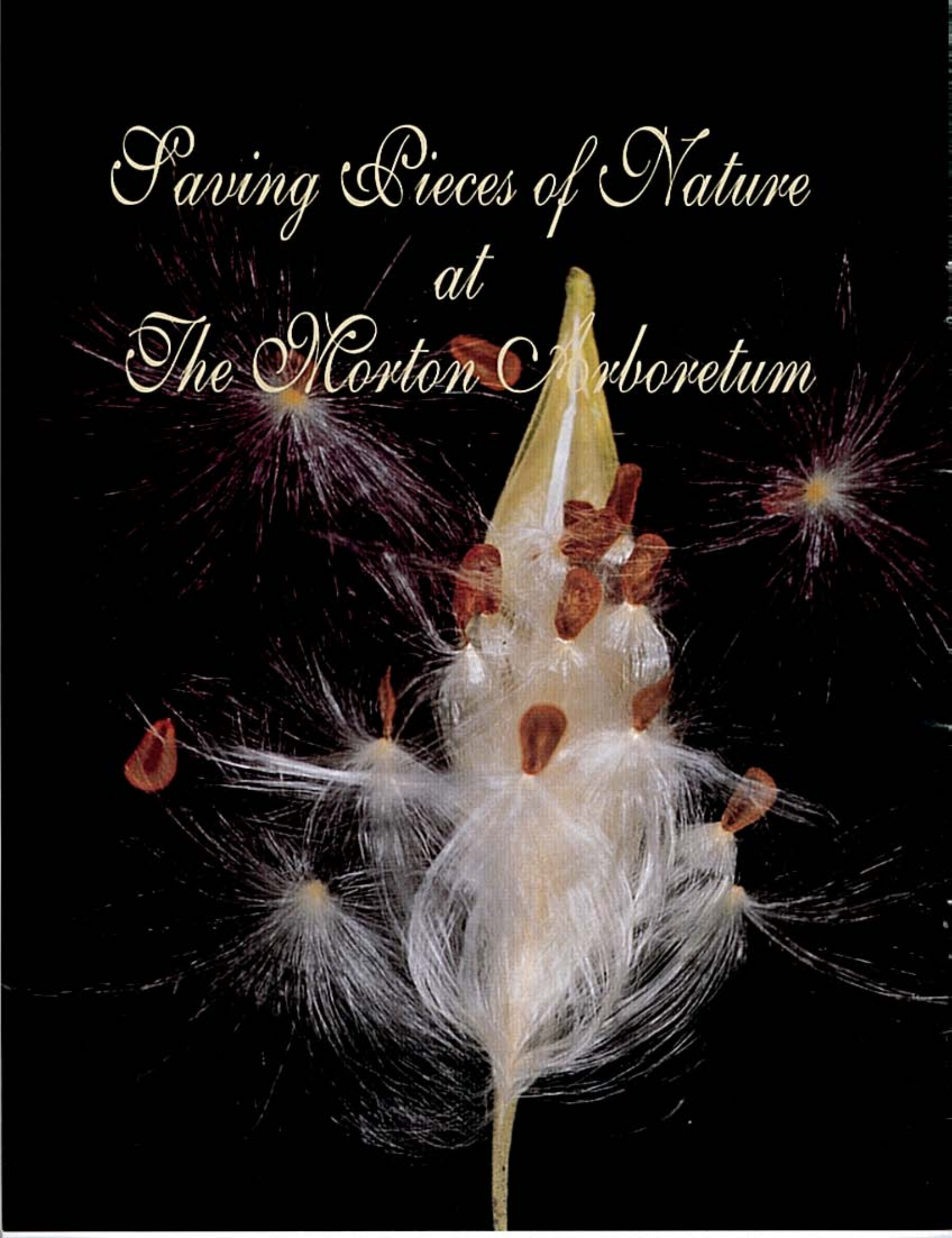
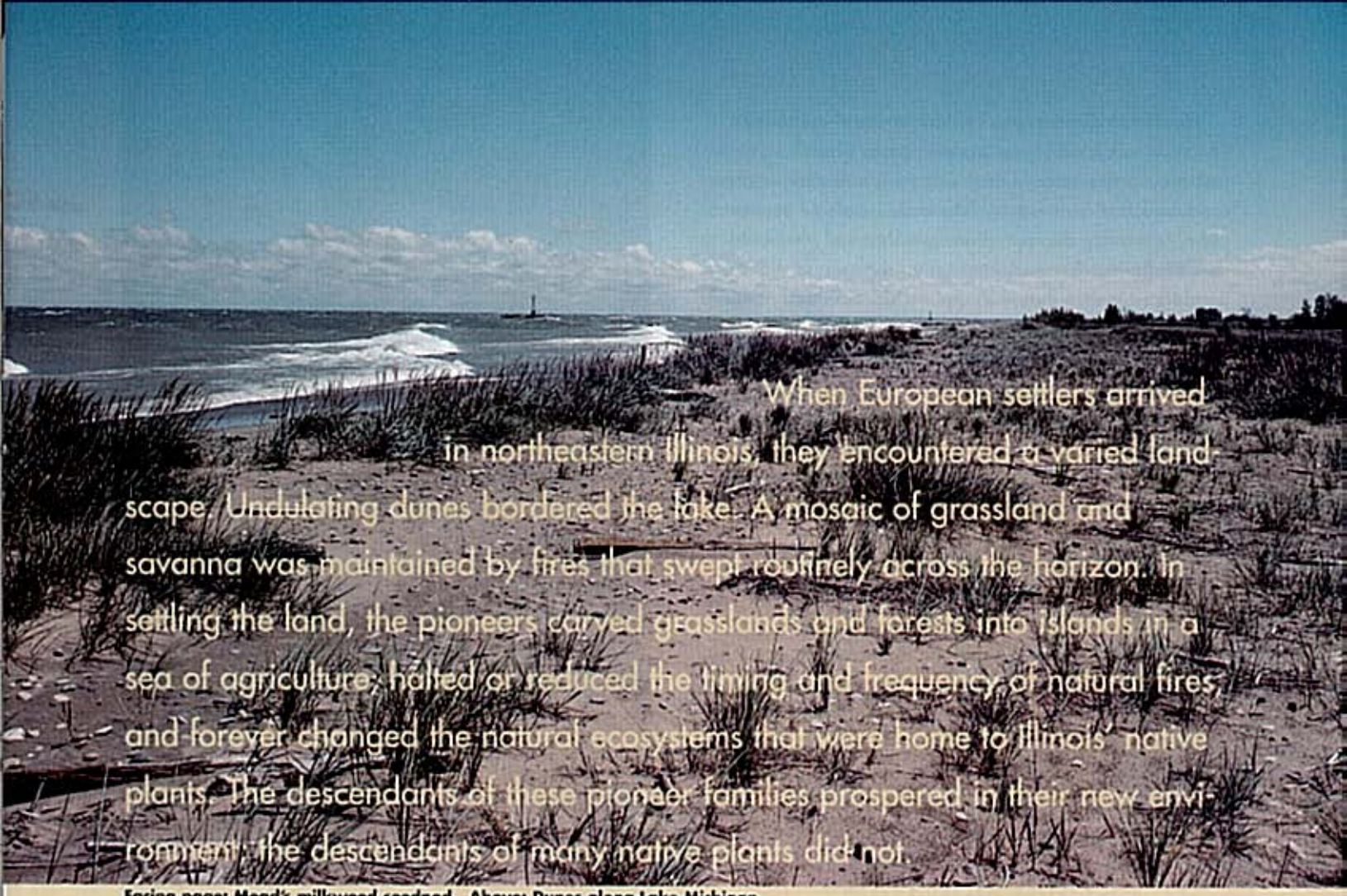
Saving Pieces of Nature at The Morton Arboretum





When European settlers arrived in northeastern Illinois, they encountered a varied landscape. Undulating dunes bordered the lake. A mosaic of grassland and savanna was maintained by fires that swept routinely across the horizon. In settling the land, the pioneers carved grasslands and forests into islands in a sea of agriculture; halted or reduced the timing and frequency of natural fires; and forever changed the natural ecosystems that were home to Illinois' native plants. The descendants of these pioneer families prospered in their new environment; the descendants of many native plants did not.

Facing page: Mead's milkweed seedpod. Above: Dunes along Lake Michigan

Urbanization further altered the landscape. Urban development and mining of sand reduced and altered the natural shoreline dune system along Lake Michigan, home to a plant called Pitcher's thistle. Also, grazing and mining of gravel and dolomite destroyed or changed many of the rare examples of gravel prairies in glacial deposits and along the Des Plaines River Valley. The gravel prairies were the natural habitat for the Lakeside daisy, Tennessee milkvetch, and leafy prairie clover. These widespread landscape changes have been disastrous for plant species that depend upon natural ecosystems to support their habitat requirements and reproductive biology. Many species nearing extinction due to human impact on their environment can no longer survive without human assistance.

Conservation biologists at The Morton Arboretum and the Chicago Botanic Garden are working hard to prevent the extinction of endangered plant species, such as the eastern prairie fringed orchid, Mead's milkweed, Lakeside daisy, and Pitcher's thistle. Because these species are very rare in the United States, they are considered "federally threatened" by the U.S. Fish and Wildlife Service. The Arboretum and the Botanic Garden have formed the Chicago Center for Endangered Plants; they are also members of the Center for Plant Conservation, a national network of botanic gardens that is developing special strategies to propagate and restore these endangered plants.

Tallgrass prairie species that were formerly widespread but few in number are often missing from small preserves that now dot the landscape. Conservation biologists are introducing them into preserves, but they sometimes encounter unexpected problems. For example, the seed of the federally threatened eastern prairie fringed orchid can be easily broadcast into new sites, but sites containing the soil conditions and soil fungi necessary for germinating and establishing orchid seedlings are not easily identified. Scientists at The Morton Arboretum maintain a culture of this fungus, isolated from the roots of some eastern prairie fringed orchids that were translocated when their habitat was about to be destroyed.

by Marlin Bowles, Christopher Dunn, and Jenny McBride

The Nature Conservancy's volunteers hand-pollinated Chicago-area orchid plants to obtain seeds. Botanists are now propagating some of these tiny seeds under laboratory conditions at the Arboretum. The seeds are placed in petri dishes containing the appropriate nutrients and inoculated with the fungus that was isolated from the roots of the translocated eastern prairie fringed orchid. Scientists monitor seed germination, using a microscope to determine whether the orchid seeds have been inoculated by the fungi. After they have germinated, the seedlings are propagated in new petri dishes until leaves develop. Scientists will eventually transfer the larger seedlings, along with the fungi, to appropriate soil and restore them to natural habitat.

Many plant species require outcrossing (cross-pollination between genetically different individuals) to avoid the negative consequences of inbreeding and to produce viable seeds. This problem rarely occurs

Germinating orchid seeds

Eastern prairie fringed orchid

Lakeside daisy

when large habitats harbor sizable populations of such species. When populations of these outcrossing species are reduced to a few closely related plants in small habitats, however, plants can fail to reproduce and the population can be lost. Mead's milkweed and the Lakeside daisy are examples of this type of reproductive failure.

East of the Mississippi River, remnant populations of Mead's milkweed are too isolated to cross-pollinate and produce seeds. Although these plants can persist for decades by relying on perennial rootstocks, they may be destroyed eventually by insect damage or by burrowing animals. Seed reproduction is necessary for the long-term survival of these plants. To supplement seed production for Mead's milkweed restoration, The Morton Arboretum established a genetically diverse garden population by collecting seeds from wild populations in Missouri and Kansas. Plants in the garden are hand-pollinated and crossed not only with each other, but with pollen obtained from small populations in Illinois and Iowa that are no longer capable of reproduction. This practice has saved genetic material from these nonreproductive populations. Seedlings produced in the Arboretum garden are now being used to restore Mead's milkweed to native prairies.

The Lakeside daisy used to grow in gravel and dolomite prairies along the lower Des Plaines River Valley near Joliet. Its last Illinois population was destroyed by industrial development in the 1970s; however, a few plants were saved, and their root cuttings were relocated to local gardens, one on the Arboretum grounds. Marcy DeMauro, formerly of the University of Illinois at Chicago, discovered that the Illinois Lakeside daisy was incapable of seed production due to "genetic incompatibility"; in other words, the plants were too closely related to be able to reproduce sexually. DeMauro overcame this reproductive barrier by crossing them with plants from Ohio and Canada. She planted some seedlings from these crosses into natural dolomite prairie habitat at the Lockport Prairie Nature Preserve. Others were planted in crevices between pieces of dolomitic limestone at

Left: Mead's milkweed growing at the Arboretum
Below: Mead's milkweed in bloom

a reconstructed gravel and dolomite prairie at the Arboretum. This reconstructed habitat is home to many other endangered and threatened species found in gravel and dolomite prairies, including Tennessee milkvetch and leafy prairie clover.

Pitcher's thistle formerly occurred along the Illinois shoreline of Lake Michigan and was last seen at Illinois Beach State Park, north of Waukegan, in the early 1920s. It still occurs in Michigan, the Indiana Dunes, and along the Wisconsin shoreline of Lake Michigan. Pitcher's thistle requires the open sand maintained in shoreline dunes by the interaction between winds and shoreline currents. Human activities such as sand mining and trampling during recreation have altered the shoreline processes that once maintained open dune environments. Unlike perennials, this species flowers only once after four or five years of growth, produces seeds, and dies. As a result, population survival depends upon large numbers of new seedlings to replace the plants that flower and die.

To begin restoring Pitcher's thistle, botanists collected seeds from Indiana, Wisconsin, and Michigan populations and propagated them at The Morton Arboretum and the Chicago Botanic Garden. They translocated the seedlings from these plants into protected shoreline habitat at Illinois Beach State Park, where Pitcher's thistle used to grow. Approximately 100 plants have been established over a five-year period. Several have flowered, but it is still too soon to tell if altered shoreline erosion processes and the area's new protected status as a state park and nature preserve will allow a viable population to be restored in Illinois.

If these endangered native plants survive and thrive in Illinois, it will be in part because conservation biologists at our state's botanic gardens have taken the lead in their propagation and restoration. Thanks are also due to Illinois landowners who care about these plants' survival, provide space for them, and nurture their growth.

The early pioneers who cleared the land were no doubt concerned with leaving a legacy of progress for their children, but their descendants will be poorer if these plants perish. Illinois' endangered native plant species are a priceless heritage that no one can afford to lose.

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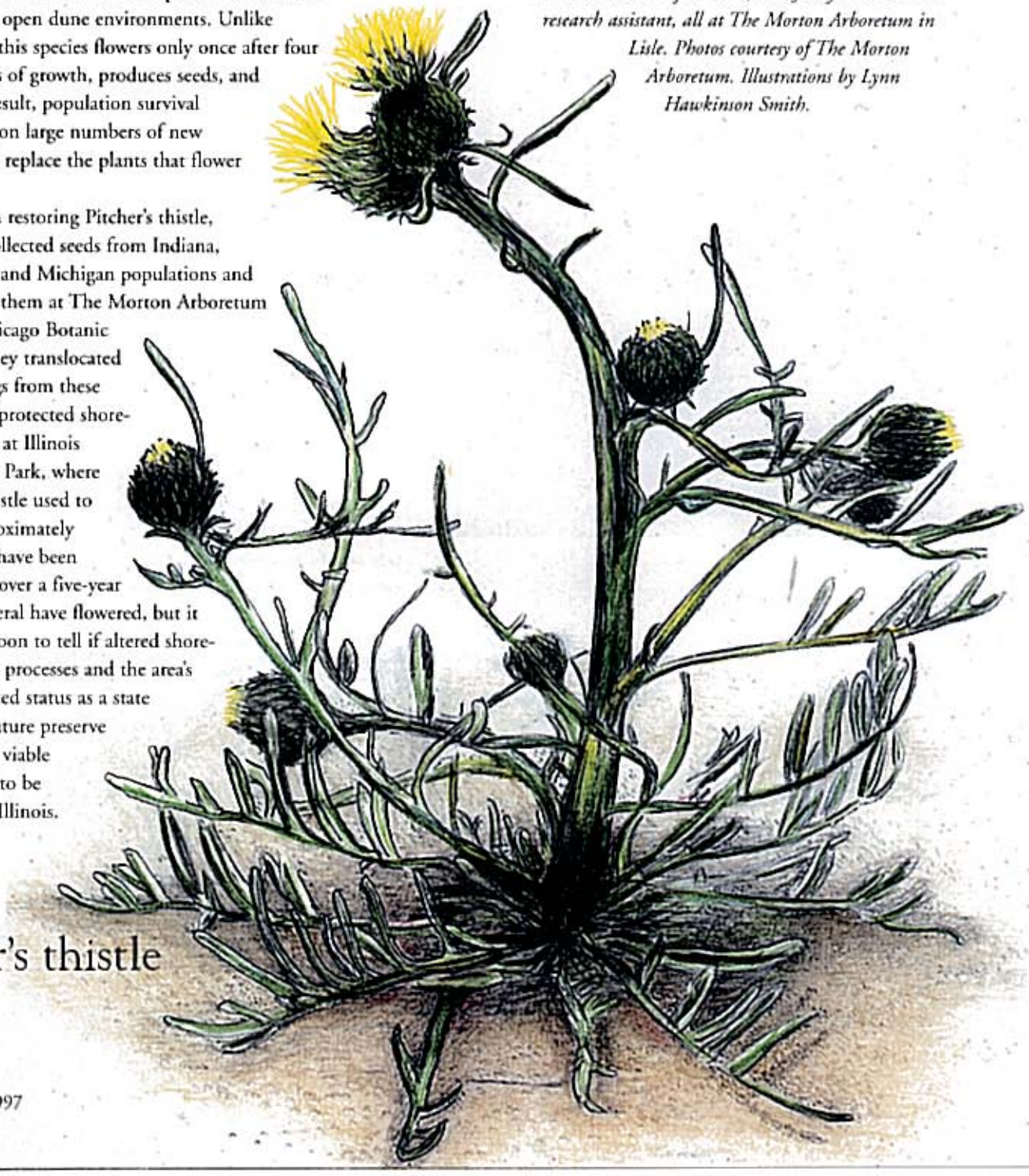

Pitcher's thistle