VOL.18 NO. 1 **JAN / FEB 1995**

CALENDAR OF EVENTS

Jan	**Salt Lake and Cache Chapter Meetings** will be announced in mailings.
Feb	**Salt Lake and Cache Chapter Meetings** will be announced in mailings
Jan- Feb 26	Utah Museum of Natural History is presenting their winter exhibit, **Wild Expressions.** Call 581-4303 for hours and admission information.
Jan 25 Wednesday 7:00 p.m.	Red Butte Garden Lecture Series **"Deserts of North America: Yesterday, Today and Tomorrow"** More information inside
Feb 22 Wednesday 7:00 p.m.	Red Butte Garden Lecture Series **"In Pursuit of Immortality: The Bristlecone Pine"**. More information inside.
Mar 22 Wednesday 7:00 p.m.	Red Butte Garden Lecture Series **"Ethnobotany: From Tropical Treetops to Desert Floors"**. More information inside.

Conservation education and horticulture opportunities! Participate in a professional training seminar to become a docent or horticultural aide at Red Butte Garden and Arboretum. Volunteers are also needed in the visitor center, office and gift shop. Call Susan at 585-5688.

EVER GREEN

by Pamela M. Poulson

Winter is here. It's cold. We pull on our long-johns or snuggle inside our cozy homes, while outdoors plants and animals settle into their individual adaptations to winter. For the next several weeks, plants and animals must survive a period of subfreezing temperatures and desiccating winds. The water based life of this planet is not designed to survive these harsh conditions. When temperatures drop, water freezes. Life giving liquid water becomes cell destroying, daggers of ice. Moving from the warm days of summer into the cold days of winter presents probably the most extreme hardship of survival for living organisms, yet through the ages of evolution, plants and animals have adapted to its rigors.

Some organisms avoid the cold; others tolerate the cold. Many birds follow the sun southward to warmer climes, while others remain behind and develop the insulating fluff of winter plumage. Warm blooded mammals migrate to lower, warmer elevations or grow thicker coats and burrow deeper into the protective mantle of mother earth. A few insects migrate south while most tolerate winter at home. They pupate or lay eggs that survive the cold in tree litter or underground. Wasps and hornets leave a single fertile queen to wait out the winter in the cavity of a rotting log.

Meanwhile, the lush green vegetation that sustained the animal kingdom is withered and dry. Many trees have lost their leaves with the shortening of days and appear lifeless in their dormant winter respite. They await the return of the sun and the warm days of spring, when buds will once again burst forth with the energy of stored sugars and starches, and the miracle of photosynthesis will begin again.

For the most part then, winter is quiet, cold and grey. Yet the stark landscape of winter is punctuated with a rich surviving greenness. Here and there, among "lifeless" other plants, photosynthesis continues year-round, for that green among the grey is the ancient symbol of life everlasting--the evergreen.

The common evergreens of our north temperate latitudes are the needled evergreens or conifers. Conifer is from the Greek conus, or cone. Conifers then, are cone bearing plants, and most cone bearing plants are the familiar needle bearing pines, firs, spruces, cedars, larches, sequoias and junipers. The order Coniferales consists of nearly 570 species.

The cone is a unique reproductive apparatus that evolved at the height of the dinosaur age around 250 million years ago. Conifers evolved as a succession to the fernlike trees of the Carboniferous coal swamps. The dramatic innovation offered by the cone was that it produced hardier seeds rather than fragile spores, which had dominated the realm of plant reproduction since unicellular algae first appeared in the ocean basins over 200 million years before. Conifers were one more step in the evolutionary advance towards the true flowering plants which dominate the Earth today.

Coniferous forests cover much of the cool temperate latitudes of the northern hemisphere and must endure the hazards of the change of seasons and dry, bitterly cold winters. Global distribution of conifer forests is limited by drought and cold. Forests generally require at least 15 inches of available water annually and a frost free growing season of at least 90 days. Locally, this global effect can be read as timberline. Above and below a mountainside "band" of water and temperature requirements, conifers cannot survive. Lower timberline is marked by deficient moisture. Upper timberline is marked by both cold temperatures and deficient moisture.

In winter not only the air is cold. The ground is frozen, and plants that continue to photosynthesize find soil water is unavailable to them. Like notorious desert dwellers, conifers circumvent this problem by conserving water. The shape of their needles exposes the least possible surface area to evapo-transpiration. Further, conifers actually have made adaptations similar to those of cacti: the needle epidermis is covered with a thick waxy cuticle, the leaf pores (stomata) are sunken below the surface and are fewer and farther between than those on leaves of deciduous trees.

The conifer's drought resistant features evolved during the Permian period, when extensive mountain building brought about drastic drying in continental climates. Coniferous forests once existed farther south and lower in elevation, but as the climate continued to dry, they retreated northward and up the mountainsides, staying with their adapted preference to cooler and wetter conditions. Farther south and in the valleys, savannahs, grasslands, chapparals and deserts replaced them.

Surviving cold and snowload was another adaptation some conifers conquered. Needles developed a single, centrally located vein for water and food transport while the remainder of the needle evolved a network of ducts filled with the antifreeze known as resin. The pyramidal shape of the trees, their slender needles and drooping branches,

developed to accommodate the shedding of snow. The pyramidal profile also allows this north temperate tree to expose the most possible needles to the low sun angle of winter.

In conifers, photosynthesis continues throughout the winter, whenever temperatures are warm enough, sometimes only on the sunny side of the tree. This is often evident as a denser foliage on the south side of the tree. (In dry climates, foliage may be denser on the north side of the tree, due to healthier growth on the shadey side of the tree.) If a conifer needle cannot reach enough light to collect energy for photosynthesis, its chlorophyll dissappates and the needle dies. Older, inner needles discolor and drop off after one to several years during late summer or early fall. Length of needle retention depends on the species. Arborvitae and White Pine lose their needles after only one or two years. Austrian and Scotch Pines retain their needles for three or four years. Spruce and firs retain their needles for several years, but the Great Basin Bristlecone Pine can retain its needles for up to 45 years. Conifers remain "evergreen" throughout the year only because they don't lose all their foliage at one time and usually, needle drop goes unnoticed because new needles conceal old, inside foliage that has died.

Probably the best way to maintain vigorous conifers in the home landscape is to understand them. Remember their long and innovative history of adaptation to the rigors of winter. Imitate their native habitats. Water them and fertilize them. They are living organisms, and of all living organisms they alone stand ever green and tolerate the onslaught of cold, grey winter--head on.

1995 Red Butte Garden Lecture Series

Red Butte Garden and Arboretum at the University of Utah will host a three-part lecture series entitled **"Beauty in the Natural World: Biological Systems Explored."** All three presentations will be held in the second floor visitor lobby of the Red Butte Garden Visitor Center. The 1995 series will feature three pesentations of botany and naturalist topics. Admission is $3.00 or non-members of Red Butte Garden. Garden members are free.

The first presentation, **"Deserts of North America: Yesterday, Today and Tomorrow,"** will be held Wednesday, January 25, 1995, at 7:00 p.m. by Dr. James A. MacMahon, dean of the College of Science at Utah State University, Logan. Dr. MacMahon will address the biological definition of a desert, the kinds of plants and animals that are found in western deserts in the U.S. and the effects a global climate change would have on deserts.

The second lecture, **"In Pusuit of Immortality: The Bristlecone Pine"**, will be held on Wednesday, February 22, at 7:00 p.m. and will be presented by Dr. Ronald M. Lanner, College of Natural Resources, Utah State University. Dr. Lanner will discuss the fascinating and mysterious biological nature of these ancient organism, said to be the oldest living trees on earth.

The final lecture is titled **"Ethnobotany: From Tropical Treetops to Desert Floor"**, will be held on Wednesday, March 22 at 7:00 p.m. Presented by Dr. Paul Cox, Department of Botany, Brigham Young University. Dr. Cox will discuss how ancient peoples depended on plants and animals around them for sustenance, shelter and healing, and address questions regarding how the loss of diversity represented by destruction of desert, forest and tropical habitats will effect modern people.

LIFE IN AN ASPEN GROVE an educational program presented by the Colorado Native Plant Society. Available in slide/cassette or videotape formats. The program includes 80 color slides depicting the varied plant and animal life in an aspen grove. A cassette tape contains the spoken narrative. Alternatively, the program is available as a 27 minute videotape. Accompanying either version is a printed booklet that includes the narrative, an extended text containing additional details, and a glossary of terms used in the program. Slide/tape is $45.50 and videotape is $23.50 which includes postage. Send check or purchase order to:

Aspen Program
Colorado Native Plant Society
PO Box 200
Fort Collins, CO 80522-0200

Try this method for checking out native seed before planting.

Step-By-Step

Testing for Germination

Nancy Bubel

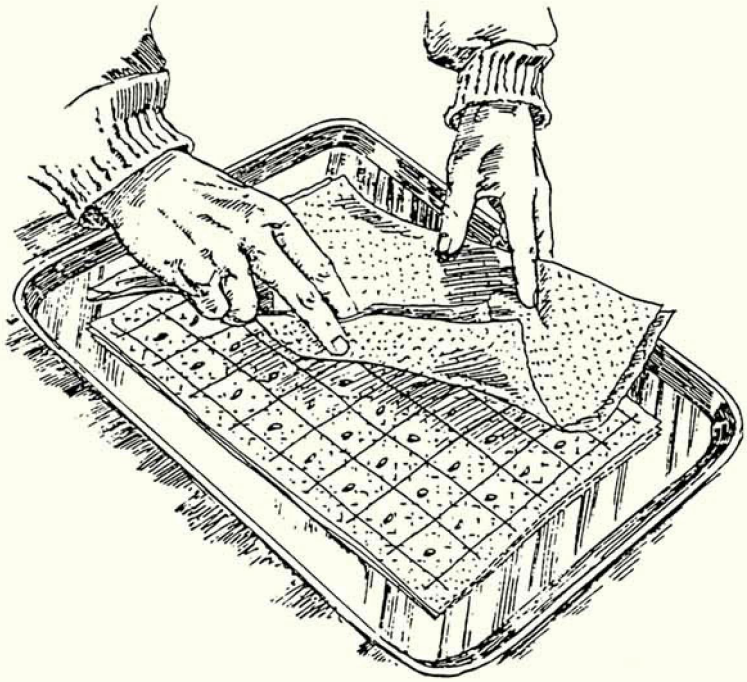
As the sun gradually grows stronger, we gardeners start to shuffle through our packets of seed. Sometimes we find ourselves with leftovers from other years, seeds of flowers, herbs, and vegetables that we never got around to trying. Except for the short-lived seeds of lettuce and parsnips, most year-old seed should still be fine for planting this year--if it has been stored in a cool, dry place. But what about older seeds, the envelopes that get shunted, once again, to the bottom of the pile because you're not sure they're still viable? What about the heirloom seeds you want to plant every few years to keep the strain alive? Or the undated seeds you've received free? With a new growing season quickly approaching, perhaps you would like to give some of these seeds a try.

You can avoid wasting time and garden space in spring (if the seeds are indeed duds) by testing them for germination now, while there's still time to replace them if necessary. Seed with a low germination rate can still produce a worthwhile stand of plants if you sow thickly. The following steps are a homegrown version of the test that seed companies use.

1. PREPARE A MOIST BASE. Professional testers often use a base of super-absorbent felt or blotting paper, but for home testing double layers of paper towels work fine. You'll also find scoring easier if you mark off the paper towel into one-inch squares with a ball-point pen. Then fit the paper towels into the bottom of a shallow pan or cookie sheet. Dampen the towels with warm water until they are moist but not soggy. [A squirt bottle works nicely.]

2. COUNT OUT THE SEEDS. Professionals usually test 100 seeds at a time, but 50 is plenty for the home gardener. If your seed supply is limited, as few as 20 should give you an adequate test, if not a completely accurate one. In any event, a good rule of thumb is to use less than 20 percent of your supply. Remember that it is easier to calculate germination percentages from round numbers. Now, place a seed in the center of each marked square. Seal the remaining seeds in their container or packet, and return them to storage in a cool, dry place.

3. INCUBATE THE SEEDS. For vegetables, herbs, and most flowers, cover the seeds with two layers of damp paper towel or newspaper and slide the whole arrangement into a large plastic bag. Some seeds --mostly flowers, need light to germinate. (For more information, see "The Light Touch," *Horticulture*, Jan., 1988.) Leave these seeds uncovered, and enclose the pan in a clear plastic bag. In either case, seeds need air as well as moisture to germinate, so don't close the bag tightly. Because the most rapid germination occurs when the seeds are in the 70- to 80-degree range, place the bagged tray in a consistently warm place--atop a hot-water heater or refrigerator, near a wood stove, or perhaps on a high shelf near a hot-air vent. For light-sensitive seeds, choose a place where they will receive indirect light, or they will get the life steamed out of them. For slower-germinating seeds, be sure the paper towels remain damp. Gently sprinkle warm water on the paper if it shows signs of drying.



4. CHECK FOR GERMINATION.
Take your first peek at the seeds after two or three days. Most viable seed will germinate within two or three weeks, and some will sprout much sooner. Seeds of plants in the cabbage family will often sprout in two days, cucumbers and zucchini in three or four. Seeds of parsley, carrots and related plants can take up to three weeks to germinate. Zinnias and marigolds are often up within a week; coleus two weeks, dusty miller and astilbe three weeks. Consult the seed-packet or a seed-starting guide so you know what to expect.

If 40 out of 50 seeds sprout, the seeds are definitely worth planting. Even a germination rate of 50 percent means there are still enough viable seeds for a decent stand. Jot down the test date and germination rate on the seed packet or label so you'll remember to plant them more thickly. A germination rate lower than 25 percent of any seed should persuade you to order fresh replacements.

Keep in mind also that these results were obtained under near-ideal conditions. If you have reservations about the germination rate of your seeds after this test you can stack the deck in your favor. Plant the seeds with a heavy hand, use only fine soil, and keep your flats or beds well-watered even before the seedlings appear. In other words, give the seeds every bit of encouragement.

Nancy Bubel's new book, The New Seed Starter's Handbook, published Jan. 88 by Rodale Press, contains complete, general seed-starting directions, as well as specifics for wildflowers, herbs, shrubs, trees, vegetables and garden flowers. A section on saving seed at home is included.

CRONQUIST'S WOODY ASTER -- REDISCOVERED

R. Douglas Stone
Utah Natural Heritage Program

The woody asters (genus ***Xylorhiza***) comprise about eight species of low shrubs with large, daisy-like blossoms. Plants of this genus are found in arid and semi-arid regions of the western United States and northern Mexico. Some of the species are restricted to selenium-bearing clays and are known to accumulate this toxic element in high concentrations. One of the species, Cronquist's woody aster (***X. cronquistii***), is a native of Kane County in south-central Utah. Discovered in June 1975 by Drs. Stan Welsh and Duane Atwood, ***X. cronquistii*** was subsequently lost to science for almost 20 years.

Utah Natural Heritage Program botanist Ben Franklin, in a cooperative effort with the U.S. Bureau of Land Management, searched unsuccessfully for ***Xylorhiza cronquistii*** in May 1989. In June 1990, he was joined by Dr. Atwood, but once again the plant could not be found. Then, in early May 1994, Ben got a phone call from Dr. Tom Watson of the University of Texas at Austin. Dr. Watson, who is working on a revised treatment of the genus ***Xylorhiza***, said that he had relocated ***X. cronquistii*** during the 1993 field season.

Xylorhiza cronquistii
Drawing by Kaye Thorne

On May 14, 1994, I met Dr. Watson at the entrance to Kodachrome Basin State Park. Together we drove east on the unpaved road past the cutoff to The Cockscomb, past Grosvenor Arch, finally reaching the south end of Horse Mountain. The road ascended through piñon-juniper woodland to a point where semi-barren, eroding slopes of the Kaiparowits Formation are visible on both sides. From there, we headed east on foot to the place where Dr. Watson had seen ***Xylorhiza cronquistii***. And there it was!

The species occurred very locally on a steep, southeast-facing slope, and by my estimation there were fewer than 50 plants. Most of the flowers were still in bud stage, but we also found a few heads in full bloom. Associated plant species included ***Atriplex corrugata***, ***A. confertifolia***, ***Zuckia brandegei*** var. ***plummeri***, ***Shepherdia rotundifolia***, ***Stanleya pinnata***, ***Ephedra viridis***, ***Chrysothamnus*** sp., ***Eriogonum microthecum***, ***Amelanchier utahensis***, ***Achnatherum*** (***Stipa***) ***parishii***, ***A.*** (***S.***) ***hymenoides***, and ***Machaeranthera grindelioides***.

Dr. Watson believes that ***Xylorhiza cronquistii*** is a sterile hybrid between ***X. tortifolia*** and ***X. confertifolia***. Both of the suspected parent species are found in the immediate vicinity, ***X. tortifolia*** on the adjoining ridgetop in cobbly loam soils of the Horse Mountain pediment, ***X. confertifolia*** at the base of the slope on heavy clay soils weathered from the Kaiparowits Formation. ***X. cronquistii*** seems to occur only in a narrow band at mid-slope, where the silty clay soils of the Kaiparowits Formation intermix with slope wash from the overlying Horse Mountain pediment. Such restriction of a hybrid population to a transitional habitat or "ecotone" was first recognized and described in a 1948 paper by Edgar Anderson of the Missouri Botanical Garden.

Hybrid plants often exhibit sharply reduced fertility when compared with their parents. Dr. Watson hopes to use this kind of evidence to demonstrate that ***Xylorhiza cronquistii*** is indeed a hybrid. In addition, Therese Meyer of Red Butte Gardens and Arboretum is now conducting germination trials with seeds of ***X. tortifolia***, ***X. confertifolia***, and ***X. cronquistii*** collected at the Horse Mountain site on June 11, 1994 (see Sego Lily, vol. 17, no. 4, July/August 1994). But she reports that the ***X. cronquistii*** seeds appear

unfilled and probably are not viable. (An article on the scope of Therese's studies will appear in the next issue of the Sego Lily.)

The U.S. Fish and Wildlife Service presently considers ***Xylorhiza cronquistii*** a Category 2 candidate for possible listing under the federal Endangered Species Act. However, if ***X. cronquistii*** does prove to be a hybrid, then it would no longer be considered a valid species and thus would not be eligible for protection under this law.

IDAHO PENSTEMON

The genus *Penstemon*, a large genus of the Figwort family (Scrophulariaceae) consisting of approximately 250 species, is one of the largest genera in the Intermountain Region. It ranges beyond our region in North America from Alaska to Guatemala, however, is most abundant in the western United States and exhibits its greatest density in Utah. Several penstemons of the Intermountain Region have localized distributions as the result of restriction to specific substrates; the penstemon discussed in this is article is one of these.

Idaho penstemon (*Penstemon idahoensis* Atwood & Welsh) is a relatively newly recognized species described by Duane Atwood (Regional Botanist, U.S. Forest Service, Region 4) and Stanley L. Welsh (Curator, Brigham Young University Herbarium) in 1988. The first specimens were collected by Duane Atwood and Sherel Goodrich (U.S. Forest Service, Ashley National Forest) in 1982 from two locations along the Goose Creek drainage approximately one mile north of the Utah-Idaho state line in southern Cassia County, Idaho. Subsequent collections all came from that same area of Idaho, until, in 1989, it was collected at a site in Box Elder County, Utah by Ben Franklin (Botanist, Utah Natural Heritage Program). The type specimen is deposited in the herbarium at Brigham Young University.

Idaho penstemon is a perennial herb 8 to 20 centimeters tall with several erect stems; the leaves are simple, oblanceolate to linear shaped, revolute on the edges, and are clustered near the base of the plant and extend up the stem; and the flowers are showy, two lipped (bilabiate), blue to blue purple, and crowded on one side of the stem. The plants are glandular almost throughout and are often observed with soil particles adhering to them.

Idaho penstemon is a local endemic restricted to a small portion of the Goose Creek basin area of Utah and adjacent Idaho near where the boundaries of Utah, Idaho, and Nevada join. In southern Cassia County, Idaho ten populations are known to occur and in immediately adjacent Box Elder County, Utah there is only one. It is to be expected from adjacent Nevada. The greatest distance separating any two populations is 6.5 miles, the total number of individuals for the species is approximately 7,300 plants, and the total estimated acreage for the species is less than forty acres.

Idaho penstemon appears to be edaphically restricted to the distinctive outcroppings of the mostly fine-textured, somewhat hard, white to gray colored tuffaceous sediments of the Salt Lake Formation. This edaphic association appears to be the limiting factor in the geographic distribution of the species. It is adapted to steep, open, naturally disturbed slopes, but does not seem to be restricted to a particular aspect. The outcrops and soils tend to be sparsely vegetated and dry. Where the slopes have been stabilized or the erosion slowed, more vegetation occurs and the species disappears. The elevational range for the species is from approximately 4,900 to 5,700 feet.

Penstemon idahoensis

Plant communities on the sites where Idaho penstemon grows in Utah are dominated by Utah juniper and big sagebrush. Other associated species include black sagebrush, needle-and-thread grass, ballhead gilia, stemless lupine, basin cryptanth, stemless goldenweed, and Sandburg's bluegrass. Idaho penstemon occurs within the range of and on the same substrate as another Category 2 plant, Goose Creek milkvetch (*Astragalus anserinus* Atwood, Goodrich, & Welsh), though they occur only sporadically together. Goose Creek milkvetch seems to prefer more open sites with looser soil at lower elevations.

Reproduction of Idaho penstemon appears to be by sexual means and most likely is open pollinated. Insects are assumed to be the primary pollinators, but no specific pollinator(s) was observed. Anthesis occurs predominantly in June. Mechanisms of seed dispersal are undetermined, although wind dispersion seems most likely. No information is currently available on seed biology.

Threats

Potential threats to Idaho penstemon from man-induced factors are limited to the effects of cattle grazing. The greatest danger appears to be from trampling, either randomly or from proximity to established trails, there is no evidence that Idahoensis Penstemon is utilized for forage by cattle. In Idaho a least four populations are being invaded by leafy spurge which could have serious consequences to a species with apparently low competitive ability, like Idaho penstemon. The restricted geographical range and edaphic specialization of Idaho penstemon are of equal or greater concern than potential threats from land uses.

Due to its restricted habitat, limited distribution, and potential threats, **Penstemon idahoensis** has been designated as a Category 2 candidate for federal listing as an endangered or threatened species. It is also a sensitive plant species for the U.S. Forest Service Region 4 and the Bureau of Land Management in Utah and Idaho.

WHAT IS IN A NAME?

When Linneus developed his sexual system for organizing plants and his nomenclature for specifying a unique entity it was in hopes of not only clarifying a growing mass of knowledge but also to simplify the study of botany. The word binomial has its roots in the latin words *bi* (two) and *nom* (name). Two words make up a latin name for a plant or animal. The first name is the genus and is in noun form. The noun is followed by an adjective or descriptive form and is the species part of the latin name. Many of these adjectives can be divided into groups that describe relationship, size, shape or structure, geology, or geography. Lets take a look at how helpful these descriptive names are in identifying a plant.

Penstemon is a genus well-represented in Utah. Penstemon with a species name describing a relationship to a collector, or a person honored by a taxonomist are probably the least useful descriptive names for the purpose of identification. Does *Penstemon atwoodii* look like Duane Atwood? No. It does denote the botanist who first collected it. There are more than a dozen such species the newest being *Penstemon franklinii* named for Ben Franklin who made the first collection of that particular species. Though many of us would recognize *Penstemon whippleanus* there is nothing in that second name of the binomial which would give us a clue to a defining characteristic of the plant.

A slightly more useful specie category is geographical. In Utah we have *Penstemon* species: *duchesnensis, uintahensis*, and *utahensis*. It is pretty easy to guess where these might be found. Species *pinorum* (pine) and *montanus* (mountain) seem rather straight forward also. The problem here is the plants haven't been fenced into these geographical boundaries and they occasionally stray.

Two *Penstemon* species described by geological adjectives are *ammophilus* (ammo-clay, and philus-loving) and *deustus* (burned), the hot-rock penstemon. In species that are totally restricted to a geological formation the name gives us a lot of information.

A distinctive texture may be used to describe a plant or in the following a lack of texture. The species *laevis* (smooth), *leiophyllus* (leio-smooth,

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and phyllus-leaf) and *subglaborous* (somewhat smooth) all seem to say the same thing. Smooth, but in this instance only a little helpful for distinguishing these from *Penstemon* that are fuzzy, hairy, glandular, anything but smooth.

Species that denote size. At last. We can all tell big from little, and short from tall. So, in the *Penstemon* genus we have the following: *procerus* (tall), *brevicaulis* (brevi-short, and caulis-stem), *humilus* (dwarf), *nanus* (dwarf), and *parvus* (small). We could probaly come up with more dwarfs than Snowwhite, but still size could eliminate a lot of choices.

Another group are the ones defined by a somewhat unique shape or structure. Part of the species name may include a plant structure ie. *phyllus* or *folia* is leaf, *flora* is flower and *caulis* is stem. Thus the specie *pachyphyllus* is a thick-leaved Penstemon, *platyphyllus* is broad-leaved, and *angustifolius* is narrow-leaved. *Rostaflorus* has a beaked flower. *Cyanocaulis* has a bluish stem while *acaulis* has no stem. *Bracteatus* has bracts and *petiolatus* has petioles. Many of these species names you will see again and again with other genera. Learn what they mean once and it will be the same whenever you encounter them again with a new plant.

Sometime while hiking in the outdoors, play the game of naming Penstemons or any other plant. Not their real names as defined in a flora, but latin names you would have given them if you were in charge and seeing them for the first time. What is the most striking characteristic you notice? Can you put that in latin? Don't limit yourself to *speciosus* (beautiful), *elegans* (elegant), and *venustus* (charming).

If playing games is not your style and you really want to key Penstemons, carry along a flora. After an hour spent trying to identify a plant you may find these next two binomials useful: *Penstemon ambiguous* and *Penstemon confusus*.

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VOL. 18 NO. 2 MAR / APR 1995

CALENDAR OF EVENTS

Mar 22 Wednesday 7:30 pm	**Salt Lake Chapter Meeting.** Watch for blue cards to announce the topic for this meeting.
	Cache Chapter Meeting. Watch mail for flyer. New meeting place: Forest Service Office in Lady Bird Park.
Mar 18 10-2:00	**Garden Workday at Pioneer Trail State Park.** We are looking for volunteers to help with planting of native plants. Contact Alyce Hreha (944-2337) if you can help and to find out an exact date of planting.
Apr 22 Saturday 9;00 am - 12:00 am	**Cache Chapter Earth Day.** A day at Golden Spike National Historic Site. Richard Shaw will lead a short interpretive walk. Michael Curto will provide an interpretive walk about the sagebrush steppe focussing on the native grasses along the Big Fill Walk. Everyone is invited.
Apr 26 Wednesday 7:30 pm	**Salt Lake Chapter Meeting.** Watch for blue cards to announce the topic for this meeting.
Apr 28 Friday 10:am	**Arbor Day at Red Butte Garden and Arboretum.** Meet with Governor Leavitt and the poster winner of "Trees are Terrific". Tree planting and other events.
May 12 afternoon	**Celebrate Wildflowers Ceremonies.** Red Butte Garden and Arboretum are sponsoring a poster contest for school children. National Celebrating Wildflowers week is May 21-27.
Apr 29 Saturday 8-12:00 am	**Wildflower Workshop.** "Take Pride in Utah" A how to use wildflowers in your garden workshop sponsored by RBG&A with the Utah Association of Garden Clubs. $5 registration gets you a large packet of materials including posters and seed. Call Pam Poulson (581-3744) for more information.
May	**Threatened and Endangered Fieldtrip.** See article inside newsletter.
Jun 17-20	**Field Botany: Flora of the Tetons.** This class is through the Teton Science School, POB 68, Kelly, WY, 83011. The instructor is Leila Shultz. Call 307-733-4765
Aug 17-19	**Mushroom Hunt 95** at Fishlake. Campground space has been reserved at Doctor Creek Cmpg. More details in next issue.

LYTLE PRESERVE, BIOLOGICAL OASIS

by **Stan Welsh**

Situated within and astride Beaver Dam Wash, seven miles north of Arizona and a mile and a half east of Nevada is a small natural history preserve. Its very setting dictates that it is unique. The wash exits the boundary at the lowest elevation in the state, and is an opening that invites visitors from the south. Northward it drains from the Clover Mountains in Nevada and the Bull Valley Mountains in Utah. North of the latter is the Great Basin. Eastward lie the Beaver Dam Mountains, and beyond them is the Colorado Plateau. The Wash proper is within the Basin and Range, but not in the Great Basin. By its unique position the Wash is influenced by the plants and animals from all of the diverse regions. But it is from the south and southwest that the major influence is felt. In that direction is the Mohave Desert, so named by explorer John Charles Fremont in 1844. He passed across it in springtime before the searing heat of summer made his trip a probable impossibility. Fremont noted its plants and collected many of them, even collaborating in naming them with botanist John Torrey.

Those Mohavean plants, bred to survive extremes of heat and drought, are the ones so impressive at the Lytle Preserve. They appear to sweep like waves across an ocean of dryness from Mexico and Baja through southern California, southern Nevada, and against the barriers of the Colorado Plateau and Great Basin. Few of them surpass those barriers, and travelers from the Great Basin are plunged into an entirely different, even alien, flora as they drop from the passes into the Mohave desert. The desert functions on extremes, temperatures in summer exceeding 110°F, winter temperatures approaching 0°F, great diurnal fluctuations in temperature, huge variations in precipitation amounts. Long periods pass without precipitation, which normally occurs from late summer through early winter. One cannot, however, count on averages. Normal is not average, it is always skewed. Long periods of drought are marked by short periods of intense storms, which cause the sparsely vegetated lands to loose its water quickly through floods of small to large measure. Plants in the region are designed to survive the normal conditions of intense drought coupled with intense heat. To the plants the climatic regime is not harsh; it is normal, and they have a genetic memory that allows them to survive to the next storm, to the next cool period, and which allows them to flower and produce seed for subsequent generations.

Mohavean animals reflect the Mohavean plants; they survive together locked in their mutual needs to survive. The low elevation wash, supplied at intervals with perennial water marked with green of trees, supplies the requirements of migrating birds in several ways. The open wash attract migrants who follow its course, and who find water and shelter along its wooded course. Some of the birds pass through on their way to the Arctic, others travel to intermediate points, but some travel no farther north. They have come from Central America and Mexico to this their northernmost point to next, rear young and return south again early in the season. Vermilion flycatchers nest at the preserve; phainopepla come to feast on mistletoe berries borne by the California mistletoe on catclaw acacias. The mistletoe is classically a parasite, but this one appears to form a more complex relationship with the catclaw, which is found in Utah only in the Wash. Trees infected with the mistletoe are late to leaf out. Those lacking mistletoe leaf out early. Could it be that the mistletoe photosynthesizes sufficiently to support both itself and the acacia early each season?

Other peculiar Mohavean animals are residents in the Wash. Gambel quail come each evening running on wheel-like legs to the blackberry thicket on the preserve, there to roost safely within the spiny bramble. Each morning they flee from the thicket into the surrounding desert. In springtime the females brood their eggs until they hatch into mobile miniatures ready to fly within a few days. They can be seen running through the desert brushlands at any time of the day in small to large flocks. Mohave rattlesnakes thrive on rodents along the Wash; sidewinders occur but are seldom seen. Desert tortoise make their dens along the drainages, feed on the desert vegetation, and live to old age, always vulnerable to badgers, coyotes, and other predators, but especially so to people.

Hollows in cottonwood trees retain water through much of the year and provide miniature rearing ponds for species of mosquitos that are adapted to breed and hatch in them. These breeding chambers are protected from the desiccation general in the desert. Ants abound in the wash. Some of them are the renowned *honeypot* ant, those with workers specialized as storage vessels for nectar. They are filled in times of plenty and the nectar is withdrawn in times of food shortage.

Figs and pomegranates, grown regularly outside in Utah only in Washington County, thrive at the Preserve. They were among the pioneer plantings, and served to make life in a land harsh or humans more bearable. In the intense heat of early August the first crop if figs ripens. Fruit hungry birds eat the large, succulent, sweet blackish fruits as they ripen sequentially on the trees. Some birds merely peck a hole in the side and eat the contents while comfortably perched. The hollowed fig then hangs attached for a while. Prior to dropping to the ground the large wasps known as tarantula hawks find the partially eaten figs, climb into the cavity with wings and abdomen protruding into the air, and clean out the remaining sweet flesh. In some years a species of oriel arrives in concert with the ripening of the figs and remain until the first crop is gone, meantime eating their fill. When figs fall to the ground they are eaten mainly by nocturnal skunks, coyotes, and fox who visit regularly. Pomegranates begin to ripen in late September and become sweeter with each passing day. They are the pale-seeded kind, sweet as honey. Many of the fruits develop cracks exposing the luscious seeds. Birds find them at once, excavate a hole into the mass of fleshy seeds and eat their fill. Finally they excavate the entire center, leaving the empty shell clinging to the tree.

Divided into three main floristic zones, The cottonwood-ash riparian, the catclaw acacia-mistletoe-desert willow terrace, and Joshua-cholla-ambrosia upland, the preserve has immediately juxtaposed, contrasting vegetative types. In the first of these, the riparian zone, the Fremont cottonwood, Arizona ash, and seep willow hod sway along a perennial stream segment. The stream is fed by springs that arise in the valley bottom about two miles above the preserve. It is home to native fish species, among them the Virgin River spinedace, speckled spinedace, and desert sucker. Great blue herons stand 1-legged to fish for these small but edible fish. Away from the stream the habitat becomes dry at once, the uplands are perhaps the driest to be found in the state. It is there that the desert tortoise, coyote, fox, mule deer, bobcat, and occasional cougar rein as the main large animals.

The low-elevation course of the Wash invites the traveler, whether plant, animal, or human. Evidence of early people's use of the land is present along the Wash in numerous location. Fire pits, shards of pottery, chips of stone, mark the places where early peoples rested, prepared food, and lived temporarily through the centuries. Settlers from the modern era followed the wash in search of water and land suitable for farming. Small holdings were cleared and irrigated from the perennial portions of the stream. Crops were raised, families grew to adulthood, and children left to find more viable places to pursue their livelihoods and happiness.

Into the Wash in the late 1870's or early 1880's came Dudley Leavitt, pioneer settler in southern Utah. In 1888 his daughter Hannah Louisa, the polygamous wife of Thomas Sirls Terry arrived with five children. She was pregnant with the sixth, and was trying to escape from persecution of federal officers bent on catching polygamists cohabiting. She had fled from the Enterprise region first to Gunlock and later to Bunkerville. Her final child, a girl, wa born that December in Mesquite. The following year she made her final move, back to the Wash with its groves of trees and their cooling shade, with its flow of clear water, and its solitude away from the persecution. Tom visited her in Mesquite following the final daughter's birth. "What shall we name this child," he asked? "We have been banished. We have been exiled. You will name this child either Banish or Exile," said Hannah! Exile it was, and she was known as Exie throughout her life.

The final move was to the Wash in the summer of 1889, Hannah then 33 with her young family aged 9,8,6,4,3, and half a year. There she fought the water from the creek, planted gardens and orchards, picked fruit and vegetables, milked the cows, and reared her family. She was cook, laundress, seamstress, nurse, teacher, and general factotum. Her husband, five years older than her

father arrived with supplies at irregular intervals. Her extended family were in evidence in Mesquite, Bunkerville, and other places a day or two distant by team and buggy, and they helped her to survive in this desolate, lonely place.

Trees planted by Hannah and her children still grow near where her small log cabin stood, near where her children grew to maturity. One by one the children were married and moved away. In 1911 a huge flood swept across the bottomland, carrying with it Hannah's beloved orchard, row by row in the thrashing chocolate waters. Hannah was desolated to see her cherished trees swept down the channel. In 1912 she was gone, moved to St. George where she spent the remainder of her live.

Ed and Jed Terry, Hannah's two youngest sons stayed on in the Wash until the 1950s. In the late 1920's John Eardley, whose family consisted of his wife and six children, acquired the upper portion of the Terry property, the part that included Hannah"s original homestead. They worked to clear the fields and develop irrigation water. A house was built, well dug, cellar constructed, fields and orchards planted, and the family thrived. Hard work, long hours, sacrifice of personal needs and requirements, were keys to their success. But that family also mature to adults and one by one left the Wash also. By the early 1950's they were all gone. John Eardley then sold his property to Talmage and Eleanor (Marie) Lytle. Marie was related to John's second wife, or at least a friend. Talmage continued to raise crops and run a small cattle operation, but the place required more labor than one man could put forth. Gradually the orchards fell into disrepair, the fields became patches of weeds, the cattle were sold, and Talmage lived in genteel retirement. Marie loved the place, and evidence of her gently hand is still to be seen around the house. In 1984, in May, Marie died in the house constructed more that five decades earlier by the Eardleys.

Now, Talmage had no reason to continue. He sold the property to The Nature Conservancy, who were under contract to Brigham Young University to pay for the property as soon as the sale price could be raised from private sources. In July of 1986 the property passed the University who are the sole owners.

The preserve is a multifaceted place; there is something unique there for everyone who both looks and sees. It is a wild land, a place at the end of the road, a solitary place where one finds solace in contemplation. It is a place of subtle charm and beauty, a place os searing heat in summer, of cold winds in winter, and place of abundant wildflowers in years of adequate moisture. This is such a year.

Facilities at the Lytle Preserve include a campground to accommodate up to 25 people, flush toilets, coldwater showers, excellent drinking water. A bunk house and house trailer for researchers and support personnel, and more the 460 acres of solitude, birds, geology, fantastic vegetation, and scenery.

The preserve welcomes researchers, teachers, students in formal classed, and aficionados of nature generally.

A day use fee of $3.00 per person, and camping fee of $5.00 per night is charged to provide operational monies. A full time operator, Heriberto Madrigal lives year-round at the preserve with his wife Debbie. The place receives heavy use during spring and fall seasons, and reservations should be made early. They can be placed with Terry (801) 378-5052. It is a garbage in, garbage out place.

NORTH AMERICAN
NATIVE ORCHID JOURNAL

published quarterly by the North American Native Orchid Alliance, a group dedicated to the conservation and promotion of our native orchids. The initial issue will be sent in March 1995 and will consist of informative articles, illustrations and orchid news. Contributions are being accepted for all issues. For further information please write to the editor, Paul Martin Brown, 15 Dresden St., Jamaica Plain, MA 02130-4407.

Membership in the North American Native Orchid Alliance, which includes a subscription to the Journal, is $22.00 per year and should be sent to Nancy Webb, 84 Etna Street, Brighton, MA 02135. Membership/Subscriptions received prior to June 1, 1995 will be offered at a special price of only $18.00 for the first year.

W A N T E D

Mountain Lady's Slipper *Cypripedium montanum*

$100 REWARD

(ONE TIME REWARD OFFERED BY THE UTAH ORCHID SOCIETY)

HEIGHT: 1 to 2 ft. FLOWER: 1-3 in the inflorescence; sepals - greenish, suffused with purple; petals - purplish; pouch - white

This wild orchid has occasionally been reported from Utah, but its presence has never been confirmed. It is to be expected in moist mountain areas at moderately high altitudes (9,000 feet), i.e., subalpine slopes, open woodlands and scrub. It flowers from May to July. Expected habitat locations for this orchid are in the Uinta Mountains and perhaps the Bear River Range. If you see this plant please do not collect. Carefully note the location and contact as soon as possible:

Jim Coyner
Utah Orchid Society
(801) 292-4777

UNPS SEGO LILY
c/o Jo Stolhand
Utah Native Plant Society
P.O. Box 520041
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(If you prefer not to cut this out of your **Sego Lily**, feel free to copy the membership form or simply write the information down and mail it with payment for the category of membership.)

Sego Lily

Newsletter of the Utah Native Plant Society

VOL. 18 NO. 3 **MAY / JUN 1995**

CALENDAR OF EVENTS

May 3 Wednesday 7:00 p.m.	Salt Lake Chapter Meeting. The Morels of Utah will be the topic addressed by Dr. Kent McKnight . This will be a joint meeting with the Mushroom Society of Utah. Meet at the Utah Department of Natural Resources, 1636 West North Temple, Salt Lake City. The entrance is on the west side of the building. Note for this time only the meeting time has been changed to 7:00.
May 15-21	Duane Atwood, Forest Service Regional Botanist is leading an interagency fieldtrip in conjunction with the newly organized National Native Plant Conservation Initiative. The schedule is very tight as the group races to see as many plants as possible in southeastern Utah. A limited number of people may join this group. Call Jo Stolhand (521-0069) for a copy of a more complete schedule or Duane Atwood (625-5599) if you are interested in going.
May 20 Saturday all day	Fieldtrip to the Little Sahara (Lyndyll) Sand Dunes with Alyce Hreha and Therese Meyer. We are going to see Giant Fourwing Saltbush, Atriplex canescens var. gigantea and Penstemon angustifolius var. dulcis. Meet at 9:00 am at Sam's Club on State Street near I215 and south of Allied. Call Alyce (944-2337) or Therese (272-3275) for more information. Please bring water and lunches.
May 25-27 Thur-Sat	Threatened and Endangered Fieldtrip will be to the Deep Creek Mountains. Camp will be at the old CCC camp near Callao. We will be looking for Draba kassii (Kass Rockcress) and Hackelia ibapensis.(Deep Creek Stickseed) among other native plants which should be spectacular this time of year. Call Rod Harding, BLM botanist (977-4361) or Dave Okelberry (968-6190) for more information.
Jun 7 Wednesday 7:30 p.m.	Salt Lake Chapter Meeting. Watch for bluecard to announce this meeting.
Jun 16-18	Wild Edible Plants and Medicinal Herbs--a class offered by the Yellowstone Institute. Telephone (307)-344-2294.
June 17-20	Field Botany: Flora of the Tetons. Leila Shultz is the instructor for this popular class offered for college credit through the Teton Science School. Write to Teton Science School, POB 68, Kelly WY, 83011 or telephone (307)-733-4765.

Jul / Aug Saturday	Grasses of the Bear River Range. Fieldtrip led by Michael Curto. The date on this fieldtrip will be set later and announced in the Jul / Aug newsletter.
July 21-22	Wildflowers of Yellowstone--a class offered by the Yellowstone Institute. Telephone (307)-344-2294.
July 28-30	Alpine Wildflower Walks--a class offered by the Yellowstone Institute. Telephone (307)-344-2294.
Aug 17-19	Mushroom Foray 1995 at Fishlake. Campground space has been reserved at Doctor Creek Campground

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MUSHROOM HUNT 1995

The annual mushroom hunt is scheduled for Aug 17-19 at Doctor Creek Campground at Fishlake. The Mushroom society of Utah will be with us and will be in charge of identifying and displaying the mushrooms. Anyone who would like to help with identification and display should call Ardean Watts (581-1931).

The campground has been reserved from 2:00 pm Wed. Aug 16 until 2:00 pm Sunday Aug 20. You can come early and/or stay late to do a little fishing or hiking. Cost for this years foray which includes food and the above campground fees is $15 for members and $25 for non-members. Children under 8 are 1/2 price. There will be sourdough pancakes for breakfast, sandwiches for lunch and dutch oven dinners. Anyone who has (a) special dietary requirements, or (b) would like to make a dutch oven cobbler, or (c) will be there for Thursday breakfast should contact Dave Okelberry (968-6190).

We have a great bunch of mycological experts this year so we hope to have small foray groups. Please make your reservation by July 15 by sending check and reservation form (back cover of Sego Lily) to UNPS, POB 520041, Salt Lake City, UT 84152-0041. Orders for t-shirts must be made by July 15th. Dr Frank Anderson is doing the artwork

THANK YOU

Thank you to Larry Meyer for his help in setting up our computer, his donation of software, and technical expertise.

Two Species of Utah's Hanging Gardens

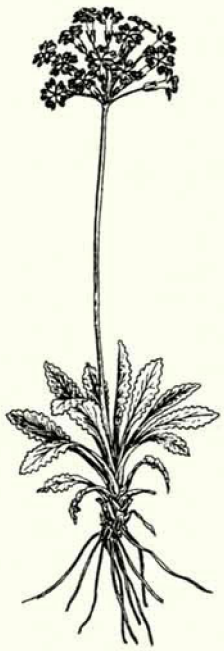
Leila Shultz

Gardens suspended in shaded alcoves of southern Utah harbor a number of rare species. Two provide examples of the different kinds of rare plants occurring in the state--those that are old and those that are new. Many of the species found in hanging gardens are relicts of distributions that were once widespread under wetter climatic regimes. These differ from the "new" species with special characteristics suited for growth in the unique habitats in Utah. Unlike the relicts represented in hanging gardens, the majority of Utah's rare species fit the category of neo-endemic--recently evolved specialists found nowhere else in the world.

Hop-hornbean (*Ostrya knowltonii* Coville), a small tree of the Birch family, is an example of a relictual species. Its distribution is fragmented: scattered populations re restricted to the occasional moist and shaded site. However, this species is widespread along waterways in Arizona, New Mexico, and Texas, where the trees are more robust and grow to a greater height. Because the Utah plants are at the northern limit of the range for the species, individual plants appear to be especially sensitive to changes in climate and by all indications, the distribution for the species is contracting rather than expanding. While this species was once considered for protected status, it is not on a Federal list or the Utah Native Plant society's watch list. Species that are rare at the outer limits of their distribution are of low conservation priority in a state where more than ten percent of its 2500+ species are unique (Shultz 1993).

OSTRYA KNOWLTONII
drawing by Kaye Thorne

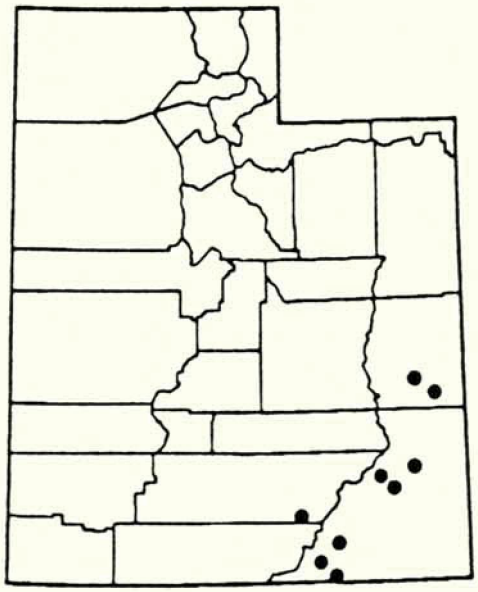
The Canyonlands Easter flower (*Primula specuicola* Rydberg) is representative of the majority of rare species in Utah. This delicate herb is an example of a neo-endemic, one that has evolved in response to recent changes in climatic conditions. Its closest relative is *Primula farinosa* L. of Europe and eastern North America, a plant of alpine habitats in distinct regions. However, the explanation for its presence remains a puzzle. Because of the distinctive habitat of the sibling species and pronounced differences in morphology, one explanation may be that the Canyon primrose is a neo-endemic evolved from a relictual ancestor. With apparent extinctions of ancestral lineages, the reasons for this species presence are difficult to explain.



PRIMULA SPECUICOLA
drawing by Kaye Thorne

In The Field

Hophornbean (*Ostrya knowltonii* Coville) is a slender tree, growing to about 15 ft. in height, in hanging garden habitats along the Colorado River (see map insert, from Albee etal., 1988). The common name refers to the fruit which develops at the end of reddish-brown to gray branches and resembles a common hop. These hop-like structures consist of 1-3 flower clusters (catkins in this case). They are surrounded by large green bracts and appear in early spring. The leaves are entire, alternate, ovate to elliptic, pointed, and about two inches long. The name *Ostrya* comes from the Greek word for 'hard wood'. The species is also known in some areas as ironwood and is named in honor of Frank Hall Knowlton (1860-1926), an American botanist. Hophornbean is an example of a relictual species.



Distribution of *Ostrya knowltonii*

Easter flower (*Primula specuicola* Rydberg) is one of the earliest blooming plants in all the hanging gardens. Lavender flowers set against a rosette of pale green leaves might remind you of an impressionist painting. At the summit of a naked flowering stalk, 10-20 flowers cluster at the ends of spoke-like rays (umbels). Color varies from rose to lavender, or white. One of the most notable features of the plant is the white-luminescent mealy coat (farina) which appears on the undersurface of the leaves and on the sepals which surround the flowers. Calling the plant "Easter Flower", residents of Moab and Bluff know when to seek the delicate flowers and brilliant displays of color along red sandstone cliffs.

If you are hiking in the plateau drainages, look for a fern as an indicator of moist habitats. The common maiden-hair fern (*Adiantum capillus-veneris* L.) grows in virtually all of the hanging gardens of the Colorado River and Virgin River portions of the Colorado Plateaus. In these suspended gardens, seeps nourish masses of summer-blooming perennials such as *Aquilegia micrantha,* Eastwood (a delicate white-flowered Canyonlands columbine), *Mimulus eastwoodiae*, Rydberg (a brilliant red monkey flower), *Habenaria zothecina,* Higgins & Welsh (Alcove Orchid), and *Carex curatorum,* Stacey (a fine leaved sedge which forms graceful arching clumps). Each of these species is rare, presenting special challenges in the study of evolutionary strategies of plants. The wet seeps of the Colorado Plateaus provide cool respite as well as a natural laboratory for studies in plant ecology and evolution.

Colorado Plateau Hanging Garden Endemics

Nancy S. Keate

An important feature of hanging gardens is that they are geomorphic and hydrologic units. Gardens occur in alcoves that have developed in sandstone formations. Two important sandstone units that occur in the Moab area of the Colorado Plateau are the Navajo and Entrada. They are mainly flat lying or gently warped over large areas. Alcove development appears to be principally related to the nature, occurrence, and attitude of these formations. These sandstones are excellent aquifers, yielding water at seeps and springs throughout the region. The recharge potential of these sandstones is high because of their widespread exposure at low dip angles, relatively uniform permeability of the rock, and pervasive fracturing. Small discontinuous bodies of perched groundwater occur throughout the formations. Perched water tables that are associated with alcove development are important in modifying the canyon walls. Furthermore, the evolution of canyon networks in the area is often dependent on sustained seepage at valley headwalls fed by regional aquifers.

The hanging gardens that occupy these alcoves contain various combinations of the endemic species *Aquilegia micrantha, Primula specuicola, Cirsium rydbergii, Habenaria zothecina, Perityle specuicola,* and *Zigadenus vaginatus* .

Zigadenus vaginatus is listed as a separate species by Welsh but is considered to be synonymous with *Z. elegans* by other researchers Welsh maintains that it is related to *Z. elegans* and notes that it occurs in gardens in Grand, San Juan, and Kane counties in Utah.

Habenaria zothecina is listed by Welsh and Albee . Cronquist includes it as synonymous with *H. sparsifolia. H. zothecina* is found in hanging gardens from Arch Canyon, west of Comb Ridge, north to Arches National Park; it is also found on moist stream banks near hanging gardens. It occurs in Emery, Garfield, San Juan, Grand, and Uintah Counties of Utah and in Moffat County, Colorado.

Perityle specuicola is endemic to Grand and San Juan County, Utah. It's southern most occurrence is just north of Dark Canyon in Cataract Canyon. It is known mostly from gardens in the Moab area with the largest population found in Pole Canyon near the Dewey Bridge. It is believed to be related to *P. tenella*, which grows only in Washington County, Utah.

Aquilegia micrantha occurs in most hanging gardens and is found in Emery, Garfield, Grand, Kane, San Juan and Wayne Counties of Utah, as well as in Colorado and Arizona on the Colorado Plateau .

Primula specuicola is found in gardens in Grand, Garfield, Kane, San Juan, and Wayne Counties of Utah, and in northern Arizona. *Mimulus eastwoodiae* occurs in Grand, Kane, and San Juan Counties of Utah and in adjacent areas of northern Arizona

Cirsium rydbergii is distributed in Garfield, Grand, Kane, San Juan, and Wayne Counties of Utah and in the Black Mesa area of Apache County Arizona. It occasionally grows outside the gardens in the adjacent drainages .

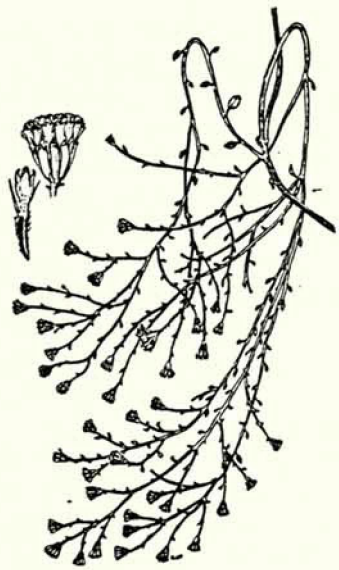
The work I am doing is examining the relationships between the physical structure (the shape and form of the alcoves in which gardens occur), site characteristics (the environmental factors such as soil salinity and aspect) and species composition (species diversity, species richness, species frequency and species similarity) of the hanging gardens of the Colorado Plateau. Relationships will be examined over a spatial hierarchy, i.e., at the microhabitat (plot), local (garden), and regional (Moab region) level. The primary factors that contribute to species composition at all scales will be identified and their importance to species composition will be examined.

HABENARIA ZOTHECINA
drawing by Kaye Thorne

In order to address these hypotheses, field work was conducted in the Moab, Utah area where Navajo and Entrada sandstone occur over wide areas. Consequently, there are numerous and varied hanging gardens. An intensive sample hanging gardens was conducted in July and August of 1994. In each garden, plots were sampled according to a random stratified sampling design. Three endemic species were always sampled if they were present-- *Primula specuicola, Habenaria zothecina,* and *Zigadenus vaginatus.* In each sample plot, all species present were recorded. Soil samples were collected in each plot by sampling the first fifteen centimeters of soil at each corner and at the center of the plot. The soil samples were later analyzed for soil color, soil water salinity, soil water pH, and soil texture by sieving oven dried samples. The aspect of the plot was determined by compass. In each garden, data was recorded on a text form and a schematic drawing of the garden. The depth, width, the aspect of the central axis and each side of the garden, the length of the visible driplines, and the average slope of the colluvial slope were measured.

Preliminary analysis of the data indicates that *Habenaria zothecina* tends to occur in north facing plots where soils have low salinitiy levels. *Zigadenus vaginatus* tends to occur in soils that are predominantly sand. At the garden level, *Habenaria zothecina* and *Zigadenus vaginatus* tend to occur where the exposed seeplines cover most of the perimeter of the wall. *Zigadenus vaginatus* tend to occur in gardens with low average soil salinity and sandy soils. *Habenaria zothecina* tends to occur in gardens that have an overall low light environment and a slightly higher than average pH level. The structure of the garden appears to be important to *Habenaria zothecina* . It often occurs in deep gardens with large overhangs. This would tend to create the low light environment that this species appears to prefer. This is very preliminary analysis. As the investigation proceeds these relationships may become clearer and other relationships may become apparent.

Nancy S. Keate PhD Candidate University of Utah
Geography Department



PERITYLE SPECUICOLA
drawing by Kaye Thorne

WHERE HAVE ALL THE ARIZONA WILLOW'S GONE

Duane Atwood

Arizona willow was proposed for listing as endangered with critical habitat designations by the U.S. Fish and Wildlife Service (FWS) in November 1992. Critical habitat designations included populations on the Springerville Ranger District, Apache-Sitgreaves National Forests (NF) and White Mountain Apache Tribal Lands in east central Arizona. Fish and Wildlife Service was not aware that the species occurred in Utah when the proposed rule was developed. In the spring of 1993, FWS was sued by several Arizona conservation groups because the final rule was not published within the one year time-frame.

In the fall of 1994 the Forest Service (FS) was notified of a previously misidentified herbarium specimen of Arizona willow collected in 1913 on the "Sevier Forest" in southern Utah (now known as the Dixie NF). Efforts were initiated by the author to gather information on both species habitat and identifying characteristics in Arizona. In the spring of 1994, having secured agreement from the White Mountain Apache Tribe and Apache Sitgreaves National Forest, Utah Forest Service personel Ron Rodriguez , Bob Thompson and the author vistied Arizona populations. Upon their return to Utah they rediscovered Arizona willow in Utah on the Dixie NF on June 30. Subsequent Forest Service surveys documented Arizona willow on the Dixie and Fishlake NF's, Cedar Breaks National Monument, and adjacent private land. Three university students were hired and in place by mid June, and they contributed significantly to the new information on the willow in the Dixie NF.

Intermountain Region Forest Service botanist and Dixie NF wildlife biologist immediately notified Fish and Wildlife Service of these new finds which resulted in a hold on the final rule to list the species which was then on the FWS Secretary of the Interior's desk for final signature. Utah populations of Arizona willow on the Dixie NF were in and adjacent to large salvage timber sales currently being harvested and others proposed for sale. Some other populations on the Dixie and Fishlake NFs (discovered August 8) were located in areas with significant impacts from livestock grazing and recreation. Coordination efforts with academia resulted in immediate graduate thesis projects for two students and by late July these students were actively working on thesis projects funded by the Forest Service Regional Office and Dixie National Forest. This research is under the direction of Dr. Kim Harper, Brigham Young University professor.

Additional survey work was completed on the Dixie NF in July. Dr. Robert Dorn (willow expert) was invited to visit Utah populations on July 14-15. An Interagency field tour was scheduled and completed August 10-11, 1994, and the first formal meeting of the Interagency Technical Team for Arizona willow was held in Flagstaff, Arizona August 12.

The FWS discussed their position, specific short and long term actions needed to remove threats to the species, and a December 15 deadline for implementation of short term actions before FWS could agree to move forward with development of a Conservation Agreement and Conservation Strategy. The final listing package or a withdrawl would have to be published by April 30, 1995.

Subsequent meetings with FS Regional Foresters, Forest Supervisors, Directors and technical staff from the Southwestern and Intermountain Regions, resulted in a decision and strategy to move forward with development of the conservation documents, that if completed and signed by April 15 would warrant withdrawl of the proposed rule to list the species.

Completion of the "Conservation Documents" involved coordination with litigants, the judge, the Intermountain and Southwestern Regions of the Forest Service, the Apache-Sitgreaves, Dixie and Fishlake National Forests, regional and state Fish and Wildlife Service offices, National Park Service Rocky Mountain field office and Cedar Breaks National Monument, Arizona and Utah State Fish and Game Departments, the White Mountain Apache Tribe, academia, research, permittees, and other public interests. The Conservation agreement was signed the week of April 3-7.

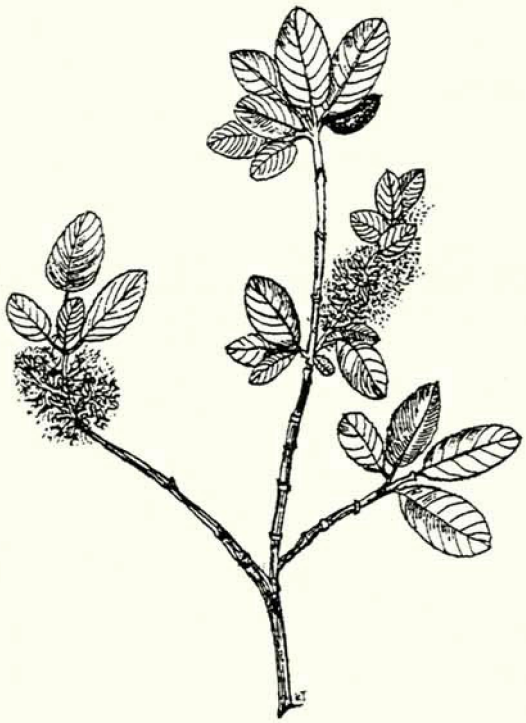
Political boundaries were fuzzed up, immediate solutions and actions were taken on complex issues to remove threats to the species and its habitat, risks were taked by line officers to implement short term actions, funding was reprogrammed to cover costs, biologist work schedules were adjusted for meetings and completion of products to meet deadlines. The technical team contributed significant personal time, with undue hardship to families, to complete the conservation documents.

A core technical group kept the vision alive, the process moving, and endured to the end.

Populations of Arizona willow discovered in Utah now represent the core area for the species and these additional populations were the primary factor in our ability to provide interagency protection and mangement of this species and its ecosystem, without the protective measures of the Endangered Species Act.

The habitat conservation assessment, conservation agreement and conservation strategy documents prepared by an Interagency Team of botanists and biologists outline the specific actions, costs and skills needed to implement protective measures and research studies needed for the species.

Arizona willow (*Salix arizonica* Dorn) was described by Dr. Robert Dorn in 1975 from specimens collected in Arizona by Eric Granfelt. Arizona Willow has several growth forms, including scraggly shrub, rounded shrub, prostrate mat or single stem and large hedge or thicket. Typically they are less than 2 feet tall in Arizona populations. Utah populations have two basic forms, those that grow in saturated soils are more dwarf and those in well drained soils can grow to a height of 6 feet with the average being around 3-4 feet tall. The mature leaves are ovate (egg-shaped) to broadly elliptical or obovate, with a rounded or cordate (heart-shaped) base, and 1.5-2.4 times as long as wide. The leaves are 1-5 cm in length and 0.5-3 cm wide with fine-toothed, gland-tipped margins. The previous year's stems are bright red but become lighter as the season progresses. The branches of the year are yellow-green, red-brown, or brownish in color and are pilose(densely haired). This species is related to and can be confused with *Salix boothii* in morphology.



SALIX ARIZONICA

Current data on this species documents occurrences at elevations above 8,500 feet in wet meadows, stream sides, and cienegas most commonly in or adjacent to perennial water. Arizona willow plants have been found in drainages that trend to the north, east, or south. Sometimes individuals are widely spaced(more than one mile apart) but occasionally plants are clustered or form dense stands, as in some Utah populations on Cedar Mountain, Dixie National Forest.

Key indicator plants associated with the Arizona populations which also occur here in Utah are *Salix monticola, S. geyerana, Picea pungens, Potentilla fruticosa, P. diversifolia, Deschampsia casepitosa, Festuca ovina,* and associated *Carex* species.

The Fish and Wildlife Service and other agency managers will have a mock signing of the conservation documents in Phoenix, Arizona, May 16, 1995 with a lot of media coverage. Development of conservation documents for Arizona willow, a proposed species, that precluded the need to list the species is the only effort attempted, and is touted as a "National Accomplishment".

RED BUTTE GARDEN RECOGNIZES BLM ENDOWMENT FOR RARE UTAH PLANT

A $6,500 endowment established by the BLM to fund research on Utah's endangered Bearclaw Poppy (*Arctomecon humilis*) was matched by a $3,500 grant from the Andrew W. Mellon Foundation, New York. Interest from the endowment fund will support Red Butte Garden's ex-situ (off site) plant research on the poppy, which is one of Utah's most endangered plant species. The research program includes annual collection of seed, germination and cultivation studies, and long-term protection of seed through freezing. The Garden has successfully germinated some of the rare poppies and will conduct pollination studies in hopes of producing seed under controlled conditions. Red Butte Garden Director Mary Pat Matheson said, "The endowment established by the Bureau of Land Management on behalf of the Bearclaw Poppy will assure long-term protection of the plant, one of Utah's most beautiful treasures. This is a very cost effective approach to plant conservation - pennies spent today to learn how to protect and preserve this plant in the wild, before the plant populations dwindle to the point of extinction, will save many dollars tomorrow."

Red Butte Garden and Arboretum is the Great Basin affiliate for the Center for Plant Conservation based at the Missouri Botanical Garden in St. Louis. The Center for Plant Conservation maintains the research and scientific data for the National Collection of Endangered Plants which is available to scientists and conservationists nationally and internationally. Twenty-five botanical gardens throughout the United States are the designated affiliates in the program, managing research collections of regional endangered plants for the purpose of germplasm preservation and reintroduction. The combined efforts of the Center and affiliate gardens have resulted in successful germination studies, production of seed, and long term storage of over 3 million seeds of 480 endangered plants throughout the country.

NEARLY NOTEWORTHY COLLECTIONS

Linda Allen & Michael Curto
Intermountain Herbarium
Utah State University

Recent additions to the Intermountain Herbarium (UTC) vascular plant collection, as well as searches through both the Intermountain Herbarium and Brigham Young University Herbarium (BRY), have yielded new state or county floristic records for Utah. State records are often published as "Noteworthy Collections" in the scientific journal *Madroño*. County records within states, however, are rarely published because they often represent intercalary localities for otherwise widespread taxa. The collections reported herein vary from previously unreported locations for species common throughout northern Utah, to truly noteworthy range extensions, or first collections for Utah. We consider all to be significant as they provide new distributional documentation within Utah.

Utah botanists are fortunate to have available two resources, Albee et al. (1988) and Welsh et al. (1993), that provide floristic distributional data at the county-level. Following each taxon, we code presence (+) or absence (-) within a particular county as listed by both references, e.g., A- W+ indicates a taxon unreported from the county in Albee at al., but reported as present by Welsh et al. Other regional floras that do not provide distributional data at the county-level are not referenced. All records are first collections within each county listed unless otherwise noted. Multiple entries for any species are chronological by collection date. Nomenclature conforms to Welsh et al. (1993), except where noted, and for author abbreviations which follow Brummitt and Powell (1992). Where necessary, synonyms are provided to facilitate cross-reference with Albee et al. (1988).

BOX ELDER COUNTY

GRAMINEAE (POACEAE)

Crypsis alopecuroides (Piller et Mitterp.) Schrader; A- W-. Wellsville Mts, Mantua Reservoir, S shore, rd along Maple Creek, T18N R1W S23, 41°30'00"N, 111°57'30"W, 5150 ft, 16 Sep 1994, *M Curto 1179 & L Allen* (UTC213017). Previously known from Cache, Millard, and Wasatch Counties.

Elymus hispidus (Opiz) Melderis; A- W-. Wellsville Mts, Mantua Reservoir, S shore, rd along Maple Creek, T18N R1W S23, 41°30'00"N, 111°57'30"W, 5150 ft, 16 Sep 1994, *M Curto 1190 & L Allen* (UTC213007).

Panicum capillare L.; A- W-. Wellsville Mts, Mantua Reservoir, S shore, rd along Maple Creek, T18N R1W S23, 41°30'00"N, 111°57'30"W, 5150 ft, 16 Sep 1994, *M Curto 1176 & L Allen* (UTC213021).

ORCHIDACEAE

Epipactis gigantea Douglas ex Hook.; A- W-. Brigham City, Hwy 89-91, 1 mi above [E of] red [traffic] light, T9N R1W S30, 4300 ft, 6 Jul 1993, *RJ Shaw 5156* (UTC211031).

SCROPHULARIACEAE

Cordylanthus parviflorus (Ferris)Wiggins; A- W-. UT Hwy 30 ca. 2 mi E of Park Valley, 25 Aug 1993, *M Ashcroft s.n.* (UTC211030). First collection in Utah north of Beaver County; also known from Cassia Co., ID.

Veronica anagallis-aquatica L.; A- W-. Wellsville Mts, Mantua Reservoir, S shore, rd along Maple Creek, T18N R1W S23, 41°30'00"N, 111°57'30"W, 5150 ft, 16 Sep 1994, *M Curto 1166 & L Allen* (UTC213030).

ZYGOPHYLLACEAE

Tribulus terrestris L.; A- W-. Wellsville Mts, Mantua Reservoir, S shore, rd along Maple Creek, T18N R1W S23, 41°30'00"N, 111°57'30"W, 5150 ft, 16 Sep 1994, *M Curto 1183 & L Allen* (UTC213013).

CACHE COUNTY

GRAMINEAE (POACEAE)

Alopecurus arundinaceus Poir. in Lam. [*A. ventricosus* Pers.]; A- W-. Cache Valley, UT Power/Light Property, S side of Mendon Rd (600 S), 1.3 rd mi E of 5400W and 3.7 rd mi W of Logan City limit, T11N R1W S3, 41°40'00"N, 111°57'30"W, 4410 ft, 8 Jul 1994, *M Curto 1160 & L Allen* (UTC213190). The illegitimate name *A. ventricosus* was somehow editorially substituted for the correct name *A. arundinaceus* before the grass treatment by Arnow in Welsh et al. (1993) went to press (Arnow, pers. comm. 1995). Persoon's name, however, is a later homonym of *A. ventricosus* (Gouan) Huds., which is based on *Agrostis ventricosa* Gouan ■ *Gastridium ventricosum* (Gouan) Schinz et Thell.

Elymus smithii (Rydb.) Gould; A+ W-. Cache Valley, UT Power/Light Property, S side of Mendon Rd (600 S), 1.3 rd mi E of 5400W and 3.7 rd mi W of Logan City limit, T11N R1W S3, 41°40'00"N, 111°57'30"W, 4410 ft, 8 Jul 1994, *M Curto 1158 & L Allen* (UTC213192). This species was listed from Cache Co. in Welsh (1987), but not in Welsh (1993); we include this collection to reaffirm that *E. smithii* is present in Cache Co.

LYTHRACEAE

Lythrum tribracteatum Salzm. ex Spreng.; A- W-. Cache Valley, 600 S (the Mendon Rd.) 10 mi W of 10th W, 41°43'17"N 111°56'35"W [*sic*], 1450 m, 10 Sep 1993, *ME Barkworth 93-163 & FJ Smith* (UTC210397); Cache Valley, UT Power/Light Property, S side of Mendon Rd (600 S), 1.3 rd mi E of 5400W and 3.7 rd mi W of Logan City limit, T11N R1W S3, 41°40'00"N, 111°57'30"W, 4410 ft, 8 Jul 1994, *M Curto 1155 & L Allen* (UTC213193). First collections within Utah; known from southern Idaho.

RICH COUNTY

BERBERIDACEAE

Mahonia repens (Lindl.) G. Don [*Berberis repens* Lindl.]; A- W+. Negro Dan Hollow, T7N R7E S19, 6600 ft, 27 Jul 1984, *K Thorne 3280 et al.* (BRY267882); Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 23 May 1993, *M Curto 890 & L Allen* (UTC210717).

BORAGINACEAE

Cryptantha flavoculata (A.Nelson) Payson; A- W-. Rich County, *sine loco*, 1938, *S. Gessel s.n.* (UTC210536); Lake Ridge, Rabbit Creek along rd from Sixmile Creek, 6700 ft, 13 Jun 1981, *K Thorne 1282a et al.* (BRY223261); ca. 5 mi W of Sage Valley Jct, T13N R7E S18, 6600 ft, 6 Jun 1983, *SL Welsh 22170 & E Neese* (BRY252204); 6 mi NW of Sage Creek Jct off Duck Creek, T12N R6E S2, 7100 ft, 28 Jun 1983, *K Snyder 562 & L Hawkins* (BRY253261); S Eden Cyn, ca. 5.5 rd mi E of East Lake Rd, T14N R7E S30, 6500 ft, 23 May 1993, *M Curto 908 & L Allen* (UTC210609).

Hackelia patens (Nutt.) I.M.Johnst.; A- W+. Bear River Range, Swan Peak, T14N R4E S11, 8500 ft, 18 Jul 1982, *R Atkins 8264 et al.* (UTC36466); UT Hwy 39 7 mi W of Woodruff, T9N R6E S21, 6600 ft, 3 Jul 1983, *K Snyder 615 & H Nielsen* (BRY253174); Bear River Range, Cottonwood Cyn, USFS Rd 054 2.3 mi NE of Wasatch-Cache NF boundary, T12N R5E S29, 6700 ft, 5 Jul 1993, *M Curto 1008 & L Allen* (UTC210304); Bear River Range, Cottonwood Cyn at Rich-Cache Co. line, USFS Rd 054 at Wasatch-Cache NF boundary, T11N R5E S6, 7220 ft, 5 Jul 1993, *M Curto 1022 & L Allen* (UTC210373).

Mertensia oblongifolia (Nutt.) G. Don; A- W+. S Eden Cyn, ca. 5.5 rd mi E of East Lake Rd, T14N R7E S30, 6500 ft, 23 May 1993, *M Curto 913 & L Allen* (UTC210698).

COMPOSITAE (ASTERACEAE)

Agoseris grandiflora (Nutt.) Greene; A- W-. Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 16 May 1993, *M Curto 872 & L Allen* (UTC115340).

Antennaria dimorpha (Nutt.) Torr. & A. Gray; A- W-. Bear River Range, 2 mi W of Garden City, Bear Lake Overlook, T14N R4E S30, 7000 ft, 23 May 1981, *B Neely 324* (UTC174491); E of Bear Lake, mesa between Pine and Mahogany Cyns, T13N R6E S15, 7100 ft, 16 May 1993, *M Curto 881 & L Allen* (UTC210219); S of UT Hwy 30, ca. 5 rd mi E of Laketown, T12N R6E S11, 7000 ft, 23 May 1993, *M Curto 916a & L Allen* (UTC210696).

Balsamorhiza macrophylla Nutt.; A+ W-. Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 13 Jun 1993, *M Curto 935 & L Allen* (UTC210292).

Balsamorhiza sagittata (Pursh) Nutt.; A- W-. Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 23 May 1993, *M Curto 897 & L Allen* (UTC210710).

Crepis occidentalis Nutt.; A- W-. Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 13 Jun 1993, *M Curto 934 & L Allen* (UTC 210297).

Erigeron corymbosus Nutt.; A- W+. SE of Bear Lake, Sixmile Cyn Rd, 3.1 mi N of Hwy 16, T13N R6E S22, 7300 ft, 28 Jun 1981, *K Thorne 1374 & J Thorne* (BRY226067); Crawford Mts, 1 mi N of Rex Peak, T11N R8E S19, 7200 ft, 17 Jul 1982, *R Atkins 8246 et al.* (UTC174840); Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 5 Jul 1993, *M Curto 1006 & L Allen* (UTC210302).

Hieracium albiflorum Hook.; A+ W-. Bear River Range, USFS Rd 055 (New Sinks Rd) ca. 6 mi S of US Hwy 89, T13N R4E S26, 7800 ft, 18 Jul 1985, *RJ Shaw 3941* (UTC189776); Bear River Range,Wasatch-Cache NF, N of US Hwy 89, North Sink, N end, 2680 m, 41°59.21'N, 111°29.55'W, 22 Aug 1993, *ME Barkworth 137-93 et al.* (UTC210753).

Hymenoxys torreyana (Nutt.) Parker; A- W-. Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 16 May 1993, *M Curto 871 & L Allen* (UTC113176); S Eden Cyn, ca. 5.5 mi E of East Lake Rd, T14N R7E S30, 6500 ft, 23 May 1993, *M Curto 901 & L Allen* (UTC210706).

Iva xanthifolia Nutt.; A- W-. Bear River Range, US Hwy 89 31.3 mi E of Logan, 41°55.50'N, 111°28.10'W, 2540 m, 12 Sep 1993, *ME Barkworth 208-93 et al.* (UTC210787).

Microseris nutans (Geyer) Sch.Bip.; A- W+. Bear River Range, UT Hwy 30 6 mi W of Garden City, T14N R4E S34, 6900 ft, 13 Jun 1981, *K Thorne 1296 et al.* (BRY223276); Saleratus Creek, W side, T8N R6E S25, 6440 ft, 27 Jul 1984, *B Franklin 1011* (BRY275984); Bear River Range, Cottonwood Cyn, USFS Rd 054 at Wasatch-Cache NF boundary, T11N R5E S6, 7220 ft, 5 Jul 1993, *M Curto 1020 & L Allen* (UTC210374).

Rudbeckia occidentalis Nutt.; A- W-. Bear River Range, USFS Rd 055 ca. 3 mi S of US Hwy 89, T13N R4E S10, 8100 ft, 1 Aug 1993, *M Curto 1033 & L Allen* (UTC210361); Bear River Range, USFS Rd 074 S of US Hwy 89, Middle Sinks, E end, 7500 ft, 15 Aug 1993, *ME Barkworth 119-93 et al.* (UTC210747).

CRUCIFERAE (BRASSICACEAE)

Alyssum minus (L.) Rothm.; A- W-. Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 16 May 1993, *M Curto 864 & L Allen* (UTC210205).

GERANIACEAE

Erodium cicutarium (L.) L'Hér.; A- W+. Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 16 May 1993, *M Curto 862 & L Allen* (UTC113175).

GRAMINEAE (POACEAE)

Poa bolanderi Vasey; A- W-. Bear River Range, USFS Rd 055 ca. 8.5 rd mi S of US Hwy 89, T13N R4E S21, 8000 ft, 1 Aug 1993, *M Curto 1036 & L Allen* (UTC210366); Bear River Range, USFS Rd 014 2.5 mi N of US Hwy 89, 41°59.21'N, 111°29.55'W, 22 Aug 1993, *ME Barkworth 136-93 et al.* (UTC210754).

Poa bulbosa L.; A- W-. Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 23 May 1993, *M Curto 891 & L Allen* (UTC210716).

Polypogon monspeliensis (L.) Desf.; A- W-. Bear Lake, SW end, Rendezvous Beach picnic site, 12 Sep 1993, *ME Barkworth 206-93 et al.* (UTC210784).

HYDROPHYLLACEAE

Phacelia heterophylla Pursh; A- W-. USFS RD 055 ca. 1.6 rd mi S of US Hwy 89, T14N R4E S34, 7800 ft, 1 Aug 1993, *M Curto 1027 & L Allen* (UTC210357).

JUNCACEAE

Juncus alpinus Vill.; A+ W-. Bear Lake, S end, 14 Aug 1931, *B Maguire 84* (UTC3649); Bear Lake, Lakota, 11 Aug 1938, *S Flowers 2156* (UTC170003); Bear Lake, Ideal Beach, 27 Jul 1941, *B Maguire 21341* (UTC21341); Bear Lake, 2 mi N of Garden City, Camp Hunt, 10 Jul 1958, *L Anderson 1316* (UTC95330); Bear Lake, SW end, state picnic area, 41°53.11'N, 111°21.98'W, 2059 m, 12 Sep 1993, *ME Barkworth 190-93 et al.* (UTC210792).

LEGUMINOSAE (FABACEAE)

Melilotus alba Lam.; A- W-. Bear River Range, US 89 ca. 31 mi E of Logan, in gravel pit, 41°55.5'N, 111°28.10'W, 2540 m, 12 Sep 1993, *ME Barkworth 167-93 et al.* (UTC210773).

MALVACEAE

Iliamna rivularis (Douglas) Greene; A- W-. Bear River Range, USFS RD 055 ca. 1.6 rd mi S of US Hwy 89, T14N R4E S34, 7800 ft, 1 Aug 1993, *M Curto 1028 & L Allen* (UTC210358); Bear River Range, USFS Rd 074 S of US Hwy 89, Middle Sinks, E end, 7500 ft, 15 Aug 1993, *ME Barkworth 118-93 et al.* (UTC210746); Bear River Range, US Hwy 89 ca. 31 mi E of Logan, in gravel pit, 41°55.05'N, 111°28.10'W, 2540 m, 12 Sep 1993, *ME Barkworth 193-93 et al.* (UTC210763).

ONAGRACEAE

Oenothera caespitosa Nutt.; A- W-. S Eden Cyn ca. 5.5 rd mi E of East Lake Rd, T14N R7E S30, 6500 ft, 23 May 1993, *M Curto 905 & L Allen* (UTC210702).

POLEMONIACEAE

Gilia inconspicua (Sm.) Sweet; A- W-. S Eden Cyn ca. 5.5 rd mi E of East Lake Rd, T14N R7E S30, 6500 ft, 13 Jun 1993, *M Curto 948 & L Allen* (UTC210283).

Microsteris gracilis (Hook.) Greene; A- W-. Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 16 May 1993, *M Curto 867 & L Allen* (UTC210210); E of Bear Lake, mesa between Pine and Mahogany Cyns, T13N R6E S15, 7100 ft, 16 May 1993, *M Curto 884 & L Allen* (UTC210222).

Polemonium foliosissimum A. Gray; A- W-. Bear River Range, Cottonwood Cyn, USFS Rd 054 2.3 mi NE of Wasatch-Cache NF boundary, T12N R5E S29, 6700 ft, 5 Jul 1993, *M Curto 1007 & L Allen* (UTC210303).

RHAMNACEAE

Ceanothus velutinus Douglas; A- W-. Bear River Range, Bear Lake Summit, Old Limber Pine Trail, 7780 ft, 41°55.60'N, 111°28.00'W, 18 Jul 1993, *ME Barkworth 93-93 et al.* (UTC210731).

ROSACEAE

Prunus virginiana L.; A- W+. hills E of Bear Lake, 6700 ft, 24 Jun 1968, *RM Lanner 6* (UTC120403); S Eden Cyn, ca. 5.5 rd mi E of East Lake Rd, T14N R7E S30, 6500 ft, 23 May 1993, *M Curto 912 & L Allen* (UTC210697).

Sorbus scopulina Greene; A- W-. Bear River Range, USU Forestry Sta, T13N R4E S15, 8360 ft, 12 Jul 1976, *GA Reese 498* (UTC158452); Bear River Range, Bear Lake Summit, Old Limber Pine Trail, 41°55.60'N, 111°28.00W, 7780 ft, 18 Jul 1988, *ME Barkworth 98-93 et al.* (UTC210733).

RUBIACEAE

Galium aparine L.; A- W-. Laketown Cyn Rd ca. 5 mi E of Laketown, T12N R6E S11, 7000 ft, 23 May 1993, *M Curto 918 & L Allen* (UTC210274).

Galium boreale L.; A- W+. ca. 5 mi ENE of Wahsatch, Sutton's Creek, T5N R7E S18, 6950 ft, 28 Jul 1984, *B Franklin 1077 et al.* (BRY276121).

SAXIFRAGACEAE

Lithophragma parviflorum (Hook.) Nutt.; A- W-. Bear River Range, Temple Cyn, USFS Rd 008 1.5 mi W of Meadowville Rd, T13N R5E S36, 7000 ft, 23 May 1993, *M Curto 917 & L Allen* (UTC210725).

Ribes viscosissimum Pursh; A- W-. Bear River Range, ridge 1 mi NW of Swan Peak, T14N R4E S11, 8900 ft, 18 Jul 1982, *B Neely 1040 & A Carpenter* (UTC177615); Bear River Range, Bear Lake Summit, Old Limber Pine Trail, 41°55.60'N, 111°28.00'W, 7780 ft, 18 Jul 1993, *ME Barkworth 97-93 et al.* (UTC210732); US 89 ca. 31 mi E of Logan, in gravel pit, 41°55.50'N, 111°28.10'W, 12 Sep 1993, *ME Barkworth 183-93* (UTC210763).

Saxifraga odontoloma Piper; A- W-. Bear River Range, USFS Rd 074 S of US Hwy 89, Middle Sinks, E end, 7500 ft, 15 Aug 1993, *ME Barkworth 122-93 et al.* (UTC210739).

SCROPHULARIACEAE

Castilleja rhexifolia Rydb. var. **sulphurea** (Rydb.) N.D.Atwood; A- W-. Bear River Range, USFS Rd 055 5 mi S of US Hwy 89, T13N R4E S26, 7880 ft, 18 Jul 1985, *RJ Shaw 3944* (UTC196348); Bear River Range, USFS Rd 055 1.6 rd mi S of US Hwy, T14N R4E S34, 7814 ft, 1 Aug 1993, *M Curto 1023 & L Allen* (UTC210209).

Collinsia parviflora Douglas; A- W-. Bear River Range, T13N R4E S14, 8560 ft, 7 Jun 1976, *G. A. Reese 439* (UTC159072); Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 16 May 1993, *M Curto 866 & L Allen* (UTC210209); Bear River Range, Temple Cyn, T12N R6E S11, 23 May 1993, *M Curto 922 & L Allen* (UTC210273).

Veronica biloba L.; A- W-. Bear River Range, UT Hwy 30 ca. 5.6 rd mi S of US Hwy 89, T13N R5E S10, 6000 ft, 16 May 1993, *M Curto 865 & L Allen* (UTC210208); S Eden Cyn, T14N R7E S30, 16 May 1993, *M Curto 878 & L Allen* (UTC210217).

TAMARICACEAE

Tamarix chinensis Lour. [*T. ramosissima* Ledeb.]; A- W-. Bear Lake, SW end, 41°53.11'N, 111°21.98'W, 12 Sep 1993, *ME Barkworth 192-93 et al.* (UTC210789).

VALERIANCAEAE

Valeriana occidentalis A.Heller; A- W-. Bear River Range,Wasatch-Cache NF, T13N R4E S15, 8360 ft, 12 Jul 1976, *GA Reese 496* (UTC153121); Bear River Range, Cottonwood Cyn, USFS Rd 054 2.3 mi NE ofWasatch-Cache NF boundary, T12N R5E S29, 6700 ft, 5 Jul 1993, *M Curto 1012 & L Allen* (UTC210311).

VIOLACEAE

Viola nuttallii Pursh; A+ W-. 2 mi W of Garden City, 6900 ft, 13 May 1967, *G Davidse 1037* (UTC117814); 1 mi W of Garden City, 6100 ft, 13 May 1967, *G Davidse 1045* (UTC117794); E of Bear Lake, mesa between Pine and Mahogany Cyns, T13N R6E S15, 7100 ft, 16 May 1993, *M Curto 882 & L Allen* (UTC210220).

Viola purpurea Kellogg; A+ W-. 4 mi W of Garden City, 6600 ft, 14 May 1966, *G Davidse 382* (UTC117985); 4 mi W of Garden City, 6600 ft, *s.d., G Davidse 1721* (UTC141707); 2 mi W of Garden City, 6900 ft, 13 May 1967, *G Davidse 1038* (UTC117815); Bear River Range, Temple Cyn, USFS Rd 008 1.5 mi W of Meadowville Rd, T13N R5E S36, 7000 ft, 23 May 1993, *M Curto 925 & L Allen* (UTC210721).

TOOELE COUNTY

LEGUMINOSAE (FABACEAE)

Oxytropis riparia Litv.; A- W-. Vicinity of Grantsville, Don Worthington Ranch, in pasture, 1 Sep 1993, *W Bitner s.n.* (UTC210399). First collection within Utah of this central Asian weed; known from Bingham Co., Idaho.

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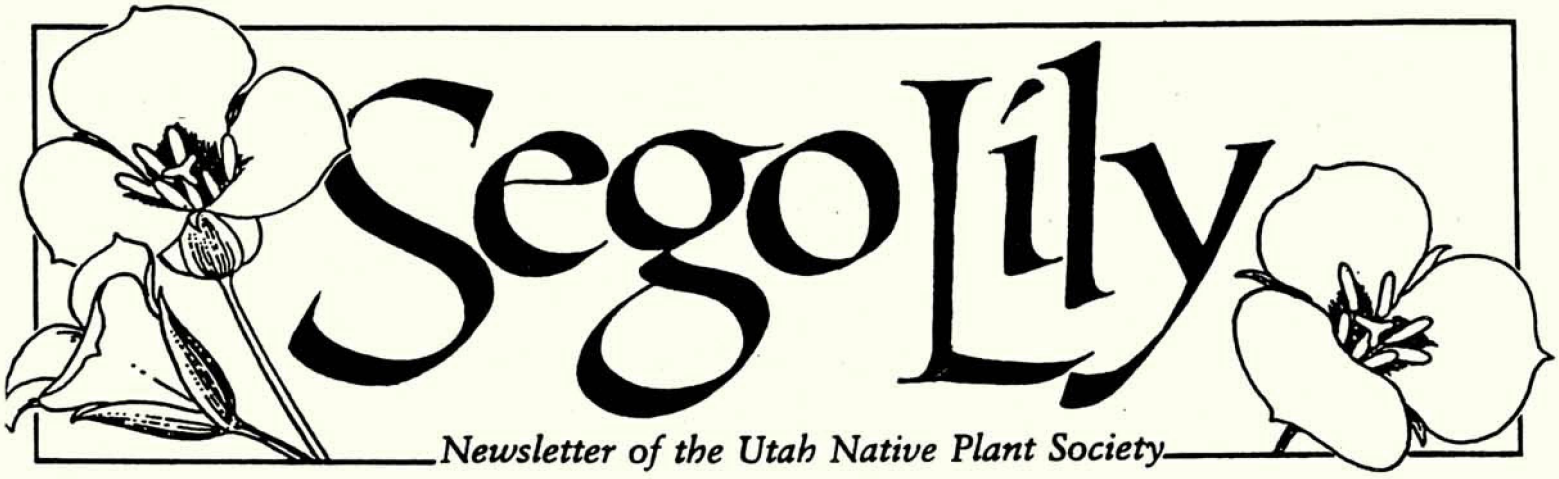

Endangered Species Act Alert

The Endangered Species Act (ESA) has been for twenty two years the strongest expression of stewardship this country offers for native plants and their habitats. Utah has twenty plant species protected under this provision, and over one hundred species on the candidate list. The current Congress (including most of our Utah delegation) is of the mindset to quickly dismantle the ESA to allow greater development without having to be concerned about destruction of rare plants and the biodiversity they represent. In Aprii Congress attached an Endangered Species funding rescission onto a Department of Defense appropriation bill and quickly passed it into law. The rescission means that no more funds will be spent in 1995 on determinations of endangered species or critical habitat. This indicates the mood of this Congress and their intent regarding species diversity!

The ESA has protected many rare plant species from harm in the Southwest. Operation of Glen Canyon Dam on the Colorado River has undergone an Environmental Impact Statement and changes will be implemented to protect endangered species (plants and animals) found in the river corridor. They were adversely affected by the old operation schedule. A planned landfill near Richfield was re-sited to avoid destroying an endangered Fishhook cactus (Sclerocactus wrightii). Highway widening in Logan was rerouted to protect the limestone cliffs where Maguire primrose (Primula maguirei) grows. The Bureau of Land Management has resisted pressure to transfer federal lands around St. George into private control and has set aside land to protect the Dwarf Bearclaw poppy (Arctomecon humilis).

The State of Utah has no legal protection for rare plants on state or private lands. Consequently, only those plants found on Federally managed lands

which fall under the provisions of the Endangered Species Act are protected.

Utah Native Plant Society members must let the delegation and President Clinton (who favors a strong ESA) know how much we value our natural floristic heritage. Please urge the President to veto legislation that weakens protection. Please send your letters and telephone calls immediately to your Congressional representatives and the President.

Letterwriting tips: Write your own views; let them know your personal experiences or observations. Try to show an awareness of how legislation will affect your community, health, jobs. Ask for a response; ask questions, without sounding demanding or threatening. Be sure to use your return address or letterhead. Say "Well done" when your representatives support good legislation. They appreciate the thanks when they have done something well.

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U.S. Senate
Washington, DC 20510

Senator Robert Bennett
U.S. Senate
Washington, DC 20510

Congressman James Hansen
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VOL. 18 NO. 4 **JUL / AUG 1995**

CALENDAR OF EVENTS

Jul 16 Sun	Wildflower Photography with the Utah Museum of Natural History. A day long trip to Albion Basin to photograph the wildflowers. Call the museum for more information (581-4887).
July 21-22	Wildflowers of Yellowstone--a class offered by the Yellowstone Institute. Telephone (307)-344-2294.
July 28-30	Alpine Wildflower Walks--a class offered by the Yellowstone Institute. Telephone (307)-344-2294.
Aug 12 Saturday	**Uinta Fieldtrip.** The trip will start at 10:00 a.m. at the Upper Stillwater Dam in the south fork of the Rock Creek Drainage. Those wishing to carpool from Salt Lake City should meet at 7:30 am at the parking lot of the State Geological Survey at 2363 So. Foothill Drive. Bring lunch and raingear. Call Jo Stolhand (521-0069) if you would like to go. There is the possibility of changing the meeting place so be sure to get your name on our call list.
Aug 17-19	**Mushroom Foray 1995** at Fishlake. Campground space has been reserved at Doctor Creek Campground. See next page for more details.
Sep 6 Wed 0700 pm	**Salt Lake Chapter Meeting.** Bruce Thompson of Ecotrack will present a program of Wildflower Photography. **Note new meeting time 7:00 pm** at the Division of Natural Resources 1636 West North Temple. The entrance is on the west side of the building.
Oct 18 Wed 0630 pm	**Annual State Membership meeting** and new world menu potluck. More information in the next newsletter.

WILDFLOWER HOTLINE 581-4747

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UNPS ANNUAL MUSHROOM HUNT AND NATURE OUTING

The UNPS Mushroom Hunt will be held at Doctor Creek Campground at Fishlake National Forest August 17, 18 and 19.

All food and cmpground fees will be provided at a cost of:
$15 per person member
$25 per person nonmember
1/2 price for age 8 and under

Bring your own camping gear: tents, sleeping bags etc.

Dutch oven dinners, sourdough pancake breakfasts, and a steak dinner on Saturday afternoon will highlight the menu. There will be a contest for the best dutch oven cobbler, with prizes to be awarded. UNPS will reimburse for the cost of the cobbler ingredients so bring those receipts with you and turn them into Dave Okelberry.

We also have t-shirts designed by Dr. Frank Anderson for $10 each.

We are looking for volunteers to :
1. Help as nature guides.
2. Help cook
3. Enter the cobbler contest

Volunteers and people with questions should call or write Dave Okelberry (968-6190) 3522 W. 4305 So, West Valley City, Ut 84119

See last page for registration forms.

PLANTS AND ANIMALS IN HIGH PLACES: THE ALPINE ECOSYSTEM OF UTAH

Dr. Richard Shaw

What is an alpine ecosystem? Simply stated it is a solar energy driven system of plants and animals that is self-sustaining in a high mountainous environment too severe to meet the requirements for tree growth. The term "treeline" is used to describe the limit either in frigid polar regions, high up in the mountains or adjacent to shrubs or grasslands. As one ecologist aptly put it: "Treeline is a biological boundary which doesn't escape the most casual observer." "Upper or alpine treeline" applies to the upper elevational limits of forest and tree growth. The alpine treeline of the Utah mountains does not form an abrupt boundary but usually forms a transition zone varying from 9,500 to 10,000 feet (2,900 to 3,050 m) depending on a series of environmental factors. Alpine treeline has a diversity of interacting causes affected by inadequate summer temperatures; thus it is classed as a "cold treeline".

Another kind of treeline may occur at lower elevations especially in valleys in semi-arid western Utah. This "lower treeline" is generally related to inadequate water; and, thus, is called a "dry" or "drought-caused treeline". Snake Valley in western Utah has a dry timberline because of low precipitation.

In this commentary we will emphasize the summits over 10,000 feet. The National Geographic Names Data Base lists 263 summits. This is quite a staggering figure as one considers a map of Utah. The Wasatch and Uinta Ranges stand out as the ranges with the most number of peaks; the latter is the largest mountain range with 39 summits over 10,000 ft. It also has the distinction of being the largest range in the western hemisphere that extends in an east-west direction (Fenneman 1931). This massive Uinta Range is 150 miles long and 35 miles wide, and its highest summit is Kings Peak at 13,498 feet. The upper portion of the range has been heavily glaciated leaving scooped-out cirque basins.The Uintas have a floristically rich alpine flora above 11,000 feet, which extends along the crest for 60 miles and covers more than 300 square miles (Cronquist et al 1972).

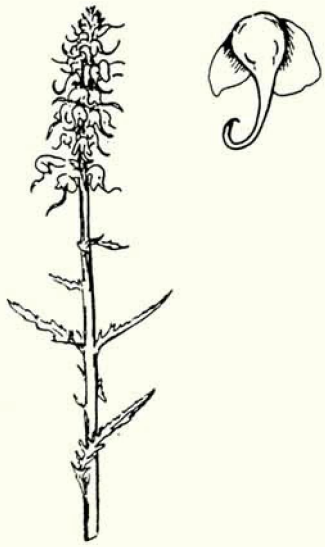
The Wasatch Range is exceptionally steep and represents a complex fault-block with various sedimentary, metamorphic and igneous rocks. The highest peaks are Mount Timpanogos at 12,008 feet and Mount Nebo at 11,928 feet. The Wasatch Range is less floristically rich than the Uintas, but has some circumboreal species such as moss campion (*Silene acaulis*).

Among some of the highest of Southern Utah mountains we should mention Mount Belknap (12,139 feet), Delano Peak (12,173 feet), Abajo Peak (11,360 feet) and Mount Peale (12,721 feet). Each of these has a distinctive history but all have unique alpine plants.

A person climbing upslope on any of these mountains will pass through the alpine treeline and note that trees become increasingly stunted and are finally reduced to shrub-like forms. This is often referred to as the "krumholz line" The term "krumholz" (German for "crooked wood") is used for the environmentally dwarfed forms of species that become treelike in less harsh environmental sites.

This challenging environment beyond the krumholz appears at first glance to be a cold inhospitable desert; but, in fact, it will reveal a wealth of miniature plants as well as some uniquely adapted interacting animals. When examined with patience, the smallest plants express themselves in a number of growth forms with incredible evolutionary ingenuity. They are truly beautiful and remarkable, and they thrive amid stressful environmental forces of low summer temperatures, buffeting winds, drought, intense ultraviolet light and soil churning processes caused by frost and burrowing animals.

Lakes and streams are common in the alpine zone but no aquatic species are likely to be found. Bogs, however, generally occur close to the lower limits of the alpine zone at 9,500 feet (2,900 m). Alpine plants commonly occur in glacial cirques and local depressions in the major canyons especially along streams. Sedges, grasses and willow species dominate the vascular flora. Other species found in bogs include elephanthead (*Pedicularis groenlandica*), redpod stonecrop (*Sedum rhodanthum*), and alpine laurel (*Kalmia polifolia*).



Pedicularis groenlandica

The bog habitat usually grades into wet meadow habitat, and these are common at lower elevations in the glacial cirques. Vegetation surviving below slow melting snowbanks is also included in this habitat type. Wet meadows are usually dominated by marshmarigold (*Caltha leptosepala*). American bistort (*Polygonum bistortoides*), alpine speedwell (*Veronica wormskjoldii*), and sedge species. Along streams Parry primrose (*Primula parryi*), pretty paintbrush, (*Castilleja pulchella*), and explorer gentian (*Gentiana calycosa*) are apt to be found. Ground which is exposed by late melting snow usually supports species such as springbeauty (*Claytonia lanceolata*), glacier lily (*Erythronium grandiflorum*), and alpine buttercup (*Ranunculus adoneus*).

Dry meadows are fairly common and perennial species of the sunflower, pea, and grass families are likely to dominate. Alpine hymenoxys (*Hymenoxys grandiflora*), dwarf clover (*Trifolium nanum*), and spike trisetum (*Trisetum spicatum*) are frequently seen herbaceous plants.

Talus, scree and boulder fields are called debris accumulation sites. These habitats are often physically disturbed by mass movements. Plant cover here is usually very low. However, many species have adapted to the disturbed and dry conditions by producing extensive root systems. Common species include mountain avens (Dryas octopetala). mountain sorrel (*Oxyria digyna*), brittle fern (*Cystopieris fragilis*), and sticky jacobsladder (*Polemonium viscosum*).

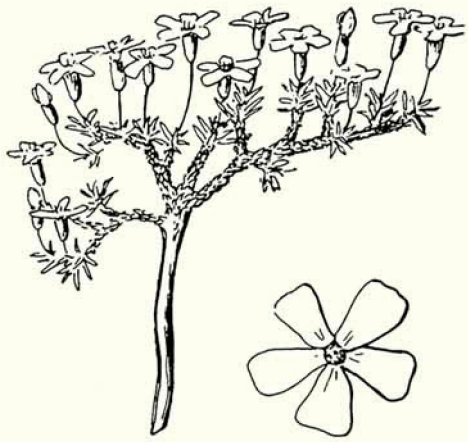
Rock faces and cliffs are abundant and climbers are greeted by pygmy saxifrage (*Saxifraga debilis),* Lyall rockcress (*Arabis lyallii*), and alpine forget-me-not (*Eritrichium nanum*).

ALPINE PLANT ADAPTATIONS

Consider just a few of the plant adaptations, and it will be apparent that they generally involve characteristics that are responsive to environmental conditions of temperature, light, moisture etc. Most of these adaptations are genetically controlled; and, therefore, persist even if the plant is moved to another habitat.

More than 99 percent of alpine plants are perennial; and, thus, they do not have to expend the metabolic energy necessary to produce stems, leaves, flowers and fruits in one growing season as seen in annual plants. Growth, however, in the short season is slow and many species may be eight to twelve years old before they flower. Alpine perennials have winter buds protected well below the soil surface in contrast to trees that have winter buds well above

Cushion plants such as alpine forget-me-not (*Eritrichium nanum*) show a distinctive low growing aspect and are the ideal pioneers in windy areas. Their low growing shape favors the wind to flow easily over them as over an airplane wing. Because of their compactness, temperatures may be several degrees higher in a cushion plant than outside. Another cushion plant species, moss campion (*Silene acaulis*), has such short dense branches and leaves that it can catch and hold wind blown soil and moisture, contributing to soil building and stabilization. A cushion plant the size of a saucer may have a four or five foot taproot seeking deep moisture and anchoring the plant against the constant wind.



Silene acaulis

Many alpine plants have various coatings of hairs: long and soft, tangled, felty, star-shaped, and often glandular. These hairs protect the plant's stomata, the pores in the epidermis which allows the exchange of gases so necessary for photosynthesis and respiration. The hairs are also capable of shading and protecting the delicate photosynthetic cells of the inner leaf from the harmful effects of ultra-violet light, and at the same time reduce water loss in this windy region. Look for other adaptations such as succulence of leaves, red pigments and crowded rosette leaf patterns.

ALPINE ANIMAL ADAPTATIONS

Bighorn sheep patrol wind blown rocky ledges in the winter, but most large animals such as elk and deer must move down into the valleys as the blizzards of winter and low temperatures create a chill factor well below zero.

Thus it is only the small animals such as the pocket gophers, meadow voles, mice, pikas, marmots and weasels that can survive the year round by either storing food, hibernating, or incessant hunting.

Pocket gophers are the only totally burrowing animals of the alpine and they, perhaps, have the greatest impact on the ecosystem. These underground tunnel makers recycle the minerals,

distribute seeds and bulblets, and bring subsoil to the surface. In the meadows in early summer meandering mounds of soil emerge from the melting snowbanks like rough brown snakes. These mounds are called pocket gopher eskers because they are like the ridges of coarse gravel dropped by streams that flow beneath glaciers.

A diminutive member of the Rabbit family, the pika, has small round ears that are not as likely to freeze. Cold environments have selected for reduced extremities to limit heat loss. The pikas even have fur on the soles of their feet which also aids in their clinging to precipitous rock surfaces. Pika haystacks of vegetation attest to the fact that they are the supreme food storers. Since there is no evidence that they hibernate, pikas must rely on stored food for nine to ten months a year.

Bumblebees, butterflies and hummingbirds have long been recognized as visitors to alpine flowers, but only recently has it been shown that muscoid flies are also important in the movement of pollen. Several alpine flowers are shaped like solar reflectors. Temperatures inside these flowers have been measured at 12° to 14°F above the surrounding air temperatures. Muscoid flies frequent such flowers; and, thus, they can begin their daily foraging earlier. Flowers species of *Potentilla* and *Ranunculus* are good examples of solar reflectors.

VISITING THE ALPINE ECOSYSTEM

Alpine plants possess many astonishing adaptations for survival in the extremely harsh landscape above the trees. Evolution of these organisms has taken long periods of geologic time, and significantly it has been a natural selection without the influence of man and his domestic animals. The plants and animals of this ecosystem are well adapted to the effects of the natural climatic conditions which we might consider severe. In this regard the alpine plants and animals are "tough". In their contacts with modern man and his domestic livestock these organisms and their ecosystems are "fragile".There is little or no carrying capacity in many of these ecosystems to disturbance by people afoot or on horseback. The vegetation is especially susceptable to the impact of countless human feet. Step on rocks where you can and stay on authorized trails. When the vegetation is damaged, the soil suffers. Alpine meadows and bogs are particularly vulnerable, but so are rocky soils on the ridges. Erosion may follow and when the soil is destroyed, so is the alpine ecosystem.

Extra precautions are necessary when visiting this ecosystem especially in terms of rapidly changing weather conditions. Rain gear, sweaters and wind breakers are essential as this is a land of contrasts from blue sky to snow storm in a matter of minutes. Eye and skin protection are also important since there is twice as much ultra-violet radiation and 25 percent more light than at sea level. Sunglasses and sun screen lotions are highly recommended.

A profitable and easy trip to the alpine ecosystem in Utah can include a vacation highway and a short hike. Take Highway 150 between Kamas, Utah and Evanston, Wyoming. The road climbs above 10,000 feet into the western end of the Uinta Range in the Mirror Lake area. Campgrounds are located in the spruce-fir forest along this road, and just west of Mirror Lake the Forest Service maintains a gentle climbing trail to the summit of Bald Mountain (11,943 feet). Shortly after leaving the parking area, the treeline is reached and a true alpine ecosystem begins. Remember that evolution has given us a natural treasure, and if you wander over its meadows and rocky ridges to discover its rapidly changing moods, its beauty and complex mosaic of many different plant communities, tread lightly as it may be easily destroyed.

Dr Richard J Shaw is Professor Emeritus and Emeritus director of the Intermountain Herbarium, Department of Biology, Utah State University.

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HORTICULTURE COMMITTEE

UNPS membership interested in growing Utah native plants and participating on the horticultural committee are requested to contact Dick Page (telephone 255-7769) by August 15, 1995. This committee will meet at a mutually acceptable time after Aug 15 to formulate the horticulture committee guidelines and initiate a plan of action for growing native plants. One of the primary objectives of this committee would be to give its members hands on experience growing native plants. The committee will take selected seed etc. of native plants and learn how to grow these species at their homes. Information developed would be disseminated in the "Sego Lily" for others to use.

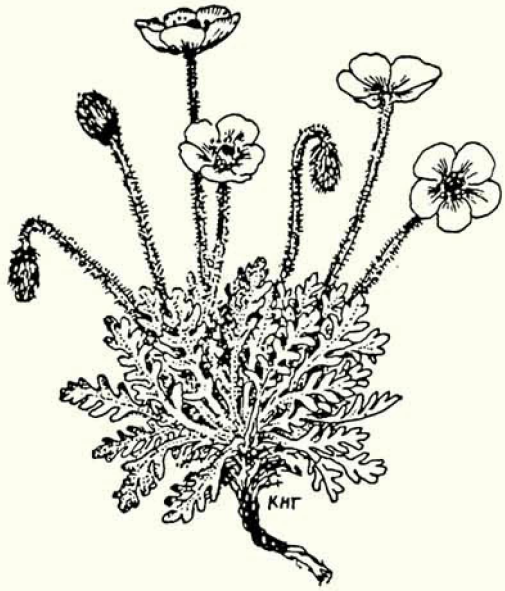
UNIQUE PLANT COMMUNITIES OF THE UINTA MOUNTAINS

by ALLEN HUBER

Geologic substrate has a primary influence on the distribution of plant species in the Uinta Mountains of northeastern Utah. Soils derived from differing parent materials in these mountains have allowed diversity in floristic structure and composition. The Uinta Mountains were formed during the Cenozoic era by an immense geologic uplift of sedimentary beds that eventually resulted in a east-west oriented flat-topped anticline—unique from most other major North American mountain ranges. This anticlinal uplift, with the help of several periods of glaciation, exposed 26 major geologic formations along the Uinta range. These formations cover a life record of approximately 500 million years. The exposed core of the Uintas consists mainly of Precambrian quartzite. These are the oldest rocks within the Uinta Mountain group. The younger Mesozoic and Cenozoic formations are exposed along the perimeter of the range, thus, as one descends the mountain on either side, the formations become continually younger. This geologic diversity has significantly influenced the diversity, composition, and structure of the Uinta Mountain flora.

The flora of the Uinta Mountains is diverse and rich with plant life. The Uintas contain over 1,050 vascular plants, approximately 140 mosses and liverworts, some 40 species of lichen, 235 fungal species, and about 800 species of algae. Many of the vascular plant species are substrate specific. This paper discusses some of the taxa and plant communities that are closely associated with soils derived from Red Pine shale and Mississippian limestone.

Glacial action and continued weathering has created numerous boulderfields and talus slopes within the alpine portions of the Uinta Mountains. The boulderfield and talus plant communities in the Uintas typically encompass high-altitude cliffs and ledges with their alluvial fans, boulderfields, and steep slopes carpeted with boulders, rocks, gravels, or fine shales. These communities, for the most part, are treeless and vegetation is relatively sparse. Quartzite is the principle substrate at these sites, but Red Pine shale (a relatively uncommon, thin grayish copper-colored strata usually sandwiched between quartzite) is present in some locations. Talus slopes consisting of Red Pine shale support a diverse, attractive, and often rare alpine flora—a treat to both the professional and lay botanist. In the Uintas, *Chaenactis alpina* (alpine dusty-maiden), *Senecio fremontii* var. *fremontii* (fremont's groundsel), *Claytonia megarhiza* (thickroot claytonia), *Senecio canus* (gray groundsel), and *Eriogonum umbellatum* var. *porteri* (porter's buckwheat) are a few of the common species that prefer Red Pine shale talus. Other species usually found on Red Pine shale, but are either considered uncommon or rare in the Uintas include *Epilobium latifolium* (dwarf fireweed), *Papaver radicatum* (alpine poppy), *Crepis nana* (dwarf hawksbeard), and *Saxifraga chrysantha* (golden saxifrage). The alpine poppy, with striking pale-yellow flowers contrasted against foliage clothed with blackish hair, is considered one of the most rare species found growing in the Uinta Mountains.

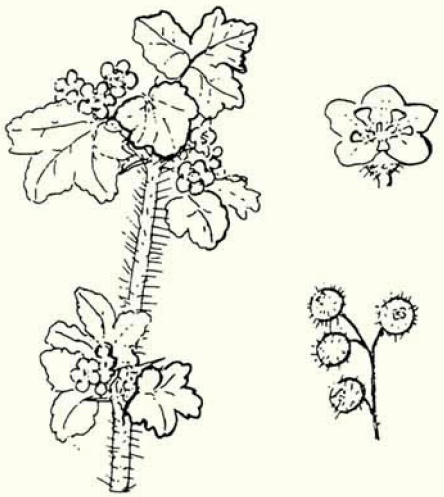


Papaver radicatum

Prominent outcrops of Mississippian limestone are exposed along the perimeter of the Uinta Mountains. At higher elevations, depressions of internal drainage are a common topographical feature for this substrate. As water moves through the porous limestone, the softer parent materials dissolve to form these depressions. The residual soils, therefore, are extremely gravelly and droughty. Precipitation, except at high-runoff, quickly permeates into the soil and recharges the underground aquifers. The few overland streams that do exist disappear into pockets or sinks and later discharge at the base of mountains or ridges. The sub-alpine and alpine plant communities associated with these limestone gravels are significantly different from the sub-alpine and alpine plant communities associated with quartzite substrates.

On limestone, the *Picea engelmannii* (engelmann spruce) forests seldom form solid stands—which is characteristic of this high elevation tree on quartzite substrates. Spruce either grows in clumps or they are loosely distributed on the landscape creating parklands of sub-alpine meadows or gravelly slopes. *Ribes montigenum* (gooseberry currant) and *Salix brachycarpa* (barren-ground willow), limestone indicator species (species that are either restricted to

or have a strong affinity calcareous substrates) in the Uintas, are principal understory shrubs associated with this community type. *Ribes montigenum* dominates the drier soils while *Salix brachycarpa* forms thickets on moist gravelly or rocky slopes. Other species that prefer calcareous soils and are commonly associated with this community include *Lomatium graveolens* var. *graveolens* (stinking lomatium), *Carex straminiformis* (Mt. Shasta sedge), *Calamagrostis scopulorum* (Jones' reedgrass), *Haplopappus macronema* (cobwebby goldenbush), *Gentianopsis barbellata* (barbellate gentian), *Synthyris pinnatifida* (Watson's synthris), *Ivesia gordonii* (Gordon's ivesia), *Phacelia hastata* (lanceleaf phacelia), *Anemone parviflora* (northern anemone), *Linum kingii* (King's yellow-flax), and *Oxytropis deflexa* var. *pulcherrima* (stemmed oxytrope).



Ribes montigenum

Most talus on limestone tends to be coarse and supports little vegetation. Only two indicator species are found growing on the limestone talus slopes located in the South Fork Rock Creek drainage. Both species are rare for the Uintas. *Asplenium viride* (green spleenwort), a fern, and *Penstemon montanus* (cordroot penstemon) are usually associated with limestone cliffs and rubble.

The alpine plant communities associated with limestone on the south slope of the Uinta Mountains are found at the head of Blind Stream and between Log and Wedge Hollows—these areas are located approximately three miles west of Upper Stillwater Dam in the Rock Creek drainage and are accessible from either Rock Creek or Tabiona. These high elevation plateaus support several limestone indicator species including *Oxytropis campestris* (yellow locoweed), *Salix arctica* (arctic willow), *Carex breweri* (brewer's sedge), *Arenaria rubella* var. *filiorum* (beach sandwort), *Potentilla rubricaulis* (redstem cinquefoil), and *Potentilla ovina* var. *ovina* (sheep cinquefoil). The limestone sub-alpine and alpine plant communities of the western Uintas are different from equivalent plant communities on other substrates, but the calcareous bogs of the Uinta Mountains are unique for the state (Scad Valley on the Wasatch Plateau is the only other calcareous bog site known in Utah).

These bogs are located at Sheep Creek and Hickerson parks on the north slope of the Uintas and in the South Fork Rock Creek drainage on the south slope. This plant community supports a unique flora seldom found anywhere else in the Uinta range or even the state. The indicator species associated with these bogs are both rare and disjunct. Included are *Carex microglochin* (subulate sedge), *Antennaria pulcherrima* (showy pussytoes), *Kobresia simpliciuscula* (simple sedge), *Thalictrum alpinum* (arctic meadowrue), and *Carex atrosquama* (dark-scale sedge). *Saxifraga herculus* (yellow marsh saxifrage), *Primula incana* (silvery primrose), and *Lomatogonium rotatum* (marsh felwort) are rare indicators also found at Sheep Creek and Hickerson parks, but are absent at South Fork Rock Creek. Several species of orchids, including *Habenaria*, *Corallorhiza*, and *Listera*, can also be found in this bog communities. The diversity and uniqueness of species found in the calcareous bogs of the Uinta Mountains make these sites a required stop for every amateur or professional botanist visiting the area.

The flora of the Uinta Mountains is diverse and rich with plant life. Most of the rare and unusual plant species found in the Uintas grow on relatively uncommon substrates such as Red Pine shale and Mississippian limestone and are less common on Precambrian quartzite, the dominate substrate. The Uinta Mountains are a good example where geologic diversity influences the diversity of floristic composition and structure.

Allen Huber is finishing a doctoral degree at BYU

ENDANGERED PLANT POSTER AT LAST

During the month of July our new endangered plants poster will go to press. This is a companion poster to the Utah Wildflower poster done in the same style by Dave Gardner with calligraphy by Pam Johnson. The poster will be available for $12 plus $3 for shipping and handling. The Utah Wildflower poster will increase in price also on July 1, 1995 to $12 plus $3 for shipping. Proceeds from the posters support our educational and conservation projects. Posters may be ordered by sending a check to:
Utah Native Plant Society
P.O.Box 520041
Salt Lake City, Ut 84152-0041
Please specify which poster you would like.

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Registration (camp fee & meals)

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_____members x $15 = _____
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number of children (8 and under)
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TOTAL _____

t-shirt ($10 each)
_____small
_____medium
_____large
_____x-large
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_____TOTAL x $10 = _____

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VOL. 18 NO. 5 **SEP / OCT 1995**

CALENDAR OF EVENTS

Sep 6
Wed
0700 pm

Salt Lake Chapter Meeting. Bruce Thompson of Ecotrack will present a program of Wildflower Photography. **Note new meeting time 7:00 pm** at the Division of Natural Resources 1636 West North Temple. The entrance is on the west side of the building.

Oct 18
Wed
0630 pm

Annual State Membership meeting and new world menu potluck. A bluecard will be sent out to announce the site for our dinner. Mark this evening on your calendars and plan to attend.

Nov 1
Wed
0700 pm

Salt Lake Chapter Meeting. Our annual UFO (Unidentified Flowering Objects) meeting is this night. Bring your photographs and slides and we will have some experts to identify your flower pictures. Division of Natural Resources, 1636 West North Temple. The entrance is on the west side of the building.

Dec 6
Wed
0700 pm

Salt Lake Chapter Meeting. Ira Beckford from UDOT will speak concerning the right of way landscaping along the freeways and highways. Division of Natural Resources, 1636 West North Temple. The entrance is on the west side of the building.

LATE BREAKING NEWS Papers will be signed Sept 20, 1995 to designate the Mont E. Lewis Botanical Area. See more about botanical areas in the article UPDATE: NEW PLACES...by Nick Van Pelt in this issue of the Sego Lily.

WILDFLOWER HOTLINE 581-4747

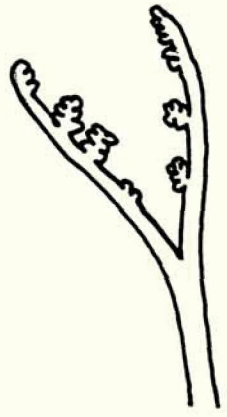
MOONWORTS: ODDITIES OF THE UNDERWORLD

Jim Vanderhorst

In moist meadows of the Uinta Mountains and Aquarius Plateau lurk tiny, primitive ferns called moonworts. Because they are seldom seen by people, folklore has it that they also hide from the sun, partially earning them their common name (also based on the moon-shaped pinnae of some species). Other folk tales describe the ability of moonworts to open any lock, to unshoe horses, and to cure lunacy. On the scale of a moonwort, meadows become forests where they inhabit the understory. No wonder these rare plants are usually found accidentally or only after repeated, long, laborious, and usually futile searches. You're not likely to see them if you are walking or even standing still, unless your eyes are very good. The preferred posture for searching for moonworts is on your hands and knees, but they can be found while sitting down or laying on your belly, thus, most sightings occur at lunch break or after a fall.

Moonworts are primitive ferns which belong to the genus *Botrychium* in the Ophioglossaceae (the adder's tongue family). Also included in the genus are rattlesnake fern and the evergreen grape ferns. These are both much larger than the elusive moonworts, but are apparently at least equally rare in Utah (see below). Within *Botrychium,* the moonworts are the smallest, least conspicuous, and most diverse. The geographical center of diversity for moonworts is western North America, but some species are circumboreal.

Moonwort sporophytes (the relatively conspicuous, diploid, spore producing generation) are small, short-lived, herbaceous perennials which mature one "leaf" (or, in fern terms, a frond) per year. At the base of the year's leaf are the next several years' leaf primordia. If moonworts are collected (for legitimate scientific purposes), only the current year's leaf should be snipped above ground level so that the next years' leaves and the plant's life are spared. The morphology of the leaf is distinctive, usually consisting of a single sterile segment and a single fertile segment. The sterile segment is one or more times pinnate, and subtle differences in the lobing of the pinnae are important characters used to distinguish species. The fertile segment bears the sporangia (which contain the spores) in two rows on branches or along its main axis. An exception to the pattern of a single fertile segment and a single sterile segment is *Botrychium paradoxum,* commonly called peculiar or leafless moonwort, whose sterile segment is replaced by a second fertile segment. Sometimes *B. paradoxum* may hybridize with other species and result in forms which have sporangia borne along the margins of the flattened sterile segment.

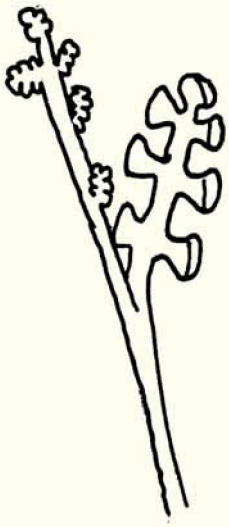


Botrychium paradoxum

Species of *Botrychium* grow from underground rootstocks which lack root hairs. They are thus dependent on mycorrhiza (a symbiosis between plant roots and fungal hyphae) for providing water and mineral nutrition. The associated fungus may even provide carbohydrates for the ferns, thus allowing evolution of species such as leafless moonwort with apparently reduced photosynthetic capacity (is there some truth to moonworts legendary aversion to the sun?). The free living gametophyte (the haploid, gamete producing generation) of *Botrychium* is entirely subterranean and is also dependent on mycorrhizal fungi. Because of these obligate associations, species of *Botrychium* cannot be cultivated.

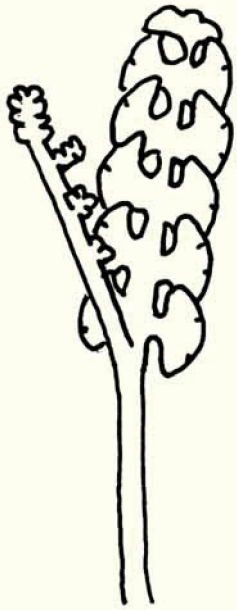
Depending on the treatment, there are a few to several species of *Botrychium* reported in Utah, but these plants remain poorly known in the state due to their inconspicuousness, their controversial taxonomy, and the general scarcity of moist habitats here. Both A Utah Flora and Intermountain Flora recognize just four species of *Botrychium*, all moonworts, from the area: *B. boreal, B. lanceolatum, B. lunaria,* and *B. simplex*. In contrast, the recently published Flora of North America, volume 2 shows Utah distributions for eleven species, including nine moonworts (*B. crenulatum, B. echo, B. hesperium, B. lanceolatum, B. lunaria, B. minganense, B. paradoxum, B. pinnatum,* and *B. simplex*), rattlesnake fern (*B. virginianum*) and an evergreen grapefern (*B. multifidum*). Some of the discrepancy between these treatments can be attributed to disagreements on nomenclature and taxonomy; for example, *B. minganense* is considered as synonymous with or a

form or variety of *B. lunaria* in A Utah Flora and Intermountain Flora, and Flora of North America considers *B. boreal* to be a strictly Eurasian species, and calls North American plants *B. pinnatum*. However, many of the species, or their Utah distribution, are simply not recognized by the local floras. These differences are in indication of the rarity of these plants and the need for further investigation of the genus in the state.



Botrychium minganense

To further complicate the taxonomy of *Botrychium*, there is a tendency for species to grow together in the same habitat in "genus communities." At one pristine montane grassland site in Montana where I found a rather large population of *Botrychium paradoxum*, there was also *B. lunaria*, *B. minganense*, possibly *B. crenulatum*, some hybrids, and a tiny undescribed plant with a single fertile spike with four sporangia and no sterile segment or second fertile segment. Thus, if a single moonwort is found, further searches in the immediate area may reveal additional, possibly even undescribed, species. Moonworts are all considered to be rare, but because of their inconspicuousness they are probably more common than we know. Two species which are documented in Utah (but not included in local floras), *B. crenulatum* and *B. paradoxum*, are currently listed as C2 plants by the U. S. Fish and Wildlife Service. This means that listing as threatened or endangered may be appropriate but not enough information is available at this time. Recent surveys in Montana and Utah have found large populations of these two species, however they remain some of the least observed plants in the world, and further surveys are needed to determine their appropriate conservation status. It is possible that the most rare moonwort species have not yet been discovered.



Botrychium lunaria

If you wish to find moonworts in the field, here are some tips. In Utah, moonworts are usually reported from wet meadows at middle to high elevations (but not above timber line). However, in Montana (with a colder, wetter climate) moonworts are most common in more mesic montane grasslands, and in the northwest part of the state the same species grow in low elevation groves of ancient western red cedars. Although there seems to be some degree of local habitat fidelity, be prepared to be surprised by where these plants may show up. Moonworts mature in middle to late summer, and their apparent abundance may vary from year to year. Individual plants or whole populations may go "dormant" in some dry years, only to reappear in the next wet year. As mentioned above, if a single plant is found, more plants of the same or other species are likely to occur nearby. In identifying moonworts, the lobing of the sterile leaf segment is perhaps the most important diagnostic character, however, other key characters include the 3-dimensional planation of the sterile blade, the plant's color, and its relative succulence. Photography is an excellent tool for recording these attributes. Color photographs of many of the species of *Botrychium* which occur in Utah and a key for their identification can be found in D. B. Lellinger's A Field Manual of the Ferns and Fern-allies of the United States and Canada, available in many libraries. Finally, if significant new populations of moonworts are found in Utah, especially of the more rare species (i.e. those not included in the local floras) or with high species diversity, the locations should be reported to the Utah Natural Heritage Program so that the occurrences can be entered into the organization's rare plant database.

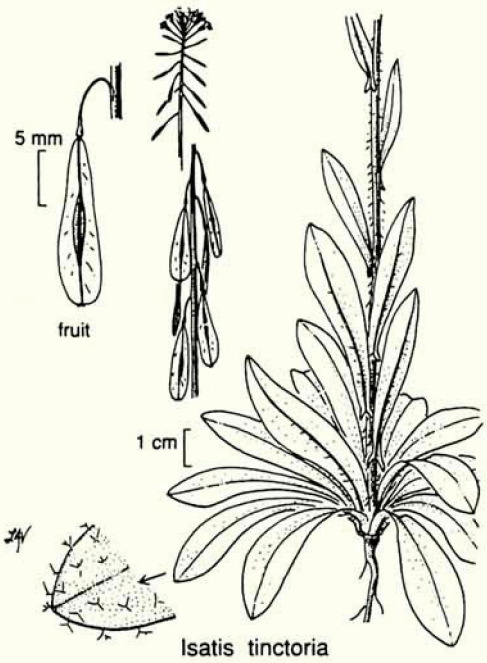
DYERS WOAD ON THE HIT LIST

Therese Meyer

In May, the Ogden Ranger District put out a plea for hikers to lend a hand eradicating a noxious weed,

DYERS WOAD.

The plant is in the mustard or *Brassicaceae* family: *Isatis tinctoria.* It is a biennial or perennial herb, producing basal leaves the first year and tall stems the next, with racemes of numerous yellow four-petal flowers from May to July, and greenish or purplish seed pods following. The seed pods often hang down and are pear shaped (see illustration from The Jepson Manual, 1993).



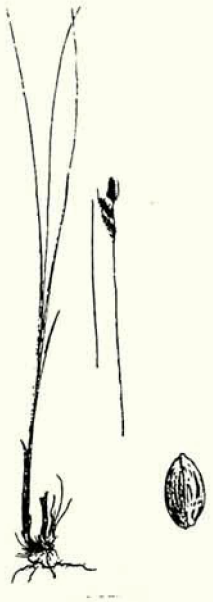
The plant originated in Eurasia and was cultivated for a blue dye, but has become a widespread weed. Dyers woad is found in Utah's valleys and foothills, often along roads or other disturbed sites. It tends to take over a site and is not palatable to livestock or native ruminants. The Forest Service is reluctant to spray herbicides, and asks instead that people pull up the plants breaking the roots off three inches below the ground, preferably before the seed matures (the purple stage). Mature seeds should be bagged and disposed where they won't continue infestation.

Homeowners in the Snyderville Basin area near Park City have been helping pull the Dyers woad along roadsides and in pastures at the request of the Summit County Public Works.

UINTA MOUNTAINS WETLANDS

by **Wayne Padgett**

When one visits the Uinta Mountains there is an obvious awareness of something different from other mountain ranges in Utah - in the Rocky Mountains for that matter. First, the backbone of the range goes from east to west (or is that west to east?), extending about 150 miles in length. It is, in fact, the largest east-west trending mountain range in all of North America. Second, with much of the range occurring above 10,000 ft elevation, it has more contiguous alpine areas than anywhere in Utah. Cronquist and others (1972), in Volume 1 of the Intermountain Flora, noted that there are nearly 10000 square miles of this high elevation land in the Uinta Mountains. Third, the high mountain peaks (Kings Peak is the highest point in Utah at 13,498 ft with Mount Emmons, Gilbert Peak and several others above 13,000 ft) receive the largest amount of precipitation of any mountain range in Utah. This comes in the form of winter snow and summer thunderstorms. Fourth, high elevation cirque basins (the largest in Utah) with their geologic base of resistant rock, form physical characteristics that have allowed the development of some of the largest mountain wetland complexes in Utah. Finally, the acidic soils resulting from the breakdown of Uinta Mountain Quartzites have created the perfect environment for acid-loving plants, some found nowhere else in the state. Put all of this together and you have one of the most spectacular mountain ecosystems in Utah. Not only that, but some of the most incredible mountain wetland ecosystems in the state.



Carex buxbaumii

Sherel Goodrich, ecologist/botonist on the Ashley National Forest and coauthor of A Utah Flora and Uinta Basin Flora, first introduced me the wonders of the Uinta Mountains nearly 10 years ago when I, as a young (well...not that young) aspiring ecologist, first started working in riparian ecosystems throughout National Forests in Utah. He brought me to special places to see plants I had never seen before; plants that occur nowhere else in Utah. He talked to me about how similar some the these sites were to those found elsewhere in the country (like the Wind River Range in southwestern Wyoming), but that this was a unique place in Utah. Nowhere else in the state did Buxbaum sedge (*Carex buxbaumii*) occur. Nowhere else could one find Marsh cinquefoil (*Potentilla palustris*), a red flowering potentilla that I had only seen before when working in the wetlands of the Targhee National Forest just west of Yellowstone National Park. My excitement grew and Sherel took me from place to place to show and talk to me about the wetlands of the Uinta Mountains. It truly is a wonderful place.

When you look at the cirque basins from above, one thing becomes evident - they're wet! In addition, for one reason or another those basins on the north slope of the Uinta Mountains typically form a simple, north-south basin pattern; those of the south slope are typically divided into large east-west basins which then feed into larger north-south cirques, making the wetlands of the south slope typically more extensive. Further east in the Uinta Mountains, as the cirque basins diminish, wet pothole areas appear, evidence of past ice fields scouring the landscape.

When thinking about mountain wetlands, I tend to think about communities dominated by willows, alder, birch, grasses and grasslike plants (rushes, sedges, spike-rush, etc.). All of these are common in the Uinta Mountains. Willow dominated communities are common throughout the area. Along the rock-lined streams it is common to find Drummonds willow (*Salix drummondiana)*, a favorite of moose that commonly inhabit the area. Geyers willow (*S. geyeriana*) and Booths willow(*S. boothii*) occur in the mid to lower-elevation meadows, rivers, and streams of the range. The low-growing wolf willow (*Salix wolfii*) and plainleaf willow (*S. planifolia*) are typical in the higher wet meadows of the Uinta Mountains, although it is not uncommon to see them even at mid-elevations.

With willows you will often find species like water sedge (*Carex aquatilis*), tufted hair grass (*Deschampsia caespitosa*), bluejoint reedgrass (*Calamagrostis canadensis*), the purple-flowered felwort (*Swertia perennis*), or Jacobs Ladder (*Polemonium*). Monkshood (*Aconitum columbianum*), mountain bluebells (*Mertensia* ciliata), and arrowleaf goundsel (Senecio *triangularis*) are also seasonal beauties. In the wet meadows one can see shooting star (*Dodecatheon spp.*), elephants head (*Pedicularis groenlandica*), marsh marigold (*Caltha leptosepala)*, and numerous sedges.

For the faint of heart, learning to identify the sedges in the meadows of the Uinta Mountains (or anywhere else in the world for that matter) can be an overwhelming task. They come in all shapes, sizes, and colors. The robust beaked sedge (*Carex rostrata*) and similar looking inflated or blister sedge (*Carex vesicaria*) occur in some of the wettest of the wetlands. Often with their feet well under water, at least early in the summer,these sedges are hard to miss. With relatively wide leaves, a bright green color, and large cylindrical flowering spikes, they are perhaps the easiest to learn. Beaked sedge has long rhizomes which make it grow much like the bluegrass in your lawn, covering large areas. Inflated sedge on the other hand has shorter rhizomes so they tend to form clumpy plants, more like the blue fescue planted in your perennial garden (only much larger). In addition, at least in the Uinta Mountains, you often find inflated sedge growing in the "bathtub ring" on the shoreline of lakes and reservoirs. Water sedge (*Carex aquatilis*), with its bluish-white tips as it begins growing in the Spring, is perhaps one of the other more easily distinguishable sedges. This sedge typically grows at mid to upper elevations in wet, boggy meadows. The similar looking Nebraska sedge (*Carex nebrascensis*) typically has broader leaves and is more common at lower elevations. It also starts the Spring growth with white-tipped leaves. Both of these species are rhizomatous like the beaked sedge, but these generally have a bluish-green appearance as they mature. In some of the boggy wetlands, particularly those of the south slope, one can find mud sedge (*Carex limosa)* and the similar looking poor sedge (*Carex paupercula)*. If you're truly interested in taking on these species I suggest you seriously consider purchasing Volume 6 of the Intermountain Flora. This volume has line drawings (and pretty good ones at that) for each of the sedges mentioned above and more.

But these are among the more common plants in wet meadows. What are some of the really fun things to see? Well, take a trip to the south slope of the Uinta Mountains and somewhere along the red cloud road are a series of potholes, part of which occur in the Sims Peak Potholes Research Natural Area (closed to general use and recreation). On the edge of some of these potholes grows the beautiful red flowered marsh cinquefoil. Also in the potholes area is Slender sedge (*Carex lasiocarpa*), which until about ten years ago was not known to occur in the Intermountain Region. In fact, the Intermountain Flora didn't even include it in the volume on the monocots. Unremarkable to many, this is one of my favorite sedges. It looks much like the common wooly sedge (*Carex lanuginosa*), but has long narrow leaves and grows in standing water, often on the edge of the potholes or actually in the potholes. If

you get a chance, got to the Ashley National Forest and check out these fantastic features. When going into the potholes, however, remember to take your compass and pay close attention to how you travel because if it becomes overcast, it can be very difficult to find your way back out.

Potentilla palustris

Switching gears and areas on the Uinta Mountains, take the drive south from Mountain View or Evanston and before you get to the Forest boundary, you'll drive past some private lands with some of the most unique assemblages of plants I've ever seen in this part of the country. Imagine seeing blue spruce, cottonwoods, aspen, sagebrush, shrubby cinquefoil, river birch, juniper and ponderosa pine growing together. Did I say juniper and ponderosa pine? Don't those grow on drier upland sites? Yup! But there they are.in those incredible meadows on the lowest flanks of the north slope. And when you look at the distribution of ponderosa pine, these are the most unique populations of this species I have ever seen - and probably the northern-most naturally occurring distribution of the southern variety of ponderosa.

The numerous meadows on the north and south slope of the Uintas provide an amazing diversity of plants and animals. Many of these areas are in the High Uintas Wilderness Area, but many others are not. Some of the diversity is yet to be discovered. Two years ago I spotted the purplish-blue *Downingia laeta* (sorry, but I don't know that this even has a common name) growing in the dried up vernal pools of Gilbert Meadows on the north slope of the Uinta Mountains. As far as I know, this hadn't been known from the Uinta Mountains before. Maybe you can be the one to learn something new about this wonderful range. And when you decide to go there, take your mosquito repellent, one of the floras for the area, and plan for rain. Its a fantastic place to explore, these valuable wetlands that provide so much wildlife habitat, clean water, quality fish habitat, and some incredibly beautiful plants and plant communities. So much to see, so little time. Go for it!

UPDATE: NEW PLACES FOR NATIVE PLANT CONSERVATION AND ENJOYMENT

By **Nick Van Pelt**

The U.S. Forest Service sets aside "special management areas", as does Congress when it passes a wilderness or a wild river bill. A **botanical area** has plant specimens or taxonomic groups that are significant because of their color, habitat, location, life history, or rarity. It is a form of "special interest area" (SIA). Others include archaeological, geological, scenic and zoological.

"Significant" may be an expert's or a Forest Service manager's judgement. Significance is usually regional or statewide, rather than national or global. Through its priority plant lists, the Society underscores the importance of certain habitats.

Once created, botanical areas are for public interpretive, educational and inspirational uses. The areas can also protect unique or sensitive environments. Just a few examples are bedrock outcrops, riparian communities, bogs, seeps, and old growth forests.

Special Interest Areas are a noncontroversial way to accomplish a range of conservation goals. Designation could be an excellent response to biodiversity issues. As "refugia", botanical areas promote federal endangered and sensitive species programs.

Just three SIAs exist on the national forests in Utah. They are the Grove of Aspen Giants Scenic Area above Manti, the Sheep Creek Geological Area near Flaming Gorge, and the Mount Timpanogos Scenic Area. No botanical areas have been set aside yet. Either the Regional Forester in Ogden or the supervisor of a national forest may designate new ones. They are generally under 150 acres.

This article reintroduces Sego Lily readers to protected sites members can visit on Society field trips or on their own. After the described areas are finally designated, a newsletter issue will supply access directions and say something about management intentions. The third area we describe hosted the August 12 Society trip to the southwestern Uintas.

Red Canyon is a beautiful part of the Dixie National Forest. The area is also botanically

remarkable. About a dozen endemic species grow on exposed soils weathered from the Claron or Pink Limestone Member of the Wasatch geological formation. In southwestern Utah, the formation consists of sedimentary rocks capping the southern edge of Utah's southern High Plateaus, at elevations of about 7,000 to 11,000 feet.

During special status plant surveys, a place was found that harbors most of the special Claron species or varieties. This discovery prompted the Powell Ranger District, the Society, and The Nature Conservancy to consider a special management area designation for about 115 acres south of the Red Canyon highway. A UNPS group compiled the species list in 1991.

The site's diversity and lack of conflicts provide an opportunity to show how the Forest Service and cooperators can perpetuate rare plants without the Endangered Species Act. The Conservancy thus proposed a Claron Special Interest Botanical Area. This measure would be vital for "ecosystem management" of species restricted to or rare on the Claron Member in Garfield and Iron counties.

Upon designation, the site will serve as an official "refugium": a place whose management criteria are sufficiently restrictive as to assure preservation of six sensitive plant species through protection from detrimental human-caused influences. The particular species are *Castilleja parvula* var. *revealii* (Reveal paintbrush), *Cryptantha ochroleuca* (yellow-white catseye), *Cymopterus minimus* (Cedar Breaks biscuitroot), *Eriogonum aretioides* (Widtsoe buckwheat), *Penstemon bracteatus* (Red Canyon beardtongue) and *Silene petersonii* (Maguire campion).

Informed visitors can easily locate the endemics, plus other plants of different families and floral characteristics growing and flowering together. Learning more about the noteworthy species is one of the main attractions of the proposed area. There are excellent guidebooks to aid the nonprofessional botanist visiting the Bryce Canyon National Park region.

The proposed area is free of economic resources, improvements, or recreational attractions other than natural history. It has negligible forage resources and thus supports no cattle, horse or sheep grazing. No timber cutting has occurred.

West of Price, on the Wasatch Plateau, is a very different kind of botanical area. Officials of the Manti-La Sal National Forest have long proposed naming it in honor of Mont Lewis, Sr., an eminent Intermountain botanist. He served many years with the Forest Service before going into active retirement and specializing in the Cyperaceae (sedges). Scad Valley was a favorite of his when he worked on the plateau.

The proposed Botanical Area is a montane, cold-water spring site containing many species not normally found outside of arctic and alpine habitats. Several species of willows (*Salix*), about twenty species of sedge (*Carex, Eleocharis, Kobresia*), and perhaps twelve wetland plant community types. Botanizing opportunities are exceptionally high, generally from late June into September. The plant list currently has over 100 species or varieties. This is one of the most species-rich places ever discovered in Utah.

A third botanical area opportunity occurs on the Duchesne Ranger District of the Ashley National Forest. The Ashley encompasses the southern Uinta Mountains, in northeastern Utah. The dammed North Fork and South Fork of Rock Creek drain part of the western High Uintas Wilderness. The wilderness is a few miles north of the area in question, which has no recreational use.

The South Fork of Rock Creek proposal takes in a subalpine wet meadow, talus slopes, and small stands of Engelmann spruce. Elevations range from 9300 to 11,000 feet. The area straddles a zone where the range's ancient quartzitic rocks adjoin much younger sedimentary formations, chiefly of limestone.

The area is mainly "special interest" because it supports sedge, figwort, and willow species that are limited, or nearly so, to this part of the Uintas. Three clubmosses previously unknown in Utah also occur, plus herb species unique to cold, wet conditions. Like the area in Scad Valley, the meadow may be characterized as a calcareous bog. It is dotted with stunted spruce trees, though.

The South Fork of Rock Creek was mentioned in Uinta Basin Flora. It was much more fully described in the last issue of The Sego Lily. The habitat type Utah botanists recognize is "bog-seeps". The site's spectacular uplands partly correspond to "rocks, crevices and ledges".

The most significant plant **group** is the sedge family, with 12 forms in three genera. There are six members of the rush family and four orchids, but none of these 10 species are considered rare or restricted. The site's slopes provide good botanizing and picturetaking opportunities, with several dozen more species present.

The responsible national forest offices received new or updated botanical area proposals this Spring. The Mont E. Lewis site has the best prospects for designation and a commemorative ceremony in the near future. Retired Forest Service employees and the Society for Range Management's state chapter support this area's protection and recognition.

The Utah Native Plant Society has twice provided essential funds for The Nature Conservancy's leadership on these botanical area prospects. The Conservancy has also worked persistently to clarify and strengthen Forest Service policies. Together we optimistically anticipate a new round of planning to guide national forest management and biodiversity protection from the mid-1990's onward. No doubt more botanical area candidates can be discovered and nominated.

***

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VOL. 18 NO. 6 **NOV / DEC 1995**

CALENDAR OF EVENTS

Nov 15
Wed
0630 pm

Annual State Meeting and New World Potluck. If you thought you had missed this meeting, what luck ! Because of scheduling conflicts it was rescheduled . We will meet at Westminster College at 1840 So 1300 E. in Salt Lake City. We have reserved the Reherd Dining Room in the Shaw Center which is located on the west side of the plaza (central campus). We will cook the turkey, so please bring a dish to share, preferably one that contains an edible piant from the new world. Some suggestions: peas, beans, squash, potatoes, tomatoes, berries, peanuts, etc.

Dec 6
Wed
0700 pm

Salt Lake Chapter Meeting. Ira Beckford from UDOT will speak concerning the right of way landscaping along the freeways and highways. Division of Natural Resources, 1636 West North Temple. The entrance is on the west side of the building.

Jan 3
Wed
0700 pm

Salt Lake Chapter Meeting. Glen Beagle from Lone Peak Nursery will be our guest speaker. Lone Peak Nursery is associated with the Utah State Prison and they raise trees for reforestation and plants for reseeding. Also a project of interest is the ponds and riparian plants they use at the nursery to clean the run-off water. Division of Natural Resources, 1636 West North Temple, SLC. The entrance is on the west side of the building.

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Ecology and Conservation of a Great Basin Endemic Species: Giant Four-wing Saltbush (Atriplex canescens var. gigantea)

by **Alyce M. Hreha**, Conservation Botanist, Red Butte Garden and Arboretum, University of Utah, Salt Lake City, Utah

Introduction

Giant four-wing saltbush (*Atriplex canescens* var. *gigantea*), a federally proposed Category 2 species, is restricted to the Lynndyl Dunes at the Little Sahara Recreation Area in Juab County, Utah. The Richfield BLM District administers the site which is part of the House Range Resource Area from an office in Fillmore, Utah.

This relict species is the suspected diploid (2n) ancestor of the common widespread tetraploid (4n) four-wing saltbush (*A. canescens*). The genetics, distributional, phenological and vegetative characteristics of the giant species are quite different from the common species of four-wing saltbush (Table 1). Characteristics which enable the giant four-wing saltbush to survive in shifting sand include its rapid growth rate and ability to root adventitiously. Newly exposed stems and roots of the shrub in the path of an advancing dune may develop chlorophyll which increases the plants' photosynthetic capacity (Stutz et al., 1975).

Atriplex canescens var. *gigantea* is the most conspicuous woody species growing on the sand dunes (Stutz, 1979). Although our biological knowledge of this Great Basin endemic shrub is limited, we do know that the activities of sand dune recreationists pose possible threats to this rare species (Stutz, 1979).

The peak season for recreational activities at Little Sahara, a favorite spot for off-road vehicle (ORV) use and organized racing events, occurs in spring, especially during the month of April (Peterson and Muhlestein, 1973; BLM, 1974).

Researchers from Red Butte Garden and Arboretem observed several dead and damaged Giant four-wing saltbushes in the dunes adjacent to the heavily used White Sands Campground, Jericho Picnic and Sand Mountain areas during preliminary field investigations in 1992. Many plants are damaged directly by vehicles driving over them and by people breaking off branches to burn in campfires.

Other uses of the shrub, which may or may not constitute possible threats, include: matresses for sleeping bags, make-shift wind shelters for campers, dry flower arrangements for the home and possibly as landscape plants in desert recreation areas.

According to Stutz (1979) and Welsh et al. (1987), the shrub is highly palatable and an important browse species for both domestic livestock and wildlife. Although livestock grazing is permitted in three allotments adjacent to the sand dunes, this activity does not appear to be a threat to the species. Domestic grazers usually do not venture into the dunes. However, those unfortunate ones that do, get trapped and die. Because of its excellent characteristics as a browse species (Stutz, 197.9), it has been used in reclamation projects and may be found outside its historical range (Welsh et al., 1987).

In order to protect this species from possible threats, especially those caused by sand dune recreationists, more information was needed. A cooperative research project was initiated in 1992 by the BLM through their challenge cost share program in conjunction with Red Butte Garden and Arboretum to map (1993), inventory (1994) and monitor (1995-97) the Giant four-wing saltbush population at the Little Sahara Recreation Area. The project will provide data on the biology, ecology and habitat requirements as well as the pertinent threats to the species. Management recommendations and a conservation strategy for the species and its sand dune habitat will be developed from information gathered during the study.

Sand Dune Geography, Geomorphology and Geology

The Lynndyl Sand Dunes, sometimes called the Jericho Dunes, are located about 115 miles south of Salt Lake City on U.S. Highway 50 & 6 in the Sevier Desert (Sack, 1981; Stokes, 1986). The dune field, one of the largest in Utah, is about 20 miles long and 10 miles wide. The BLM administers about 45% of the total area of 220 square miles occupied by the dunes:

Atriplex canescens var.*gigantea*

The dunes are oriented in a southwesterly to northeasterly direction with predominant wind direction from the southwest. Topography varies from 4,600 ft in the southwest to 5,600 ft in the northeast. Active dune heights range from 6.5 ft to 200 ft. Smaller dunes are prevalent in the southwestern section of the dune field where there is less available sand while larger dunes are more prevalent in the northeastern section where sand is more abundant (Sack, 1981).

The Little Sahara Recreation Area is dominated by active dunes which are composed of loose sands. At Sand Mountain, active dunes overtop limestone bedrock ridges whose exposure varies depending upon the amount of wind action. The remainder of the area is primarily older dunes composed of weakly consolidated sand which appear to be stabilized by a sparse cover of vegetation (Pampeyan, 1989). About 64% of the dune field is occupied by active dunes, while 17% and 19% are occupied by semi-active and stable dunes, respectively (Sack, 1981).

Sand particles composed of fine to medium sized quartz grains originated from sandbars that were deposited along the southern shoreline of Lake Bonneville during the Pleistocene. Sand movement is estimated at 18 inches per year. Active dunes are about 150 miles northeast of where they originated in the Sevier Desert (Peterson and Muhlestein, 1973). Although several types of dunes occur within the dune field, the endemic shrub occurs primarily on active areas of transverse dunes within the Little Sahara Recreation Area.

Sand Dune Flora and Fauna

Utah junipers and a variety of shrub species such as serviceberry, sagebrush, saltbush, shadscale, mountain mahogany, rabbitbrush and cliffrose, cover about 40 percent of the recreation area, while sagebrush, grasses and annuals cover approximately 35 percent (Peterson and Muhlestein, 1973). The remaining 25 percent of the area consists of relatively barren sand dunes on which the Giant four-wing saltbush grows.

The giant shrub occurs most often in the relatively stabilized inter-dunal valleys (swales) or on the active leeward dune margins (Stutz et al., 1975). Other sand tolerant species such as buckwheat (*Eriogonum corymbosum*), rubber rabbitbrush (*Chrysothamnus nauseosus*), Indian ricegrass (*Stipa hymenoides*), dock (*Rumex venosus*), sand verbena (*Abronia fragrans*), pale evening primrose (*Oenothera pallida*) and the rhizomateous legume *Psoralidium lanceolatum* occur within these shrub communities and help to stabilize the dunes. The understory, in many cases, is comprised of weedy species such as cheat grass (*Bromus tectorum*), Russian thistle (*Salsola kali*) and tansy mustard.

According to Peterson and Muhlestein (1973), the recreation area 0is inhabited by a diverse wildlife community. There are 17 species of mammals including mule deer and antelope populations as well as 15 species of birds and 9 species of reptiles.

Threats to the Species

Several dead and damaged shrubs were observed in the areas of high visitor use: 1) White Sands Campground, 2) Jericho Picnic Area and 3) Sand Mountain. Damage to shrubs in the White Sands Campground area is primarily caused by vehicles running over them. Some shrubs have several broken branches which were possibly collected for firewood (Peterson and Muhlestein, 1973). Other shrubs have been burned by campers as the base of bonfires.

Besides being damaged by firewood collection, several shrubs with broken branches on the hillside adjacent to the Jericho Picnic Area were dead. However, the cause of death was not determined. The entire shrub community in this area including several rubber rabbitbrush appeared dead. We observed numerous trails running through this dead plant community. The probable causes of shrub mortality may be compaction of sand by visitors hiking along the dunes as well as exposure of and damage to shrub roots (Peterson and Muhlestein, 1973).

At Sand Mountain, most damage and destruction to the shrubs is due to ORVs driving over them. In the dune area east of Sand Mountain, some shrubs appear to have been crushed from above possibly from heavy snow accumulation. Several shrubs had deer pellets close to their bases and broken branches. Because they are the largest woody species on the dunes, perhaps, deer use them for cover during the winter (Stutz, 1979). Evidence of deer browsing on the shrub was observed this past spring during a grazing survey that we conducted as part of this research project.

Management Recommendations

In order to protect these unique endemic shrubs the following
recommendations should be considered:

1. Signs that describe the shrub and explain its rarity would be useful in educating the public that utilize the recreation area.
2. Signs could also request that recreationists not drive over these shrubs or break off branches for firewood.
3. Signs could be located on recreation area bulletin boards at the main entrance, campgrounds, picnic areas and along popular ATV trails.
4. Higher visibility of rangers patrolling heavily used areas and enforcing regulations and more frequent drive throughs where campers and ORV users are impacting the vegetation might curtail damage to the shrub.

5. Education of the public about the sensitivity of these plants to disturbance and destruction would be beneficial to their survival.

6. Population data should be recorded along several belt transects in the shrub communities in order to determine mean shrub density, height, width, reproductive age, male/female ratio, vigor, damage and mortality. We completed this phase of the project last fall.

7. Monitoring plots should be established in high use areas such as the White Sands Campground, Jericho Picnic Area and at Sand Mountain in order to monitor population viability, sand movement and threats to the species. We completed this phase of the project this fall.

8. Continue monitoring the species for at least 5 years and preferably 10 years. We have been promised funding through 1997.

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Table 1. Comparison of Giant and Common Four-wing Saltbushes

Characterisitics of Giant four-wing saltbush (*Atriplex canescens* var. *gigantea*)

(2n=18/diploid)
range: endemic restricted to the Lynndyl Dunes
dioecious: 1/1 (male/female) ratio
flowers: late June
large fruits: 12 (length) x 15 (width) mm
leaf length: mean= 75 mm (up to 85 mm)
high growth rate: 100 cm/season
overall size: 10-12 ft high by 12-15 ft wide

Characteristics of Common four-wing saltbush (*A. canescens*)

(2n=36/tetraploid)
range: Canada to Central Mexico
from the Pacific Coast to the Misouri River
usually dioecious but sometimes monoecious
flowers: mid May
small fruits: 11 (length) x 12 (width) mm
leaf length: mean= 60 mm
low growth rate: 20-40 cm/season
overall size: 3-4 ft high by 5-6 ft wide

(Stutz et al., 1975)

New Book Looks at Native Foods of the Sonoran Desert

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Wild Foods of the Sonoran Desert was written by Kevin Dahl, Education Director at Native Seeds/SEARCH, a Tucson-based nonprofit organization dedicated to conserving seeds of Native American crops and promoting the use of traditional foods. It is the second in a series of natural history booklets produced by Arizona-Sonora Desert Museum, one of the world's leading natural history museums.

To order call 1-800-734-8469 or send a check for $6.95 to Arizona-Sonora Desert Museum, 2021 N. Kinney Road, Tucson, AZ 85743.

STOP THE RUSSIAN-OLIVE INVASION

What is the Russian-olive Invasion?

Throughout the West, an intruder invades our grasslands and riparian areas along rivers, streams, and ditches, forever changing the plants and animals found there. The intruder? The Russian-olive (*Elaegnus angustifolia*). This seemingly innocent tree is actually an aggressive Eurasian invader engaging in a subtle takeover!

Why is it a threat?

Wildlife

Wildlife biologists are just beginning to understand that Russian-olives are of little or no use to many wildlife species. This is surprising to people who see common species such as starlings, cedar waxwings, and robins using the trees. But these birds are very adaptable and can find food and shelter in a variety of trees.

Unfortunately, biologists estimate that one-third of the bird species using native riparian (streamside) areas, including a number of rarer species, do not use areas dominated by Russian-olive. Native trees like conttonwoods and willows serve as food and nest sites to these birds, but the invading Russian-olive does not, its small limbs and hard wood are not appealing to cavity-nesting birds like the chickadee. Furthermore, Russian-olive does not support many insects so warblers and other insect-eating birds cannot rely on it as a food source.

Plants

Russian-olive seeds grow slowly in the shade of native cottonwood and willow trees, and may even appear somewhat dwarfed. However, when the cottonwoods and willows die, Russian-olives grow rapidly, taking advantage of available sunlight. Cottonwoods and willows need full sunlight to reestablish themselves and cannot grow in the shade of the invading Russian-olives. The result is a permanent conversion of native riparian areas to areas dominated by Russian-olive. And this spells disaster for many native plants and animals.

Agriculture

Farms and ranches are impacted by Russian-olive as it invades pasture land and blocks irrigation ditches. The invasion can be a hindrance to daily operations, and removal of the trees is costly and difficult.

How did this happen?

Russian-olive's ability to thrive in a wide range of soil types and moisture conditions made it a popular choice for landscaping in the West. Following the Great Dust Bowl it was promoted for windbreaks and soil conservation, evident today where rows of Russian-olive mark abandoned homesteads. Since the 1950's, it has been recommended for landscaping and mistakenly, for wildlife habitat. Continued promotion by many state and federal agencies and commercial nurseries, coupled with its aggressive nature, results in establishment of not only intended plantings but a number of "escapees" as well. "Escapees" occur primarily with the help of birds. The hard-coated seeds pass unharmed through the digestive tract of birds and may be carried a mile or more from the original tree. They are often deposited along rivers, streams, diches, and even wetlands, ultimately spoiling important habitat for many native animals.

Where does it grow?

Russian-olive is a thorny, medium-size tree with silvery-green leaves and small one-seeded fruits or "olives." The tree has already invaded the 17 western states, and its movement continues. If the Russian-olive threat is not recognized and addressed soon, some of the most important habitat in the West will be permanently altered. It is already a dominant species along the Boise River in Idaho, and is expected to soon dominate floodplains of the Platte River in Colorado and Nebraska and Rio Grande River in New Mexico.

Can we stop the invasion?

Stopping the Russian-olive invasion is costly and difficult. The costs increase with delayed action, and on public lands, taxpayers foot the bill. Attempts to control Russian-olive include cutting, girdling, burning, herbicide application, mowing, and mechanical removal. The most cost effective and evironmentally responsible method of control is to prevent seed dispersal by removing trees and eliminating seed sources. But this isn't easy unless people are aware of the threat and act accordingly.

What can I do?

Russian-olive is a problem, in part, because it hasn't been broadly identified as a serious environmental threat. Awareness is an important first step.

* Educate your friends, family, and colleagues. Encourage them to pass on information about Russian-olive.
* Landscape responsibly. Write your state's Native Plant Society for a list of landscape plants. In Colorado, some good alternatives include: Peach-leaf willow (*Salix amygdaloides*), cottonwood (*Populus deltoides ssp. monolifera* - east slope; *P. deltoides ssp. wislizenil* - west slope and *P. angustifolia* - mountains), hackberry (*Celtis reticulata*), chokecherry (*Prunus virginiana*), and wild plum (*Prunus americana*). Be sure to plant species that are appropriate to your region.
* Ask your local nursery to stop selling Russian-olive, and to stock plants that are native to your region.

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* Write to local, state, and federal government agencies and request formal designation of Russian-olive as a noxious weed.
* Remove existing Russian-olives from your propery, especially if you live within three miles of a river, stream, or ditch. Ask your local weed control office for assistance.
* Organize a volunteer removal project on public lands. Ask your local land management agency for assistance.

STOP THE RUSSIAN-OLIVE INVASION

This brochure was produced by the City of Boulder Open Space Department, with technical assistance from the National Ecology Research Center, U.S. Fish and Wildlife Service. Printing was funded in part by the Colorado Native Plant Society and the City of Boulder Mountain Parks Division

HELP

It is the time of the year when the UNPS begins to reorganize and prepare for the next year. We are looking for a lot of good people who would like to fill leadership roles in the UNPS at both state and chapter levels. One of the goals of the board of directors is to start new chapters throughout the state, so if you live outside of Salt Lake City and are interested in starting a chapter we need you. Anyone who can volunteer some time or anyone who knows a shy person they would like to volunteer should call Alyce Hreha (801-944-2337) or Brent Shipley (801-268-2601).

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