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NOMENCLATURE CHANGES IN THE ORCHIDACEAE OF ARIZONA AND NEW MEXICO

Ronald A. Coleman

Orchidaceae could be the largest and most-studied flowering plant family, causing its nomenclature to be in constant flux. It's no surprise that different publications have different names for the same orchid. The recently published *Wild Orchids of Arizona and New Mexico* (Coleman 2002) shows differences in 60% of the taxa when compared to those in Kearney and Peebles (1951) and Martin and Hutchins (1980). In Coleman's book, thirteen taxa have partially or totally revised names and there are nine new plant identifications of Arizona and New Mexico natives. Three taxa in Kearney and Peebles and/or Martin and Hutchins (KP/MH) are excluded from these two states in Coleman's catalogue. (See Table 1 for KP/MH versus Coleman nomenclature.)

Calypso bulbosa var. *americana* is the name Luer (1975) used to separate local calypso from the west coast variety known as *Calypso bulbosa* var. *occidentalis*.

The color of the hairs on the lip is the difference -- yellow in *Calypso bulbosa* var. *americana* and white in *Calypso bulbosa* var. *occidentalis*.

The monotypic genus *Coeloglossum*, established in 1820, was largely ignored by American botanists who preferred to place the lone species in *Habenaria*. Since Luer (1975), there is universal agreement that the taxon is distinct.

There are two varieties of *Coeloglossum viride*, the United States has *Coeloglossum viride* var. *virescens*, with *Coeloglossum viride* var. *viride* common in Europe. *Coeloglossum viride* var. *virescens* is common in New Mexico, but is the least common orchid in Arizona, perhaps only an occasional visitor.

The large yellow lady's slipper, *Cypripedium parviflorum* var. *pubescens* goes by many names. Correll (1950) identified this plant as the European yellow *Cypripedium*, *C. calceolus*. Beginning with Atwood (1984), authors recognized that the American and European plants were different. Sheviak (1993, 1994, 1995) recognized three varieties: *Cypripedium parviflorum* var. *parviflorum*, *Cypripedium parviflorum* var. *pubescens* and *Cypripedium parviflorum* var. *makasin*. Only *Cypripedium parviflorum* var. *pubescens* occurs in the southwest where it is extremely rare in Arizona but more plentiful in New Mexico.

Two local *Malaxis* had nomenclature changes. Todsén (1997) pointed out that local purple *Malaxis porphyrea* differed

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PRESIDENT'S MESSAGE

Ken Morrow

As I write this, U.S.-led armed forces are completing the fight to overthrow the regime in Iraq in a thankfully short campaign. All Americans, regardless of politics, are hoping for our troops' safe and quick return. I'm sure there are ANPS members with family and/or friends who are deployed in the area, and I speak for the Board in wishing them a joyful reunion with their loved ones.

While the war on terror continues in the Middle East, invading hordes of exotic plant and animal species continue to raise havoc here. What if just 1% of the U.S. military's annual budget of \$360 billion was diverted to thwart these bio-invaders? \$3.6 billion annually would go a long way toward slowing, maybe reversing, damage these aggressive foreigners do to our fragile ecosystems. Imagine a well-equipped, highly-motivated chapter of Weedwackers in every community, seeking out and destroying the evil invaders wherever they appear!

As spring envelops our region, signaling the change from winter -- a wet one at last -- there have been changes in the names and faces of those who volunteer to help make ANPS a more responsive and relevant organization.

Heading this list would be Barb Skye Seigel, whose tireless enthusiasm and ability to envision "the big picture" revived a somnolent board of directors. Although Barb has stepped down as President to concentrate on family issues, she has agreed to stay on as an advisor to the Board. I have the feeling her telephone will be ringing and her e-mail inbox filling with questions from other Board members, particularly me, since it's my job to serve as interim President until elections are held at the annual meeting in September (see Calendar of Events). Thanks, Barb, for all you've done for the Society!

Thanks to Gail Virtes, Dave Bertelsen, and Mima Falk.

Gail has been State Treasurer for the past 2 ½ years, keeping our books organized so that whoever takes over has an easy system to follow. Any volunteers? Meanwhile, Joanne Basta, Southern Region treasurer and state board member, has agreed to fill in. Thanks to both of you!

Dave Bertelsen, as Corresponding Secretary for several years, has been the Society's "answers man" and served on the Publication Grants committee. He painstakingly researches answers to a myriad of questions posed by the public who access the Society's website. His thoughtful contributions at state Board meetings will be sorely missed unless we can somehow lure him back. Thanks Dave!

And finally, many thanks to Mima Falk who, in her most recent reincarnation as Past President, provided a valuable link with our past, helping to fill in gaps in the Board's collective memory on various and sundry issues. Thanks again to all of you!

Any Society member who might like to serve on the Board should send a brief note to our P.O. Box in Tucson, and the Nominating Committee will be sure to consider you. In addition to the above-mentioned positions, the state Board is also seeking a Conservation Chair to replace Jeff Kreamer, now the Southern Region president.

Ken Morrow
Interim President

EDGAR ALEXANDER MEARNS

Barbara Tellman

Edgar Alexander Mearns, born in Highland Falls, New York in 1856, first became interested in nature while hunting with his father. A keen observer, Mearns began to make systematic observations and collections at the age of ten. Before he was twenty, he corresponded with European naturalists. In 1881, he earned a medical degree from the New York College of Physicians and Surgeons.

In 1883, he was commissioned as a first lieutenant in the U.S. Army and in 1884 became medical officer at Fort Verde, where he collected in earnest. He had two assistant surgeons, freeing him to explore the wildest and least-known parts of central Arizona on horseback, sometimes spending a month or more in the saddle.

In 1891, the U.S. government wanted the border to be resurveyed. Many of the boundary markers were lost or destroyed. The U.S. needed more accurate information. To transport 60 people and supplies for the expedition required 83 mules and 14 horses. A military escort of 88 soldiers protected the surveyors. The survey began in Texas in 1892 at the height of a severe drought, with Mearns as medical officer and naturalist. His primary focus was on fauna, but he and eight other naturalists documented flora, particularly trees, shrubs, and large cacti.

His *Mammals of the Mexican Boundary* contains detailed information from the survey along with information from his earlier trips in Arizona. Places in Arizona and Sonora where his report lists trees and shrubs are: Guadalupe Canyon, San Bernardino Valley, Cerro Gallardo, Mule Mountains, San Juan Mountains, San Pedro Valley, Huachuca Mountains, Santa Cruz (Sonora) Nogales, Tucson, Pajaritos Mountains, Sonoita Valley, and Lower Gila River. The botanists were especially interested in the Huachuca Mountains and collected all the way to the top of the range. Timothy Wilcox, another army surgeon-naturalist, produced an extensive annotated list of the flora of that area. (See Britton and Kearney below.) After the survey was done, Mearns was sent to Ft. Meyer, Virginia, where he worked on his collections and began to write his report. For lack of government funds, he was only able to finish and publish Volume 1.

Mearns explored Fort Yellowstone and in the Philippines, studying the island flora and fauna for several years. In 1908, his childhood

friend Theodore Roosevelt invited Mearns to join him on a trip to Africa. Mearns retired from the Army to go on the African adventure and spent another year there in 1911, reporting his findings directly to the President of the United States. Because of failing health, he curtailed his activities after this trip and died in 1916.



Throughout his career, Mearns published at least 125 papers and books on a great variety of topics. He also contributed hundreds of thousands of flora and fauna specimens to the U.S. National Museum, the American Museum of Natural History and other repositories.

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TUCSON AUDUBON SOCIETY SANTA CRUZ RIVER HABITAT PROJECT - NORTH SIMPSON SITE

Ann Phillips

The Tucson Audubon Society Santa Cruz River Habitat Project - North Simpson Site, consists of river corridor and adjacent abandoned farmland in the floodplain of the lower Santa Cruz River. It is located northwest of Tucson, Arizona, in the Sonoran Bioregion. The river flow is effluent dominated in this reach, supported by releases of secondary effluent from regional wastewater treatment plants around 18 miles upstream. A burgeoning cottonwood/willow habitat lines the channel, while sparse upland plants are present on the massive earthen flood control berms on either side of the channel.

The Tucson Audubon Society (TAS) restoration site is on the northern-most parcel of 23,000 acres of Avra Valley farmland purchased and retired by the City of Tucson in the 1970s and 1980s to obtain associated groundwater rights. The site has been damaged by off-road vehicle use, grazing, long-term farming, burning, dumping and flooding. TAS is able to conduct restoration work on this land through its 99-year right-of-entry agreement with the City of Tucson. TAS received funding for restoration from Clean Water Act, Section 404 in-lieu mitigation funds, the Arizona Water Protection Fund, and the US Fish & Wildlife Service. After a planning period, site implementation commenced in the winter of 2001. By the conclusion of the spring 2003 planting season, TAS will have planted and seeded 175 acres at this site.

A number of innovative techniques have been used to accomplish restoration at this site. Plants are placed in water harvesting basins and swales to concentrate available rainfall around plant roots, and then mulched to reduce evaporation losses. Seeds collected at the site are grown out in 2-foot tall PVC tubes to encourage the natural

formation of tap roots in desert trees. Tube planting techniques allow seedlings to be slipped out of the bottom of the tall tubes into the planting holes with virtually no disturbance to the root structure.

Native seeds are pelletized using clay obtained at the site, then distributed in localized depressions where rainwater naturally collects. Broad-scale seeding is conducted using a land imprinter, a tractor-pulled device that creates triangular-shaped depressions in the soil that concentrate rainfall and shield seeds from desiccating winds. Erosion gullies on flood control berms are repaired by constructing vegetative gabions made with dried limbs, twigs and leaves collected at the site. Plants are arrayed in "guilds" consisting of one tree and two shrubs/grasses, to replicate the mutually beneficial relationships of plants found in natural Sonoran Desert systems. Avian, vegetation and photographic monitoring provide documentation of restoration outcomes.

Restoration work has been designed to engage the local and regional community. A distinguished Technical Advisory Committee composed of scientists, land managers, restoration specialists and government representatives provided input on site assessment and design. Volunteer students and adults help pelletize seeds, construct water harvesting basins, and plant seedlings. Site tours and birding trips provide visitors with an opportunity to see restoration in action, and they observe the abundant birdlife at the site. The next public event is a birding field trip that will be held April 26. For more information about the site and/or the upcoming birding field trip, call 520-206-9900, or email aphillips1@qwest.net

Orchidaceae (cont'd. from page 1)

from *M. ehrenbergii*. Salazar and Arenas (2001) showed that the name *Malaxis tenuis* was used for an Asian species; our taxa had not been named until they described it as *M. abieticola*.

When Luer (1975) acknowledged *Coeloglossum* as separate from *Habenaria*, he also recognized *Platanthera*, so all taxa that KP/MH treated as *Habenaria* are again called *Platanthera*. Notable among the changes within *Platanthera* is the case of *P. aquilonis*. *Platanthera hyperborea* had long been considered the most widespread of the *Platanthera*, but Sheviak (1999) established that *P. hyperborea* applied to a species from Iceland that does not occur within the United States. The wide-ranging North American taxon had not been described until he named it *P. aquilonis*, which means "of the north."

Many genera had been lumped within *Spiranthes* such as *Schiedeella* and *Dichromanthus*, now recognized as distinct. For one taxon in Arizona and New Mexico, Brown (2000) named our *Schiedeella* in honor of Arizona as *S. arizonica*. Our most recent nomenclature change involves *Dichromanthus michuacanus*, postdating The Wild Orchids of Arizona and New Mexico, where it is treated as *Stenorrhynchus michuacanum*. Salazar, Chase and Arenas (2002) moved *S. michuacanum* to *Dichromanthus* based on flower structure. *Epipactis helleborine*, *Hexalectris nitida*, *Hexalectris revoluta*, *Piperia unalascensis*, and *Platanthera huronensis* have been around for a while, but are relatively recently named additions to local orchid flora. Others such as *Hexalectris spicata* var. *arizonica*, *Platanthera purpurascens*, *Platanthera zothecina*, and *Spiranthes delitescens* have all been described since 1986. The type specimen for *H. spicata* var. *arizonica* is from the Rincon Mountains in Pima County, AZ. *Spiranthes delitescens* is the only orchid endemic to Arizona, federally listed as an endangered species.

Spiranthes magnicamporum was described by Sheviak (1973) as part of his work in the *Spiranthes ceruna* complex, the southwestern limit of its range being New Mexico.

Three taxa covered by Kearney and Peebles or Martin and Hutchins do not occur in either Arizona or New Mexico. *Platanthera stricta* (*Habenaria saccata* in KP/MH) occurs mainly in the Pacific Northwest and is replaced entirely by *P. purpurascens* in the southern Rocky Mountains, Arizona, and New Mexico. *Platanthera dilatata* (*H. dilatata* in KP/MH) is represented in Colorado by *P. dilatata* var. *abliflora* but has not been found in either Arizona or New Mexico. Very white flowers of *P. huronensis* have been misidentified as *P. dilatata* in

these states. *Spiranthes vernalis* was reported from New Mexico by Martin and Hutchins probably due to a labeling error and is not believed to be in our area.

In the table below the phrases "New to Region" and "Newly Described" are relative to KP/MH.

TABLE 1

Current Name	Kearney and Peebles or Martin and Hutchins Name
<i>Calypso bulbosa</i> var. <i>americana</i>	<i>Calypso bulbosa</i>
<i>Coeloglossum viride</i> var. <i>virescens</i>	<i>Habenaria viridis</i> var. <i>bracteata</i>
<i>Corallorhiza maculata</i>	<i>Corallorhiza maculata</i>
<i>Corallorhiza striata</i>	<i>Corallorhiza striata</i>
<i>Corallorhiza trifida</i> ¹	<i>Corallorhiza trifida</i>
<i>Corallorhiza wisteriana</i>	<i>Corallorhiza wisteriana</i>
<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	<i>Cypripedium calceolus</i> var. <i>pubescens</i>
<i>Dichromanthus michuacanus</i> ²	<i>Spiranthes michuacana</i>
<i>Epipactis gigantea</i>	<i>Epipactis gigantea</i>
<i>Epipactis helleborine</i> ¹	New to region
<i>Goodyera oblongifolia</i>	<i>Goodyera oblongifolia</i>
<i>Goodyera repens</i>	<i>Goodyera repens</i>
<i>Hexalectris nitida</i> ¹	New to region
<i>Hexalectris revoluta</i> ²	New to region
<i>Hexalectris spicata</i> var. <i>arizonica</i>	Newly described
<i>Hexalectris spicata</i> var. <i>spicata</i>	<i>Hexalectris spicata</i>
<i>Hexalectris warnockii</i> ²	<i>Hexalectris warnockii</i>
<i>Listera convallarioides</i> ²	<i>Listera convallarioides</i>
<i>Listera cordata</i> ¹	<i>Listera cordata</i>
<i>Malaxis abieticola</i>	<i>Malaxis tenuis</i>
<i>Malaxis corymbosa</i> ²	<i>Malaxis corymbosa</i>
<i>Malaxis porphyrea</i>	<i>Malaxis ehrenbergii</i>
<i>Malaxis soulei</i>	<i>Malaxis soulei</i>
<i>Piperia unalascensis</i> ¹	New to region
<i>Platanthera aquilonis</i> ¹	<i>Habenaria hyperborea</i>
<i>Platanthera brevifolia</i> ¹	<i>Habenaria sparsiflora</i> var. <i>brevifolia</i>
<i>Platanthera huronensis</i> ¹	New to region
<i>Platanthera limosa</i>	<i>Habenaria limosa</i>
<i>Platanthera purpurascens</i>	Newly described
<i>Platanthera sparsiflora</i>	<i>Habenaria sparsiflora</i>
<i>Platanthera zothecina</i> ²	Newly described
<i>Schiedeella arizonica</i>	<i>Spiranthes parasitica</i>
<i>Spiranthes delitescens</i> ²	Newly described
<i>Spiranthes magnicamporum</i> ¹	<i>Spiranthes ceruna</i>
<i>Spiranthes romanzoffiana</i>	<i>Spiranthes romanzoffiana</i>

1 New Mexico only

2 Arizona only

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EDITOR'S NOTE: *The author of this article, Ron Coleman, recently published the book, The Wild Orchids of Arizona and New Mexico. Cornell University Press, Ithaca and London. 2002. Be sure to buy a copy for yourself!*

CALENDAR OF EVENTS

May 31, 2003: The next **ANPS State Board Meeting** will be held at the Triangle Y Ranch Camp in Oracle, Arizona. If you are interested in becoming a State Board member, contact a current Board Member to attend this meeting to learn about the position first hand.

September 26-28, 2003. The **ANPS Annual Meeting** will be held at Triangle Y Ranch Camp in Oracle, Arizona. Save the date, and look for details in the mail.

9-11 May, 2003: The 20th Spring Wildflower Symposium will be presented by The Wintergreen Nature Foundation at Trillium House, Wintergreen Resort in central Virginia. Instructors will include Dr. Jim Duke, author of *The Green Pharmacy*. Participants can choose from over 50 offerings of guided hikes, lectures and workshops centered on the unique flora of the Blue Ridge. Learn the life histories of these plants, propagation and design with natives, identification and historic uses for plants in indigenous cultures. A full weekend schedule will be posted on the Foundation's website at <http://www.twnf.org> Or receive a brochure in the mail by contacting the Foundation at 434-325-7451 or info@twnf.org

8-13 June, 2003: The 24th annual meeting of the Society of Wetland Scientists will be held at the Hyatt Regency Hotel in New Orleans, Louisiana. Wetland Stewardship: Changing Landscapes and Interdisciplinary Challenges is the theme. The conference will address interdisciplinary, innovative approaches and technologies

that are currently being applied to sustaining wetlands across diverse environments and spatial scales of the world. Symposia and workshops will combine traditional and applied wetland sciences with ecological, physical, engineering, economic and/or social sciences. For more information, please visit the conference website at <http://www.sws.org/neworleans/> or contact Dr. Robert R. Twilley, Program Co-chair, Center for Ecology and Technology, University of Louisiana at Lafayette, PO Box 42451, Lafayette, LA 70504 USA; Email: ccct@louisiana.edu; Phone: (337) 262-1776; Fax: (337) 262-1866.

29 June - 1 July, 2003: The annual meeting of the American Association of Botanical Gardens and Arboreta, titled "The Seeds of Revolution," will be held in Boston, Massachusetts. For more information, please visit <http://ac2003.aabga.org/>

26-31 July, 2003: The annual meeting of the American Society of Plant Taxonomists will be held in conjunction with Botany 2003 at the Arthur R. Outlaw Convention Center, Mobile, Alabama. The theme for Botany 2003 is "Aquatic and Wetland Plants: Wet & Wild." For more information, please visit <http://www.botany2003.org/> The event is hosted by the New England Wild Flower Society, Tower Hill Botanic Garden, the City of Boston Parks and Recreation, and the Massachusetts Horticultural Society. For more information, please visit <http://www.botany2003.org/>

UNUSUAL SIGHTINGS IN THE MIDST OF DROUGHT

Chris Trask

Our current drought might make us suspect that nature would offer little in the way of wildflowers. Compared to 2001, we could encounter even the elusive Mariposa Lily (*Calochortus kennedyi*) in densities of more than one per square meter. There are, however, exceptions to everything.

In April of 2002, I spent a weekend overnight in the Mazatzal Wilderness. I have hiked this area for over 20 years now. I've become intimately familiar with the geology, fauna, and flora. Year after year, I have watched as the manzanita forest reclaims the area burned in 1972. As this cover thickens, juniper, ponderosa, and oak seedlings are protected from the harsh summer sun. The seedlings are able to get a good foothold before penetrating the canopy that is 12 feet in places.

As I travel the Barnhart Trail through the gorge of Barnhart Canyon, I get a good view of the rock strata that form this range. On the southern slope of the canyon, the veins of quartz outline the layers of rock and shale that formed over millions of years, convoluting as the pressures increased. The rock was split, folded, and forced upward to form the front of the range.

After passing the last of the burn area, the trail passes through a stand of ponderosa pine that is obviously suffering from the ravages of both the drought and the pine borer beetle. There are a few stately junipers dispersed through the area, along with some equally elder oak. At one point, there are even obvious signs of some underground moisture that serves the local bird population.

The pines slowly diminish in density and the trail passes in and out of stands of young oak trees that are only just now coming into leaf, seemingly late in the season. There are occasional wildflowers

such as Peavine (*Lathyrus leucanthus*) and Golden Corydalis (*Corydalis aurea*), as well as thick stands of grass that have now dried as the seeps that they draw upon dry up with the combination of early summer winds and the lack of winter snow.

In one of these oak thickets, I paused to rest. I had less than a half mile to go to reach the Divide Trail, and less than a mile after that to reach my destination.

Looking around, I spotted an unusual solitary plant. In getting a closer look, I had difficulty in believing that I was looking at a very healthy specimen of Leopard Lily (*Fritillaria atropurpurea*). I had only seen this unusual plant once before on a raft trip down the Middle Fork of the Salmon River the previous May, and it had taken me almost a week after I returned to identify it. At that time, I had understood that it was very common in northern



Fremontodendron californicum
© Br. Alfred Brousseau, Saint Mary's College

California, Oregon, Idaho, and Montana. What I did not understand until after I returned from this trip was that it could be found as far south as New Mexico, according to Rickett ("Wild Flowers of the United States", Vol. 4, Pt. 1, p. 44). The only other mention I can find of this plant is in Lehr ("A Catalogue of the Flora of Arizona", p. 32), and it is not to be found in any of the popular wildflower identification guides for Arizona.

Earlier, from a variety of online sites, I had learned that Leopard Lily prefers to grow in areas that have an abundance of fungal growth and, that being the case, wet, rotting oak leaves make an ideal environment. As I looked around, I found that the community extended for about an acre and I suspected that, if I were to

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Unusual Sightings (cont'd. from page 7)

venture up the slope, I would find even more specimens where the oaks thickened. Not having a camera with me, I decided that I would return the next weekend and search further. There were other interesting wildflowers along the way, including New Mexican Raspberry (*Rubus neomexicanus*) and Rocky Mountain Bee Plant (*Cleome serrulata*). I never anticipated any of these since I have not ventured in this area this late in the season.

The following weekend, the weather cooperated with the temperatures being moderate and the air remaining dry. I got an early start as I had thirteen miles to cover and wanted to explore the slopes to determine how extensive the range was and to take as many photos as time would allow.

While still in Barnhart Canyon, about a half mile before the first switchback, my attention was turned to a small tree about twenty feet to the right of the trail. This tree was unusual in that it was covered with large, yellow blossoms, something that I had never seen before in over twenty years of desert hiking. Leaving the trail, I made my way to this blaze of color and took a number of photos. The field guide I had with me was of no assistance, and I was therefore at a complete loss to identify at what I was looking. I made a few drawings of the leaves and flowers to help me later on.

Returning to the trail, I continued and shortly afterwards ran into almost three-dozen specimens of this wonderful new discovery. Looking closely at the leaves, I recalled that I had long thought these plants to be just common Mountain Mahogany (*Cerocarpus montanus*), which can be found throughout the Mazatzal range. When I made mention of these trees to some friends at a gathering later in the week, I was told that they were likely to be Golden Currant (*Ribes aureum*), the identification having been made by way of the leaves. However, the flower was definitely wrong.

It wasn't until I browsed through a copy of the Audubon "Field Guide to Trees: Western Region" that I learned that what I was looking at was California Fremontia (*Fremontodendron californicum*, aka California Slippery Elm, aka Flannel Bush) at the peak of flowering. For Arizona, this is

a very unusual tree, probably a remnant from the last glacial period. According to Kearney and Peebles ("Arizona Flora, 2nd ed.", p. 554), California Fremontia is only found in Peoples Valley (Yavapai County), the Mazatzal Mountains, Cliff Dweller Canyon (Pinal County), and at the junction of Rock and Pinto Creeks (Gila County). Even further, the online USGS Atlas of North American Hardwoods (<http://geology.cr.usgs.gov/pub/ppapers/p1650-a/pages/hardwoods.html>) shows that California Fremontia is more commonly found at higher elevations (3500 to 6500 feet according to the Audubon guide) in the Coastal Range and the Sierra Nevada surrounding the Central Valley of California, as well as one site in northern Baja California. There is also an entry in Lehr.

There is very little that can compare to the show of color when this tree is in full bloom. The intensity and density is such that they can be easily seen from the rocky overlook and rest stop at the top of the grade just before entering the burn area. Given this spectacular show of color, it is surprising that this tree, like the Leopard Lily that I am here to study, is not to be found in any of the popular field guides for Arizona.

Reaching the point at which I found the Leopard Lily the week before, I am disappointed to find that all of them have since gone to seed, and that I have missed an opportunity to gather photos of my own. I do find one specimen that is over a foot tall, which is not unusual as they range from 6 to 24 inches in height (Rickett). The others are generally less than 8 inches tall. Also, I manage to find a second community of about the same acre in size in an adjoining oak grove that strengthens my conviction that more will be found higher up in the thicker oak groves. However, given the advanced state of these here, I decide to put that venture off until April 2003 when I will have more than enough time to search the higher slopes for a day or two.

Chris Trask is a member of the Phoenix Chapter of ANPS.

ECOSYSTEM CONSERVATION IN THE GRAND CANYON ECOREGION

Grand Canyon Wildlands Council
Larry Stevens and Bianca Perla

On a clear day atop the San Francisco Peaks, there is an expansive view. Its radius extends 100 miles (as far as Grand Canyon's North Rim) and sweeps through myriad interlaced plant communities and steep topography, forming a wealth of distinct ecosystems. Mixed coniferous forest and alpine meadows give way to tundra in the highest elevations. Ponderosa forests, pinyon-juniper country, and sagebrush flats spread out sequentially below, running against one another like crazy patterns in an enormous Navajo rug. Crosscutting the major habitats, or randomly interspersed, are unique micro-ecosystems: springs-bright embroideries of color-sustaining life in this arid landscape, cliff systems jutting out at odd angles and thin lines of riparian vegetation.

About one-third of the Grand Canyon ecoregion can be seen from this perch, an unusually diverse and ecologically connected region that covers 35.2 million acres of the Colorado Plateau. It is a land responding to the complex evolution of the Colorado River. Defined from a combination of social, ecological and geological commonalities, the ecoregion disregards state boundaries. It starts at the Mogollon rim, continues north into southern Utah, spills east into western New Mexico and ends in the west at the Grand Wash Cliffs. It is the intersection point of three North American deserts (Great Basin, Sonoran and Mojave), all abruptly contrasted against Rocky Mountain boreal forests in the surrounding highlands and containing a unique mix of the Sonoran/Mojave, Madrean, Intermountain and Cordilleean floristic provinces.

In human terms, the view from the Peaks is disjointed. Protected areas like Grand Canyon National Park and the San Francisco Peaks Wilderness are becoming ever more isolated as human encroachment increases. Our system of land management does not mirror the interconnectedness and diversity of the natural landscape. Existing protected areas are impacted by human actions outside their boundaries. Groundwater pumping threatens to dry up delicate springs, roads and houses close biological movement corridors, and exotic species invade. But the hour is not too late. A few people have wisely

designated key large areas, most recently Grand Staircase-Escalante, Grand Canyon-Parashant, and Vermilion Cliffs National Monuments. The task now is to expand our vision outward to the larger perspective needed to sustain, reconnect, and 'rewild' this landscape.

In order to prevent or reverse the impairment of nature, we must understand interconnections in the ecoregional context, like the view from the San Francisco Peaks. Are all ecosystems represented in protected areas? Are connections maintained that allow gene flow and population movements in response to long-term climate fluctuations? Are rare habitats, like springs, cliffs and alpine tundra, protected in adequate proportions?

Grand Canyon Wildlands Council, a non-profit consortium of scientists and conservationists, is applying this ecoregional perspective to conservation issues in the Grand Canyon ecoregion. Using a science-based approach, the Wildlands Council gathers information and uses geographic information systems (GIS) and other analyses to map out an ecoregional conservation network. The conservation network is both a map showing core-protected areas, buffers around those areas and connecting corridors, and a plan of action with recommendations for restoration, habitat acquisition and further research. Its purpose is to focus conservation efforts towards effective protection of all native species, ecosystems and ecological processes-carrying them intact into the next one hundred years.

Ecosystem Representation

The basis of a conservation network is ensuring the long-term persistence of all native species and natural ecosystems. Survival of species depends on adequate habitat and functioning ecological and evolutionary processes (primary production, nutrient cycling, gene flow, trophic interactions, decomposition). These are the services that intact ecosystems provide. Therefore, protecting adequate proportions of all ecosystems within an ecoregion is likely the surest way to ensure protection of species within those

Grand Canyon Ecoregion (cont'd. from page 9)

ecosystems. To do this, information on distributions of vegetative communities (the basis of ecosystems) is needed. In the absence of an accurate ecoregional vegetation map, the Wildlands Council combined more detailed local maps (National Park and National Forest vegetation maps) with regional remote-sensed data to generate a predictive map of plant community locations based on slope, aspect and elevation.

Shrublands are the most common vegetation type in the ecoregion, covering 44% of the landscape, followed by coniferous woodlands (29.6%), grasslands (13 %) and forests (9%). Riparian areas, although extremely essential to wildlife, are only .05% of the landscape and springs, .01%. Desert and plateau elevation riparian habitats are the most threatened, having the highest concentrations of exotic species (10.5%) of any plant community. In terms of current land protection, shrublands and grasslands are highly underrepresented considering the proportion of the ecoregion they cover. Rare habitats include riparian areas, springs, barren cliffs and caves, canyon rims, alpine and wet meadow environments, and old growth forests.

Combining predictive modeling and mapping with on-the-ground research increases our understanding of ecosystems and informs conservation action. By conducting biological and hydrological inventories of 130 springs, we learned that springs are not only rare but also ecologically important, regularly supporting 100-500 fold productivity levels compared to surrounding uplands. Springs serve as activity centers for both obligate and facultative species. There are 35% of the plants in the Grand Canyon region that inhabit springs and 11% that are spring obligates (including cardinal monkeyflower (*Primula bunnewelli*) Helleborne orchid (*Epipactus gigantea*), and endemic McDougall's flaveria. Springs are also threatened habitats. Humans manipulate over 90% of spring habitats, through piping, grazing, ground water pumping and recreational activities.

Species representation

Typically, federally endangered species, top carnivores and wide-ranging species are used to simplify stewardship decisions. These species are thought to adequately "umbrella" the needs of other species. The Wildlands Council created a database of 992 species (667 plants) with stewardship implications. Called 7E species, they fell into one or more of the following groups: extinct, extirpated, endemic, endangered (or sensitive), ecologically important, economically important and exotic. Top carnivores, wide-ranging species and federally endangered species did not adequately represent all 'species of concern' in our database. Plants and invertebrates, as well as those species living in rare habitats, were most often underrepresented. This shows the need to combine species information with an ecosystem perspective to ensure adequate protection.

Conservation Action

Bruce Stein (2000) cautions, "As we learn more about how natural ecosystems work, we are drawn inevitably to thinking on broader scales, both geographically and temporally. To be successful, though, we must take that grand vision and translate it into action at a particular place inhabited by real people." In an effective conservation network, science informs conservation action. Currently, the Wildlands Council has combined data including our vegetation map, springs information, and 7E species to identify critical management reaches of the Little Colorado River watershed in Arizona. We sponsored a springs management conference for land agencies, are removing tamarisk from 63 different tributaries in Grand Canyon National Park and are implementing native re-vegetation projects. In the end, implementing our bold conservation vision requires the passion of dedicated people to support applied scientific knowledge.

For more information or to become involved in the Grand Canyon Wildlands Council: (928) 556-9306, www.grandcanyonwildlands.org, puma@grandcanyonwildlands.org



WILD Kids



Global Hitchhikers

Arizona is home to more than 800 species of fish, amphibians, birds, reptiles, and mammals, and about 3,500 plants. Many are **native** species, but some are **non-native**. Non-native species are plants or animals that have been brought from other places, introduced into Arizona, and are able to survive here. Some came as accidental visitors or hitchhikers, some were brought on purpose to benefit people, and some were brought with good intentions, but turned out to be bad choices. Not all non-native species cause problems, but some do.

Arizona es el hogar de más de 800 especies de peces, anfibios, aves, reptiles y mamíferos, así como de aproximadamente 3,500 especies de plantas. Muchas de estas son especies **nativas**, pero algunas otras son **no-nativas**. Las especies no-nativas son plantas o animales que han sido traídas de otras partes, introducidas en Arizona, y que son capaces de sobrevivir aquí. Algunas vinieron como visitantes accidentales o de aventón, algunas fueron traídas a propósito para beneficiar a la gente, y algunas otras vinieron accidentalmente o fueron traídas con buenas intenciones, pero resultaron ser una mala idea. Aunque no todas, algunas especies no-nativas causan problemas.

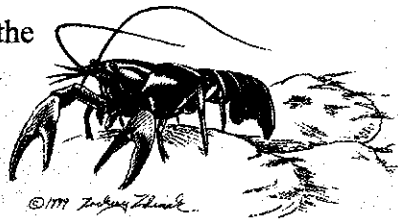
How do non-native species get to Arizona?

Some non-native plants are brought here by animals. For example, seeds are carried in animals' feet or fur, or in their digestive tract. But more often people, intentionally or unknowingly, introduce (bring in) non-native species. Many of our crops, such as corn and soybeans, and most of our livestock, are non-native species.

¿Cómo llegan a Arizona las especies no-nativas?

Algunas plantas no-nativas son traídas aquí por animales. Por ejemplo, las semillas son transportadas en las patas o en la piel de los animales o en su tracto digestivo. Pero es más común que la gente, intencional o accidentalmente, introduzca especies no-nativas. Muchas de nuestras cosechas, tales como el maíz y la soya, y la mayoría de nuestro ganado, son especies no-nativas. Las ranas toro y las tortugas de carapacho suave, nativas en el

Bullfrogs and softshell turtles, native to the eastern U.S., were introduced to Arizona as a food source (yum!). Brown trout, from Europe, rainbow trout, from west of the Rockies, and flathead catfish, from the eastern U.S., were introduced for sport fishing in the 1880s. Introduced birds include pigeons, English sparrows, and starlings, which all come from Eurasia.



este de los Estados Unidos, fueron introducidas en Arizona como fuente de comida (yum!). La trucha café, de Europa, la trucha arco iris del oeste de las Rocallosas, y el pintontle, del este de los Estados Unidos, fueron introducidas para la pesca deportiva en los años 1880s. Entre las aves

introducidas están la paloma, el gorrión inglés y el estornino pinto, todas ellas provenientes de Europa y Asia.

What problems can non-native species cause?

Most non-native species are not harmful to native wildlife and plants. However, some non-natives, like crayfish and bullfrogs, can move in and take over.

Bullfrogs and crayfish, also known as crawdads, have caused some problems in Arizona waterways. Both feed on anything they can catch, including native frogs, tadpoles, and fish. Crayfish also dig up aquatic

¿Pueden las especies no-nativas causar problemas?

La mayoría de las especies no-nativas no son dañinas para las plantas y la vida silvestre nativas, pero hay algunas no-nativas, como los langostinos y las ranas toro, que pueden invadir y apoderarse del hábitat.

Los langostinos y las ranas toro, han causado algunos problemas en las aguas de Arizona. Ambas especies se alimentan de cualquier cosa que puedan atrapar, incluyendo ranas nativas, renacuajos y peces. Los langostinos también exterminan a las plantas acuáticas y puede transformar un

plants, and can turn a clear stream into a mud bog in no time at all. Even though bullfrogs and crayfish can be harmful to native species, they're not bad or mean. They're just doing what comes naturally, looking for food and a place to live. The reason they are so successful in Arizona is because of our mild climate and because the predators that prey on them were not introduced with them.

What should be done about non-native species?

Most non-native species do not cause problems, so we don't worry about them. But when non-natives threaten native species, we may need to take action. This might include passing laws, such as the *Arizona Game and Fish Department Wildlife Rules* and the *Plant Protection Act*, which regulate the movement of animals and plant pests that can be harmful to the environment. Another way to help native species is to inform people, so they understand the possible problems associated with introduced species.

When non-native species start taking over, we may need to take action. We can dig up and remove unwanted non-native plants, or use chemical pesticides or fire to control them. Another control method is called "bullying the bully." In this method, native species are used to out-compete non-natives.

How can you help?

1. Begin with your own backyard; plant native species and keep out unwanted weeds.
2. After hiking, camping, or fishing clean your shoes, clothing, and gear to avoid spreading non-native seeds.
3. Don't send potentially harmful plants or seeds through the mail, or take them across state boundaries.
4. **Never release classroom pets into the wild.** Most classroom pets are non-natives and can introduce harmful diseases and parasites into the environment. They also compete with, and prey upon, native species. And even if they're native, they may carry diseases that could be spread to wild animals.
5. Wash down boats and boating equipment and don't dump bait into the water.
6. Tell your friends about this problem.

Research the following non-native species. Where do they come from, how did they get here, and how do they impact Arizona native species? *Lehmann lovegrass*, *New Zealand mudsnail*, *tumbleweed*, *salt cedar*, *hydrilla*, *giant salvinia*, *northern pike*.

riachuelo limpio en un lodazal en un abrir y cerrar de ojos. Aun y cuando las ranas toro y langostinos pueden ser dañinas para las especies nativas, eso no significa que sean malas o crueles. Simplemente están haciendo lo que su naturaleza les dicta, buscar comida y un lugar donde vivir. La razón por la cual son tan exitosos en Arizona es debido a nuestro clima templado y debido a que los depredadores que se alimentan de ellas no fueron introducidos con ellas.

¿Qué se debe hacer con las especies no-nativas?

La mayor parte de las especies no-nativas no causan problemas, así que no nos preocupamos por ellas. Pero cuando las especies no-nativas amenazan a las especies nativas, entonces necesitamos tomar acción. Esto puede incluir aprobar leyes, tales como las reglas para la vida Silvestre del *Arizona Game and Fish Department* y el *Acta para la Protección de las Plantas*, que regulan el movimiento de animales y plantas que puedan ser dañinas para el medio ambiente. Otra manera de ayudar a las especies nativas es informando a la gente para que entiendan los problemas potenciales asociados con especies introducidas.

Cuando las especies no-nativas comienzan a invadir, es probable que necesitemos tomar acción. Podemos escarbar y remover las plantas no-nativas no deseadas, o utilizar pesticidas o fuego para controlarlas. Otro método de control es llamado "depredando al depredador." En este método las especies nativas son utilizadas para competir con éxito a las no-nativas.

¿Cómo puedes ayudar?

1. Empieza en tu propio patio; planta especies nativas y deshazte de la hierba mala.
2. Después de ir de caminata, acampar o ir de pesca, limpia tus zapatos, ropa y equipo para evitar la dispersión de especies no-nativas.
3. No envíes plantas o semillas potencialmente peligrosas por correo o de un estado a otro.
4. **Nunca sueltes animales utilizados en experimentos en clase.** La mayoría de los animales utilizados en clase son no-nativos y pueden introducir enfermedades y parásitos dañinos al medio ambiente. Además, estos compiten con y cazan a las especies nativas. Y aun siendo nativos, estos animales pueden tener enfermedades que pudieran ser contagiadas a la vida silvestre.
5. Lava lanchas y equipos de pesca después de usarlos y no tires carnada al agua.
6. Cuenta a tus amigos este problema.

Investiga las siguientes especies no-nativas ¿De dónde vienen, cómo llegaron aquí y cómo impactan a las especies nativas de Arizona? *Zacate africano*, *Caracol de tierra Neocelandés*, *Quelites*, *Pino Salado*, *hydrilla*, *salvinia grande*, *lucio*.



WILD Kids



7-12

Published by the Arizona Game and Fish Department - Education Branch and the Heritage Fund

Number 30

Introduced species: Are we sorry we invited them?

The introduction of non-native plants and animals in Arizona is not a recent event; it's been going on for thousands of years. Native Americans introduced a small number of species, but species introductions increased rapidly with the arrival of Europeans in the Southwest. Livestock, food crops, landscape plants, and animals for sporting opportunities for hunters and anglers were intentionally introduced to benefit people. Other species were accidentally introduced or

were introduced with good intentions, but turned out to be bad choices.

Not all introduced species are harmful, but some are causing serious problems for native plants and animals, especially those that are already threatened by habitat loss, disease or other threats. Introduced species that are so well adapted to their new environments that they interfere with and displace native species, are called *invasive*.

Who are the problems?

Giant salvinia is an aquatic fern from South America that was probably introduced as an ornamental pond or aquarium plant. This fast-growing fern can double in size in a few days. It is now found in the lower Colorado River, where it forms thick floating mats that block sunlight and oxygen, choking out aquatic life. Giant salvinia is an invasive plant.

Hydrilla, native to Eurasia and North Africa, is an aquatic plant that spreads quickly through waterways, diminishing water quality and degrading aquatic habitat. Hydrilla and giant salvinia spread by fragmented plant parts, which are dispersed by human activities such as boating and fishing. Both plants are included on the *Arizona Department of Agriculture's List of Noxious Weeds* - plants that are prohibited from entry into the state unless accompanied by the appropriate federal and state permits.

Red brome, an invasive grass, is native to the Mediterranean region, but is now found throughout the Sonoran Desert. Whereas red brome grows back vigorously after a fire, Sonoran desert vegetation is not adapted to fire and can be destroyed by even a single fire.

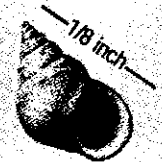
Crayfish, were introduced in the 1960s to control aquatic vegetation. They compete with, and prey upon, native fish and other aquatic wildlife, which evolved without such predators.

The **New Zealand mudsnail** is only 1/8 of an inch in length, but has rapidly spread through U.S. waterways. First discovered in the 1980s, in rivers in Idaho and Montana, this tiny snail is now found in the Colorado River, around Lees Ferry. It reproduces asexually - meaning one snail can reproduce off-

spring on its own, and can reach very high densities, as many as a half a million per square meter! This snail competes with other native wildlife for nutrients, food, and space. It provides very little or no food value to fish and other aquatic life and is an invasive species.

Bullfrogs were introduced into Arizona waterways as a food animal in 1926. They quickly multiplied and spread, before people realized the damage they could do. Bullfrogs are prolific breeders that eat anything they can catch, including fish, other frogs, turtles, snakes, and small rodents.

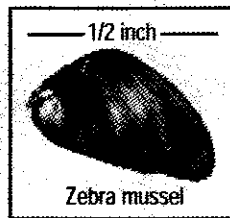
The **zebra mussel**, originally from the Caspian Sea, has not yet found its way into Arizona waterways. It was first discovered in North America in 1986, and by 1990 it was observed in all of the Great Lakes. It probably arrived there as a result of ballast water introduction. Zebra mussels reproduce at a phenomenal rate; a fe-



New Zealand mudsnail

The addition or removal of a species from an ecological community will create positive and/or negative influences within the environment.

male can release up to one million eggs each season! They spread on boat hulls and on aquatic plants, and can have devastating effects on industrial/public drinking water supplies and power plants, costing billions of dollars to control.



To prevent the spread of zebra mussels, inspect your boat and boating equipment and remove any plants or animals before leaving any water access. Public assistance in reporting zebra mussel sightings is necessary to help prevent its spread into our waters. If you see a boat or other equipment encrusted with these striped clam shells, get a good description, and the location, and call the Arizona Game and Fish Department's Fisheries Branch right away! To read about other things you can do to help, read this issue's WILD Kids, 4-6.

Species of Arizona Wildlife			
	Native	Non-native	
Fish			
	Freshwater	30	50
	Saltwater	2	0
Amphibians	25	4	
Reptiles	95	4	
Birds			
	Raptors	42	0
	Nonraptors	460	5
Mammals	134	11	
Total	788	74	

What's being done about invasive and nuisance species?

The *National Invasive Species Act of 1996* re-authorizes and amends the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (the "Zebra Mussel Act"). It expands the scope of the Act beyond the zebra mussel and ballast water, and begins to "address introductions and infestations of non-indigenous aquatic species that may be as destructive as the zebra mussel."

The *Arizona Game and Fish Department's Wildlife Laws and Rules* include restrictions on transporting and releasing certain types of wildlife. For example, crayfish can be used as bait, but individuals must capture them at the lake or stream where they will be using them. If crayfish are transported, they should be transported dead. This applies to all areas of the state, except for a small area in southwestern Arizona. Anglers are still encouraged to harvest crayfish, but must transport them dead. (website: azgfd.com)

The Arizona Game and Fish Department has also placed signs along the Colorado River, from Yuma to Bullhead City, to warn boaters and other recreational users about aquatic nuisance species. The signs are designed to inform boaters, anglers and other water recreators about the "do's" and "don'ts" that will help

keep nuisance species from entering and spreading throughout Arizona. Some of Arizona's nuisance species include the plants giant salvinia, hydrilla and Eurasian water milfoil and animals like the New Zealand mudsnail.

The U.S. Fish and Wildlife Service's *Invasive Species Program* monitors invasive species. Check their website: <http://invasivewfs.gov/>.

The Arizona Department of Agriculture is responsible for preventing the introduction and spread of noxious weeds and dangerous plant pests in Arizona. Their website is <http://agriculture.state.az.us/PSD/quarantine2.htm>.

The *Arizona State Aquatic Nuisance Management Plan* website provides a list of non-native species of concern in Arizona, <http://ag.arizona.edu/azaqua/extension/ANS/ArizonaPlan.htm>.

1. Write a report on an invasive species or noxious weed in Arizona. Include where the species came from, how it got here, why it is so successful in Arizona, its impacts on native species, and what actions, if any, are being taken to control it. Use the websites listed above or other resources.

FIRST ANNUAL MEETING OF ARIZONA BOTANISTS A HUGE SUCCESS

Regina Rodgers

On Saturday, February 8, 2003, Arizona Botanists met at the Desert Botanical Garden in Phoenix. Over one hundred enthusiastic professional and amateur Arizona botanists attended. The meeting venue and logistics were well-organized, very pleasant, and the presentations were informative and diverse in subject matter. This first annual meeting fulfilled the meeting purpose as stated in the program brochure:

1. To foster a spirit of cooperation for the sharing of ideas among and facilitating collaboration between individuals from academic institutions, local, state and federal government agencies, and non-governmental organizations, from across the state of Arizona.
2. To provide a forum to meet others who share interests in the flora of Arizona.
3. To celebrate the new meeting and research facilities at the Desert Botanical Garden (DBG) in Phoenix.

After registration and morning snacks, Ken Schutz, the Executive Director of the Desert Botanical Garden, opened the meeting. He spoke briefly about the history and mission of the Desert Botanical Garden and welcomed the meeting attendees. Wendy Hodgson, one of the meeting organizers, gave an overview of the events planned for the day. Other members of the organizing committee are Andrew Salywon and Martin Wojciechowski, both from Arizona State University. Numerous other individuals contributed their time to meeting preparations.

Leslie Landrum of Arizona State University presented the first in-depth topic on the "Flora of Arizona Project." The Journal of Arizona-Nevada Academy of Science is publishing installments documenting Arizona flora. He presented the list of plant families that have been completed, those that are in progress, and the families on which no one has yet committed to work. The updating and publishing of the Arizona flora catalogue is an enormous task. Arizona has the fourth largest state flora after California, Texas, and Florida.

I was most inspired by the presentation on web tools that are becoming available to Arizona botanists. This presentation, the "WWW database of Arizona plants," was presented by Edward Gilbert from Arizona State University. This topic was my personal favorite because my professional

life has been spent in computer software. Computer science has given us tools that are available to anyone with access to the Internet.

This online database of Arizona plants consists of the herbaria collection at Arizona State University, the University of Arizona, Northern Arizona University, and Desert Botanical Garden. These institutions have made their collection data and images available online. The website can be accessed at <http://ces.asu.edu/explora/>.

From this website, twenty-one Arizona regional checklists can be searched by scientific or common name. The Arizona checklist webpage allows the user to search or limit checklists by taxonomic, synonym, or common names. It also provides different display options for the generated checklists: alphabetic by genus or family and annotated or full hierarchy.

A search engine is also provided at the home website <http://ces.asu.edu/explora/>. It allows the user to simultaneously search one or multiple collection databases, select search criteria such as scientific or common name, locality, collector name or collector number, and show the results as a list of collections or as a taxonomic checklist. For each taxon, a link is available to taxonomic information and images. Future functionality will be an option to represent the search results on a map of Arizona.

Steven P. McLaughlin from University of Arizona presented an update on recent floristic efforts in Arizona. His work includes analyzing reliable local floras for patterns and identifying the floristic subdivisions that are indicated by the patterns. He reviewed geographical areas in the state of Arizona that currently have reliable, well-documented floras. Some areas, such as Four Corners, are relatively unsurveyed. One particularly interesting point he made was that high biodiversity does not correlate with high endemism. Areas with high biodiversity have low endemism and vice versa.

John Anderson, Bureau of Land Management State Botanist, gave a talk on rare and endangered plants of Arizona. He discussed the Arizona Rare Plant Guide and made copies available to attendees. He noted that 36 of 82 rare plant genera are found in Santa Cruz County -- most in the Sky Islands. Quite a few other rare plants are found in this geographic area. He discussed several individual **cont'd. on page 16**

YEAR 2002: A PRODUCTIVE YEAR FOR THE ARIZONA NATIVE PLANT SOCIETY

Marilyn Hanson

Under the leadership of Barb Skye Siegel, Arizona Native Plant Society has streamlined its operations and focused on educating the public about native plants. Our Administrative Assistant updated the membership database and responded to membership deadlines. The State Treasurer and ANPS Accountant streamlined accounting procedures so we can efficiently file Federal and State Taxes.

We fill ANPS orders promptly and efficiently. ANPS materials are placed throughout the state at appropriate venues. We have improved communications between ANPS and our vendors, as well as between State Chapters and the Board.

ANPS sent representatives to community and regional gatherings, published articles and created new brochures and a Northern Arizona poster, all distributed to spread the message about the importance of native plants in Arizona. We keep the ANPS web site current and new links are added if they foster our goals.

The following list describes the most important activities we accomplished throughout the year.

February

1. Held first Board meeting at Central Arizona College in Coolidge.

April

1. ANPS streamlined to three regional chapters, Northern, Central and Southern. Other chapters are now disbanded. This organization is noted on the membership form and the website.
2. Held second Board meeting at home of M. Hanson

May

1. Corporation Commission Report and State and Federal Income Tax Reports are filed.

June

1. Sent out 458 reminder postcards with 200 returning memberships.
2. Made arrangements for State Meeting. Sent out announcements to membership.
3. Evaluated Publication Grant submissions.

July

1. Held third ANPS Board meeting at The Arboretum at Flagstaff.
2. Awarded two grants from the Horace Miller Publication Grant
3. Held a State Meeting with three speakers and two field trips. About 40 attendees.
4. Elected 4 new members to the Board and 2 advisors
5. Transferred to new editor for the Plant Press. First edition finished in July.
6. Bulk mail responsibilities transferred to Administrative Assistant and mailing party.
7. Paid Margaret Pope royalties overdue for two years.
8. Committed to a table at the BANWR Refuge Celebration in March, 2003
9. Solicited and received old ANPS notes from past presidents. Old notes added to master file of ANPS Historical Notes (1987-2002)
10. Received and distributed 500 copies of the Invasive Plants of the Sonoran Desert. ANPS supported this publication with \$1500.

August

1. Printed 20,000 new ANPS brochures
2. Put Publication Grant announcement on the web site with 8 months lead time.
3. Completed 2 identical State Meeting binders.
4. New Northern AZ Wildflower poster printed.

September

1. Re-established the Chiricahua Workshop with 43 attendees. Tucson Chapter implemented the Chiricahua Workshop with State Board support. Questionnaires asking about satisfaction with the workshop indicated good to high satisfaction.
2. Inventoried the old Plant Presses, filed by issue and year.
3. Put new brochure file on the website.
4. Held Strategic Planning meeting with 11 Board members. Set goals for 2003.
5. Set up web site for marketing both ANPS posters.

October

1. ANPS is represented at the Biodiversity Day at the Arizona Science Center on October 5 and 6

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Productive Year (cont'd. from page 12)

2. ANPS is represented at the Sky Island Alliance Conference on October 19.
3. Finished master file of ANPS Board Notes from 1976 -2002.
4. Paid up overdue shared revenues to SASI from sale of Butterfly Gardening. Last piece of old financial business.
5. Article about "What's So Great About Native Plants?" published in A Peek at the Peak, a neighborhood association newsletter in the Phoenix area.
6. ANPS initiated an email response for the addition of fountain and buffel grass to the Noxious Weed list.

November

1. Held fourth ANPS Board meeting at Desert Botanical Garden, Phoenix.
2. Insurance is upgraded to cover the full inventory, fraud protection and directors/officers liability.
3. Article about "The Protective Embrace of Nurse Plants" published in A Peek at the Peak, a neighborhood association newsletter in the Phoenix area.

December

1. Third issue, the 32-page Anniversary issue of the Plant Press, mailed, using a mailing service.

2. Article about "Pruners in the Wilderness" published in A Peek at the Peak, a neighborhood association newsletter in the Phoenix area.

Under the auspices of ANPS, Pima Invasive Species Council increased communication between agencies. Sonoran Desert Weedwackers remove buffel and fountain grass monthly.

We reply to an average of two inquiries a week from the website, indicating our website is being read. We have responded to people from all over the country, high school students, many concerning horticulture. We're making a concerted effort to emphasize the importance of using native species in landscaping.

The ANPS Board has been working hard to create an organization that is more focused, more financially responsible, and more prepared for future growth to influence native plant preservation and appropriate use in landscapes.

If you have any concerns or input that you would like the Board to address, please contact any Board member or Marilyn Hanson at mfhanson@mindspring.com.

WANTED

Administrative Assistant for the Arizona Native Plant Society Part-time paid position

Primary Responsibilities

Coordinate mail, direct inquiries, and strengthen communication among members, officers and Chapters. Manage membership and inform members of volunteer opportunities and other ANPS news. Market, invoice, distribute, and inventory ANPS products.

Qualifications

Written and verbal communication skills and excellent interpersonal skills. Computer experience (database management, e-mail, and word processing). Record keeping.

Other Requirements

An interest in native plants and commitment to the ANPS mission. Up to ten hours per week. Personal computer and printer; internet access; fax desirable. Initiative in streamlining ANPS operations.

Interested? Questions? Send a cover letter and resume by email attachment to Jon Titus as soon as possible. jtitus@bio2.columbia.edu 520.838.6127



FIRE IN CHAPARRAL, OAK WOODLAND, AND PINYON PINE-JUNIPER

Jon Titus

In the last issue of the Plant Press, I wrote about fire in Arizona's Ponderosa Pine forests. This

article is about fire in plant communities located in Arizona's lower elevations. Grasslands also occur at roughly the same elevations, but these will be discussed in a future article.

First, what distinguishes these vegetation types? Chaparral, pinyon pine-juniper woodlands, and oak woodlands all occur at roughly the same elevation in the Sky Islands of southeastern Arizona. Pinyon pine-juniper woodlands extend throughout the west but chaparral and oak do not. Chaparral is characterized by thick, dense, impenetrable shrubbery with broad, sclerophyllous (tough and leathery) leaves. Our chaparral is called "interior chaparral" and has fewer and different species than California chaparral.

Spanish explorers adopted the word chaparral from the Spanish chaparro (low-growing vegetation). (Barbour et al.1993). Common chaparral in the Santa Catalina mountains are point-leaf manzanita (*Arctostaphylos pungens*), Pringle manzanita (*A. pringlei*), silk-tassel (*Garrya wrightii*), mountain-mahogany (*Cercocarpus spp.*), holly-leaf buckthorn (*Rhamnus crocea*), sugar sumac (*Rhus ovata*), desert ceanothus (*Ceanothus greggii*), Emory oak (*Quercus emoryi*), shrub live oak (*Quercus turbinella*), wait-a-minute bush (*Mimosa biuncifera*), yerba-santa (*Eriodictyon angustifolium*), broom snakeweed (*Gutierrezia sarothrae*), bear-grass (*Nolina microcarpa*), grama (*Bouteloua spp.*) and bottlebrush squirrel-tail (*Elymus elymoides*). Some chaparral species have very large root crowns called lignotubers and long roots that probe for trapped water in deep cracks in the rocks. Chaparral always occurs over fractured bedrock. If the substrate is otherwise, chaparral will be replaced by one of the other plant communities (Brown 1994).

Oak woodland occurs in the Sky Islands of southeastern Arizona and the Sierra Madre in Mexico at elevations from 4000-7000 ft. Oak woodlands transition into pine-oak woodlands or

pine forests as the elevation increases. At lower elevations, these oak zones border grassland or desert scrub and there is often a broad ecotone between oak woodlands and grassland where the oaks become gradually more widely spaced and grasses increasingly predominate. Many of these oaks and associated species are drought-deciduous during the late spring dry season. The autumn colors associated with the temperate zone are seen here during the pre-summer drought. Some common species of oak woodland include: bellota (*Quercus emoryi*), Arizona white oak (*Quercus arizonica*), Mexican blue oak (*Quercus oblongifolia*), grey oak (*Quercus grisea*), silver leaf oak (*Quercus hypoleucoides*), net leaf oak (*Quercus rugosa*), shrub live oak (*Quercus turbinella*), Arizona cypress (*Cupressus arizonica*), alligator juniper (*Juniperus deppeana*), one-seed juniper (*Juniperus monosperma*), Mexican pinyon (*Pinus cembroides*) and a wide diversity of herbaceous species. Bellota acorns are harvested in northern Sonora in early summer, one of the few remaining commercial, wild food harvests in the region -- acorns are eaten fresh.

Common species of Arizona pinyon pine-juniper woodlands include one-seed juniper (*Juniperus monosperma*), Utah juniper (*Juniperus osteosperma*), Rocky Mountain juniper (*Juniperus scopulorum*), alligator juniper (*Juniperus deppeana*), single-leaf pinyon (*Pinus monophylla*), Colorado pinyon (*Pinus edulis*), skunk-bush sumac (*Rhus trilobata*) and grama.

In southeastern Arizona, annual rainfall and seasonal temperatures differ little among chaparral, pinyon pine-juniper woodland, and oak woodland or grassland. The climates are the same. These communities coil about each other because of local differences in soil depth, soil chemistry, fire frequency, slope steepness and aspect. Further north, though, cold temperatures limit oak woodlands, so pinyon pine-juniper woodlands are widespread. Many plants in these communities have adapted to fire, triggering seeds that germinate with heat. Other species have extensive root systems that allow the plant to resprout after a fire.

Many chaparral plants sprout vigorously following fire. Chaparral fires burn hot (surface soil

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Fire, cont'd. from page 14)

temperatures of 1000 degrees F.) and are all-consuming because of the high fuel loads of dry wood and the accumulation of flammable oils in the leaves. These fires are difficult to control because of the high temperatures, leaping fire front, and rugged terrain. In southern California where millions of people live, urban interfaces with chaparral are a big problem. Even in the hottest fire, the insulating quality of the earth keeps seeds and roots cool. Temperatures just four inches deep are 150 degrees F. when surface temperatures are 1000 degrees F. Most burrowing mammals survive.

Immediately after a fire, the landscape appears barren, but not for long. Seeds germinate, buds sprout, and roots resume growth. A carpet of herbs, shrub sprouts, and seedlings cover the ground the following spring. For several years after the fire, the shrub sprouts and seedlings grow larger and the composition of herbaceous species shifts. When the shrub canopy closes, most of the herbs have disappeared. In coastal chaparral, the decrease in herbs is related to changes in soil chemistry and/or the number of herbivorous rodents; their demise is unrelated to shade cast by the shrubs. The leaves of many chaparral shrubs release chemicals that inhibit the germination and growth of most herb seedlings, called allelopathy. Fire consumes these leaves, thereby eliminating the allelopathic effect. This inhibition does not return until the canopy closes.

Changes are also caused by rodents nesting beneath the shrub cover. They intensively forage for grains and shoots close by their nests. When chaparral burns, the protective cover is lost. The rodents leave the area, allowing the herbs to grow back after the fire. As the canopy closes, the rodents return and consume the herbs. This continuing chain of events has been well documented in California chaparral but poses a research opportunity in Arizona's chaparral.

Over time, the chaparral community becomes simpler, gradually becoming dominated by shrubs that readily sprout after fire. The seeds of the shrubs and herbs that are not present in closed canopy chaparral are dormant in the soil until after the next fire. Fire in chaparral occurs every 30 years or so, often accompanied by tremendous erosion (Barbour et al. 1993).

In open oak woodlands, dry grass-fueled fires have lower surface soil temperatures of ~300 degrees F.). Few mature oaks will be killed by these

cooler fires. Burned oaks often vigorously resprout from their extensive root systems. Unless covered by an insulating layer of soil, acorns are killed by fire.

Closed canopy oak woodlands, having accumulated duff and woody debris on the ground, will have greater fire severity and oak mortality. The number of post-fire oak seedlings will be as much as three times higher on sites after a cool fire (~60 seedlings/acre after a fire in the Santa Ritas) than on a hot fire site or an unburned site. The species composition of the oak woodland understory becomes significantly more complex after a fire, improving germination of herbaceous species that were either rare or absent before the fire. This may be due to the influx of soil nutrients added by ashes or the warmth required by seeds to germinate (Caprio and Zwolinski, 1992).

Pinyon pine-juniper woodlands generally have low combustibility. Often many decades pass between fires. During drought years when woody debris accumulates, fires will rage. In these fires, almost all of the pines and most of the junipers die. Entire stands of woodland trees are replaced by grassland or sagebrush. Through a slow, successional process, these grass and sage communities are replaced by woodlands, such as a Gambel's oak woodland. Eventually, pinyon pine-juniper woodlands reappear on the landscape (Erdman 1970, Tausch and West 1988).

Livestock grazing and fire suppression have dramatically changed these three vegetation types and their natural fire regimes. Cattle act as fire suppressors by consuming all of the grasses that could carry a fire. Grazing cattle and active fire suppression by land management agencies prevent fire from spreading through the bare tree interspaces, resulting in widespread "desertification" of understory conditions throughout the Southwest. Intense soil erosion has removed the surface soils throughout the region, leading to dramatic losses in site productivity and continually eroding watersheds (Jensen 1971, Lanner 1993). Fragmentations of the landscape from road construction, agriculture and suburbanization have altered fire regimes. Natural processes that have shaped chaparral, oak woodlands and pinyon pine-juniper woodlands have been opened to invasions by non-native species because of human impact. With proper management and controlled fire, non-native species invasions can be curtailed so that

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these communities can remain with us for a long time to come.

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Arizona Botanists (cont'd. from page 11)

rare plants, such as *Ericameria cervinus*, *Asplenium dalbousiae*, and *Hymenoxys beledioides*.

John Hall of The Nature Conservancy initiated discussion on invasive species in Arizona. He spoke on The Nature Conservancy's process by which a state invasive species list is generated. Juliet Stromberg's (Arizona State University) presentation on invasive species was by far the most controversial talk of the day. She suggested that invasive species are not necessarily bad species, but rather they are species that find themselves in a well-suited environment in which they can thrive. Her philosophical premise was that invasive species are part of a natural evolution of ecosystems. A spirited discussion ensued, with some attendees expressing the opinion that introducing plants into new environments by humans has occurred at an unnatural pace, causing many anthropogenic

changes to the environment.

Richard Felger of the Drylands Institute concluded the day with a presentation on "Flora of the Sonoran Desert National Park." He talked about plants of the Organ Pipe Cactus National Monument, the Cabeza Prieta National Wildlife Refuge and the Tinajas Atlas Mountains. After this talk, we were all grateful for a national park proclamation by former President Clinton.

At the end of the day, attendees were asked for their input on if and when there should be another meeting of Arizona Botanists. The enthusiastic and overwhelming response was that this should be continued as an annual event. I learned from and enjoyed the events of the day and would highly recommend future meetings to both amateur (like myself) and professional botanists.

Help Us Build ANPS

Please consider inviting your friends and family to participate in ongoing ANPS chapter and state activities. And be sure to pass your Plant Press and chapter newsletters on to them. We are always looking for new and enthusiastic members to join us in our mission.

Please also consider sending a fully tax-deductible monetary donation or upgrading your membership to a higher category. We are eager to build on our 25 years of success to take our organization to the next level of active involvement in education and the use and preservation of Arizona's unique native plants and habitats.

As always, thank you for your continuing support. We really appreciate it!

BOOK REVIEWS

Nash, Thomas H. III, Bruce D. Ryan, Corninna Greis, and Frank Bungartz (eds.) 2002. *Lichen Flora of the Greater Sonoran Desert Region - Volume I*. 532 pages. Tempe, AZ: Lichens Unlimited, Dept. of Plant Biology, Arizona State University. 532 pages. \$30

On November 12, 2002, Frank Bungartz gave a presentation on lichens to the Central Arizona Chapter of the Arizona Native Plant Society in Phoenix, Arizona. Bungartz is a doctoral candidate in Lichenology at Arizona State University.

I purchased his co-authored book because the subject has always intrigued me. Finding anything in mass print about lichens, particularly in the form of a field guide, is a difficult assignment.

As one of the first regional studies on Sonoran Desert lichens, this book is an outstanding effort. Not necessarily a "field guide," the book represents the work of 36 lichenologists who, if there were a "Who's Who" list of lichenologists, would be on it. They present species information in their areas of expertise, including suggested field trips to various locations within the greater Sonoran Desert area.

This first volume covers about 600 species and 140 genera. A second volume is due for release this year or next. Volume I deals with micro, pyrenocarpous, lichinales, and squamulose lichens found in the greater Sonoran Desert region. The areas treated in this flora are Arizona, Southern California, Baja California Norte, Baja California Sur, the northern half of Sinaloa, Mexico, all of Sonora, Mexico, and a part of Chihuahua, Mexico. Sixty percent of this study is true Sonoran Desert, and forty percent is in the outskirts of the Sonoran Desert region.

The introduction includes an excellent section on the morphology and anatomy of the lichen thallus. The thallus is the makeup of the lichen, which includes the fungus, the mycobiont, and the photosynthetic partner called photobiont (algae or bacteria). This is a simple explanation, but lichen thallus is a much more complex, symbiotic association in which at least two very different organisms form a very tight relationship.

Lichen reproduction and fertilization processes are introduced in a section entitled "Morphology and Anatomy of the Fertile Structures." Not all lichens produce fruiting bodies; some species reproduce asexually.

Lichenologists are still learning about lichens, with much yet to be discovered.

Lichen colonies exist over decades, if not centuries, unlike annual or perennial growth of simple plant life. The study of grasses was the most complex assignment that I'd tackled in the immense botanical world but lichens definitely have overtaken my number one spot.

Along with the fascinating introduction (53 pages), the section on the "Keys to the Genera of Lichens and Similar Fungi" (34 pages) explains the necessary processes to identify lichens and fungi.

The bulk of this text deals with the subject of "Generic and Species Descriptions." As mentioned earlier, about 140 genera and 600 species are covered in this first volume. Expert lichenologists address each genera and the species within those genera. Magnified photos or drawings illustrate lichen species, especially useful for identifying newly-described taxa and rarer species. The authors provide references to other texts for photographs not shown. To get an idea where different lichens grow, the authors supply maps of substrate, ecology, world, and Sonoran distribution. All lichens are fully described by providing keys for the species of a given Sonoran desert genera. About forty percent of the species in North America are known to reside in this greater Sonoran Desert region.

My only disappointment, and it's a major one, is that there are no color photographs of these lichen species. The rainbow hues of lichens are what first attracted me, piquing my imagination. Their memorable colors led me to learn more about their structure, makeup, chemistry, and anatomy. Perhaps if color photographs were provided, Volume I would not have been so reasonably priced at \$30.

Despite the lack of color in a book about colorful lichens, I personally enjoyed and profited from the reading of Volume I and I look forward to the publication of Volume II. Kudos to Tom Nash and his contributors for a job well done!

Reviewer: C. Douglas Green, Director, Arizona Native Plant Society Board



ANPS MERCHANDISE

You can purchase ANPS booklets and posters from our local chapters or by mail order.

In addition, you can find posters at Saguaro Park - East and West, Tohono Chul Park, the Audubon Society, Arizona Sonora Desert Museum, Organ Pipe National Monument, Boyce Thompson Arboretum, and Desert Botanical Garden (obtain through Kathy Rice, Phoenix Chapter President, who works there.)

ANPS Booklets

Desert Accent Plants, Desert Butterfly Gardening, Desert Bird Gardening, Desert Grasses, Desert Ground Covers and Vines, Desert Shrubs, Desert Wildflowers

Prices per booklet ordered:

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1-9	\$2.25 each (any combination of titles)
10-49	\$1.75 each (any combination of titles)
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Price per booklet ordered includes postage for U.S. addresses only.

Non-U.S. Prices (shipped via airmail; no quantity discounts)

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ANPS Posters

Wildflowers of Northern Arizona, Sonoran Desert Wildflowers

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\$14.00 each (non-members)
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Shipping and Handling:

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10-49	\$8.00 each
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Shipping and handling are an additional charge depending on the size of the order. Please contact ANPS for specifics on shipping costs.

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NEW MEMBERS WELCOME

People interested in native plants are encouraged to become members. People may join chapters in Central, Northern, or Southern Arizona, or may be members only of the statewide organization. For more information, write to ANPS at the address below, visit the ANPS Website at www.aznps.org, or contact one of the people below.

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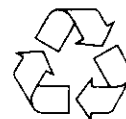
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If the year in the upper right-hand corner is not 2003, please be sure to renew so you stay current with ANPS news!