

## BRIEF NOTE

# Natural Areas Assessment and Research Opportunities at the Holden Arboretum, Kirtland and Mentor, Ohio<sup>1</sup>

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A natural areas assessment, focusing on research opportunities and management issues, was conducted at the Holden Arboretum in Kirtland, OH, in August and September 1999. Participants included members of the Board of Trustees, staff members, and several consultants with expertise in conservation, natural resources management, and ecology. Our charge was to evaluate the intrinsic quality of the natural areas at the Arboretum, to describe potential avenues of scientific research, and to publicize these opportunities, particularly in ecology and organismal biology, to the scientific community at large. Other goals were to evaluate the stewardship of the non-horticultural holdings, and to anticipate impacts of increased urbanization in the area. The meetings were coordinated by Robert Marquard (Director of Research), Brian Parsons, and Roger Gettig.

The Holden Arboretum, founded in 1931, is the largest arboretum in the US. The horticultural collections and gardens are about 365 ha (800 acres) of its 1545 ha, which also include two National Natural Area Landmarks—Stebbins Gulch and Bole Woods. The proximity of the Holden to metropolitan Cleveland is an advantage to its visitor numbers and its accessibility from out of state. However, urban sprawl threatens to engulf the Holden, adding urgency to the necessity of planning for buffer zones, easements, and for mutual stewardship arrangements with adjacent landowners.

The natural areas are both physiographically and ecologically diverse, and are spread over several discrete land parcels of variable contiguity (Fig. 1). They include cliffs, valleys, meadows, ravines, gulches, ridges, slopes, lakes, rivers, streams, and bogs. The forest types represented in the natural areas comprise a mixture of northern hardwoods-conifer (*Acer saccharum*, *A. rubrum*, *Fagus grandifolia*, *Tsuga canadensis*, *Pinus strobus*), mixed-oak-hickory (*Quercus rubra*, *Q. alba*, *Q. nigra*, *Q. prinus*, *Carya ovata*, *C. glabra*) and mixed-mesophytic (*Liriodendron tulipifera*, *Magnolia acuminata*, *Nyssa sylvatica*, *Fraxinus americana*, and *A. saccharum*). The non-forested areas include early- to mid-successional old fields, wetlands, and various aquatic habitats.

In general, we found the quality of the natural areas to be remarkably high, especially given the Arboretum's proximity to Cleveland. A substantial portion of the

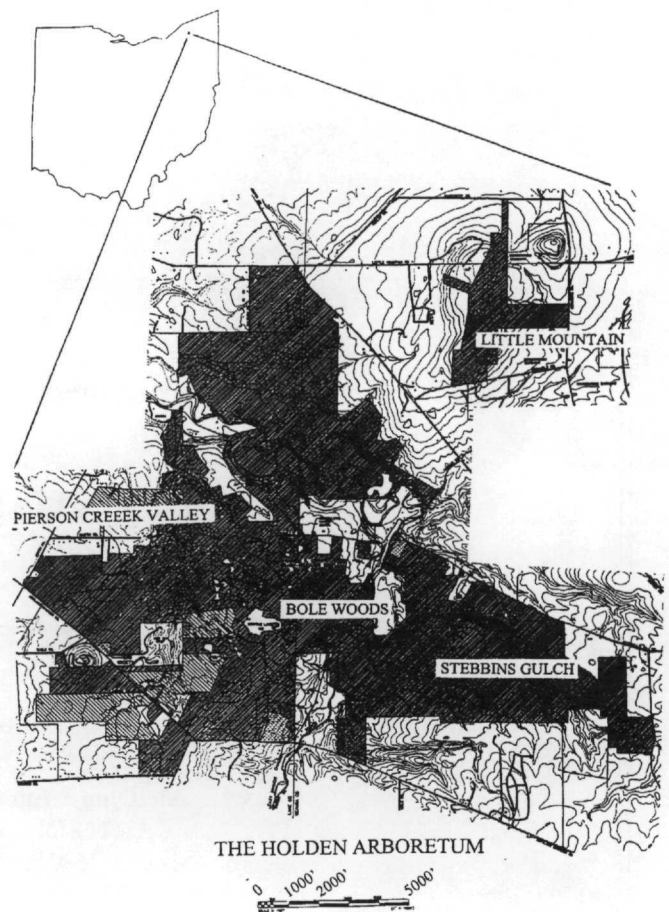


FIGURE 1. Map of the Holden Arboretum, Lake and Geauga counties, illustrating fragmentation of the various parcels.

natural areas include fragments of old-growth forests, a rarity for northeast Ohio. These patches exist on Little Mountain, in Stebbins Gulch, and in the Pierson Creek Valley. Very old trees (over 250 years) of both coniferous and hardwood species include hemlock, white pine, blackgum, sugar maple, beech, chestnut oak, and white oak. Much of the non-old-growth forest is mature second growth (60–80 years old) dominated by mixed-hardwoods and hemlock that appear to be healthy and robust. We believe the natural areas of Holden Arboretum are unique due to the diverse physiography, complex species mix, and the presence of old-growth forests.

The relatively pristine areas of old growth forest are perhaps the most obvious areas for potential ecological

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research. However, it is agricultural land (currently grazed pastures, some field crops, some degraded areas) and dense young second-growth woodlands that comprise the larger part of the actual land area of the Holden's natural areas, and most of the edge conditions of the Arboretum's holdings. These non-forested lands also surround and penetrate many of the horticultural collections, obscuring many of the functional boundaries between natural areas stewardship and the intensive landscape maintenance of the collections areas. Second growth woodlands and recently abandoned agricultural lands are among the most common landscapes in the eastern United States, and their stewardship requires at least as much research as the preservation of more pristine plant communities. These areas are not unique in any recognizable way, but management strategies developed for the Holden may have significance for parks and urban/suburban green spaces across the northeastern United States. Landscape edges, peripheral parcels, and non-forested areas of the Holden are as rich in potential research as the old-growth forest remnants.

Manipulation of successional changes in desirable plant communities is one such avenue of research. Removal, exclosure, and/or internal control of destructive mammals (especially white-tailed deer, *Odocoileus virginianus*) is an increasingly urgent problem for managers of urban, suburban, and rural green spaces. Perhaps equally important is study of invasive exotic species, some of which (for example, *Rhamnus cathartica* and *Lonicera maackii*) have irrevocably altered native plant associations. Can these exotics be eradicated, or even controlled? If not, what can we ultimately expect to see in native forest understory and in successional or maintained open areas? Ironically, landscape "edges," while providing optimal habitat for both plant and animal invasives, tend also to support very high local species diversity, not only for some desirable plants, but for birds and insects as well.

The buffering and protection of the old-growth areas is an essential function of the secondarily-forested, or even non-forested lands. However, in some areas of the Holden Arboretum (notably on Little Mountain) there is no buffer at all between new residential development and the old-growth forest. It is critical that such situations be addressed, both biologically and socially—the latter by engagement and involvement of neighbors to foster commitment. The discussions resulting from the field walks led to a re-phrasing of the Holden's mission statement: "The mission of the natural areas of Holden Arboretum is to facilitate the management, research, and education activities to promote ecosystem function and the conservation of desirable native species in their natural environment."

Research questions proposed by the focus groups include long-term study of forest succession, gap dynamics in relation to beech bark disease, windthrow, beaver activity, gypsy moths, seed predation, and sugar maple decline. Evaluation of the impacts of exotic in-

vasive plants and their removal on forest communities, especially along boundaries and forest edges, should include assessment of the impact of red maple increases on forest dynamics. Manipulative experiments should include understory burning treatments to encourage oak and pine regeneration, and liming (pH increase) of sugar maple stands to retard maple decline symptoms. A survey of total biodiversity (flora and fauna) would be the basis for monitoring the loss of rare and endangered plants. Studies of gene flow within and among tree species populations in the Holden and across the metropolitan area could elucidate the consequences of forest fragmentation on the genetic diversity of populations.

While some research can be effectively completed in a field season or year, many components of the natural areas should be regularly or continually monitored, either annually or at intervals of several years. The recommendations of the focus groups were to monitor precipitation, soil, and streamflow chemistry for acid rain impacts; breeding bird populations; human impacts (for example, trampling, soil compaction, vector for seed dispersal/invasion) on natural areas, exotic and invasive species distribution, changes in regional land uses, changes in groundwater levels and purity, and septic infiltration from increased housing and domestic animal numbers.

In summary, the natural areas at the Holden Arboretum are of high quality, comprising a diverse physiography and variety of microhabitats, including both unique uplands and wetlands sites, a diverse mixture of forest types and old-fields, and a significant amount of old-growth forests. The natural areas represent an important resource for long-term and short-term ecological study. The Holden is working internally to position itself as a center for long-term ecological research in the mid-west. It is hoped that the Holden may be able to join the LTER (Long-term Ecological Research) network of sites, funded by the National Science Foundation. Holden's location near a major urban center should enhance its importance for long-term research and external funding. Although the focus of this report is on research opportunities, we reiterate that the use and importance of the natural areas crosses the boundaries of education, management, and research. All three of these areas can be enhanced in a synergistic relationship. Research in the natural areas will increase educational opportunities as well as provide information for ecosystem management decisions.

The Trustees and staff of the Holden Arboretum have committed to the creation of a Natural Areas Division within its administrative structure. This will ensure proper archiving of previous research and monitoring, synthesis and publication of the results of past and present research, and establishment of ties with universities to facilitate long-term networking with regional ecologists. The mailing address is: The Holden Arboretum, 9500 Sperry Road, Mentor, OH 44060; phone number is 216/946-4400. The web address is [www/holdenarb.org](http://www/holdenarb.org).