



# KALMIOPSIS

Journal of the Native Plant Society of Oregon



*Erythronium hendersonii* S. Watson

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## EDITORIAL

Welcome to *Kalmiopsis*! In this issue Frank Lang shares his decades of historical research on Elmer Ivan Applegate, the son of a southwestern Oregon pioneer family who became the botanical authority on *Erythronium* species. To complete the story, Belinda Vos shows us, using her husband Bob's photographs, how southwestern Oregon inspired an *Erythronium* specialist and tells the history of other botanists who fell under the spell of these special lilies. Less showy, but just as fascinating, is the hidden world of the mycorrhizae in the roots of Oregon white oak, by Lori Valentine, Darlene Southworth and coworkers.

Looking to the future, I'm convinced that a treasure trove of potential articles for *Kalmiopsis* exists for other parts of Oregon. This isn't the Journal of the Native Plant Society of *Southwestern* Oregon. The goal is a geographic balance of botanical articles from all of Oregon, from lay or amateur botanists as well as professionals, on history, conservation, plants, and places.

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## COVER PHOTO

Flower of *Erythronium hendersonii*, the lamb's tongue seen by Elmer Ivan Applegate near his boyhood home at Ashland, photographed by Bob Vos of Talent, Oregon.

See page 1 for Applegate's biography and page 28 for Henderson's.

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## Elmer Ivan Applegate (1867-1949): The *Erythronium* Man

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(Adapted from an essay that will appear in *Plant Hunters of the Pacific Northwest*, edited by A.R. Kruckeberg and R.M. Love)

Throughout much of the 19th century the practice of field botany was a highly regarded activity for boys and girls, men and women. Botanizing trained the mind and the body. Botanizing increased powers of observation and critical thinking. The lure of the field provided fresh air and healthy exercise. A young farm boy in Klamath County, Oregon, took up botany at a young age and later evolved from amateur to professional botanist. In the plant world, Elmer Ivan Applegate's true love was *Erythronium*, the lamb's tongue genus in the lily family. His interest in *Erythronium* dated back to his boyhood (Applegate 1935) when the first lamb's tongue that he learned, a southwest Oregon - northwest California endemic, was as yet unnamed. Applegate found it a matter of satisfaction that the species was named *Erythronium hendersonii* S. Wats., for his friend Louis Henderson. As a professional botanist, Applegate named eight taxa of *Erythronium* and had species in four other genera named for him (see sidebar for list).



Tuolumne fawn lily (*Erythronium tuolumnense* Applegate) near Columbia, CA. Described by Applegate in 1930, this species grows only in Tuolumne County, CA. Photo by Bob Vos.

### Southern Oregon Roots

According to the family Bible, Elmer Ivan Applegate was born March 31, 1867, near Ashland, Oregon on the donation land claim of his maternal grandfather, Sam Grubb. As the eldest of six children of Margaret Grubb and Lucien B. Applegate, Elmer was of pioneer stock. The Grubb family came to Oregon in 1852. Lucien Applegate was only one year old when he traveled west in 1843 with the famous Applegate Wagon Train led by his father Lindsay and uncles, Jesse and Charles Applegate. Elmer grew up on the Brookside Ranch in Upper Swan Lake Valley, east of Klamath Falls. Lucien started the 5,000-acre ranch in 1869 (when Elmer was two), and his wife Margaret and their two children, Elmer and Minnie (1869-1951), joined him a year later. Elmer's

### Taxa named by Applegate

*Downingia sikota* Applegate 1929. Contrib. Dudley Herb. 1:97.

*Downingia yina* Applegate 1929. Contrib. Dudley Herb. 1:97.

*Erythronium giganteum* subsp. *leucandrum* Applegate 1933. Contrib. Dudley Herb. 1:189.

*Erythronium grandiflorum* subsp. *chrysandrum* Applegate 1933. Contrib. Dudley Herb. 1:190.

*Erythronium helenae* Applegate 1933. Contrib. Dudley Herb. 1:188.

*Erythronium klamathense* Applegate 1930. Contrib. Dudley Herb. 1:151.

*Erythronium nudopetalum* Applegate 1933. Contrib. Dudley Herb. 1:189.

*Erythronium oregonum* Applegate 1935. Madroño 3:99.

*Erythronium oregonum* subsp. *leucandrum* (Applegate) Applegate 1935. Madroño 3:106.

*Erythronium tuolumnense* Applegate 1930. Contrib. Dudley Herb. 1:153.

*Frasera umpquaensis* M. Peck & Applegate 1941. Madroño 6:12.

*Mertensia siskiyouensis* Applegate 1930. Contrib. Dudley Herb. 1:154.

### Applegate Eponyms

*Astragalus applegatei* M. Peck 1936. Proc. Biol. Soc. Wash. 49:111.

*Castilleja applegatei* Fernald 1898. Erythea 6: 49.

*Lecanora applegatei* Herre 1944. Bryologist 47:24.

*Quercus applegatei* F.W. Knowlton. 1900. US Geol. Survey, 20th Ann. Rept. pt. 3, 42.



Cascade downingia (*Downingia yina* Applegate) at Great Meadow, Lake of the Woods, Klamath County. Photo by Bob Vos.

brother Fred (1871-1953) and three sisters, Evelyn (Eva) (1875-1965), Bessie (1879-1918), and Elsie (1881-1965) were born there. Unlike many ranch families of the time, the Applegate children were given the advantages of high school and university educations, and musical training. The family spent many winters in California (e.g., in 1884 Elmer, 20, was in Santa Barbara, and in 1885 his father built a house in Ontario, California). In 1891 Elmer was in Ontario, California, having left the family ranch the previous year. He completed a shorthand course at Woodbury Business College in Los Angeles in 1892. A year later the *Ashland Daily Tidings* reported that Elmer was visiting from San Bernardino County, California, where he had “become a fixture in that inviting section having a good situation in the Recorder’s Office.” The following year, when he was 27, Elmer was in San Jose with his brother Fred. Elmer’s letter to his sister Minnie gives the first indication of Elmer’s formal botanical education at the California State Normal School (at San Jose). It is worth quoting, both for its botanical information and for the sense of family it conveys.

*San Jose, California, September 23, 1894.*

*Dear Minnie:*

*I have been so busy that I have depended upon Fred, who hasn’t a great deal to do, to keep you all informed as to our doings etc. I will try to write occasionally, even if I do have to dig to prepare my lessons. This is Sunday afternoon. We have been in the park, resting awhile and getting a little fresh air—pretty warm and close.*

*We wish that we could be with you at home today! Someone in the adjoining room is playing some of Eva’s old tunes, and though she can’t play nearly as well as Eva, it makes us feel homesick. Why is it that we cannot appreciate our dear Ma and Pa and sisters until we go away from home, among strangers? Wish that circumstances were such that we could*

*all be together here. I am sure you would like this country. It is a great thing to have Fred with me, and I am sure the change is doing him a great deal of good. I went to see his doctor last evening to enquire about his case. He thinks he can soon have him as well as ever. His eyes are much better. Before he got his glasses he could not stay in a lighted room, now he reads considerable. Another encouraging thing is that he is in much better spirits that [sic] he was. Notwithstanding the fact that I have all the work that I can possibly do, I believe that I feel better than I did before leaving home. It will be much easier for me after awhile. After being out of school so long it is rather difficult to get into the way of studying, hard to concentrate my mind; besides being a teacher, I am allowed [sic] to do extra work. Instead of four regular registrations a day, I have five. My regular studies are, psychology, elocution, literature, music and botany. Also have physical culture, and hygiene. Have been so fortunate as to be promoted in several studies. Have been granted standing on about half a year’s work without examinations. Prof. Rattan—the botanist who wrote the “California Flora”—told me that I had done a great deal more work than was done in the Normal so I have a good record on that, and am doing only a little extra work in that line, and studying methods of teaching the subject. I find that my own Swan Lake method is just about the same. Professor R. and I are quite thick. He has shown so many of my specimens to the school, and said so much to the students about my work that I have gained quite a reputation as a botanist. I have a lot of students around me asking questions, every day. Over one hundred and fifty in my class, and I think not more than fifteen boys. Yesterday was gone all day, as instructor for a botanical crowd. Went up a cool canon [sic], something like San Antonio, took our lunches and had a jolly time. Walked about ten miles. Fred was along; said he never had more fun in his life.*

*Next to botany I like drawing. Have nearly two hours work a day. All from nature. Have been at work on leaves and fruit. Have a jolly old German prof. He gives a good deal of encouragement. I wish that Elsie could have a few lessons from him. You ought to take a special art course at Stanford. But music—oh my! deliver me. Our teacher of that is German, too—and a great old coon he is! I asked him about my case; he informed me that I was not as bad a case as some! How encouraging! I cant [sic] take any interest in it; would rather do all the rest of my work, yes and do the chores for some farmer, than to monkey with my music lesson. Our athletic teacher wears knickerbockers—oh, just the thing for you girls, next summer. I’ll ask her for the pattern. She is a fine looking girl, and can stand on her head as well [as] any of us boys.*

*A week ago Friday night a big reception was given the new students at the Normal. It was entirely informal. Each one, armed with a large card for autographs, began to circulate about the crowd. I got one hundred and fifteen names on my card during the evening. The fun of it is to connect the names with their owners! It is a one-sided affair—the boys being so few the girls have no trouble in remembering us. Last week one of the girls came to me with a letter of introduction from Mr. Goodfriend. She and her sister are in*

the school. Frank Carl, son of Billy Carl, is a Normalite. Too sporty. Miss Hopkins is a very nice appearing girl, but am not very familiar with her. She seems to worry a good deal about her brother.

Week ago Saturday we were awfully glad to see the familiar face of Frank Anderson. Got a card from him and received him at the station. First person that we had seen that we had ever known. We got him a good dinner and had a regular old Oregon time. We want to go over to Palo Alto before long. Only seventeen miles. Our crowd that used to meet at Uncle Ivan's [Lucien's brother] is badly scattered, isn't it? I hope that we can all meet in camp next summer. I think a good deal of that expedition; we must carry it out. We were very sorry to learn of the poor outlook for beef sale. Hoped that it might be a little better. Make the children write to us—there are any amount of little items that would be of great interest to us. We shall probably go to church tonight. We haven't found our preacher yet; try a new one tonight. Adios me hermana. Love from both of us. Don't neglect,

Your affectionate brother, E.I.A.

Has Engle got my money yet? [hand-written postscript]

Elmer's boyhood hobby of plant collecting and his previous botanical education were enough to impress his botany teacher, Volney Rattan. Rattan was an inspiring teacher of botany at the California State Normal School at San Jose from 1889 until his retirement in 1906 (Jepson 1928). He wrote the *Popular Flora of California* and several plants bear his name (e.g., *Collinsia rattanii* and *Penstemon rattanii*).

Elmer attended Stanford University in the spring of 1895, when he probably took a botany course from Professor Dudley for a semester. Evidently he never graduated from Stanford, nor did he receive an honorary degree from Stanford as reported by the Oregon Daily Journal (November 24, 1949). He did not finish at Stanford because of poor eyesight, a hardship that bothered him most of his life. In 1886 he wrote his father from Brookside that he "didn't wear glasses to amount to anything after sundown or in the dark." In January of 1898 Elmer wrote to F.V. Coville, "although my eyes have improved very much I can use them but little yet."

Mrs. Cressa Vineup (Grubb) Tennant, the unofficial keeper of the Lucien Applegate family history, told the following story about Elmer much later in life when he worked for the National Park Service at Crater Lake National Park:

*Elmer was a very slight man about 5 feet 10 inches tall who wore thick heavy glasses and couldn't see well even with those. One time, he was up at Crater Lake. They always wanted him to have somebody to go with him. He told me, "I don't want anybody with me. They hold me back." Well one day he went alone and got down in Annie Creek Canyon and he got into a hornet's nest. He knocked off his glasses and they fell down into the water, clear down the mountain. He was there all night. He couldn't find his way out. Then they told him he had to have someone with him. They wouldn't let him go alone after that. Elmer, who was in his sixties at the time, said "They just hold me back. I don't like to work with them."*

## Applegate, the Botanist

The years 1895 and 1896 were productive for botanical collecting, as shown by Applegate's collections in the Oregon State University herbarium from Klamath and Jackson counties, and a letter to Thomas Seale on August 18, 1895 in which Applegate mentioned having collected several hundred duplicates that year. He noted that the plants he sent to Seale were not poisoned, because he had never had problems with insects. Some of the collections were ten years old, evidence of his boyhood passion. His letter to Searle ends, "Having never ventured upon that sea over which



Elmer Ivan Applegate, Park Naturalist, Crater Lake National Park, about 1938. Crater Lake National Park Museum and Archives Collection CRLA 8885-4365, courtesy of the National Park Service.

the bark of Hymen sails, I cannot fully appreciate your position, but extend to you my heartiest congratulations and best wishes.” (This apparently was a quaint way of congratulating Seale on his marriage, as Hymen is the Greek god of marriage.)

During 1896 Applegate was in contact with many eminent botanists of the day: F.V. Coville (head botanist and curator of the National Herbarium) and J.B. Leiberger (field botanist), U.S. Department of Agriculture; W.R. Dudley at Stanford; J.G. Lemmon; C.S. Sargent at the Arnold Arboretum, Harvard University; E.W. Hammond; B.L. Robinson and M.L. Fernald at the Gray Herbarium, Harvard University. Much of the correspondence had to do with Applegate’s discovery of a tree near Lake of the Woods west of Klamath Lake that he thought was Sitka spruce.

Sargent wrote to Applegate asking for some conifer specimens for his *Silva of North America*. Applegate must have mentioned or sent him specimens of his Sitka spruce. Sargent expressed surprise that it would be that far from the coast. On February 14, Applegate wrote to J.G. Lemmon, who had a new book on

conifers, asking if he had seen Sitka spruce so far inland.

Lemmon sent Applegate a copy of the book and asked for specimens of the spruce, which Applegate sent forthwith. Letters from Lemmon and Sargent caused Applegate to doubt his initial assertion as to its identity. Sargent thought it was Engelmann spruce. Lemmon, quoted by Applegate in a letter to E.W. Hammond: “Your tree with all others of the Cascades must be called *Engelmannii* until someone with the materials at hand has the bravery to separate this middle form from the two others—or to unite all in a polymorphic species.”

Much to Applegate’s disgust, Lemmon described the species as *Picea columbiana* in an article in which he did additional species splitting by describing a new species carved out of *Pinus ponderosa* and raising *Abies magnifica* var. *shastensis* to species status (his own variety, by the way). Lemmon’s spruce was a segregate of *Picea engelmannii*. Dividing polymorphous species was Lemmon’s way of advancing “knowledge of the lines—these genera and species—more by detecting and separating than by ignoring and generalizing.” Applegate had expected a new species, *Picea klamathensis*, the name he had suggested. Lemmon mentioned neither Applegate nor his specimens in the publication. Applegate wrote to Dudley explaining that Sargent thought the name *Picea columbiana* more appropriate, but how Lemmon obtained his specific epithet is not known. On March 12, 1898 Applegate wrote to Sargent at the Arnold Arboretum, “I may be mistaken about this matter but I do not approve of Mr. Lemmon’s scientific methods, in fact I am inclined to think that they are sometimes rather ‘commercial’ than scientific.” (Applegate was not happy.)

During the summer of 1896 Dr. Frederick Coville and J. B. Leiberger took advantage of an opportunity to visit Crater Lake with the Mazamas, an Oregon mountaineering club. One result of this visit was Coville’s chapter on the August vegetation of Crater Lake in the Mazamas’ journal. This chapter featured Applegate’s account of the vegetation of Mount Scott on the eastern rim of the lake. According to Coville (1897), Mount Scott offered little of interest—vegetation consisted of hardly more than 25 species, all of which grew in more accessible places—concluding, “This peak is not recommended for a botanical excursion.”

Not, that is, unless you want to visit the type locality of *Castilleja applegatei*. Applegate had started sending specimens to Harvard University because he lacked the literature to identify plants in his part of Oregon. In the opinion of M.L. Fernald, Applegate’s Mount Scott *Castilleja* was a new species, not *Castilleja parviflora* as reported by Coville. Applegate wrote to Coville that Fernald very soon would describe the plant in a revision of the *C. parviflora* group. Fernald initially planned to name the species *C. glutinosa*, but ended up calling it *C. applegatei*. Applegate wrote to Fernald on July 29, 1898, to express his sincere appreciation for naming the Mount Scott paintbrush in his honor.



Pumice Moonwort (*Botrychium punicola* Coville) at the type locality, Llao Rock, Crater Lake National Park. Discovered by Elmer Applegate and C.V. Coville the summer of 1896. Photo by F.A. Lang.



Klamath lamb's tongue (*Erythronium klamathense* E. Applegate), drawn by F.A. Lang.

Applegate wrote that his Crater Lake trip was the most enjoyable and instructive outing he had ever had. He camped with parties of Professor Coville and Dr. C. Hart Merriam (famous for developing vegetation Life Zones descriptions). Applegate found Coville to be “exceedingly pleasant and interesting,” and also took up a brief correspondence with Merriam. In a letter to Merriam, Applegate regretted not securing any animal specimens for him: “I am usually quite successful in capturing plants, but seem to be most [sic] too slow for animals.” In a discussion of the distribution of birds and mammals in his vicinity, he mentioned his father and brother each killed lynxes and that what he called red foxes had declined greatly in numbers in recent years.

During the winter of 1896-97 Applegate was in charge of his father's cattle ranch. In letters to Professor Dudley, he wrote that he was “following my old cowboy life” and very much regretted that he had been unable to return to the university the previous fall. He hoped to return to Stanford the next year: “As I ride my bronco over the ranges day after day I become quite impatient to work on my plants.” Applegate expressed an interest in spending part of his time studying forestry and could see no reason why he could not return the next year (1898), although probably not to a regular course of study because his time might be limited to one year. Applegate also thought he might make a business collecting for herbaria, recognizing that “Field work agrees best with my health and disposition.” He asked Dudley for an outline of the course “you think best for me to pursue.” On May 25, 1897, Applegate wrote to Dudley, “I wrote you sometime ago asking your advice about university work for next year. I fear the letter was lost.”

In June 1897 Applegate wrote to Coville that he had just completed a 400-mile field trip with Vernon Bailey (naturalist with the Biological Survey and eventual author of *The Mammals and Life Zones of Oregon*, N. Amer. Fauna No. 55, USDA Bureau of Biological Survey, June 1936) to determine the extent of the Sonoran Zone. Bailey suggested that Applegate write to Coville to ask about work for the coming season. On the 12th of June

Applegate received a letter from Coville asking him to accompany him on a collecting trip as “chief cook and bottle washer.” Applegate replied that he was willing to work in any capacity just to be in the field with Coville. As his only hesitation with the arrangement was the risk of not reaching Stanford by the beginning of the university year, Applegate spent the collecting season with Coville.

Applegate was 30 years old when he first served as Dr. Coville's assistant, studying the vegetation of the Oregon Cascade Mountains during the collecting season of 1897. As they traveled by pack train, Applegate must have been an ideal field assistant. He was an experienced wrangler, had a complete camping and collecting outfit, including pack animals, and was well versed in botany. They visited Crater Lake both seasons, collecting numerous plant specimens. The first year, they discovered *Botrychium pumicola* Coville, pumice moonwort. Crater Lake remained the only known location for pumice moonwort until it was recently discovered elsewhere in Klamath and Deschutes counties.

In January 1898 Applegate wrote Coville from San Jose, California, complaining about his eyes and mentioning his plan to return to Klamath in February. In April Applegate learned of his appointment for the 1898 field season with Coville.

Apparently Applegate still planned to continue his Stanford studies. He wrote to Sargent that he went directly from The Dalles, Oregon, to Stanford but had to give it up because of “serious” eye trouble. Applegate spent five months in treatment in San Francisco before returning home to Klamath Falls. During this time he was unable to do much writing.

Applegate spent the winter of 1899 in Washington, DC, working on the Coville collections. On February 3, 1899, he wrote to his sister Minnie explaining that he had not replied to her letters because he was trying to save his eyes for his work. Commenting on the progress on his work, he wrote that he had almost finished the trees and shrubs and that his time would be up in about three weeks. On February 13, he wrote his sister Elsie that he had attended *the* social event of the season, the congressional reception at the White House. Applegate “enjoyed mingling with the highest and most fashionable society in the land.” He also was introduced to the President of the United States who said, “Mr. Applegate, I am glad to see you—this is Mrs. McKinley.”

Applegate was also something of a paleobotanist. In a letter to Minnie from Washington, DC, he mentioned giving his collection of fossil plants from near Ashland, Oregon, to Professor C.H. Knowlton, a paleobotanist. From this collection Knowlton reported two new species that he named *Quercus applegatei* and *Ficus anderssonii* (“after Frank,” Elmer's cousin Frank Anderson, who became a well-known geologist and discoverer of the LaBrea Tar Pits).

### Marriage and Farming

On July 5, 1899, at the age of 32, Elmer became a seaman “on the bark of Hymen.” He married Esther Emily Ogden, age 34, in Nevada City, California. Esther belonged to a pioneer family of Grass Valley, California, and was a relative of the famous mountain man Peter Skene Ogden, who led a Hudson's Bay Company brigade south from Fort Vancouver on the Columbia River to southern Oregon in 1826-27. Her father Robert Ogden

came west from Illinois in 1849 to the gold fields. Esther was born in a mining camp near Nevada City, grew up in California, and completed her education at UC, Berkeley. She taught for 16 years at Miss Head's Finishing School for Girls at Oakland before her marriage to Elmer. For another period she was in charge of nature studies and geography for the San Bernardino Schools. One could surmise that Elmer and Esther met in San Bernardino when Elmer was living there.

The couple made their home in Klamath Falls. She spent considerable time in California and on collecting trips with her husband the length of the Pacific Coast and inland to the Rocky Mountains. She was a talented artist who worked in watercolors, pastels, and oils. Like another botanical couple, Carrie and Albert Sweetser (see *Kalmiopsis* 6:13-15), Esther painted watercolors of botanical specimens while Elmer botanized. The plants were done on Empire bond paper, sketched lightly in pencil, then finished in watercolor. About half are at least partially named. Two signed sketches were done in 1907 and 1908. These drawings were rather crudely done, but not without a certain charm. Cressa Grubb Tennant donated 172 of these drawings to the Oregon Institute of Technology, where they are housed at the Shaw Historical Library. Tennant owns a very fine oil painting of yellow roses done by Esther. Although Esther was not particularly robust, falling ill to various unspecified maladies during her married life, she was Elmer's constant companion. At times, this limited their

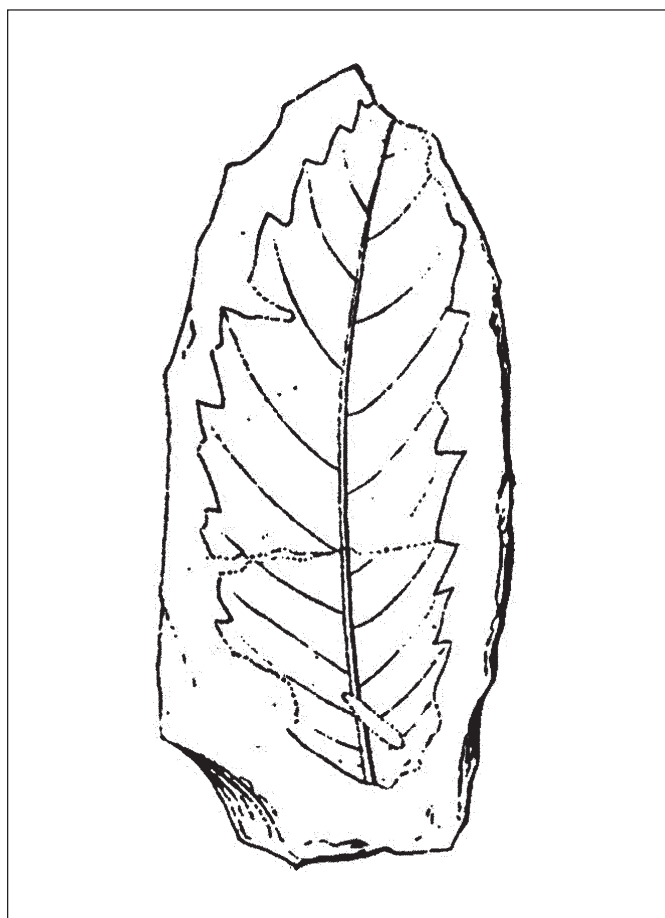
travels. Once Elmer wrote to the "Brooksiders" that he would have visited: "If I could have left Esther, I should have been there before now. She has not been at all well; sore throat and quite a bad cold."

After his wedding, Elmer's main focus seemed to shift from botany to other things. He did maintain contact with Dudley at Stanford and Coville and others in Washington, DC, and in 1902 he wrote to Dudley about various conifer species on Mount Shasta and mentioned not hearing anything about his appointment. In 1904 he collected mistletoes for botanists at the Bureau of Plant Industry, USDA. In 1905 he received a letter from Coville with advice on killing insects using carbon bisulphide and congratulating him on the progress of the Klamath irrigation project. In June 1905 William Lowell Finley of Portland quizzed him about the Klamath area and the location of a bird's nest for photography.

In 1909 Applegate sent Coville a plant collection of about 360 species, mostly from Swan Lake Valley and corresponded with the great agrostologist A.S. Hitchcock, custodian of grasses at the US National Herbarium. In September Professor J.O. Snyder of Stanford requested an immense number of live garter snakes from the population that congregated on the banks of the Klamath River. He wanted two or three thousand of them for a study in snake variation. Applegate wrote Snyder that it was too late to collect this year and that the advent of settlers and prohibition had greatly reduced the number of snakes. This is an example of Applegate's dry sense of humor. Seeing snakes and pink elephants are said to be part of delirium tremens brought on by the excessive and prolonged use of alcoholic beverages. Prohibition meant fewer drunks, seeing fewer delirium-induced snakes.

In 1912 he was corresponding about potatoes with Mr. W.A. Curtis of Wood-Curtis Company, a wholesale produce company. Applegate's main interest of the time was water. As an organizer and first secretary of the Klamath Irrigation District, he was a moving force in the establishment of the Western Reclamation Association (National Federation of Irrigation Associations). According to Evans (1911), Applegate was a pioneer in getting the government to organize the Klamath irrigation project. As the first secretary of the Water Users' Association he persuaded prospective users to sign up. When the price reached \$30 an acre to irrigate, there was dissension in the Association. Applegate quit his position and purchased a farm.

In 1908 Elmer and Esther built a bungalow at the corner of Eberlein and Austin Streets in Klamath Falls. The property was bordered by the main irrigation canal and extended to Shasta Way. The house, much modified, now sits amid a collection of apartment houses, and is still surrounded by a grove of trees planted by Elmer. Evans (1911) described the Applegate home and farm in *Sunset Magazine*. The house, he wrote, "is as fine a bungalow as any you can see in the Berkeley hills, where only rich people are supposed to live." (*Sunset Magazine* at that time was a Southern Pacific Railroad booster magazine designed to lure settlers to the golden west, presumably by railroad.) When Evans asked Esther about the life of a woman in this new country, she replied, "The only thing that bothers me is the servant problem." Besides irrigated garden crops, the Applegates raised chickens. The *Sunset* article has a photograph of Esther surrounded by her chickens in the chicken yard with a tent that served as a chicken house.



Drawing of the fossil oak *Quercus applegatei* from F.W. Knowlton (1900).



## A Return to Botany

By 1923 Applegate appeared ready to reconnect with botany, writing to Roxana Ferris at Stanford: "Back in pioneer days I was a special student in botany at Stanford under Prof. Dudley." In 1927 he wrote to Dr. LeRoy Abrams at Stanford University describing his first trip to Steens Mountain. In 1930 he wrote Mrs. Ferris about *Erythronium* and his trip back from Palo Alto to Klamath Falls. He took the long way home, visiting the gardens of the famous California plantsman, Carl Purdy, and his "wonderful" *Erythronium* beds. He also mentioned a trip to the high Siskiyou where he hoped to visit Steve Peak and other mountains in the area. On August 28, he reported on his trip and mentioned that he and Mrs. Applegate hoped to be back at Stanford in early September.

During this time Elmer was appointed Acting Director of the Dudley Herbarium at Stanford. Barnhart (1965) gave the year of Applegate's appointment as 1927, although Stafleu and Mennega (1992) stated that he was Honorary Acting Director during 1928-1934 and 1934-1938.

On August 9, 1931, Esther Ogden Applegate died of a stroke at age 66. Her obituary lauded her as a marvelous companion, secretary and assistant to her husband, sharing in his botanical research. She and Elmer were childless. Esther's death was a severe blow to Elmer. They had been married 32 years. He wrote to Mrs. Ferris:

*During all the years we were together, I was rarely away from Esther, even for a day. In all my undertakings, her help and sympathy [sic] and encouragement were my inspiration. Added to this was a rare comradeship that made life very beautiful. And so I find it most difficult [sic] to bear up under the great sense of loss. Her wish has always been that I carry on no matter what happened.*

Carry on he did. It was during this time after his wife's death that Applegate did most of his significant botanical work, perhaps as a salve for his loneliness and grief. He became the monographer of *Erythronium* and author of the floras of Crater Lake National Park and Lava Beds National Monument.

He continued to alternate his summers in Oregon with his winters in California. In 1934, at 67, he received an appointment as Park Ranger (naturalist) at Crater Lake National Park, a relationship that continued until 1939. It is apparent from the naturalists' schedules that Elmer did not interact a great deal with the interpretive program. His name never appears as a part of the evening lecture series and he worked a half day only once or twice a week in the information building. Most of his time was spent at botany and writing Nature Notes.

Elmer knew most of the Oregon botanists. He visited Morton Peck at Willamette University, Ethel Sanborn and Helen Gilkey at Oregon State University, and Louis Henderson, "etc." at the University of Oregon. Collections in the OSU Herbarium from Hood River County in 1932 by Applegate and Henderson on the same dates suggest that Applegate was visiting the Henderson ranch there. LeRoy Detling, Frank Sipe, and Albert Sweetser were probably the University of Oregon "etc." to whom he referred in his letter to Roxana Ferris. In 1941 Applegate and Morton Peck co-authored *Frasera umpquaensis*, a member of the gentian family



Mt. Helena fawn lily (*Erythronium helenae* Applegate) near Actna Springs Road, Angwin, CA. Photo by Bob Vos.

related to the monument plant, *Frasera speciosa*. A list of Applegate's publications, the taxa he described and citations for his four eponyms are shown in sidebars on pages one and ten.

He also continued his collecting trips. On August 10, 1932 he wrote to LeRoy Abrams at Stanford expressing special appreciation for Abrams' words of commendation concerning his botanical work. He mentions collecting 600 specimens for the herbarium [Stanford] from the Warner Mountains and plans for an *Erythronium* trip to Mount Hood. He claimed it would be a flying trip. Perhaps by his standards, but Mrs. Tennant told a different story: "The Applegate family all talked about those crazy people who drove so fast. I mentioned once to Elmer's sister Evelyn that it was sometimes safer to drive faster than to drive so slow. Evelyn took it personally and just flared up. I listened to them talk about her (Evelyn) and they all go 20-25 miles an hour. Well, I can understand Elmer. He couldn't see, but they *all* drove slow."

Bad eyesight and slow driving did not keep Elmer from his appointed rounds. He continued to collect in the parks and national monuments. In a letter to Abrams (July 23, 1935) he wrote of the beginning of his summer with the National Park Service. He said that he began work much earlier in the season than the rest [of the naturalist crew] but had a free hand, "although both of them were full." When he took the oath of office, he wrote

that he swore to support the constitution, defend the flag and fight The New Deal. He seemed Republican in his political views.

Lincoln Constance (1909-2001), renowned botanist at the University of California at Berkeley, was a ranger naturalist at Crater Lake National Park during the summers of 1931 and 1932. The only personal exchange with Applegate that Constance could recall (Constance interview, August 9, 1995) was that when the Civilian Conservation Corps (CCC) had finished whatever they were doing at the moment, Applegate commented that they should be given the task of “rooting out” the “intermediates” that adversely affect our keys. He remembered Applegate, then in his mid-60s, as a slender man with a dry sense of humor.

### The *Erythronium* Story

Applegate made his first *Erythronium* collections for scientific study while an undergraduate at Stanford in 1895. He collected others during his summers with Frederick Coville (1897-98).



*Erythronium oregonum* with its swept-back tepals. Photo by Bob Vos.

Applegate realized that the best way to get to know these plants was to see them in the field. He began his observations in 1921 and concluded this phase in 1933. The summer of 1930 Elmer and Esther made a 3,000-mile collecting trip through five states. He collected “a lot of good *Erythronium* material and a whole book of notes on the growing plants and specimens examined in the herbaria of various State Universities and colleges.” He mentioned that Harold St. John (Washington State College) was the only one he found doing any “real special work” on the genus, although Sereno Watson at Harvard produced a revision of the genus in 1891. Elmer wrote M.L. Fernald and C.A. Weatherby at Harvard University with a number of nomenclatural questions concerning various taxa in the genus.

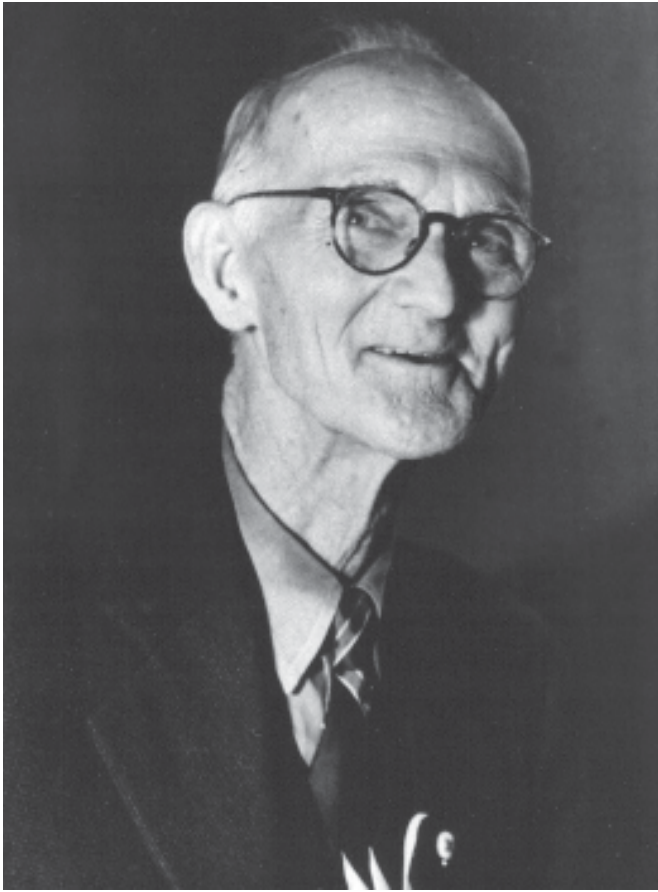
Applegate’s monograph on the genus did not appear until 1935 when it was published in *Madroño*, the Journal of the California Botanical Society. His treatment of the genus, based on leaf mottling, stigma and style characters, and perianth and anther color has stood the test of time. With a few exceptions, the taxa of his treatment are still considered valid in modern treatments (compare Applegate 1935 with Kartesz 1994).

Elmer accompanied Dr. Joseph Ewan, the eminent botanical historian, to Llao Rock at Crater Lake to see the pumice grapefern the summer of 1937. *Erythronium* was the subject of several letters exchanged between Ewan and Applegate. Ewan remembers Applegate as “a genial enthusiast whose service at Crater Lake was exemplary, combining as he did an informed naturalist with an interest in the public as visitor.”

Applegate’s monograph of *Erythronium* was his greatest contribution to plant systematics and was the result of his life-long interest in this handsome group of lilies (see the Vos article on page 11 of this journal) that dates back to his boyhood home in the Siskiyou Mountain region of southwestern Oregon. “...the very center of the *Erythronium* world,” as Applegate put it. This work, published in 1935, was the first and last comprehensive treatment of the North American species since Watson’s Revision of the species in 1891. The monograph included 15 species and three intraspecific taxa found from the Rocky Mountains to the Pacific Ocean. Of these, eight taxa were newly described by Applegate.

His taxonomic treatment has stood the test of time, largely because he carefully examined hundreds of borrowed herbarium specimens and took his study as an opportunity to indulge in his “innate liking for wilderness wandering.” He was able to collect and examine each species in his monograph in its native, wild habitat.

Brian Mathew’s 1992 world-wide review of *Erythronium* maintained all 15 species in Applegate’s treatment plus three species described by others in the past 25 years. Mathew’s paper focuses on the considerable horticultural value of dog-toothed violets. It lacks the taxonomic rigor of Applegate: no specimens cited, no assessment of the literature, no extensive



Dr. Elmer Ivan Applegate at Stanford, December 1940.  
Photo by Roxana Ferris, courtesy of Dr. John Thomas.

consideration of things nomenclatural. It is, however, a useful modern summary of the taxonomy of the genus throughout its range.

I cannot find mention of dog-toothed violet, lamb's tongue, amber lily, trout lily, or fawn lily in Applegate's monograph. He did not use common names. It was just plain *Erythronium* to him. Perhaps the lack of vulgar names expressed his devotion to the scholarship of his work.

### Final Works and Honors

Applegate continued as Honorary Acting Curator of the Dudley Herbarium at Stanford until 1938. At 71, Applegate's botanical endeavors were slowing down, as was he. The following year he published his *magnum opus*, *Plants of Crater Lake National Park*, in the journal *American Midland Naturalist*. Although Applegate's work is often cited as the first flora of Crater Lake, Frederick Lyle Wynd, a student of Henderson's, had published his *Flora of Crater Lake National Park in American Midland Naturalist* in 1936 (Love 2002). Curiously, Applegate did not mention Wynd's work. By September 1939 Elmer had sold most of his Klamath Falls property and moved to Josephine County, Oregon, where he had a small (18 by 24 feet) comfortable cabin built near the home of sisters, Evelyn and Elsie, on the West Fork of Williams Creek. Sister Minnie joined them later. In some ways, it must have been like the old times at Brookside Ranch when they were young. Elmer was 72 years old.

The following year Elmer received his greatest honor. On April 25, 1940, he received a letter from George W. Peavy, President of Oregon State College, informing him that the Administrative Council of the College had unanimously decided to offer him the honorary degree of Doctor of Science (Abrams and Applegate 1939). Elmer gratefully accepted. Apparently his sister Evelyn and Dr. Helen Gilkey at Oregon State College were responsible for the honor. Dr. Applegate was further honored in 1944 when Dr. W.C.T. Herre (Stanford University) named a new lichen *Lecanora applegatei*. Applegate had collected the lichen on the Garfield Peak trail at Crater Lake National Park some years before.

Elmer's last years were spent with his sisters at Williams, botany a thing of his past. In May 1942 he wrote to Mrs. Ferris at Stanford that Reed Rollins (Harvard University) and Lincoln Constance (UC, Berkeley) had called, but that he had been ill with the flu and could not see them. "Since leaving Stanford," he wrote, "I haven't done anything in the line of botany and have otherwise been idle. It's the hardest work I ever did. The Caves mountains and old Grayback right at my door, beckon to me and yet I cannot go!"

An occasional botanist visited Applegate after his move to Williams. Milo Baker visited looking for violets as did Charles Piper Smith, "poor fellow," (Elmer's words) in his search for lupines. He also mentioned a visit by Wolf and his nice family (C. B. Wolf, student of *Cupressus* who in 1948 published "Taxonomic and distributional studies of the New World cypresses," *Aliso* 1:1-250).

The Applegates were self-sufficient and survived World War II in good order. In 1946 the locker in Williams was full of meat, fruit, and vegetables. There was plenty of milk, cream, butter, and a garden full of winter vegetables. Sugar was the shortage. Elmer wondered how people in town got along.

On October 28, 1947, Applegate, at 80, wrote to Leroy Abrams remarking on age and its effects, marveling that Dr. Cample (probably D.H. Campbell who died in 1953 at 94) and Bailey Willis, ten years his senior, were able to keep up. Applegate, for his part, could only hike about in the nearby woods and "his car was ready for short drives." On November 16, 1949, Elmer Ivan Applegate died at his sisters' home on Williams Creek near Grants Pass, Oregon (*Klamath Falls Herald & News*, November 17, 1949). He was buried in IOOF plot 14-4-6, Linkville Cemetery, Klamath Falls, with his wife and other relatives. His plant collections are housed at the California Academy of Sciences, Oregon State University, and at Crater Lake National Park.

Elmer Applegate was a man whose varied interests included irrigation activities that may have contributed to current water conflicts between agricultural interests and the endangered fish of the Klamath Basin. During the 1880s and 1890s amateur and professional botanical interests became increasingly incompatible as the science of botany shifted from natural history to biology, a scientific, experimental approach to the study of plants that emphasized physiology and ecology over taxonomy. Amateurs who collected for professionals became scarce. The shift was particularly hard on individuals like J.G. Lemmon (Keeney 1992). Dr. Elmer Ivan Applegate, however, made the transition and occupies a solid place among the plant hunters of the west who became respected professional botanists.

## Acknowledgements

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# Lamb's Tongue: The *Erythronium* Species of Jackson County, and The Botanists Who Collected and Described Them

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It's hard to imagine a flower more symbolic of spring than the beautiful lamb's tongue. With its swept-back petals and fragile nodding blossoms, the genus *Erythronium* of the Lily family is distinctive. Since Jackson County is home to five species of *Erythronium*, it is not surprising that Elmer Ivan Applegate (also a native of southwestern Oregon) wrote in his 1935 monograph on *Erythronium* that the Siskiyou Mountain region was "the very center of the *Erythronium* world." Early plant hunters fell under the spell of these lovely lilies and collected and described them from their first journeys into the wilds. The histories of the collectors and botanists are as interesting as the plants they discovered, and learning about their lives builds a greater appreciation for the plants they discovered.

The father of binomial plant taxonomy, Carl Linnaeus, described the first *Erythronium* in 1753; the European dogtooth violet, *Erythronium dens-canis*. *Erythros* is Greek for red, alluding to the pink to purple flowers of this species. *Erythronium* is closely related to the genus *Tulipa* (Allen 2002). Common names abound for this plant including fawn lily, rattlesnake violet, and trout lily, referring to the mottled or spotted leaves of some species. Dogtooth violet is derived from the shape of the long, pointed bulb thought to look like a canine tooth. The plant's narrow flower stalk somewhat resembles a snake's tongue, hence adder's or serpent's tongue. In Jackson County, the preferred common name is lamb's tongue as the mottled leaves of several local *Erythronium* look like the speckled pattern on a lamb's tongue. By whatever name, these plants are a welcome addition to our springtime landscape.

## Distribution

Depending on taxonomic opinion concerning subspecies, there are about 27 species of *Erythronium* worldwide. *Erythronium* species grow in the north temperate zone around the world in Europe, Asia, and North America (Mathew 1998). Europe has

one species, *Erythronium dens-canis*, along with several varieties that may be recognized as species in the future. Three taxa related to *E. dens-canis* grow in Asia (the Caucasus and northwest Iran, Siberia and Japan). In 1842, Harvard botanist Asa Gray hypothesized that the floras of eastern North America and those of Europe, China, and Japan were closely related by means of an ancient forest which stretched across much of the northern hemisphere (Grothaus 2001). Later, this forest region was broken up by continental drift and glaciation, resulting in the similarity between species of the Old World and those of eastern North America. The Rocky Mountains divide the North American species into two groups, with 6 eastern species and 17 western species.

The western *Erythronium* species in Northern America have adapted to more varied habitats than those of other parts of the world. While they are primarily woodland plants elsewhere, in the West their habitats vary from sea level to alpine meadows. Speciation has created localized endemics, and given the remote terrain favored by some plants of this genus, it is possible some species remain undiscovered. In fact, a new species in southwestern Washington, *Erythronium quinaultense* G.A. Allen, was just described in 2001. Fourteen species grow in California and eight in Oregon. The five species of *Erythronium* in Jackson County include *E. citrinum*, *E. grandiflorum*, *E. hendersonii*, *E. klamathense*, and *E. oregonum*.

## Morphology

*Erythronium* bulbs consist of fleshy scales that are fused together and covered by a thin brownish tunic (Grothaus 2001). The yellowish white bulbs, 8 to 25 mm long, are often narrowly elongate and pointed at the apex, with a rounded to blunt base, but they can also be more ovate. Buried deeply in the soil, they have a solid, firm consistency and are internally white and starchy. Some species reproduce vegetatively by stolons, often resulting in extensive colonies.



Under favorable conditions, *Erythronium hendersonii* may bloom in large masses, making a spectacular display. Photo by Bob Vos.



Intricate pattern on the leaves of *Erythronium hendersonii*. Photo by Bob Vos.

Although Mathew (1992) describes the leaves as cauline, most references call them basal, as the point of attachment on the stem is normally at or below ground level. Typically, flowering plants bear two leaves with one being somewhat larger than the other. They vary in size from 6 to 60 cm and are lanceolate to ovate in shape. Immature non-flowering plants usually produce a single leaf that arises directly from the bulb on its own petiole.

Leaves may be plain green or patterned. The varying patterns of leaf color also provide a clue to past alliances. Leaves of eastern North American and Eurasian species have a spotted pattern resembling splattering with random droplets of paint (Allen 2002), in contrast to the mottled or netted pattern of western North American species in which the pattern is more or less symmetrical, like elongated lateral streaks or veining. The mottling in the western North American species varies widely, from a subtle combination of colors, to bold patterns of brown, green, and white and in some cases even deep, rich purple. Some of the mottling is very dark while other markings are softer and fade as the leaf ages. This variation in leaf color is a key characteristic when identifying fawn lilies. Applegate (1935) divided the western American species into two groups based on leaf coloration; plain green (*Concolorae*) and mottled (*Pardalinae*). This approach is still used in current keys and provides an efficient way to initially differentiate species. Mathew (1992) states that “this feature may not be of fundamental significance in the infrageneric classification of *Erythronium*, it is of practical value and is for the present retained.”

Flowers are borne in a terminal inflorescence of one to many blossoms on a single, leafless, green or reddish scape. The flowers are showy, usually nodding, and are made up of six free perianth segments: three inner petals and three outer sepals (Allen 1996), collectively referred to as tepals. The symmetrical flowers have a

typical lily-like appearance with the tepals reflexed at anthesis. Stigma shape and anther color vary by species and can be useful diagnostic traits. The six stamens are in two whorls, with the inner filaments shorter than the outer ones. The ovary is superior, with the style attached abruptly to the ovary. Flower color ranges from white, cream or yellow to pink, lavender or violet, with many species having dark markings or deeper coloring in the throat. The genus is not noted for its fragrance, but some species do have a scent.

Another diagnostic feature are auricles or saccate appendages at the base of inner tepals in some species. Mathew (1992) describes them as “two longitudinal furrows running along the segments, culminating at the lower end in two conspicuous swellings.” The auricles are oppressed to the ovary and form pocket-like hollows. The nectariferous zone is located at the extreme base of the segments and these appendages seem to act as gates. Because this feature can be very helpful in distinguishing between species, it should always be noted.

### Life Cycle

The identity of the insect pollinators is not known for most species, but the bumblebee-pollinated *Erythronium grandiflorum* has been the subject of several studies (Allen 2002). After fertilization takes place, the trilobular ovary develops into an ovoid to oblong seed capsule. During this time the nodding pedicel becomes erect, with the seed capsule perched on top. At maturity, the capsule splits open to release the brown, angular seeds.

The seeds lie dormant until the fall rains prompt germination, followed by the emergence of the seedling, which looks like a tiny blade of grass. Each year this single leaf enlarges as the plant pulls its bulb downward. Three or more years may pass before a

second leaf is produced, with the first flowers appearing the following year. At this time, the bulb has migrated to a depth of 10 to 15 cm below the soil surface.

### Taxonomic History of *Erythronium*

Most eastern American species of *Erythronium* were described during the 1800s. The first known western American species, *Erythronium revolutum*, was collected in 1793 by Archibald Menzies “on the west coast of North America,” likely in the vicinity of Vancouver Island (Applegate 1935). It was subsequently described and published in 1809 by James Edward Smith in England. During the 1800s, the typical procedure was to send collections of botanical material to prominent herbaria where they were analyzed and described; seldom did the collectors themselves describe and publish new species.

In many cases, the early descriptions were made from poor specimens, which led to confusing and overlapping identifications. Pressed specimens of *Erythronium* fade rather quickly (Allen 2002), so valuable information was often lost, especially when field notes were incomplete. Rarely, if ever, was fresh material used as the basis for the botanist’s determination, and for the most part, they never saw the subject plant in its natural setting. Elmer Applegate (1935) lamented these facts in his monograph and felt strongly that it was imperative to see the plants in their native habitat in order to correctly describe them. He commented that for his work, “all descriptions were drawn in the field from the living plants.”

One of the species that grows in Jackson County (*E. grandiflorum*)



*Erythronium* seed capsule nearing maturity. Photo by Bob Vos.



The presence of auricles or saccate appendages are an important identifying feature. Photo by Bob Vos.

was collected by the Lewis and Clark Expedition and described in 1814. Many of the specimens collected in the West were sent to Asa Gray, the “Father of American Botany,” who established the Gray Herbarium at Harvard University. Gray was the pre-eminent American botanist of the time and his work was renowned throughout the botanical world. Gray’s assistant, Sereno Watson, published a treatment in 1891 (Revision of the American species of *Erythronium*) that included two Jackson County species (*E. citrinum* and *E. hendersonii*) collected by Northwest botanists Thomas J. Howell and Louis F. Henderson. No in-depth treatment of all western North American species appeared until many years later, when Elmer Applegate’s monograph was published in 1935. His monograph, compiled over a twelve-year period, describes two more of the Jackson County species (*E. oregonum* and *E. klamathense*).

Currently, Dr. Brian Mathew of the Royal Botanic Garden in Kew, England, works extensively with the genus and has produced a comprehensive worldwide summary. In the Northwest, Dr. Geraldine A. Allen, University of Victoria in British Columbia, has written numerous articles and published several new species. Here in Oregon, Dr. Kenton L. Chambers recently wrote the *Erythronium* treatment for the Oregon Flora Project vascular plant checklist.

### ***Erythronium* Species in Jackson County**

Following is a description of *Erythronium* species occurring in Jackson County in chronological order according to the date they were first described in botanical literature. In addition to physical descriptions, habitat, and distribution, information on the lives of their associated botanists, who often pursued their chosen fields despite personal sacrifice and small financial gain, is included to provide insight into the plant’s history.

#### ***Erythronium grandiflorum* – Glacier Lily**

Frederick Pursh, *Fl. Amer. Sept.*, 1:231, 1814. Holotype in Philadelphia Academy of Sciences, Philadelphia, PA, collected “on the Kooskoosky,” Clearwater River near Kamiah, Lewis County, Idaho. June 5, 1806, by Meriwether Lewis.

True to its name, glacier lily grows near the snow line in Jackson County, and blooms just as the winter’s accumulation is melting. Its synonyms include *E. giganteum*, *E. leptopetalum*, *E. nuttallianum*, *E. obtusatum*, *E. pallidum*, *E. parviflorum*, *E. idahoense* and *E. utahense*. Several early specimens were misidentified and erroneously attributed to this species. Through the years, many subspecies and varieties have been described, but current convention is to acknowledge only two: *E. grandiflorum* subsp. *candidum* and *E. grandiflorum* subsp. *grandiflorum* (Allen 2002). Most of the previous subspecies and varieties were based on variations in anther color. However, current thinking is that differences in anther color are not enough to warrant taxonomic recognition. Jackson County plants having white anthers were classified as *Erythronium grandiflorum* var. *pallidum*.

*Erythronium grandiflorum* is the most widely distributed of the western North American species and occurs in British Columbia, Alberta, Colorado, Idaho, Montana, Oregon, California, Utah, Washington, New Mexico, and Wyoming, and is the only *Erythronium* found in the central Rockies. It can often be found

growing in great numbers, especially in subalpine meadows, where its masses of flowers put on a magnificent display. Typical habitats are open woodlands and meadows, with cold (often snowy) winters, and hot dry summers. Flowering from April to July depending on elevation, as its range extends from lowlands to subalpine regions.

Its solid green leaves may be wavy-margined or not, and the 5 to 30 cm stalk bears 1 to 5 flowers. At higher elevations, plants are notably smaller. Flowers are bright yellow with a narrow, paler zone at the base. The inner tepals have auricles and the stigma may be unlobed or with slender recurved lobes.

This was the second *Erythronium* species to be discovered in the West, and its rich and sometimes convoluted history features many prominent men of the time. *Erythronium grandiflorum* was first discovered by Meriwether Lewis in 1806 on his return trip from the Pacific coast during the Lewis and Clark Expedition. He collected it twice along the Kooskooskie (Clearwater) River in what is now the state of Idaho, on May 6 and on June 5 (Applegate 1935). The second collection, at “Camp Chopunnish,” where the expedition spent nearly a month waiting for the snow to melt enough to allow them to continue their journey east across the Bitterroot Mountains, is considered the type locality, although both specimens were probably consulted when Frederick Pursh wrote the description. On June 16, 1806, Meriwether Lewis wrote in his journal “the dog-tooth violet is just in blume” and noted that he had seen it in great abundance in the area (Reveal 2000).

When the expedition returned to the East in 1806, Meriwether Lewis delivered his plant collections to President Thomas Jefferson, who wanted a natural history book published about the discoveries. Jefferson turned to his friend and fellow American Philosophical Society member, Dr. Benjamin Smith Barton, to undertake the project. Barton’s qualifications included publication of the first American botany textbook and a general knowledge of sciences. Also, in 1803 Jefferson had sent his private secretary, Meriwether Lewis, to Barton for instruction in botany. Given these ties, Jefferson assumed that Barton would prepare the natural history manuscript, and he handed the collections, including abundant notes, over to him. However, Barton did virtually nothing with the material and by 1807 Lewis began to look for someone else to take over the task. Barton’s employee, Frederick Pursh, was recommended. Born in Saxony in 1774, Frederick Pursh had little formal botanical education but his love of plants was strong (Reveal 2000). After immigrating to the United States in 1799, he worked as a gardener for several prominent men and had access to their often extensive botanical libraries. In 1805, he went to work for Benjamin Barton as a part time curator and collector. Barton had visions of creating a huge herbarium of American plants and sent Pursh on several collecting trips to gather specimens.

In mid-April of 1807, Meriwether Lewis and Frederick Pursh met to discuss preparation of a catalogue of the expedition’s plants. Pursh received \$60 to begin work and Lewis gave him “a small but highly interesting collection of dried plants” (Reveal 2000). The collection included 150 specimens, most of which Pursh noted, “were new or little known.” He did a series of drawings and descriptions and by the end of May 1808 had completed the initial work. Relations between Pursh and Barton became strained, and in 1809 Pursh left Philadelphia and went to New York, taking





Nodding blossoms of the yellow-flowered *Erythronium grandiflorum*. Photo by Bob Vos.

with him a portion of the Lewis and Clark plant collection, most of his drawings and all of his notes. When Lewis died in 1809, William Clark became worried about the location of the plants collected from the expedition. He managed to recover a portion of the specimens (including *Erythronium grandiflorum*) which were eventually returned to the American Philosophical Society.

In 1811, Pursh moved to London, once again taking the botanical material with him. In London, he stayed at the home of Aylmer Lambert and went to work preparing his new flora of North America that was to include the Lewis and Clark plants. Unfortunately, his personal habits interfered with the completion of his work. Pursh was described as “drunk morning, noon and night,” by a London contemporary, and Lambert went as far as locking him in his attic room in order to get Pursh to finish his flora (Reveal 2000). Finally, in December of 1813, his *Flora Americae Septentrionalis* was published and included the description for *E. grandiflorum*: a long journey for a little plant found seven years before in the wilds of Idaho. Pursh’s flora of

3,076 species was the first to include plants from the Pacific Northwest, 124 of which were species from the Lewis and Clark Expedition. Although Pursh credited other botanists for various descriptions, he was notorious for stealing and publishing the discoveries of others as his own. He describes two *Erythronium* species in his *Flora* (pp. 230-231). The first is *E. lanceolatum*, now known as *E. americanum*. He described *E. grandiflorum* as “flowers double the size of the preceding, and of a pale yellow colour.” Pursh (1814) probably chose the epithet *grandiflorum* (large flowered) because the species has distinctly larger flowers than the other *Erythronium* he described. However, compared to other western species, its flowers are not particularly large. The book was a modest success, but Pursh’s fortunes went downhill rather quickly afterwards. He eventually went to Canada where he did some minor collecting; but, still drinking heavily, he died destitute in Montreal in 1820.

A footnote to this story is Elmer Applegate’s mention in his monograph (1935) that the collections from the Lewis and Clark expedition that Clark recovered, including *Erythronium grandiflorum*, were finally deposited with the Philadelphia Academy of Natural Science, where they were “lost” for about 75 years. Eventually, the specimens were recovered from an old closet, but by then insects had done so much damage the specimens had limited use for botanical research.

Elmer Applegate traveled to the type location in Idaho while researching his monograph, seeking to determine anther color of Lewis’s 1806 type specimen. After much searching, Applegate found only red anthers in the type locality, so deduced that anthers of the type were also red. Applegate recognized three varieties based on anther color and acknowledged Harold St. John’s 1931 description of the variety *pallidum*. Applegate gives a detailed

list of specimens he collected of the white-anthered form, which includes those from Jackson County.

*Erythronium grandiflorum* is the only lamb’s tongue in southwestern Oregon with plain green leaves and yellow flowers. Look for it near Mt. Ashland and along the Siskiyou Crest just as the snow pack is melting. Its bright yellow blossoms set against the white snow are a spectacular sight.

#### ***Erythronium hendersonii* – Henderson’s Fawn Lily**

Sereno Watson, *Proc. Amer. Acad.*, 22:479, 1887. Types in the Gray Herbarium, Harvard University, Cambridge, MA. Collected near Ashland, Jackson County, Oregon, April 1887, by Louis Henderson. Cotype collected Grants Pass, Josephine County, Oregon, April 1887, by Thomas Howell.

Henderson’s Fawn Lily grows only in Josephine and Jackson counties, Oregon, and in Siskiyou County, California. Despite this limited distribution, in Jackson County it is the most common species of *Erythronium*. This abundance is partly explained by its

ability to grow in a range of habitats from near the valley floor (450 m) in dry woodlands or oak scrub to forest openings at 1500 m. An early spring bloomer, its flowers appear from March through April, and into May at higher elevations.

The leaves of *E. hendersonii* are mottled with irregular streaks of brown or white, a pattern that varies substantially from plant to plant. They taper gradually to the base and the margins are entire to wavy. The reddish to purplish scapes typically have 1 to 4 flowers, but up to 11 blossoms have been noted on especially robust plants (Watson and Woodward 1974). Its flower color makes this species distinctive. The darker tipped tepals are lilac-lavender with a dark purple zone at the base. The purple center of the flower is surrounded by a tinge of pale yellow or white. Auricles are present on the inner tepals and the perianth is strongly recurved. The slender, linear filaments are violet-purple while the anthers are pale brown to purple. The style is violet and the stigma is unlobed or shortly three-lobed.



*Erythronium hendersonii* blooming in mid-March on the Vos's property near Talent where they grow under a canopy of *Quercus garryana*. Photo by Bob Vos.

*Erythronium hendersonii* was named for Louis F. Henderson, who has been called "The Grand Old Man of Northwest Botany" in tribute to his long and accomplished botanical career (Love 2001). Born in Roxbury, Massachusetts, in 1853, Henderson settled in Oregon in 1875. (For a detailed account of his life, refer to NPSO Occasional Paper No. 2 (Love 2001).) He was an avid collector and traveled extensively in search of new plants. From 1877 to 1889 he was a teacher, then principal, at Portland High School and although maintaining a full time job, he still found time for his botanical work. During the spring collecting season, Henderson would rush home from school on Friday, change clothes, then jump a train to his chosen destination, often traveling through the night. After collecting all day Saturday he would then board the night train back home on Sunday, probably exhausted, but with a plant press full of botanical treasures. He noted, "Every few weeks I would find some new plants, which would repay me for all my labors. Among these were ... the beautiful vari-colored lamb's tongue," (*Erythronium hendersonii*) (Love 2001). It was on April 18, 1887, that he found the then-unnamed *Erythronium* on "moist wooded slopes" near Ashland.

Henderson sent unknown plant specimens to Harvard where Asa Gray and Sereno Watson wrote descriptions for the new species. Sereno Watson was born in 1826 in Connecticut and graduated from Yale in 1847. He had a variety of occupations and, although lacking formal botanical training, he wrote the botanical report for The King Expedition (1867-1871) that did a geological survey of the 40<sup>th</sup> parallel (Gray Herbarium 2002). His work caught the eye of Asa Gray who hired Watson as the curator of the Gray Herbarium, a post that lasted from 1873 until his death in 1892. Watson first described *E. hendersonii* in the *Proceedings of the American Academy of Arts and Sciences* in 1887, naming the new species in honor of its collector. An isosyntype exists at OSU. Also in April 1887, Thomas Howell sent Watson a specimen of the same species from Grants Pass, Josephine County. This specimen is listed as a cotype. Although Howell and Henderson had collected together in the past, there is no evidence that they were collecting together at this time. Watson (1891) wrote in his revision of the genus *Erythronium* that he had been presented with opportunities to study the various forms of *Erythronium* and was "proposing the revisions with some hesitation." His hesitancy acknowledged his lack of firsthand knowledge of the plants in their natural habitat and to his role as only a compiler of information from field botanists, including Howell and Henderson. Watson was said to be a shy person, known for his careful attention to detail.

This colorful lamb's tongue growing near Applegate's boyhood home at Ashland is credited with inspiring his interest in plants, and in *Erythronium* in particular. In his monograph Applegate (1935) wrote, "It is a matter of satisfaction to note that the species here discussed fittingly bears the

name of my friend Professor L.F. Henderson.” Applegate and Henderson became acquainted when Henderson was curator at the University of Oregon in his later years, and they collected together at least once (R. Love, pers. comm.).

Springtime in southwestern Oregon finds *Erythronium hendersonii* with its vivid lavender flowers making a wonderful display blooming alongside the bright magenta of *Dodecatheon hendersonii*, another namesake of L.F. Henderson.

### ***Erythronium citrinum* – Lemon-Colored Fawn Lily**

Sereno Watson, *Proc. Amer. Acad.* 22: 480, 1887. Type in the Gray Herbarium, Harvard University, Cambridge, MA. Collected in Deer Creek Mts., Josephine County, Oregon, by Thomas Howell.

*Erythronium citrinum* occurs only in limited areas in Josephine and Jackson counties, Oregon, and in Del Norte and Siskiyou counties, California. It is fairly common in the Illinois Valley, where it sometimes forms large patches. Often growing on serpentine, it can be found in chaparral and open oak and pine forests at elevations from 100 to 1300 m. It flowers in early spring, March through May.

*Erythronium citrinum*'s inner tepals typically have auricles. Similar plants lacking auricles were described as *E. howellii* by Watson in 1887, and many sources list it as a separate species. However, *The Jepson Manual* and the new *Flora of North America* submerge *E. howellii* in *E. citrinum* stating that it does not differ from the typical *E. citrinum* in any other characteristic other than the lack of auricles (Allen 2002). Howell's fawn lily is restricted to Josephine County. *Erythronium citrinum* var. *roderickii* Shevock & G.A. Allen, which has purple anthers, grows in the Scott River drainage in Trinity County, California, and may be the result of introgression with *E. hendersonii* (Allen 2002).

The lanceolate to narrowly ovate leaves are mottled with irregular streaks of brown or white. Scapes are 10 to 25 cm tall, sometimes branching above the leaves, and often bearing several flowers. Tepals are white to creamy-white with a lemon-yellow base marked by an irregularly shaped zone of greenish-yellow overlaid with vertical bands of light orange. The strongly recurved tips often turn pinkish with age, making for a striking color combination. Auricles on the tepals may be moderately well developed or not. The slender filaments are linear, white or pinkish, while the anthers may be white, cream, pink, reddish, or brownish red. The white or pink style is straight and the stigma is unlobed or with lobes shorter than 1 mm.

Thomas Jefferson Howell was born in Missouri in 1842. His family came west by wagon train in 1850 and homesteaded on Sauvie Island west of Portland (Ornduff and Kruckeberg, unpublished). Although his father was a doctor, young Howell received little schooling and was primarily self-taught. He was always interested in plants and

despite his educational obstacles, took it upon himself to learn the names of all the flowers near his home. As his interest in botany grew, he collected plants throughout the Northwest, which he pressed and sold. To market these plants, he published catalogs that listed the species. Howell recognized the absence of a comprehensive flora covering the Northwest and at age 40 began compiling his notes into the region's first flora, *Flora of Northwest America*. The first fascicle, published in 1897, consisted of 112 pages and cost 50 cents. His lack of formal education was revealed in his unorthodox spelling and, because the printers were unable to read his copy, he was forced to set the type himself. His botanical endeavors provided scant income, and after marrying in 1892 and having two sons, he was forced to supplement his income by taking a series of other jobs. He published the seventh and final fascicle of his flora on August 10, 1903. The flora's 792 pages described 3,150 species. Howell (1903) described it as “containing brief descriptions of all the known indigenous and naturalized



The yellow-orange centers of *Erythronium citrinum* are striking against the white tepals. Photo by Bob Vos.

### Key to Jackson County Species of *Erythronium*

- 1. Leaves uniformly green, not mottled
  - 2. Perianth white with yellow base ..... *E. klamathense*
  - 2. Perianth yellow ..... *E. grandiflorum*
- 1. Leaves irregularly mottled with brown or white
  - 2. Perianth violet to pink with dark purple base ..... *E. hendersonii*
  - 2. Perianth white with yellow base
    - 3. Filaments flattened at base, wider than 2 mm ..... *E. oregonum*
    - 3. Filaments linear, less than 0.8 mm wide ..... *E. citrinum*

plants growing without cultivation north of California, West of Utah and South of British Columbia.” Howell (1903) raised nearly all published varieties to specific rank because he believed “if a plant is sufficiently distinct from others to deserve a name it is better to have it described as a distinct species.” From a botanical viewpoint, his work was remarkable in its scope and attention to detail. Unfortunately, the book was a financial failure, and Howell struggled to survive on his meager income.

Thomas Howell and Louis F. Henderson were good friends, and Henderson visited Howell regularly on Sauvie Island where he helped him with his Latin (R. Love, pers. comm.). In 1882, the two embarked on a collecting trip to the Oregon Coast near Tillamook and then on to Mount Adams. Since Henderson knew of Howell’s financial problems and had steady employment himself, he allowed Howell to take credit for new species they discovered while collecting together. Henderson commented in his memoir, “I always allowed him (Howell) to send off what collections went East for naming, as anything new, or even rare, brought the most money in the plant market” (Love 2001).

On April 24, 1887, Howell collected specimens of an unknown *Erythronium* on a hillside near Deer Creek in Josephine County and sent them to the Gray Herbarium to be identified. Watson described the new species, *E. citrinum*, as well as two other southwestern Oregon fawn lilies, *E. hendersonii* and *E. howellii*, in an 1887 article in the *Proceedings of the American Academy of Arts and Sciences*. He describes *E. citrinum* as “resembling the last (*E. hendersonii*): flowers rather smaller, the petals lemon-color, with a broad orange-colored spot near the base and the tips becoming tinged with pink.” As *citrinum* means “lemon yellow” it seemed a fitting epithet. However, as Elmer Applegate (1930) noted, the flowers are in fact white with a yellow center. He adds that *E. citrinum* was originally described by Watson from herbarium specimens and that “a lack of field knowledge has been a fruitful source of confusion in the identification and description of various species of *Erythronium*.”

*Erythronium citrinum* only occurs in a few places in northwestern Jackson County and is much more common in Josephine County, especially in serpentine areas. Its intricate color combination with white, yellow-green, and orange layering on the tepals is unique. Along the Illinois River near Star Flat, the lemon-colored fawn lilies grow in large patches and on warm days emit a noticeable, almost spicy fragrance.

### *Erythronium klamathense* – Klamath Fawn Lily

Elmer Applegate, *Contrib. Dudley Herb.* 1:151, 1930. Type in the Dudley Herbarium, currently housed at the California Academy of Sciences, San Francisco, California. No. 199386, collected among lodgepole pines, at the south end of Four Mile Lake, Klamath County, Oregon, June 2, 1926, by Elmer Ivan Applegate.

The Klamath fawn lily occurs in limited areas of Jackson, Klamath, and Douglas counties, Oregon, and Siskiyou County, California. It grows in montane meadows and openings in coniferous forests from 1200 to 1900 m. Populations are rare below 1500 m and then only under favorable conditions of shade and slope (Applegate 1935). It flowers just as the snow melts in late spring to summer (April to June).

Its leaves are a solid yellow-green and may be folded along the midvein with margins that are entire to wavy. Usually it bears solitary flowers but can have two or three, on rather long pedicels of unequal length. It is a relatively small plant, reaching only 20 cm. The upper half or two-thirds of each tepal is milk-white with the lower zone pure yellow. The flowers may become pinkish as they age. Auricles are present, anthers are yellow, and the stigma is unlobed.

Elmer Applegate’s interest in the genus *Erythronium* began when he was a young boy (see his biography on page one of this journal) and culminated in his monograph in 1935. His investigations for the monograph began in the Siskiyou and southern Oregon Cascade Mountains in 1921 and concluded in the Rocky Mountains in 1933. He worked at Stanford University and deposited his collections at the Dudley Herbarium there. Currently, the Dudley Herbarium specimens are housed at the California Academy of Sciences at Golden Gate Park, San Francisco.

Applegate’s monograph (1935) reveals that he collected many specimens of *Erythronium klamathense* through the years. From 1895 to 1929, he found examples in Jackson County from Pilot Rock in the southern part of the county, east to the Klamath River canyon, and north along the Cascade Mountains to the Rogue-Umpqua divide. He collected the type specimen on June 2, 1926, at the south end of Four Mile Lake, Klamath County. Its description was included in the journal *Contributions from the Dudley Herbarium of Stanford University* in 1930. He named it *klamathense* in reference to the Klamath region where it grows. In describing *E. klamathense*, he took care to distinguish it from its closest ally, *E. purpurascens*, whose northern-most range is in the Mt. Lassen area of California.



*Erythronium klamathense* nestled among the rocks on Grizzly Peak east of Ashland. Note the wavy leaves that are folded along the mid-vein. Photo by Bob Vos.

*Erythronium klamathense* is a delightful plant sometimes seen growing abundantly in crevices on rocky outcrops such as Grizzly Peak near Ashland, its white flowers showing brightly against the dark background of rocks. Applegate (1935) reported that he found the species easy to cultivate, growing it in his garden in Klamath Falls, where the plants “flowered earlier than the other endemic species of southern Oregon.”

#### ***Erythronium oregonum* – Oregon Fawn Lily**

Elmer Applegate, *Madroño* 3:99, 1935. Type in the Dudley Herbarium, currently housed at the California Academy of Sciences, San Francisco, California. Collected in the fir woods near and north of Oregon City, Clackamas County, Oregon, April 23, 1932, by Elmer Ivan Applegate.

The history of *Erythronium oregonum* is clouded with misidentifications, and, as Applegate (1935) noted, “for nearly a century this familiar plant has been known erroneously as *Erythronium giganteum* Lindl. or as *Erythronium grandiflorum* var. *albiflorum*.” It was also at times confused with *E. revolutum*, a species that grows near the coast. Oregon fawn lily can be found west of the Cascade mountains from British Columbia south through Washington, Oregon, and into northern California. Habitats include open coniferous forest, rock outcrops, oak woodland, and meadows from sea level to 500 m with occasional occurrences at higher elevations. It flowers from March through May.

The wavy-margined leaves vary from 12 to 25 cm, and have green, white, and purplish-brown mottling which is at times very pronounced. The pattern is sometimes made up of three rows of

dark-brown spots on each margin, with a large central dark area, which is then separated by light green veining. Reddish scapes bearing 1 to 3 flowers are 15 to 40 cm tall, making it one of the largest among *Erythronium* species. Some variation in color exists across its range, but typically flowers are white to cream with yellow at the base, sometimes with maroon zigzag markings at the throat. Flattened filaments, measuring 2 to 3 mm wide, are an important identifying characteristic. The stigma has thin recurved lobes; anther color ranges from cream to yellow.

Botanists who wrote the original descriptions were handicapped by working from dried plant materials that did not enable them to note flower color or accurately measure distinguishing features. Applegate (1935) managed to get a photograph, as well as detailed drawings and measurements, of the type specimen of *Erythronium giganteum* from the Lindley Herbarium in Cambridge, England. He devoted several pages of his monograph to describing the problems with the original determinations of this plant, eventually coming to the conclusion that the plant had never been accurately and truly described. He then described and named the new species whose type was collected near Oregon City where it grew in great abundance. The specific name, *oregonum*, is “dedicated to ‘Old Oregon’ which included all of the territory within which the species is found” (Applegate 1935). It’s interesting to note that although this is a fairly common plant throughout a wide area, it wasn’t correctly named until 1935.

Applegate (1935) described *E. oregonum* as abundant in the “open wooded hills of Douglas and northern Josephine and



Close-up of *Erythronium oregonum* showing its distinctive flattened filaments and strongly three-lobed stigma. Photo by Bob Vos.

## *Erythronium* Hybrids

Hybrids occur quite readily where *Erythronium* ranges overlap, as there appear to be few breeding barriers among western North America species. According to Mathew (1992), “lack of hybridization in the wild is likely to be as a result of geographical separation rather than for genetical reason.” In general, mottled leaf species (Applegate’s *Pardalinae*) hybridize quite readily, with the resulting offspring being fairly fertile, while other hybrid combinations appear to be sterile or have a low fertility rate (Mathew 1992). In Jackson County, several hybrids occur with some producing interesting combinations of their parental characteristics. Combinations include the following: *E. hendersonii* x *E. klamathense*, *E. citrinum* x *E. hendersonii*, *E. hendersonii* x *E. oregonum* and *E. citrinum* x *E. oregonum*. *Erythronium oregonum* and *E. hendersonii* appear to hybridize easily with varied and attractive results. On Slate Creek in eastern Josephine County, *E. oregonum*, *E. citrinum*, and *E. hendersonii* are all present and appear to combine in many interesting forms. There are no known hybrids with *E. grandiflorum*, but Applegate (1935) speculated that they may occur on the Umpqua-Rogue Divide where *E. grandiflorum* and *E. klamathense* grow together and flower at the same time.

In cultivation, no hybrids have been reported between European/Asiatic and North American species, or between the eastern and western North American species, even when grown in gardens over an extended period of time (Mathew 1992). Several commercial hybrids have been made using *E. oregonum* and either *E. californicum* or *E. tuolumnense* as parents, and these are available through specialty plant nurseries.

## Food and Medicinal Uses

*Erythronium* species have been used by native North American people as both a source of food as well as for medicinal purposes (Tilford 1977). The bulbs of all species are edible and are said to be crunchy and have a mild flavor. They were eaten raw, boiled,

Jackson counties.” In Jackson County, it is known from locations near Prospect, Evans Creek, Sardine Creek near Gold Hill, and the lower Applegate River area. Applegate also described a subspecies, *leucandrum*, which differs only in having white instead of golden-yellow anthers. Anther color seems to vary across the populations, but in the southern range of the species pale anthers are fairly constant.

A striking plant when encountered growing in shady spots under the forest canopy, it sometimes seems to spring from a bed of moss. When finding a particularly accommodating site, it often grows in large patches where its boldly patterned leaves contrast with its nodding flowers. An up-close inspection of the blossoms reveals beautiful maroon colored veining and markings, making it one of the most beautiful springtime flowers. Its distinctive flower is currently used as the logo for the Oregon Flora Project.



*Erythronium oregonum* growing in a shady place under the forest canopy. Photo by Bob Vos.

or roasted, and it is reported that early settlers stored them in root cellars to be used as winter food. The bulbs of *Erythronium grandiflorum* were a staple food for Native Americans as this species often grows in large masses, allowing the bulbs to be collected in great numbers. The bulbs were also used as a trading item. This species also grows in Montana where they are said to be a favorite of grizzly bears. The very young leaves can be boiled for 10-15 minutes and eaten. Although the fresh leaves are edible, they may act as a laxative if eaten in large quantities.

Native Americans used a tea made from the leaves for fevers and infections, while the women ate the raw leaves to prevent conception. The leaves and roots have been used in infusions for scrofula and other skin problems as well as in poultices for wounds and tumors (Grieve 2003). Leaf poultices have also been used to draw out splinters and reduce swelling while the fresh root simmered in milk is said to help dropsy, hiccups, and vomiting. Modern tests of water extracts have shown the infusion to be active against gram-positive and gram-negative bacteria confirming its potential for fighting infections (Medicinal Herbs online: [www.egregore.com/herbs/erythronium](http://www.egregore.com/herbs/erythronium)). Although the historical uses of *Erythronium* are interesting, consumption of any kind is not recommended due to conservation issues.

### Cultivation

*Erythronium* species are attractive additions to a woodland garden as well as suitable for growing in shady flowerbeds, rock gardens and containers. However, their cultivation requires patience and knowledge of their specific growing requirements. *Erythronium* bulbs are brittle and must be handled carefully, and should never be allowed to dry out completely, characteristics that make them difficult and rather expensive to market commercially. However, several nurseries offer the bulbs, which are usually shipped in the fall when they are dormant. Paul Christian's Rare Plants in Wrexham, England and Fraser's Thimble Farms on Salt Spring Island, British Columbia both offer a wide variety of *Erythronium* bulbs and their catalogs are colorful and informative. Several rock gardening books offer tips on *Erythronium* cultivation.

The mottled leaf, lower elevation species are generally easier to grow in the typical garden and usually do well in partial shade in humus-rich soil. *Erythronium hendersonii* is particularly adaptable and multiplies readily, often forming large clumps. *Erythronium grandiflorum* and *E. klamathense* are more demanding as they naturally grow at higher elevations. All species require good drainage with adequate amounts of moisture during the growing season. Plant growth is closely related to bulb depth, and it may take a year or two after transplanting for plants to settle in and bloom. Plants do not respond well to being moved, and should only be divided when absolutely necessary.

Growing *Erythronium* from seed requires patience as it often takes several years to obtain flowers. Germination rate is improved by planting the seed as soon as possible after it is harvested. Do not gather bulbs from the wild for transplanting to the garden because this procedure is seldom successful. It is much better to buy bulbs from a reputable nursery or to just enjoy the plants in their native habitat.



A beautiful light pink and yellow hybrid of *Erythronium hendersonii* x *E. oregonum*, revealing characteristics of both parents. Photo by Bob Vos.

### Conclusion

An artistic combination of lines, shapes and colors make *Erythronium* one of the most memorable and loved members of the plant kingdom. If, in the spring of the year, you are lucky enough to come upon the lovely lamb's tongue while wandering the hills and valleys of southwestern Oregon, pause to examine its delicate

flowers and distinctive leaves. Also, take a moment to reflect on the botanists whose persistence and dedication help us to understand and appreciate these endearing plants even more.

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Belinda L. Vos is a Jackson County native with a long-time interest in *Erythronium* dating back to her childhood days spent exploring the woods and mountains of southern Oregon. She is the Region 11 Coordinator for the Oregon Atlas Project and is also active in the Siskiyou Chapter of the NPSO. She and her husband, Bob, live on five acres in the foothills of the Rogue Valley where they enjoy many native plants including a patch of *Erythronium hendersonii* that numbers in the thousands.

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## The Hidden Half of Oregon White Oaks: Mycorrhizal Fungi and Roots

Lori Valentine, Aaron Hart, Carolyn Petersen, Heather Tugaw, Harold Berninghausen, and Darlene Southworth  
Department of Biology, Southern Oregon University, Ashland, OR 97520



Fig. 1. Sampling soils for mycorrhizae under Oregon white oak (*Quercus garryana*) at Whetstone Savanna. Photo by Harold Berninghausen.

Savannas of Oregon white oak (*Quercus garryana* Hook., also called Garry oak), form a familiar landscape in western Oregon, lining the I-5 corridor from the Willamette Valley south into California. Oregon white oak is easily recognized in both of its growth forms: the widely spreading limbs of savanna oaks (Fig. 1) and the narrow, vase-shaped oaks of denser woodlands. Cloaked in mosses and lichens, often with mistletoe hanging from their branches, our native oaks have long fascinated those interested in natural history. Acorns have formed an important energy source for a wide array of foragers (e.g., Native Americans, gray squirrels and acorn woodpeckers). Because it is the overstory species, Oregon white oak modifies the habitat for native shrubs, grasses and forbs. Although many oak associates

are easily observed, other interdependent organisms such as mycorrhizal fungi on oak roots are hidden from view. Mycorrhizae are *not* related to the sudden oak death organism, *Phytophthora*, but are friendly fungi that are essential to tree health. In fact, without mycorrhizal fungi, Oregon white oaks probably would not be present in our landscape.

### What are Mycorrhizae?

“Mycorrhizae” translates literally as “fungus-roots.” They are roots composed of plant cells and fungal tissue growing together. Mycorrhizae on oaks are short, branched, and often fuzzy roots (Fig. 2). The most common type of mycorrhizae on oaks is

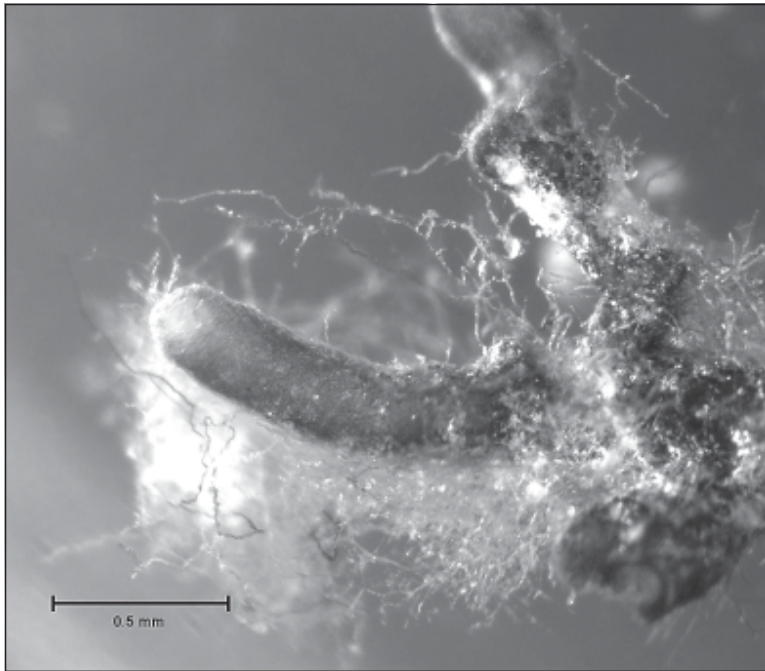


Fig. 2. Mycorrhiza with hyphae. Photo by Lori Valentine.

ectomycorrhizal, characterized by a *mantle* and *Hartig net* (Fig. 3). The *mantle* is a layer of fungal tissue that covers the surface of the root tip. It may be smooth or fuzzy with long, thin cells called hyphae that extend out into the soil. The *Hartig net* is a meshwork of fungal hyphae that grow between the cortical cells of the root. They do not actually penetrate root cells, but grow between them. The interface between the Hartig net cells of the fungus and the cortical cells of the root is the site of nutrient exchange between tree and fungus. Ectomycorrhizal fungi are either Basidiomycetes, the fungus division that includes mushrooms and puffballs, or Ascomycetes, the group that includes cup fungi, morels, truffles, and various molds. Some ectomycorrhizal fungi produce fruiting bodies, but many do not or do so infrequently.

In forest ecosystems, mycorrhizal fungi are critically important; most terrestrial plants and nearly all trees form mycorrhizae. The mycorrhizal relationship is symbiotic, that is, it mutually benefits both the plant and the fungus. The fungi contribute to the health of trees by aiding in uptake of water and minerals, especially nitrogen and phosphorus; by protecting roots from soil pathogens; and by increasing tolerance to drought, high soil temperatures, and soil toxins. Mycorrhizae also maintain soil structure by holding soil particles together. In return, trees provide carbohydrates to the fungi. These fungi do not function as saprophytes living off leaf litter, nor do they cause disease as parasites or pathogens. Because they have such a reliable source of carbon compounds from the host tree for energy, they often form relatively large fruiting bodies.

### Underground “Unknowns”

Although we knew the importance of mycorrhizal fungi to Oregon white oak, we were curious whether they could serve as a communication link between trees. If mycorrhizal fungi on one tree extend through the soil to form

mycorrhizae on another tree, nutrient sharing and possibly other types of communication could occur between adjacent oaks. Also, seedling oaks might be linked to mature trees. Thus, we began a five-year study, in collaboration with colleagues at the University of California, Riverside, and the University of California, Davis, to answer these and related questions. Our initial questions concerned biodiversity:

- How many species of ectomycorrhizae associate with Oregon white oak?
- Which fungal species form ectomycorrhizae on oaks?
- Which species are common?
- Do the fruiting bodies of fungi (Basidiomycetes and Ascomycetes) one sees growing with oaks represent ectomycorrhizae? That is, can mycorrhizae on oak roots be predicted by the fungi that form fruiting bodies above ground?

To approach these questions, we first needed to identify the mycorrhizal fungi and determine whether neighboring oak trees have the same species of mycorrhizae. Putting a name on a mycorrhiza is not as simple as keying out a vascular plant. Although oaks are known to be mycorrhizal (Cairney and Chambers

1999), no catalogue enabling us to identify the mycorrhizae was available. We used molecular methods to compare mycorrhizal fungi with fungal fruiting bodies. This enabled us to identify and quantify the players, i.e., which fungi form mycorrhizae in an oak savanna. With this taxonomic base, we will be able to start researching the functions of mycorrhizae, and perhaps quantify their roles in the ecosystem.

### Study Site

Our primary field site was Whetstone Savanna Preserve, a 58-ha site owned by The Nature Conservancy, located on the western edge of the Agate Desert in Jackson County, Oregon. The Agate Desert, an alluvial fan capped with a shallow layer of clay loam over cemented hardpan, is characterized by a mosaic of mounds

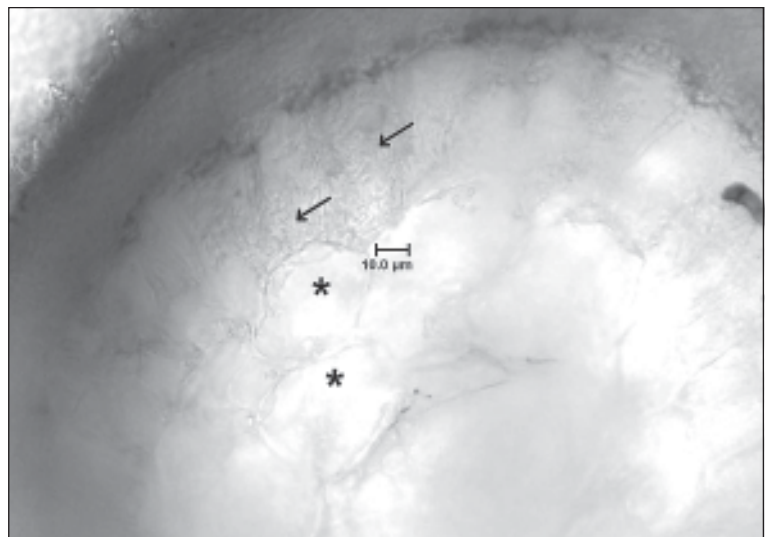


Fig. 3. Cross-section of an oak mycorrhiza with large cortical cells (asterisks) enmeshed by the fungal cells of the Hartig net (arrows). Photo by Lori Valentine.

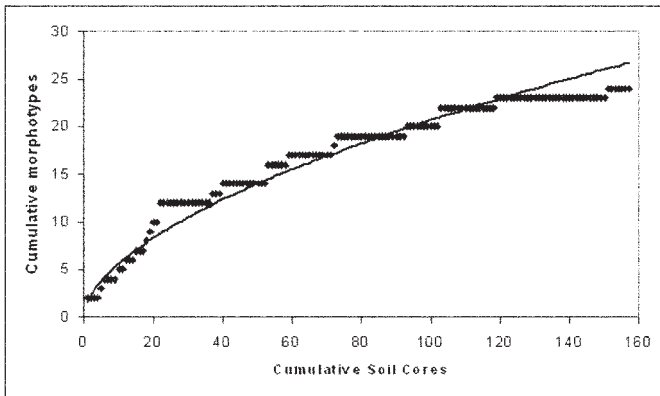


Fig. 4. Number of accumulated morphotypes plotted against the number of soil cores taken in random order. This is similar in concept to a species-area curve.



Fig. 5. A truffle (*Tuber* sp.) from Whetstone Savanna. Bar = 5mm. Photo by Harold Berninghausen.

and vernal pools. Average annual precipitation is 48 cm. At Whetstone Savanna, Oregon white oak grows as scattered individuals as well as clustered in relatively dense stands. Buckbrush (*Ceanothus cuneatus*) grows among the oaks, but not below their canopies. The grassland understory includes perennial native bunchgrasses such as Lemmon's needlegrass (*Achnatherum lemmonii*) and California oatgrass (*Danthonia californica*). Introduced annual grasses such as medusahead (*Taeniatherum caputmedusae*) and *Bromus* species are also abundant. Whetstone Savanna is home to several rare plants including Cook's desert parsley (*Lomatium cookii*), southern Oregon buttercup (*Ranunculus austro-oreganus*), and large-flowered woolly meadowfoam (*Limnanthes floccosa* ssp. *grandiflora*). A full site description and species list are available on the study website: <http://www.sou.edu/biology/biocomplex/Main.htm>.

## Finding Mycorrhizae

To collect mycorrhizal roots, we took soil samples with a soil corer (2.5 cm diameter x 15 cm) around Oregon white oaks at edges of oak stands where tree canopies overlapped grasses, buckbrush or other Oregon white oaks. Samples were collected under the canopy, at the dripline, and beyond the canopy, in lines extending north, south, east, and west from selected trees (8-20 cores per tree). Mineral soil was removed by immersing samples in water over a 1.0-mm sieve. Roots were picked out with forceps and examined under a dissecting microscope.

Initially, we sorted the mycorrhizae by physical characteristics such as color, shape, branching pattern, and cell arrangements (Agerer 1991, 1987-1998; Agerer *et al.* 1996; Goodman *et al.* 2002). This process, called morphotyping, gave us categories of ectomycorrhizae with distinct forms, i.e., morphotypes. Although we were able to classify the mycorrhizae by structural differences, we could not identify the fungal species represented by a particular morphotype.

## Assigning Names to Mycorrhizae

Most fungi are taxonomically described and named based on fruiting bodies (structures such as mushrooms, puffballs, truffles, and cups) rather than by characters of their belowground structures. Because it is not practical to follow fragile hyphae from a mycorrhiza to a fruiting body, and because fruiting bodies may occur only infrequently, we used molecular methods to identify the fungal component of Oregon white oak mycorrhizae.

To do this we needed DNA from both the mycorrhizae and the fruiting bodies. DNA can be extracted from a single mycorrhizal tip or from a tiny piece of mushroom stipe tissue. We ground the tissue with a small electric pestle in CTAB that dissolved DNA. Both oak and fungal DNA were released, but the next step eliminated the oak DNA. We copied a short DNA



Fig. 6. A tan-yellow mycorrhiza with DNA pattern that matches the truffle. Photo by Lori Valentine.

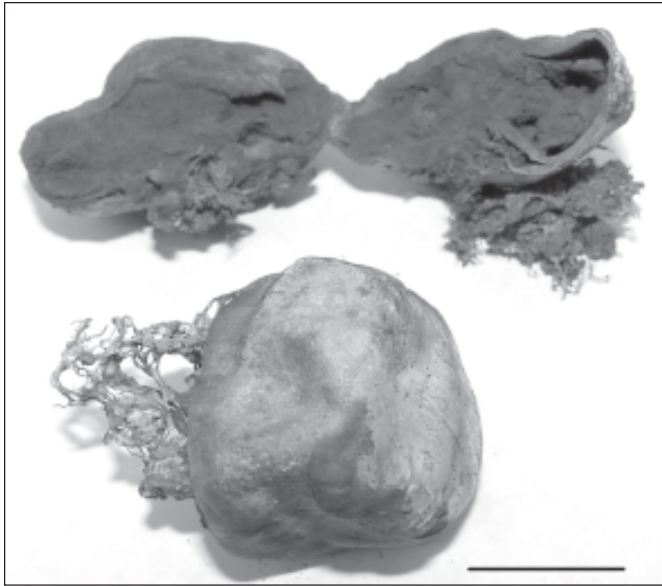


Fig. 7. An earthball (*Scleroderma* sp.). Bar = 10mm.  
Photo by Harold Berninghausen.

sequence, the ITS region, by a procedure called polymerase chain reaction (PCR), using DNA primers that copy sequences unique to Basidiomycetes and Ascomycetes (Gardes and Bruns 1993). Next, we cut the DNA into fragments of various lengths using commercially available enzymes (restriction endonucleases) and separated these DNA fragments by size using gel electrophoresis. We ended up with a gel with several bands of DNA of various lengths. We compared the pattern of DNA fragment lengths from mycorrhizal tips to that of DNA from identified Basidiomycetes and Ascomycetes collected on site.

Thus, we were able to compare DNA bands from mycorrhizae with bands from mushrooms identified by the usual morphological methods (Arora 1979). We also identified the mycorrhizae by sequencing short pieces of their DNA and comparing our sequences with those in a public database (Genbank). Once we have linked each mycorrhizal description to a specific fungus, less DNA work will be needed.

## Results

We found over 40 ectomycorrhizal morphotypes in 160 soil samples (Valentine *et al.* 2002), but only five were relatively common, found in 5% or more of soil cores. Many types were found only once or twice. During initial stages, every soil core contained new morphotypes! Gradually, the number of new ones decreased, so we think we have observed most of the diversity of mycorrhizae at this site (Fig. 4).

We have collected fruiting bodies of over 100 species of fungi, both Basidiomycetes and Ascomycetes. So far we have found nine ectomycorrhizal tips with DNA patterns that match those of identified fungal species. Several mycorrhizal tips match Ascomycete truffles that grow underground in the upper few centimeters of mineral soil (Figs. 5, 6). These truffles are in the genus *Tuber*. These species are as yet unidentified (and possibly unnamed), but they are not the edible truffles of France and Italy, nor the Oregon white truffle (*T. gibbosum*) that is associated with

Douglas-fir (Arora 1979). Most fruiting bodies of *Tuber* species are reported to be edible, but these are quite small (1 cm in diameter). Another fuzzy yellow-white mycorrhiza matches an earthball (*Scleroderma* sp.) that grows in leaf litter (Figs. 7, 8), and a reddish-brown tip matches *Boletus zelleri* (Fig. 9, 10).

Most tips do not match any fruiting bodies that we have collected. We have purposefully collected roots from soil under fruiting bodies, and, although mycorrhizae are present, they usually do not correspond to the fruiting body. This indicates that fruiting bodies often do not develop directly above the mycorrhizae formed by their hyphae.

## Conclusions

So far, we have confirmed that one cannot tell which fungi are associated with oak roots by collecting the fungi fruiting bodies that appear on the surface. Not all mycorrhizal fungi produce fruiting bodies or do so only in favorable years, or at some distance from the mycorrhizae, and some fungi that do have fruiting bodies may produce few or only short-lived mycorrhizae (Horton and Bruns 2001). The molecular approach is a useful way to identify mycorrhizae, especially when DNA sequences can be tied to specific morphotypes in a region. By isolating more than 40 morphotypes we have shown that the below-ground, hidden

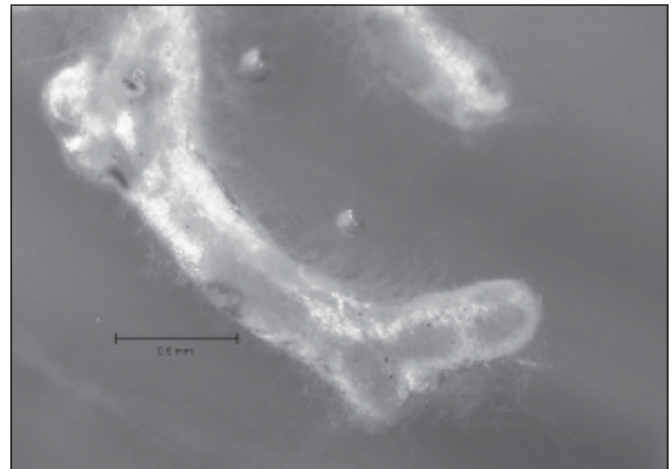


Fig. 8. A fuzzy, yellow-white mycorrhiza with DNA pattern that matches the earthball (*Scleroderma* sp.). Photo by Lori Valentine.

fungal community associated with Oregon white oaks is quite diverse. Many morphotypes were encountered only once or twice. We identified several genera (*Tuber*, *Scleroderma*, and *Boletus*) and have linked DNA sequences of nine isolates with known species.

Next we will work to understand the function of specific mycorrhizal fungi by inoculating oak seedlings in the greenhouse and comparing how various species of ectomycorrhizal fungi differ in nutrient uptake. We will also test whether minerals from one seedling can be transferred to other seedlings via the fungi associated with roots. If this transfer occurs in the greenhouse, communication may be possible between adjacent trees that share mycorrhizal fungi at Whetstone Savanna.



Fig. 9. A mushroom, Zeller's bolete (*Boletus zelleri*). Bar = 5 cm. Photo by Harold Berninghausen.

### Acknowledgements

Special thanks to The Nature Conservancy for access to the study site. This research was funded by Grant DEB-9981337 through Research at Undergraduate Institutions and the Biocomplexity Program at the National Science Foundation. Dr. Dan Luoma reviewed an earlier manuscript and offered valuable suggestions.

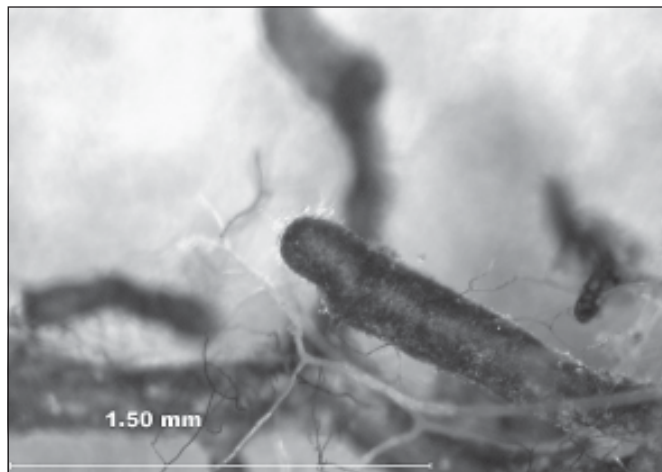
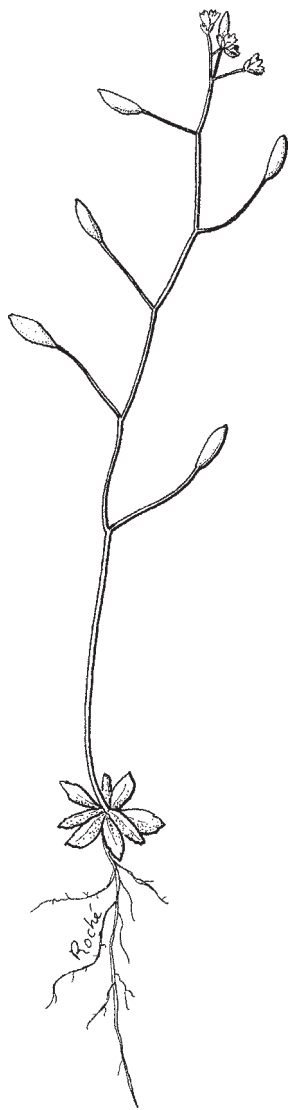


Fig. 10. A reddish-brown mycorrhiza with DNA pattern that matches Zeller's bolete (*B. zelleri*). Photo by Lori Valentine.

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Lori Valentine has a BA in health psychology from the University of California, Davis, and an MS in environmental education from Southern Oregon University. She is employed by BLM working on the new Cascade-Siskiyou National Monument and recently shared the vice-presidency for programs for the Siskiyou Chapter, Native Plant Society of Oregon. Aaron Hart, a junior in biochemistry, Carolyn Petersen, a junior in biology, and Heather Tugaw, a senior in biology and environmental studies, are undergraduates at Southern Oregon University. Harold Berninghausen, laboratory technician at Southern Oregon University, has a BS in biology from University of Oregon and a BS in chemistry from Southern Oregon University. Darlene Southworth is a retired professor of biology from Southern Oregon University where she taught for 22 years. She has a BS and an MS in botany from the University of Michigan and a PhD in botany from the University of California, Berkeley. In retirement she continues her research and served as Conservation Chair for the Siskiyou Chapter of NPSO.



***Draba Verna* Speaks**

They call me *Draba verna*, and I think  
 I've figured out just what that means, although  
 I don't know Greek or Latin. Yes, I think  
 I know. I'm sure they've seen that in full blow  
 My flower's as big and bright as my whole self,  
 Which, sometimes green and sometimes brilliant red,  
 Will thrive and multiply where nothing else  
 Will grow, a silver lining to the lead  
 Of many feet. On stony ground I bring  
 The clouds to earth, like mountain lambs at play;  
 I know the paws of many a secret thing,  
 And lay out galaxies upon the clay.  
 Those names must surely signify that I  
 Am big and bold, as big as the whole sky.

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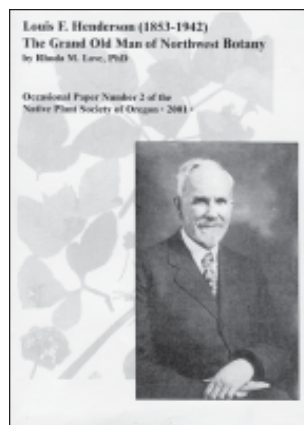
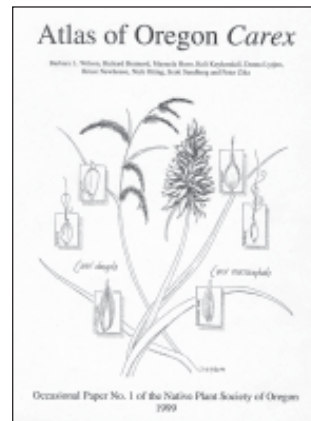
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## FELLOWS AWARDS 2003



### Charlene Holzwarth

Charlene McMahon Holzwarth was born in Beattie, Kansas, in 1927. After earning a BS degree from Kansas State University, she moved west to Oregon. Here she continued her education, earning an Oregon Teaching Certificate. She began a career of teaching elementary age children in Portland which lasted 34 years, mostly as a full-time substitute teacher.

In 1951 Charlene married Milbert Holzwarth, a contracting officer for the US Forest Service in Region 6. The family lived in John Day, Eugene, and Portland. Milbert retired with 30 years of service. He died in 1982. Charlene and Milbert have three children, all of whom live in Oregon. When the children were young, Charlene was an active leader in 4-H, Campfire, and the PTA.

Charlene joined the young Native Plant Society of Oregon in 1963, at a time when the Society was primarily a Portland organization. She soon assumed the duties of Treasurer for the group. From 1979 to 1980, after regional chapters had begun to form, she served as State Treasurer under President Frank Lang.

In 1983 Charlene was urged by Portland Park employees, neighbors, and members of NPSO to help save the John and Lilla Leach property in southeast Portland for the public. Charlene was instrumental in the designation of the Leach Garden as a public park. She was especially effective in working with the adjacent landowners, and was instrumental in the founding of the Leach Garden Friends who have a contract with the City of Portland to manage this garden. Leach Botanical Garden is one of the important native plant gardens in Oregon. It has a library, a small museum, and items from the Leaches' pharmacy and home. Charlene has volunteered at the Leach Botanical Garden for over twenty years. She continues to be a member of the Portland Chapter of the Native Plant Society of Oregon and in 1980 began the trail lists of their observations; the lists were later kept at the Leach Garden.

After Milbert's death, Charlene yielded to a lifetime love of adventure in exotic places by joining the Peace Corps. In her late 50s, Charlene spent two years, from 1984 to 1986, in Sierra Leone, Africa. There she helped train ten village elementary school teachers and acquired funds from the US to repair four school properties in remote villages. Her mode of transportation in Africa was a motorcycle!

In 1995 Charlene, with co-authors Linda Mullens and Golda Kirkpatrick, wrote the charming book, *The Botanist and Her Muleskinner* about Lilla and John Leach and their adventures in southwestern Oregon. The book is a historical account of the botanical explorations of this husband and wife plant collecting team who botanized in the Siskiyou Mountains during the 1920s and 1930s and made the first scientific collection of *Kalmiopsis leachiana*.

Now a septuagenarian, Charlene remains active at the Leach Garden as a gift shop hostess and special project coordinator. She continues her active participation in the Native Plant Society of Oregon.

— Bette Howard and Joyce Peters,  
*Leach Botanical Garden and Portland Chapter, NPSO.*



### Russ Jolley

Russell I. Jolley was born in Texas on December 6, 1922. He obtained a BS in Chemical Engineering from Texas A&M. After graduation, he served in the US Navy in the Pacific Theater during World War II. He studied astronomy at the University of Leiden in Holland where he discovered two variable stars, before realizing that astronomy was not his field. After taking some time to explore Europe, he accepted a position with a chemical company in Idaho. He later earned MS and PhD degrees in biochemistry at Oregon State University.

Russ's initial interest in botany, encouraged by his father during family vacations in Texas and the mountains of the Southwest, intensified when he came to Oregon. Russ spent his professional career working as a research biochemist at Oregon Health Sciences University and taught chemistry courses at the University of Portland. He first published a survey of wild flowers of the Columbia River Gorge in 1980 and donated the profits to the Native Plant Society. Each year he updated the list and organized NPSO members to gather information on flowering seasons, elevations, range, and sites. He retired in 1982 to devote full time to the study of the flora of the Columbia River Gorge and to the preparation and publication of his outstanding regional flora, *Flowers of the Columbia River Gorge*. He also assisted Nancy Russell in her efforts to protect the Gorge and its flora.

Through the years, Russ served as a consultant to the Corps of Engineers, the US Forest Service, the Oregon Department of Transportation (ODOT), and The Nature Conservancy regarding sensitive plants, and delineated areas of special botanical interest worth preserving. Russ was responsible for the revegetation of a five-acre plot along Oregon's Interstate 84 between Hood River and Mosier. His field work incorporated excellent ecological and conservation guidelines, and he has continued to monitor and upgrade the revegetated plot over the many years since the initial plantings. He organized action that led to the removal of cattle from state park lands in the wetlands near Rooster Rock. Russ has volunteered his help and recruited others to build fences in the Gorge to protect sensitive flora. He was responsible for removing cattle from a vernal pond on Dalles Mountain and fencing




Catherine Creek to keep neighboring cattle from the property. He has also been instrumental in arranging work parties to eliminate teasel from Alder Creek, working in cooperation with the High Desert Chapter of NPSO (Bend). The discovery of a rare species of *Rorippa* on two Columbia River islands saved them from being used for deposition of river spoils. He organized a multi-chapter rescue of *Penstemon barrettiae* from a gravel pit east of Hood River and replanting of the seedlings at milepost 68 on I-84 with the cooperation of ODOT.

As a member of the Portland Chapter of the Native Plant Society, Russ chaired the Conservation Committee. During that time he prepared some of the best letters I [Fahey] have ever seen in defense of the conservation positions of NPSO. His correspondence was both tightly reasoned and filled with facts in support of his arguments. His fellow volunteers were urged to build fence in a very rocky terrain to prevent destruction by livestock on the Washington side of the Columbia Gorge. He successfully organized many letter-writing campaigns to remove cattle from Rooster Rock State Park to save the wapato (*Sagittaria latifolia*).

Russ has published numerous articles in the Native Plant Society *Bulletin*, the *Oregonian*, and appeared on Public Broadcasting and Oregon Field Guide programs. His dedication to educating and inspiring fellow members, Boy Scouts, garden club members about the diversity of the Northwest floral wealth has made his name a familiar one to all who care about Oregon's flora.

— Elizabeth and John King, Nancy Russell, and Michael Fahey, Portland Chapter.

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by Robin Wall Kimmerer. 2003. 176 pages. Line drawings, index. ISBN 0-87071-499-6  
Oregon State University Press, \$17.95, paper.

I love mosses! I love them so much that I welcome their colonizing my roof where I have fun watching birds pick them over for the small animals that live in the clumps. I love them in my so-called lawn, where I'm letting nature produce a moss garden in places too damp and shady for grass. I love them in cracks in the sidewalks, and of course in the forest where they hang in splendor from the trees and form green cushions on fallen logs.

The author of *Gathering Moss: A Natural and Cultural History of Mosses*, Robin Wall Kimmerer, obviously loves them too. In fact she has made them her career. Dr. Kimmerer is a Bryologist at the State University of New York and Director of the college's Biological Station in the Adirondacks. She is also, as you will learn from her book, an author of scholarly papers, an advisor to graduate students, a consultant, a mother, and a Native American. And she has written a lovely book, which taught me many things I did not know.

There is not room here to detail all that I learned from this collection of charming and educational essays. Each of the twenty chapters highlights a fascinating aspect of bryology. For example, the chapter "Back to the Pond" reviews moss reproduction and describes how these diminutive plants first colonized the land. In "Choices" we learn that mosses possess a whole suite of reproductive options, not just the sporophyte-gametophyte model we learn as beginning students; some species can even change from one gender to another under different environmental regimes. In her chapter on the use of mosses by native peoples, Robin tells us that the 5,200-year-old "Ice Man," who melted out of a Tyrolean glacier, had boots packed with the moss *Neckera complanata*, indicating to bryologists that he had come from the valleys of Italy to the south. "The Red Sneaker" describes the formation and functioning of sphagnum bogs as well as the dangers of losing footwear in their depths. "The Owner" tells a chilling cautionary tale about what land ownership may mean to some individuals. And "The Bystander" relates the equally disturbing story of commercial moss collecting in Oregon.

One of the book's reviewers had these words to say: "Something I took for granted suddenly has come alive, because I have been given its story. ... [T]his is so much more than a book about mosses. This is a Native American woman speaking. This is a mother's story. This is science elevated through the human psyche. Robin Kimmerer is a scientist who combines empiricism with all other forms of knowing." I must agree. Sometimes I find myself impatient with so-called "nature writing." Not so in this case. This book will teach you many things you did not know about mosses, and I predict will give you a much enhanced appreciation for those charming green patches on your roof and in your lawn.

— Rhoda Love, Emerald Chapter

### *Best Old-Growth Forest Hikes: Washington and Oregon Cascades*

by John and Diane Cissel. 2003. 288 pages. Maps, line drawings, index. ISBN 0-89886-839-4  
The Mountaineers Books, \$16.95, paper.

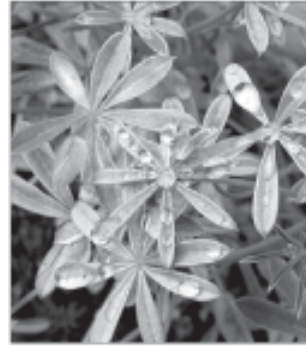
Even if you don't love big trees, this book is likely to entice you to hike some trails in the Oregon Cascades that pass among trees so big that you can't hug one all by yourself. Imagine one so large that it takes nine of your friends to help you extend your arms around its circumference! Lest you also imagine that hiking through old growth forests is boring, with the sky blocked above and the ground essentially bare of living vegetation, the Cissels open your eyes to the splendors of the world of big trees. Illustrations by Diane accompanying each hike description relate to plants, animals, insects, or fungi that may be seen along that trail. Originally from Michigan, the Cissels were drawn to the Pacific Northwest with visions of "gigantic old trees extending to the base of spectacular, snow-clad peaks." That they have hiked 2,000 miles of trails to select the hikes featured in this book proves that they faithfully pursued their vision!

This is a guidebook for day hikes, which vary in length from 2 to 15 miles, some of which are loops and others are out-and-back. Of the 100 hikes featured in the book, 55 are in Oregon. The Oregon Cascades are divided into northern, central and southern regions. A locator map at the beginning of each section facilitates trip selection based on locality, and if one is interested exploring beyond the common species in his/her neighborhood, hikes featuring particular tree species can be found in the index. Information for each hike is presented in an easy-to-use format, featuring trail length, difficulty, season of use, lowest and highest elevations, and "human imprint." Human imprint refers to how likely human activities are to intrude on your hiking experience, in the form of roads, clearcuts, other hikers, mountain bikers, and developed recreation sites. Topographic maps (1 inch to the mile) show the location of old growth, partial old growth, and extraordinary old growth along the trails, view points, unbridged water crossings, and alternative trails and trailheads. Sidebars feature the old growth species and noteworthy big trees nearby.

Hiking guidebooks can be deadly dry reading, but Cissel's writing skirts most of the clichés and finds colorful ways to describe old trees: "a glorious grove of shreddy barked western redcedar" or "short, stout, wind-whipped veterans" of whitebark pine. While one wouldn't sit and read the book from cover to cover, individual hike descriptions are engaging enough to sample several before settling down to choose one. Introductory material on old growth ecology and conservation are worth reading. The five appendices provide an old growth bibliography, a guide to tree identification, champion tree measurements, sources for additional maps, and agency contact information.

As a person who naturally gravitates to open grassy places, I see at least three uses for this book in my household: an impetus to explore new trails (the long hikes), greater appreciation of old growth forest along trails we hike for other reasons, and a resource for ideas of places to take out-of-town guests who prefer leisurely, short walks.

— Cindy Roché, Siskiyou Chapter



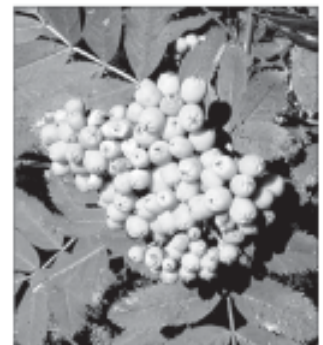
# Vascular Plants of Lane County, Oregon

## An Annotated Checklist

By C. Simpson, J. Koenig, J. Lippert, R. Love,  
B. Newhouse, N. Otting, S. Sundberg, D.  
Wagner, and P. Warner. Emerald Chapter, Native  
Plant Society of Oregon. Eugene, Oregon. 2002.  
Approximately 90 pages. Paper, spiral bound.



This county checklist includes more than 1,740 species and varieties, representing 39 percent of the 4,460 plants currently recognized by the Oregon Flora Project at Oregon State University. The Checklist is far more than simply a list of species: it includes a color map of Lane County's five major ecoregions, information about rare and endangered species, noxious weeds, and invasive gardening and landscaping plants. Information is included for every species on habitat, ecoregion, and occurrence frequency. Native or non-native origin is also designated.



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Emerald Chapter, NPSO  
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Contributors of articles should submit one hard copy of a double-spaced manuscript accompanied by an electronic copy of the file (PC in Word, or a Text or Rich Text Format File; indicate name of Program and Version in the accompanying cover letter).

Computer facilities are available for use at libraries and printing or word-processing businesses. Please do not submit text material without electronic copy.

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Send all submissions to the *Kalmiopsis* editor, or e-mail the *Kalmiopsis* editor to request an electronic submission. (Specific instructions for submission of photographs, figures, and tables will be sent to contributor upon request or after article idea has been accepted.)

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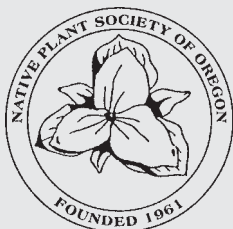
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~ Native Plant Society of Oregon ~

*Dedicated to the enjoyment,  
conservation, and study of  
Oregon's native vegetation.*



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