likely clinical trials will start soon.

In the meantime, the best way to prevent basal cell cancer is not to rub *Veratrum californicum* on your skin, but to wear a hat while looking for it. It is worth noting that botanists and gardeners have a high incidence of skin cancer, so seek the shade in midday.

Wacky Weed Warriors on the Warpath

Editorial by Susan Garvin

Some of you may be familiar with a non-native annual plant, called Yellow starthistle



(*Centaurea solstitialis*).

It has been declared a noxious weed in nine western states, including Utah, and two western Canadian provinces. This plant has caused millions of dollars of economic damage to pastures and rangelands in California, Oregon, Washington, and Idaho and is invading other western states rapidly. This weed is known to increase in Idaho at the rate of 60% per year. It has been present in California since the gold rush days, where it was accidentally introduced as a contaminant in alfalfa seed. It can grow anywhere cheatgrass (*Bromus tectorum*) can grow and appears to be more competitive in many places.

I was first introduced to this plant late last summer on a weed tour in eastern Washington and western Idaho. I happened to be wearing sandals, and the tour leader tumbled us out of the bus and strode toward a pasture with no warning of what we were headed for. So all of a sudden I was knee-deep in the horrible prickly stuff. It left a lasting impression on me!

Less than a month after my return to Utah, Dea Nelson called to say that Yellow starthistle had been spotted at the base of Battle Creek Canyon, just above Pleasant Grove. I was horrified and hurried over to have a look. Amateur botanist that I am, I couldn't find it and soon became distracted with other concerns. But Phil Allen, knowing of my detestation for the weed, brought up the nasty subject again in July of this year while I was talking to him by cell phone. He said "I happen to be standing in a patch of Yellow starthistle right next to Kiwanis Park."

Young plant

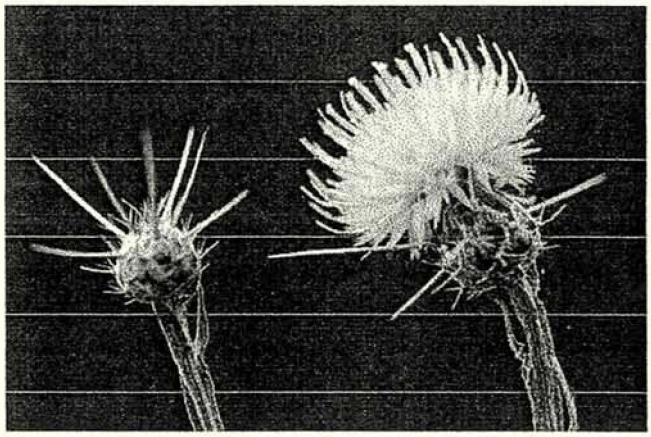
I couldn t ignore it any longer. I got on the phone to Dea Nelson, who got on the phone to Craig Searle, our Utah County Weed Coordinator. He said he knew of it in at least ten patches between Grove Creek and Battle Creek. Knowing how busy Craig is, we decided it was our responsibility as supporters of Utah's native plants to help eradicate this pest from the county before it gets a chance to march up into National Forest in the very area where bighorn sheep were introduced this spring.

We also found out that it has been present in Utah County for at least 10 years, in Highland along the American Fork Creek between two golf courses, on the edges of some very expensive recently developed subdivisions and in an alfalfa field. It appears to be contained there and not invading surrounding neighborhoods.

We think our only course of action is to go after this weed and eliminate it from our county while it is present only in small numbers. This has been a successful approach in Montana, where the herbarium listings for this plant almost always end with the notation: "ERADICATED!" So, three of us went on a search and destroy mission August 24 to the mouth of Battle Creek Canyon. We spent about 40 minutes pulling every plant we could find in the infamous Allen patch (named after our fearless president). Craig Searle agreed to burn the rogued plant material for us so it doesn't have to go to the county landfill. Then I called John Hendrix, the volunteer coordinator for the Pleasant Grove Ranger District to ask for his help on the weed in Highland. He promptly came up with 40 eager BYU honor students, who went out with us on September 9 and pulled everything we could find on the banks and environs of American Fork Creek. Thank you John, the Forest Service, and BYU. We have enlisted the help of a retired rangeland monitor named Bill Losee and a Botany and Range Science Master's degree student named Jeff Ott to help survey the bench above Pleasant Grove. We will know where to send future volunteer crews and where the county weed crews need to spray late next spring. And we have begun to plan for a community education campaign so this horrible pest will be spotted, reported, and eradicated before it can become the bane of hikers, rock climbers, trailriders, mountain bikers, and other nature lovers of our foothills.

Hopefully they will never have to experience, as so many in California and other western states have already experienced, what a nasty weed this is. If we are successful, we would like to extend our campaign into neighboring counties so we can eradicate this weed from the whole state of Utah. Of course, we know that even if we find and pull all of the patches this fall (unlikely), we still have a hard fight ahead of us: 5-10% of the seed can seedbank (live in the soil) for up to 10 years, and it's had 2-10 years to spread its seed already. So it's not a short campaign, it's a war!

THIS WEED HAS THE POTENTIAL TO WIPE OUT MANY OF OUR NATIVE PLANT COMMUNITIES!! I am not exaggerating the competitiveness of this weed. I have seen entire hillsides in the California Coastal Range and western Sierra Nevada foothills where virtually no other species are growing, let alone native species. Huge private acreages that used to support cattle grazing in Idaho have been completely abandoned. Hell's Canyon is a monoculture of this weed in some places. If we want to enjoy our foothills WE MUST ACT NOW! This weed may just be poised, waiting for the right set of weather conditions or a fire on the hills of Pleasant Grove (or Alpine!) or a disease epidemic in Bluebunch Wheatgrass to give it an opening which will allow a population explosion of Yellow Starthistle. Once that happens, it may be too late to stop it. Witness the explosion of Squarrose knapweed (*Centaurea virgata*) that started in Tintic county. This weed is suspected to have been introduced to the area in sheep fleece. It was first collected there in 1954 but may have been present in low numbers for 25 years or more before it started to spread. Now it dominates huge acreages. How many millions of dollars will it take to control knapweed now that it is successfully established and our native sagebrush communities in the Tintic area are decimated? How many millions of dollars will we have to spend fighting fires on that degraded wildland? We dare not wait to ask those questions when a noxious weed is first introduced into our county. Yellow starthistle is the enemy of our foothill plant communities. It's got to go! If you are interested in helping us fight this weed, please call Susan Garvin or Dea Nelson to join the Weed Warrior's Brigade. We can use help in getting the word out to our foothill communities and in grubbing out the nasty villain before it can drop seed. We especially need people willing to learn the habits and masquerades of this outlaw plant and hike the bench above Pleasant Grove to spy out the villain– and help us get it mapped.



Flower

For more information on this desperado, see Steve Dewey's Extension WeedWeb site at http://www.ext.usu.edu/ag/weeds/index.htm. The pictures in this article come from that site. Thanks for the great website, Steve, and Extension Service. Or, search the web using "yellow star thistle" or "yellow starthistle."

Other opinions on this subject expressed eloquently will be published in the next newsletter. Please send to Susan Garvin.

Actions by the UNPS:

Letters Opposing Weeds and Supporting Natives

The following two letters were sent out last month. They are reprinted here so you can follow the actions of the UNPS. If you wish to add your voice to that of the organization, please do so. Even better, you could volunteer to help on the weeds or conservation committee.

Letter to David Gardner,
Utah County Commissioner

From Phil Allen,
President of the Utah County Chapter of the Utah Native Plant Society
Phil_Allen@byu.edu

September 6, 2000
Re: Invasive Plants

The Utah Native Plant Society is dedicated to the understanding, preservation, enjoyment, and responsible use of Utah native plants. We fully endorse efforts to control noxious weeds as well as other exotic invasive plants. In general, our own weed control efforts are coupled with restoration of native plant communities. For example, planting projects in Rock Canyon and along the Bonneville Shoreline Trail will provide enhanced recreational opportunities, improve winter wildlife habitat, and reduce the risks associated with wildfires in the foothills.

During the past two years we have coordinated thousands of volunteer hours at the Rock Canyon Trailhead Park, where weeds are being replaced with native shrubs, grasses, and wildflowers. As a result of these efforts we have become extremely aware of invasive plant species that have potential to dramatically reduce the quality of wildlands in Utah County. These include blue-spurge (*Euphorbia myrsinites*, also called ' donkeytail' spurge), dalmation' toadflax (*Linaria genistifolia*), and salt cedar (*Tamarix chinensis*). Each of these plants has successfully invaded many sites along the Wasatch Front. We believe these weeds should be added to the Utah County Noxious Weed list.

Unlike morning glory and white top, there is still time to contain these weeds before they become a major problem. We pledge our support in educating the public regarding the threat of these weeds and in coordinating efforts of volunteers to assist in their control. Again, urge you to take action that will result in these weeds being added to the Utah County noxious weed list.

Letter to regional Forest Supervisors
From Therese Meyer, Conservation Committee
TMeyer@xmission.com

September 22, 2000

We were glad to learn that he US Department of Agriculture recently seeded 20,000 acres of the most environmentally sensitive land burned in the Los Alamos area from the Cerro Grande Fire in New Mexico with native plant seed, in an attempt to restore the vegetation destroyed by the fire and protect the land with ground cover. USDA's Natural Resources Conservation Service provided $1.2 million in technical and financial assistance, including 750,000 pounds of native grass and small grain seeds, while the Forest Service provided a helicopter and five planes for the seeding.

The recent and ongoing forest fires throughout the west will leave naked devastation in the forests and rangelands. We hope that the Forest Service will use this opportunity to foster and develop a vital native plant seed supply system, so that in the future there will exist a stable, reliable supply of native plant seed for revegetation.

Our organization supports the use of plants native to the area, rather than non-natives, for revegetation efforts. Native plants are more adapted to the vicissitudes of climate change, and are more effective in soil protection. Ecosystems sustaining diverse native species provide better habitat for wildlife. Use of native species such as Indian Ricegrass (*Stipa hymenoides*), Bluebunch Wheatgrass (*Elymus spicatus*), and Great Basin Wildrye (*E. cinereus*), as well as native shrubs and trees, would help restore our rangelands to a more fire resistant condition. We hope that the land and forest management agencies will discontinue use of nonnative species such as Crested Wheatgrass (*Agropyron cristatum*) and Smooth Brome (*Bromus inermis*) in restoration programs.

There exist six Forest Service tree nurseries in the west that could be converted over to grass and forb production. Additionally, private seed collectors and producers should have standing contracts to provide seeds, which could be utilized in other weed control and revegetation efforts (such as cheatgrass control in Nevada) when not needed for fire restoration. Agricultural field production of locally native plant species must be developed in order to produce the quantities needed at an affordable cost.

We urge you to use this opportunity to support and foster a native seed industry for revegetation across the west.

More UNPS Activity:
Conference on Rare Natives

The UNPS is organizing and sponsoring a two-day workshop November 14-15, to review the state lists of rare plants maintained by the Utah Natural Heritage Program and various State and Federal agencies. The workshop is by invitation and is designed to be a working meeting of professionals involved in rare natives. Many of the State and Federal agency botanists will participate, including those from the National Park Service, the Forest Service, the U.S. Fish and Wildlife Service, the Bureau of Land Management, the Natural Heritage Program and other concerned botanists. UNPS will publish a report incorporating the results and recommendations following the workshop.

Famed Rock Garden & Plant Expert to Speak at Red Butte Garden

The Utah Native Plant Society is proud to be cosponsoring a talk by Panayoti Kelaidis, renowned plant explorer and Curator of Plant Collections, Denver Botanic Gardens. The subject of his talk will be "Rock Gardens of the World: Public, Private and Natural" and will be held at Red Butte Gardens, Salt Lake City at 7:00 PM, November 10, 2000. The talk will be $5.00 for UNPS members and other sponsoring organizations and $7.00 for the general public.

While Panayoti studied linguistics and Chinese in graduate school at Cornell University, his life long passion has been for plants. He helped to found the Rocky Mountain Chapter of the American Rock Garden Society in 1976 and he became the Curator of the Rock Alpine Garden, Denver Botanic Garden at its inception in 1980. In 1995, Panayoti took on the additional title at the garden of Coordinator of Plant Evaluations, as such he helped found the highly successful "Plant Select" program which has introduced many new plants to Rocky Mountain gardens. In 1996, he was also placed in charge of the environmental gardens including the Xeriscape.

As a plant explorer, Panayoti has traveled the world over in search of new species suitable for Rocky Mountain gardens. He has spent extensive time in the mountains of Mexico, South America, Europe, South Africa and China. But he has not neglected the nearby Rockies, Uncompaghre Plateau or the Uinta Basin.

Panayoti has also been a very prolific writer, having published over 100 articles. He has written in many garden magazines and journals as well as collaborating on numerous books. He has written on irises, phlox, townsendias, penstemon, ferns, zauschnerias, gentians, cactus, and physarias, just to name some.

Panayoti has won many honors over the years. He has received three awards from the North American Rock Garden Society, as many as any other person. In 1994, he won the Florens DeBevoise Metal from the Garden Club of America. In 1998, he had the distinct honor to present the Anderson Memorial Lecture to the Alpine Garden Society in England. This year he won the Arthur Hoyt Scott Garden and Horticulture Award from Swarthmore College for outstanding national contribution to the science and art of gardening.

Panayoti and his wife Gwen, who has been editor of the Rock Garden Quarterly, have two gardens of their own in Denver. Their gardens have been featured in many articles, including Sunset and the New York Times. As gardeners they make the perfect team with Gwen adding the design elements while Panayoti experiments with species from around the world.

Panayoti is a popular speaker and has given talks world wide. He is known for his entertaining talks and wonderful photography. Few know our gardens and our mountains better then Panayoti. Don't miss out on this opportunity to see one of the brightest stars of the plant world, November 10 at Red Butte Gardens.

Annual Meeting

The annual meeting of the UNPS will be October 20, 2000 at the Sugarhouse Garden Center, 1420 E 1300 South, Salt Lake City. The building is at the northeast corner of Sugarhouse Park. As is traditional, we will combine a potluck dinner, a program and the required business meeting.

The New World Potluck will have a turkey provided. Please bring your choice of New World foods to share, anything from corn chips and salsa to potatoes or pumpkin pie. (Are Coke and Pepsi new world foods too?). Recipes are often exchanged so bring yours. The dinner starts at 6:00, and the meeting starts at 6:45, with the program at 7:00.

The business meeting is usually brief, with a status report and the election of the state board of directors. The slate of nominees for the Board of Directors from the Nominating Committee for the next year is:

Phil Allen * (Utah Valley)
Ben Franklin (Treasurer)
Anthony Frates
Susan Garvin
Kim Harper
Mike Hubbard * (Price)
Bill King
Larry Meyer (President elect)
Susan Meyer (President)
Therese Meyer (Secretary)
Paula Mohadjer
Abby Moore * (Mountain)
Theresa Prendusi
Julie Rotalo
Eugene Schupp
Jo Stolhand
Janett Warner
Mindy Wheeler * (Salt Lake City)

(* indicates chapter presidents of the Utah Valley, Price, Mountain and Salt Lake chapters.) Nominations from the floor will be open, but please make sure your nominee is willing to serve. And yes, you may nominate yourself.

The program will include two guest speakers on Utah native plants, Elaine York and Merry Harrison. Both will be addressing aspects of historical medicinal uses of native plants. This should start at about 7:00, and might involve a second round of dessert.

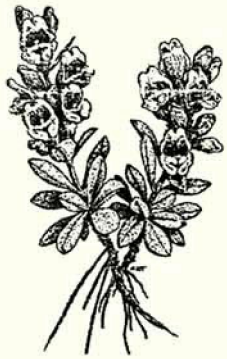
Elaine York has an interesting background with native plants of the Intermountain West. In collaboration with Garrett Herbarium curator, Mike Windham, her work ranged from seed germination of herbarium voucher specimens to protein analysis of Utah's *Lesquerella* species. With a bachelor's degree in Anthropology and master's degree in Biological Education, she has been involved in various aspects of science education at the University of Utah, Red Butte Garden, the Utah Museum of Natural History and in her current position with The Nature Conservancy of Utah. From 1995 to 1997, Elaine and research professor Todd Capson studied the ethnobotany of the Gosiute Indians of the Deep Creek Mountains, Utah. Funded by the Utah Humanities Council, this cultural preservation project recorded the gradually disappearing botanical knowledge of the tribal elders. She will present to our group some of her findings.

Merry Harrison is a trained, clinical herbalist and the owner of Millcreek Herbs. She studied ethnobotany and completed a Master Gardener Program, and then went on to study with Master Herbalist, Michael Moore of the Southwest School of Botanical Medicine. She has been studying prehistoric Utah Native American herb bundles to determine the identity of of the plants they contain. She will present to us her discoveries and comment on possible medicinal uses of the herbs.

UNPS SEGO LILY
c/o Jo Stolhand
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, UT 84152-0041

Return Service Requested

Non-Profit Org.
U.S. Postage
PAID
Salt Lake City, Utah
PERMIT No. 327



For more information about the Utah Native Plant Society please feel free to call:

Bill King	582-0432
Jo Stolhand	521-0069
Susan Garvin (Utah Valley Chapter)	377-5717
Larry and Therese Meyer	272-3275

Or check our website:
www.unps.org
Or write to unps@xmission.com

Membership Application

❒ New Member ❒ Renewal ❒ Gift

Name _____

Street _____

City/State _____

Zip _____ Phone (____) ____-_____

e-Mail _____

If Gift, From: _____

Check Membership Category Desired

❒ Student	$6.00
❒ Senior	$10.00
❒ Individual	$12.00
❒ Household	$20.00
❒ Sustaining	$35.00
❒ Supporting Organization	$50.00
❒ Corporate	$250.00 and up
❒ Lifetime	$250.00

❒ Please send a complimentary copy of the **Sego Lily** to the above individual.

Please enclose a check, payable to **Utah Native Plant Society,** and send it to:
Membership
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, Utah 84152-0041

If you prefer not to cut this out of your **Sego Lily**, feel free to copy the membership form or simply write the the information down and send it with payment and category of membership.

Sego Lily

Newsletter of the Utah Native Plant Society

VOL. 23 No. 6 **Nov/Dec 2000**

CALENDAR OF EVENTS

Tuesdays, January 2nd, January 16th, and January 30th, 7:00-9:00pm	The Price Chapter Native Grasses I.D. Workshops. Price BLM Office, 125 South 600 West. See details page 6.
Saturday Jan. 20, 10am-noon and Thursday, Feb.1 from 12-1:30 PM	Mindy Wheeler, Utah Native Plant Society Heritage Garden program (same talk twice) at Red Butte Gardens Cottam Visitor Center, Wakara Way, University of Utah.
Thursday, February 8, 2001 7:00 PM.	Dr. Dennis M. Bramble: Native Plant Recovery on an Old Homestead in Southern Utah. Cottam Visitor Center, Red Butte Garden. See details page 6.

THE BOTANICAL PARTS OF THE PATTERSON BUNDLE

A Report to the Utah Native Plant Society
By Merry Lycett Harrison, Trained Clinical Herbalist

It is with great pleasure that I present my report to Utah Native Plant Society. After almost 2 years of work, I am able to give to you my findings of the analysis of the botanical parts in the Patterson Bundle. The Bundle was discovered by Margaret and Bryce Patterson buried under a ledge in the Book Cliffs of southern Utah in 1988 and was given to the Bureau of Land Management in Moab for safekeeping. Among the varied contents are smaller bundles of roots and plant parts and basketry materials. I received permission to study the Bundle from BLM district archaeologist, Bruce Louthan, who had already had an article published on the subject in the Fall 1990 issue of *Canyon Legacy*. The grant from UNPS helped support my efforts.

I became interested in doing this study as a result of my experience as an herbalist. When I first spied the grouping of dried roots laid out on a piece of old leather in the back of the display case, I thought the crown of one of them looked like one I am very familiar with and use in my pharmacy, Osha, *Ligusticum porteri* (Umbellifereae). Osha grows above 7,000 feet and I knew it was in the La Sal Mountains next to Moab so it could have been obtained from the area close to where the Bundle was found. As an herbal practitioner, I use Osha to help relieve bronchial problems such as coughs and congestion. Some indigenous cultures consider it sacred and useful in other ways. It is definitely an herb of great importance, potency and usefulness. Looking at this grouping, I wondered if all the plants represented could be of such important medicinal value and, if so, I wanted to try to learn what they were.

Having decided to try to identify the plant parts, I spent a considerable time sitting with the contents of the Bundle just looking at everything. This time gave me an opportunity to make observations that helped bring focus to my study. Although the Bundle has not been attributed to a particular native culture, carbon dating had shown that the leather wrapping was between 200 and 400 years old which would have been during the time of contact with Europeans. I noticed, however, that there was nothing of Anglo nature included in the contents (i.e., no metal, woven fabric or thread). This was one of the reasons that both Bruce and I suspected that the Bundle could be older than thought which piqued my interest even more. We believed that without European influence the contents, context and nature of the Bundle would more accurately represent the culture of the people who made it. Interestingly, BLM recently resubmitted it for carbon dating using a different technique and the results show that it is between 400 and 600 years old.

Another observation I made was that there was nothing exotic among the contents such as macaw feathers or pigments from another part of the world. It appeared that everything, i.e. stones, red ochre, feathers and animal parts and even the leather wrappings, were from materials that could be found locally. These observations led me to think that it was possible that all the plant parts could be found locally as well. Considering that the horse had not yet been introduced, it was reasonable to think that all traveling was still done on foot; therefore, the areas for hunting and gathering would have a limited range. Based on this, I constructed a theory that began with the notion that everything in the Bundle could be found in fifty miles or less from the site where it was discovered. Since the region of possibility included mountains, rivers, deserts and canyons, there were a very large variety of plants that could be gathered from different elevations and bioregions.

Thinking that there must be other such collections in museums in Utah and surrounding states that might offer insight into my study, I contacted them only to learn that they had nothing remotely similar. I was even allowed to examine all the boxes in storage that contained botanical parts at the Edge of the Cedars Museum in Blanding, Utah, but found just the usual pinyon nuts and yucca fiber one would expect. Realizing how unique the Bundle collection is left me awed and a little stymied as to how to proceed. Fortunately, help and direction came from former teachers, Dr. Karen Adams of the Crow Canyon Archaeological Center in Cortez, Colo. and Dr. Enrique Salmon from Ft. Lewis College in Durango, Colo. They advised that initial evaluation should be based on morphology by bringing modern plant material in to visually compare to the contents of the Bundle.

When I began to try to determine what the roots were, I received some suggestions about possible identities, but they did not make sense to me. For example, there is a big, chunky root in the collection that was assumed to be Canaigre, *Rumex hymenosepalus*, "because it was used to tan hides". I investigated how much root it would take to tan a hide and realized that a thumbsized piece would not go very far in the tanning process. It was also thought that some of the roots had to be Rabbitbrush, *Chrysothamnus sp.*, "because the root was known to have been chewed like gum". I asked why the people would go to the trouble to dig up, clean, dry, wrap and bury small amounts of plants that are in abundance all around them all the time. This thought created a doubt that reinforced my idea that the roots were more rare and of greater importance and supported my decision to investigate other possibilities for identification, specifically, to look for roots in the area that were known to have significant medicinal value. I had rejected the idea that the roots in the Bundle might be food because the amount stored was so small. The quantities resembled the amounts I would use as an herbal practitioner to treat an ailment.

Making sense of the roots seemed like a formidable task at first because there were so many parts and pieces. I took my time to look very carefully and realized that in some cases what looked like many roots was actually a couple of roots cut into thirds or quarters. I could place the parts end to end and see how the pieces fit. It is remarkable how clean and exquisitely preserved these roots are as a result of the carefulness with which they were dug, handled and stored.

The method I used to identify the roots was to visually compare a modern root with an old one from the Bundle under a microscope. To do this, I had to create my own herbarium because most herbarium specimens do not have roots attached. This meant that I had to go out in the field, find the plant, dig it up, clean it, dry it and bring it into the BLM office where the Bundle is stored. This was very time consuming and at times discouraging. Imagine how I felt after spending the day looking

for *Rudbekia laciniata, which only grows in one small place in the state,* but then discover that it was not a match.

It has been a journey to get to this point in that the discovery unfolded slowly, one step at a time. It was not until I reached a destination that I knew where to go next and there were many times I thought I was at a dead end. Every time, however, a green light would eventually flicker and I would be off to the field, herbarium or library to investigate yet another idea or possibility. I had help and encouragement along the way from those already mentioned and Daryl Trotter, botanist for the BLM, Dr. Stanley Welsh and Dr. Duane Atwood of Brigham Young University, Bill King and UNPS, people at the Natural History Museum and Edge of the Cedars Museum, Margaret Patterson, Liz Montague, Sara Finnegan and others.

The following is the inventory of my findings of the plant parts in or associated with the Patterson Bundle. The item numbers represent those assigned by the BLM to every item in the Bundle. I have separated the list into 5 categories: Herbs, Basketry Materials, Necklace and Trim, Wrapping and Miscellaneous.

HERBS

Item #8- This is the largest grouping of an assortment of plant materials and, although there are many pieces, it turns out to have four plants represented: three roots and a leaf. They are wrapped together in one piece of leather and a small stone blade is with them.

1) Osha, *Ligusticum porteri,* (Umbelliferae)
   Medicinal Value- Just the smell of an Osha root tells you that this plant has much to offer. It is commonly given to help relieve respiratory problems brought on by the cold or flu. It has mild antiviral and antimicrobial properties. Osha has many other applications and uses and is considered sacred by some indigenous cultures. The inclusion of a small stone blade with this grouping might suggest that the roots and leaf were scraped to create smaller pieces that could be ingested or used in an infusion.
2) Pleurisy Root, Butterflyweed, *Asclepias tuberosa* (Asclepiadaceae).
   Medicinal Value- This is a powerful plant that is often used in cough remedies as an expectorant. It is also muscarinic, meaning that it can cause cardiac inhibition, vasodilatation, gastrointestinal stimulation and other parasympathetic effects.
3) Arrowleaf Balsamroot, *Balsamorhiza sagittata* (Compositae)
   Medicinal Value- This is a thumbsized piece which includes the crown. Dr. Welsh confirmed that it was Balsamroot. Michael Moore likened the usefulness of Balsamroot to that of *Echinacea sp.* from the Plains. It is an immunostimulant and inhibits respiratory viruses.
4) Yucca leaf, *Yucca sp.* (Agavaceae)-
   Medicinal Value- Dr. Welsh identified this as the base of a yucca leaf. Yucca root is used to relieve arthritis. Recent studies of some species show antiviral and antimicrobial actions.

Item #3- Pleurisy Root, Butterflyweed, *Asclepias tuberosa*

This leather wrapping contains the tops of two of the same kinds of roots.

Item #9- Balsamroot, *Balsamorhiza sagittata*

This small, fringed pouch contains small pieces of the big Balsamroot. These fit like puzzle pieces to the bottom of the big root in Item #8. Why these fragments were stored separately from the mother root is a mystery.

Item #2- Stream Orchid, Helleborine, *Epipactis gigantea,* (Orchidaceae)

This clump of multiple roots is stored in what looks like the heal of a worn out moccasin. This was one of the most difficult ones to determine but, after examining many possibilities, I believe these roots most closely resemble the Stream Orchid. It is another powerful herb that has many uses, i.e., for tachycardia, migraines and poison ivy, to name a few. Michael Moore recommends using it in place of the rare Lady Slipper, *Cypripedium sp.*, also from the Orchid family.

All of these plants I have discussed are available within the close region I described. Most would have to be harvested at certain times of the year when they were available and the people were in the area where they grew, such as during a summertime hunting expedition in the mountains. It has been very exciting to discover that these few plants represent the most potent and effective plant medicine that the area has to offer.

BASKETRY MATERIALS

There are four circles of uniformly stripped lengths of bark.

Item #53- Sumach, *Rhus trilobata,* (Anacardiaceae)

Items #52, #54, and #55- Willow, *Salix sp.*, (Salicaceae)

Some possibilities are: *Salix amygdaloides, S. eriocephala, S. interior, S.lucida.*

NECKLACE AND TRIM

Juniperus sp.

Exquisite handwork created these fragile and beautiful pieces that include juniper seeds along with bone, sinew and leather. The seeds have been drilled to allow them to be strung.

PRESERVATIVE WRAPPING

Juniperus sp.

Margaret Patterson who found the Bundle reported that when she unearthed it she had to dig through considerable juniper bark that had lined the pit it was in. It is presumed that the juniper bark acted as an effective repellent to bugs and organisms that could destroy the contents since they are still so beautifully preserved.

MISCELLANEOUS

There are sixteen small plastic bags that contain bits and pieces of what appear to be fragments of the plants already mentioned. They may have broken off from the larger roots over time or as a result of being handled. There is a small twig or branch that was unidentifiable to me and Drs. Welsh and Atwood. There is also a horn spoon with a wooden handle.

It has been such a unique experience to have the opportunity to examine these botanical parts so closely. I feel I have now taken the study as far as possible with my findings on morphological comparison. I can imagine taking it further to have more sophisticated anatomical testing done, especially on the *Epipactis* and *Yucca*. Although I could not predict what herbs I would discover when I started, now that I see the whole picture, it does make very good sense that the biggest medicine of the area would be stored and protected in such a careful manner, especially if it was not easily obtainable throughout the year. I cannot presume to know for what or how these plants were meant to be used, but I can imagine concocting a very effective infusion from what is available here. Either singly or in combination it is reasonable to believe that these herbs could have a significant, positive effect on a very sick person. Even if they were meant to be used ceremonially, they represent powerful healing potential.

In an attempt to understand more about the context of the botanical parts of the Bundle, I brought the animal parts to the University of Utah to be analyzed by Jack Broughton, assistant professor of anthropology, and Dr. Eric Rickart, curator of vertebrates. I had not examined these materials very closely because I did not feel I had the expertise, and I did not want to disturb the contents more than necessary. They determined that the contents of the five small pouches that contained animal body parts were; cottontail rabbit foot bones, a tail of a short-eared owl, a single, headless native trout, a rabbit arm bone, a rabbit leg, the skin of a small mammal, and an unidentifiable body part.

It seems apparent that the entire contents of the Bundle were much more than a stash of extra supplies. It looks to me to be more of an assembly of precious, valuable and important materials of great significance, and I always regarded it in this way. Maybe we can never know the use of the herbs in the Bundle but I think we can surmise that these plants were of special importance to the people who assembled it.

I am greatly appreciative of the grant from UNPS. It seems particularly fitting that the funds from the grant went to research a most unique representation of Utah cultural and botanical history from a time and people about which little is known. Thank you for your support!

Suggested Reading:

Louthan, Bruce D.
Fall 1990 *"The Patterson Bundle: A Pre-horse Ute Subsistence Kit?"*
Canyon Legacy: a Journal of the Dan O'Laurie Museum- Moab, Utah, Number 7. ISSN: 0897-3423

Moore, Michael
1979- *Medicinal Plants of the Mountain West*
and
1989- *Medicinal Plants of the Desert and Canyon West*
Museum of New Mexico Press, Santa Fe, N.M.

Moerman, Daniel E
1998- *Native American Ethnobotany*
ISBN 0-88192-453-9

Yuletide Ramblings of an Ethnobotanist

From *Aquilegia*, the newsletter of the Colorado Native Plant Society, V.23 no.6

Don Hazlett and Clem Atis
Fort Collins Chapter of the Colorado Native Plant Society

It's the holiday season once again! Although our memories of the Thanksgiving *Cucurbita moschata* pie, *Vaccinium macrocarpon* sauce, *Dioscorea trifida* and *Ipomoea batatas* tubers are still with us, we have begun to focus more on the traditional plants and plant products of Christmas. Clem will soon risk a hike in the mountains (or in a Safeway parking lot) to find a sapling of *Picea*, *Abies* or *Pseudotsuga* for us to decorate. We plan to deck the halls with boughs of *Ilex quercifolia* and hang an *Arcuethobioun* sprig over the door. If it gets real cold, we could roast *Castaneaea sativa* seeds over an open fire. Aunt Eneria will probably mail us her traditional box of candied *Phoenix dactylifera* fruits from California. We'll both go to the nursery to get a *Poinsettia pulcilerrima* plant, maybe the variety with mauve-colored upper leaves? We will make the traditional *Zea mays* tamales flavored with *Pimenta dioica*, *Piper nigrum* and cooked in *Musa* leaves. In case the holiday doldrums set in, we have a bottle of *Hypericum perforatum* handy. If indigestion is a problem we have *Matricaria recutita* and *Mentha piperita* tea available. It we have heartburn, there is *Carica papaya* and *Ananas comosus* in the refrigerator. To stay up until the kids are in bed on the 24th we will need plenty of *Coffea arabica*. And we still are not too sure how many *Zingiber officinale* cookies Santa can eat? Finally, since it's our turn to host the New Year's Eve party, Clem will get the egg nog and I will get the ground *Myristica fragrans* seeds and, perhaps, also a few dried red arils of *Bixa orellana* to sprinkle on top.

Happy Holidays!
Don Hazlett and Clement (Clem) Atis,

Arabidopsis thaliana: First Plant Genome Deciphered

The first plant genome has now been completely decoded. This has been hailed as a breakthrough that will improve our ability to grow food and identify new drugs. *Arabidopsis thaliana*, known to gardeners as the weed, thale cress, now joins fruitflies, a worm, 600 viruses and several bacteria as organisms for which we know the genetic blueprints. The genetic code was published in Nature, 14 Dec. 2000, Vol. 408 no. 6814.

Arabidopsis thaliana, close relative of broccoli and cabbage, was selected as the study plant because it is small and simple, grows well in the laboratory, and can produce up to eight generations per year. It has been the study plant in developmental biology of plants for years, so much is already known about its genetics and biology.

Scientists predict that with the genome in hand, genetic modification of crops will become more refined, precise, predictable, and controllable. Opponents of genetic engineering may be assuaged if the breeding of new crops is more precise and predictable. One of their fears has been that blindly tinkering with crops' genetics may result in unforeseen modifications that could have health or environmental consequences.

The *Arabidopsis thaliana* genome contains about 26,000 genes, twice as many as the fruitfly. This is clearly a surprise to the animal-centric biologists who assumed the nervous system would give animals a larger genome than plants. Researchers also found that about 100 of the plant's genes are closely related to human disease genes involved in deafness, blindness and cancer. So far, the scientists know only what about 10 percent of the plant's genes do. It does seem to have a smaller genome than humans do, who have about 100,000 genes (estimates range from 50,00 to 180,000).

Flowering plants are thought to have had their origins about 200 million years ago. In evolutionary terms, this means flowering plants are more closely related to each other than mammals as a group. It seems likely that the same basic organization and genetic tool kit will be recapitulated in plants from the diminutive A. *thaliana* to flowering trees.

Statewide News

Price Chapter:
The Price Chapter will be holding four Tuesday evening workshops (7:00-9:00 PM) at the BLM office in Price (125 South 600 West) to learn how to key out and field identify native grasses. Each workshop will build on the knowledge gained from the previous ones and will emphasize different tribes. DATES: December 12th, January 2nd, January 16th, and January 30th. For additional information please contact: Mike Hubbard e-mail: mhubbard@castlenet.com . Evening Phone Number: (435) 637-4834

Salt Lake Chapter:
Mindy Wheeler will give a talk on the Utah Native Plant Society Heritage Garden program (same talk twice) at Red Butte Gardens Cottam Visitor Center. The dates are Saturday Jan. 20, 10 AM-noon, and Thursday, Feb.1 from 12-1:30 PM.

Dennis M. Bramble to speak Feb 8, 2001:
Dr. Dennis M. Bramble will give a talk titled: Native Plant Recovery on an Old Homestead in Southern Utah Thursday, February 8, 2001, 7:00 PM, Cottam Visitor Center, Red Butte Garden,Wakara Way, University of Utah. Admission is free. Dr. Bramble is Professor and Deputy Chair of Biology at the University of Utah. His name will probably be more familiar to those with interests in the animal rather than plant kingdom. Though originally trained as a paleontologist, Dr. Bramble's research has concentrated on the functional anatomy and physiology of animal locomotion, including the mechanisms by which running mammals synchronize their breathing and stride cycles. More recently, he has been investigating the anatomical basis of human endurance running and what it may tell us about human evolution. This work will be featured in a forthcoming episode of the PBS television series, NOVA.
Although animal physiology has been his vocation, Dr. Bramble has a developing interest in botany, specifically in native Utah plants. On the land that he and his wife acquired in Garfield County nearly a decade ago, they have initiated a passive revegetation program in which the manipulation of cattle grazing has played a central role. The project has enabled them to observe plant species succession, the impact of various types of grazing, patterns of soil erosion and stabilization, and changes in local ecosystem health. In this presentation, Dr. Bramble will share some of his observations and thoughts concerning the preservation and restoration of native Utah plants as well as the growing importance of small rural landholders to this process.

Statewide:
Utah Native Plant Society **Annual Members Meeting** was held October 20, 2000, at the Sugarhouse Garden Center. Jo Stolhand cooked a turkey, and everyone else brought side dishes on the traditional theme "new-world foods". Everything was delicious. We were fortunate to have two guest speakers both on the topic of indigenous North American's use of native plants. Elaine York gave a slide show about her study withTodd Capson on the ethnobotany of the Gosiute Indians of the Deep Creek Mountains. Merry Harrison gave her report on the herbal bundle project (see her report this issue). We elected a slate of Board Members, as posted in the last newsletter.

The Rare Plant Workshop, November 14-15, 2000, sponsored by our Society, was a big success. Approximately 30 state and federal botanists attended and managed to go through lists of 650 species and subspecies of rare plants in the state. Utah Natural Heritage Program will be compiling the results for use by various agencies. The attendees requested that we continue to organize an annual meeting of this type, perhaps expanded with presentations, and open to the members and public.

Chestnuts may roast again.

American chestnut trees were once a common shade tree throughout the Eastern U.S. Older specimens grew to heights of 100 feet tall. A favorite Christmas carol extols the pleasure of roasting the tasty nuts. In 1904, however, a fungal pathogen was introduced from Asia that proved to be lethal to the stately trees. After thriving on this continent for more than 40 million years, the trees were virtually exterminated within 50 years.

Many of the chestnut trees surviving today are sprouts from the old stumps, but they never get larger than 40 feet. Scientists are hoping to restore the chestnut forests with new strains of trees developed by introducing resistance genes from Europe and Asia. For 30 years, Sandra Anagnostakis and her colleagues at the Connecticut Agricultural Experiment Station have crossbred American chestnut trees with the resistant species,

and hope to see blight resistant trees filling the forests over the next 10 years.

Why Weeds are Weedy:
Invasive plant study by University of Montana Researchers

Review by T. Meyer

Nonnative invasive plants threaten agricultural and natural landscapes throughout the world. In Utah, we are experiencing invasions by such plant species as cheatgrass, dire's woad, whitetop, several knapweed species, and recently detected starthistle. Invading plant species have been thought to succeed because they have escaped their natural enemies, freeing them to express their full competitive potential. A new study on *Centaurea diffusa* (diffuse knapweed) by Ragan Callaway and Erik Aschehoug (Science Vol 290, 20 October 2000).suggested otherwise.

In cultivation experiments with knapweed and bunch grasses, the Montana authors found that *Centaurea diffusa* grown in common gardens with North American bunchgrasses significantly reduced the growth of the bunchgrasses as compared with common gardens with Eurasian bunchgrasses that coexist with *C. diffusa* in their natural setting. *C. diffusa* had a much stronger negative effect on North American species than it had on Eurasian species. The biomass of North American species decreased 85.7 ± 0.3% when grown with *C. diffusa,* compared to a biomass decrease of only 50.0 ± 4.7% of Eurasian grasses grown with *C. diffusa.* Correspondingly, the North American grasses had no significant competitive effect on the biomass of the *C. diffusa*, but the Eurasian grasses did significantly reduce the biomass of *C. diffusa.* Evidently, the Eurasian grasses have evolved weaponry in the arms race of competition that the American grasses have not yet chanced upon.

To further test and measure the effect, the authors used phosphorus (a mineral plant nutrient taken up through the roots) in a radioactive form (^{32}P) that can be tracked and measured, in uptake analysis. ^{32}P uptake followed the same patterns as the biomass analysis.

The explanation for the differences in the competitive relationships between the knapweed and the two suites of grasses may lie in chemical effects in the root zone. The authors mixed activated carbon with the soil mix for two sets of experiments. Activated carbon adsorbs chemicals in the soil solution. In the carbon soils, the North American grasses had significantly greater biomass and the *C. diffusa* had lower biomass than in the non-carbon soils, suggesting that some toxic exudate from the *C. diffusa* was responsible for the decrease in biomass of North American species without carbon soils. In contrast, Eurasian grasses grown with *C. diffusa* in soils containing activated carbon had reduced biomass, and the *C. diffusa* had increased biomass as compared to the non-carbon soil, further supporting the theory that the Eurasian grasses were exuding a chemical into the soil to counteract exudates from *C. diffusa.* The evolutionary "arms race" in Eurasia had selected for grasses that could produce exudates that allowed them to reassert themselves in the species mix.

The phenomenon of one plant suppressing the growth of another species due to the release of toxic substances is termed "allelopathy". Allelopathy seems to be a major component of plant competitiveness, and may be responsible for much of the invasive nature of exotic plants.

Wild Seed Poachers Hit Hanford National Monument.

December 8, 2000, Environmental News Service

Federal law enforcement officers have uncovered an illegal harvest of sagebrush seed on the Hanford Reach National Monument Saddle Mountain National Wildlife Refuge, located in south central Washington. U.S. Fish and Wildlife Service (USFWS) officers encountered individuals in the process of harvesting seed on Monument lands, then traced the activity to a local contractor and seed company. No arrests have yet been made. The investigation is continuing, with leads being pursued on other public and private lands region wide.

Disturbing or removing plants, animal, minerals, and cultural and historic artifacts is prohibited on public land. Violators may receive fines up to $5000.00 and/or six months in jail. Large wildfires across shrub-steppe habitats and subsequent vegetation replanting needs have prompted increased demand for native seed throughout the western U.S. "Native seed is a hot commodity in the marketplace right now," said FWS biologist Heidi

UNPS SEGO LILY
c/o Jo Stolhand
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, UT 84152-0041

Non-Profit Org.
U.S. Postage
PAID
Salt Lake City, Utah
PERMIT No. 327

Return Service Requested

Brunkal. "However, if the seed is not collected under the right circumstances with proper technique, it will not germinate. As a result of this illegal operation, many healthy sagebrush plants were damaged and much of the harvested seed is unusable." About 1,500 pounds of illegally harvested seed have been recovered so far. Any salvageable seed will be used in future vegetation restoration projects. The Monument consists of about 195,000 acres of the Department of Energy's Hanford Site, and includes some of largest remaining undisturbed shrub-steppe habitats in the Columbia Basin. The U.S. Fish and Wildlife Service manages the majority of the Monument under agreement with the Department of Energy.

For more information about the Utah Native Plant Society please feel free to call:

Bill King	582-0432
Jo Stolhand	521-0069
Susan Garvin (Utah Valley Chapter)	377-5717
Larry and Therese Meyer	272-3275

Or check our website:
www.unps.org
Or write to unps@xmission.com

Membership Application

☐ New Member ☐ Renewal ☐ Gift

Name _____

Street _____

City/State _____

Zip _____ Phone (____) ____-_____

e-Mail _____

If Gift, From: _____

Check Membership Category Desired

☐ Student	$6.00
☐ Senior	$10.00
☐ Individual	$12.00
☐ Household	$20.00
☐ Sustaining	$35.00
☐ Supporting Organization	$50.00
☐ Corporate	$250.00 and up
☐ Lifetime	$250.00

☐ Please send a complimentary copy of the **Sego Lily** to the above individual.

Please enclose a check, payable to **Utah Native Plant Society,** and send it to:
Membership
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, Utah 84152-0041

If you prefer not to cut this out of your **Sego Lily**, feel free to copy the membership form or simply write the the information down and send it with payment and category of membership.