OREGON FLORA *Newsletter*

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21st century plant identification

by Aaron Liston & Richard Halse

Every year, new plants are discovered in Oregon. These are not "new species" unknown to science, but rather species that are well known somewhere else in the world, but have never been found growing in this state. Although occasionally new native plants are discovered in Oregon, most of the additions to the state flora are introduced species, native to other parts of the world. One such plant was found by Richard Halse last year in late September. It was growing on the gravel road shoulder of State Highway 42 northeast of Camas Valley in Douglas County. The plants formed a couple of small patches and were obviously in the Apiaceae (Umbelliferae – Carrot Family). However, when it came time to try and put a name on this little annual the difficulties encountered were more than expected. All of the local floras were tried – *Flora of the Pacific Northwest* and the *Jepson Manual* as well as *A Manual of the Higher Plants of Oregon*. The search then continued using floras of eastern North America – with no success. The search then moved to European floras – again with no luck. Eventually, floras from around the world were also consulted, only resulting in more frustration.

In such cases, the problematic plant is usually sent to the taxonomic expert for the family. In the case of the Apiaceae, that person is Dr. Stephen R. Downie, a professor at the University of Illinois at Urbana-Champaign. Dr. Downie is a molecular systematist, and over the past 15 years he and his students and collaborators have published DNA sequences from over 2000 species of Apiaceae, representing many genera and over 2/3 of the species of the family. A large number of these sequences are from one small and variable part of the plant genome, the nuclear ribosomal DNA internal transcribed spacer (ITS) region, and are easily accessible from the public DNA database, GenBank.

With this comprehensive database, Dr. Downie assumed that it would be "straightforward" to match the DNA of the Oregon unknown to one of the published sequences. His student Clark Danderson readily obtained ITS sequences from fruits and leaves that we provided. Quoting from Dr. Downie, here is what happened next:

"As expected, the sequences from both fruits and leaves matched perfectly. However, these sequences did not match anything available in GenBank! After some effort, I eventually matched it to some unpublished data I have — and your plant matches perfectly with sequence I have for *Petroselinum segetum*! Many years ago I obtained a small specimen of *P. segetum* from France, provided to me from Dr. Jean-Pierre Reduron, an Apiaceae specialist. He wanted me to look at this species because it does not ally with other *Petroselinum* species (e.g., *P. crispum*, parsley) and might be a new genus."

Petroselinum segetum (L.) Koch, or "corn caraway," is a weed of arable land and hedgerows in northwestern Europe. In fact, it is considered a declining species in Great Britain, where modern agricultural practices have greatly reduced its native habitat. It does not seem to be a very "successful" weed, and this is apparently the first report of corn caraway outside of its native range. Unlike many Apiaceae, the plant has neither ornamental nor culinary attraction, and thus it is not a plant that is grown in gardens. How it came to a roadside in Douglas County, Oregon is a mystery that may never be solved.

With a name in hand, we returned to check the venerable

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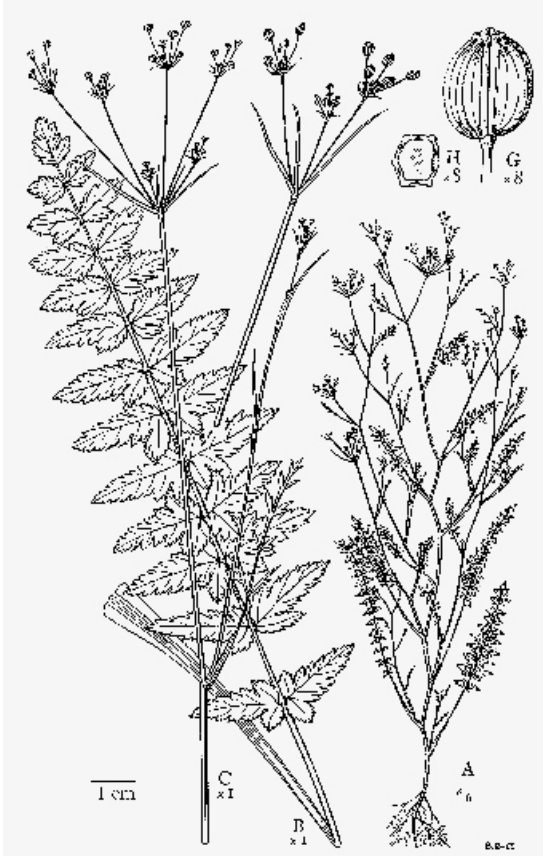

Corn caraway, Petroselinum segetum *(L.) Koch. Drawing by Stella Ross-Craig,* Drawings of British Plants*, George Bell & Sons, London, 1958. The publisher went out of business in 1989, and Ms. Ross-Craig died last year at the age of 100. Before her death she received the coveted Kew Award for her artistic work.*

21st Century, continued from front page

Flora Europaea. It turns out that *Petroselinum segetum* cannot be identified using the family key. This species has white to lavender flowers, while the genus can only be reached via the "yellow flowers" lead. There are only two European species in the genus *Petroselinum* – this plant and the commonly cultivated parsley – *Petroselinum crispum*, which does have yellow flowers. Once the plant was identified as a *Petroselinum*, it keyed out easily to *P. segetum* based on flower color.

The identification of organisms based on their DNA sequences has recently attracted considerable attention, and several international efforts are underway to pursue this goal. These methods are known as "DNA barcoding," and the above example illustrates the power of this approach. DNA barcoding is not without controversy. Some are concerned that it will lead to a decline in traditional taxonomy, while others believe it will lead to increased global interest in cataloging and preserving biodiversity. The method is also unproven in the many plant genera with polyploid, apomictic, and hybrid species. These species are difficult to delimit with traditional and experimental approaches, and DNA barcoding will not be a panacea. To learn more about DNA barcoding, visit w*ww.barcodinglife.org*.

Dr. Richard Halse is the curator of the OSU Herbarium, and Dr. Aaron Liston is the director of the OSU Herbarium. They thank Dr. Stephen Downie and Clark Danderson for the DNA sequence-based identification, and Dr. Downie for comments on the manuscript.

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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New data for the Plant Atlas

by Linda Hardison

Our online Oregon Plant Atlas mapping program (*www.oregonflora.org/oregonplantatlas.html*) has proved to be an extremely popular resource for those of you seeking up-to-date information about plant distributions in Oregon. One of the features of the Atlas that greatly enhances its value is our ability periodically to edit and add new information to its database. Our free online maps were originally made public in March 2005, and were based on approximately 385,000 records from herbarium specimens and observations. This March we will be adding 93,743 new records to the Atlas database! This influx of plant distribution information is based on our ongoing taxonomic research, coupled with a focused effort to obtain new data from herbaria other than those housed at Oregon State University. Thanks to the helpful involvement of many people, we are updating our information from several regional and national herbaria, and introducing significant new datasets from the University of Washington, Portland State University, and the Carex Working Group.

Katie Mitchell, one of the Oregon Flora Project's two database managers, oversees the Atlas. Her work includes logging, verifying, and correcting errors reported by Atlas users as well as preparing new datasets for inclusion in the database. The format of data we receive varies widely—from handwritten species lists by individuals, to extensive herbarium collections databases. Whatever its source or format, the dataset always requires careful review to make it compatible with our own records. This can involve adding information inferred from the data given, such as designating a county or assigning latitude-longitude coordinates that will make the record mappable. Some records may require further investigation, for example, to confirm the scientific name that was applied. The level of quality control for incoming Atlas data is impressive, and makes the Atlas a peerless resource for information on Oregon plant distributions.

Another role our Plant Atlas plays is that of a taxonomic guide to accepted scientific names. Naturally, all components of the Oregon Flora Project will reflect the nomenclature established within our soon-to-be-released *Vascular Plant Checklist*. However, in order to avoid a delay in the release of the Atlas, this version will use the taxonomic names that are currently under review by the eighteen members of the Checklist Advisory Committee. At the completion of the review process, the Checklist will be prepared for online publication on the Oregon Flora Project website and integrated into a second Atlas update, anticipated for later this year. Readers should watch for on-line Oregon Flora Project maps with many new data points, and be prepared to encounter some new plant names!

Rare Plant Guide now online

Readers who have explored our website this winter may have discovered our searchable Rare Plant Guide. This site (*www.oregonflora.org/rareplants/*) provides information on 110 of Oregon's rare, threatened, and endangered plants. The OFP began creating fact sheets about rare plants in 2002, with the financial assistance of Willamette Industries, Inc. The two-sided, color pages were designed to aid field botanists in the determination of appropriate habitat and the correct identification of rare

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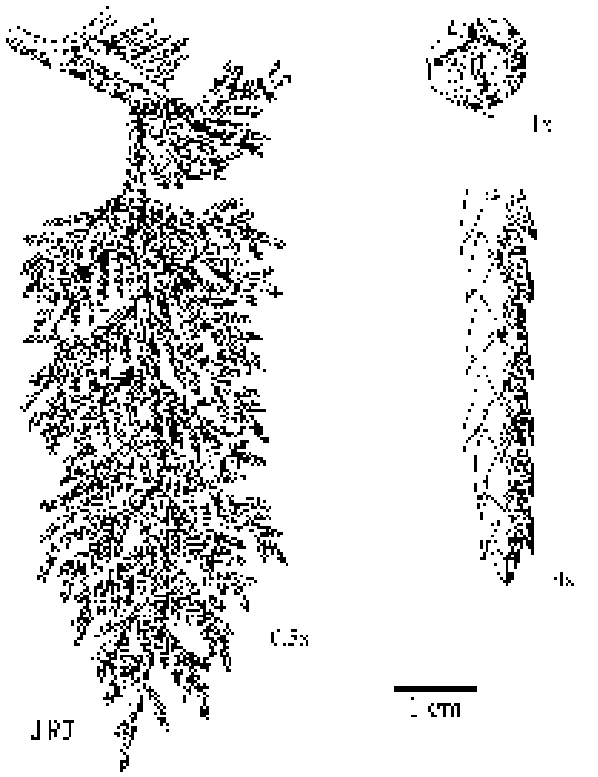
Generic concepts and conflicts in the Cypress Family

by Kenton L. Chambers

One would think that the scientific names of all our common forest trees would be so well established by now, that they would be immune from change at the "whim" of taxonomists. However, be assured that plant classification is no longer done by whim. Instead it is based on hard data produced by modern research technology; and when DNA analysis and computer algorithms are utilized to the full, beware of what can happen to those Latin names you thought you knew so well.

If you learned the scientific name of Alaska Yellow Cedar as *Chamaecyparis nootkatensis*, you are in for a surprise. Perhaps you were already surprised, as I was, to look up this well known Northwest tree in *The Jepson Manual* for California flora (Hickman 1993) and find it classified there as a species of *Cupressus* (along with its congener, Port Orford Cedar). But that is not the end of it. Several recently published research papers, based on combined DNA phylogeny and cladistic analysis of morphology, report that neither of these trees belongs in *Cupressus*, nor do the two of them even belong together in the same genus. As a further shock, we learn that the 16 Western American species of *Cupressus* don't belong in *Cupressus* either! Let me try briefly to make sense of this complicated story.



Foliage and cone of Callitropsis nootkatensis *(formerly* Chamaecyparis nootkatensis*). Illustration by Jeanne R. Janish, from* Vascular Plants of the Pacific Northwest*, courtesy of* University of Washington Press.

It begins with the discovery early in this century of a rare forest tree in Vietnam, which in 2002 was assigned the name *Xanthocyparis vietnamensis*. When compared in detail with other members of the Cupressaceae (Cypress Family), this new tree's closest relationship was found to be with Alaska Yellow Cedar—separated by thousands of miles and on the opposite side of the Pacific Ocean. Nonetheless, the two species were so similar that the authors, working in Kew, England, combined them generically, and Yellow Cedar became *Xanthocyparis nootkatensis* (Farjon *et al.* 2002). Port Orford Cedar, on the other hand, resembles other members of *Chamaecyparis* in both morphology and DNA, so it remains in that genus as *C. lawsoniana*.

Soon, more researchers were attracted to the question of evolutionary relationships in Cupressaceae, and an increased number of species were sampled with the same combination of morphological, chemical, and molecular data. When these were fed into computer-based cladistic analyses, new results were immediate. Little *et al.* (2004) pointed out that Alaska Yellow Cedar is the only *Chamaecyparis* species that forms spontaneous, fertile hybrids with *Cupressus* species when these are grown together in botanical gardens. The evidence from DNA and morphology is that it and the Vietnam species are closely related phylogenetically to a group of New World species of *Cupressus*. The Old World species of *Cupressus*, however, are a separate evolutionary line, as is the large genus *Juniperus*. True *Chamaecyparis* species are only distantly related to the cluster of genera that combines Old World *Cupressus*, *Juniperus*, *Xanthocyparis*, and New World *Cupressus*.

In an even more thorough follow-up study, Little (2006) proved that Alaska Yellow Cedar and its Vietnam relative should be classified in the same genus with New World *Cupressus*, but that the correct generic name for this group is *Callitropsis*. The name *Cupressus* technically goes only with the Old World species of the genus. *Juniperus* is more closely related to Old World *Cupressus* than to *Callitropsis*, and it keeps its traditional name.

Callitropsis nootkatensis (D. Don) Florin was first given this unfamiliar generic name in 1864, long predating *Xanthocyparis*. Thus, although the name *Callitropsis* was overlooked for so many years, it must become the correct name for whatever genus Alaska Yellow Cedar is assigned to. As Little (2006) discovered, this genus also contains the 16 New World species formerly placed in *Cupressus*, and he proposes new names in *Callitropsis* for all of these. The species affected are mostly in California, Arizona, and Mexico, with only one, *Callitropsis bakeri* (Jeps.) D. P. Little, ranging to southwestern Oregon. The former "intergeneric hybrid" *Cupressocyparis* X *leylandii*, much cultivated in botanical gardens, becomes an intrageneric hybrid, *Callitropsis* X *leylandii*. I mentioned above that this is a fertile hybrid of Alaska Yellow Cedar with various "*Cupressus*" species.

In this brief note I can't do full justice to Damon Little's study, which incorporated 88 morphological and wood-chemistry characteristics in 56 species of Cupressaceae, combined with sequence analysis of three chloroplast genes and two nuclear genes. I believe that he has clearly identified what taxonomic problems are raised by this new knowledge of the evolutionary history of the *Cupressus* group. His decision to reinstate the old genus *Callitropsis*, rather than join it, *Juniperus*, and all of *Cupressus* into one inclusive genus, causes the least disruption to present taxonomy. The past error of lumping Old World and New World "*Cupressus*" into one genus, based on morphology, was probably due to their parallel evolution of traits adapted to growth in warm, dry climates and azonal soil microhabitats. *Callitropsis nootkatensis* and *C. vietnamensis*, growing in moist forests and cooler climates, represent the other extreme of habitat adaptation in the genus.

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Cypress, *continued from page 3*

In broader molecular studies of this family and its relatives, the commonly recognized Taxodiaceae, or Bald-cypress Family, does not show as a unified phylogenetic entity (Gadek *et al.* 2000). Rather, small groups of taxodiaceous genera appear in the analysis as separate lines of evolution (clades) attached to the larger family Cupressaceae. If the families are merged taxonomically, the name Cupressaceae is used, and clusters of related genera—such as *Sequoia*, *Sequoiadendron*, and *Metasequoia*—appear as clades within this enlarged family. The history of this group of conifers must be very ancient, extending back to the early Mesozoic era (Age of Dinosaurs) or before, giving time enough for them to have diversified and dispersed throughout the world.

References:

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Little, D. P. *et al.* 2004. The circumscription and phylogenetic relationships of *Callitropsis* and the newly described genus *Xanthocyparis* (Cupressaceae). *American Journal of Botany* 91: 1872-1881.

Little, D. P. 2006. Evolution and circumscription of the true cypresses (Cupressaceae: *Cupressus*). *Systematic Botany* 31: 461-480.

Rare Plant Guide, *continued from page 2*

plants from Western Oregon. Each fact sheet includes images of the living plant, an illustration, and a herbarium specimen; a distribution map; a detailed description of the taxon and its habitat; and a list of similar-looking plants with characteristics that distinguish them from the rare species. Additional sheets detailing plants throughout Oregon were created in 2004 and 2006 with funding from the Oregon Watershed Enhancement Board and the US Forest Service Region 6.

We are happy to make these fact sheets accessible to a greater number of people by posting them on our website. They can be viewed and printed from a pdf file. Additionally, we have enhanced the usefulness of the fact sheets by presenting the data in a searchable format. There are also direct links to each taxon within the Oregon Plant Atlas, displaying a "live" map and the data associated with each dot.

The Rare Plant Guide's fact sheets are an excellent example of the scope of information that the Oregon Flora Project is collecting on every native or naturalized species, subspecies, and variety of plant in Oregon. The features presented in the fact sheets—images, maps, and descriptions—represent all facets of the Flora Project. As we continuously develop the science behind the Oregon Flora Project, we are also developing the software tools that enable users to access and combine information from these different aspects in ways that are meaningful to a wide audience. We hope you enjoy using the Rare Plant Guide, and view it as one of the exciting features made possible by your financial support.

Louvera Horn Raymond (1908-2005): a lifelong love of botany

by Linda Hardison

We are always pleased to receive gifts to the Oregon Flora Project in honor or in memory of individuals. It is a fitting tribute to those who value the aims of our project: appreciating and learning about Oregon plants, and building connections between science and citizenry. A generous gift was recently donated in memory of Louvera Horn Raymond by two of her children, Geraldine Custer and Torrance Raymond.

Louvera was born in Kansas on July 10, 1908. When she was a young teenager, she and her family moved to Oregon. Louvera graduated from Salem High School, and went on to earn a teaching certificate from the Oregon Normal School (now Western Oregon University). In 1931 she transferred to Oregon State College (Oregon State University), hoping to study science. However, course offerings and degree majors available to females at that time were limited. The following year, the botany major was opened to women, and Louvera happily filled her schedule with science and botany courses. Louvera Horn graduated from OSC in 1933. She married Louis Raymond in 1934, and eventually the couple settled in Chappaqua New York. Although Louvera never worked as a paid botanist, plants always held an important role in her life. She was a devoted gardener and president of the Chappaqua Garden Club. She also used her teaching skills to share her botanical knowledge through workshops and programs for both adults and children. As a widow, Louvera moved back to Oregon, where she fed her love of plants through container gardening at her retirement home in McMinnville. She passed away October 26, 2005 at the age of ninety-seven.

As someone who was equally enthralled by botanical classification as by the aesthetic beauty of plants, Louvera would have appreciated the work of the Oregon Flora Project, her daughter Geraldine Custer recently said. The Oregon Flora Project is honored to have been chosen to help celebrate the memory of Louvera Horn Raymond and her lifelong love of botany.

Louvera Horn (Raymond). Photo from Oregon State College yearbook, The Beaver*, 1933.*

2006-2007 Challenge Drive:
many thanks for your support !

Our last newsletter informed readers of our 2006-2007 Challenge Drive, which offered $25,000 in matching funds for the Oregon Flora Project if an equal amount were contributed. Thanks to the generosity of 214 donors, the challenge amount was met—and surpassed! Donations of $27,119, in combination with the matching funds, have brought $52,119 to the Oregon Flora Project!

Of those who participated in this fundraiser, nine households contributed more than once. The average contribution was $122, and seventy-five of the 223 donations were of this amount or higher. Many have been longtime supporters: 184 donors to this challenge drive have given to the Oregon Flora Project more than once, and 36 have contributed ten times or more! As important as our sustaining donors, are the 39 new Friends of the Oregon Flora Project who participated in the Challenge Drive.

We extend a heartfelt thanks to all who contributed. This challenge money represents a significant portion of our 2007 operating budget, and will fund our staff as we make progress on many fronts. Thank you all!

Thanks

We extend a sincere thanks to the many generous donors who participated in our 2006-2007 Challenge drive:

Special thanks go to those who provided the matching funds for the Challenge Drive: two anonymous donors, the State NPSO, and the Corvallis and Siskiyou Chapters of the NPSO. Your confidence in and support of the goals of the Oregon Flora Project have been an inspiration!

Gifts were given in memory of the following individuals: Bill Chilcote; Louvera Horn Raymond; Danna Lytjen; Scott Sundberg; and Shep Wilson.

How can I contribute?

Donations to the Oregon Flora Project are a critical part of our operating budget. Your contributions help pay the salaries of our staff and students, as well as all newsletter expenses.

There are two ways to donate to the Oregon Flora Project:

(1) With a check payable to the Oregon State University Foundation, ATTN: Oregon Flora Project.

(2) Through the Friends of the Oregon Flora Project, with a check payable to the Native Plant Society of Oregon, ATTN: OFP.

Mail your check to:
Oregon Flora Project
P.O. Box 402
Corvallis, OR 97331-2902

With your contribution, please let us know if you do *not* wish your name listed in our "Thanks" column, and if you would like to be added to our *Oregon Flora Newsletter* mailing list.

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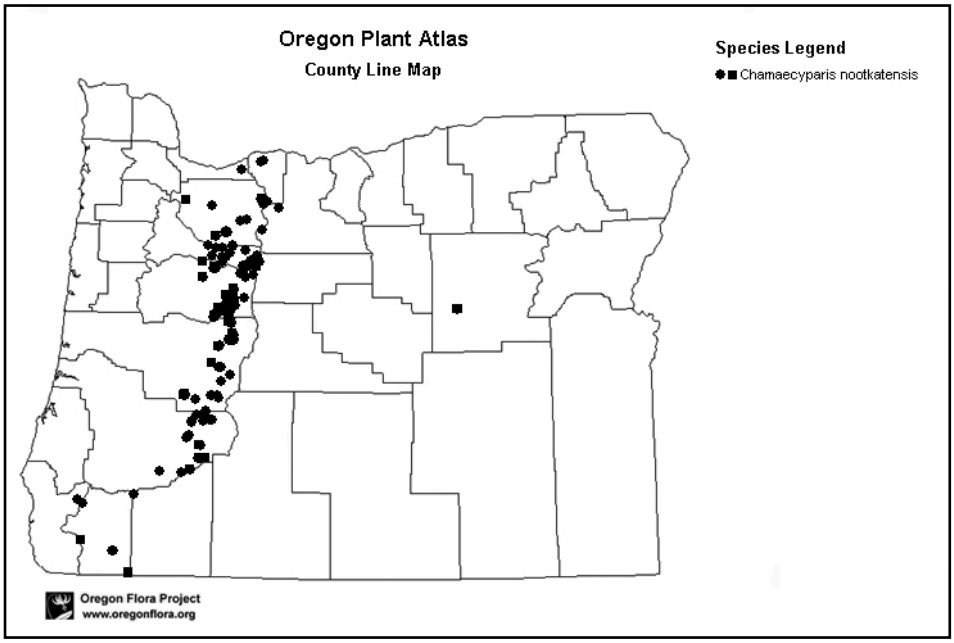
TIME DATED MAIL

Did you know?

- "Corn caraway" is the common name of *Petroselinum segetum*, featured on page one. The word "corn" is Old English for "grain." Our plant probably received this common moniker because it grows in traditionally farmed grain fields.
- The Oregon Plant Atlas lists thirteen different plants that have "corn" in their common names, including corn poppy (*Papaver rhoeas* in the Papaveraceae family) and corn cockle (*Agrostemma githago* in the Caryophyllaceae).
- The Oregon representatives of *Callitropsis bakeri* were once designated as *Cupressus bakeri* subsp. *matthewsii* C. B. Wolf, named in 1948.
- The earliest collection of *Callitropsis bakeri* in Oregon was made by M.W. Gorman, Aug. 24, 1917. He found it on Steve Peak in eastern Josephine County. "Only 127 trees and about 1000 seedlings" were seen, wrote Gorman, "the grove having been burned over 60 or more years ago."



Known sites of Alaska Yellow Cedar, *Callitropsis* (*Chamaecyparis*) *nootkatensis*, in Oregon.