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On the Cover: *Red Oak, Turning,* watercolor, 40″ × 30″ painted in 1974 by Lee Weiss. Permanent collection of the artist.

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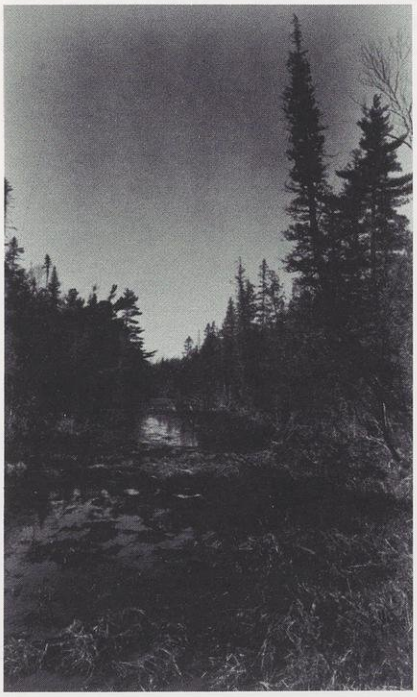

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Wisconsin Vegetation

Editorial

This issue had its origin at a Wisconsin Academy Council meeting when councilor John Thomson asked if we would be interested in an article on botanist Norman Fassett. As we discussed the focus of the article, we thought of several Wisconsin Academy members who had done or were doing research on Wisconsin's plant world. The article grew into an issue, and John agreed to present the historical background of botanical research in the state. We invited papers from our members and others whose work we knew about. At our annual Wisconsin Academy conference in April we solicited papers from members of the Botanical Club of Wisconsin which was holding concurrent paper sessions. By no means are all the currents of botanical research in the state represented in this issue, not even the projects of all our botanist members. What we offer here is merely a sample of some significant historical projects such as the UW-Arboretum with its work with native plant communities and the Ridges, the first state nature preserve; the current work of such important institutions as the Milwaukee Public Museum, the Sigurd Olson Environmental Institute, and The Nature Conservancy; and the work and concerns of some individuals.

I want to correct an error of omission in the September 1989 35 (4) issue. We have had many comments and compliments about the cover photograph, which is a museum reconstruction of mastodonts at the New York State Museum in Albany, based on fragments of hair found in Wisconsin. By failing to give credit to the New York State Museum, we gave, perhaps, the false impression that the mastodonts were at the Milwaukee Public Museum, where the author of the article on mastodonts is a curator. Our apologies to the New York State Museum, to author Kurt Hallin, and to anyone who visited the Milwaukee Public Museum looking for that display—though you, no doubt, found much else to interest you.

Our color cover is provided by the Walter and Trudi Scott Publication Fund, honoring the *Review*'s editors for its first ten years. Wisconsin Academy Fellow Lee Weiss painted the beautiful watercolor which graces our December cover. I went to her home studio to look at the painting, *Red Oak, Turning* (1974), which is part of her permanent collection. She allows herself to keep one painting every five years, she explained, and showed me her most recent indulgence, a subtle study of stones in browns and blues, painted for an entry wall which receives strong light from a skylight. Gracious as always, Lee gave me a tour of house and studio, giving critiques of her work as well as of other paintings she had collected. Lee likes to purchase the work of young artists who should be encouraged and older artists who have become discouraged. Born in California, Lee has lived in Madison since the early sixties. She had a retrospective exhibition at the Wustum Museum of Fine Arts in Racine in 1987: *Lee Weiss: 25 Years in Wisconsin.* Although she studied with Nels Eric Oback and Alexander Nepote, she is primarily a self-taught painter. Oback, in fact, advised her not to take classes, just to go home and paint. Weiss is noted for her intricate work in the difficult medium of wet-on-wet watercolors, primarily of stones, branches, grasses, water—realistic but abstract. Since our cover cannot do justice to the original, make an effort to see her work in Wisconsin at the Bergstrom-Mahler Museum in Neenah, the Elvehjem Museum in Madison, the Kenosha Public Museum, the Rahr-West Museum in Manitowoc, or at the Wustum.

Patricia Powell

Patricia Powell

Letters

Editor:

In the September 1989 issue of the *Review* I have just read with special interest "An Author's Self-Education" by Merton M. Sealts, Jr. (whom I know as a retired professor of English and as a fellow alumnus of the College of Wooster) and "Edgar B. Gordon: The Epitome of the Wisconsin Idea." This article is of special interest to me, since Gordon was for twenty-five years director of the choir of the First Congregational Church of Madison, the last twelve years of which I was minister there (though I spent thirty-five years in the service of the church until my retirement in 1965). Professor Gordon had a most remarkable facility for drawing music out of people!

Rev. Alfred W. Swann
Madison

Cover artist Lee Weiss

Authors

R. Bruce Allison is owner of Allison Tree Care and Consulting Service in Madison. He received his undergraduate degree in English from Brown University and a Master's in forestry from UW-Madison where he is completing his Ph.D. in environmental studies. He has served as president of the Wisconsin Arborist Association, on the board of the International Society of Arboriculture and was elected to membership in the American Society of Consulting Arborists. He has written *Wisconsin's Champion Trees, Milwaukee County Tree Walks, Dane County Tree Walks,* and *Wisconsin's Famous and Historic Trees.*

Erik R. Brynildson is a landscape architect and consulting ecologist who specializes in historic landscape restorations and wildlife habitat enhancement. He is a graduate of UW-Madison and a former park superintendent. He resides on and is restoring Fountain Lake Farm, the boyhood home of naturalist John Muir, near Montello, Wisconsin; he has initiated an effort to have the farm declared a national historic site. Brynildson is president of the Wisconsin Muir Foundation and also serves on the board of directors of the Bluebird Restoration Association of Wisconsin. In 1988 he received an award for outstanding public service from the UW-Madison Department of Landscape Architecture.

Grant Cottam is emeritus professor of botany, UW-Madison. As a student of John T. Curtis he was involved in the studies that led to publication of Curtis's book on Wisconsin vegetation. He received his Ph.D. in 1948 and joined the Madison faculty after a year at the University of Hawaii. He has conducted research at the UW-Arboretum for forty years and served as chairman of the arboretum committee from 1961 to 1971.

Martyn J. Dibben was born and raised in England. He has B.Sc. and M.A. honors degrees from Kings College, London, and a Ph.D. from Duke University. He was on staff at Harvard University before becoming Milwaukee Public Museum's resident mycologist and senior curator in botany in 1975. Director of the annual Wisconsin Mushroom Fair, he and his students research fungal biochemistry and lichens. He as an adjunct professor of cryptogamic botany at UW-Milwaukee and in 1986 was appointed the MPM chief curator.

Victoria Ford published her chapbook, *Following the Swan*, in September 1988 with Fireweed Press, a Madison collective.

Virginia Kline is a plant ecologist who was a student of Grant Cottam, receiving her Ph.D. in botany from UW-Madison in 1976. She is the staff ecologist and research program manager at the UW-Arboretum, where she has worked for thirteen years. She teaches a unit on ecology for the UW-Madison Biology Core Curriculum and a popular evening course called Reading the Landscape at the arboretum. Kline and Cottam taught UW Botany/Forestry 455, Vegetation of Wisconsin, together for ten years, introducing hundreds of students from diverse fields to the ecology of biotic communities.

Roy Lukes has served as manager and chief naturalist of the Ridges Sanctuary since June 1964. He has a B.S. from UW-Oshkosh and M.S. from UW-Madison. Since 1969 he has written 1100 nature essays for the *Door County Advocate*, the *Appleton Post-Crescent*, and the *Green Bay Press Gazette*. He has written three books: *Once Around the Sun, A Door County Journal; Out on a Limb, A Journal of Wisconsin Birding;* and *The Ridges Sanctuary.* Since becoming naturalist for the Ridges Sanctuary, Roy has dedicated himself to preserving this rich botanical area and to helping people develop a better understanding of its history, geology, plants, and animals.

Mark Peterson is executive director of the Sigurd Olson Environmental Institute at Northland College in Ashland. Before joining the institute in 1984, he served as assistant director of Trees For Tomorrow Center in Eagle River. A native of Madison, Peterson received a B.S. in education and M.S. in environmental communications at UW-Madison. He serves on numerous committees including the International Timber Wolf Center, the Great Lakes Wetlands Policy Committee, and the Wisconsin's Acid Deposition Research Council.

John W. Thomson graduated from Columbia University and earned his Ph.D. from the University of Wisconsin, Madison, in 1939. He was the director of staff of School Nature League, the American Museum of Natural History, New York, 1939–41, then taught at the Wisconsin State Teachers College, Superior, until joining the UW Madison Department of Botany in 1944. He became professor emeritus in 1984. He was advisor for students in the major of the biological aspects of conservation from 1946 to 1984. He helped found the Wisconsin Junior academy of Science and the Botanical Club of Wisconsin. A member of the Wisconsin Academy since 1937, he served as its president in 1967–68 and continues as a member of the council. His research and publication is mainly on lichens, especially arctic ones, and he has written four books on lichens.

People, Plants, and Preservation in Wisconsin

By John W. Thomson

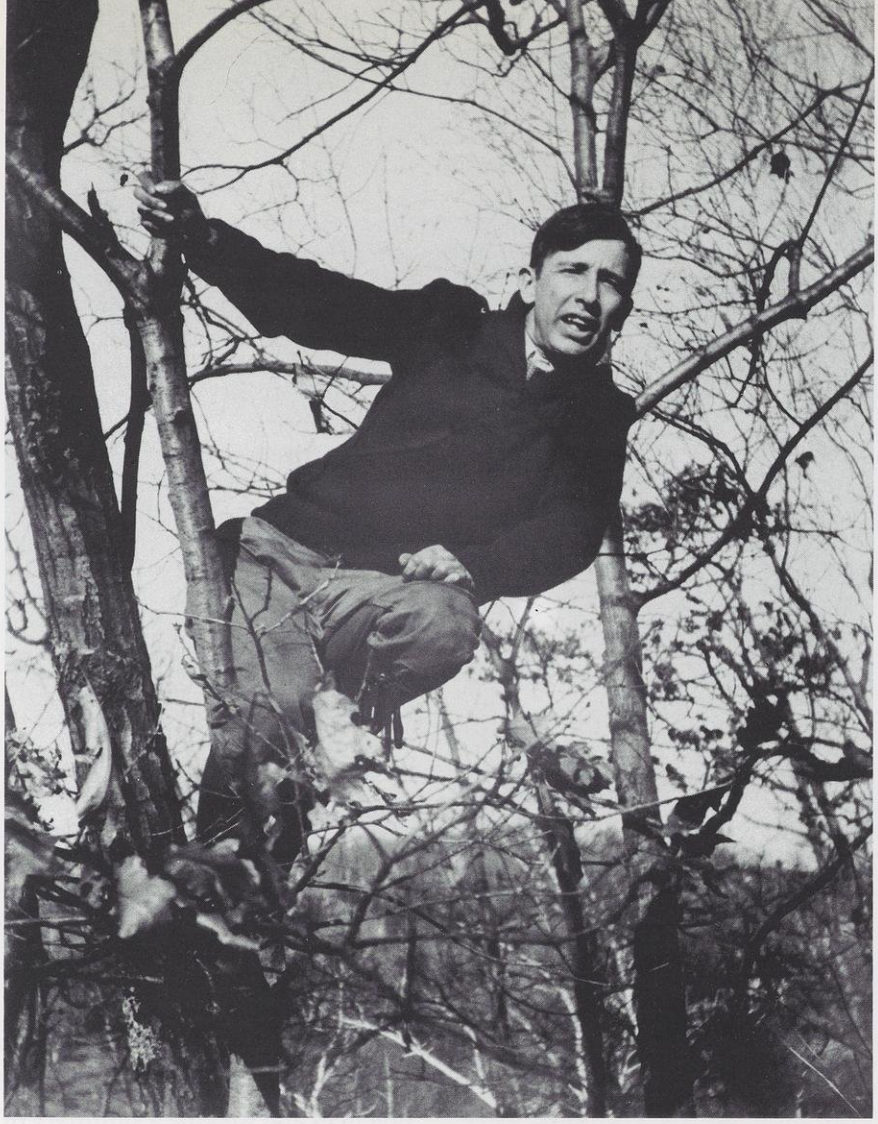
In Wisconsin's early statehood an eminent naturalist pleaded to save our trees, even though the state was still a wilderness. Today, after a century and a half of logging, plowing, fencing, road-building, subdividing, and otherwise altering our environment, we are in the desperate situation of attempting to save the remnants of our native plants. The tale of the efforts of our dedicated naturalists demonstrates to us how much we owe to some marvelous Wisconsin citizens.

The long line of illustrious scientists commences with Increase A. Lapham, a distinguished archaeologist, surveyor, geologist, naturalist, one of the founders of the predecessor college to Milwaukee-Downer, one of the founders of the State Historical Society, and one of the founders of the Wisconsin Academy of Sciences, Arts and Letters. His earliest scientific paper actually predates the state; "Catalogue of plants and shells found in the vicinity of Milwaukee on the west side of Lake Michigan" was published in 1836. In an 1867 legislative commission report cowritten with J. G. Knapp and H. Crocker, Lapham predicted that continued destruction of the forests would have disastrous effects on the climate, soil erosion, and the air and water quality. Certainly this early discussion appears as a precursor of our concerns with the current destruction of the tropical forests.

Many other botanists compiled lists of plants in our Wisconsin environment, contributing to the state's inventory, but seldom commenting upon their disappearance or a need for saving them. C. C. Parry in 1849 published a small catalogue of plants of Wisconsin and Minnesota. W. D. Whitney in 1850 published a list of the plants in the Lake Superior region near La Pointe. In 1860 T. J. Hale published a pair of lists on plants of Milwaukee, Wisconsin Dells, Lake Superior region, and the southwestern part of the state. In 1876 Thure Kumlien, the naturalist who lived in the vicinity of Albion, near Lake Koshkonong, observed how many plants had disappeared over a period of thirty years due to cultivating and pasturing; yet he suggested no remedy. During the 1870s he and T. C. Chamberlin, T. A. Bruhin, G. D. Swezey, and W. F. Bundy also contributed short notes on the Wisconsin flora.

In 1881 William Trelease joined the faculty at the University in Madison in botany. Later as professor he published the first survey of the parasitic fungi of Wisconsin and offered the first course in bacteriology at the university. In 1889 L. H. Pammel of the University of Iowa published a list of the weeds of southwestern Wisconsin.

In 1890 L. S. Cheney, professor of pharmaceutical botany at the University in Madison, summarized the studies on the Wisconsin flora in the *Pharmaceutical Review*, entitled "An historical review of the work done on the flora of the territory now included within the limits of Wisconsin." Much of the data for this had been gathered by May I. Randall for her B.S. thesis. Cheney himself made unusual field collecting trips in the area, one during 1891 along the north shore of Lake Superior and into the canoe



N. C. Fassett climbed a sturdy oak to recite Robert Frost's "Swinging in the Birches" and then took his class across the hill at Black Hawk's Lookout, Prairie du Sac, to swing in the more flexible birches, 1937. Photo by J. W. Thomson

country along the International Boundary waters; another in 1893 down the Wisconsin River from the source to Wausau; and in 1894 to 1897 a number of trips in the northern part of the state. He collected cryptogams as well as the more usual flowering plants. Although lumbering in the north was then at a peak, we have no evidence that this troubled Cheney. Did the resources through which he passed appear inexhaustible?

Next upon the scene appeared John J. Davis. Davis was born in Illinois, went to medical school in Chicago, then by 1879 settled in Racine to practice medicine. He became world famous in the field of parasitic fungi, publishing on the parasitic fungi of Wisconsin and building up a world-class herbarium of these plants. In 1888 he appeared before the legislature supporting bills to regulate cutting timber on state lands, an indication of his sensitivity to the disappearing vegetation. Davis served as president of the Wisconsin Academy from 1903 to 1905. He retired from his medical practice in 1911 to become curator of the university herbarium at Madison and served there until his death in 1937. His influence will be felt for years to come, as he bequeathed his estate to be distributed upon the death of his two children, one half to botany, one half to biology (zoology) to support work in those fields. The Davis fund has supported field work by graduate students in botany and zoology and also the purchase of land in Green County and in the Baraboo Hills for the preservation of our native plants.

Another Wisconsin physician influential in botany was George Hall Conklin, who was born in Battle Creek, Michigan and earned his M.D. degree at the University of Michigan in 1888, then moved to Superior, Wisconsin. He served as county physician, then in an Army medical unit, returned to the City Health Department at Superior, and later was in charge of the nearby tuberculosis sanatorium until his death in 1940. Conklin published on the liverworts (Hepaticae) of Wisconsin and nationwide was noted for his friendly help. He served as head of the hepatic herbarium of the Sullivant Moss Society and willed his books and herbarium to that society and the University of Cincinnati.

We certainly must remember that his life in Wisconsin led John Muir to become one of the nation's most influential conservationists. Muir grew up on a farm near Portage after coming with his family at the age of eleven from Scotland in 1849. He lived on the hardscrabble farm for a while, attended the University of Wisconsin, and then set out on his wanderings over the continent that culminated in his becoming the chief advocate for the preservation of the forests and natural features which became the foundation of the national park system. Muir later tried to purchase from his brother a small part of the family farm that he especially treasured for its plants but was rebuffed. It is awesome to realize that the beauty of that farm meadow near Portage might have been responsible for such a far-reaching impact on the entire nation. Part of the farm meadow John Muir had tried to obtain was purchased for a county park by Marquette County in the early 1960s. The rest was added in the past few years by the Sierra Club with the help of The Nature Conservancy. It is designated under agreement as a state natural area. Thus the state and

county are honoring John Muir by restoring the sedge meadow and low prairie.

During the 1920s the automobile permitted an increasing invasion of the countryside by city dwellers, who unthinkingly brought back from field and woodland quantities of wildflowers and Christmas greens. In addition many unscrupulous dealers obtained vast quantities of flowers from the wild to be sold as "grown in nurseries." This destruction led to the formation of wildflower preservation societies in many states. The earliest of these, the Wild Flower Preservation Society, was founded in 1902 by Elizabeth G. Britton, wife of the director of the New York Botanical Garden. Such societies as the Garden Clubs of America fostered an appreciation of the wildflowers and advocated passing laws to protect particularly vulnerable species. Especial protection was needed for plants used for decorations and Christmas greens. Delaware, a pioneer in 1915, with Connecticut and Maryland in 1918, then many other states all passed variations of such laws. The Wisconsin law of 1923 protected only the American lotus, but in 1939 was expanded to protect trailing arbutus, all species of Cypripedium or any other orchids, all trilliums, bittersweet, pitcher plants, and wood lilies. In one of the publications dealing with such protection, in 1928, Ralph Benedict of the Brooklyn, New York, Botanic Garden urged plant sanctuaries for rare plants when he discussed the loss of the rare hart's tongue fern in state reservations where it should have been inviolate. The idea for setting aside areas for the preservation of the native flora was in the air in the 1920s and took root in Wisconsin.

In 1925 Norman C. Fassett was hired at the University of Wisconsin to teach botany, especially plant taxonomy. Fassett's training had been at Harvard University under the world-famous M. L. Fernald. Fassett was particularly influenced by the course in plant geography and by his doctorate research on the plants of the New England and Canadian estuaries. At Madison Fassett developed a course called Flora of Wisconsin and its Conservation. This spring semester course included field trips to nearby sites with remnant native vegetation—Hope Lake Bog, Baxter's Hollow, Parfrey's Glen, Devil's Lake, Black Hawk Lookout opposite Prairie du Sac—and sometimes optional trips farther afield to the Appalachians. Conservation and the principles of ecology were taught in the course.

Shortly after Fassett, Aldo Leopold came to Wisconsin in 1931 bringing a kindred spirit of urgency. Leopold had advocated saving wilderness areas when he was working in the southwest for the Forest Service.

Fassett's students were expected to attend the Leopold seminars in wildlife ecology, or game management as it was then called, and there to present their research results. Both groups of students thus had their horizons broadened. Several of Fassett's students were working on prairie history and establishment, so much of their information was presented in those seminars. This undoubtedly led to the experiments on prairie establishment in the newly established University Arboretum as well as in the sands by the Leopold shack.

Fassett and Leopold, Dean Russell of the UW College of Agriculture, Dean Anderson of the College of Education, E. O. Bean of the Natural History Survey, and E. M. Gilbert, head of the UW Department of Botany, developed many projects to save natural areas and native vegetation. Allied with these men was Albert M. Fuller, a graduate of the University of Wisconsin in 1923 who joined the staff of the Milwaukee Public Museum and became their curator of botany from 1933 until his retirement in 1964. (He died in 1981). Fuller, whose special interest was Wisconsin orchids, played a significant role in the protection of the Ridges Sanctuary natural area, especially set aside for its rich flora of orchids.

During 1937, Fassett, Fuller, and George Sieker, an attorney from Milwaukee with property in Door County, acquired the Ridges Sanctuary, aided by such other Door County residents as Emma Toft and Frank Oldenburg. They also encouraged another local group, with the help of George H. Conant, to save a prairie near Ripon. The same group, known as the South Woods Association, also saved a local woodland for Ripon.

During 1934-36 President Glenn Frank of the University of Wisconsin appointed committees for a "science inquiry," which brought together faculty from diverse university departments to plan interdisciplinary programs. The report of the committee on conservation of wildlife was published in 1937. Its members included Aldo Leopold as chairman, L. J. Cole, N. C. Fassett, C. A. Herrick, Chancey Juday, and George Wagner. This committee recommended dovetailing land uses with conservation practices and making a summary of preserves and sanctuaries. The report recommended four professorial chairs: one for fish management, one for game management, one for mammology and ornithology, and one for floral conservation. It is interesting to note that eventually, albeit in different schools and institutes, most of these have been added to the university staff. Floral conservation developed a bit differently. John T. Curtis, who had earned his Ph.D. at Madison in 1937, as instructor in botany taught a portion of a course on plant anatomy, plant physiology, and ecology. Curtis had been trained as a plant physiologist, working with orchids, but by 1941 he had shifted into ecology, and from then on developed the field of plant ecology for the Madison campus. He was, of course, intensely interested in preserving the stands of original vegetation with which he worked.

N. C. Fassett in the field with his spring flora class at Black Hawk's Lookout, Prairie du Sac, 1937. Photo J. W. Thomson

In 1946 the Wisconsin Conservation Commission established a Natural Areas Committee, composed of a representative each from the Conservation Department (Fred C. Wilson), the Milwaukee Public Museum (Albert M. Fuller), and the University of Wisconsin (Norman Fassett). Fassett's report for the committee to the president of the university was reprinted in the 1947 *Wisconsin Conservation Bulletin* and is an excellent summary of the situation at that time. It is an eloquent plea for preserving natural areas and noted ways in which they might be managed. Areas which that committee recommended preserving included *Cedarburg Bog, *Parfrey's Glen, Hope Lake bog, *Faville Prairie, *Ferry Bluff and *Cactus Bluff, Beech's Woods, Martin's Woods in Waukesha County, Babcock Grove near Albion, Dane Prairie relict near Arlington, a maple woods in Coon Valley, La Crosse, Black Hawk's Lookout (see photo) opposite Prairie du Sac, Bells Woods near Platteville, and *Fernwold in Wood County. Of these, the six indicated by asterisks have been saved by one organization or another; the others have succumbed to the march of "progress."

During the World War II years most conservation activities were in abeyance. Despite the travel restrictions, scientists from the University of Wisconsin and the Conservation Commission surveyed the Brule River during 1942–1944, and the resulting papers appeared in the *Transactions of the Academy* during 1945 and 1946, with more popular accounts in the *Conservation Bulletin.* Some papers were on such topics as topography and geology, the fish, and a paper by N. C. Fassett on the past and current vegetation, plus papers by J. W. Thomson on the vegetational cover and on the aquatic plants and bank flora. These studies engendered an awareness of the need to control alteration of the Brule River watershed vegetation. Most of the watershed is in the Brule River State Forest. The Nature Conservancy has recently obtained conservation easements on private inholdings to prevent subdivision.

In May of 1943 the lakes and streams committee of the university initiated a subcommittee consisting of E. F. Bean, N. C. Fassett (chairman), A. D. Hasler, Aldo Leopold, E. J. Muckenhirn, H. L. Russell, and J. W. Thomson to prepare a major in the biological aspects of conservation. This became available for students early in 1946 and has produced many graduates who as members of conservation organizations and in other capacities have influenced conservation efforts. Similar majors now exist at

UW-Stevens Point and UW-Milwaukee.

During 1948 Aldo Leopold died while fighting a fire at the shack. During 1954 Fassett died, and in 1957 was replaced in plant taxonomy by H. H. Iltis, a dynamic conservationist. In a meeting of the Wisconsin Academy in 1960 he urged the establishment of a chapter of The Nature Conservancy in Wisconsin. He was joined by Joseph Hickey, Gene Roark, Paul Olson, Dorrie Vallier, Marge Ryerson, and Avis Anderson in forming the chapter. The immense work of the chapter and its success in finding and saving areas are detailed in the accompanying paper by Virginia Kline and need not be summarized here.

By 1965 state garden clubs had also been active in acquiring areas worth saving. A Sheboygan garden club bought a natural area, and the Green Tree Garden Club of the Madison area purchased Lodde's Mill Bluff in Sauk County, Oliver Prairie in Green County, and Benedict Prairie in Kenosha County and then turned these over to the University of Wisconsin for management.

The State Board for the Preservation of Natural Areas evolved from the Natural Areas Committee of 1946 mentioned above. In 1951 the state legislature created the State Board for the Preservation of Scientific Areas. The first meeting of this board was called by C. L. Harrington of the Conservation Department and included Albert Fuller representing the Milwaukee Public Museum, Alvin Throne from UW-Milwaukee, Carl Welty from Beloit College, and George Watson from the Department of Public Instruction. John T. Curtis, who had served on the Natural Areas Committee since 1950, was soon added and served as the first chairman. The board operated without funds but nevertheless set about inventorying areas based upon their scientific botanical or ecological values, and designated thirty-seven of them by 1965.

In that year the Wisconsin Academy, under the leadership of President Walter Scott, named a committee on natural areas' use and management. The committee included Rezneat M. Darnell (Milwaukee), Boothe Courtenay (Madison), Harold Kruse (Loganville), Carl Welty (Beloit), James H. Zimmerman (Madison), Joseph J. Hickey (Madison), Orie L. Loucks (Madison), Philip B. Whitford (Milwaukee), and John W. Thomson (Madison) as chairman. The report of this committee was presented to the governor and was published in the *Wisconsin Academy Review*. Among other recommendations it suggested that the State Board for the Preservation of Scientific Areas be given financial and staff support for its work. From its beginning the state board was working with other agencies such as the counties, the federal government, and private groups like the Ridges in the preservation of natural areas. This report resulted in the association of the State Board for the Preservation of Scientific areas with the Wisconsin Conservation Department and having assigned staff from the Conservation Department. Clifford Germain was appointed and served exceedingly well in this capacity until his retirement in 1986.

Reorganization of the state government in 1967 changed the Conservation Department to the Department of Natural Resources. The State Board for the Preservation of Scientific Areas then became the Scientific Areas Preservation Council. In the mid-1970s the council was enlarged from six to eleven members. The council, with the Department of Natural Resources, actively inventoried, acquired, and designated new sites for preservation, by 1977 listing 139 sites encompassing 19,000 acres. In 1984 the work of the council was located in the Department of Natural Resources, Bureau of Endangered Resources as a natural areas section. Its staff then consisted of Clifford Germain, Paul Matthiae, William Smith, and Mark Martin. It has been active in finding, acquiring, and managing the areas designated by the council. Well over 200 areas have now been acquired or designated by agreements. Legislation in 1985 changed the name to the Natural Areas Preservation Council and strengthened the program by providing legal dedication of natural areas, match grant funding for acquisition, and a stewardship funding. Forest Stearns of UW-Milwaukee has served as chairman of the council since 1977. Others who have served on this council include Genevieve Bancroft, William Brooks, Grant Cottam, Gerald Davis, Martyn Dibben, Howard Druckenmiller, Robert Engelhard, David Engelson, Francis Hole, Cyril Kabat, Kent Klepinger, Virginia Kline, Henry Kolka, Boye Ladd, Orie Loucks, Kenneth MacArthur, Richard Newsome, Ron Nicotera, Laurie Osterndorf, Sumner Richman, Arne Salli, Carl Taylor, and Olive Thomson. The collaboration of this board with the Wisconsin Chapter of the Nature Conservancy has immensely aided the conservation of the most valuable remnants of native vegetation of Wisconsin.

Yet another organization involved in preserving native vegetation is the Botanical Club of Wisconsin, which was organized in 1968 under the aegis of the Wisconsin Academy. Starting with a club in the Madison area, this expanded to include chapters in La Crosse, Milwaukee, and Stevens Point. With the leadership of Robert and Sally Freckmann, the Stevens Point chapter tried to save a local woodland tract which was later deemed too full of "overage trees" and cut.

Further impetus for purchasing and preserving natural areas came from the 1984 act of the legislature permitting taxpayers to designate a portion of their rebate or additional tax to support the work of the Office of Endangered Species. A generous response by the taxpayers has enabled much work with both endangered plants and animals.

Aldo Leopold in the field in Walworth County with a class from the Lake Geneva Institute of Natural Sciences, 1940. Photo. J. W. Thomson

With the current emphasis in the newspapers, magazines, and radio upon environmental problems, strong support should be forthcoming for such conservation activities. It is obvious that the efforts of the people mentioned in this brief history could not have been effective without the help of many others committed to saving the remaining bits of Wisconsin's native vegetation. Future generations will owe them all a debt of gratitude.

References

Cheney, L. S. 1900. An historical review of the work done on the flora of the territory now included within the limits of Wisconsin. *Pharmaceutical Review* 18: 1-22.

Fassett, N. C. 1947. Natural areas. *Wisconsin Conservation Bulletin* 1-4.

Fuller, A. M. 1947. Saving Wisconsin wildflowers. *Milwaukee Public Museum Handbook* 1: 1-48.

Fuller, A. M. 1950. The Ridges Wild Flower Sanctuary at Baileys Harbor, Wisconsin. *Transactions of the Wisconsin Academy of Sciences, Arts and Letters* 40: 149-57.

Iltis, H. H. 1959. We need many more scientific areas. *Wisconsin Conservation Bulletin* 24: 3-8.

Kumlien, T. 1876. On the rapid disappearance of Wisconsin's wild flowers. A contrast of the present time with thirty years ago. *Transactions of the Wisconsin Academy of Sciences, Arts and Letters* 3: 56.

Leopold, Aldo et al. 1937. The university and conservation of Wisconsin wildlife. *Bulletin of the University of Wisconsin* 2211: 1-39.

Noland, L. E. 1965. Some Wisconsin biologists of the past and the significance of their work. *Transactions of the Wisconsin Academy of Sciences, Arts and Letters* 54: 95-106.

Read, R. H. 1976. Endangered and threatened vascular plants in Wisconsin. *Technical Bulletin* 92:1-60. Scientific Areas Preservation Council, Dept. of Natural Resources, Madison.

Stearns, F. et al. 1983. *Scientific areas long-range plan.* 1-136. Wisconsin Department of Natural Resources.

Stearns, F. 1984. Research in Plant Ecology at UWM—1965–1984. *UWM Field Station Bulletin* 17:18-30.

Thomson, J. W. et al. 1965. Natural areas use and management. 1964–65 Report to the Governor. 9-11. (Published by the Wisconsin Academy of Sciences, Arts and Letters).■

"In Nature when we pick out anything by itself we find that it is hitched to everything else in the universe."
John Muir

A Synecological Approach To Species Preservation

By Erik R. Brynildson

"The creation of the new science of ecosystem ecology is, without doubt, the most important single event that has occurred in the twentieth century." So declared Dr. S. Dillon Ripley, founder of the Smithsonian Institution. As the reading public has become aware, an ecosystem is a balanced natural unit that includes living and perished organisms, as well as the chemico-physical environment.

Although the synthetic, ecological viewpoint was accepted by scientists only toward the end of the first half of this century, a few naturalists and philosophers saw glints of it long before. Prairie painter George Catlin first proposed federal parks in 1832 to preserve extensive wilderness tracts that included the Plains Indians as a part of the native fauna "galloping their wild horses amid the fleeting herds of elk and buffalo." Catlin further lobbied in Washington, D.C. for "a nation's park." Yellowstone National Park, our first national park, was established forty years later.

In 1864 three years before German biologist Ernst Haeckel coined the word "ecology," the statesman-scholar-linguist George Perkins Marsh published the ecological classic *Man and Nature*, humbly subtitled *Physical Geography as Modified by Human Action.* In the book, Marsh gave to the most inclusive ecological unit we yet know the appropriate term "terraqueous machine." This carries the connotation of an energy component. Today we call it the "planetary ecosystem" or "biosphere."

Marsh perceived smaller systematic units also, albeit vague, but unique for his time: "We must remember that a forest is not an arbitrary assemblage of trees, without bond of union. It is, on the contrary, a whole, the different parts of which are interdependent upon each other, and it constitutes, so to speak, a true individuality. Every forest has a special character, determined by the form of the surface it grows upon and other factors."

Just before the turn of the century, a pair of University of Wisconsin limnologists, E. A. Birge and Chancey Juday, applied the term "microcosm" to a lake and studied it as an ecological unit. About thirty years later, Nebraska botanist Frederick E. Clements applied "holism" to biology. He concluded that the primary unit in ecology should be the community, not cells or individuals. Though his claim that living communities could be considered "super-organisms" was met with great resistance by his contemporaries, it did help usher the way for the modern ecosystem concept. Even today, within government bureaucracies and academia, only a small minority believe that the division of Clements's "super-organisms" is arbitrary and unnatural. The reasons are not always clear why such disparate views are held by ecologists. It has been suggested that a preference for classification is developed in childhood and persists as a habitual form of thought throughout adulthood. Other theories hold that biologists are so indoctrinated with the hierarchical taxonomy of organisms that they find it nearly impossible to think in other ways. Whatever the root-reasons, such ingrained mindsets are myopic and inappropriate to the maxim of ecology.

The U.S. Endangered Species Preservation Act passed unopposed in 1966, riding on the success of such tame legislation as the Inter-American Treaty on Nature Protection and Wildlife Preservation (1940); the Fish and Wildlife Act (1956); and the Land and Water Conservation Fund Act

(1965), which provided funding for threatened habitat protection.

Pioneer campaigns to save a single species from extinction, such as the brown pelican, whooping crane, and bald eagle, were well received scientifically, politically, and publicly. Nothing indicated that endangered species preservation was anything but a harmless posterity-rendering program at most. Federal endangered species protection was further extended and defined in 1969 and 1973. About the time of the latter revision, the states began to join in the recovery efforts. Wisconsin passed endangered species legislation in 1972. Arising from the initial decade of protective legislation were some conspicuous keystone animals, such as the grizzly, timber wolf, great whale, California condor, and bald eagle.

But it took the addition of a three-inch fish to the endangered species list in 1976 to test the teeth of the federal act. The now-famous Snail Darter v. Tellico Dam case in Tennessee clearly illustrated that a single species or autecological approach to the salvation of threatened life forms does not work, at least not well enough. Even though the fish itself was protected by law, it would soon disappear forever unless its habitat was likewise protected and preserved. The lesson of the snail darter is that habitats or whole functioning communities must be protected as an integral part of any endangered species preservation program.

In the wake of Tellico, the Endangered Species Act was amended to require economic impact analysis as well as analysis of a species' critical habitat, prior to listing. This requirement is hardly reminiscent of the committed-at-any-cost tone of the original version of the act.

In media and political debates that surrounded the Tellico dispute, much was made of the size of the "tiny fish," as though size governs ecological importance. Even a casual observer of the earth's processes soon realizes that many of its most essential members are unseen and minute. Consider oceanic plankton; although microscopic, they provide the single greatest share of the planet's food energy. Since we cannot photosynthesize, we are ultimately not as free and self-sustaining as duckweed. Again consider the myriad of "lowly" life forms that shred decaying matter and build nutritious soils—the same soils that grow our food. Would congress halt dam construction for a fungus, a slug, or an earthworm? I doubt it. They may, however, for an old-growth forest.

Recently, another classic example of single species protection versus threatened/endangered community preservation has come to the fore. Along the Pacific coast, from northern California through Washington state, lives the northern spotted owl. The bird's critical habitat is the ancient coastal coniferous forest community, endemic to the Pacific Northwest region. These last old-growth stands only represent board footage to large logging operations seeking increased profits. Not unlike the snail darter, the spotted owl is also inconspicuous and "tiny" in stature. Both species, however, act as indicators or barometers of ecological health, whether for landscape or fresh water, similar to the canary-in-the-coal-mine phenomenon.

Countless other examples can be cited worldwide. The tragedy of endangerment to natural diversity is that the problem is rapidly becoming greater in magnitude and political complexity. Many of the earth's organisms facing either local extirpation or extinction are highly evolved in situ; that is, they are ultra-specialized in their ecological habits, often sharing a state of symbiosis with a fellow niche-member. Most of these organisms are beyond "native" to a region or continent, but are typically endemic to a place. One place on one planet—*only*.

For many birds and marine mammals, especially the photogenic cranes and whales, preserving a single habitat or community type just isn't enough. Unlike most plants and animals, these species migrate great distances between their respective breeding and winter resting regions. Whether it be a crane in the air or a whale in the water, neither can detect political boundaries. Their only hope is planetary cooperation, international laws to protect both organism and the "super-organism" it is dependent upon for continuance.

Biological communities exhibit a property that I call "eco-rhythmicity," a repeating pattern of events. They are characterized by a beginning, an interim of sustenance, and a finale. This can be seen in small sea life, vertically migrating through the water column by day; in the autumnal food-caching of squirrels; and in the seasons themselves.

Though one missing note disrupts the tempo, the composition survives. Natural succession, when applied to legislation to benefit waning life forms, has evolved to where we now must legally designate whole communities as "threatened" or "endangered." Such state-of-the-art legislation would create a protective umbrella over functioning ecosystems, from soils to swans, as well as such landscape "intangibles" as aesthetics, history, and sense of place.

Jack pine barrens, deciduous savannas, prairies, wetland phases, and forest types, as well as antique folk settings, are all viable candidates for protection in Wisconsin.

Landscape or community alteration and annihilation are responsible for a full three-quarters of all extirpations and extinctions. The time has come to cast a larger, more buoyant life ring. A captive masthead is of little value without the ship. Divergency is our anchor. Nothing less than a holistic, symphonious, no-compromise commitment is needed to save not only Clements's "super-organisms," but what remains of the greater continuum as well. The good Earth, our only home, may meet universal criteria for endangerment. Under the sun, all things are a matter of scale.■

Tree Diseases in Wisconsin's Urban Forests

By R. Bruce Allison

Of Wisconsin's 4.7 million population over three million are urban forest dwellers. They are shaded by the public trees growing along roadways, in parks and preserves, or by the private trees in residential yards or institutional grounds. Whereas commercial forests are cultivated as crops primarily to produce pulp and lumber, urban forests are maintained for landscape aesthetics, architectural contributions, and engineering benefits such as cooling and wind resistance.

Community desirability and property values are significantly enhanced by a well-maintained tree landscape. According to a study conducted by the Weyerhaeuser Company, trees can contribute up to 20 percent of residential property value. The City of Milwaukee estimates the value of its 330,000 street trees to be $384 million, and they require a $10 million annual budget to maintain them. Wisconsin's first natural scientist, Increase Lapham, recognized the value to the community of landscaping with trees when in 1867 he wrote:

> Desolate indeed would be our dwellings were their environs entirely treeless. They are associated with our early recollections and become in a great degree companions of our lives . . . increasing our love of home and improving our hearts.

The Wisconsin urban forest is subject to various diseases which can diminish its condition and value. Who can forget the impact and economic loss caused by the Dutch elm disease epidemic as it swept across the United States leading to an estimated loss of 60 million trees, with a financial loss in the billions. Fortunately, not all of the diseases which threaten Wisconsin's trees are as damaging as Dutch elm disease.

Plant pathologists define disease as an interaction between a host plant, a pathogen, and environmental factors which result in damaging effects on the plant's physiology (vital functions) or its morphology (structure). Pathogens are living organisms, usually microscopic, which invade and develop in plant tissue mostly obtaining needed nutrients parasitically

The last elm taken down (1974) on State Street in Madison, directly in front of the State Historical Society of Wisconsin. Justin (Chet) Schmiedeke, photographer. Courtesy of State Historical Society of Wisconsin.

from the living host. Pathogens include fungi, bacteria, viruses, viroids, nematodes, mycoplasm-like organisms, and phanerogams.

Diseases develop when (a) a virulent form of a pathogen (b) comes in contact with a susceptible host (c) under favorable environmental conditions. A disease will not develop if any of the factors in this triad is absent. The severity of the disease is a function of the coordination of these three factors, which explains why a disease may be severe one year and totally absent the next year.

Diseases of plants can also result from abiotic or nonliving causes. These are generally physical or chemical components of the environment that harm plants. Examples are extremes of temperature or soil moisture, unfavorable conditions of light, deficiencies, excesses, or imbalances in soil nutrients, toxicity of pesticides, or pollutants of air. Some scientists refer to damage from such abiotic causes as "injury" rather than disease. Unlike most biotic or pathogen-caused diseases, abiotic tree diseases are noninfectious but are nonetheless quite significant in the urban forest.

Specific diseases can be grouped by the part of the tree affected. For example, systemic diseases are those that invade the vascular system of the tree, foliar diseases affect leaves or needles, and stem diseases cause cankers or ulcerations on the root, trunk, or branches. Though there are hundreds of tree diseases, I will limit my review to a selection of certain systemic, foliar, and stem diseases which are the most prevalent and/or damaging in the Wisconsin urban forest.

Systemic diseases

Three serious systemic diseases are Dutch elm disease, oak wilt, and verticillium wilt. Dutch elm disease is caused by the fungal pathogen *Ceratocystis ulmi*. Spores of this fungus can be transferred from infected elms to healthy ones by elm bark beetles. The beetles, which breed under the bark of dying elms, move on to feed in the crowns of other elms creating small wounds which become points of entry for the pathogen. Once in the tree, the fungus can be passed to neighboring elms by underground bridges formed by grafted roots. This explains the speed with which the epidemic overtook the elm-lined streets of American cities. In reaction to the invading fungus, the elm plugs its own water-carrying vessels resulting in its wilting and

death. Ironically, it was the tragic devastation caused by Dutch elm disease that made Europe and the United States more aware and appreciative of the urban forest. Legislative incentives and scientific research have led to disease-resistant elms and to fungicide injection treatments for this disease.

A fungal pathogen (*Ceratocystis fagacearum*) related to Dutch elm disease is the cause of oak wilt. It can enter the tree through root grafts or through fresh wounds made in the vulnerable spring/early summer season. Unlike in Dutch elm disease, there is no insect which both carries spores and makes wounds. However, once a wound is made by people, animals, or wind, some insects, especially the picnic beetle, can carry spores to wounds thus completing the disease development triad, i.e., host (oak), pathogen (*C. fagacearum*), environment (wound in vulnerable season). Oak species differ in their reaction to the systemic infection. Red and black oaks wilt and die quickly. White and bur oaks usually show symptoms in just part of their canopy. They may progressively decline over years, but they often grow beyond the infected vessels and recover. The phenomenal stress factor of the 1988 drought which continued through the spring of 1989 dramatically decreased the frequency of that happy ending for infected white and bur oaks.

There are no therapeutic treatments for oak wilt. However, isolating infected trees by severing roots and avoiding wounds in spring and summer is effective in preventing infections. Some Wisconsin municipalities have passed ordinances making spring or summer pruning of oaks illegal.

A third significant systemic tree disease in Wisconsin is verticillium wilt. It affects a variety of trees including ash, catalpa, linden, maple, Russian olive, smoke-tree, and red bud. The pathogen, a fungus (*Verticillium dahliae*) which can live indefinitely in soil, enters trees through wounds in roots, trunk, or branches. Recent research by Gayle Worf, professor of plant pathology at UW-Madison, has linked verticillium infection to the mysterious "ash decline" disease affecting many trees of that species in southern Wisconsin. It is interesting to note that the incidence of verticillium during the 1988–89 drought seems to have diminished, indicating that dry soils present an unfavorable environmental condition for the development of this disease.

Foliar diseases

The foliar diseases common in the state's urban forest are scab and rust. Scab affects many crabapple varieties leading to dried, curled, or spotted leaves in late spring and summer. Wet seasons can lead to epidemics resulting in total leaf drop and somewhat reduced tree vigor. The causal fungal pathogen (*Venturia inaequalis*) is spread by wind or splashed by rain to new leaves from infected ones. Fungicide sprays are effective in controlling this disease, but a far better approach is to plant one of the scab-resistant varieties of crabapple, thus eliminating the vulnerable host from the disease development triad.

Rust is an interesting tree disease because it requires two hosts to complete its life cycle. There are two common rust fungi: *Gymnosporangium juniperi-virginiani* which causes cedar-apple rust and *Gymnosporangium globosum* which causes cedar-hawthorn rust. On the cedar—properly called juniper—the rust fungus produces a reddish-brown growth up to two inches in diameter. During wet spring periods these growths, called galls, swell and push forth gelatinous spore-producing projections. The spores leave the juniper host, finding their way to the alternate host, apples or hawthorns. They infect the leaves or fruit forming rust-colored spots. These points of infection in turn produce spores which can reinfect junipers, thus continuing the cycle. The hosts are disfigured for the season but seldom significantly harmed.

Stem diseases

Three stem diseases that can do permanent harm are honey locust canker, cytospora canker on spruce, and maple decline. These are diseases resulting from parasitic fungi invading the woody tissue and causing ulcerations, called cankers, in the cambial zone. These cankers, if large or numerous enough, will inhibit movement of water and carbohydrates in the tree leading to the branch dying back or to the decline or death of the tree. *Nectria cinnabarina* is the common cause of honey locus canker in Wisconsin. *Cytospora kunzei* causes canker on spruce and successfully invades only more mature trees. Cankers at the root collar and trunk base of sugar maples result from infections by the fungi *Phytophthora* and *Fusarium*. Research leading to an explanation of maple decline was conducted at UW-Madison about ten years ago.

As our urban forests grow and expand, the importance of research on tree diseases increases. The urgency of maintaining healthy urban forests is made greater by the dramatic loss of forests elsewhere and the global threat of excessive carbon dioxide levels leading to overheating. The American Forestry Association has initiated a program called Global Releaf with a goal of planting an additional 100 million new urban trees in the United States by 1992. We hope that people in Wisconsin will respond to the challenge by planting trees and properly maintaining them for many years to come.

References

Kostichka, C. J. 1982. Investigation of butternut canker and Dutch elm disease. M.S. thesis. University of Wisconsin-Green Bay.

Lapham, Increase A. 1867. Report on the disastrous effects of the destruction of forest trees. Madison.

The value of landscaping: ideas for today. 1986. Vol. 4. Tacoma, WA: Weyerhaeuser. ■

Poems by Victoria Ford

Following the Swan

If I move, you will go back to the wild myth you came from,
and so I follow you with a blink, and a blink,
my feet having joined the pavement, as you turn
the fat ducks into sandpipers, the water
into circles of yourself.
How much farther
can a neck bend beauty? I watch the iceberg
of your folded wings, not daring you
to open them, not having admitted your name,
a word I have not seen afloat
in twenty years, except for yesterday
in the marsh.
I do not wish to see the feather
of a greater flock than duck, those that accept
our ponds and pavements, that we have made or made
room for in the essays of our lives:
I cannot fit "swan" into a day
of buses and motor boats; I do not know
if you can fly, until I look you up
in the books I keep at home.
Yesterday,
in the marsh, I keep you secret as the land
talking to water: You drift near the reeds
and the willow roots, as I walk near the edge
of the unpronounceable; when I leave, I leave
you floating in hyacinth and myth.
But today, you come here, and I watch the ducks watch you,
as rowboats keep an eye on the galleon,
and wonder how much weight a lake can hold.

When tomorrow comes, you are gone. I follow
the lines of leg and sidewalk, until
at dusk, I move in the shadow of my own feet,
leaving behind the lines of feather and pond,
walking beyond the pages of the past
two days, when you swam around my reality
like words blurring after days of reading,
and I blink, focusing into the clearing dark,
when night wings the air, and the moon
reeds and willows the still of the lake;
there floats a white hush; I move like the ripples
to the book of the shore

Drought

In silence
the summer
aspen leaves
dangle,
their hearts

hanging like fruit,
as shaped as desire,
as still
as a promise
sagging in the air;

until a wind
chatters into the aspen
and taps the leaves
against each other: they rain
leaf on leaf

as though sound alone
made sense
enough to stir
a drop
from the white-blue sky.

Vein against vein
the aspen
leaves rattle,
and sound
thins into insult

like a lover
gritting words;
a leaf, a leaf
another leaf drops,
until the wind

drops, and the aspen
stands like a stone,
and the leaves
that endure
shudder and hold still.

The University of Wisconsin Arboretum:

Restoring Biotic Communities

By Virginia M. Kline and Grant Cottam

Each spring hundreds of visitors come to the UW-Arboretum, stroll on the lawns of the Longenecker Horticultural Garden, and enjoy the spectacular flowering of the outstanding collections of lilacs and crabapples for which the garden is known. Many of these once-a-year visitors are unaware that the UW-Arboretum is known worldwide for its pioneering efforts to establish quite a different sort of collection, a collection of *biotic communities*, which covers much of the 1270 acres. In contrast to the tree and shrub collections displayed in mowed lawns which are characteristic of most arboreta, a biotic community consists of the complete assemblage of plants and animals that normally grow together in nature. Developing a collection of such communities was a unique idea when it was adopted as a goal for the new University of Wisconsin Arboretum fifty-five years ago. Attempting to reach that goal has presented unique challenges, learning experiences, and research opportunities.

Since adding the animals that should be in the biotic communities is even more difficult than establishing the plants, the approach has been to provide the proper habitat (the plants growing in their proper place) and hope that animals, being mobile, will discover and colonize it. The Arboretum is not large enough to provide a home for bison or wolves, but many smaller mammals, birds, and invertebrates have colonized the communities.

Natural communities in Wisconsin often contain over one hundred different kinds of higher plants, and even more kinds of bacteria and fungi. Needless to say, getting all these plants together in the proper proportions on abandoned or denuded land was, and still is, a herculean task. At the time the UW-Arboretum was started no one even knew what trees, shrubs, and herbs occurred in the different communities and in what relative numbers. Acquiring this basic information was critical for developing planting plans. Graduate students under the direction of John T. Curtis of the University of Wisconsin-Madison Botany Department surveyed the state in depth, and the result of these labors was his book, *The Vegetation of Wisconsin*, published in 1959, which is one of the classics of American ecology. In connection with these studies, Curtis and his students developed a master plan that has guided development of the Arboretum communities.

Beginnings

The idea of having an arboretum is almost as old as the university itself, having been first proposed by Increase Lapham in 1853. There were many suggestions about the location and about what it should contain. Many prominent residents of the state, and particularly of Madison, promoted the idea and participated in the planning, among them University of Wisconsin Regent Michael Olbrich, who in 1927 secured the Board of Regents' approval to begin development of an arboretum around Lake Wingra. Olbrich's leadership was lost with his death two years later, but Colonel Joseph W. Jackson, a prominent civic leader with a talent for fund raising, was able to rekindle interest in the project, and the first land purchase was made in 1932. Influential members of the UW-Arboretum committee organized to direct the fledgling project included chairman E. M. Gilbert, of the botany department, Albert F. Gallistel, director of buildings and grounds for the university, Norman C. Fassett of the botany department, and Maurice E. McCaffery, secretary of the Board of Regents. Soon after the formation of the committee, two members were added: Aldo Leopold, recently appointed to the University of Wisconsin faculty as the country's first professor of game management, and G. William Longenecker, landscape architect in the horticulture department, who was named executive director of the Arboretum.

As the planning began, several committee members, including Gilbert, Fassett, Leopold, and Longenecker were interested in the idea of developing biotic communities. It was Leopold who, at its dedication in 1934, said that the UW-Arboretum should be "a sample of what Dane County looked like when our ancestors arrived here." It was a grand plan, a stroke of genius. Leopold showed remarkable insight in describing the difficulties of this endeavor, though even he underestimated its complexities.

Even the most astute biologist could not foresee all the problems, and the Arboretum committee was well supplied with astute biologists, notably Leopold, Fassett and, later, Curtis—all giants in their fields. Over the years the "Dane County" aspect of Leopold's idea was broadened to include all the biotic communities of the state and, rarely, areas outside of Wisconsin, with the degree of success inversely proportional to the distance from Dane County.

The year 1934 was a time of economic depression and extreme drought, hardly a propitious time to launch such an ambitious project, but this timing actually turned out to be an advantage in acquiring the key elements for a successful beginning: land and labor. Because of the failure of many farms during the drought, land prices were low, making it possible to acquire larger parcels of land with money contributed to the project. Land acquisition was accomplished entirely with private funding, most of the money coming from a few generous benefactors such as Louis Gardner. Labor was provided the first year by the Wisconsin Emergency Relief Administration, and from 1935 until 1941 by the Civilian Conservation Corps (CCC), an agency established during the Depression to provide conservation work for unemployed young men. Living in a camp set up not far from what is now the headquarters area, 200 CCC recruits built ponds, roads, fences, walls, and shelters. They also planted trees, shrubs, and hundreds of prairie plants. Buckets were used for the watering that was so critical during those drought years. This essentially free labor was of the utmost importance in setting the UW-Arboretum on its course.

The first plantings

Fassett had a special interest in prairies. By 1935 he and his students, with the help of the CCC, had set up experiments to study the feasibility of establishing prairie in a sixty-acre field that had been a horse pasture. Since no one had ever attempted such a project, there were no how-to directions. To obtain planting material the crew went to relict prairies in sandy areas along the Wisconsin River, on very dry rocky hills, and in wet meadows. They dug sods, which were then planted into the old pasture. Digging sods is labor intensive, but has the advantage of providing not only the species of greatest interest, but other higher plants growing with it, and the bacteria, fungi, and invertebrates as well. Other methods were also tried. Native prairies were mowed at different times of year and the "hay" collected and spread over prepared areas of the site. Some planting of seeds of individual species was done. Given the experimental nature of these attempts and the drought that occurred during the time the planting was carried out, it is surprising that there was any success at all, but many of the plants did become established and it was soon apparent that the sod planting was most successful. The experiments were accompanied by the first major planting of the pasture, by the CCC crew under the direction of Theodore Sperry, a professional ecologist who was employed by the UW-Arboretum from 1936 to 1940. After pioneering experiments on prescribed burning carried out by Curtis and his students in the 1940s showed that the pasture weeds could be discouraged and prairie species encouraged by burning, a burn schedule was implemented for the new prairie (later named Curtis Prairie).

A few years after the first large prairie was started, Henry Greene began to plant a prairie in a forty-acre former corn field at the southern boundary of the UW-Arboretum. The soils were mostly sandy, but varied from wet to dry. Greene was a mycologist on the staff of the UW Botany Department with a long interest in and familiarity with Wisconsin prairies. He asked for and was granted complete autonomy in the planting of this prairie, and proceeded to plant it himself with great skill and artistry, using a variety of techniques and keeping careful records of his trials.

All of the upland woods in the UW-Arboretum were oak forests at the time of acquisition, differing in soil type, topography, and in the amount of past disturbance. Two that are contiguous, Wingra and Gallistel Woods, lie on the north and south slopes, respectively, of a ridge paralleling the south shore of Lake Wingra. On the steep north slope the canopy is dominated by very large red oaks, while the more gradual south slope and the top of the ridge support white oak, black oak, and black cherry. It was decided that these woods should be converted to mesic forests, which were not represented in the UW-Arboretum. Gallistel Woods (thirty acres) was to become a southern mesic forest dominated by sugar maple, basswood, and beech, while Wingra Woods (forty-five acres) would have those three species as well as hemlock and yellow birch, which are found in mesic forests in northern Wisconsin. Hundreds of tree seedlings were planted beneath the oaks from 1941 to 1961. Large numbers of mesic forest wildflowers and ferns were also planted. The lowest, most southern portion of Gallistel Woods was to represent Ohio Valley hardwood forests, so the plantings there included trees such as Ohio buckeye, tulip poplar, and flowering dogwood, which do not occur naturally in Wisconsin.

The least disturbed of the oak woods, Noe Woods (thirty-six acres), is a black oak/white oak woods on moderately dry soil. The only management planned for this woods was continued removal of trees and shrubs not native to Wisconsin to allow for long-term interaction of the native species, and the natural changes in the woods that would occur. Grant Cottam, botany professor emeritus, and his students have been following those changes for forty years, and what they have learned has challenged

some widely held beliefs about succession in oak forests. No one knows what changes will take place naturally in unharvested oak woods in southern Wisconsin in the next century, and this is one of the few places where those changes can be documented.

Pine plantings in the UW-Arboretum began in the spring of 1933 before any labor force was available. Fifteen thousand pine seedlings were donated by the Wisconsin Conservation Department, and these trees along with 150 larger pines donated by McKay Nursery were planted by university students at a gala work day. This was the beginning of fifty acres of pine plantings that were to be developed to represent the drier forests of northern Wisconsin. Smaller numbers of white birch, red maple, and other species of trees frequently associated with the pines in northern Wisconsin were also planted. Numerous trips north were made to bring back truckloads of herbs and shrubs.

Present status of the communities

The prairies are undoubtedly the most successful of the restored communities. Three-hundred species of prairie plants have been established in Curtis Prairie and Greene Prairie, providing a continuous display of color and texture throughout the season. This year, visitors to Curtis Prairie, the oldest restored tall grass prairie in the world, were treated to spectacular shows of tall, white wild indigo in July and of prairie gayfeather and prairie dock in August. On the silt-loam soils of this prairie big bluestem grows as tall as ten feet during a good year, and walking through it on the narrow trails gives the visitor the feeling the settlers may have had when they first encountered the "sea of grass." The success of Curtis Prairie and its visibility in the UW-Arboretum has contributed to the current surge of interest in prairie plantings for wildlife areas, parks, grounds of schools, and other institutions, and commercial property.

How good a representation of the original prairie is it? Unfortunately the lack of a naturally occurring prairie on good silt loam soil in southern Wisconsin to serve as a model makes it difficult to answer that question. We know that the number of prairie species and their distribution (roughly ten prairie species in each half square meter in substantial parts of the prairie) compare favorably with remnant prairies on other types of soil, and that many of the prairie plants are continuing to spread. Some species have been less successful, and research is in progress to evaluate the role of competition as a factor in the lack of success.

Henry Greene Prairie is a remarkably diverse prairie with few problems, due at least in part to the skill of its creator, but also to its poorer soils, which favor prairie plants over weeds.

There are many nonnative species present that never occurred in the presettlement prairies. Curtis Prairie was a pasture before it was established; Greene Prairie was a cornfield. Both contained a rich assortment of agricultural weeds. It has been much more difficult to get rid of the weeds, particularly the pasture weeds in Curtis Prairie, including Kentucky bluegrass, sweet clover, and wild parsnip, than it has been to establish the prairie species. The most widely distributed plant on the prairies is still Kentucky bluegrass. This nonnative species is ubiquitous in prairies all over the country, and there seems to be little hope of eradicating it. However, prescribed burning appears to suppress growth and flowering sufficiently to keep it from competing seriously.

In the case of sweet clover, research carried out by Virginia Kline at the UW-Arboretum has shown that a change in the timing of burns is the key to control. Sweet clover is a biennial, living only two years, and producing seed the second year. The former practice of burning in spring every two or three years actually increased the amount of sweet clover because burns stimulate germination of seeds and also because plants germinating after early spring burns

A winter view of Wingra Woods, showing the large red oaks, the smaller planted sugar maples, and the absence of shrubs. Photo by Don Kirkoff, 1980.

are more likely to survive the winter and mature to produce seeds the second year. Changing the burn schedule to include later burns (early to mid May) to kill second year plants has eliminated sweet clover in an extensive area of Curtis Prairie where in a growing season with adequate rain there had been a continuous canopy six to eight feet tall. In other areas it has been necessary to supplement the May burns with mowing or hand pulling of second-year plants to keep them from seeding.

Neither burning nor mowing controls wild parsnip. Small areas have been controlled by hand pulling to prevent seeding. In general parsnip appears to die out gradually in the better parts of the prairie except along the trails, so the best strategy may be to pull it along the trails (and other disturbed places) and let the prescribed burns continue to improve the health of the prairie.

Of special concern is leafy spurge, a more recent arrival in the prairies. This is an extremely aggressive weed with a deep storage root system and the capability of spreading rapidly by runner or by seed. No effective control measure has yet been developed.

Changing oak woods to more mesic forest types has presented a different set of problems. The underplantings of sugar maple, basswood, and beech in both woods and of yellow birch and hemlock in Wingra Woods have done quite well, as have a few of the groundlayer herbs. Honeysuckle and buckthorn, invasive Eurasian shrubs that have been a major problem in all the UW-Arboretum oak woods, have been greatly reduced—partly as a result of many crew hours devoted to cutting and applying herbicides and partly because of the increased shade cast by the planted trees. (The shade also helps prevent reinvasion.) The results are aesthetically pleasing, especially in spring when the wildflowers are showy and in fall when the combination of oak and sugar maple foliage colors is spectacular.

There are, however, substantial differences between these woods and natural sugar maple forests. First and most obvious is the difference in the number of seedling and sapling sugar maples present. A forest dominated by sugar maple characteristically has abundant seedlings and saplings of all sizes, and the trees vary in size as well. In Wingra and Gallistel Woods there are as yet almost no seedlings or small saplings, and of course there is not much variation in the size of the trees. If for some reason this site will not support sugar maple reproduction, it will be extremely difficult to develop a realistic mesic forest.

A second concern is the lack of success in establishing many of the mesic forest wildflowers. Some of the species planted did not survive at all; others survived but did not spread. Only a few, such as toothwort and troutlily, have increased substantially, and then mainly by spreading vegetatively. Large areas of the forest floor are essentially without herbaceous plants, and where there are plants the spatial pattern is not like that in a natural forest. Some of the reluctant species depend on ants for dispersal of their seeds, and research done by UW-Arboretum ranger Brock Woods has shown that in the Arboretum woods there are very few of the kinds of ants that carry the seeds around. Such ants are abundant in natural sugar maple woods. Other factors that may be restricting mesic forest herbs (and possibly sugar maple reproduction as well) include soil that is too dry or too low in some mineral nutrient, too much oak leaf litter, a climate less suitable than that found in areas with naturally occurring sugar maple forests, or excessive predation by deer or other animals. A graduate student is currently investigating some aspects of the role of nutrients.

The pine forests are another example of greater success in establishing trees than understory. In general the largest pines today are the white pines; those that are most impressive in size usually were planted low on a slope, near a firelane, or near a deciduous tree, and not too close to another white pine. Mortality has been highest in the red pines, especially those high on a slope. The pines were planted densely in anticipation of a timely thinning, but the first plantings were never thinned. Some of the later plantings were thinned five to ten years ago, and they appear to have responded to the thinning. In marking the trees for thinning an attempt was made to make the pine spacing more irregular, to favor any surviving red maples, white birches, and other appropriate deciduous trees, and to open up clearings for additional plantings.

The groundlayer has undergone some interesting changes since the trees were planted in what had been a grassy field. When the pines became large enough to form a continuous low canopy, the grass was shaded out, and for many years there was virtually *no* groundlayer. As the trees became larger and conditions changed, shrubs, vines, and trees began to invade the forest floor. The pines provided attractive roosting cover for birds, and nearly all of the new invaders, including black cherry, woodbine, poison ivy, and of course honeysuckle and buckthorn, had small, bird-dispersed fruits. Some of the areas of red pine developed a continuous groundlayer of bittersweet nightshade. When the canopy was opened by thinning or by pine mortality, honeysuckle and buckthorn were quick to fill the gaps.

Poor survival and little spread was the rule for most of the planted groundlayer species. For example, over 1,000 wintergreen plants have been planted over the years, but none can be seen today. On the other hand, starflower, partridge berry, and gaywings did become established and in recent years have begun to spread. The thick layer of pine needles that has accumulated is gradually providing a more natural substrate for the shallow roots of these northern species, and there have been several years of good

View of Henry Greene Prairie from the adjacent oak woods. Photo by Norman Lenburg, UW-Madison, c. 1980.

snowfall to protect the evergreen leaves of partridge berry and gaywings. As further changes take place in the soil under the influence of the pine litter, it is possible that more of the northern species will find conditions suitable. It is probably advisable to wait for soil changes to take place *before* attempting groundlayer plantings in situations where a new canopy type is to be developed.

Other communities that were planted have received less attention, including a dry prairie planted on a low mound built up with crushed limestone, a boreal forest, a sphagnum bog with tamaracks, a white cedar swamp, and a red cedar glade. None of these communities is as successful as the prairies or Wingra Woods, but in another fifty years, with active management, they too might begin to approximate their natural models. And, as in the cases described above, attempting to put the pieces together may increase understanding of the community.

The most overwhelming problem interfering with further biotic community development is the massive invasion of woods and wetlands by honeysuckle and buckthorn. Research in the Arboretum by the authors has identified safe and effective control techniques using herbicides and has documented the response of the ground layer plants after liberation from the dominance of those species. However, the techniques are labor intensive. The UW-Arboretum crew has been able to control these species in Noe, Wingra, and Gallistel Woods, and volunteers have helped control them in selected choice areas, but the considerable follow-up required to prevent reinvasion and the small size of the crew prohibit rapid expansion of the attack into the hundreds of acres that still need treatment. It is a situation that must make UW-Arboretum director Greg Armstrong yearn for the days of the CCC!

Looking ahead

Future plans and dreams for the UW-Arboretum include the development of twenty-five or more acres of oak savanna in an undeveloped part of the UW-Arboretum south of the Beltline where scattered oaks were planted thirty-five years ago, development of an open oak woodland and savanna complex by use of prescribed burns in a dry oak woods that now is infested with impenetrable honeysuckle and buckthorn, and creation of a thirty-five-acre marsh with cattails and other emergents as part of a wetland improvement project. None of these communities is well represented in the UW-Arboretum, yet they were truly part of "what Dane County looked like when our ancestors arrived here."

Since Leopold spoke those words, interest in the use of biotic communities for land restoration has become widespread in this country and beyond, and the Arboretum has become an acknowledged leader in the field of restoration ecology. The new restoration projects in the Arboretum and the research accompanying them will contribute importantly to the growing body of knowledge in this field.■

In My Opinion . . .

The Race to Save the Planet

By Charlotte R. Zieve

To what point do we defend from foreign enemies a country that we are destroying ourselves? The foreign threat inevitably seems diminished when our air is unsafe to breathe, when our drinking water is unsafe to drink, when our rivers carry tonnages of topsoil, . . . when our forests are dying from air pollution and acid rain and when we ourselves are sick from poisoning in the air. . . . Who are the enemies of this country?
(Wendell Berry, *Home Economics*, North Point Press, 1987)

National security has traditionally been defined strictly in military terms. World leaders are just beginning to acknowledge that if livable conditions are not preserved national security becomes a meaningless concept.

The following problems present formidable challenges to the world community:

- Earth's forests are being destroyed at the rate of one football field's worth every second.
- A hole is opening in the ozone layer, reducing the earth's ability to protect life from ultraviolet radiation.
- Living species that inhabit the earth are being destroyed at an unprecedented rate, such that more than half may disappear in the next few decades.
- Toxins in growing volume are poisoning our groundwater.
- Carbon dioxide, methane, and chlorofluorocarbons dumped into the atmosphere trap heat and may trigger a global warming trend.
- The continuing wholesale worldwide loss of topsoil is undermining future food productivity at the same time world population continues to escalate.
- World fishing grounds are being destroyed through overexploitation.
- Each year irreversible desertification claims an estimated six million hectares worldwide.

The most daunting impediment to solving the world's environmental problems is the present arms race. It is diminishing the potential of rich and poor countries alike to provide their citizens with a healthy environment as well as a sound economy in which to live. The report of the 1989 economic summit—which included the United States, Japan, West Germany, France, Britain, Italy and Canada—noted with "great concern the growing pollution of air, lakes, rivers, and seas." Although this concern was not translated into a call for specific action, the report cautioned against delaying action because of uncertainty on some of the issues.[1]

The global community spends one trillion dollars each year on weapons systems which put the entire world in jeopardy, while degrading and destroying the resource base which sustains us. This vast outlay for military spending also diverts scientific talent which could be used to better advantage addressing industrial, social, and environmental needs. In fact, 27 percent of all U.S. scientists and engineers are engaged in military work.[2] Worldwide, perhaps as many as five million people, either as soldiers or as workers in military industries, are on the military payroll.[3]

The threats to natural life-support systems are the whole world's enemy. The Earth Day 1990 celebration is designed to elicit a worldwide public demonstration to galvanize the nations' political leaders into cooperating to stop the deterioration of the planet. International treaties to address such global environmental problems as destruction of species, climate modification and degradation of the air, land, and water should be ratified. Finally, world leaders must end the arms race and rechannel resources from the military to the civilian economy.

Growing environmental awareness should create a new willingness to collaborate on a global basis. If we can successfully initiate the battle to preserve the integrity of the planet, we might then stand a chance of solving the many other issues which divide the people living here.

[1]"National Call for Action on Environment. *New York Times*, July 16, 1989.

[2]Michael Renner, "National Security: the Economic and Environmental Dimensions." Worldwatch Paper 89. Worldwatch Institute, May 1989.

[3]Lester Brown, "State of the World 1989." Worldwatch Institute. New York: Norton, 1989.

Charlotte Zieve has received a grant from the Lee Verhulst Foundation (Sheboygan) to study landfill siting in Wisconsin as an assistant scientist in the Environmental Policy Studies Research Center, Institute for Environmental Studies, UW-Madison.■

The Ridges Sanctuary

Baileys Harbor, Wisconsin

Text and Photographs By Roy Lukes

Stand in the black-topped parking lot at the Baileys Harbor beach, at the foot of the seventeen consecutive ridges or ancient abandoned shorelines, on a day of strong southerly winds. Watch the sand drift steadily over the hard surface. With no obstacles on the parking lot or road, the sand collects into a small dune or ridge, where its movement is slowed and stopped by the plants growing there. This phenomenon occurs all along the Baileys Harbor beach bordering the Ridges where man-made disturbances have been kept to a minimum. The predominantly fine-grained quartz sand, deposited by the melting glacier several thousand years ago, is piled higher on the beach in time of storm. Dried by the sun, then picked up by off-lake winds, sand drifts into the grasses, wormwood, silverweed, goldenrods, willow shrubs, and white spruce and horizontal juniper to the north.

Geology researchers at the sanctuary concluded that the glacial rebound was completed at this latitude by the beginning of the formation of the ridges. UW-Green Bay Geology Professor Ronald Stieglitz and his students conducted a sedimentology and post-glacial history study of the Ridges Sanctuary in 1979. A more detailed

The nature center in 1977, framed by the jack pine growing next to the brick oil shed.

The newest bridge, built in 1986–87, joining the east ends of Winter Wren and Labrador ridges.

geological study was conducted by Tezz Marquardt in 1984–85 (see bibliography).

Aerial photographs reveal underwater sand bars separated by lower troughs paralleling the present shore, which is number seventeen ridge. Wading into the shallow sand-bottom quickly reveals to the wader the slightly higher sand bars and lower troughs, nuclei of future ridges and swales. Wind and wave action requires approximately 140 years to form one ridge and swale.

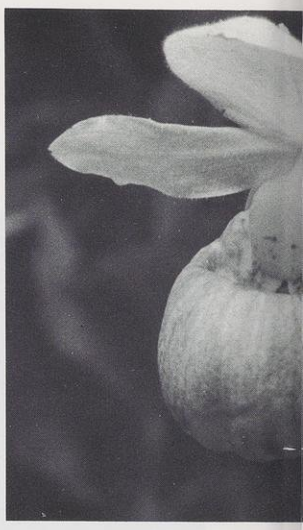
The entire 1001.9 acres of the Ridges Sanctuary is encompassed by an isolated pocket of the only known boreal (northern) forest in eastern Wisconsin. The nearest similar plant habitat is in Iron County, eighty miles north and one hundred seventy miles west. Ashland, Bayfield, and Douglas counties contain the largest continuous span of boreal forest bordering Lake Superior in Wisconsin.

The Ridges Sanctuary was completely covered by several thousand feet of ice in the past 15,000 years, and all previous plant life was scoured and carried away. As recently as 3,000 years ago, the Ridges was beneath the waters of the post-glacial Lake Algoma. The glacial drift deposited when the glacier melted must have contained plant remains, including seeds and roots. Several northern plants growing in the Ridges today are examples of what botanists call glacial relicts, plants of an earlier time surviving in a considerably changed environment.

Due to the refrigerative effect of Lake Michigan, off-shore winds constantly bathe the Ridges Sanctuary with cold, humid air, preserving somewhat the boreal climate that existed thousands of years ago at the foot of the glacier. The Ridges today is bordered to the west and north by the northern hardwood forest of sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), eastern hemlock (*Tsuga canadensis*), and on higher ground red oak (*Quercus rubra*).

Glacial relicts growing in the Ridges include the rare nationally threatened lake iris (*Iris lacustris*), arctic primrose (*Primula mistassinica*), Labrador tea (*Ledum groenlandicum*), and northern spikemoss (*Selaginella selaginoides*). Other plants there, such as trailing arbutus (*Epigaea repens*), creeping snowberry (*Gaultheria hispidula*), blue bead lily (*Clintonia borealis*), twinflower (*Linnaea borealis*), and Canada dogwood (*Cornus canadensis*) would all be part of the normal plant environment of, for example, Isle Royale National Park, lying in northern Lake Superior 225 miles to the north.

Typical of the boreal forest, as experienced at the Ridges Sanctuary, are rigorous, damp, cold winters usually accompanied by deep snows, a spring that is slow to arrive due to nearby cold Lake Michigan, and a short, cool summer. It may seem strange that due to various plant adaptations, the blossoming season can in some years extend from April 1, when the first trailing arbutus may bloom, to November 15, when a few very small fringed gentians (*Gentiana procera*) might still be flowering. This is not typical of the usually short growing season of the boreal forest, but rather is related to the warming effect upon the land of nearby Lake Michigan in late fall.



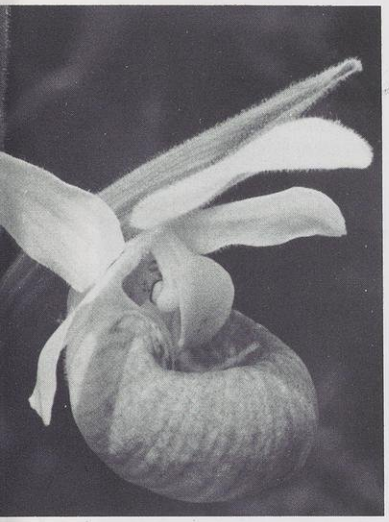
Clockwise from top left: rare round-leaved orchid (blooms June), showy lady's slipper orchid (June 23–July 14), Canada dogwood (June 5–July 4), smaller fringed gentian (August 24–October 1), trailing arbutus (April 20–June 1).

History

Numerous ancient abandoned shorelines in northern Illinois, eastern Wisconsin, and Upper Michigan led James W. Goldthwait early in this century to note: "This Baileys Harbor district offers perhaps the best opportunity for detailed study of extinct shore-line topography along the peninsula; for here are unusual irregularities of outline in the old lake, and the exposure to wave action must have been great." Goldthwait's study, "Abandoned Shorelines of Eastern Wisconsin," earned him a Ph.D. at Harvard in 1906.

Perhaps the first person to write scientifically about the plants of the Ridges area was Albert M. Fuller, curator of botany of the Milwaukee Public Museum. Fuller began conducting orchid research in Wisconsin in 1924 and began taking small groups of nature enthusiasts to the Ridges in 1925.

Interest in this rich botanical area began to grow in 1935 when the U.S. Department of Commerce deeded to Door County the forty acres on which two range lights (to be lined up by ships for safe passage into the harbor) had been built in 1869. The Door County Park Commission decided to develop a trailer park with fire pits, picnic tables, and camp sites, since the property contained one of the best swimming beaches in the county. They anticipated this would be a valuable asset to the county. Those op-



posed to these development plans contacted Albert Fuller, who responded with a letter to the *Door County Advocate* on February 19, 1937 which stated:

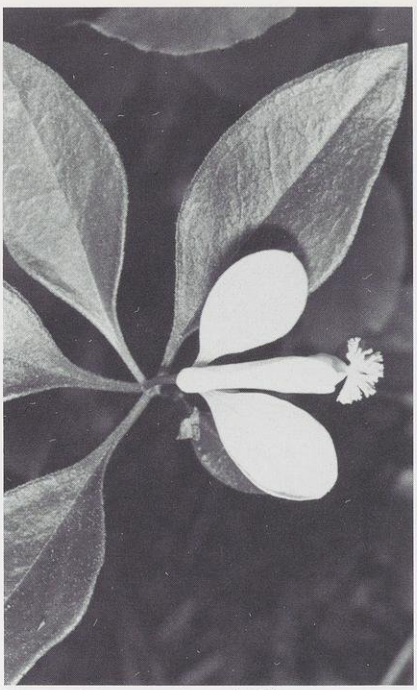
> It would be a sacrilege that the people of Door County would always regret if "the Ridges" area at Baileys Harbor were permitted to be made into a camp site, because campers and rare plants are incompatible.
>
> Forty-five species of orchids are found in Wisconsin. Of this number at least thirty species are found in Door County. Twenty-five native species are found in the region of Baileys Harbor, particularly in the area under discussion.
>
> The people of Door County should take great civic pride in localities that are rich in orchids and other rare plants and see that they are amply protected. Every school child in Door County should be taught to love and protect all the plants and trees of the county.
>
> Many of our large cities have spent millions of dollars to reproduce what Mother Nature has given Door County free of charge. It would probably cost at least a million dollars to reproduce the area at Baileys Harbor elsewhere. This area not only belongs to Door County, but it also belongs to the people of Wisconsin, and above all it belongs to future generations. The past generations have nearly wrecked the natural beauty that the state once possessed.

This letter rallied support for preserving the Ridges area and, with the approval of the county park commission, ten people signed the articles for the newly formed Ridges Sanctuary for Plant and Animal Life Incorporated on October 4, 1937, the first sanctuary of native plants in Wisconsin. In time the group received donations of money and land. Volunteer members led tours into the sanctuary and gave evening nature lectures at the town hall, and county

school groups hiked in the sanctuary and competed in picture and essay contests about it.

In 1964 a summer naturalist and tour guide was hired. By the end of 1965 membership in the Ridges Sanctuary had grown to 365. More land was purchased whenever the treasury permitted. An old log farm house was disassembled and rebuilt as a nature center in 1975, and the education program expanded.

In August of 1989 the membership was about 3,100, from forty-five states and three foreign countries. Three assistants help the chief naturalist conduct a summer program which includes daily guided hikes into the sanctuary, early morning bird-watching, children's classes, adult member workshops, weekly evening nature lectures, and nighttime astronomy classes. About a hundred members volunteer for such tasks as building wooden bridges and trails.



Rare white gaywings (3X)

Ram's head lady's-slipper

Inventory

The ever-changing plant and animal populations of the Ridges require us to learn more about what exists within the sanctuary boundaries, which factors affect the numbers of rare species, and how to maintain desirable vegetation and animal numbers in all Ridges habitats.

Albert Fuller listed plants growing in the sanctuary. In 1934 George F. Sieker wrote a B.S. thesis on "The Flora of the Baileys Harbor Bog" for the University of Wisconsin, Madison. He worked on and collected the woody plants and orchids during the summers of 1932 and 1933, comparing them with specimens in the university herbarium. As Ridges naturalist from 1964 to 1989, this author compiled a list of flowering plants beginning in the spring of 1964. Working with lists by member Valdemar Schwarz and this author, James Zimmerman compiled "Plant Life of the Ridges Sanctuary" in 1967. In the mid 1970s Ann Lubbers, a UW-Green Bay botany student began collecting for a herbarium of all plants in the Ridges. In 1975 she gathered about 100 species which are now a part of both the Ridges Sanctuary and the UW-Green Bay herbariums.

On June 22, 1977 James Zimmerman made a thorough study of the showy lady's-slipper orchids (*Cypripedium reginae*) growing on county and private property along Ridges Drive. He counted over 400 individual plants, noting their flowering conditions and paying close attention to soil conditions in and near the swale. Eventually the largest concentration of showy lady's slippers was buried beneath several feet of gravel by owners constructing homes, despite the counseling and advice of Zimmerman.

Later in 1977 Zimmerman, using plant reports and personal observations, compiled a list of about 450 species of plants growing at the Ridges Sanctuary and Toft Point. He included in this list plants which were likely to occur but which needed checking.

The UW-Madison herbarium donated to the Ridges herbarium in March 1980 thirty-five packets of moss specimens. In 1981 Zimmerman documented forty-four species of sedges—seven uncommon—which were growing in the Ridges and at Toft Point. Two threatened sedges in Wisconsin are the beautiful sedge (*Carex consinna*) and Garber's sedge (*Carex garberi*).

UW-Green Bay graduate student Joel Trick studied vascular plants in the Ridges in 1981 and collected for the herbarium all but the state's threatened or endangered plants. He listed 475 species of vascular plants, with annotations and general locations. He established permanent quadrats to enable accurate year-to-year study of the large round-leaved orchid (*Platanthera orbiculata*), Hooker's orchid (*Platanthera hookeri*), and ram's head lady's slipper (*Cypripedium arietinum*). He laid out three plant transects at right angles to the shore of Baileys Harbor Bay and the Ridges Drive to enable us to study annual vegetative changes there. Trick studied and defined fifteen different vegetation types in the sanctuary, useful concepts for understanding the occurrence and distribution of the vegetation there. He did not attempt to describe each aggregation of plants on any given

Categories of vegetation communities

Beach: open sand with scattered forbs (broadleaf herbs).
Dune: sandy ridge mostly covered by grasses, shrubs, and forbs.
Open ridge: ridge covered by prostrate shrubs, scattered forbs, and grasses.
Shrubby ridge: ridge dominated by upright shrubs, scattered forbs, and grasses.
Shaded ridge: ridge dominated by canopy-forming trees.
Open swale: swale dominated by mat-forming sedges with scattered forbs.
Flooded swale: open water areas in open swales, with scattered emergents.
Shrubby swale: swale dominated by shrubs and small trees.
Shaded swale: swale dominated by canopy-forming trees.
Boggy swale: swale dominated by a mixture of typical bog plants.
Boreal sedge meadow: open meadow dominated by sedges and forbs with boreal affinities.
Sedge meadow: open meadow dominated by tussock-forming sedges.
Alder thicket: moist ground dominated by tall shrubs.
Bracken-grassland: open, disturbed sites dominated by old field grasses and forbs and/or bracken fern.
Beach on Moonlight Bay: sand beach with variable topography and variable composition of mixed forbs and grasses.

site in precise phytosociological terms, but rather noted obvious growth forms as related to equally obvious physiographic characteristics of the microsites present. While some of these communities may be equated with those of John Curtis, others differ significantly.

Current research

In 1983 Joyce C. Bender, biology student at Akron University in Ohio, worked on pollination and population studies with orchids, especially the yellow lady's-slipper (*Cypripedium calceolus, var. pubescens*) and the ram's head lady's-slipper. During the month of June from 1983 through 1989 she mapped the ram's-head lady's-slippers in the sanctuary as well as monitored specific ram's head habitats.

An experimental program proposed by James Zimmerman is underway in which the roadside ditches along County Highway Q, which bisects the northern Ridges land, are only mowed by the county during specific periods to protect and enhance various wildflower populations, including several species of orchids,grass of Parnassus (*Parnassia glauca*), and smaller fringed gentians.

Charlotte Lukes has studied and photographed the fleshy fungi of the Ridges and Toft Point in recent years and plans to produce an illustrated book on them.

Two invasive plants threaten the thousands of the rare lake iris (*Iris lacustris*) which grow on most of the seventeen major ridges. One invader is an alien, the orange hawkweed (*Hieracium aurantiacum*), and the other is a native, the largeleaf aster (*Aster macrophyllus*). Because a better understanding is needed before action can be taken, a UW-Green Bay Master's candidate will study the invasion of lake irises by largeleaf asters.

Other plants encroaching on the western ends of several of the ridges need study and, possibly, control. These include the field horsetail (*Equisetum arvense*), reed canary grass (*Phalaris arundinacea*), sugar maple, red oak, and alder-leaved buckthorn (*Alnus alnifolia*).

A deer exclosure 15 by 30 feet in area and 10 feet tall was constructed in 1982. This cedar pole and heavy wire structure prevents the white-tailed deer from reaching those plants growing inside. This enables the researchers to compare protected vegetation with that accessible to deer.

This author began a checkpoint study designed to record changes in vegetation within the sanctuary in 1986. One hundred checkpoints, marked by numbered brass tags fastened to two-foot iron stakes pounded into the ground, have been established throughout the sanctuary. We are making plant counts and photographs of the ground or terrain in specified directions. These black-and-white photographs and colored slides are stored in files to be accessible for future study of the vegetational changes occurring in the sanctuary.

An archival duplicate set of all Ridges Sanctuary transactions, correspondence, newsletters, and directors' minutes from 1937 to the present has been filed in the county historical room of the Door County Library in Sturgeon Bay.

The Ridges Sanctuary of Baileys Harbor and its work since 1937 with rare plant habitat and outdoor education are good examples of what dedicated people can accomplish with organization, leadership, and volunteer help.

Bibliography

Curtis, J. T. 1959. *The vegetation of Wisconsin*. Madison: The University of Wisconsin Press.

Fuller, A. M. 1933. Studies of the flora of Wisconsin, Part I, The Orchids: Orchidaceae, *Bulletin of the Public Museum of the City of Milwaukee.*

Fuller, A. M. 1950. The Ridges Wildflower Sanctuary at Baileys Harbor, Wisconsin, *Transactions of the Wisconsin Academy of Sciences, Arts and Letters* 40: 149-57.

Lukes, R. W. 1988. *The Ridges Sanctuary*. Baileys Harbor: The Ridges Sanctuary, Inc.

Marquardt, T. C. 1986. Age and paleoclimatic significance of a Lake Michigan beach dune ridge complex located at Baileys Harbor, Wisconsin. M.S. Thesis, University of Wisconsin-Green Bay.■

The Nature Conservancy:

Saving Biodiversity

By Virginia M. Kline

When Peter McKeever became director of the Wisconsin Chapter of The Nature Conservancy (TNC) in March of this year, he assumed responsibility for a staff of seven, an annual budget of $375,000, and the continuing mandate of preserving biodiversity in Wisconsin. He also assumed leadership of one of TNC's most successful chapters—a success achieved with the help of exceptional volunteer and staff involvement and commitment.

McKeever is the third director hired by the chapter, succeeding Brent Haglund, who had served in that role for seven years. When the first director, Russ Van Herik, was hired in 1978 it was a major departure from the tradition of a completely volunteer organization, one that had started in 1960 and had been enormously successful in saving many of the biotic gems of Wisconsin as well as fostering an awareness of the need for preserving such areas. The early effort was shrewdly and enthusiastically led for eighteen years by chairman Paul Olson, school principal and conservation leader, who was recently named to the Hall of Conservation Fame.

Many volunteers were actively involved in this early effort, among them Grant Cottam, Louise Erickson, J. J. Hickey, Hugh Iltis, Alfred Krampert, Harold Kruse, Lorrie Otto, Marjorie Reisinger, Eugene Roark, Peter Salamun, William Sieker, Fan Taylor, Dory Vallier, and Philip Whitford. Peg Watrous was in charge of membership for fifteen years, writing personal notes to each contributor. Ruth Hine edited the newsletter for the first sixteen years, and mailings were addressed by volunteers using a hand-operated addressograph machine in this author's basement.

The first project was Abraham's Woods, in Green County, with a cathedral-like canopy of sugar maples and a spectacular ground layer of spring wildflowers. Saving Abraham's was complicated because of multiple ownership, but the biggest concern was whether the necessary money could be raised. To everyone's surprise this was achieved in a very short time.

Representing a broad spectrum of vegetation types, other early projects included Chiwaukee Prairie, Cedarburg Bog, and several sites in the Baraboo Hills. Chiwaukee Prairie, located in the southeast corner of the state on a series of ridges and swales representing former shorelines of Lake Michigan, has 400 species of native plants, some of them very rare. Alfred Krampert, a Kenosha businessman who was entranced with the beauty of this prairie when he first saw it, was instrumental in initiating this project, and his business acumen was important in negotiating the early purchases. Since the area had already been platted and sold for development, it has been necessary to buy it lot by lot. The project goal is 260 acres; of this 165 have been acquired.

Cedarburg Bog includes twenty-three acres with sphagnum and other mosses, tamarack trees, insect-eating pitcher plants and sundews, and rare orchids. Located north of Milwaukee, the bog and a nearby beechwoods were acquired by the Conservancy for the University of Wisconsin-Milwaukee Field Station and have been used extensively for research and teaching. A boardwalk makes the bog accessible for these activities while protecting the fragile bog community.

Hemlock Draw, Pine Hollow, and Baxter's Hollow—each a cool valley cut deeply into the sandstones of the unglaciated west section of the Baraboo Hills—were among the first projects. Here clear rushing streams, northern ferns and wildflowers, hemlocks and pines create a bit of northern Wisconsin forest far south of its usual range, and spectacular rock cliffs support rare and unusual plants. Harold Kruse, a local farmer who knew and treasured these unique habitats, played a key role in making the necessary contacts for acquisition. These small gems were to become the nucleus for a landscape-scale Baraboo Hills project, in which much larger areas, including the entire watershed of Otter Creek, will be protected. Donald Kindschi, retired anesthesiologist, who lives in the area and grew up there, has greatly assisted in assembling this large block.

Saving biodiversity is the watchword of the Conservancy. It refers to the preservation of viable representations of every native species of plant and animal and every natural community in the state. (A natural community might be a dry prairie, a sphagnum bog, or a sugar maple forest, for example.) The system of sites protected by TNC has often been compared, appropriately, to an ark (although Noah's single pair per species would not meet today's standards for the

minimum number required for a viable population!). TNC is unique among conservation organizations in its single focus on the preservation of biodiversity.

Identification of target sites for preservation is the first step in the process. During the early years of the Wisconsin chapter most of the sites protected were special places already known to the chapter trustees or brought to their attention by interested individuals. (See John Thomson's article in this issue.) The first systematic effort to identify good quality natural communities throughout Wisconsin was that of John T. Curtis, who in 1948 contacted biologists and naturalists throughout the state and asked them for the location of any undisturbed natural areas known to them. Curtis wanted to know where these were so that his graduate students could carry out the vegetation studies that led to the publication of *The Vegetation of Wisconsin* in 1959. It is surprising how many good examples of the various types of vegetation were found for those studies, i.e., fifty-four stands of southern dry-mesic forest and forty-five of mesic prairie. Most of these, however, were too small and too vulnerable to be suitable for TNC project status, and many have since been disturbed.

The Wisconsin Department of Natural Resources and its predecessor the Wisconsin Conservation Department have played a major role in the identification of areas in the state in need of preservation. In 1969 the Scientific Areas (now Natural Areas) staff of DNR began to inventory each county of the state, using a combination of aerial photos and ground checking to locate potential scientific areas, which were assigned to one of three categories based on quality. The entire state had been inventoried by 1981; since then many counties have been reinventoried.

After a potential project is identified, the Wisconsin chapter projects committee (currently chaired by Stanley Temple of the UW-Madison Department of Wildlife Ecology) reviews the information available, makes a site visit if indicated, and considers factors such as the quality of the site, whether it can be protected, and the contribution the communities and species represented make to biodiversity in Wisconsin. Recommendations for the adoption of new projects are made to the board of trustees. The committee works closely with staff member Mary Jean Huston, director of protection, who provides much of the necessary information and develops and carries out the strategy for protecting the projects approved.

The identification process has been aided since 1985 by the installation in the DNR Bureau of Endangered Resources of a computerized data system for storing and retrieving information on the status of threatened and endangered communities and species and the occurrence of these "elements" in potential and already protected project sites. The system is part of the nation-wide Heritage System, that was developed and is promoted by TNC, and has been adopted by all fifty states. Site data from the county inventories and from field observations of the Heritage staff are filed in the system and are used to generate a priority list of potential project sites based on the elements present. The projects committee makes use of the list in selecting TNC projects, as does the DNR Natural Areas Section in selecting its acquisition projects. The two groups cooperate closely in making these selections.

Chiwaukee Prairie in spring, with showy display of shooting stars.

The projects committee also recommends what level of protection—acquisition, conservation easement, or registry—is appropriate for a site. Acquisition affords the greatest protection. It is also the most expensive option, but many of the lands are acquired as gifts or are bought at less than market value because of the interest of the owner in preserving the natural quality of the site.

Conservation easements are used for protection in selected cases where the owner does not wish to sell but is interested in preserving the elements present on the property, when outright purchase is too expensive, or where a lesser degree of protection is acceptable. A conservation easement is legally binding and remains in force even when the land is sold to another owner.

Registry involves informing the property owner of the presence of rare or endangered species or communities on the property and negotiating an agreement to manage the site in a manner that protects those elements. A plaque is usually given to acknowledge the agreement, and follow-up visits are important to foster continued interest. The agreement is not legally binding; the owner can withdraw at any time.

To date, the Wisconsin chapter has been involved in the protection of over 24,800 acres of land and water in 109 sites throughout the state. Under the leadership of staff member Karen Crossley, who was director of development until her recent retirement, and Clifford Messinger, chairman of the board of trustees, the chapter recently successfully completed a seven-million dollar fund drive.

The Nature Conservancy's role does not end with the establishment of a mechanism for protection, but includes long-term stewardship of the protected lands. In some cases ownership of acquired land has been transferred (always with protective restrictions and a reverter clause) to an appropriate agency or institution, which then assumes stewardship responsibility. For example, Cedarburg Bog is owned and managed by the University of Wisconsin-Milwaukee Field Station; Abraham's Woods by the University of Wisconsin-Madison Arboretum, and several properties are owned and managed by the Wisconsin Department of Natural Resources. However, many properties are retained and managed by the chapter, and since it is becoming increasingly difficult to find appropriate institutions with the resources to take on stewardship responsibilities, TNC's stewardship role is expected to expand greatly.

Stewardship encompasses a variety of activities, including fencing, sign posting, dealing with unwanted activities, controlling exotic plant invasions, and cutting brush. Of special importance is the burning of prairies and some wetlands, for without fire these succumb to tree and shrub invasion and the value for which the land was preserved is lost. Nancy Braker, stewardship director, has become a very experienced "fire boss," who plans and directs as many as fifteen prescribed burns each year. Labor for stewardship may be volunteers, Young Adult Conservation Corps (YACC) recruits, interns, or even prison inmates. In planning and organizing these activities Braker works closely with Emily Earley, board of trustees vice-chairman for stewardship, who has volunteered an extraordinary amount of time and energy on behalf of stewardship for many years.

An increase in stewardship responsibility is one long-term trend anticipated by the chapter. Another is the increasing emphasis on preserving large blocks of land such as the Otter Creek watershed (3000 acres) in the Baraboo Hills. Only large blocks can protect certain species of animals. For example, it has been shown that the hooded warbler can reproduce successfully only in forest blocks large enough to prevent cowbirds, which inhabit forest edges and do not penetrate deep forest interiors, from parasitizing the nests. Projects chairman Temple feels that it is critical to determine the minimum area needed to support viable populations of each endangered or threatened animal species the Conservancy seeks to protect, and to set project boundaries accordingly. For example, one of the species the chapter hopes to protect at Spring Green Preserve is the rare ornate box turtle, and it will be important to be reasonably certain that the area acquired will be large enough for a viable population of that species.

Large blocks also make it easier to protect choice communities from undesirable human intrusion on the edge. In addition they usually provide more varied habitat, which may be critical for continued viability of the community during intervals of climate change. For example, a large prairie like Chiwaukee will have habitats for wet and dry prairie plants; if the climate becomes drier, the dry prairie plants will move into spaces no longer suitable for wet species. During wetter intervals the area inhabited by wet species will increase. In both cases the prairie community will remain intact.

Otter Creek at Baxter's Hollow. Much of the watershed of this pristine stream has been protected by the TNC.

Even for smaller projects there will probably be more emphasis on including buffer areas in the project boundary, and in some cases in trying to expand the protected community into the buffer. The project boundary for a small hilltop prairie recently given to the Conservancy by John and Olive Thomson as a memorial to their son Douglas includes not only the small prairie remnant on the untillable thin rocky soil at the top, but also some surrounding land disturbed by farming activity. The boundary is located to facilitate burning of the entire site and it is hoped that the entire area will eventually revert to prairie.

The Wisconsin chapter has been enormously successful in its effort to preserve the natural heritage of Wisconsin because of the synergistic combination of volunteers and professional staff. Whatever the trends in the future, success in implementing the goals will continue to depend on that combination.■

Can We Save the Northwoods?

The Work of the Sigurd Olson Environmental Institute

By Mark Peterson

"The Northwoods"—the phrase conjures up images that inspire the chamber of commerce, sportsmen, and hardy tourists. Just thirty-five miles north of Madison, on Highway 51 in Portage, a rustic sign proclaims "where the north begins." While one can argue about where the north precisely begins, we instinctively know when we've arrived.

In northern Wisconsin the ribbons of highways to the south are replaced by winding rivers. Instead of the neon and amber lights of downstate cities are stars in the heavens above so bright that they seem nearer to the earth. The howl of the wolf or call of the coyote is more likely to be heard than the siren of a police car or the thunder of a jet. A defining difference, quite simply, is that in the northwoods there are more white-tailed deer than Fords, more lakes than shopping malls.

These are the images of the north, all there to be discovered. Yet beneath this wonderfully natural exterior, unnatural processes are almost imperceptibly at work in this region, eroding the very fabric that binds this distinctive system together. The north is succumbing to the same forces that have altered natural landscapes in other places and in other times.

Within our lifetimes many of the lakes have become more acid. Chemicals we can hardly pronounce are turning up in northern lakes far beyond civilization's bounds. The exquisite variety of flora and fauna is not as diverse and plentiful as it once was. And roadless areas found on detailed maps become smaller with each decade. The north is not in a pristine state, unaffected by human enterprise.

The north has known its share of human-caused environmental changes from the day in 1659 when Radisson and Groseilliers, the first white men in the region, set eyes on Lake Superior. They presaged events to come as they returned to Montreal with $10,000 worth of furs from the abundant wildlife. The northern fur trade network was to become so efficient that the estimated sixty million beaver from Hudson Bay to the Missouri River in the mid 1600s were brought to the brink of extinction by 1830.

But mining and timber harvesting quickly developed after the demise of the fur trade. The first northern iron mine opened in Negaunee, Michigan in 1846. About that same time the first sawmill began operation on Lake Superior. Less than thirty years later, one million tons of ore were shipped out of the region, and sawmills were found in nearly every coastal town. Ashland in 1886 had six ore docks and was the busiest port after Chicago and Buffalo on the Great Lakes. But the forests were mostly cut down by 1910, and ore production began steadily dropping two years later.

Another natural resource, Lake Superior fish, was exploited with zeal by Scandinavian immigrant fishermen. Millions of pounds of fish were caught from 1900 to 1950. But the fifties saw steep harvest declines, brought on largely by resource depletion.

What is next for the north? Could the next boom be tourism and the associated promise of substantial dollars for local economies? Tourism might be a sustainable economy more in harmony with the natural resources of the north. But little attention is being given to what kind of tourism the north should provide. Will tourist promotion without planning bring on water slides, amusement parks, fast food, and strip development such as found in Wisconsin Dells? Author Edward Abbey dubs this kind of unplanned development "industrial tourism," made up of tourists whose three main questions are: Where's the john? How long's it take to see this place? Where's the Coke machine?

Enlightened tourism, however, can advance conservation and environmental quality, if the attraction is the unique character of the landscape.

While we wait for the next significant economic force to affect the north, scientists struggle to protect the significant natural resources that give the region its integrity. But times have changed. Unlike the localized environmental impacts of the past, today's challenges are complicated by the global village nature of our planet today. Impacts today may be from activities hundreds or thousands of miles distant.

Isle Royale, for example, is as isolated and pristine as any place in the north. This largest island of Lake Superior has been a national park since 1940; it is managed as a wilderness with no roads and few structures along its forty-mile span. Its shores have never known industry, and its waters are cold, clear, and deep. In 1975 the U.S. Environmental Protection Agency (EPA) selected Lake Siskiwit on Isle Royale as the northern lake to establish a baseline from which all others could be measured. It was a mile hike from the Lake Superior

dock to Siskiwit, which lay in an impervious bed of basalt. Sixty feet above Lake Superior, with no known ground or surface water connection to Lake Superior, Siskiwit's waters should have been as unpolluted as any in the north. Yet in the wilderness lake waters were PCBs, DDT, heptachlor epoxide, BHC, and HCB. The explanation was inescapable—the chemicals traveled to Isle Royale through the air, much like acid rain.

In the past fifteen years scientists have learned much more about the airborne deposition of toxic chemicals in Lake Superior and elsewhere. Experts estimate that 90 percent of the PCBs and 97 percent of the lead entering the lake are fallout from the air. Toxaphene, a DDT substitute used on cotton crops and in the Dakotas to fight root pests until it was banned in 1983, is found in the lake. Surprising, too, are the increasing levels of DDT found in some northern lakes. Banned by both the U.S. and Canada in the early 1970s, the DDT is coming from developing countries, scientists suggest, which use large quantities of this compound.

While these environmental problems pose great challenges for the region, they may collectively awaken us to the opportunities and possibilities. This region still can take an alternate pathway into the future, one not traveled by other parts of the country, and thus retain its distinctiveness.

An alternate future is the mission of the Sigurd Olson Environmental Institute (SOEI) at Northland College. Founded in 1972, the institute is dedicated to educating people about the environmental issues and choices facing the north. Last year the institute presented over two hundred programs to over 24,000 people throughout the region. Staff members use many strategies to convey environmental information: conferences, workshops, press releases, audio-visual programs, and the quarterly newsletter *Horizons*.

The institute focuses on the Lake Superior region, which encompasses Michigan's Upper Peninsula, the northern portions of Wisconsin and Minnesota, and the Ontario shoreline. In all its programming it strives to convey the interconnections between the living and the nonliving and between the local geography and the rest of the planet. Programs urge people to understand long-term as well as immediate consequences of actions. Another focus is the Lake Superior ecosystem. (The region is usually considered as part of the Great Lakes system.) The lack of consciousness of the bio-region is reflected in the fact that no agency or organization possesses a full range of materials which deal with all aspects of the region's natural resources. Less is known about Lake Superior than other of the Great lakes, and less data have been compiled about the population, industry, and resources of the region. A data base is essential to making policy for sustainable development.

Contributing to the lack of information is the political split among four jurisdictions; Canadian and American residents around the inland sea know little about each other. Ordinary communication links are missing: the air link between Duluth and Thunder Bay was dropped; television signals are not exchanged, and local newspapers are not regionally distributed.

The institute holds region-wide conferences and exchanges designed to break down state and international borders. The conference held in 1987 north of Sault Ste. Marie in Ontario brought together managers of natural areas and environmental activists to learn about land, water, and wildlife choices facing the region. Another conference is planned for 1990 to examine toxic chemicals in the lake.

Perhaps the best-known institute program, especially to users of Wisconsin's northern lakes, is Project Loon Watch. Begun in 1978 when loon populations had declined in the state, Loon Watch is intended to teach users of the lake how to protect the loon. "Loon alert" signs are now common at boat ramps on lakes where loons nest. Of more than 1300 Loon Watch members, many canvass lakes to report information about the loon population each summer. Loon Watch

The Sigurd Olson Environmental Institute at Northland College in Ashland, Wisconsin

programs discuss issues affecting this and other species, such as acid rain, mercury pollution, habitat loss, and increasing boat traffic.

Perhaps the education is having an effect. In 1986 Loon Watch conducted a comprehensive, statewide lake survey and estimated that populations may have stabilized at 2500 birds, or perhaps are slowly increasing from a decade ago. The project has been so enthusiastically received that the institute is now expanding the program to Minnesota, which has the loon as state bird.

Loons are one component of the institute's great concern for preserving biological diversity in the northwoods. With 60 percent of the lands in the Lake Superior region managed by state or federal agencies, the future of the region's wildlife largely depends on the activities these agencies conduct.

Decades of intensively logging the lands and building roads has fragmented large blocks of forest lands into smaller pieces. This fragmentation reduces biological diversity because it reduces or eliminates populations and species of plants and animals, such as the scarlet tanager and many warblers that were dependent on large forested tracts. The regeneration of hemlock and yellow birch trees and a variety of orchids are adversely affected because fragmentation increases populations of white-tailed deer which browse these species heavily.

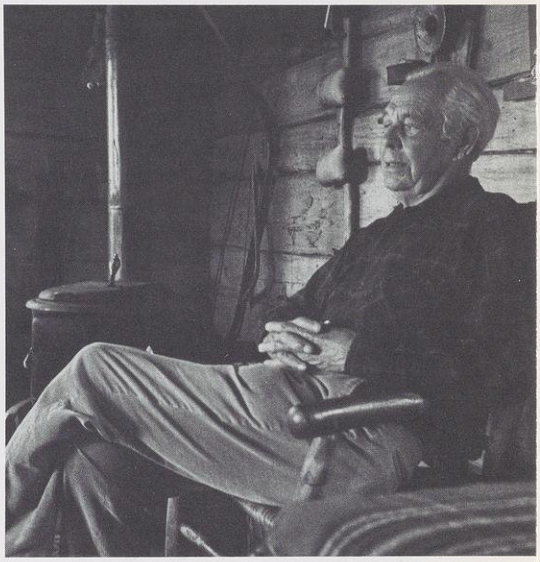
The institute believes that education is necessary to enhance biological diversity. Biologist Paul Strong just completed a question-and-answer brochure about the subject. Ten thousand brochures are being distributed at nature centers around the state or can be requested from the institute. SOEI will sponsor two symposia in 1990, one examining old-growth forests in the region and one the status of bobcats, a species for which there is concern.

Preserving biotic diversity is the reason for the institute's newest statewide project, its establishment of the Timber Wolf Alliance (TWA). Recognizing that many of the state's citizens have attitudes shaped by misinformation and childhood stories such as "Little Red Riding Hood," TWA will acquire, develop, and disseminate facts about the timber wolf. The project consists of twenty-eight sports, conservation, and business groups in Wisconsin and Michigan's Upper Peninsula volunteering to inform the public about the role of the wolf and its place in the ecology of the region. Providing a greater understanding should decrease human harassment and opposition to the creature, permitting the present two dozen or so wolves to increase in the next decade to about eighty, which is a self-sustaining, secure wolf population.

The Sigurd Olson Environmental Institute is as concerned with preserving the land as protecting wildlife. SOEI worked to create the Apostle Islands National Lakeshore and for federal legislation for five wilderness areas in Wisconsin. In 1988 the institute sponsored a three-day symposium for 120 river managers and activists to discuss more effective methods for preserving free-flowing wild and scenic rivers.

The SOEI's philosophical commitment to land preservation derives from the inspiration of its namesake, Sigurd F. Olson. Young Sigurd went to Northland College in 1918 and later became a college trustee. He taught biology and became a dean at Ely Junior College in northern Minnesota, but he was best known for his writings and devotion to wilderness preservation.

Olson prodded congress to designate the Boundary Waters Canoe Area in northern Minnesota a federally protected wilderness area. "We need," Sigurd wrote, "to preserve a few places, a few samples of primeval country so that when the pace gets too fast we can look at it, think about it, contemplate it, and somehow restore equanimity to our souls."

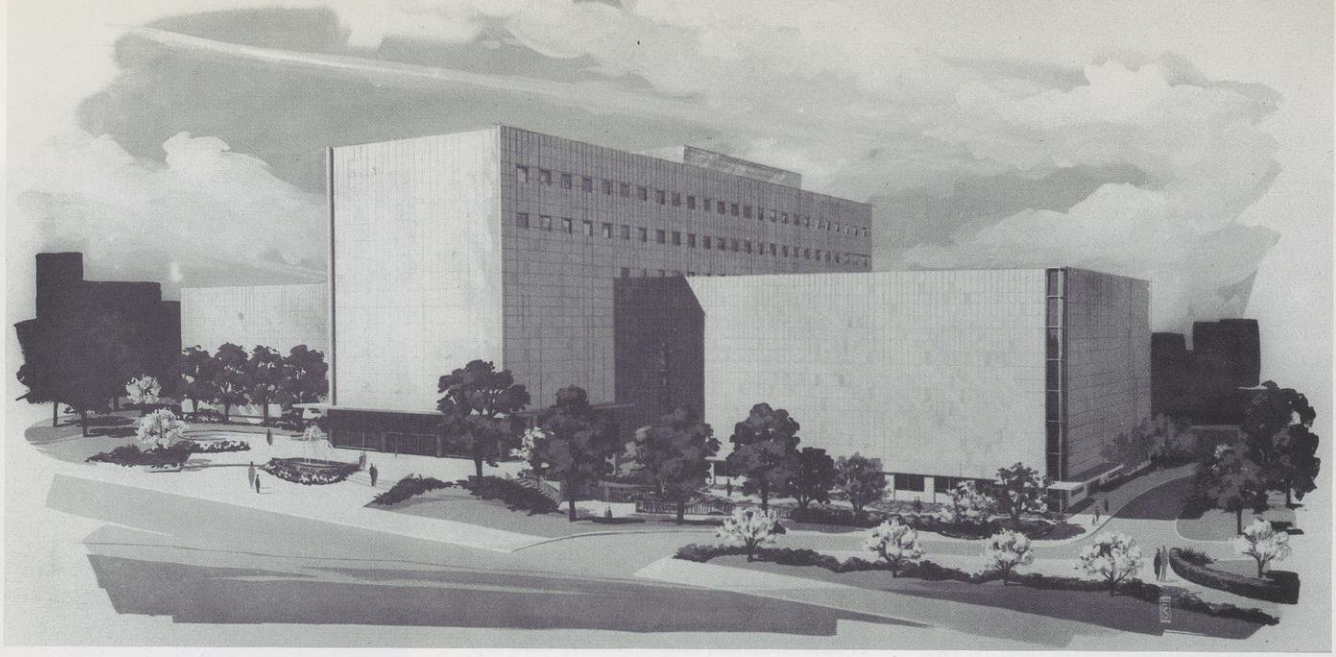


Sigurd F. Olson (1899–1982)

In the 1920s he fought plans to divide and flood the Boundary Waters with roads and dams. He opposed mining and logging in the area and fought to curtail float plane flights into this wild place. He battled for motorboat restrictions that became part of the wilderness legislation passed in 1978.

Olson died in 1982 while snowshoeing on the edge of the Boundary Waters. His canoe and broken paddle, symbolizing his passing, hang in the institute's conference room.

The writings he left—nine books and numerous magazine articles and speeches—set the agenda for the institute and its mission of environmental education in the north. Sigurd believed in this kind of education: "The great challenge is to build such a broad base of understanding, one with such depth and clarity, that it cannot be ignored. Only when emphasis is placed on humanitarian values that affect the welfare and happiness of all will the land be safe, and only when we realize that the real dividends lie in the realm of the imponderables will we do what is necessary to restore what has been despoiled and protect what is left."■



Milwaukee Public Museum

A Century of Wisconsin Botany

By Martyn J. Dibben

By definition a museum is a place of collections, and plant collections are traditionally kept by botanists in *herbaria* (singular *herbarium*). But the raison d'etre for any museum is to build program around these holdings, to develop not just a repository of inanimate objects but a positive learning experience for visitors. Milwaukee Public Museum (MPM) has always been this way, and its trend-setting exhibits are known nationwide and internationally. Yet its collections and its educational, public service, and research activities are equal to peer establishments worldwide. MPM resides amid the country's twenty-fifth largest metropolis but is the sixth largest institution of its kind in the United States. Its significance as a national resource and treasury thus far exceeds the confines of current ownership—Milwaukee County, Wisconsin, and attests to its early (1972) accreditation by the American Association of Museums. Appropriate expertise and productivity is found among all of its scientific disciplines: anthropology, history, geology, invertebrate and vertebrate zoologies, and botany.

History

The MPM herbarium began with a single donation of 5,190 botanical specimens received by the City of Milwaukee from the Wisconsin Natural History Society (WNHS) in 1883. The society was organized in 1857 as *Der Naturhistorische Verein für Wisconsin* by Peter Engelmann, founding principal of Milwaukee's German-English Academy. Although WNHS was dissolved in 1915, many of the society's members continued to donate plant materials to the museum. Early Milwaukee and Wisconsin collections of Engelmann and Increase A. Lapham were initially expanded by the late 1800's activities of Fr. Theodore Bruhin and naturalist Thure Kumlien. In the first quarter of the 1900s local businessman Adolph Meinecke and attorney Charles E. Monroe added over 15,000 midwestern specimens. (Monroe personally gathered more than 5,000 asters over a ten-year period.) Herman E. Hayward then gave his Black Hills' materials from South Dakota, and by the 1930s the herbarium holdings finally became international in scope. Dr. Samuel A. Barrett (MPM's fifth director, 1921–40) and staff associate George L. Waite collected materials from Africa. Plants from Mexico and the southwestern United States were donated by Marjorie Clary, Hugh Cutler, Susan Hutchinson, and C. A. Purpus.

Other museum personnel added to the herbarium, and Henry L. Ward (MPM's fourth director, 1902–20), although not trained in the field, had appointed himself its curator. But botany was not yet a separate section, being ignominiously placed under the care of invertebrate zoology. The first published account of MPM plant holdings, written by Ernest Bruncken in the 1902 *Bulletin of*

the Wisconsin Natural History Society, reported 10,000 specimens. The majority were gathered in Milwaukee County, with smaller numbers from elsewhere in the United States and central Europe. Aside from the dominant flowering plants and ferns, there was an assortment of European mosses, and a growing collection of local fungi started in 1901.

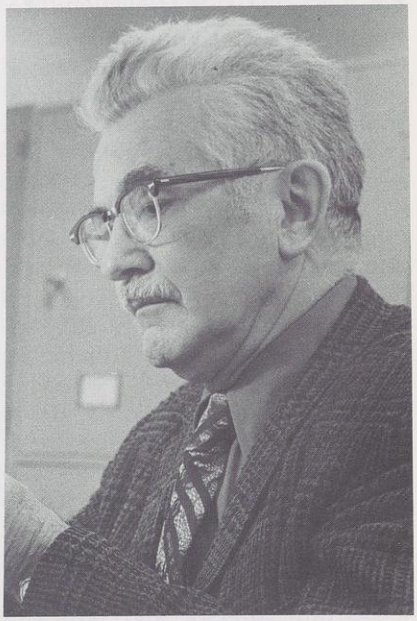
The earliest qualified staff botanist was John R. Heddle (B.A. plant ecology, University of Wisconsin, 1910). From 1912–16 he collected plants and compiled an index to regional collectors and localities based on label data in the herbarium. Following Heddle, Charles Goessl collected widely throughout the state in the summers of 1915–17; from Sheboygan, he had actively sought plants throughout the region since 1901. In 1917 a botany division was finally created, and Huron Smith was appointed the first curator. His studies of Wisconsin's Indians and tribal plant uses resulted in over 1,700 significant collections. But an early death in 1933 at an Illinois railroad crossing tragically cut short his work. Specimens gathered by Smith are now housed separately in the museum's Huron H. Smith Ethnobotanical Collection. There is much current interest in these holdings, as well as in Smith's manuscripts and publications.

In 1933 Albert Fuller became MPM's second curator of botany. He had joined the museum in 1923 as an assistant curator of botany and remained as section head until his retirement in 1964 (dying finally in 1981 after prolonged illness). Fuller was a dean of Wisconsin plant preservation and founding member of the state's conservation commission. He studied and published on Wisconsin's orchids and the blackberries of eastern North America. His *Rubus* materials now comprise more than 5,000 sheets and form a special collection within the museum's Albert M. Fuller Phanerogamic Herbarium. Emil Kruschke, hired as assistant curator of botany in 1938,

Huron H. Smith became the division of botany's first official curator when it was created at MPM in 1917. Here he is shown sorting ethnobotanical materials in 1925.

Albert M. Fuller, MPM's second curator of botany (shown here in 1950), became both acting and assistant museum director for short periods before his retirement in 1964.

Emil P. Kruschke, MPM's third curator of botany (shown here in 1971), died shortly after his 1974 retirement following thirty-five years of museum employment.



became section head on Fuller's retirement. Kruschke specialized in the flora of Wisconsin, especially the borage family (Boraginaceae) and the state's hawthorn shrubs and trees. In 1962 he described an active herbarium of some 110,000 specimens (more than a ten-fold increase in the sixty years since Bruncken's first review) in the MPM Friends periodical, *Lore*. Upon retirement in 1974, Kruschke had devoted thirty years to studying the state's flora, amassing over 8,500 hawthorn specimens that form the core of the museum's *Crataegus* collection. Following his death in 1976, the Emil P. Kruschke Reading Room was established and now contains both botany's periodicals and word-processing computer facilities.

During the 1930s and 40s many new plant specimens were added (and an active herbarium exchange started) through the efforts of a statewide museum program. Funded by the Works Progress Administration, several of these WPA project workers continued in botany at University of Wisconsin after the program folded. Richard W. Pohl developed into a national authority on grasses and retired as professor emeritus of botany at Iowa State University. Lloyd H. Shinners produced a thesis, *The Vegetation of the Milwaukee Region*, and a dissertation on Wisconsin grasses; he eventually became professor and herbarium director at Southern Methodist University in Dallas. Post-1950 botany appointments included several assistant curators who helped set new direction for MPM following its 1963 move to current quarters. Robert Reich joined the Milwaukee Area Technical College as a biology instructor in 1966 but retained close ties with the museum. Following his recent death, a Robert J. Reich Trust was established for support of local students and volunteers who provide commendable service to botany. Robert W. Freckmann left in 1968 to teach at the UW-Stevens Point campus, where he is today herbarium director and professor of botany. David A. Kopitzke became both a mushroom fanatic and active proponent of native plant landscaping while at MPM. In 1976 he left to become director of a regional Frank Lloyd Wright museum and founded his own wild plant nursery in southwestern Wisconsin.

Entrance facade of the library-museum building during World War I homecoming celebrations. MPM shared this, its third home, on Grand (now Wisconsin) Avenue from 1899 to 1963.

In 1975 this author (a fungus specialist) became botany's earliest doctoral section head, director of the herbarium, and MPM's first curator of nonvascular plants. Dr. W. Carl Taylor (a fern specialist) was appointed in 1976 as senior vascular plant taxonomist and MPM's associate curator of botany. In 1981 Neil T. Luebke (a regional specialist) became MPM's assistant curator of vascular plants, having been hired in 1971 as a student aide. And in 1985 John A. Christy (a moss specialist) was appointed MPM's assistant curator of nonvascular plants, after serving as a visiting scholar funded by the Institute of Museum Services. During the late 1970s and early 1980s other short-term or part-time botany staff curated some 35,000 lower plant specimens accumulated for a newly cre-

ated and privately funded Joan Marr Pick Cryptogamic Herbarium. Similar appointments have now permitted partial computerization of the herbarium's current 250,000 specimens and better management of the section's biochemical laboratory, greenhouse, and records' facilities.

Since the early 1970s, botany's pan-museum role of live plant decoration has blossomed from the activities of a museum garden club, started by MPM's ninth director, Dr. M. Kenneth Starr (1970-87). Section programming has also benefited from in-house formation of a southeastern chapter to the Botanical Club of Wisconsin and reactivation of the Wisconsin Mycological Society. Herbarium activities have been enhanced by Marquette University work-study students, plant projects of MATC and UW-Milwaukee students, and a pool of a dozen or more botany volunteers. And use of the collections has also been extended by awarding a number of museum plant research titles. The latest update to MPM's listing in the international *Index Herbariorum* tabulates eight active research affiliate, research associate, or honorary curator appointments for botany. Herbarium records indicate a total of twenty-two such positions have been granted over the last one-hundred years. Barring drastic cuts in monies budgeted for Milwaukee County's "discretionary" cultural centers, current botany staffing should make the 1990s an active decade of plant research at MPM.

City to county government

In 1976 after forty years of discussions, Milwaukee's governments agreed to transfer the museum from city to county ownership. As the nation celebrated its bicentennial and MPM opened its Urban Habitat exhibit, museum staff suffered the triple trauma of bureaucratic change, political repriority, and procurement procrastination. Despite the lack of an endowment, insufficient Friends' support funds, and some still unresolved governance issues, the museum and botany have now survived over a decade of county calamities. In 1988 after twenty-five years in the current building, a new administration was created under MPM's tenth director, Dr. Barry H. Rosen. Coinciding with the appointments of a new state governor, county executive, and city mayor, this act heralds a new chapter for one of Milwaukee's best cultural centers.

Compared to shared quarters in the 1899 library-museum building, MPM's 1963 occupation of its current facility signaled an era of expansion. Of advantage to botany was Albert Fuller's intimate involvement in planning the move, and his appointment as the museum's first assistant director at the time of transfer. The allocated herbarium space and subsequent ability to build in modern ancillaries is much appreciated by MPM's current plant curators. Today's botanical activities derive directly from this legacy and represent the culmination of roughly fifteen years of development.

Plant research is done to benefit the public in five program areas: collections, scholarly activities, exhibition, education, and public service. Three clearly offer direct user return; two appear esoteric and of immediate concern only to MPM's scientists. Understanding the broader implications of these curatorial tasks, however, is perceiving just what museum work is all about: **To hold in trust stored objects, to manage these, to ferret out information about them, and to make this variably available to the taxpayer.** Not all objects can be on general display, and not all public communication need be through exhibition. Identification, publication, educational outreach, and audio-visual presentation are some museum alternatives. Each of these requires an appropriate investigation to generate accurate and usable data. All are activities applicable to botany as practiced in Wisconsin by MPM's herbarium staff.

Collections

Management of plant collections entails acquiring, preparing, preserving, identifying, labeling, accessioning, cataloging, inserting, storing, using, lending, returning, and servicing specimens. Dried plants kept in herbarium cabinets require scheduled maintenance to mitigate damage by insects and humidity or temperature changes. Add to this the wear-and-tear of public consultation and degradation caused by scientific study in-house or on borrowed specimens. Need to access collections must be minimized and is greatly helped by today's electronic capture of label data. Computerization proves to be a great preservation tool!

Live plants have their own problems, and those associated with specimens grown for display are distinct from those associated with specimens raised for research. Maintenance of MPM's greenhouses and various environmental growth chambers requires trained support staff, as does upkeep of botany's biochemical laboratory, microscope and photographic facilities, and special basement storage area. Today almost as much effort is expended in managing plant holdings and their accessories as is spent on scientific endeavor.

Over the last ten to fifteen years, acquisitions have included personal herbaria of incoming staff, products of various regional field trips, vouchers collected as part of state natural areas projects, plants gathered on exhibition or research expeditions, deeded gifts from donors, purchased herbaria, and inter-institutional exchange materials. Specimens have come from all parts of the world, but in particular from those areas visited or being researched by current staff (Australasia, Europe, Central, North, and South America). Intake for the period is around 75,500 numbers (collection 24,920, exchange 9,660, gift 36,270, and purchase 4,650), while negotiated loans have totaled 226 (25,874 specimens), averaging 115 speci-

mens per transaction or 2,585 specimens per year.

Complete computerization of the herbarium is in progress. Checklists for suspected state algae, brophytes, fungi, lichens, myxomycetes, ferns, and vascular plants have been produced. Species map-cards now define Wisconsin county distribution records for each identified MPM plant specimen. And literature or taxon indices exist for all ongoing plant projects. Photographic documentation has always been part of any MPM scientific endeavor. Over the last fifteen to twenty years, staff botanists have produced 18,000 photographs to file.

Scholarly activities

Herbarium curators generally practice plant taxonomy. But today, along with naming plants, such systematists study plant anatomy, biochemistry, cytology, ecology, geography, productivity, reproduction, and ultrastructure using sophisticated equipment. MPM's botanists—both regular staff and appointees—have diversified, and now research such problems for both cryptogamic (nonvascular or spore-producing) and phanerogamic (vascular or seed-producing) plants. Programs developed involve both short and long-term projects with local, regional, national, or international implications.

Local projects include bryophytes of the Illinois-Wisconsin border, city feral plants, lichens and urban pollution, Milwaukee's railroad flora, parkland natural areas, shoreline fungi, tamarack swamp vegetation, and weed ordinances. Regional projects involve Amer-Indian ethnobotany and edible wild plants, Apostle Island and driftless area floras, ferns and fern allies of Arkansas and Wisconsin, Ice Age Trail and sphagnum bog vegetation, midwestern prairie and strip mine bryophytes, mushrooms of the Great Lakes states, state natural area surveys, and vegetation of Wisconsin old-growth forests.

National and international investigations cover Arctic and alpine fungi; American and old world quillworts; Caribbean island floristics; flora of North America projects; lichens of Australasia, Latin America, and the Sonoran Desert; Rocky Mountain and West Coast bryophtes; and vegetation of the Queen Charlotte islands. Specific taxon treatments involve the biology of *Aster furcatus* and *Iris lacustris* and the genera *Isoetes* (a fern ally), *Limbella* (a moss), *Ochrolechia* and *Pertusaria* (lichens), and *Scleroderma* (a puffball fungus).

Since 1975 the botany staff has organized or participated in fifty-eight regional, national, or international professional plant conventions and workshops. They have visited Australia and New Zealand, the British Isles, Canada (Alberta, British Columbia, and Ontario), the Caribbean, central and western Europe, Japan, Scandinavia, the Soviet Union (Baltic states, Georgia, Leningrad and Moscow), and most of the United States including Hawaii. Expeditions led or attended have been part of annual American Institute of Biological Sciences society excursions, regional Great Lakes mycological and midwestern bryological forays, IAL tropical lichen symposia (Baja California and Costa Rica), and two MPM-NYBG Projecta Flora Amazonica trips to the central regions (Mato Grosso and Para) and western frontier (Rondonia) of Brazil. During the past decade staff have also been appointed as adjunct professors of cryptogamic botany and pteridology at UW-Milwaukee, to a variety of peer society positions (such as officers and journal editors), and as grant reviewers for professional funding agencies.

Over the last fifteen years staff and appointees have won more than $285,000 from a dozen or so such granting agencies in support of museum botany projects. This excludes team participation in the funding for MPM's 1983 centennial geology hall ($400,000) and 1988 quaternary rain forest biology hall ($600,000) from the National Science Foundation's "Understanding of Science" program. During this time, research by these same botanists has produced over 250 invited or presented papers at plant meetings, resulting in some 185 peer-reviewed publications appearing in forty or more botanical journals. In addition, there have been three major monographs, five popular booklets, and a recent keynote address, "Museum Collections: Responsibilities for a Coming Age," given before the Chicago Annual Meeting of the American Association of Botanic Gardens and Arboreta.

Exhibition

Exhibition design and installation is the prerogative of the museum's exhibit and graphics section, but exhibit concept, subject knowledge, and object selection emanates from the curatorial staff. Plant research related to exhibition is varied; it depends upon whether the exhibit is to travel or be home-based and then of short- or long-term duration. Short-term exhibits involve merely case or wall renovation and are generally small. Most are displayed only weeks or months before being destroyed, and normally cover "hot," seasonal, or temporary subjects. Long-term exhibits are discipline or interdisciplinary shows which involve major renovation of a hall or wing. They display significant portions of the collections, last ten to fifteen years or more, and usually are designed to be periodically updated. Traveling exhibits are intermediate, of various size and subject, and may or may not involve objects. Smaller photo/graphic displays may be in replicate while larger unicate (often "blockbuster") shows borrow their unique materials from multiple sources. Both are designed to survive transport and reconstruction over a three-to-five-year or more lifespan.

In the last two decades botany has contributed to six major museum exhibitions, as well as updates of earlier natural history cases, and the long-term plant exhibits in the Discovery Center and hands-on children's workshop of

education's Wizard Wing. Input has ranged from botanical "decoration" of historic themes in the European Village and Streets of Old Milwaukee, through discrete units on plant domestication and paleobotany placed respectively in the Urban Habitat and geology halls, to the full vegetation and multiple plant biology concepts just created in the rain forest biology hall. The latter, in particular, has set new standards for museum display and brought Milwaukee further national acclaim. At its 1989 meetings in New Orleans, the American Association of Museums in initiating recognition for museum exhibition awarded MPM's environmental rain forest hall first place.

Temporary botanical exhibits have covered Carnivorous Plants, Dandelions, Dinosaurs Need Plants Too, Endangered Plant Species, Winter Botany, Wisconsin's Cranberry Industry, Wood in Man's Life, and 100 Years of Collections. Plant photoexhibits have portrayed Amazonia—Glimpses of a New Frontier, Australasia—MPM Down Under, Fruits of Decay—Midwestern Mushrooms, and Lichens—An Unholy Marriage. Traveling exhibits requiring vegetational support have included Fields of Grass, Magnificent Voyagers, Native Harvests—Plants in American Indian Life, 500 Years of Botanical Illustration, and a pending exhibit on Hawaii's Unique and Vanishing Flora. Proposed topics will encompass floristics of both regional and national concern: Cocaine—History of a Global Epidemic and Plant Trash—Urban Management of Garden Wastes.

Beyond these dead displays, botany also controls a three-climate rooftop greenhouse and two plant demonstration gardens on the museum grounds. The greenhouse includes live collections of plant kingdom members used in class teaching, reference specimens for plants modeled in exhibit cases, and experimental materials concerned with ongoing research (currently populations of the quillwort fern ally *Isoetes*). MPM's frontage wild yard extols the virtues of native plantings as an alternate to urban and suburban lawns. Concepts, plant types to use, and potential sources of material are explained in a supporting pamphlet "Following Our Second Nature." A complementary herb garden is maintained by the museum's garden club in the open-air courtyard associated with the Wizard Wing's Pioneer Village.

"Rain Forest: Exploring Life on Earth." A small sample of the diversity diorama, one of thirty-five theme areas within MPM's new 12,000 square foot interactive environmental exhibit hall which opened in the fall of 1988.

Education

As adjunct professors of botany, staff members teach aspects of graduate and undergraduate courses in the plant sciences at UW-Milwaukee. Special topic seminars are also given at Marquette University and the Milwaukee Institute for Art and Design. Student project or M.S. thesis studies completed during the last dozen years have reported on *Amanita* Mushroom Toxicity, Bryophytes of the Upper Milwaukee River, Conservation of Coastal Mosses, Distribution Patterns of Urban Tree Lichens, Fern and Fern Ally Hybrid Species, Fungi of the UW-M Field Station, Graveyard Lichens and Pollution History, Isozyme Protein Banding Patterns, Kettle Moraine Freshwater Spring Algae, Quillwort Spore Morphology and Ornamentation, Regenerative Multiplication of Conifer Cuttings, Rural and Urban Soil Ascomycetes, and Ultrastructure of Lichen Fruiting Bodies.

Adult plant education is conducted at the museum and selected

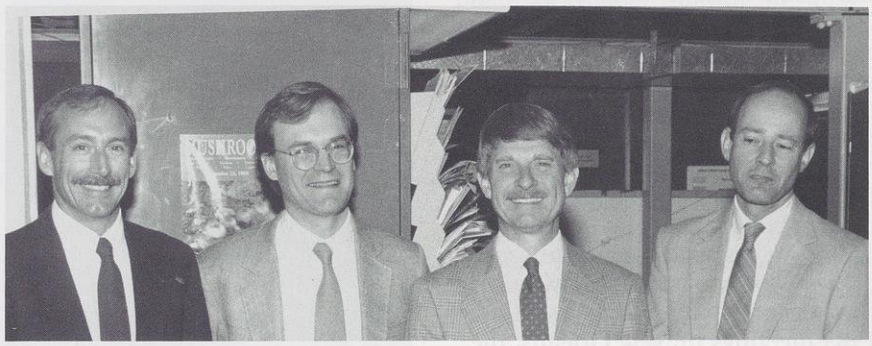
field sites by means of Elderhostel, Museum Naturalist, or Vision Quest-type courses. Indirect teaching of public groups through training of teacher naturalists is also performed at area centers through Ecofocus-type classes. Brochures, field guides, identification keys, and 35 mm slide sets have resulted from such programs given at The Clearing, the Ridges Sanctuary, UW-Milwaukee's Field Station, and the Retzger, River Bend, River Edge, River Wildlife, Schlitz Audubon, and Wehr nature centers. Plant related teacher in-service has also developed at MPM from a NSF-funded workshop on "Learning to Read Natural History Objects" jointly organized by botany, education, and the state's Milwaukee-based Havenwoods Environmental Awareness Center.

As a supplement to MPM education staff, curatorial training of volunteer docent and muse guides is done to improve exhibit hall botanical tours. And across the year additional plant education is provided by the museum's garden club for Arbor Day activities, festive holiday celebrations, and selected museum exhibits. Two seasonal programs that provide specific plant information are run by the clubs affiliated with the botany section. The Mushroom Fair (last Sunday in September) and Wildflower Show (first Sunday in June) are each one-day events focused on specimen identification that attract around 2000 persons.

Public service

A 1976 ad hoc association of Milwaukee city and county botanists redefined roles, decreased redundancy, and maximized public service among the region's civil service plant agencies. From this base, MPM's current botanical outreach allows for both local campus and extension service facilities. Second only to UW-Madison as a major state plant repository, the MPM herbarium is uniquely placed amongst Wisconsin's largest populace, who enter its domain for a variety of museum interests. Accordingly, programs have been developed to meet the needs of this captive metropolitan audience.

Current curatorial staff in MPM's Section for Botany (spring 1989). L to R: W. Carl Taylor (ferns), John A. Christy (mosses), Martyn J. Dibben (fungi), and Neil T. Luebke (vascular plants).



Indirect herbarium service varies from aiding city, county, state, and federal agencies to interacting with business and industrial colleagues. For example, analysis of Milwaukee County parklands has established that less than 2 percent of the woodlands and wetlands are botanically significant as remnant areas. Cooperation with Center for Great Lakes Research scientists has influenced investigations on biological phenomena, sewage disposal organisms, and waste recycling. Staff botanists have provided expert testimony in court cases dealing with environmental issues, federal and state-listed species, narcotics seizures, and noxious plant infringements. Watershed baseline vegetation studies done for regional power companies have addressed potential site degradation with respect to station placement, contaminant spills, altered runoff, gaseous discharge, and thermal pollution. Public activities during the 1980s included more than thirty-five uses of plant collections or the botany staff in the service of society.

Direct herbarium service borders on education and the two frequently overlap. For example, identification aids to mushrooms, poisonous plants, spring flowers, winter twigs, and woody plants are available for class teaching or individual learning. The herbarium also lends selected specimens or slide sets for artistic and classroom use. Botany receives requests to speak on career advice to students, popular plant groups or exhibits to the general public, or specific expedition or research reports to colleagues or Friends of MPM. Business, civic, and social organizations along with area libraries and garden clubs frequently schedule lectures. Workshops on plant groups are always popular, and similar success is currently being enjoyed by a visiting lecturer series on global environmental issues. Staff also regularly judge entries in the Marquette University statewide science fair.

Educational hikes in season along city streets, in county parks, and at local nature centers complement the state forays run as part of allied club meetings. Public or society tours to state, regional, and national conservancy or natural areas complement the more exotic MPM expeditions run abroad to island or mainland territories. An edible and poisonous mushroom course, recently established in part by botany staff at the Alberta Ford Forestry Camp (L'Anse, Michigan), has become a regular fall meeting for members of the Wisconsin Mycological Society. A tropical museum plant ecology and ornithology workshop, initially run in conjunction with the Schlitz Audubon Center, uses Costa Rica as its base. MPM biologists have to-

gether organized a successful public tour that includes Ecuador, the upper Amazon, and the Galapagos Islands.

Botanical outreach is also achieved through staff membership of (or board appointment to) such area conservation bodies as the Natural Areas Preservation Council, Southeast Wisconsin Regional Planning Commission, Wisconsin's Naturalists Association and Phenological Society, and state chapters of the Audubon Society, Nature Conservancy, and Sierra Club. Similar roles occur through association with support groups for nature centers and neighborhood plant facilities like Boerner Botanical Garden, Mitchell Park Domes, and the Milwaúkee County Park System. Such alliances have proved of use in addressing vegetational issues facing local significant habitats, for example Falk Park, Jacobus Park, and Bradley Woods.

The botany section is also a twenty-four hour resource for the region's poison center through staff expertise in mushroom and higher plant toxicities. Health fair and hospital lectures on these subjects inform the public, train nurses, and certify doctors in plant toxicology. During the 1980s the staff created video disc segments for educational use within the rain forest biohall. But earlier in the 1970s botany had cooperated with Wisconsin's Department of Health in producing a 16 mm medical training film, "Nature's Magic: Toxic Beauty," on poisonous plants of the American Midwest. Outreach has also been offered through the electronic media, such as recorded UW-Extension Dial-A-Tip telephone plant services, and radio or television appearances about upcoming botanical events, or on news programs, in regional documentaries and shows.

Finally, the botany staff respond to numerous public plant-identification requests, letters, phone calls, and personal visits to the herbarium. It is not surprising, therefore, that over the last dozen years botany's annual public service contacts have averaged 645 persons per curator—roughly ten section contacts per working day!

The 1990s and beyond

With the twenty-first century only a decade away thoughts turn to planning for the future. The botany section's mission and goals must address predictions and shortfalls about designed growth and use of the plant collections among a changing society.

Within any tax-supported institute staffing needs are always a prime issue. For the 1990s botany needs the allocation of two part-time summer assistants to facilitate precomputerization work on backlogged plant collections; these positions could provide herbarium experience for retraining of high school teachers. The botany and geology sections together could also benefit from joint funding to support a shared curator of paleobotany. The museum's fossil plant collections need much rescue and redirection.

Expansion of the herbarium through either mezzanine construction or installation of compactor-units is also critical. A tripling of lower and a doubling of higher plant storage space will be needed before the year 2000. Before this time both greenhouse and growth chamber facilities and controls will need to be renovated. And botany's biochemical laboratory should be modified to improve procedures and safety for both organic thin-layer chromatography and protein electrophoretic operations.

MPM plans to acquire a scanning electron microscope (SEM) to be located in the botany section in the 1990s and hire a part-time technician to support pan-museum use. Until then museum staff and students must continue to operate using time available on UW-Milwaukee's bioscience SEM facility. If the herbarium is to be fully computerized by 2000, then upgrade of MPM mainframe and personal computers' capabilities is required to permit multiple user access, faster data recall, quality graphics display, improved label production, and safer backup systems.

Botany programming should remain much the same with established courses, club activities, hikes and tours, and annual or seasonal museum events. However, the visiting lecturers program may be broadened to include interdisciplinary plant biology topics; new photodisplays on Australasia and Baja California could be generated from ongoing research; and popular photoguides to common plant groups of the Great Lakes region will likely be produced. National coach tours led by the botany section are also proposed as alternating spring trips to see the Appalachian flora and deserts of the Southwest.

Positive evaluation received on the botanical content of MPM's rain forest should provide a good start to education's new 1990s biosciences grade school programs. Also proposed is the development of one or more MPM-sponsored symposia on museums as natural science learning centers for the twenty-first century. Special programs for handicapped visitors to the greenhouse, mushroom fair, and wildflower show may also be created, with outreach versions distributed to hospice care, retirement home, and senior citizen centers. And elements of MPM's wild yard will probably be transferred to the enclosed Pioneer Village courtyard to eliminate the frontage display which is now suffering abuse from city street people.

The museum's current long-range plan includes support for all these goals via administrative approval of proposed budget and outside funding strategies into the next century. Success will be achieved, however, only if museum marketing is improved and correctly targets both audiences and those news and communications media which readily promote the botanical awareness and plant appreciation found at the Milwaukee Public Museum.■

BOOK MARKS/WISCONSIN

THE BOSS: J. EDGAR HOOVER AND THE GREAT AMERICAN INQUISITION by Athan G. Theoharis and John Stuart Cox. Philadelphia: Temple University Press, 1988. 489 pp. $27.95.

By Lawrence J. McAndrews

In October 1924, the newly installed director of the Federal Bureau of Investigation despatched a memorandum to the acting assistant attorney general. The director acknowledged that "the activities of Communists and other ultra-radicals have not up to the present time constituted a violation of Federal statutes," and the bureau "theoretically . . . had no right to investigate such activities." He nonetheless recommended the continued investigation of such individuals because they might violate federal laws in the future.

On this frightening pretext, J. Edgar Hoover launched a career as FBI director during which he would accumulate forty-eight years of service and twenty-five million personal case files. In *The Boss: J. Edgar Hoover and the Great American Inquisition*, Marquette University history professor Athan Theoharis and free-lance journalist John Stuart Cox argue that Hoover "had more to do with undermining constitutional guarantees than any political leader before or since," yet "in certain crucial respects [was] a representative American of his time."

The authors examine the heretofore unavailable FBI record destruction, Symbol Number Sensitive Source Index, and Surreptitious Entries files and exhaustively prove the first part of their thesis. They impressively detail how Hoover deftly acquired power, astutely played politics, and ruthlessly violated civil liberties.

Hoover's rise to power began four months after his high school graduation when he became a file clerk at the Library of Congress in order to pay his way through night law school. During World War I, he served as an intelligence clerk, then an attorney in the Department of Justice, preparing dossiers on alien radicals for the department's alien enemy registration section.

At the end of the war, Attorney General A. Mitchell Palmer empowered Hoover to create and command a general intelligence division in the Federal Bureau of Investigation. Hoover's office amassed files on over 200,000 individuals allegedly linked to foreign-inspired radicalism, including Wisconsin Republican Senator Robert La Follette. With the attorney general ill, Hoover coordinated the so-called Palmer raids of alleged subversives in 1919 and 1920.

In 1924 Attorney General Harlan Fiske Stone appointed Hoover as director of the Federal Bureau of Investigation. Hoover won the job by assuring Stone that his office would be "divorced from politics" and "responsible only to the Attorney General." Hoover kept the job by maintaining a low profile, obsequiously seeking advice from his bosses, and minimally apprising attorneys general of the bureau's activity.

When it appeared that President Franklin Roosevelt would replace Hoover with private detective Val O'Farrell in 1933, Hoover ordered an intensive investigation which thoroughly discredited O'Farrell and helped save Hoover's job. When Congress threatened to bring the FBI under the Civil Service in 1940, Hoover misrepresented the proposal as an affront to the bureau's professionalism, and the FBI retained its Civil Service exemption. When Nebraska Senator George Norris led an attack on FBI methods in 1940, Hoover exploited his popular support by disingenuously offering to resign and thus stayed in office.

Presidents Truman, Eisenhower, and Kennedy all considered removing Hoover, but their fear of public backlash rescued the director. "The sources of Hoover's power," the authors conclude, were "the [FBI] files; his ability to avert critical scrutiny and independent knowledge of his administration of the FBI; services rendered to V.I.P.'s; information given to politicians about their opponents and high-ranking corporate officials about militant labor unionism; and his cozy relationship with key reporters, editors, and syndicated columnists."

Hoover remained in office not

just by duping his employers and cultivating a powerful public image, but by remaining keenly attuned to the nation's political currents. Hoover reveled in the popularity of the Palmer raids in 1920, then downplayed his role in the face of public criticism in 1921. Hoover disarmed conservative critics by capitalizing on the wartime emergency to expand the FBI's domestic surveillance during World War II, then enraged liberal adversaries by supplying the House Un-American Activities Committee with covert assistance after the war. From 1950–1953, Hoover fueled Wisconsin Senator Joseph McCarthy's popularity by making speeches, providing counsel, and monitoring the senator's opponents. But the director wisely deserted McCarthy in January 1954 when the senator began his rapid political demise.

Beyond Hoover's enormous power and shrewd politics lay the most troubling component of his legacy: his unrepentant assault on the rights of innocent Americans. The Palmer raids resulted in over 10,000 arrests, but only 556 deportations. When asked by Senator Thomas Walsh of Montana in senate hearings on the raids in 1921, "Do you know how many searches were made without a search warrant?" Hoover replied simply, "I do not."

In the 1920s, unknown to the attorney general, Hoover instituted "summary memoranda" on all congresspersons, which would include accounts of their "subversive activities" and "immoral conduct." In 1925, defying the attorney general, Hoover inaugurated an "obscene file," which would contain personal and sexual information on persons ranging from prominent radical activists to presidents. In 1943, circumventing the attorney general, Hoover continued a "custodial detention" file designed to investigate "individuals (other than alien enemies) who may be dangerous or potentially dangerous to the public safety or internal security of the United States," by simply rechristening the file "security matter."

From 1956 to 1963, Hoover compiled a secret file on John F. Kennedy, filled with negative personal information, pamphlets, articles, and letters. And from 1963 to 1968, Hoover supervised the wiretapping of Rev. Martin Luther King, Jr., and even sent an audio tape of King's illicit sexual activity to the minister's wife.

Theoharis and Cox thus provide a fascinating account, replete with primary evidence, of a powerful man's tragic perversion of American democratic ideals. Yet the authors also describe Hoover as quintessentially American. They do not prove this second part of their thesis, however. Hoover's personal life, the popularity which he and the agency accrued, and the historical context in which he operated receive too little attention.

The authors nobly attempt to surpass the previously incomplete accounts of Hoover's private life, most notably Don Whitehead's *The FBI Story*, written under bureau auspices. But in the end they fail to penetrate significantly the secrecy which characteristically shrouded Hoover's life. They concede that there is no evidence of Hoover's homosexuality, then pointedly note the good looks and constant companionship of first Frank Baughman and then Clyde Tolson (FBI underlings), and lament the director's aversion to women other than his beloved mother. Relying on their own judgments rather than those of any cited Hoover associates, they conclude that Hoover was a sad and lonely man—hardly a representative American.

This portrait of the private Hoover vividly contrasts with the public image of the FBI and its director which Hoover meticulously promoted. Allusions to Hoover's personal popularity fill the book, but the evidence barely transcends an absorbing few pages on "G-Man" image-making (hair, weight, and dress regulations) in the 1930s; specialized recruiting (Catholics preferred for their religiosity and good looks) in the 1940s; FBI-assisted Hollywood moviemaking (for example, *The FBI Story*) in the 1950s; and wooing of "conservative media" representatives throughout. Theoharis and Cox thus leave the mistaken impression that Hoover manipulated the masses as easily as he manipulated his superiors.

In short, the authors are unwilling to credit Hoover for anything except his instinctive leadership. A major reason for this drawback is the limited scope of their study. By concentrating almost exclusively on Hoover's virulent anticommunism, the authors play to Theoharis's scholarly strengths (McCarthyism, civil liberties), but overlook Hoover's considerable accomplishments in fighting crime, terrorism (right-wing as well as left-wing), and civil rights abuses—achievements which contributed to his popularity. As David Burner writes in *John F. Kennedy and a New Generation*, "Hoover was not the irresponsible psychopath television docudramas have made him out to be, and for many years the FBI maintained at least the appearance of a procedurally careful investigative force, a buttress rather than a threat to constitutional restrictions on federal power."

While conjecture plagues the book's account of Hoover's private life and selectivity distorts its assessment of his popularity, personalization compromises the historical context of the subject. Theoharis and Cox, by blaming Hoover for virtually every infringement of civil liberties in the name of anticommunism from 1917 to 1972, implicitly absolve numerous attorneys general and presidents from Wilson to Nixon. The authors contend that Hoover stayed in power because the attorneys general and presidents of the 1920s erroneously believed that they could control Hoover, and the attorneys general and presidents since the 1930s were afraid they could not. Yet Theoharis and Cox admit that all of the presidents and congresses

during Hoover's directorate at least tacitly approved most of Hoover's activities.

Harry Truman created the Central Intelligence Agency in 1947 over Hoover's protest. Lyndon Johnson's attorney general limited Hoover's wiretapping and bugging authority in 1965. Hoover was therefore neither easily controlled nor uncontrollable.

He was instead, as the authors state, in many ways a reflection of his time. Yet their "Great Person" history, with a few exceptions, fails to capture Hoover's era. There is ample documentation of McCarthyism, but little explanation for it. Theoharis would have done well to recall how his colleague Robert Griffith (with whom he edited *The Specter: Original Essays on the Cold War and the Origins of McCarthyism*)explained the second "Red Scare," by noting traditional American fears of radicalism as well as the Korean War. Not only was Hoover popular, but so was what the authors label "The Cause"—anticommunism—which every president whom Hoover served ardently embraced.

Which leads, finally, to the title. The Spanish Inquisition counted thousands of victims of torture and death. J. Edgar Hoover, for all his abuses of power, was no Torquemada. Comparing Hoover's excesses at the FBI to the excesses of the fifteenth-century Spanish Church and state is akin to calling the recent Iran-*contra* scandal a "reactionary scare and a wholesale repression," which the authors also do, in tenuously connecting Hoover's FBI to the late CIA director William Casey's purported "secret government."

The Reagan White House's Iran-*contra* deal nonetheless shared with Hoover's FBI a penchant for secrecy and a disrespect for the U.S. Constitution. The age-old question, revisited by Theoharis and Cox, regarding the proper balance between national security and individual rights in a democracy, deserves close scrutiny. But this issue has always been far bigger than one person.

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OLYMPIA BROWN: THE BATTLE FOR EQUALITY by Charlotte Coté. Racine, WI: Mother Courage Press, 1988. $16.95 cloth; $9.95 paper.

By Audrey Roberts

Olympia Brown by Charlotte Coté is a thoroughly interesting and inspiring biography of a woman whose life spanned two centuries and two careers. Born in 1835, Brown was thirteen-years-old at the time of the Seneca Falls convention. At twenty-eight, in 1863, she was the first woman to be ordained a minister in a denominational church in America. Brown's life followed two clear callings, one in the ministry, the other for women's suffrage.

Coté's biography tells of Brown's personal campaign to make the pulpit available to women, then touches on all the shifts in policy and leadership in the long struggle for women's suffrage, focusing on the important role Brown played at all stages.

Olympia Brown was the eldest of four children born to Lephia and Asa Brown, who had left Vermont for better farming land and settled in the prairie village of Schoolcraft, Michigan in 1834. Lephia was an unusual woman. An intellectual, ardently devoted to education, she believed in full equality between the sexes and supported Olympia's strivings for complete self-realization.

Charlotte Coté, drawing on the Brown papers in the Schlesinger Library at Radcliffe, Brown's unpublished autobiography, and on her published recollections, *Acquaintances, Old and New, Among Reformers* (Milwaukee: Tate Printing Company, 1911), traces Olympia's life: her childhood on the frontier, her education at Mt. Holyoke and Antioch, her training for the ministry at St. Lawrence Universalist Theological School, culminating in her ordination in 1863. During this period of her life Brown cut her own path through uncharted territory in preparing for the ministry.

Brown was ordained in the Universalist Church in 1863. In 1864 she began her career as minister in Weymouth Falls, Massachusetts. In 1865 she took a leave from her church to campaign for four months in Kansas for women's suffrage. A co-campaigner wrote: "She has great physical power of endurance, lately speaking two or three times each day in hottest weather, travelling from twenty to fifty miles each day with only an average of about four hours sleep, and her speeches from one to two hours in length, without apparently the least fatigue, and weighing only ninety-one pounds . . . Eloquent, hopeful and brave, . . . she is the best pleader for woman that we have yet seen before the public."

In 1869 she moved, for a larger salary, to her second parish in Bridgeport, Connecticut, where P. T. Barnum was a friendly supporter. John H. Willis, whom she had met in Weymouth, followed her to Bridgeport, courted her, and they were married in 1874. They had two children. But because Brown faced persistent hostile opposition to her appointment, she sought a more congenial church. In 1878 the family moved to Racine, Wisconsin, where Brown was minister at the Universalist Church until she resigned in 1887 to devote full energy to the suffrage movement.

Susan B. Anthony had asked Brown, shortly after she began her career, to join her in the suffrage cause, but after deep consideration, Brown refused. She felt her first calling was the ministry. At this point in the story one wishes Coté had devoted more discussion to Brown's religious convictions, even some excerpts from her sermons. But Coté does not explore Brown's

position on theological issues except to distinguish a humanistic, loving, Universalist God from a hellfire-and-damnation god of other sects. One wonders what Brown said about equality of the sexes in her sermons from her pulpit.

We do get a much better sense of Brown as a campaigner for women's suffrage. Excerpts from her speeches and samples of some platform exchanges with other speakers (for example, Stephen Douglas) show her to be lively, quick witted, and forthright on the platform. Coté sketches the history of women's struggle for the vote, the achievements and setbacks. She briefly touches on the conflicts among the various personalities and associations, particularly in Wisconsin, but her focus keeps Brown in the forefront, always independent, stubborn, and single-minded.

Brown emerges as both formidable and engaging. Slight in stature (under five feet and less than one-hundred pounds), she had steadfast determination. When she realized that her voice was small and might not carry to the back of the hall, she took physical education and voice lessons. For the rest of her life, her oratorical style won admiring comment. Brown's strong-headedness sustained her through many battles; it also prevented her from joining with groups with which she did not fully agree. Coté considers that Brown's place in the history would have been far larger, that her name would have been as familiar as Susan B. Anthony, Elizabeth Cady Stanton, and Lucy Stone, if she had not been so self-directed.

The book provides some history of Wisconsin's not always enlightened attitudes towards women's suffrage. But one of the most dramatic episodes describes the suffragists' winter-long picketing of the White House protesting President Wilson's opposition to women's suffrage. How many of us are aware that American women were beaten, arrested, jailed, and went on a hunger strike in 1917, in attempts to win the vote?

Olympia Brown, in 1920, at the age of eighty-five, cast her first vote in a national election. She had participated all her adult life in the struggle to get the vote and, because she lived so long, succeeded in achieving her ambition. We are made painfully aware of the slow, frustrating history of achieving equal rights for women. Not much has been written about the life of this indomitable feminist; therefore Coté's biography is most welcome.

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HARRIER, HAWK OF THE MARSHES by Frances Hamerstrom. Washington, DC: Smithsonian Institution Press, 1986. 171 pp. $24.95 cloth; $10.95 paper.

By James O. Evrard

This is another in a series of popular and readable books by Frances Hamerstrom, a pioneering woman in the field of wildlife research and conservation in Wisconsin. The book is illustrated by Jonathan Wilde, a noted Wisconsin artist. Roger Tory Peterson contributed the foreword.

Frances, better known to her coworkers and friends as Fran, spent nearly thirty years with her husband, Frederick, studying prairie chickens in central Wisconsin near Plainfield. Their work was the basis for the conservation effort that saved the species from extirpation in the state. During this period, she also became interested in the harrier or marsh hawk (*Circus cyaneus*), another inhabitant of the grasslands of the Buena Vista marsh.

The peculiar mating flight of the harrier, termed skydancing, drew her attention from the chickens to the hawk. Puzzled by the significance of skydancing, she wondered if harriers mated for life and formed the first of many hypotheses that were tested in her twenty-five-year study. In order to test the hypotheses, she decided that breeding harriers on the marsh would have to be first trapped and individually marked. But how? Fran turned to the ancient art of falconry for guidance and inspiration. Her writing is replete with terms like "bal-chatri," "dho-gaza," and "imping," which describe trapping and marking techniques. Fran developed her own trapping variation, which included using her pet great horned owl Ambrose to lure harriers into nets erected over their nests. She even invented a word, "gabboons," which she called the many apprentice students who helped her through the years with her study.

Fran's diligent research demonstrated that harriers do not mate for life; the homing of females prevents year-to-year fidelity to mates. Males had different mates each year and in some years had several mates at the same time. She found polygamy regulated harrier numbers to prevent overpopulation.

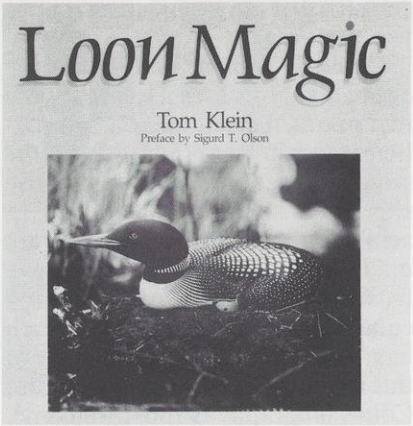
She found a close relationship between harriers and their principal food, mice or voles (*Microtus sp.*). This relationship was characterized by the subtitle of the book, *The Hawk That is Ruled by a Mouse.* Fran set out thousands of traps each year to sample vole populations to compare statistically their numbers to harrier numbers. She found voles to be cyclic, peaking in numbers every four years. During years of high vole populations, harriers responded to the increased food supply by males mating with more females, which produced more nests and more young. Contrary to popular opinion, harriers did not control vole numbers. Harriers did not prey upon larger creatures to any degree: only one kill was recorded in 886 encounters between harriers and prairie chickens.

In the early 1960s the harrier

population on the Buena Vista marsh dropped precipitously. Birds appeared sick, skydancing disappeared, and breeding ceased. She suspected agricultural pesticides, but to prove her suspicions she had to sample harriers for chemical contamination. The commonly accepted technique to determine pesticide contamination at that time required killing the bird to obtain tissue samples for laboratory analysis. Fran, however, could not force herself to destroy the hawks in order to save them, so she used a new technique, biopsy. After capturing and restraining a harrier, she carefully made a small incision in the live bird, removed a tissue sample, and sewed the incision shut. The bird was then released to continue its life. Because Fran's harrier study was poorly funded, the cost of laboratory analysis of tissue samples was prohibitive. Undaunted, she traded her home-baked pies for tissue analysis. After DDT and related pesticides were banned in Wisconsin in the early 1970s following landmark legislation, the harrier population on the Buena Vista marsh recovered.

To learn more about the development of young in the nest, Fran removed birds from the nest and raised them herself. The process of raising hawks and teaching them how to fly and hunt is called "hacking." She hacked a female harrier which she named Euphoria, and a male harrier, Benjamin. From observations of these birds and others in the field, Fran learned that young harriers are fed by their parents after flight and do not learn to hunt until they migrate.

I enjoyed the book because of its content and ease of reading. The bibliography provides additional information for those who want to learn more about harriers and other raptors (hawks and owls). The twelve appendices provide the technical information which professionals need in order to utilize Fran Hamerstrom's study. I recommend this book to anyone interested in wildlife and the Wisconsin ecosystem.



LOON MAGIC by Tom Klein. Minocqua, WI: NorthWord Press, 1989. Updated with new photographs. 164 pp. $50 cloth; $19.95 paper.

By James O. Evrard

This is the second edition of a popular book noted for its beautiful loon photography. The author, Tom Klein, is a Wisconsin native who lives in Ashland and self-published the first edition of this book in 1985. The foreword of the second edition is by Sigurd T. Olson, son of the late Sigurd F. Olson, noted Wisconsin ecologist.

Tom Klein has designed and written a book synthesizing scientific and popular loon literature into a form that the average reader can understand and enjoy. The many beautiful and fascinating photographs alone are worth the cost of the volume. Wisconsin residents and locations are featured throughout the work. Each chapter begins with an appropriate quotation from a respected writer, biologist, or just plain loon person. Similar quotations are scattered throughout the text.

Loon people are the most irrational of birders according to Klein. He speculates that a loon "religion" exists in the north country, complete with festivals and idols like the nineteen-foot-high fiberglass loon in downtown Mercer, Wisconsin. Tom was first introduced to the religions nature or magic of the loon while on a Boundary Waters canoe trip.

Five loon species exist in North America, but the emphasis of this book is on the common loon, *Gavia immer*. This loon has captured the imagination of people as a symbol of wildness and wilderness much like the wolf has. The haunting calls of the loon remain forever in the memories of those who have visited the northern lake country of Canada and the United Sates.

The late Olaus J. Murie, a biologist and wilderness philosopher, wrote: "We returned to camp in the evening. The wind was dying down as the sun sank below the trees. The sky was saffron when the moon climbed into view and a large bright star dropped its reflection with that of the moon on the still, darkening water while from out of the lake arose the exuberant yodeling of the loons. We stood in the deepening dusk, reverently . . . Long after we had crept into the tents and lay quiet and contented in our sleeping bags, we listened to the wild serenading of the loons."

Klein ably leads the reader through the scientific classifications, physical characteristics, and status and distribution of the loon species in the first four chapters of the book. Calls, breeding habits, nesting, brood raising, food habits, migration, and winter habitat are discussed in succeeding chapters. Finally the future survival of the loon is explored.

Despite pressure from increasing human populations, there is hope for loons. Human attitudes have changed from unrestricted persecution of a perceived competitor to reverence for the symbolic creatures. Loons have also adapted to people. If we can conserve and preserve the environment we share with the loons, their future is assured.

The final chapter, "Loon Lovers Digest," contains fifty questions and answers about loons. The questions are grouped in units of ten in increasing complexity and, along

with a glossary of loon terminology, provide a good synopsis of the book. The bibliography is arranged by subject matter to help persons wanting more detailed information. A directory lists organizations that deal directly with loon conservation. The digest contains an essay, "A Day in the Life of a Loon," written by Paul Strong, a biologist with the Sigurd Olson Environmental Institute at Northland College.

This book is a must for both amateur and professional "loon people."

James O. Evrard is a wildlife research biologist with the Wisconsin Department of Natural Resources at Baldwin.

GLOBAL BIOETHICS: Building on the Leopold Legacy by Van Rensselaer Potter. East Lansing: Michigan State University Press, 1988. 203 pp. $9.00 paper.

By Brian J. Resler and David L. Schiedermayer, M.D.

A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.

—Aldo Leopold,
A Sand County Almanac

The life and work of Aldo Leopold were major influences in the modern ecological movement. From his scholarly publication of *Game Management* in 1933 (which created the science of wildlife management) to his poetic contributions as an observer and ethicist of nature, Leopold demonstrated a passion for the natural world which can perhaps best be described as compassion. The University of Wisconsin-Madison is justifiably proud of having nurtured this world-class naturalist, although Leopold was always a self-effacing academic, more interested in the prairie remnants growing along neglected cemeteries than in revising his textbook. Despite the current recognition of Leopold's work, the thesis of Van Rensselaer Potter in *Global Bioethics: Building on the Leopold Legacy* is that Leopold's true efforts may have gone unrecognized.

While acknowledging Leopold's impact as a conservationist, Potter (an emeritus professor of oncology at UW-Madison) proposes that Leopold's "Land Ethic" applies not only to the land, but also to human behavior and survival. Leopold was deeply concerned for the world's exponentially increasing human population and overconsumption of both renewable and nonrenewable resources. Potter uses these concerns to define "global bioethics": "... a secular program of evolving a morality that calls for decisions in health care and in the preservation of the natural environment. It is a morality of responsibility." (p.153)

Potter begins by analyzing the Leopold legacy, developing a series of important tenets or categorical imperatives for the land ethic. He then discusses, in separate chapters, human survival; dilemmas in ecological ethics, global ethics, and feminism; issues in clinical ethics; and the control of fertility. The book has several appendices including a "Bioethical Creed for Individuals." The bibliographies are extensive, and the book is worth having on the shelf as a reference resource alone.

"Bioethics" was first coined in 1970 by Potter, whose *Bioethics: Bridge to the Future* was published in 1971. *Global Bioethics* is an attempt, as philosopher Tris Engelhardt points out in the book's foreword, to formulate a general philosophical and moral challenge which addresses a wide range of issues. For example, Potter claims that *survival* would be a "basic supra-ethical criterion." (p.3) To increase the chance for human survival in harmony with the ecosystem, one must recognize the "fatal flaw in the combined biological mechanism." (p.7) This flaw, first defined by Theodosius Dobzhansky, is that as a species becomes better adapted to a given nonchanging environment, it may lose the ability to adapt to a sudden change in that environment.

For Potter, the road to survival is through the merging of medical bioethics or clinical ethics (with its short-term focus on individual concerns of patients and health professionals) and ecological ethics, which incorporates a broad outlook on the environment as a whole. Individually, he notes, each viewpoint fails in some respect. But combined, the concentration on *both* individual and species survival in the context of a healthy ecosystem could lead to controlled human fertility and a stabilized world population, resulting in "acceptable survival."

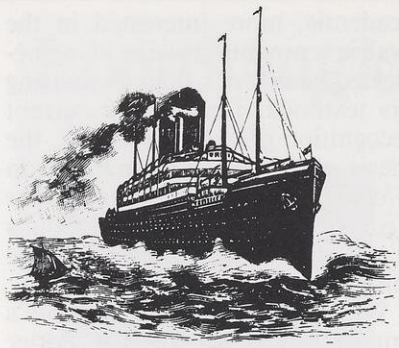
Of course, there is bound to be much dissention over the criteria for acceptable survival. As Potter defines it, acceptable survival involves not merely sanctity of life but quality of life as well. An optimum environment would satisfy "by effort: food, shelter, clothing, space, privacy, leisure, and education (both moral and intellectual)" and "freedom from toxic chemicals, unnecessary trauma, and preventable disease." (p.60) His concern is that *overpopulation* is the primary cause of ecological damage and unfitness. Quoting Leopold, Potter states, " 'Ecology knows of no population density that holds for indefinitely wide limits. All gains from density are subject to a law of diminishing returns.' " (p. 129-30)

Overpopulation invariably leads to overconsumption, and with this concept in mind, Potter argues that "a case-by-case approach seems called for" (p.97) in birth control, abortion, and selective nontreatment of newborns and the terminally ill. In the consideration of abortion, he calls for "counseling for and against ... [where] the se-

riousness of parenthood should be discussed." (p. 164) This would include information about abortion or withdrawal of treatment in instances of "defective" fetuses and newborns. Potter believes it is wrong to adhere to the "sanctity of life" philosophy when a child has a very slim chance of survival, or when circumstance (either genetic or societal) cannot ensure a tolerable existence. These policies would also apply to organ transplantation and euthanasia. While medical and ethical advice considering all responsible options should be available, Potter writes that the final decision regarding human life should be made by the individual, or, if an infant or newborn, by the parents.

Potter admits that cultural and religious differences will pose serious obstacles to worldwide adoption of a global bioethic. His is a macro, even armchair, view, and one wonders if he has ever been in a neonatal intensive care unit or a busy community hospital emergency room on a Friday night. He says in the book's preface that while Leopold advocated his intuitive ideas by means of poetic prose rather than by tables or charts, "fifty years later, we cannot rest the case on poetry alone." Perhaps, in the end, this is the book's major flaw: it was precisely in their poetry that Leopold's ideas found and held their power. While Potter builds thoughtfully and carefully on Leopold's work, he does not give his new ideas the passion and energy required for long life.

Brian Resler is a senior majoring in bacteriology and philosophy at UW-Madison, with plans for entering law school. David Schiedermayer is assistant professor of medicine and associate director of the Center for the Study of Bioethics, Medical College of Wisconsin, Milwaukee.



THE U.S.S. WISCONSIN: A HISTORY OF TWO BATTLESHIPS by Richard H. Zeitlin. Madison: The State Historical Society of Wisconsin, 1988. 56 pp. $5.95 paper.

By Frederick I. Olson

The modern American navy may be said to have begun with congressional approval for three new battleships in 1896. These were to be state-of-the-art ships, emphasizing seagoing qualities, heavy firepower, and the most modern armor. Their names—*Illinois, Alabama*, and *Wisconsin*—began the tradition of honoring states, an extraordinarily shrewd long-term public relations coup for the navy. How shrewd was underscored nearly one hundred years later. In 1988 the navy recommissioned the second *Wisconsin*, amid an amazing outpouring of public interest throughout the Badger State. Governor Tommy Thompson led a large delegation to the recommissioning at Pascagoula, Mississippi, in the fall of 1988, to the accompaniment of extensive press coverage. The entire state glowed with pride over this event in the Reagan defense rebuilding program.

No item in this recommissioning saga is more interesting than the publication of this slim, instructive, and candid volume. In forty pages Richard H. Zeitlin, a professional historian and curator of the Wisconsin Veterans Museums in the Capitol, traces the development of the battleship concept in the United States, the construction of the two vessels named for the Badger State, and their experiences and exploits on behalf of the American people before and after two world wars. Anne Woodhouse, curator of decorative arts for the State Historical Society, adds a seven-page footnote on the highly visible contribution the people of Wisconsin made to their two battleships, a handsome sterling silver service authorized by the state legislature for the first *U.S.S. Wisconsin* just ninety years ago and often on exhibition in the state since then.

Zeitlin makes no claim that our *Wisconsins* changed the course of American history, but both have had interesting careers. The first, launched at San Francisco late in 1898, missed out on the Spanish-American War, but its early years were spent cruising in Pacific waters, symbolic of the nation's new role in that part of the world. It joined President Theodore Roosevelt's Great White Fleet in its dramatic demonstration of America's newly created naval power in the Pacific in 1908. Before the United States entered World War I, the now-aging *Wisconsin* was recommissioned, but its war service was limited to training and patrol along the east coast. It made a farewell cruise to the Caribbean at the end of hostilities and was decommissioned in May 1920. Thereafter it was ignominiously sold for $42,000, its scrap value, and dismantled in 1922.

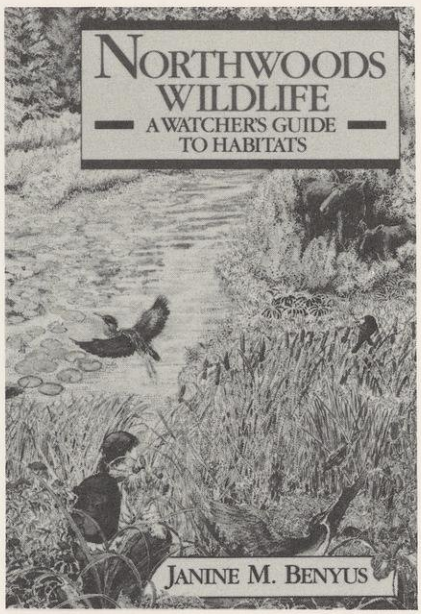
The 1920s witnessed a world effort to limit and even to reduce major naval fleets, and only the rise of new threats to world peace in the middle 1930s led to resumption of battleship construction by the United States in 1938. The *North Carolina*, launched in 1940, represented the new fast battleships, but improvements continued until they reached what was to be the finest—and final—group constructed for World War II, the *Iowa* class of four vessels. The *Wisconsin* was begun in January 1941 and launched just two years to the day following the Pearl Harbor attack. For nine months thereafter it served, as did

the nations's other battleships, primarily in support of carrier operation, not in the classical big ship duels of the past. Decommissioned in 1948, the *Wisconsin* was called back to serve in the blockade of North Korea and remained in active service until 1958, the survivor of the *Iowa* class. There were threats to its very existence in the 1970s, and President Carter opposed its reactivation. A new life for the *Wisconsin* awaited President Reagan's defense buildup.

Readers will enjoy the details Zeitlin provides of the careers of both *Wisconsins*. Of the second he concludes: "The *Wisconsin* and the other *Iowa*-class battleships are the most beautiful and puzzling capital ships of the World War II era. *Wisconsin* was never tested in action against the enemy battleships it was designed to fight. It entered service too late, and airplanes had become the Navy's primary weapon. The remarkably high speed of the *Iowas* made them ideal companions for the fast aircraft carriers, however, and for that reason they remained in service long after all other battleships were scrapped."

Produced as a slick paper pamphlet, of attractive design and handsomely illustrated, this publication reveals what can be accomplished for the general reader in the present publishing program of the State Historical Society. Gone are the scholarly monographs, and in their place (except for the monumental six-volume definitive history of the state) we have more modest efforts of broader appeal—site guides, reprints from the *Wisconsin Magazine of History*, bibliographical aids, and timely reconstructions of popular history such as this. The demonstrated public interest in the *Wisconsin* should guarantee Zeitlin's work a wide readership.

Frederick I. Olson, professor emeritus of history at UW-Milwaukee, has lectured and written widely on Milwaukee and Wisconsin history.



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New book shelf

Janine M. Benyus. *Northwoods Wildlife Guide: A Watcher's Guide to Habitats.* Minocqua, WI: NorthWord Press, 1989. illus. 440 pp. $19.95 paper. Produced by the North Central Forest Experiment Station, USDA Forest Service, St. Paul, MN.

F. M. Clover and R. S. Humphreys, eds. *Tradition and Innovation in Late Antiquity.* Madison: The University of Wisconsin Press, 1989. 343 pp. $40.00 cloth.

Gordon Gullion. *The Ruffed Grouse.* Minocqua, WI: NorthWord Press, 1989. 144 pp. 130 full color photographs by Tom Martinson. $19.90 paper.

Jane Hamilton, *The Book of Ruth.* New York: Ticknor and Fields, 1988. 328 pp. $18.95, fiction, an innocent mind trapped by meanness and isolation in a small Iowa town

Claudia Johnson. *Jane Austen: Women, Politics, and the Novel.* Chicago: The University of Chicago Press, 1988. 186 pp. $27.50, a reexamination of the supposed social and political isolation of the author

John and Joanne Judson, eds. *Remember That Symphonies Also Take Place in Snails.* La Crosse: Juniper Press, 1989. 190 pp. $18.00 paper. Selections from twenty-five years of the little magazine *Northeast*, 1963-88.

Ronald Wallace, ed. *Vital Signs: Contemporary American Poetry from the University Presses.* Madison: The University of Wisconsin Press, 1989. 502 pp. $29.95 cloth; $14.95 paper.■

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