Biographical Portrait

ESTELLA BERGERE LEOPOLD

PALEOECOLOGIST AND CONSERVATIONIST (1927–)

by Susan Flader

Estella Bergere Leopold, paleoecologist and conservationist, has combined a distinguished scientific career exploring the history of forest ecosystems and climate change over the past 65 million years with a lifelong commitment to the land ethic philosophy of her father, renowned ecologist and writer Aldo Leopold. Her work led her to leadership roles in the establishment of Florissant Fossil Beds and Mount St. Helens national monuments. Elected in 1974 to the National Academy of Sciences, she was honored in 2010 in Osaka, Japan, with the International Cosmos Prize.

Born January 8, 1927, in Madison, Wisconsin, Estella was by seven years the youngest of Estella and Aldo Leopold's five children. She was deeply influenced by her father, a forester who developed the new field of wildlife management at the University of Wisconsin; her mother, scion of an old Spanish family in New Mexico and a musician; and her older siblings, who served as mentors and with whom she competed to master the guitar and a repertoire of Spanish songs. She was only eight when her father bought the derelict farm along the Wisconsin River with its chicken coop shack that he would immortalize in *A Sand County Almanac* (1949). As a result, she spent more time there with her parents—nearly every weekend for thirteen years, helping restore the land to ecological integrity—than any of her siblings, who were beginning their careers.

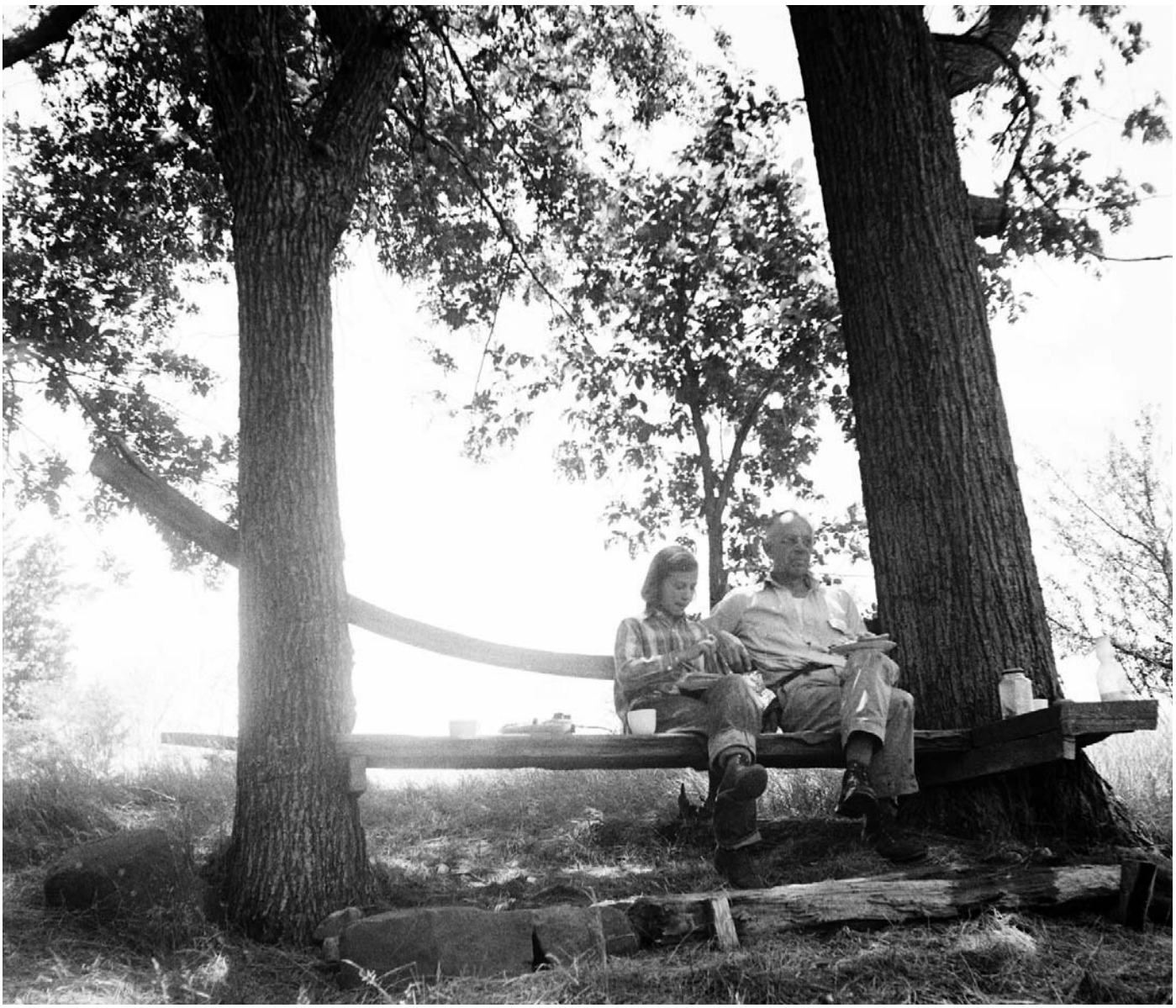
COURTESY OF ESTELLA LEOPOLD

Since retiring as professor emerita in 2000, Estella Leopold has maintained an active research program and is very involved in the work of the Aldo Leopold Foundation.

When her father asked her one day what she wanted to be when she grew up, she thought awhile before replying, "A bugologist." Asked why, she said, "Because everything else is taken." Her oldest brother, Starker, was a wildlife ecologist; Luna was an engineer and geologist who became a noted hydrologist; Nina studied geography; and Carl became a plant physiologist. A few days later, her father took her to the university bookstore to get her a botany manual and a vasculum for collecting field specimens. She eventually studied botany at the University of Wisconsin with the author of that manual, Norman Fassett. Then, after earning a master's in botany at Berkeley (1950) and a stint at the tree-ring laboratory at the University of Arizona, she studied at Yale with Paul B. Sears, G. Evelyn Hutchinson, and Edward S. Deevey and soon found her way into an esoteric specialization, palynology (the study of fossil pollen), reconstructing environments of the Tertiary and Quaternary periods.

After earning her doctorate in botany from Yale in 1955, Leopold began a two-decade career as a research palynologist in the Paleontology and Stratigraphy Branch of the U.S. Geological Survey in Denver, studying pollen taken from deep cores in the Rocky Mountains, Alaska, China, on Eniwetok and other atolls in the South Pacific, and elsewhere to reconstruct changing plant assemblages in response to mountain building, volcanism, and climate change over the past 65 million years. Her research on the dense tropical forests that had covered the coral atolls during the Miocene epoch helped confirm Darwin's hypothesis that the corals had colonized subsiding volcanoes. To test and correct for how far various types of pollen grains could have been blown on the winds, she and Alan Solomon ran pollen "trap lines" at Searles and Mono lakes in the Mohave Desert.

While studying Tertiary flora of the



COURTESY OF THE ALDO LEOPOLD FOUNDATION ARCHIVES

Estella Leopold and her father Aldo, at the Shack, 1937.

Rocky Mountains, Leopold came to appreciate the incredible survival of fossils preserved in the Florissant Valley, southwest of Denver, by volcanic mud and ash some 34 million years ago, and she began leading field trips in the 1960s with ecologist Bettie Willard of Boulder to show people the area. After the National Park Service in 1964 announced a proposed national monument to protect the fossil beds, land values escalated as developers began buying up lands for residential development. Leopold joined with Willard and other Colorado conservationists in 1965 to cofound the Colorado Open Space Coordinating Council, an umbrella organization of conservation groups, to work on Florissant and other issues of the day, including proposed dams in the Grand Canyon and oil shale development.

To save the fossil beds, Leopold and her colleagues in 1969 formed Defenders of Florissant and sought a restraining order in federal court, backed by mothers with children prepared to lie down in the path of the bulldozers—all before passage of the National Environmental Policy Act and the first Earth Day. They secured the services of charismatic New York attorney Victor Yannacone and future Colorado Governor Richard Lamm, who won one of the nation's first explicitly environmental lawsuits, in part by invoking the public trust doctrine and the land ethic. In his closing argument, Yannacone declared:

> *The Florissant fossils are to geology, paleontology, paleobotany, palynology, and evolution what the Rosetta Stone was to Egyptology. To sacrifice this 34-million-year-old record, a record you might say written by the mighty hand of God, for 30-year mortgages and the basements of the A-frame ghettoes of the seventies is like wrapping fish with the Dead Sea Scrolls.*

Days later, Congress finally acted, and the bill to establish Florissant Fossil Beds National Monument was signed by President Richard Nixon on August 20, 1969.

In 1971–72 Leopold spent a sabbatical at the new Institute for Environmental Studies at the University of Wisconsin, while concurrently serving as adjoint professor of biology at the University of

Colorado. When she was elected in 1974 to the National Academy of Sciences, she joined her brothers Starker and Luna there, the first and probably only time in the history of the academy that three siblings have achieved that signal honor. Then in 1976, she left the USGS to become director of the Quaternary Research Center (QRC) at the University of Washington, in Seattle, shifting part of her research agenda to the past two million years (the Quaternary) and to the Puget lowlands and China. Through her research on 25,000 years of environmental change in the Puget lowlands, she helped document what is now known as the Seattle fault zone running through the city (*Science*, 4 December 1992). After serving as deputy chair of a paleoanthropology delegation of the National Academy to the People's Republic of China in 1975, she began decades of collaboration with Chinese paleobotanist Gengwu Liu and others to explore affinities in the vegetation history of China and western North America.

For a quarter-century until her retirement to professor emerita in 2000 (after which she continued an active research program), she taught variously in the QRC, the Institute for Environmental Studies, and the Departments of Botany and Forest Resources, adding courses in general biology, forest history, history of Pacific Northwest environments, and restoration ecology to her usual suite of more specialized courses in palynology and paleoecology. In addition to her research and undergraduate teaching, Leopold chaired or served on committees for more than 40 master's and doctoral students in a wide array of disciplines. With her students and colleagues and on her own, she published more than 100 scientific papers and authored dozens of other articles. She also gave more than 100 invited presentations worldwide.

When Mount St. Helens, on the Gifford Pinchot National Forest, blew its cone-shaped top in 1980, flattening and burying trees on 230 square miles of forested slopes and blanketing the Northwest in volcanic ash, Leopold and her colleagues in the QRC and citizen environmental organizations swung into action against U.S. Forest Service plans to sow exotic grasses and replant forests. They made a case instead for a national monument where scientists could study and the public could learn about the processes by which an ecosystem responds to traumatic disturbance. As a result of their vision, political organizing, and testimony at congressional hearings, Congress in 1982 passed and President Ronald Reagan signed a bill establishing the 110,000-acre Mount St. Helens National Volcanic Monument.

Estella Leopold served as an officer or board member of numerous scientific, professional, and citizen organizations and committees over the years, including at least eight committees of the National Academy of Sciences dealing with environmental quality, climate, and global change. As a member of the Washington Governor's Advisory Council on High-Level Nuclear Waste Management from 1982 to 1987, she engaged colleagues in the U.S. Geological Survey to present evidence regarding flow patterns in the highly pervious basalts beneath the Hanford Reservation, resulting in an agreement not to bury nuclear wastes there. In addition to her election to the National Academy, she is also a fellow of the Geological Society of America, the American Association for the Advancement of Science, the American Academy of Arts and Sciences, and the American Philosophical Society, and she has received numerous other awards for scientific research and conservation action.

Since joining with her siblings to establish the Aldo Leopold Foundation in 1982, she has been particularly devoted to its development and effectiveness, serving at various times as president, board chair, and longtime chair of science and stewardship. She has been a champion of its mission to foster land health and a land ethic and anticipates helping to extend the foundation's international reach through its forthcoming documentary film, *Green Fire: Aldo Leopold and a Land Ethic for the Twenty-first Century*, and with some of the proceeds of the 40-million-yen 2010 International Cosmos Prize, awarded for her lifelong work illuminating the harmonious coexistence of nature and mankind. □

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