OREGON FLORA *Newsletter*

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Katie Mitchell and Rena Schlachter join Oregon Flora Project staff

by Rhoda Love

Our staff is growing! The Oregon Flora Project hired two new employees early in 2004. Botanist and data manager Katie Mitchell, who hails from the state of Washington, joined the Project in January; and Rena Schlachter, an Oregon native and recent OSU graduate, was hired in May as the Project's first Illustrations Editor. We extend a warm welcome to our two new team members.

Katie is a native Washingtonian with a degree from the University of Washington and two majors, one in botany, and the other in ecology, evolution and conservation biology. Through post college studies she developed expertise in the use of Geographic Information Systems (GIS). In the summers, Katie worked as a field botanist for the National Park Service on the Olympic Peninsula as well as in eastern Washington, and she spent a couple of winters volunteering at the University of Washington Herbarium in Seattle. This diverse background serves her well in her new position. As she recently stated, "In my previous work I gained experience with databases, data management, and the Northwest flora that has been valuable in my present position."

Katie was hired to replace Ann Willyard who left the Project to pursue graduate work; she works half time for the Flora Project and half time for the OSU Herbarium; her

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Photo: Stephen Meyers

Katie Mitchell and Rena Schlachter

Tarweeds and silverswords – Californians on a Hawaiian vacation

by Kenton L. Chambers

It is a common event for Californians to travel to the Hawaiian Islands today, across 2,400 miles of open ocean, but could a botanical "long-range dispersal" like this have occurred 5 million years ago? Plant species that grow far away from their nearest relatives offer fascinating challenges to taxonomists. However, modern methods of genetics and biochemistry offer powerful tools to explain how such disjunctions in range originate. A newly published book, entitled *Tarweeds and Silverswords – Evolution of the Madiinae*, discusses the evidence for a relationship between the unique Hawaiian genera of Asteraceae called silverswords—*Wilkesia, Dubautia,* and *Argyroxiphium*—and such familiar Californian genera as *Madia*, the common tarweed. This relationship, which was suggested on the basis of microscopic characteristics of morphology, anatomy, and cytology (Carlquist 1959), had not previously been recognized by taxonomists working on the Hawaiian flora. The origin of the silverswords was unknown, and they were assumed to be unique to this group of islands. But an abundance of new information establishes these genera as a case of spectacular evolutionary diversification following the chance introduction, from California, of their single ancestral tarweed species approximately 5 million years ago. The evidence for the date and origin of this relationship comes mainly from DNA mutations in certain nuclear and chloroplast genes, analyzed by the new methods of biochemical cladistics. What may never be known, however, is what the ancestral tarweed looked like, and how some bird managed to transport its tiny seed (achene) to these oceanic islands so long ago.

Persons familiar with Oregon's flora usually associate the name "tarweed" with species of *Madia*, whose leaves and stems are well endowed with sticky, odoriferous glandular hairs. Other glandular-hairy tarweed genera are *Layia* (tidy-tips)*, Hemizonia* (spikeweed)*,* and *Calycadenia* (tackweed), while the related *Achyrachaena* (blow-wives)*, Blepharipappus,* and *Lagophylla* (rabbit-leaf) are pubescent but mostly lack glands. In a major change from earlier taxonomic systems, the alpine genus *Raillardella* has recently been transferred from the *Senecio* group to the tarweed subtribe. Some other Californian genera important to the silversword story have now been given new, unfamiliar names, such as *Anisocarpus* and *Carlquistia* (formerly *Raillardella*), *Jensia*

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primary duties are managing and developing electronic databases and supervising student workers. She commented, "When I first saw the online Atlas, I was really impressed. It is a pleasure to apply my GIS skills in this position."

Rena Schlachter grew up in Gresham, Oregon where her parents are teachers. She graduated from Gresham High School and entered Oregon State University, where at first she was not certain whether she would major in art or biology. She noted, "I ended up somewhere in between with a Bachelor of Science in Fine Arts and minors in Biology and Philosophy." During her junior year Rena took advantage of a national exchange to West Chester University in Pennsylvania. Here she enrolled in special art courses and found opportunities to visit famous art galleries. She often spent Sunday afternoons at the Longwood Botanical Gardens taking pictures and sketching.

Rena's name is familiar to *Oregon Flora Newsletter* readers as she has been the production assistant for the newsletter since June 2003. In this position, she is responsible for our attractive layout and design. Rena now becomes the Oregon Flora Project's illustrator, and she will continue her work with the newsletter. Rena also assists with the Oregon Photo Gallery which she describes as "a growing collection of donated images of noncultivated plants in Oregon. Our goal is to obtain images of each taxon's habitat, important characters, representative herbarium specimens and illustrations."

Rena recently commented on her new position, "I have found all the individuals who are committed to the Oregon Flora to be amazingly zealous about the project and its goals. I feel privileged to have been hired as part of this wonderful endeavor." Katie echoed these sentiments when she stated, "It is very exciting to be working on a new Flora for Oregon. I enjoy working with the people on the project, especially the volunteers and students who do so much to move us toward our goal."

Welcome, Katie and Rena. Your expertise and enthusiasm greatly enrich our Project.

Scirpus pendulus *(drooping bulrush), is a rare Oregon plant illustrated by Rena Schlachter for the OFP's Rare Plant Guide (2003). The species inhabits marshes, moist meadows, and ditches, often on calcareous soils, and is found in Oregon and California, though not in neighboring Nevada, Idaho or Washington. It is, however, abundant throughout the eastern United States. Until 1966,* Scirpus pendulus *was misidentified as* Scirpus lineatus*, which is found only in the American southeast.* Scirpus pendulus *is scabrous near the nodes and on the rays and pedicels, whereas,* Scirpus lineatus *is often scabrous throughout the plant. (See map back page.)*

Erythronium oregonum logo and masthead designed by Tanya Harvey.

The Oregon Flora Newsletter is published three times a year by the Oregon Flora Project and the Oregon State University Herbarium. The Editor is Rhoda Love and the Production Assistant is Rena Schlachter.

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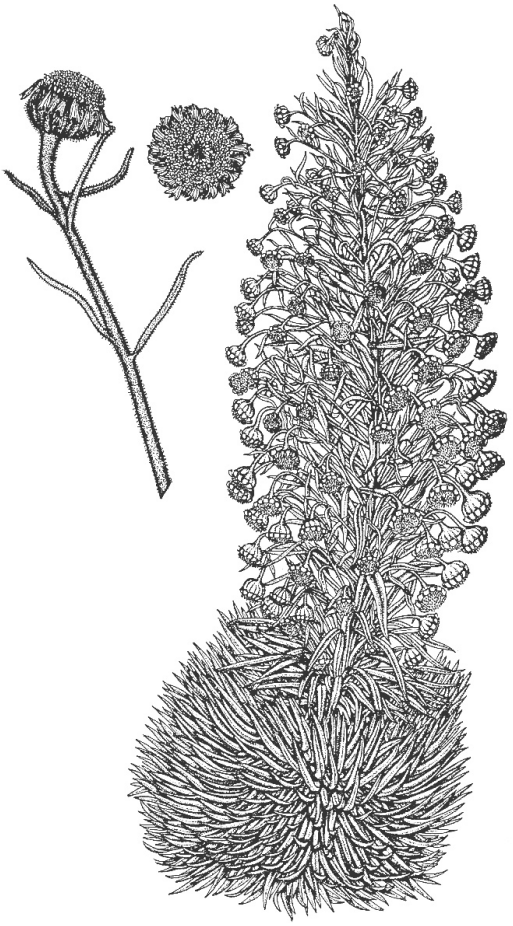
and *Harmonia* (formerly *Madia*), and *Deinandra* and *Centromadia* (formerly *Hemizonia*).

The three Hawaiian genera, called the "silversword alliance," contain 30 species and 41 additional subspecies. These entities are morphologically highly diverse and occur on all the major islands, occupying almost the full range of available habitats, from dry lava flows, pumice barrens, and brushlands to wet forests, rain-drenched cliffs, and high-elevation bogs. Many taxa are classified as rare and endangered. Probably the most famous species, for its spectacular appearance and extreme habitat, is the Haleakala Silversword (*Argyroxiphium sandwicense*), which grows at 10,000 feet on the barren volcanic slopes of Haleakala crater, Maui. Its cluster of dagger-like leaves, covered with silky hairs, mimics a yucca plant; strangely, each individual produces a mass of blooms just once, and then dies. All the species of this alliance are woody perennials, which differentiates them from the annuals and herbaceous perennials of the mainland genera. Their growth forms include tufted rosette plants like *Argyroxiphium*, along with cushion-plants, multiple-stemmed shrubs, lianas, forest trees (*Dubautia*), and naked-stemmed rosette trees with monocot-like leaves borne in a terminal cluster on a pole-like trunk up to 5 m. tall (*Wilkesia*).



Haleakala Silversword, Argyroxiphium sandwicense. *Height 1.8 m. (Drawing from Otto Degener,* Flora Hawaiiensis*.)*

Despite their remarkable diversity, the Hawaii silverswords appear to be closely related genetically, such that hybrids are possible between almost every pair of taxa, when controlled cross-pollinations are made. Hybrids occur in nature, as well, even between species with very different growth forms. A second notable feature is that all the silversword species are polyploid, their somatic chromosome numbers being 2n=26 or 28. These numbers are tetraploid, approximately four times the most common gametic numbers in *Madia* and its allies (where n=6, 7, 8, and 9). In tetraploids, with 4 sets of chromosomes, it may be possible—using modern molecular methods—to pinpoint the duplication of certain genes and trace their origins. When this was done for the silverswords (Barrier et al. 1999), not only were two duplicate genes found, but the two copies of each had close affinity with the genes of *two* different modern California tarweed species! This strongly implies that the ancestor of the silverswords was a polyploid hybrid between two species on the California mainland, and that its seed was bird-dispersed to Hawaii (tarweed achenes can't survive immersion in salt water). The ancestral tetraploid meanwhile became extinct in California, leaving only its diploid relatives whose descendents persist to the present day.

Among the modern tarweed taxa showing close molecular affinity with the silverswords are *Madia sativa* (coast tarweed), *Kyhosia bolanderi* (formerly *Madia bolanderi*, Bolander's tarweed), *Anisocarpus madioides* (formerly *Madia madioides*, woodland tarweed), *Carlquistia muirii* (formerly *Raillardella muirii*, Muir's raillardella), and *Anisocarpus scabridus* (formerly *Raillardella scabrida*, leafy raillardella). The first three of these are familiar Oregon species, all formerly associated in the genus *Madia*. The last two grow above 1000 m. in the California Coast Range and northern Sierra Nevada. They were found, upon molecular DNA analysis, to be particularly close to the Hawaii silverswords. Bruce Baldwin, a principal author of the "new taxonomy" of Madiinae, placed them in *Raillardiopsis* in *The Jepson Manual*; however, he later reclassified these and the other species mentioned above into separate genera. This new classification reflects the phylogenetic evidence, from DNA-based cladistic research, that a number of separate and distinct evolutionary lines exist *within* the older genera *Madia* and *Raillardella*. As in the other "compound" genus *Hemizonia*, these so-called monophyletic clades are to be assigned their own unique generic names.

The geological history of the volcanic Hawaiian Islands is well understood, and the geographical origin and spread of their native biota—plants and animals—can be related in time to the origins of the major islands (see Wagner and Funk 1995). Detailed studies of the silverswords (Baldwin 1997) point to an origin on Kaua'i, the oldest and most western of the islands. *Dubautia* has the largest number of endemic species there (9), and *Wilkesia* is found only on Kaua'i. Results of the molecular-cladistic studies also support an origin on this island—with one exception. *Argyroxiphium*, a plant of high elevation pumice slopes on the younger volcanoes of Maui and Hawai'i, is not on Kaua'i. Baldwin and co-authors propose that the genus may have evolved on Kaua'i when the island was young and volcanically active. When volcanism ceased and the mountain became forested to the summit, the genus' habitat was lost there, but migration took it to the younger volcanoes erupting to the east. The approximate ages of the major islands are Kaua'i 5.0 million years, O'ahu 2.5 million, Maui 1.0 million, and Hawai'i 400 thousand. Thus, the first Californian tarweed ancestor came to Kaua'i around 5 million years ago, and as new islands arose, its descendents evolved, spread, and

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diversified into the present-day silversword alliance—the most striking example of adaptive radiation in the world's island floras.

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Project news

by Oregon Flora Project Staff

The Oregon Flora Project is achieving important goals. Student workers, volunteers, and staff are collaborating on the Oregon Plant Atlas, a Rare Plant Guide, a Digital Field Guide and the Oregon Photo Gallery.

Additions to the Oregon Plant Atlas continue as the remainder of the Oregon State Herbaria's specimens are databased. We are also fine tuning and trouble-checking the atlas by weeding out erroneous points on the maps. Such points are usually caused by the misidentification of a taxon, occasionally by a mapping mistake, and rarely by a database entry error. All potential errors are carefully researched until a resolution can be made. Using GIS (Geographic Information Systems), we have improved georeferencing of township, range and section locations, as well as rivers and creeks. Georeferencing has kept pace with specimen data entry, with over 125,000 Oregon specimens entered so far. The Oregon Plant Atlas is available for preview by newsletter readers at: www.oregonflora.org/oregonplantatlas.html. Our next newsletter will explore the Atlas in depth.

In collaboration with the Oregon Natural Heritage Information Center, we are compiling a Rare Plant Guide of Oregon's most endangered taxa which will be available to the public via the internet. Each taxon will be accompanied by a description, a list of look-alikes, distribution data, habitat type, elevation range, best survey time, and photographs.

The initial data to construct a Digital Field Guide is currently being collected. In addition to information from the regional floras, we are gathering morphological data from herbarium specimens. The Field Guide will eventually provide detailed descriptions and images of each taxon in Oregon as well as a user-friendly electronic key.

The Oregon Photo Gallery is growing rapidly as we have recently added several large slide collections. Wilbur Bluhm, Glenn & Barbara Halliday, and Don Roberts have volunteered many hours to the expansion and organization of our slide collection. Student workers have been scanning and databasing slides to achieve our goal of obtaining digital images for all of Oregon's recognized taxa. We have compiled a list of species for which we need images. If readers are interested in viewing this list, or would like to donate slides to the project, please visit: http://www.oregonflora.org/oregonphotogallery.html.

As many readers are aware, Oregon Flora Project Coordinator Scott Sundberg has been ill for several months. He is now working part time and recovering at home. He expresses his appreciation to project staff and volunteers for the great progress that has recently been made on the project. He also sends his thanks for the many good wishes he has received. ---Editor

Photo: Rhoda Love

The Oregon Flora Project Staff. Left to right: Stephen Meyers (graduate student worker), Rena Schlachter, Linda Hardison, Thea Cook, and Katie Mitchell.

Thanks

Tenth anniversary challenge drive: your dollars will be doubled!

by Linda Hardison

Ten years ago research began at OSU for a new Flora of Oregon. Those of us involved with the Oregon Flora Project have seen many changes in the last ten years. We have watched the project grow from an idea and a rudimentary checklist into a multifaceted resource involving hundreds of volunteers, staff, and users.

For its first 7 years, the Oregon Flora Project was funded almost exclusively by the sponsorship of the Native Plant Society of Oregon (NPSO) and donations from individuals. The countless hours of volunteer work by Scott Sundberg, project leaders, checklist contributors, and dedicated supporters created the building blocks for the Oregon Flora Project. From this foundation, further support has been awarded and collaborations forged to expand the scope of the project to include the checklist, a new flora, an atlas of plant distributions, and a photo gallery.

Like all growing things, the Oregon Flora Project needs nourishment in the form of your financial support! Several generous donors have offered to match contributions made to the Oregon Flora Project from now through January 31st. This challenge is an excellent opportunity to show your support for this critical botanical resource, and to double the impact of your gift. Because the challenge drive extends into the new year, you have the opportunity to contribute twice, and apply your tax-deductible gifts to two calendar years.

Help us celebrate ten years of botanical research by supporting the Oregon Flora Project's challenge drive!!!

Checks should be made out to NPSO, with "OFP Challenge" on the memo line, and mailed to:

Friends of the Oregon Flora Project
P.O. Box 402
Corvallis, OR 97339-0402.

Alternatively, your check may be made out to the OSU Foundation (memo to "Oregon Flora Project") and mailed to the same address. *All funds go to the Flora Project, whichever way you choose to donate.*

Would you like to make a donation?

Tax-deductible donations can be made to the Oregon Flora Project in two ways:

(1) A check made out to the Oregon State University Foundation, mailed to Scott Sundberg at the address on page 2.

(2) A donation to the Friends of the Oregon Flora Project, with a check made out to Native Plant Society of Oregon, and mailed to P.O. Box 402, Corvallis, OR 97339-0402.

For either, please note on the check that it is for the Oregon Flora Project. Your donations are used to support newsletter expenses and other activities of the project.

☐ Please check here if you do not wish to have your name listed in our "Thanks" column.

☐ Please put me on the *Oregon Flora Newsletter* mailing list.

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10th Anniversary Challenge Grant
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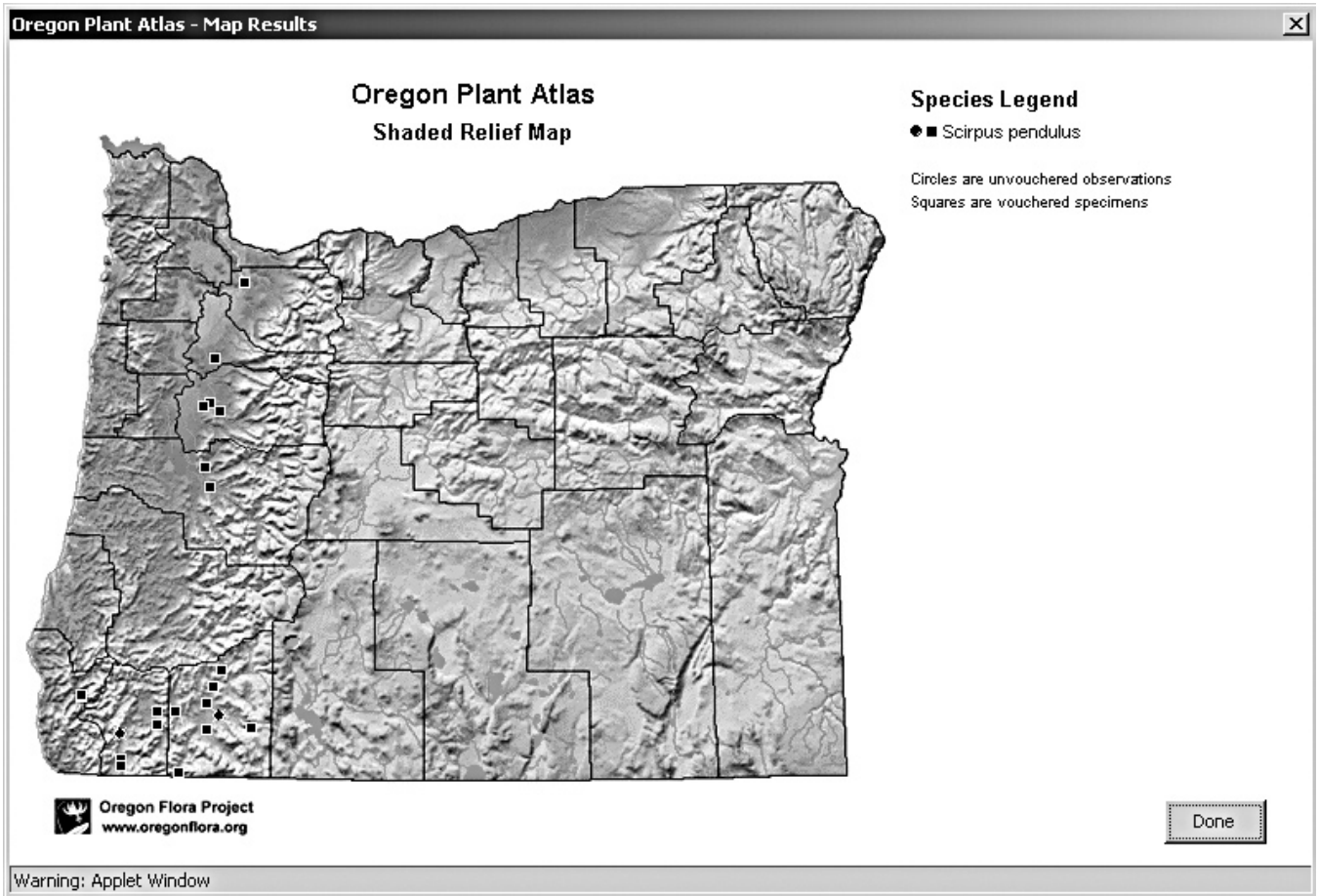

Oregon sites for Scirpus pendulus *(drooping bulrush), from the online Atlas.* *(See illustration on page 2.)*