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Steward's Circle

Public Land Acquisition and Ecological Restoration: an Example from Northwest Ohio's Oak Openings Region

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In many oak savanna regions of the Midwestern United States, the land area available for ecological restoration needs to be increased for successful restoration. Most restoration in midwestern savannas has occurred on small sites, and examples

of restoring large, relatively contiguous areas of more than 200 hectares are rare (McCarty 1998). A central principle of conservation biology is that maintaining large areas of healthy habitat is critical for sustaining species and ecosystem diversity (Primack 1998). While preserving land could be viewed as competing with economic development, this may not be the case if forward-thinking, long-term land planning is implemented (Ewan et al. 2004). Our purpose in this note is to highlight a need for acquiring more land on which to conduct ecological restoration in midwestern savanna ecosystems. Using northwest Ohio's Oak Openings region as an example, we suggest that even nearly perfect restoration on existing preserves will not maintain long-term species and ecosystem diversity. In this note, we: (1) report the results of a recently implemented public land acquisition program designed to increase the land area available for ecological restoration in the Oak Openings region, and (2) summarize anticipated benefits of this increased land base for implementing restoration and maintaining ecological diversity.

REGIONAL DESCRIPTION

The approximately 40,000-ha Oak Openings region is located mostly in Lucas County near the city of Toledo in northwest Ohio (Figure 1). Based on 1817-1832 land surveys, presettlement vegetation was dominated by white oak (*Quercus alba* L.) and black oak (*Quercus velutina* Lam.) savannas and woodlands, with interspersed wet prairies (Brewer and Vankat 2004). Beginning in the 1800s, these ecosystems were reduced by fire suppression facilitating conversion to forest, draining of wet prairies, clearing of agricultural land,

and urban development (Moseley 1928). Primarily by tree thinning, prescribed burning, and removing exotic species, open-structured ecosystems are being restored in regional preserves such as the 1497-ha Oak Openings Preserve managed by the Metropolitan Park District of the Toledo Area (Metroparks), the 76-ha Irwin Prairie State Nature Preserve managed by the Ohio Department of Natural Resources, and the 285-ha Kitty Todd Preserve managed by The Nature Conservancy (Abella et al. 2001).

Only about 10% of the Oak Openings region is in preserves (Figure 2). These preserves vary in condition and include old fields, conifer plantations, and other highly altered ecosystems. Preserves also are dispersed and fragmented, with the largest relatively contiguous protected area being Oak Openings preserve. At most, 15% (570 ha) of the approximately 3800-ha total protected area has received restoration treatments to date. The small, fragmented land area available for restoration hinders reestablishing the landscape ecosystems necessary for sustaining biodiversity (Abella and Jaeger 2004).

PUBLIC LAND ACQUISITION

Accelerating habitat loss and disappearing future options, because of increasing suburban development, prompted additional public land acquisition in the Oak Openings region. With the support of area residents, Metroparks placed a 10-year, \$23 million (0.3 mill) land acquisition levy on the November 2002 Lucas County ballot. This levy passed strongly, with 61% (70,600) of voters approving the levy. Metroparks also has received grants from the State of Ohio to match part of the levy money for land acquisition. Land acquisition from the levy and grant money sharply increased habitat protection in the Oak Openings region (Figure 3). Part of this acquired land already has received ecological restoration treatments, with additional treatment areas planned.

Metroparks has a guiding plan for which sites in Oak Openings have priority for protection and subsequent restoration. This

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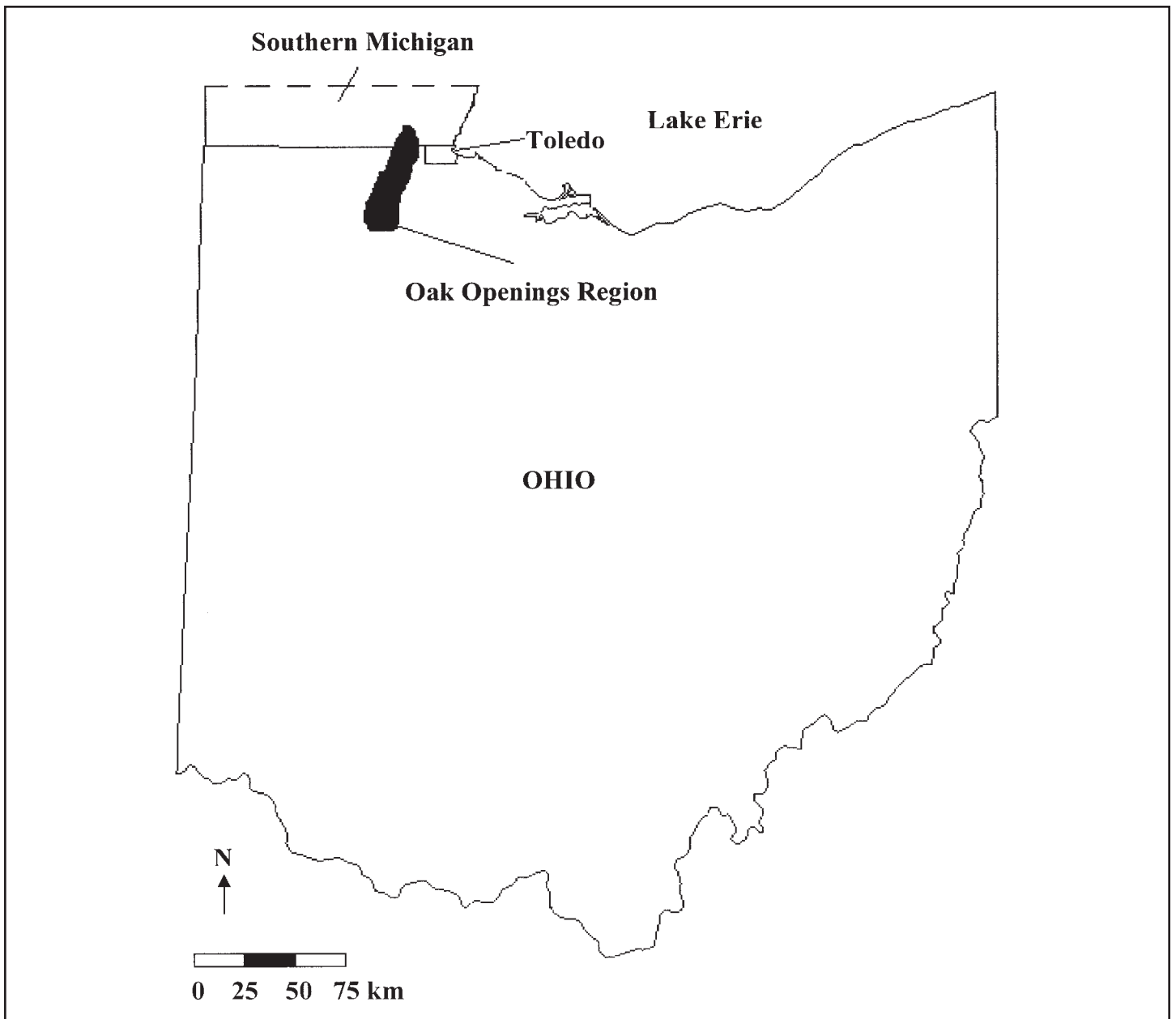


Figure 1. Location of the approximately 40,000-ha Oak Openings region in northwest Ohio.

plan is partly based on practical considerations and the ecological principles of Gap Analysis to prioritize critical habitats requiring protection (Scott et al. 1993). Sites are acquired from willing sellers, with consideration given to the financial cost per unit area and the possibility of pollution liabilities from past land uses. Ecological considerations for choosing acquisition sites include the: (1) presence of rare species or communities, (2) size, (3) proximity to other public holdings, and (4) potential for restoration. Because of fragmentation and scattered land owner-

ship, the amount and location of land to be protected by the levy depends on what sites become available for acquisition and how much they cost per unit area. About 1600 hectares are estimated to be acquired throughout the county, with a substantial portion of that total in the Oak Openings region. In the following sections of this note, we present examples of how this additional land benefits restoration and the maintenance of regional species and ecosystem diversity.

BENEFITS OF INCREASING THE RESTORATION LAND BASE

Species Richness Increases with Area

An established principle in ecology is that larger areas contain more species (Connor and McCoy 1979). This principle is amplified in the context of ecological restoration, which also often increases the number of species per unit area. We illustrate this principle in Oak Openings using species-area curves containing the numbers of plant

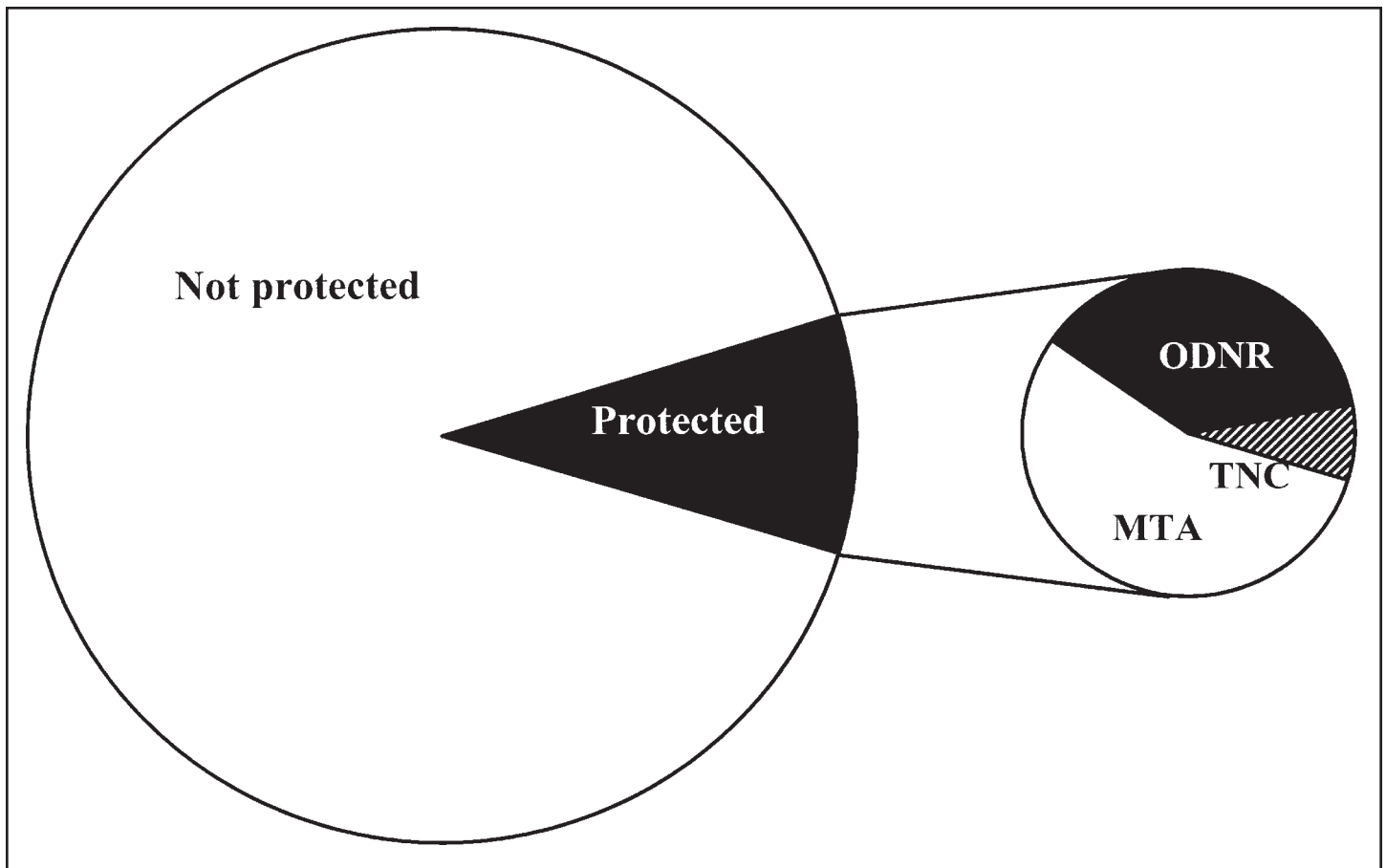


Figure 2. Proportion of protected and unprotected land, and ownership distribution of protected land in northwest Ohio's approximately 40,000-ha Oak Openings region. MTA = Metroparks of the Toledo Area, ODNR = Ohio Department of Natural Resources, TNC = The Nature Conservancy.

species recorded on nine 0.05-ha plots each in unrestored forests and in restoration oak savannas (Abella et al. 2001; Figure 4). The species-area curve shows that more species per unit area and more total species occur in restoration savannas than in unrestored forests. This indicates that as the number of restoration sites increases in the Oak Openings region, there will be a regional increase in the average number of species per unit area. Greater restored area on different sites might also allow more native species to occur on a greater number of sites.

Restoration Response Diversity Increases with Area

As larger sites or greater numbers of sites are restored, different soil types and their corresponding vegetation will be included in restoration. Increasing restored area, therefore, increases the chances for unique

responses to ecological restoration, such as when unique ecosystems develop on rare soil types or when an unexpected plant species emerges from the soil seed bank.

More Habitat Area Helps Species with Metapopulations

Metapopulations consist of linked, temporary populations that move from site to site through time and are subject to local extinction (Panzer 2002). Many species of insects in midwestern savannas have metapopulations, and many have been reduced because habitat fragmentation precludes their ability to move from site to site. For example, the federally endangered Karner blue butterfly (*Lycaeides melissa samuelis* Nabokov), a metapopulation species, was extirpated from the Oak Openings region by the 1980s because of habitat fragmentation and an absence of healthy, open-structured savannas containing a

wild lupine (*Lupinus perennis* L.) food source (Shuey et al. 1987). Increasing the area and the number of restoration sites provides more room for metapopulations to shift among sites in different stages of restoration that provide suitable habitat at different times (Kurczewski 1998).

Savanna Landscapes are Shifting Mosaics Requiring Area on Which to Develop

Presettlement savanna landscapes were mosaics varying in tree densities, and the location of high and low density areas probably changed through time with variations in fire frequencies (Nuzzo 1986). With a small amount of either contiguous or dispersed land, it is unlikely that ecological restoration can adequately restore this shifting mosaic (Chapman et al. 1993). Increasing land available for restoration increases flexibility for applying different

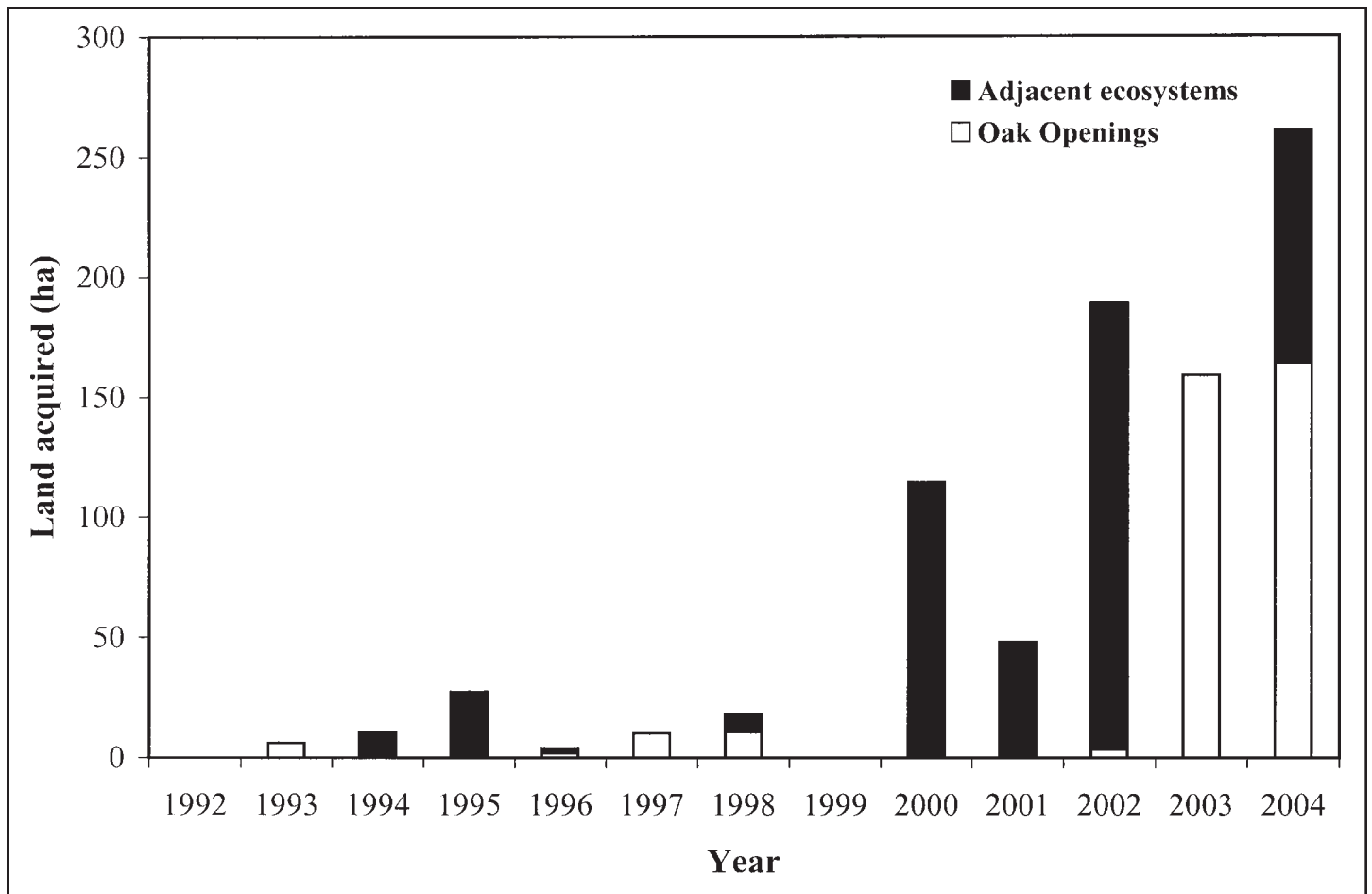


Figure 3. Land acquisition from 1992-2004 by the Toledo Metroparks in northwest Ohio's Oak Openings region and surrounding ecosystems.

fire frequencies among sites, while allowing for some unrestored area (primarily oak forest) to serve as a comparison for monitoring restoration effectiveness.

Public Satisfaction may Increase with Increasing Site Diversity

Research in savanna and woodland frequent-fire ecosystems suggests that visitor satisfaction with the scenic beauty of nature preserves increases with increasing ground-flora cover and dispersed, large trees (Brown and Daniel 1986). Savanna restoration increases both of these variables, and greater area in preserves also permits more management flexibility for park visitors to experience a mix of restored and unrestored ecosystems.

FUTURE OPTIONS

We do not believe that even nearly perfect

ecological restoration (e.g., replicating exact presettlement conditions, like tree density) on existing small, protected sites could sustain species and ecosystem diversity in the Oak Openings region for long periods. If current rates of suburban expansion and habitat loss continue (EPA 1997), ecological restoration on a small area could not do enough cumulative good to prevent additional regional species extinctions. While the implementation of the public land acquisition program is an ecological milestone in this region, it is also important to encourage private landowners to maintain natural area corridors between preserves, establish native plant species, and restore native ecosystems on their land to supplement restoration of public land. Other conservation organizations in this region, such as the Ohio Department of Natural Resources, also are continuing efforts to protect additional land, because time is running out for acquiring land for ecological restoration. Without action

today, there will be few options for ecological restoration and land management in the future.

SUMMARY AND CONCLUSIONS

Ecological restoration in northwest Ohio's Oak Openings Region has started to reverse a century of ecosystem decline on protected land, but increasing habitat loss from suburban expansion suggests that even perfect ecological restoration on existing preserves cannot sustain species and regional ecosystem diversity. To increase land available for restoration, the Toledo Metroparks proposed a 10-year, \$23 million public land acquisition levy that was passed in 2002 by 61% of county voters. Land acquired from this levy will increase the cumulative benefits of restoration by maintaining regional ecosystem diversity and increasing the land area for restoration. If we are to successfully restore ecosystems in many

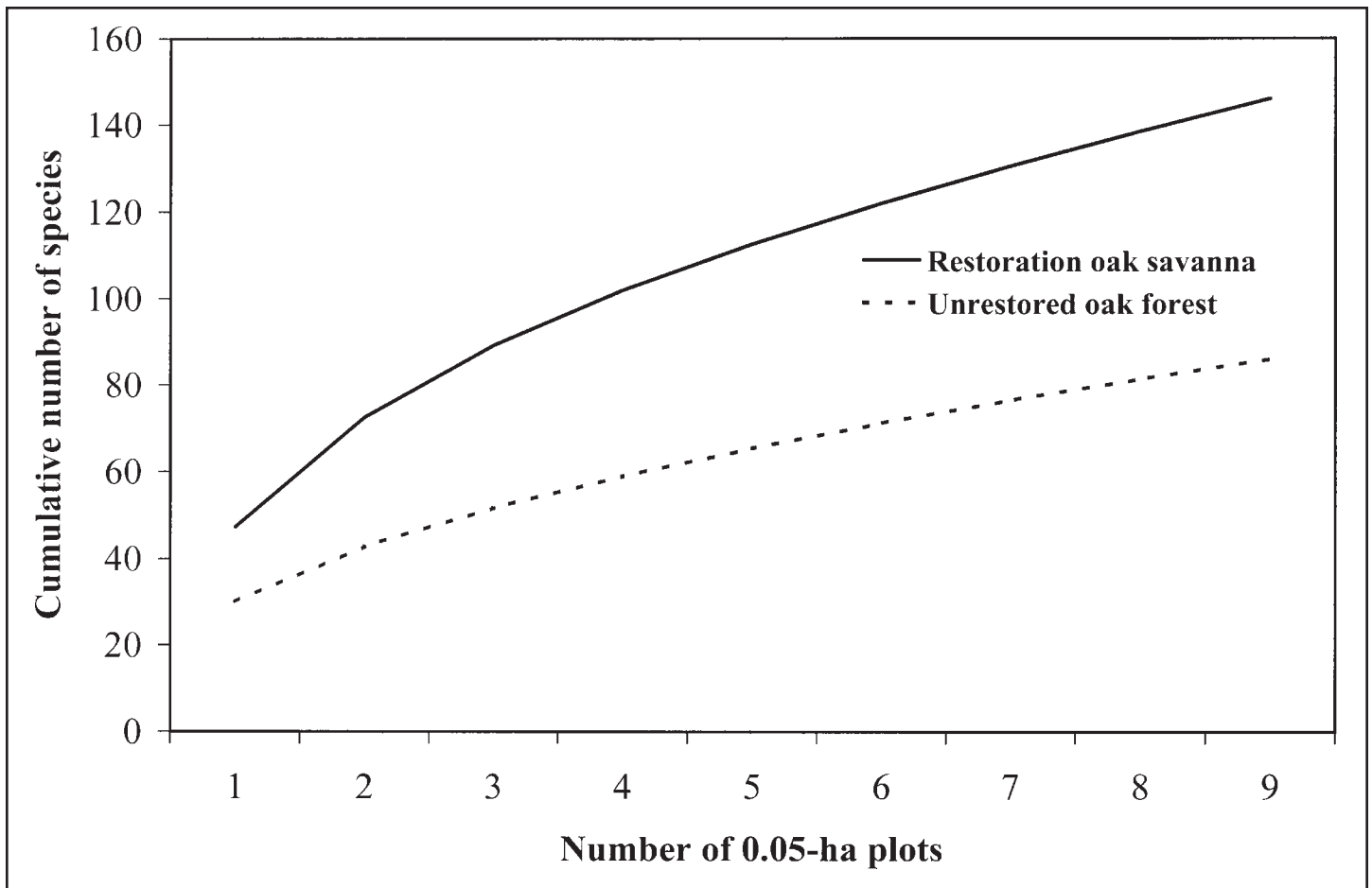


Figure 4. Species-area curves for plant species in unrestored forests and in restoration oak savannas in the Oak Openings region, northwest Ohio. About 90% of species were native, and curves were computed by randomizing the order of plots. Tree thinning and burning treatments had been implemented in the restoration savannas four years earlier (Abella et al. 2001).

midwestern savanna regions, like the Oak Openings, restorationists need to play a role in conservation biology to increase the size and number of preserves available for restoration. While protection of native ecosystems should be encouraged on private land, public acquisition of key habitats is one means for the long-term protection and restoration of native ecosystems, while, simultaneously, providing public access to those ecosystems. A reasonable goal is to double the current protected area so that more than 20% (8000 ha) of the Oak Openings region is in preserves, with at least 25% of that area receiving restoration treatments by the year 2025. This goal is attainable through cooperation among conservation organizations and continued support from northwest Ohio citizens. By strongly passing a 2002 land protection levy, northwest Ohio citizens demonstrated that they believe that the protection and

restoration of northwest Ohio ecosystems is an important part of both human and ecological quality of life. We hope that this note encourages continuation of public land acquisition in this region and may inspire managers in other regions to increase efforts to protect and restore land before such land is no longer available.

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