The Botanists at Crater Lake National Park

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Even before it became a National Park, Crater Lake attracted botanists and amateur plant enthusiasts. Early botanical explorations may have been inspired by William Gladstone Steel (1854-1934), who is often called the founder of Crater Lake National Park. As a teenager, Steel moved with his family from Kansas to Portland, Oregon. In 1894, he founded the Mazamas (an intrepid group of Portland mountaineers), who held their annual summer encampment at Crater Lake two years later. Steel invited numerous dignitaries and members of the scientific community, undoubtedly to enlist support for national park status for Crater Lake.

Among the invited groups was the National Forest Commission, responsible for making recommendations for legislation and management of public lands known as the Forest Reserves. Steele met them in Medford, Oregon, and traveled to Crater Lake with them to the 1896 Mazama meeting. The group included Gifford Pinchot (later to become first Chief of the Forest Service), Dr. Charles S. Sargent (Director of the Arnold Arboretum, Harvard University), and John Muir (champion of Yosemite which became a national park in 1890) (Applegate 1939). Even though inclement weather ended their camping trip after only one night, Pinchot was awed by the natural beauty and later helped Steel have Crater Lake designated a national park (S. Mark, pers. comm.).

Early Exploration and Discoveries of New Species

Steel also invited a party from the Department of Agriculture, including Dr. Frederick V. Coville, Chief Botanist, and John B. Leiberg, who were investigating the plains vegetation of southeastern Oregon at the time. They reached the Crater Lake rim on August 13 from Fort Klamath via Anna (Annie) Creek (Coville 1897). Other members of this group were Dr. C. Hart Merriam, Chief of the U.S. Biological Survey, and his assistants Vernon Bailey, Edward Prebble, and Cleveland Allen (Applegate 1939). Merriam was working on his Life Zone classifications, which were later widely used throughout the mountainous West. Elmer I. Applegate, who had been corresponding with Coville, also joined the Crater Lake expedition (Lang 2003).

Coville's party camped on the rim of Crater Lake for a week, collecting plants from Llao Rock, the Watchman, Castle Crest, and Mount Scott as well as from Pole Bridge Creek, Vidae Cliff, and Red Cone. Coville even descended the trail down the caldera wall to a boat landing and visited Wizard Island (Coville 1897). Applegate and his brother Fred explored Mount Scott and provided Coville with a list of 22 specimens collected on the summit as well as additional species from the southern flank. Coville also received specimens from Mazama member/Oregon botanist Martin W. Gorman, who had made collecting trips to Crater Lake in the 1880s and again in 1896 (Bornholdt, pers. comm.).

"The August Vegetation of Mount Mazama" (Coville 1897) included 175 species, five of which were newly described: pumice sandwort (*Arenaria pumicola*), Mount Mazama collomia (*Collomia mazama*), Gorman's buttercup (*Ranunculus gormanii*), Crater Lake currant (*Ribes erythrocarpum*), and grouseberry (*Vaccinium scoparium*) (Zika 2003). This doesn't count the paintbrush that Applegate collected on Mount Scott, which was originally identified as *Castilleja parviflora*, but was later named *C. applegatei* by M. L. Fernald of Harvard (Lang 2003).

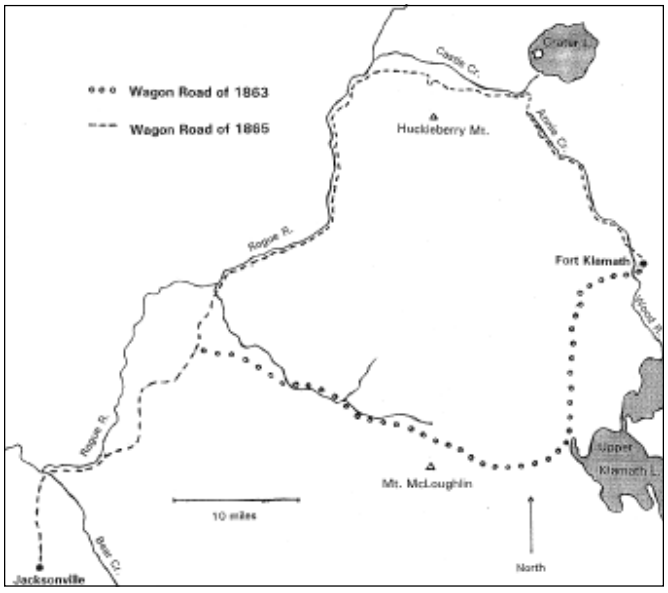
Hart Merriam, Chief U.S. Biological Survey, in lead on horseback, followed by his assistant Vernon Bailey on horseback at Crater Lake in August 1896. Photo courtesy of Crater Lake National Park.

Crater Lake currant (*Ribes erythrocarpum*) is a narrow endemic found only in a few Oregon counties and was first collected by Coville and Leiberg in 1896. It is an intermediate host for the blister rust on whitebark pine. Photo by Norm Jensen.

Coville's description reveals that generally, the vegetation has changed little since 1897:

> "*The vegetation about Crater Lake is primarily a great coniferous forest. Most of the mountain slopes are covered by a dense growth of trees.... The forests are rather dry and have almost no underbrush, not enough to impede a foot-traveler. The commonest shrub is* Ribes erythrocarpum *and the most abundant plant* Juncus glabratum [Luzula hitchcockii].... *On the gentle outer slopes of the crater occur long stretches of open land entirely devoid of trees and evidently covered until late in the spring with snow.*"

What has changed is public access and botanical collection. In the 1890s, botanical collection at Crater Lake was difficult: it took three days by wagon or horseback to travel from Ashland or Jacksonville, and about the same amount of time from Linkville [Klamath Falls] (Applegate 1939), via an 1865 military road that the Army built to carry supplies from the Rogue Valley to its post at Fort Klamath. This road followed much the same route as present-day Highway 62, staying above and south of Annie Creek and Castle Creek Canyons. From the military road, a tourist group from Jacksonville blazed a two-mile track from the Army road up Dutton Creek to the rim of Crater Lake (Mark 1997). After national park status was achieved in 1902, road improvements followed, as did the botanists. Now over 500,000 people visit the park every year, and plant collection may only be done by permit.



Map of wagon road route to Crater Lake in 1865. Map by Steve Mark, Crater Lake National Park.

Early Interpreters and a Park Flora

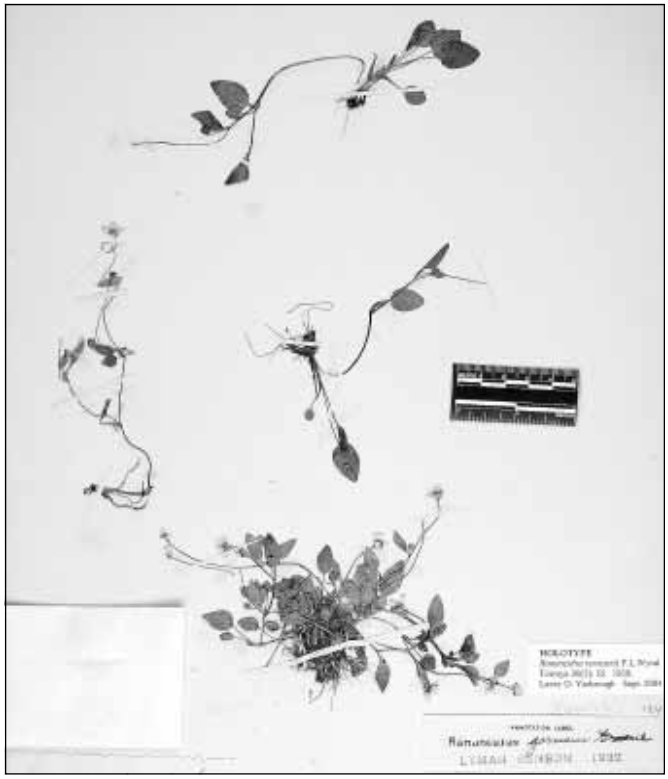
Three botanists who served on the park staff during the 1920s and 1930s, F. Lyle Wynd, Lincoln Constance, and Elmer Applegate, shaped the early botanical heritage of Crater Lake National Park, including the first floras of the Park, the concept of life zones, and informative articles published in *Nature Notes* (www.nps.gov/crla/notes).

F. Lyle Wynd high school graduation photograph, 1923, from Eugene High School Yearbook. Courtesy of Lane County Historical Museum, Eugene, OR.

F. Lyle Wynd

Wynd (1904-1987) spent his youth at Fort Klamath, only ten miles from the Park's boundary and became enthralled with Crater Lake. He was only 18 when he started working there as a ranger naturalist (Love 2002). Between 1923 and 1930 he collected extensively, and six years later he published the first "Flora of Crater Lake National Park" (Wynd 1936), which listed 433 species (Zika 2003). He personally collected all but three of the listed specimens, indicating his intimacy with the Park's flora. His specimens became part of the University of Oregon Herbarium (now housed at Oregon State University).

Wynd worked with C. Hart Merriam and was intrigued with the concept of Life Zones, which recognized that plant and animal species occur in latitudinal and altitudinal zones. Wynd went beyond finding and listing plants to describe how plants grouped together in communities; thus expanding botanical knowledge at CLNP to include habitats and vegetation patterns. He adapted Merriam's concept to describe three Life Zones in the Park. By increasing elevation these were 1) the Transition Zone, indicated by ponderosa pine (*Pinus ponderosa*) occurring mostly in the southeastern and northeastern corners of the park and interspersed with moist canyons, open slopes and meadows; 2) the Canadian Zone where forest cover is primarily lodgepole pine (*P. contorta*) and western white pine (*P. monticola*), from about 5,500 ft. elevation up to the Hudsonian Zone; and 3) the Hudsonian Zone, which includes forests of mountain hemlock (*Tsuga mertensiana*) and whitebark pine (*Pinus albicaulis*) on ridges (Wynd



Herbarium sheet of Wynd's holotype for *Ranunculus terrestris* collected at Red Blanket Creek, CLNP. Lyman Benson annotated the specimen as *Ranunulus gormanii* Greene in 1932.

1941). Within the Canadian Zone, diversity is contributed by environments such as streamsides, pumice flats (the Pumice Desert), and islands (Wizard Island and Phantom Ship). Comparable variation in the Hudsonian Zone is found in open pumice slopes around the rim, streamsides, talus slopes, and wet areas.

Lincoln Constance

Constance (1909-2001), a fellow student of Wynd under the enthusiastic direction of Louis F. Henderson at the University of Oregon (Love 2000), worked as a seasonal naturalist at Crater Lake in 1931 and 1932 (Ertter 2001). In addition to continuing work begun by Wynd, Constance wrote Nature Notes, in which he described several park wildflower displays, including those at Castle Crest. His whimsical bent was revealed by an article entitled "Flowers, Where the Scene-shifter–Nature–Is Always Busy" (Constance 1931). His more serious side was displayed when he advocated Crater Lake National Park as an ideal place for scientific study, arguing that the geologic beauty of the park is not more important than the "manifold fields for scientific investigation which it offers" (Constance 1932). While at Crater Lake Constance kept a few labeled specimens for visitors to identify and regularly led Rim caravans. Although one of his assignments while a seasonal employee was to compile a flora checklist, other chores prevented him from completing the list (S. Mark, pers. comm.).

Elmer I. Applegate

Applegate (1867-1949) worked as a Park Ranger (naturalist) from 1934 to 1939, starting when he was 67 years old! A native of southern Oregon, Applegate first visited Crater Lake as a ten-year-old boy. Since he began collecting and studying plants at an early age (Lang 2003), it is not surprising that he was involved with the 1896 Coville and Merriam expedition. That experience led to a job as field assistant for Coville as he collected in the Oregon Cascades (including Crater Lake) in the summers of 1897 and 1898. Applegate capably managed the pack animals as well as camping and plant collecting chores (Lang 2003). During the 1897 season, they discovered pumice grape fern or moonwort (*Botrychium pumicola*) (Applegate 1939). Applegate's checklist of the flora of Crater Lake National Park listed 564 species (Applegate 1939) and was published ten years before he died at the age of 82. In his flora he acknowledged Wynd's earlier work as well as that of Coville and Merriam. Most of Applegate's collections are housed in the CLNP herbarium.

Research Natural Areas

Reseach Natural Areas (RNAs) are designated to represent significant, undisturbed ecosystems, where natural processes can take place unhindered. These sites are valuable for scientific research and as a reservoir of native plants and animals. These sites are designated administratively by state or federal agencies and do not require congressional action. They are chosen to represent specific "cells" described in a statewide natural heritage plan. Four such areas have been designated in Crater Lake National Park (Mark 2000). The state's Natural Heritage Plan can be found at http://oregonstate.edu/ornhic/publications.html.

The Pumice Desert RNA consists of 3,055 acres along the North Entrance road northwest of the Crater Lake rim. It represents a barren pumice and ash desert surrounded by lodgepole pine forests. Ecological succession and slowly encroaching lodgepole pine are being studied and monitored (Horn 2002).

The Desert Creek RNA includes 1,869 acres in a remote northeast portion of the park. It includes a remnant plant community of bitterbrush (*Purshia tridentata*) and old growth ponderosa pine. Outside the Park similar communities have been logged or grazed.

The Llao Rock RNA consists of 435 acres of thick pumice deposits and represents subalpine timberline typical of southern Cascade pumice fields. Two rare plants can also be found there: the Crater Lake rock cress (*Arabis suffrutescens* var. *horizontalis*) and the pumice grapefern (*Botrychium pumicola*). Llao Rock also contains a whitebark pine plot that is part of a larger program within the park to monitor whitebark pine communities.

Sphagnum Bog RNA along the Park's western border includes 180 acres with plants that contrast sharply with the surrounding pumice dominated forest. The insectivorous sundews (*Drosera anglica* and *D. rotundifolia*) grow here as well as the rare Mazama collomia (*Collomia mazama*). Sphagnum Bog contains a diversity of plant communities that makes it an outstanding example of a Cascade bog or mire.

Mahala mat (*Ceanothus prostratus*) and snowbrush (*Ceanothus velutinus*) illustrated by Charles Yocom. Reprinted from Shrubs of Crater Lake National Park.

Lean Years and Re-vitalized Botany

Park budgets declined during the 1930 Depression years and World War II (1940s). Many plans, projects, and programs were postponed for lack of funding and staff (Mark 1990). An increase in activity came with the 1950s.

Charles Yocom

One notable effort in the 1950s was the work by Charles Yocom (1914-1985), a seasonal naturalist in 1951 and 1952. A skilled illustrator who learned his trade drawing plants used by waterfowl, he developed an interest in the Park's shrubs. He left an illustrated manuscript with the Park which was later published by the Crater Lake Natural History Association (Yocom 1964). He went on to illustrate other popular publications and became a professor of wildlife at Humboldt State College (N. Simmons, pers. comm.).

Richard M. Brown

Interest in botanical exploration within the Park got a boost with Richard M. Brown (1926-1998), who began his career at Crater Lake as a seasonal naturalist in 1952. He then became Assistant Park Naturalist (1953-1960), Chief of Interpretation (1963-1966), and Research Biologist (1967-1970). He held a Masters from Harvard and put his training in plant taxonomy to good use by adding to the Park herbarium. He also recruited energetic, skilled seasonal naturalists and encouraged them to pursue research within the Park. He helped create a library in the Park, which was dedicated as part of the CLNP centennial celebration in 2002 as the Richard McPike Brown Memorial Library.

Dwayne Curtis

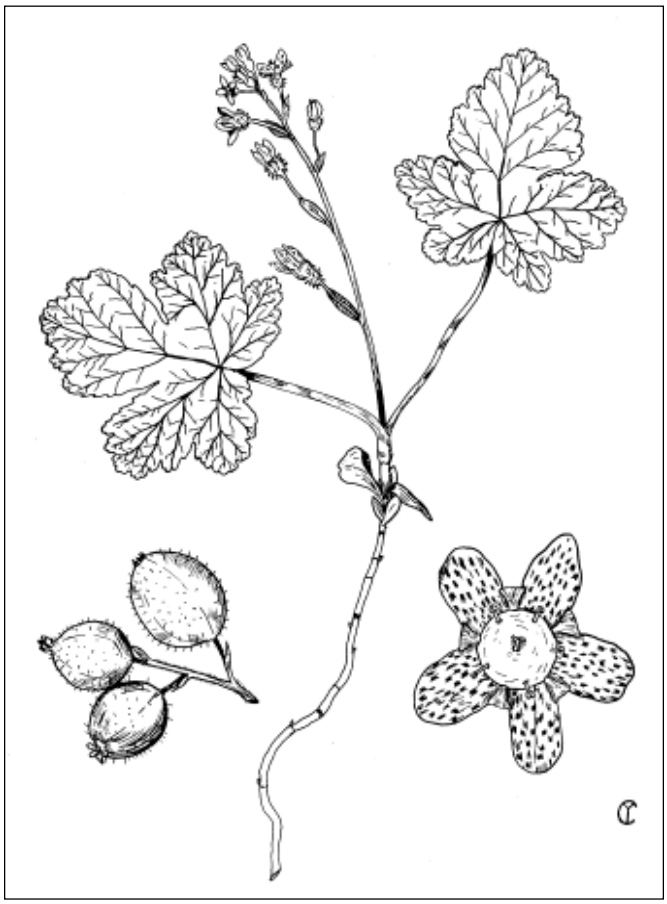
Curtis of Chico State College was a seasonal naturalist in 1966 and 1967. During that time he pursued his interest in slime molds and collected within the Park, finding eight species new to Oregon (Curtis 1969).

Elizabeth L. Horn

Horn of Purdue University was a seasonal naturalist in 1964 and 1965. Richard Brown encouraged her to study the Pumice Desert, a five square mile dry meadow in the northern portion of the Park. Horn spent lieu days (off-duty time) on the desert and many other seasonal employees assisted with field work. The study showed only 14 species of plants inhabited the area and covered less than 5% of the surface (Horn 1968). Subsequent monitoring showed that succession is slowly proceeding: in one plot, lodgepole pine numbers increased 75% over 35 years (Horn 2002).

Marion T. Jackson, Adolph Faller

Jackson from Indiana State University was a seasonal naturalist from 1965-1966. He became intrigued by the vegetation of



Charles Yocom's illustration of Crater Lake currant (*Ribes erythrocarpum*). Reprinted from Shrubs of Crater Lake National Park with permission from the Crater Lake Natural History Association.

Pumice slope west of Llao Rock, with Hillman Peak in the background. Foreground vegetation is primarily spreading phlox (*Phlox diffusa*) and Newberry knotweed (*Polygonum newberryi*). Photo by E. Horn.

Wizard Island while conducting boat tours. Brown encouraged Jackson and another seasonal naturalist, Adolph Faller, to study vegetation patterns on the volcanic island in 1966. Jackson returned again in 1969. Jackson and Faller spent their lieu days on the island, taking the morning tour boat to the island and returning on the last trip of the day. They described five different plant communities on the island: cinder slope, crater rim, lower cone, north slope, and lava flow (Jackson and Faller 1973). In addition, Jackson conducted a floristic survey, recording 106 species on the volcanic island, including 33 not previously noted (Jackson 1973). Looking back, Jackson commented on what could be accomplished with little funding or grant support (M. Jackson, pers. comm.).

The Role of Fire

During the 1970s and 1980s emphasis shifted to the study of fire ecology at Crater Lake National Park. Much of this work was done cooperatively through partnerships with Oregon State University and the University of Washington. Forest ecologists looked at fire regimes and wondered if it was possible to return portions of the Park landscape to pre-settlement vegetation patterns.

Donald Zobel, Robert McNeil, Robert Zigler

Zobel of Oregon State University looked at vegetation patterns during the mid-1970s, documenting fire history as background for initiating a prescribed fire program. He focused work on the southeast corner of the Park known as the panhandle. Graduate student Robert McNeil examined vegetation patterns and fire history of an *Abies concolor-Pinus ponderosa* forest inside the southern boundary of the Park. Zobel and McNeil correlated the vegetation with fire frequency, noting that the occurrence of a widespread fire appeared to reduce the size and intensity of fires occurring in the same area for the next ten years. They also noted changes in forest composition that may have resulted from the exclusion of fire (McNeil and Zobel 1980). Another graduate student Robert Zigler did similar studies on *Pinus contorta* forests within the Park (D. Zobel, pers. comm.).

James K. Agee, Terri Thomas, Christopher Chappell

Agee has studied fire within CLNP since the mid-1970s. He first visited Crater Lake while working for the National Park Service in San Francisco, where he was involved in fire regime studies in the Sierra Nevada. Crater Lake administrators had seen prescribed fire used in the Sierra Nevada and wanted to know what techniques could be applied at CLNP to restore historic forest systems. When Agee transferred to the Seattle NPS office as an ecological and research biologist, CLNP became part of his responsibilities. He directed graduate student and seasonal employee Terri Thomas' study of the effects of fires on woody debris accumulation (Thomas and Agee 1986). Another graduate student, Christopher Chappell, studied the reburning of *Abies magnifica* forests when a fire was allowed to burn in 1980 around Crater Peak (Chappell and Agee 1996). The summer of 1988 was a turning point for natural fire on federal lands. At Crater Lake, managers were letting the Prophecy Fire near Mount Scott burn as a natural fire when it blew eastward out of the Park. The Yellowtone fires of the same year prompted the suspension for many years of federal plans to allow natural fires to burn when prescribed conditions were met. In 1988 Agee became chair of the Division of Forest

Ponderosa pine forest with understory of snowbush (*Ceanothus velutinus*) and sagebrush (*Artemisia tridentata*) found in the southeast and northeast corners of CLNP. Photo by E. Horn.

Lodgepole pine (*Pinus contorta*) forest in Munson Valley. Photo by E. Horn.

Resources Management at the University of Washington. He continues, with cooperators, to study the effects of prescribed fire throughout the Pacific Northwest, including the effects of timing (spring or fall) of prescribed fires and insect infestation on tree mortality in CLNP (J. Agee, pers. comm.).

Current Crater Lake Botanists

Peter F. Zika

The historical plant lists compiled by Wynd and Applegate were recently updated and expanded by Peter F. Zika, who began park survey work through the Oregon Natural Heritage Program during the summers of 1994 and 1995 (P. Zika, pers. comm.). Additional field work and examination of herbarium specimens led to "A Crater Lake National Park Vascular Plant Checklist." Published through the Crater Lake Natural History Association, Zika's list documents 682 species, including locations. The publication lists the narrow endemics of Crater Lake and the Park's immediate surroundings, including *Botrychium pumicola*, *Collomia mazama*, and *Ribes erythrocarpum*. Other southern Oregon endemics found in the Park include *Arenaria pumicola*, *Castilleja applegatei* ssp. *applegatei*, and *Polygonum cascadense*. Species that have not been seen since early collections are noted, providing botanists the opportunity to search for them (Zika 2003).

Michael Murray

Terrestrial ecologist Michael Murray oversees the current botany program at Crater Lake. Having studied fire-dependent ecosystems in diverse locales such as Redwood National Park, Alaska, and the northern Rocky Mountains, Murray monitors fire effects at CLNP, as well as coordinates programs for revegetation, exotic species, and whitebark pine restoration. The fire monitoring program involves inventorying "pre-burn" vegetation in anticipation of natural fires to provide a baseline for comparison after a fire occurs. Murray also coordinates the cooperative fire regime studies with researchers at the University of Washington, Oregon State University, and Portland State University. For a description of his whitebark pine ecosystem studies, see Murray's article on page 25.

Mark Buktenica

Mark Buktenica, CLNP's aquatic biologist since 1985, researches moss in Crater Lake. Aquatic moss rings the lake to a depth of about 100 to 450 feet. Earlier evaluations of the extent of the moss and its associated epiphytes and invertebrates indicated the biomass of the moss could dwarf any other biological component in the lake. That would make it a significant player in the lake's nutrient dynamics (Buktenica 1996). A remote-operated submersible robot will be used during the summer of 2005 to further evaluate the moss beds and their associated aquatic life. (M. Buktenica, pers. comm.).

Steve Jessup

While Buktenica is looking at moss beneath the lake's surface, Steve Jessup of Southern Oregon University is surveying the mosses along the lakeshore. There, an environment shaded by steep caldera walls in proximity to the cold water of the lake creates a cool, moist habitat for species of mosses and liverworts that are normally found further north. Partially funded by the Crater Lake Natural History Association, Jessup's two-year survey began in 2004. One of the first moss specimens he found was a species not previously recorded elsewhere in the Pacific Northwest, the closest known location being at higher elevations in the Rocky Mountains (S. Jessup, pers. comm.).

Mountain hemlock (*Tsuga mertensiana*) and whitebark pine (*Pinus albicaulis*) along Garfield Peak Trail. Photo by E. Horn.

Conclusion

Crater Lake National Park is well known for its geological gem, the deep blue lake. It is less well known for its botanical treasures. Early botanists had the pleasure of exploring, identifying, and characterizing its species and plant communities. Although CLNP is relatively small by national park standards (about 250 square miles), it teems with a diverse flora. Ranging from 4,000 feet in elevation in the southwest corner to the nearly 9,000 foot Mount Scott along the eastern rim of the lake, CLNP straddles the Cascade crest with plant communities representing both the western and eastern slopes. Much of the lake's rim holds snow well into the summer and water flows through porous lava to create spectacular wildflower displays in the dry forest. Current botanical programs, built on knowledge accumulated by the park's earlier botanists, emphasize preservation and ecology: whitebark pine, plant associations, succession, and fire ecology. CLNP is an ideal outdoor laboratory in a breathtakingly awesome setting. A magical place to botanize–that's Crater Lake National Park.

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Elizabeth L. Horn began her love affair with Crater Lake National Park while a seasonal naturalist and did graduate work there leading to a MS from Purdue University (1966). She has published several popular wildflower guides covering the Oregon coast and the Cascade and Sierra Nevada mountains. She retired from the US Forest Service and lives in West Yellowstone, Montana, but returns to Crater Lake often to monitor her plots in the Pumice Desert.
