Sego Lily

Newsletter of the Utah Native Plant Society

January 2013
(volume 36 number 1)

In this issue:

Chaenactis douglasii is just one of more than three dozen western plant species named for David Douglas (see article on page 4). Also known as Douglas' dustymaiden, this species occurs in deserts, prairies, shrublands, and forests from southern Canada to Montana south to California, northern Arizona, and Colorado. Douglas' dustymaiden is a member of the sunflower family (Asteraceae) though it lacks the signature petal-like ray flowers along the rim of the flower head. The white to pink disk flowers comprising the head of Douglas' dustymaiden are all about the same size, but in other species of *Chaenactis* the outer row of disk flowers are sometimes enlarged, perhaps in an effort to mimic showy rays. The close-up of the disk flowers (left) shows the ring of purple anthers and emergent two-forked styles characteristic of the sunflower family. *Chaenactis* is rarely seen in cultivation, despite its interesting silvery-white, fern-like, foliage. Paiutes used young leaves in infusions and decoctions for headaches, colds, or coughs. Photos by Al Schneider

Utah Native Plant Society

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Website: For late-breaking news, the UNPS store, the *Sego Lily* archives, Chapter events, sources of native plants, the digital Utah Rare Plant Field Guide, and more, go to unps.org. **Many thanks to Xmission for sponsoring our website.**

For more information on UNPS: Contact Bill King (801-582-0432) or Susan Fitts (801-756-6177), or write to UNPS, PO Box 520041, Salt Lake City, UT, 84152-0041 or email

Sego Lily Editor: Walter Fertig (walt@kanab.net). The deadline for the March 2013 *Sego Lily* is 15 February 2013.

The *Sego Lily* is a publication of the Utah Native Plant Society, a 501(c)(3) not-for-profit organization dedicated to conserving and promoting stewardship of our native plants.

Chapter News

Cache: Plant Propagation Workshop, Thursday, March 14 @ 6 PM and Saturday, March 15 @ 9 AM. USU Teaching Greenhouse (1390 North 800 East Logan). Registration: $20 for UNPS members of Cache Master Gardeners (must state at time of registration); $25 for all others. Cost includes growing materials and selected seeds. Other seeds or cuttings available for additional purchase to cover cost. $5 for printed workbook (must be requested at time of registration, otherwise all printed materials will be available online). To register, please call 435-752-6263 or email taun.beddes@usu.edu. For more information, please contact Michael Piep at Michael.piep@usu.edu. Co-sponsored by the Cache Chapter and the Cache Master Gardeners -*Michael Piep.*

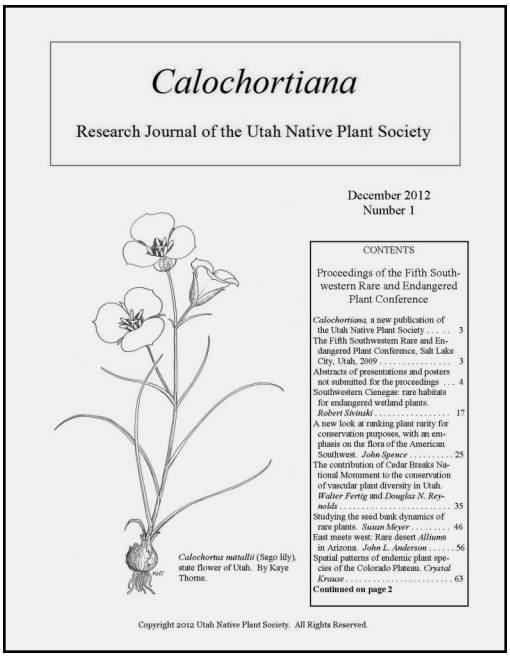
Fremont: The Chapter's annual dinner will be at Steve's Steakhouse on January 18 at 6:30 PM. The new address for Steve's Steakhouse is 510 South Main, Richfield. Please RSVP before Jan. 16 to Kent (kentr22@gmail.com) or call Janean at 435-527-3777 (before 3 PM since she gives piano lessons in the afternoon). We will discuss events from 2012 and make plans for the coming year. Just a reminder to chapter members who haven't renewed, they can give their check to Ron Parsons and he will mail them in UNPS. - *Janett Warner*

Manzanita (Kane County): Our January meeting will feature Zion National Park botanist Becca Lieberg who will discuss the park's efforts to grow and reintroduce native plant species. Becca manages the Zion NP greenhouse and has helped with our winter propagation workshop for several years. The meeting will be on Monday, January 14 at 7 PM in the Best Friends Animal Sanctuary Welcome Center (about 1 mile off Hwy 89 on the lower entrance to Best Friends).

Salt Lake: Start off the New Year with a couple of events for plant lovers. Wednesday, January 9: Red Butte Garden, 7PM. Mary O'Brien, Utah Forests Program Director for the Grand Canyon Trust, will give a talk on "Why did the beaver come out of the water?" The answer, of course, is "because she wanted to eat plants!" The relationship of beaver to cottonwood, aspen, and willow is a durable one … as long as we make sure those plants are there for them, This presentation reviews the challenges to restoring dam-building beaver throughout Utah, and the great work of many to meet those challenges,

January 28-30: Utah Green Industry Conference at South Towne Center, Sandy (9575 South State St.). Sponsored by Utah State University and the Utah Nursery and Landscape Association, with 3 days of presentations and displays. Some are technical and commercial, but there are many that will appeal to a general audience. For more information, go to www.utahgreen.org - *Bill Gray*

Bulletin Board


Calochortiana

Research Journal of the Utah Native Plant Society

December 2012
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Proceedings of the Fifth Southwestern Rare and Endangered Plant Conference

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Calochortus nuttallii (Sego lily), state flower of Utah. By Kaye Thorne.

<u>*Calochortiana*, Number 1 now available</u>: The first issue of the Utah Native Plant Society's new technical journal, *Calochortiana* ("of or pertaining to *Calochortus*, state floral emblem of Utah") was finished and posted to the UNPS web site (www.unps.org) in December, 2012. The inaugural edition contains 20 papers and 39 abstracts presented at the 5th Southwest Regional Rare Plant Conference in March 2009 (hosted by UNPS). Papers cover topics including taxonomy, ecology, biogeography, demography, and conservation botany of rare plants from Utah and the Intermountain West. Originally, these papers were to be published in a proceedings volume by the US Forest Service, but after several delays UNPS took over publication of the volume in October 2012. The issue can be downloaded as a pdf from the UNPS website for free.

The second edition of *Calochortiana* will be published in the summer or early fall of 2013. Papers will be accepted through April 30, 2013. If you would like to submit a paper, contact Walter Fertig at walt@kanab.net. Submissions should be previously unpublished and focus on Utah botany or ecology.

<u>2013 Utah Rare Plant Meeting</u>: The annual rare plant meeting sponsored by the Utah Native Plant Society and Red Butte Garden is scheduled for Tuesday, March 5, 2013 from 9 AM to 4 PM in the conference room at Red Butte Garden. The meeting will include 20 minute presentations by speakers working on various aspects of plant conservation biology in Utah. Contact me (walt@kanab.net) if you would like to present a paper or poster. Presentation titles or abstracts are needed by February 18. Participants can register online at the Red Butte Garden website (www.redbuttegarden.org/conservation) or by calling the Red Butte front desk (801-585-0556), A boxed lunch will be provided as part of the $15 registration fee.

The UNPS Rare Plant Committee will be meeting at the Red Butte conference room on the afternoon of Monday, March 4 (1-4 PM) to revise the UNPS rare plant list. A number of new species have been documented in Utah in the past five years that need to be assessed, and conservation priority ranks for other taxa may need revision. If you are interested in attending the meeting, or wish to suggest species to be reviewed, please contact me (walt@kanab.net) by February 28.—*W. Fertig*

<u>UNPS Scholarship</u>: Students are encouraged to apply for the annual UNPS student research scholarship. The Society will award $500-1000 for research proposals that address native plant taxonomy, ecology, or biology within the state of Utah. See the UNPS website for more details and the application form. Applications are due by 1 April 2013.

<u>Department of Corrections</u>: In my review of *Intermountain Flora* Volume 2 Part A, I mistakenly stated that *Opuntia basilaris* var. *longiareolata* was no longer being recognized, when I meant to say that *O. basilaris* var. *heilii* was being synonymized under var. *longiareolata*. Dorde Woodruff made the case for recognizing var. *heillii* as a separate taxon in the 2012 issue of the *Sego Lily*.—*W. Fertig*

In Quotes: "Ornithologists have an official committee to approve both vernacular and scientific names for birds. But botanists have no such august court, and a single tree species may be known by several common names. Perhaps that is why botanists always talk in Latin and Greek, although I sometimes suspect it is also to impress the laity." - Hal Borland, *A Countryman's Woods*, 1983.

Unidentified Flowering Object: This month's UFO is usually drab and inconspicuous in its sand dune habitat in southern Utah (here photographed in Kane County in early June). Even in flower, it can be hard to see because its purplish-blue corollas are just 3/8 " across and early-deciduous. Any guesses?

The November UFO was *Kalstroemia parviflora*, a fall annual in the caltrop family (Zygophyllaceae) that resembles the nasty exotic weed *Tribulus terrestris* (goatshead or puncture vine). It was photographed by Ben Everitt. Congratulations to Lee Hughes for being the first reader to email the correct answer.

Have a UFO to share? Send it in! - *W. Fertig*

Who's in that Name?

David Douglas (1799-1834), Intrepid Botanizer

By Al Schneider, reprinted from *Aquilegia*, Winter 2007 (newsletter of the Colorado Native Plant Society)

Few botanists have shined so brightly and had their light extinguished so quickly as David Douglas. He was born in 1799 to a poor Scottish family and attended school until he was eleven, walking a twelve mile round trip daily. His schooling may not have prepared him for the intellectual side of botanizing, but his walking certainly prepared him for the physical side of a field botanist, a position he embraced with such vigor and success that he became a British national hero.

After leaving school Douglas became a gardener's assistant and rose steadily in the estimation of all he worked with. In 1820 he was hired by the Glasgow Botanic Garden to work under William Hooker. In 1823 Hooker recommended him to the Royal Horticultural Society and the Society sponsored Douglas for his first trip to North America.

During his six months there he met John Torrey and Thomas Nuttall, examined some of Meriwether Lewis' specimens, and collected extensively in the eastern United States and Canada. The Royal Horticultural Society report of his travels stated that the "mission was executed by Mr. Douglas with a success beyond our expectations."

Douglas was engaged again by the Society and The Hudson Bay Company and he left for the northwest coast of North America in 1824. From 1825 through 1827 he traveled thousands of miles by foot, horse, and canoe: from April to December 1825 he traveled 2,100 miles, in 1826 he traveled 4,000 miles, in 1827 he left the coast and traveled 3,000 miles to Hudson Bay, and from there sailed home. (On his way to Hudson Bay, Douglas met Thomas Drummond and the Franklin Expedition in Canada.)

Through these years and thousands of miles, Douglas was an intrepid botanizer, searching, climbing, crawling, digging, collecting, studying, pressing, and drying and re-drying after soaking rivers and rains. His miles of travel in 1825-1827 took him- often only in the company of an Indian guide/interpreter - up the Columbia River, back to the coast, to California, back to British Columbia, up the Columbia to the Rockies, and back to the coast. He was almost always in areas no westerner had ever been. He was wrecked in canoes, thrown into a river by his horse, lost collections and went back for more, slogged through deep snows to reach alpine plants, slept many nights with no shelter, faced Indian hostilities a number of times, was next to starvation, but he continued to collect and collect. The months on end of living in wilderness, said Douglas, were "looked upon by me [at first] with a sort of dread. Now I am well accustomed to it so much that comfort seems superfluity."

Above: David Douglas, Hunt Institute for Botanical Documentation.

Douglas brought large collections of plants and seeds home with him from this trip, but he had also shipped many extensive collections home over the years from the Pacific coast. When he arrived in England his reputation was already established and he was treated as a hero. He was only 28 but was elected Fellow of the Linnaean, Geological, and Zoological societies - quite an honor for a Scottish poor boy gardener.

He returned to the Pacific coast in 1829, again under Hudson Bay patronage, and spent several years botanizing up the Columbia, southward into California, to Hawaii, back to Fort Vancouver and the Columbia area, and then again to Hawaii in 1833. Douglas loved Hawaii, climbing its volcanoes, scorching his feet , and collecting plants. On July 12th, 1834, he set off with his terrier to explore Mauna Loa, one of the two huge volcanoes on the island of Hawaii. Douglas never returned from this trip: he fell into a pit trap and was trampled to death by a steer that had previously fallen in. We don't know how the accident happened, but we do know that Douglas' eyesight had been damaged on his snowy expeditions and it is quite possible that he did not see the pit that cost him his life - or perhaps he saw the pit and slipped in when he curiously looked into it.

From his travels, Douglas introduced to Britain over two hundred plants (including many pines and firs) that were widely planted as ornamentals and plantation crop trees. Douglas described, among many other plants, the Ponderosa pine, Sug-

ar pine with its enormous cones, Sitka spruce, and the Coastal redwood. His collections formed the bases of several seminal botanical works including Hooker's *Flora Boreali-Americana*. Many western plants bear Douglas' name.

For an enlightening, intriguing, mind-boggling view into the complexities and vagaries of the naming of plants, see James Reveal's excellent discussion of "Douglas fir" on the Lewis and Clark website, www.lewis-clark.org (see sidebar for more).

For the riveting story of Douglas and other explorers in Britain's worldwide quest for plants from 1768-1836, see Kenneth Lemon's *The Golden Age of Plant Hunters.* Chapter after chapter is filled with calamity, success, death, heroism, and surprises. For example, Captain Cook was leading expeditions that had as a primary goal - botanizing. Botany Bay in Australia was named by Joseph Banks on a Cook expedition. Captain Bligh's voyage on the *Bounty* met with catastrophe in large part because of the rigors of botanizing. From China to Tahiti to California to Brazil to Africa and India, the British were around the world collecting plants for their gardens and meals. During the reign of King George III (1761-1820) it is estimated that nearly 7,000 new species were brought to England from around the world. Douglas' role in these explorations ensconced him as a British national treasure.

Douglas-fir (*Pseudotsuga menziesii*) is perhaps the most iconic plant species named for David Douglas. As mentioned in the preceding article, the nomenclatural history of the species is as convoluted as the branches of the stunted, twisted Doug-fir (above) photographed in the Abajo Mountains of southeastern Utah. According to James Reveal, Douglas-fir was first collected by Archibald Menzies on Vancouver Island in 1792. The species was formally named in 1803 by English conifer expert Aylmer Lambert as *Pinus taxifolia* for the resemblance of its foliage to yew (the unrelated genus *Taxus*). Unfortunately, this name had already been applied to another species in violation of the rules of botanical nomenclature. The species was then transferred from the pine genus to the true firs (*Abies*) as *Abies taxifolia*, but this name, too, was already applied to another species and so illegitimate.

David Douglas shipped specimens and seeds of "Oregon pine" to England in 1830 , where the species became established in cultivation (and still thrives). Two new names for the species were published in 1832. David Don examined Douglas' specimens and named the tree *Pinus douglasii* in his honor. This name was later changed to *Abies douglasii* by John Lindley, who also introduced "Douglas-fir" as its common name. Eccentric taxonomist Constantine Rafinesque read the description of Douglas-fir in the journals of Lewis and Clark and published the name *Abies mucronata* based on their drawing of the distinctive pointed (mucronate) bracts associated with each woody cone scale (below left).

In 1867 Elie-Abel Carrière created the new genus *Pseudotsuga* ("false hemlock" for the resemblance to the genus *Tsuga*) and made the new combination *Pseudotsuga douglasii*. For most of the next century taxonomists debated whether the correct name should be *Pseudotsuga douglasii*, *P. taxifolia*, or *P. mucronata* based on which name was oldest (according to the arcane rules of nomenclature). The conundrum was finally resolved in 1950 by Portuguese botanist João Manuel Antonio do Amaral Franco who rediscovered an obscure 1825 French manuscript in which Charles Mirbel published the name *Abies menziesii* for the Douglas-fir. This proved to be the oldest legitimate name for the taxon, and so forms the basis for our current name *Pseudotsuga menziesii*. Or at least until someone comes along with an older name! - *W. Fertig*

Photos by Al Schneider from his informative website www.swcolorado wildflowers.com

Wild Strawberries

By Aaron Liston, adapted from the Oregon Flora Newsletter, Vol 18 No. 1 and *Kelseya*, newsletter of the Montana Native Plant Society

Considering its familiarity, it is easy to overlook the fact that the edible strawberry is a botanical oddity. In most plants, the fleshy part of the edible structure is derived from the ovary, and this fits the botanical definition of a fruit. Thus despite the fact the US Supreme Court ruled in 1893 that the tomato is legally a vegetable, to a botanist, it will always be a fruit. I am certain if asked, the Supreme Court would also decree that the strawberry is a fruit. At least this is partially correct. We do eat fruits when we ingest a strawberry, but it is definitely not a berry! The fruits are the small achenes (dry one-seeded fruits) that are scattered on the surface of the tasty, red receptacle (the vegetative tissue from which the floral organs originate).

From an evolutionary perspective, the strawberry is a remarkably successful innovation for seed dispersal. "Everything eats strawberries" according to Dr. Tia-Lynn Ashman, a plant ecological geneticist at the University of Pittsburgh who has been studying wild strawberries for 15 years. The fleshy receptacles are enjoyed by mammals, birds, reptiles and even mollusks, as anyone who has grown strawberries will know. All of these creatures are capable of spreading the achenes. Their popularity in the animal kingdom has facilitated the spread of the 20 species of wild strawberry to appropriate habitats (not too dry and not too wet with plenty of sun) throughout the Northern Hemisphere. One species, *Fragaria chiloensis,* has even dispersed to Hawaii and the southern tip of South America. Based on a recent fossil-calibrated molecular clock analysis, the genus *Fragaria* originated between 1-4 million years ago, and thus attained its widespread distribution in a relatively short time, on an evolutionary time scale.

*Above: Virginia strawberry (*Fragaria virginiana*) by Peter Lesica.*

When I started working on *Fragaria* four years ago, I was excited to make my first visit to the strawberry greenhouses at the USDA National Clonal Germplasm Repository. This facility houses the national collection of *Fragaria*, including all 20 of the wild species. I was eager to see the morphological diversity of these species. To my disappointment, most of the flowers had been removed to prevent cross pollination, and vegetatively, they all looked pretty much the same! Even if flowers had been available, most species would still have been indistinguishable to me, as floral variation is limited. The mature receptacles are more diverse and can potentially be used to differentiate species. However, they are also quite variable within a species, and because they lose most of their features in herbarium specimens, they are not well-documented in the botanical literature. For this reason, identification keys tend to focus on details of leaf texture, dentation, venation, and pubescence.

The cultivated strawberry is *Fragaria* × *ananassa* subsp. *ananassa*. The "×" symbol denotes that this is a hybrid species, originating as a cross between *F. chiloensis* and *F. virginiana*. The origin of this subspecies is fairly well-documented. It can be traced to France in the mid-1700s, where both of its parental species were being grown, having been introduced from Quebec and Chile, respectively. These plants combined the large receptacles of *F. chiloensis* with the delicious flavor of *F. virginiana*, and the hybrid soon eclipsed both parents in popularity.

Less well-known is the fact that these same two species also hybridize naturally in northwestern North America, and the resulting plants are named *Fragaria* × *ananassa* subsp. *cuneifolia*. This taxon is particularly abundant in the vicinity of Corvallis, Oregon. It is interesting to speculate that if Native American agriculture had developed in the Willamette Valley, these people would likely have incorporated the hybrid into their crops, and the Pacific Northwest could have been the birthplace of the cultivated strawberry.

*Right: Woodland strawberry (*Fragaria vesca*) by Peter Lesica.*

plant

Have you Started your^ Life List?

By Walter Fertig

Truth be told, I started out to be an ornithologist. For my tenth birthday I got a pair of clunky, 7x Sears binoculars and a Peterson field guide. I was quickly hooked on birds and started dutifully checking off new species in the little squares next to their names in the index.

I'm not alone in my affection for birds. A government study in 2001 found that 46 million Americans either fed birds or traveled at least one mile to observe birds. That year birders* spent 32 billion dollars on bird seed, field guides, binoculars and spotting scopes, outdoor apparel, gas, and lodging in pursuit of their hobby. Economists estimate that birding infused a total of 85 billion dollars into the economy when taxes and wages associated with retail sales and bird-related travel were included.

Of course bird watching offers other rewards besides economic activity. Spending time outdoors and in the educational pursuit of bird identification can make birders more knowledgeable and appreciative of nature. This often translates into greater concern for the conservation of species and their habitats.

About 2.3 million birders confess to keeping a "life list" or tally of all the bird species they have observed during their life. Birders may also keep track of the number of species they have seen in their yard, town, county, or state. In extreme cases, birders may travel the country to identify as many bird species as possible in one year, the so-called "big year" described in a recent book and popular movie with Hollywood A-listers Steve Martin, Owen Wilson, and Jack Black.

So if birders can channel their listing impulses into socially-acceptable, healthy, outdoor activity that promotes conservation and the economy, why shouldn't plant enthusiasts do the same thing? Isn't it time for "plant watching**" to be recognized as a legitimate pastime?

For starters, there are way more plant species to count. Birders travel to remote islands in the Aleutians to add a few Asian stragglers to get over 700 species on their big year or life list. A plant-watcher could spend the entire year in Zion National Park and not see all 1074 plant species and varieties in the local flora. There are nearly 16,000 species of flowering plants and ferns in the United States (and approximately 250,000 worldwide) to keep plant-watchers busy.

Being sessile organisms, plants are quite easy to "watch" - all you need to do is get to them. Of course, not all plants are identifiable year-round, and annuals may not appear at all some years. But overall, plant watching is much simpler than stalking birds (which often can be seen for only a fleeting moment). Plants don't fly off into dense cover or the next county while you are fumbling

*The older word "bird watcher" is now considered passé. Another term, "twitcher," is applied in Great Britain for those hobbyists who seek out rare birds.

**"Planting" might be a better term (or at least match 'birding'), but I think it would be too readily confused with the act of depositing seed in the ground.

*Above: King's yellow-flax (*Linum kingii*) from Tri-Story Canyon, Cedar Breaks National Monument. I hiked 5 miles and climbed 2000 feet for this picture—so darn right I'm going to count this species on my life list!*

with binoculars or thumbing through Sibley. Also, a plant watcher does not have to get up in the cold, early hours of the morning to glimpse birds at first light when they tend to be most active. The plant watcher can sleep in, like other civilized folk.

Plant watching tends to be less gear-intensive than birding. A good 10x hand lens is a must, of course, as are sensible outdoor clothing and sturdy shoes. A camera is a useful accessory to document a find or confirm its identity later. And a good plant guide or flora is required. Fortunately there are as many wildflower, tree, and fern guides as there are bird books and nearly every region has a modern technical key or manual for the more advanced plant watchers.

Like birding, the basic premise of plant watching is quite simple: get outside, find some plants, observe their floral or vegetative characteristics, determine their identity, record the names, and repeat. Budding plant watchers may want to start slow—perhaps in their own backyard or a neighborhood park—to get practice. Trips farther afield will yield more species, as will careful planning to visit a mix of different habitats. As with learning any new skill, the more you practice at plant identification, the better you become.

One of the charms of birding is that the sport is self-regulating; that is all participants are on the honor system in reporting their finds. The same code should apply to the plant watcher. Strange reports, such as *Welwitschia mirabilis* from your neighbor's backyard, will not be taken seriously unless supported by compelling evidence.* Unusual finds, such as populations of rare species or noxious weeds or new distribution records, should be reported to the local native plant society, state natural heritage program, weed and pest district, or university herbarium. To be considered credible, such records need to be accompanied by suitable documentation—preferably a clear photograph and coordinates of the location—so a knowledgeable person can relocate the plant if necessary. Reports can be corroborated by physical specimens, but this should only be done in special cases by bona fide researchers (and deposited in a public herbarium), so as not to threaten populations or diminish the enjoyment of plants by others.

*unless, of course, your neighbor's yard is in the Namib Desert of SW Africa.

There are many ways in which a plant watcher's observations can benefit science and society. Surprisingly few parks or other protected areas have plant species lists, or those that exist may be incomplete. Managers or naturalists associated with these areas would be interested in unusual finds, especially those accompanied by photos and location data. For example, in the past several years dedicated amateurs and park visitors have added nearly a dozen new species to the known flora of Zion National Park, many of which are rare species. Several states have launched programs to encourage people to report new locations of aggressive weed species. Other "citizen science" programs include Project Budburst (sponsored by the National Science Foundation) which seeks volunteers to record the earliest dates of flowering for selected plant species in order to study the effects of climate change on phenology (for more information, go to http://neoninc.org/budburst).

So why should birders have all the fun? It seems like high time to promote the sport of plant watching. Gardening consistently ranks as one of the five most popular hobbies in the country. In 2006, US consumers spent 16.4 billion dollars on non-edible flowers, trees, and shrubs for home landscaping. At least 43 million American households have a vegetable garden. There certainly is a large potential market for plant watching.

Native plant societies could play an important role in promoting plant watching. Field trips are a great way to explore nature with fellow plant lovers, especially if led by an accomplished guide. In the off-season, meetings can be used to share photos and identification tips, study herbarium specimens, or plan for future expeditions. The important thing is to get started on a lifetime of botanical discovery!

Grow This:
Cottonwoods and Aspen

By Robert Dorn (adapted from *Castilleja*, the publication of the Wyoming Native Plant Society)

Populus, the cottonwoods and aspen, are all relatively fast growing trees and thus desirable for shade trees. All of our cottonwoods are easily grown from hardwood cuttings. In winter cut off the last two year's growth (twigs 8 to 15 inches long), place in water in a large jar up to about half their length, and add a little rooting hormone. When roots are well developed, transplant to pots for later transplanting outside. If you dislike the "cotton" that the catkins produce, select staminate trees, but be aware that staminate catkins may stain whatever is under the tree. They are all tolerant of poor soils but need adequate moisture. Our five native species will not do well over the entire state so you need to choose the best ones for your area.

*Above: Narrowleaf cottonwood (*Populus angustifolia*) from Albany County, WY. Photo by R. Dorn.*

Populus tremuloides (Aspen) is the smallest of the five species, reaching up to 45 feet high and 20 feet wide. It is common in all the mountains of the state. The leaves turn bright yellow or gold or occasionally reddish or orange in the fall depending on the clone from which it is derived. It is susceptible to several diseases and insect infestations in warmer areas so is best planted above 6000 feet and even then on the north side of a building. The trees often sucker extensively and may become chlorotic in alkaline soils. Our cottonwoods are often a better choice.

Populus acuminata (Lanceleaf cottonwood) is best for elevations below 7000 feet and grows to 60 feet high and 25 feet wide. It is found naturally in the foothills and basins and on the plains along rivers and lake shores. The leaves turn yellow in fall. It tolerates cold, heat, and drought when established but tends to lose branches in high wind areas. It can be grown easily from hardwood cuttings and is in the nursery trade.

Populus angustifolia (Narrowleaf cottonwood) is best for elevations between 5000 and 9000 feet. It grows up to 60 feet high and 25 feet wide. It is found naturally in all of our mountains and extends into the basins and plains along rivers and lake shores. The leaves turn golden yellow in fall. The species can be grown from seed or hardwood cuttings and is in the nursery trade.

Populus balsamifera (Balsam poplar) is best for elevations between 6000 and 9000 feet. It grows to 100 feet tall and 25 feet wide and likes a cool location. Balsam poplar is found naturally in all of our mountains. The leaves turn bright yellow in fall. It can be grown from seed or hardwood cuttings and may be hard to find in the nursery trade.

Populus deltoides (Plains cottonwood) is best for elevations below 6000 feet. This species grows up to 60 feet high and 40 feet wide and is found along rivers and lake shores in the Great Plains. In Utah, Plains cottonwood is replaced by its close relative, Fremont cottonwood (*P. fremontii*), which occurs commonly along waterways across the state. Both species can tolerate cold, heat, drought, and alkalinity once established. The leaves turn yellow in fall. They are easy to grow from seed or hardwood cuttings.

Botanica,
or Odds and Ends from the World of Botany

by Walter Fertig

Plants to the Rescue: It is hard to imagine humanity without plants. Directly or indirectly, plants provide nearly all of our food, as well as medicine, fiber for clothing, lumber for construction, and floral ornamentation for our aesthetic pleasure. Even fossil plants have made the ultimate sacrifice of their carbon for the coal and petroleum we consume for energy. As if all of these contributions were not enough, scientists are uncovering novel ways that plants can aid human society by combating pollution, reducing energy consumption, alleviating environmental degradation, or controlling global warming. A few examples follow:

Dandelion rubber: Car tires are about 4/5 synthetic rubber derived from petroleum and 1/5 natural rubber from the Brazilian rubber tree (*Hevea brasiliensis*). Both are expensive and come with steep environmental costs from drilling and converting tropical rain forests to plantation farms. Rubber trees are also impacted by the South American leaf blight, which effectively killed the rubber industry in Brazil in the 1930s and now threatened plantations in Southeast Asia. Researchers have discovered another plant that might be an alternative rubber source from an unlikely source - a species of dandelion. The Russian dandelion (*Taraxacum kok-saghyz*, or frequently abbreviated as TKS) is native to Kazakhstan and Uzbekistan and produces rubber in its milky sap. During World War II, Soviet and American scientists studied TKS as an alternative source of natural rubber, the supply of which was cutoff by the Japanese. After the war, cheaper natural and synthetic rubber put an end to the research. Interest in dandelion rubber has resumed, however, as the price has become more competitive. Researchers at Ohio State University and the Fraunhofer Institute in Germany are genetically engineering and cross-breeding dandelions to increase the size and rubber yield of the plant's roots. One of the primary advantages of growing dandelions for rubber is that the plants are significantly smaller and reach maturity more quickly than Brazilian rubber trees.

Coconut cars: Like something out of *Gilligan's Island*, Baylor University professor Walter Bradley has built a car out of discarded coconut husks. Well, not an entire car like Roy Hinkley*, but various car parts, such as floorboards, interior door covers, car ceilings, and dashboards. Bradley developed a process to combine the stiff, strong, and fire resistant fibers that make up the inedible husk of the coconut (*Cocos nucifera*) with recycled polypropelene to make a plastic-like substitute. Using the coconut husks solves two problems. Coconut fibers can replace plastics in the manufacture of car parts, thus reducing the demand for petroleum. Recycling husks also reduces the amount of waste associated with coconut farming. In tropical areas the discarded husks can trap water and become breeding sites for mosquitoes that transmit human diseases. The Baylor researchers believe that selling husks will triple the annual income of coconut farmers (currently about $500).

Fruit batteries: Coconut husks, bamboo, and a variety of tropical fruits, including the delectable but malodorous durian (*Durio* sp.) may be an alternative source of activated carbon, according to research being conducted at the University of Nottingham's Malaysia campus. Activated carbon is used in the manufacture of supercapacitors used in electric car batteries and in solar and wind energy production. Normally, activated carbon comes from coal, a non-renewable, and often expensive, resource. The skin of the durian fruit, coconut husks, and certain species of bamboo, contain trace minerals that increase the ability of a supercapacitor to hold an electric charge. Growing these tropical plants can reduce the demand for coal and provide a stable economic return to poor villagers in rural areas of southeast Asia.

Algae sop up Carbon: In China, engineers are using microscopic algae to reduce carbon emissions associated with coal-fired power plants. The algae are cultivated in arrays of transparent pipes in a greenhouse and fed carbon dioxide extracted from gasified coal. Algae absorb the carbon as part of ordinary photosynthesis. The algae in turn can be used as animal feed, fertilizer, or processed into oily biofuel. Due to their rapid growth rate, algae are more efficient at taking up carbon than trees. Scientists now need to determine how to scale-up algae production to be cost-efficient for an entire power plant. If successful, algae farms could significantly reduce carbon emissions in China, which derives nearly 70% of its electricity from burning coal.

Kelp as biofuel: Not to be outdone by their smaller, algal cousins, giant kelp may be an ideal candidate for biofuel, according to researchers at the University of Washington. Compared to other potential biofuel plants, such as corn or switchgrass, marine kelp require no fertilizer or irrigation. More importantly, kelp does not contain lignin, a component of wood that stiffens the stems of land plants and is difficult and expensive to remove in the production of biofuel.

Yasuo Yoshikuni has bio-engineered a form of *Escherichia coli* (better known as the gut bacterium *E. coli*) that can readily digest alginate, the sugar molecule found in kelp and other brown algae. Ground-up kelp can be fed to the modified *E. coli* in relatively low temperature water to produce solutions that are 5% ethanol. Growing kelp for bio-fuel would not compete with corn grown for human consumption and would reduce the amount of land needed for biofuel production.

* a.k.a the Professor, played by Russell Johnson, who also starred in such classic films as *Ma and Pa Kettle at Waikiki* (1955) and *Attack of the Crab Monsters* (1956).

Noteworthy Discoveries:
Two new plant species from Utah

by Walter Fertig

The flora of Utah continues to grow each year as new species are discovered within the borders of the state. Often the newcomers are non-native species that have escaped from cultivation or appeared accidentally from other lands. Occasionally, however, native species are discovered that have, until now, eluded detection. Sometimes these are species that are new to science.

Two such species have been documented from Utah in the past year. Leigh Johnson and a team from Brigham Young University announced the discovery of a new species of *Navarretia* in the January 2012 issue of the journal *Phytotaxa*. *Navarretia* (some-times called pincushion-plant for their prickly leaves and floral bracts) is a genus of approximately 35 annual herbs in the Phlox family (Pol -emoniaceae) found primarily in western North America (especially California). Individual species can be difficult to identify in part because the flowers are miniscule (often less than 0.9 mm long) and other taxonomic characters are obscure.

Johnson's research team was using DNA sequencing data to tease out the origin of the allotetraploid species *N. propinqua* (*N. intertexta* var. *propinqua*). Allotetraploids are derived from hybridization between two related diploid taxa. Earlier work had shown that one parent was *N. intertexta* and the other was probably the recently named *N. saximontana*. When they began to look at the genetics of *N. saximontana*, however, Johnson's group discovered that specimens ascribed to *N. saximontana* fell into two distinct groups: typical tetraploid *saximontana*, and an unnamed diploid. Only the diploid (or a very close relative) could be the putative second parent of *N. propinqua*. By accident, Johnson and colleagues had stumbled upon a new species!

Named for Blaine Furniss, a retired professor of botany from BYU and mentor to many students, *Navarretia furnissii* differs from *N. saximontana* and *N. propinqua* in having shorter corollas (4.7 mm long or less) stamens not exserted beyond the corolla, consistently 2-3 pronged calyx lobes, and fewer seeds. Furniss's pincushion-plant is endemic to the Wasatch and Caribou mountains of northern Utah and southeastern Idaho and the adjacent Salt River Range of western Wyoming (with a disjunct occurrence in the mountains of north-central Colorado). Like many other *Navarretia* species, *N. furnissii* grows in seasonally moist depressions or the margins of pools in open meadows, sagebrush, or aspen communities. It flowers from late June to August.

All specimens of *N. saximontana* previously reported for Utah except the type specimen (collected in Dog Valley in Garfield County) are now thought to be *N. furnissii*, suggesting that *N. saximontana* may be quite rare in the state.

The second new species for Utah is *Eriogonum domitum,* which was formally described in 2011 by Ben Grady of the University of Wisconsin and James Reveal of Cornell University. Ben was a recent recipient of a Utah Native Plant Society scholarship for his research on the systematics of the buckwheats of western North America. *Eriogonum domitum* is endemic to the House Range of western Millard County where it grows on limestone outcrops above the pinyon-juniper belt. (*Domitum* translates as "of the house" for its namesake range.) The House Range buckwheat is a low, mat-forming perennial herb with broadly elliptic to nearly round basal leaves and leafless flowering stalks capped by a round cluster of white to pinkish white flowers. The entire plant (except the perianth) is covered by wavy gray tomentum.

Utah plants were initially thought to represent a disjunct population of *Eriogonum mancum*, but molecular data suggest the two species are distinct. *Eriogonum domitum* is most likely to be confused with *E. ovalifolium*, but that widespread species tends to have longer flowering scapes, more consistently oval leaves, and distinctly dimorphic perianth segments (which can be white, purplish, or yellow). Other relatives include *E. panguicense* which has broadly linear leaves and *E. soredium*, which has flowers on short stalks nearly embedded in the basal rosette of leaves.

Isolated mountain ranges of the Great Basin, like the House Range, have frequently produced locally endemic species. What other surprises await, especially among the more cryptic genera?

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