CW JOURNAL

Best Practices in Conservation and Restoration

Volume 3 • Number 2
July, 2005

In This Issue

Chicago WILDERNESS

Plant Science Gardens in Conservation

Gerard Donnelly
The Morton Arboretum

Botanical gardens and arboreta are more than pretty vistas, as Gerard Donnelly explains they play a distinctive and integral role in protecting and preserving biodiversity.

Many of the world's arboreta and botanical gardens are committed to the same goals as those we pursue in Chicago Wilderness. With a particular focus on plants, these plant science gardens are living, outdoor museums dedicated to the conservation and exhibit of plant diversity, botanical research, vegetation ecology and management, natural lands protection and preservation, and the engagement and education of the public on the importance of plants and nature.

There are more than 2,000 botanical gardens and arboreta worldwide, according to Botanic Gardens Conservation International (BGCI; www.bgci.org), with an estimated 200 million people visiting them each year. BGCI is working to advance the Global Strategy for Plant Conservation among the world's plant science gardens. The ultimate goal of the Global Strategy is to halt the current and continuing loss of plant diversity worldwide. This plan includes a series of specific measurable goals and targets for achievement by 2010 related to plant conservation, sustainable use, benefit sharing, and capacity building. BGCI has worked in earnest to foster the establishment of botanical gardens and arboreta in areas of critical conservation concern throughout the world, such as in the tropics and in areas of intensive human pressure.

Chicago is fortunate to have two world-class plant science gardens, with both The Morton Arboretum and the Chicago Botanic Garden playing a substantial role in plant conservation in the Chicago Wilderness region. At The Morton Arboretum, we have had a long-standing role in regional plant study, natural areas restoration and management, conservation, and urban greening. With more than 400 classes and programs annually, we have also provided educational programs in these areas for children, plant and natural area enthusiasts, professionals, college students, and the general public. The Arboretum contributes to the natural lands and open space assets of Chicago Wilderness by being active stewards of our 1,700 acres of plant collections, woodlands, savanna, and prairie landscapes, together with the numerous wetlands, lakes, ponds, river, and streams on the property.

Among the wide array of organizations engaged in plant conservation, botanical gardens and arboreta play a distinctive role in elucidating essential horticultural aspects of conserving plants. Plant propagation and cultivation methods are not well developed for the majority of rare and endangered plants that

are otherwise not cultivated. These techniques are essential to efforts to maintain viable conservation collections and to reintroduce plants into the wild.

The Center for Plant Conservation (CPC; www.cpc.org), which is based at the Missouri Botanical Garden in St. Louis, is a network of 33 botanical gardens and arboreta dedicated to the conservation of our nation's endangered plants. According to the CPC, one in 10 native U.S. plant species is of conservation concern. The Morton Arboretum and the Chicago Botanic Garden are active participants in CPC and its National Collection of Endangered Plants. This is a collection of cultivated plants and seeds of more than 600 imperiled plant species native to the United States. The collection is grown and stored at one or more of the collaborating gardens, with certain regional gardens principally responsible for selected species. The National Collection provides safekeeping of these endangered plants, in case of extinction or in case a particular species does not reproduce effectively in the wild. The National Collection also serves as a source of plants for species restoration efforts, and as a resource for scientific study about the causes of rarity, reproductive biology, population ecology, and horticultural requirements of plants.

The Morton Arboretum, Chicago Botanic Garden, and other CPC gardens work with endangered plants off-site and in the wild. In greenhouses, gardens, and habitat collections, CPC research scientists conduct horticultural research to learn how to grow endangered plants from seed or cuttings. CPC scientists also monitor plant populations in the wild, protect and manage the ecosystems in which they grow, and reintroduce plants to native plant communities.

Another network of plant science gardens is the American Association of Botanical Gardens and Arboreta (AABGA; www.aabga.org), an association of several hundred public gardens located principally in North America. AABGA is collaborating with CPC, BGCI, and other organizations in the development of a North American Strategy for Plant Conservation. This plan is a collaborative effort among plant science gardens and other agencies in the United States, Canada, and Mexico to implement the Global Strategy with specific, measurable, conservation targets for achievement by 2010.

Of particular value is the work of public gardens in planting, greening, and conservation in urban and developed areas. In late June of this year, Chicago hosted the 2005 annual conference of the AABGA, with the theme of "Rooted in Your Community." The conference theme was centered on the important roles that public gardens play in enhancing the quality of life and the environment, especially in cities and towns. Mayor Daley was invited to give the keynote address on the value of plants, parks, and nature to the vitality of cities and their citizens.

AABGA conference tours included opportunities to experience Chicago Wilderness ecosystems, and several conference program sessions addressed conservation topics, such as the North American Strategy for Plant Conservation, invasive species management and research, ecological restoration, and ideas for engaging the public in plant conservation. One conference program in particular focused on Chicago Wilderness as a model of how plant science gardens and other conservation organizations can conserve and enhance regional biodiversity.

In addition to distinctive contributions in the horticultural aspects of plant conservation and the many other roles that plant science gardens play in the conservation realm, arboreta and botanical gardens are uniquely positioned to

provide meaningful experiences in nature that connect people to the importance of conservation. These plant science gardens provide extraordinary venues to engage the public with plants and nature by providing an inspiring, enjoyable, and educational experience in natural areas and in the diverse botanical landscapes they contain.

The Morton Arboretum (www.mortonarb.org) is such a venue, presenting an exceptional experience with plants and nature on our 1,700 acres of vegetated landscapes, gardens, and natural areas. In recent years, the Arboretum has been building upon its collections, research, conservation, and educational strengths to attract and serve a broader public audience. Recent capital improvements have been designed to grow attendance from the more than 400,000 visitors in 2004, to 750,000 or more in the future.

These improvements include a new public entrance, environmentally-innovative parking lot, a new visitor center with many green design features, rehabilitation of our centrally-located Meadow Lake to improve water quality and other values, and a new Maze Garden that opened in May of this year.

Of particular excitement this year is the opening in September of The Morton Arboretum's new 4-acre Children's Garden. This garden is designed to create an opportunity for children to learn about trees and nature through play. We hope to give them a hands-on experience with plants, and provide them with an enjoyable and rewarding experience that will encourage their exploration of nature—elsewhere in the Arboretum and in the rich regional natural resources that comprise Chicago Wilderness.

As exemplified by the Chicago Wilderness consortium, the conservation of biological diversity and a healthful, sustainable environment require coordinated strategies among many different agents. Government agencies at different levels, academic institutions, museums, zoos, and other non-governmental agencies all must work together to address the broad, complex, and interdependent needs and objectives for conservation in our world. Plant science gardens play a meaningful and distinctive role as integral partners in these collective efforts, both regionally here with Chicago Wilderness, nationally, and throughout the world.

Gerard T. Donnelly, PhD, is the President and CEO of The Morton Arboretum. He can be reached at donnelly@mortonarb.org

Temporal Instability in Chicago's Upland Old Growth Forests

Marlin Bowles, The Morton Arboretum
Michael Jones, Christopher B. Burke Engineering
Jenny McBride, The Morton Arboretum
Tim Bell, Chicago State University
Christopher Dunn, Chicago Botanic Garden

As maples and oaks battle for control of the Chicago region forests, learn what several researchers discovered when they tested their assumption that maples are winning.

Abstract
We tested the assumption that sugar maple is replacing oaks in Chicago region forests by re-sampling 28 old growth upland forests that were first sampled in 1976. These stands were dominated by sugar maple, red oak, or white oak. Maple basal area increased over time, and its stem densities increased in smaller size classes in maple and red oak stands. Oaks decreased in basal area and in stem densities in all stands, with the greatest loss in lower to mid size-classes. In the shrub layer, these changes were accompanied by declines in dominant shrubs and a shift toward dominance by tree saplings in maple and red oak stands. Ages of declining oak cohorts indicate they originated in the mid-1800s, probably soon after European settlement reduced fire frequencies; however old-growth canopy oaks and maples are of pre-settlement origin. Causes of oak mortality and shrub decline appear to be increasing shade from canopy closure associated with forest succession and stand maturation. Maple has played a role in these processes in maple and red oak stands, but not yet in white oak stands. We attribute these changes to loss of landscape-scale fires that maintained more open forests in the early 1800's, although over-browsing by white-tailed deer has recently contributed to loss of shrub layer vegetation on some sites. As these stands shift to canopy gap replacement processes, oaks are likely to decline further, as maples that now dominate the sapling layer in most stands will most likely replace canopy oaks. A high priority for management and research should be to understand how to restore natural fire processes that will maintain oak dominance and shrub layer diversity in these stands.

Background
Replacement of shade-intolerant fire-resistant oak (*Quercus*) species by shade-tolerant fire-intolerant sugar maple (*Acer saccharum*) is a well-known successional process in midwestern upland oak forests (McIntosh 1957; Pallardy et al. 1991; Roovers & Shifley 1997). It is usually attributed to fire suppression (Curtis 1959; Lorimer 1985; Abrams 1992) and linked with loss of biodiversity through decline of light and fire adapted

understory plants (McIntosh 1957; Curtis 1959; Wilhelm 1991; Bowles et al. 2000). Other potential causes of structural change in oak forests include self-thinning of smaller size classes as forest canopies mature (Christensen 1977; Johnson et al. 2002), over-browsing by eastern white-tailed deer (Strole & Anderson 1992; Anderson 1994), and invasion by alien species such as common buckthorn (*Rhamnus cathartica*) and the honeysuckle *Lonicera maackii* (Apfelbaum & Haney 1991; Swink & Wilhelm 1994).

Despite concerns about deteriorating forest structure and composition, few studies have documented such changes in Chicago region forests, nor clarified possible cause and effect relationships. In this paper, we describe woody vegetation changes in 28 maple-or-oak dominated old growth forests in the Chicago region of northeastern Illinois (see Table 1 & Figure 1 in Bowles et al. 2000). The Illinois Natural Areas Inventory (INAI) described these remnants as the last remaining old growth (Grade A) or old second growth (Grade B) upland forests in this region (White 1978), and sampled them in 1976. We re-sampled them in 1997, and assessed twenty-year changes in tree species basal area (BA), dominance (relative BA), size-class distribution, and changes in shrub layer stem densities and species richness.

The INAI classified 26 of the 28 forest stands into 12 sugar maple / red oak (*Acer saccharum-Q. rubra*) dominated mesic stands and 14 white oak / red oak / black oak (*Quercus alba-Q. rubra-Q. velutina*) dominated dry-mesic stands. Two additional stands were flatwoods; one was red oak / pin oak / red maple (*Q. rubra-Q. palustris-A. rubrum*) dominated and the second was swamp white oak / white oak / scarlet oak (*Q. bicolor-Q. alba Q. ellipsoidalis*) dominated. Flatwoods are difficult to classify because they occupy poorly drained uplands that retain water during much of the growing season and support species that occupy a wide range of moisture conditions. Exclusive of the flatwoods, we classified the sites into maple-dominated, red oak-dominated and white oak-dominated stands, with red oak stands occupying an intermediate drainage position between mesic and dry-mesic (Bowles et al. 2000). For this paper, we include the first flatwoods with red oak stands, and the second with white oak stands.

Methods

The INAI sampled each forest stand with 20 nested plots, which we re-sampled in 1997 (Bowles et al. 2000). Data used to compare temporal change included density of trees by 1-dm size-class in 0.025 hectare plots and density of shrub layer stems in circular 0.001 hectare plots. We also aged dominant tree species with increment cores. Twenty-year changes in basal area, dominance and size class distribution were compared within each stand type. For this analysis, we used dominant and sub-dominant tree species that occurred in all stand types and exceeded 5% dominance in at least one stand type. This group includes sugar maple, basswood (*Tilia americana*), white ash (*Fraxinus americana*), red oak, white oak and bur oak (*Q. macrocarpa*). Because swamp white oak and bur oak can hybridize when they co-occur, these species were combined as “bur oak.” Basal area was calculated by using size-class medians as estimates of tree diameters, and dominance was calculated as the percentage of total basal area for each species within stand types (Bowles et al. 2000). To analyze temporal change in the shrub layer, we partitioned species data into three life-form groups: true shrubs, understory tree species (which do not enter forest tree canopies) and tree saplings representing potential canopy

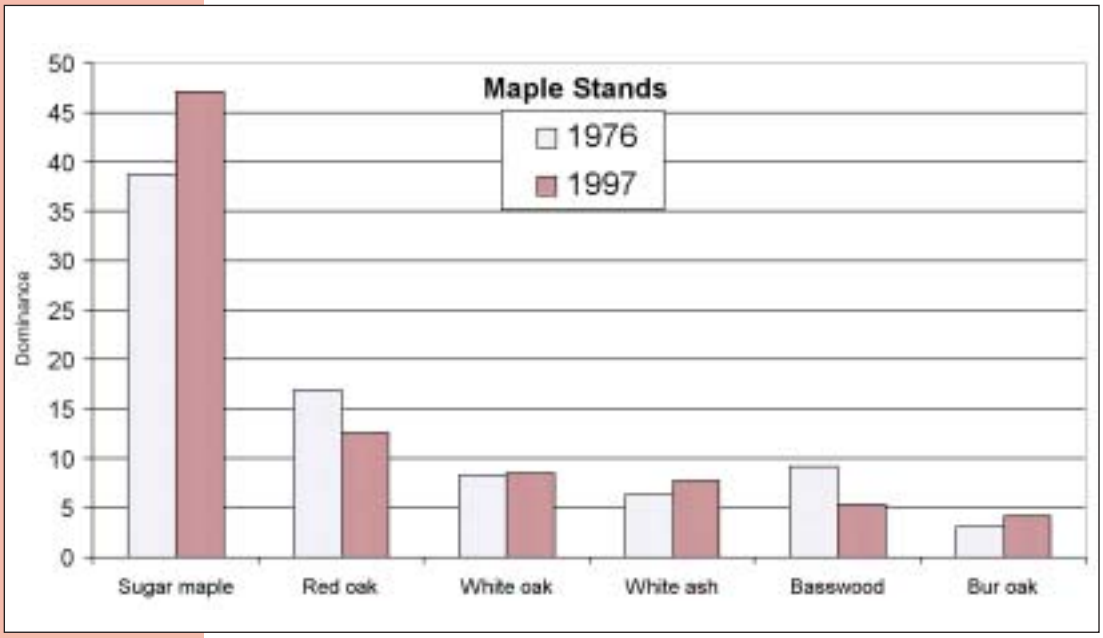
trees. Percent change in stems / ha was calculated for life-form groups as well as for dominant species.

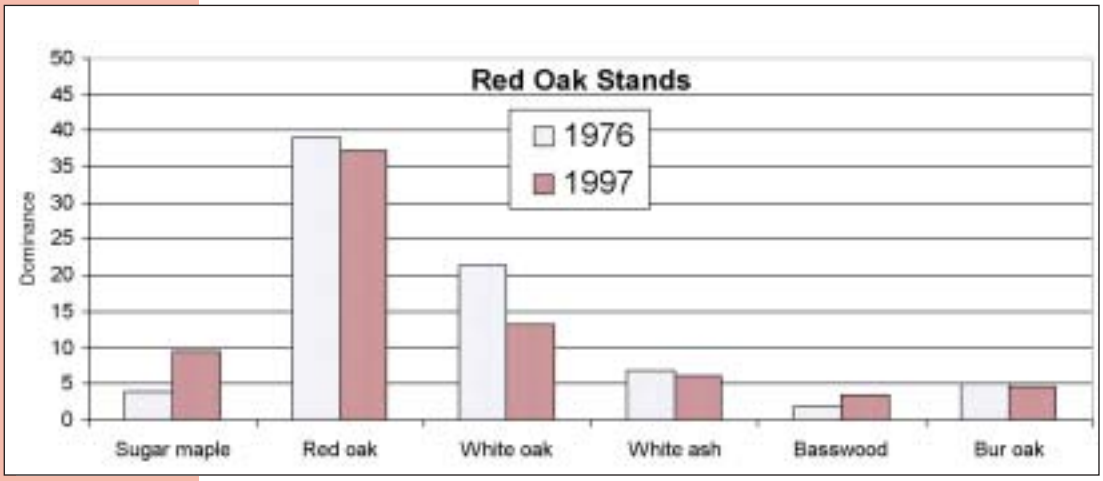
Results

Change in canopy structure

The three stand types differed in canopy structure primarily among single dominant and subdominant species (Figure 1). In sugar maple stands, red oak was sub-dominant over other secondary species, while red oak stands had sub-dominance of white oak, and white oak stands had sub-dominance of red oak. White oak stands also tended to have lower dominance of white ash and basswood, and greater dominance of bur oak. Across all stands, BA of sugar maple increased significantly ($P = 0.017$) over time, while BA of oaks dropped significantly ($P = 0.013$). In all three stand types, maple gained from 6-9 % in dominance (Figure 1).

Figure 1. Temporal change in dominance (relative basal area) of dominant and sub-dominant trees among maple, red oak and white oak forest stand types sampled by the Illinois Natural Areas Inventory. *(Figure 1 continued on page 8.)*





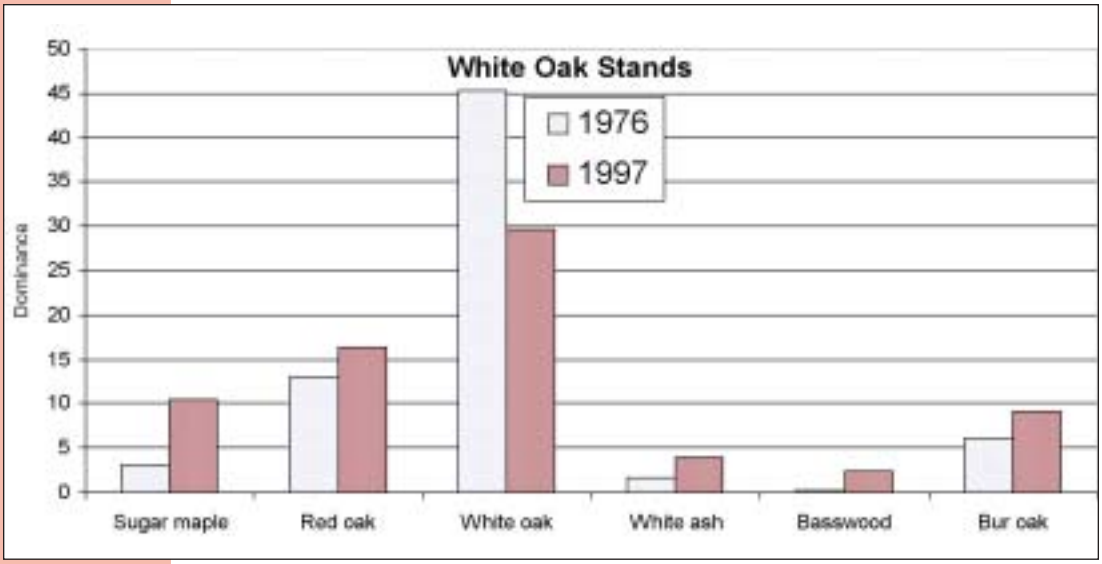


Figure 1. Temporal change in dominance (relative basal area) of dominant and sub-dominant trees among maple, red oak and white oak forest stand types sampled by the Illinois Natural Areas Inventory.

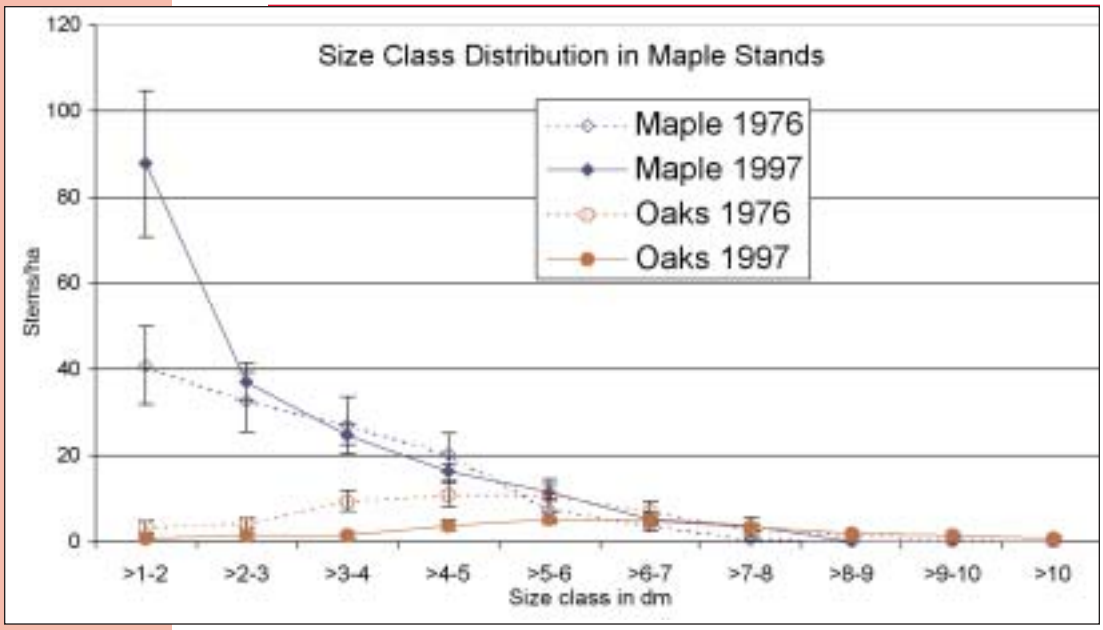
Red oaks decreased in dominance in maple and red oak stands, but increased in white oak sands. White oaks decreased in red oak and white oak stands. These changes were accompanied by a 100% or more increase in maple stem densities in the smallest size class, which was non-significant only in white oak stands (Figure 2). In contrast, oaks underwent a significant decline, dropping by 50% in mid-size classes.

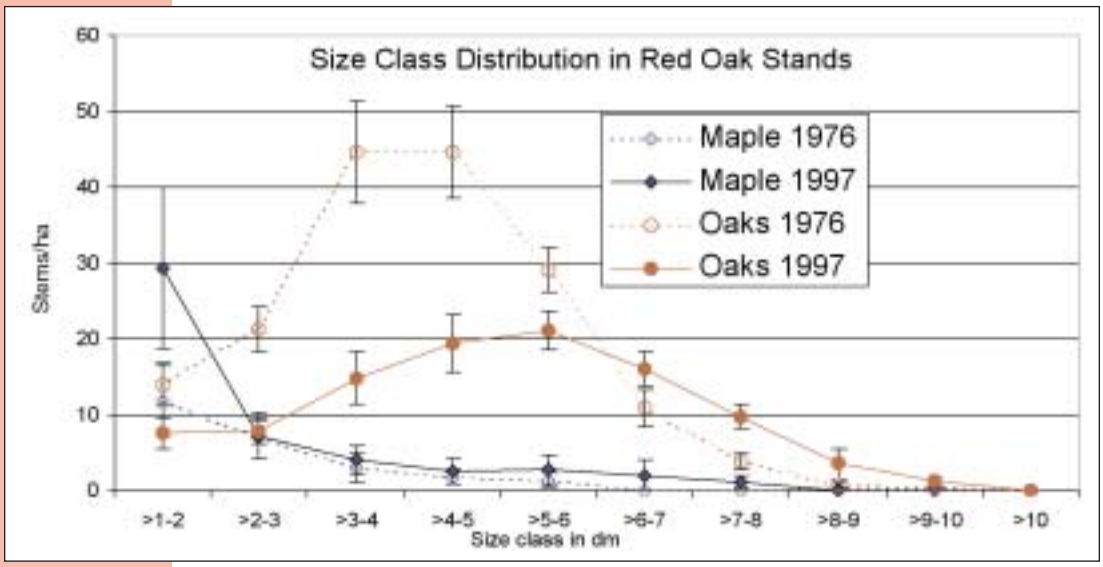
Regression analyses of tree age vs. size indicate that, excluding basswood, forest-grown trees exceeding 0.75 m diameter are likely of pre-settlement (pre-1820) origin, and individuals reaching 1 m originated prior to 1800. These analyses also suggest that the large cohorts of maple appearing in the smallest size class in 1997 originated in about 1950, while declining oak cohorts in the > 3-4 and > 5-6 dm size classes appear to have originated between 1820-1880.

Change in shrub layer structure

The structure of shrub layer species groups differed among stand types and changed significantly over time, with the greatest decline among shrubs in oak stands (Figure 3). In 1976, shrub layer stem densities ranged from about 5,000 stems / ha in maple stands, which were dominated by tree saplings, to 9,000 stems / ha in white oak stands, which were dominated by shrubs. By 1997, total stem densities had declined significantly ($P < 0.0001$) to about 3,000 stems / ha across all stand types. This decline was accompanied by a significant ($P < 0.0001$) decrease from about 2.2 to 1.2 species / plot.

Figure 2. Change in size class distribution of sugar maple and oaks among maple, red oak and white oak stand types. ANOVA: Maple stands: maple ($P = 0.0106$), oaks ($P < 0.0001$), red oak stands maple ($P = 0.0188$), oaks ($P < 0.0001$), white oak stands: maple ($P = 0.2088$), oaks ($P < 0.0001$).





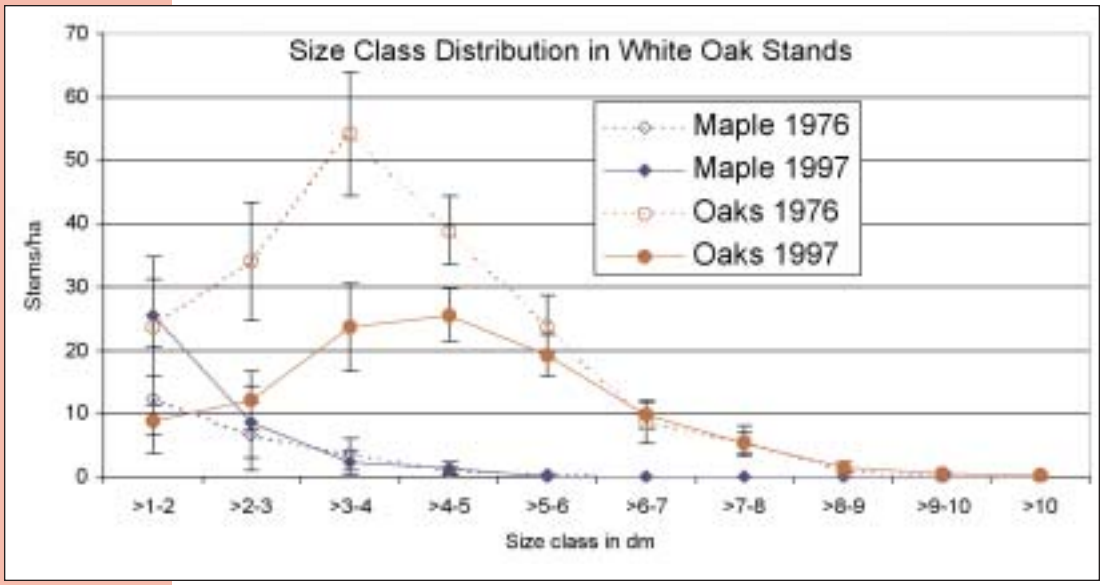
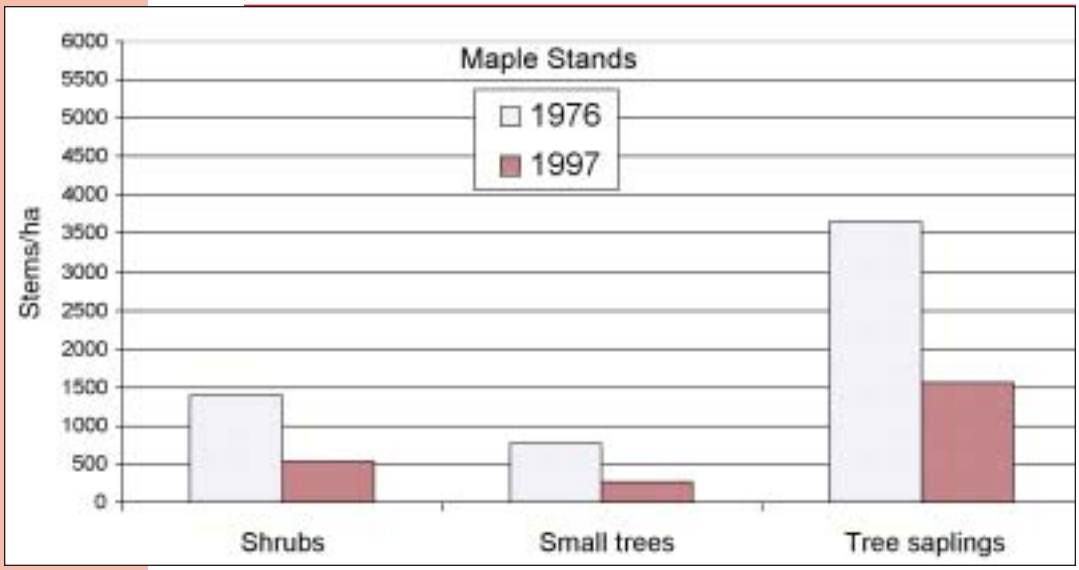
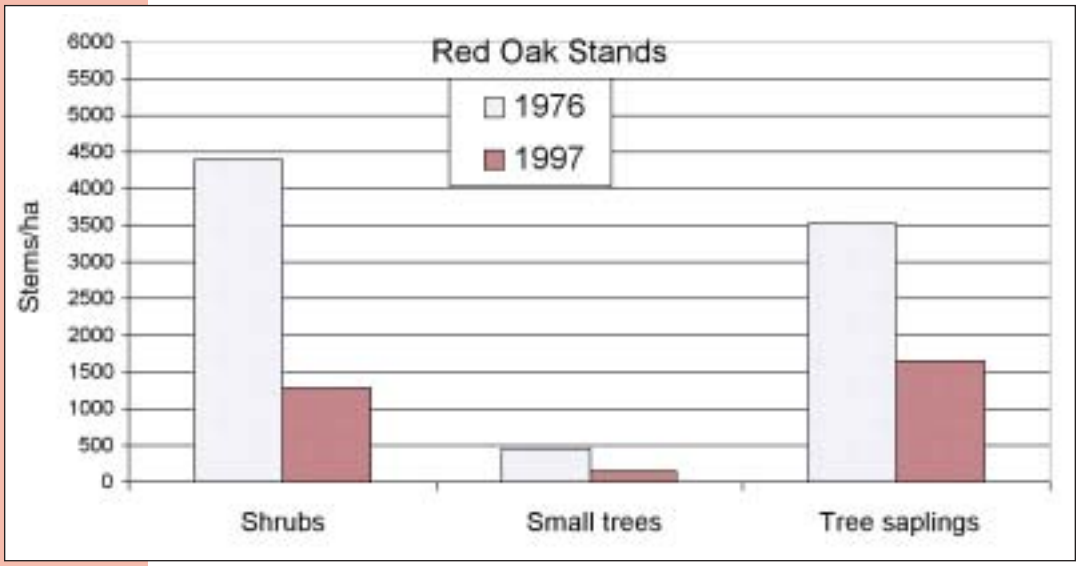
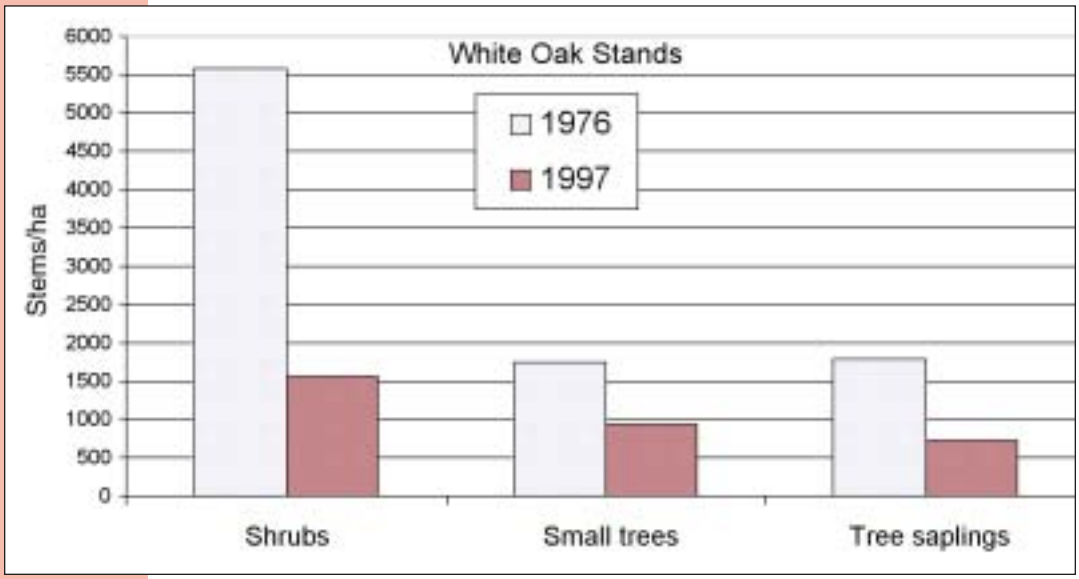


Figure 3. Temporal change in shrub layer structure in maple, red oak and white oak stand types between 1976 and 1997. Chi-square: maple stands (X2 = 5.886, P = 0.004), red oak stands (X2 = 19.216, P < 0.001), white oak stands (X2 = 26.507, P < 0.001).







The distribution of dominant shrub layer species varied across stand types (Table 1). In 1976, maple stands were dominated by maple saplings, but also had a strong component of witch hazel (*Hamamelis virginiana*) and maple-leaved arrow-wood (*Viburnum acerifolium*). In 1976, red oak stands were also dominated by maple-leaved arrow-wood and maple saplings, as well as choke cherry (*Prunus virginiana*), and had minor representation of eastern hop-hornbeam (*Ostrya virginiana*). White oak stand shrub layers in 1976 were dominated by downy arrow-wood (*Viburnum rafinesquianum*), gray dogwood (*Cornus racemosa*) and American hazelnut (*Corylus americana*), with moderate representation of eastern hop-hornbeam and American hornbeam (*Carpinus caroliniana*). Almost all shrub layer species declined by 1997, with dominance shifting to maple saplings in both maple and red oak stands (Table 1). Most species retained their dominance in white oak stands, but underwent substantial declines. The alien buckthorn was rarely encountered in 1976; although it had increased by 1997, it remained a minor component of all stands.

	Maple stands			Red oak stands			White oak stands		
Species/type	**1976**	**1997**	**% change**	**1976**	**1997**	**% change**	**1976**	**1997**	**% change**
True shrubs (total)	**1400**	**545**	**-61.07**	**4400**	**1273**	**-71.07**	**5580**	**1555**	**-72.13**
Prunus virginiana	150.00	42.33	-71.78	811.11	448.09	-44.76	220.00	85.00	-61.36
Viburnum acerifolium	310.00	195.77	-36.85	1155.55	125.68	-89.12	--------	--------	--------
Hamamelis virginiana	510.00	301.59	-40.86	--------	--------	--------	--------	--------	--------
Corylus americana	--------	--------	--------	222.22	38.25	-82.79	700.00	460.00	-34.29
Cornus racemosa	--------	--------	--------	588.89	103.93	-82.35	910.00	155.00	-82.97
Viburnum prunifolium	--------	--------	--------	--------	--------	--------	320.00	45.00	-85.94
Viburnum rafinesquianum	--------	--------	--------	--------	--------	--------	1840.00	230.00	-87.50
**Rhamnus cathartica*	0.00	5.30	100.00	27.78	54.56	96.40	33.33	122.22	266.67
Small trees (total)	**760**	**265**	**-65.13**	**467**	**148**	**-68.31**	**1750**	**935**	**-46.57**
Ostrya virginiana	80.00	60.00	-25.00	188.89	89.33	-52.71	455.56	200.00	-56.10
Carpinus caroliniana	70.00	115.00	64.29	33.33	46.00	38.00	566.67	422.22	-25.49
Saplings (total)	**3660**	**1561**	**-57.35**	**3511**	**1650**	**-53.00**	**1800**	**725**	**-59.72**
Acer sacchrum	4080.00	1616.90	-60.37	1011.11	776.11	-23.24	166.67	122.22	-26.67
Ulmus rubra	230.00	15.00	-93.48	355.56	142.44	-59.94	266.67	50.00	-81.25
Fraxinus sp	70.00	95.60	36.57	455.56	98.00	-78.49	488.89	166.67	-65.91
Tilia americana	120.00	45.00	-62.50	611.11	128.67	-78.95	55.56	38.89	-30.00

Table 1. Density (in stems/ha) and percent change in total, dominant native, and alien (*) shrubs, small trees, and tree saplings in old growth forest stands sampled by the Illinois Natural Areas Inventory in the Chicago region of northeastern Illinois.

Discussion

Processes of forest change

The woody composition and structure of Chicago region old-growth forests is linked with historic pre-settlement and post settlement conditions. The pre-settlement ages of larger canopy trees indicates that these stands would have been exposed to natural fire processes occurring before European settlement. The large number of mid-size class oaks that originated during the early- to mid-1800s appears to have been released by reduced fire frequencies associated with landscape fragmentation that began after settlement (Anderson 1991). The appearance of these oaks also suggests that an open canopy structure in the mid-1800s allowed enough light to promote their regeneration from seedlings or grubs (Bowles & McBride 1998). Original fire processes appear to have been moderated by landscape fire breaks, as maples and smaller oak cohorts co-occurred in more mesic stands that would have received more fire protection (Bowles et al. 1994). Nevertheless, these smaller oak cohorts also declined over time.

In the narrow time frame of 20 years, these forests have undergone substantial losses of oak saplings and native shrubs, with increasing dominance by sugar maple in maple and red oak stands. This pattern of changing structure represents two interconnected processes of forest change that are closely linked with fire suppression. A successional process of increasing maple dominance and replacement of oaks characterizes changes in mesic stands, while a stand maturation process best describes the loss of subcanopy oaks in dry-mesic stands (e.g., Christensen 1977; Abrams & Downs 1990; Oliver & Larson 1990; Abrams 1992). These changes occur because oaks are relatively shade-intolerant and fire-tolerant, regenerating after disturbance and declining as closing forest canopies reduce shade and cause mortality of sub-canopy individuals (Crow 1988; Abrams 1992; Crow 1992; Will-Wolf & Roberts 1993). Successional replacement by more shade tolerant maples occurs as part of the maturation process when they are present or occur as adjacent seed sources (Schlesinger 1976; Pallardy et al. 1991). The decline in shrub layer species also appears to fit these models because many shrubs sprout after fire and are relatively shade-intolerant, declining with increasing tree basal area (Loucks & Schnur 1976). An important finding is that the significant decline of oaks and shrub layer species in white oak stands, and to some extent in red oak stands, has occurred without significant maple invasion and appears linked with increasing oak canopy cover. Oak forests are thus unstable without recurring disturbance (McCune & Cottam 1985; Abrams 1992; Will-Wolf & Roberts 1993).

These changes indicate that the stands we studied have shifted toward canopy gap tree replacement processes, in which shade-intolerant oaks will not reproduce in the face of increasing maple dominance and shade (e.g., Bray 1956; Schlesinger 1976; Christensen 1977; Anderson & Adams 1978; Canham 1985; Abrams & Downs 1990; Pallardy et al. 1991; Abrams 1992; Roovers & Shifley 1997). This process appears to be much further developed in maple stands, which have comparatively lower structural and compositional diversity, as well as greater percent canopy cover (Bowles et al. 2000).

The increasingly high population levels of eastern white-tailed deer in the Chicago region (Witham & Jones 1990) are no doubt contributing to loss of woody plant diversity in forest stands. Browsing was almost always evident in 1997, and probably

contributed to reduced densities of shrubs. It reduced height of arrow-wood stems from the shrub layer to the ground layer in one white oak stand; but, it also led to an increase in *Carpinus caroliniana* basal stem sprouts. Deer browsing also contributes to mortality of oak seedlings (Buckley et al. 1998), and consumption of acorns may also reduce oak recruitment. However, the significant losses of larger oak saplings is apparently not a direct result of deer browsing, but more likely an effect of decreasing light availability due to canopy closure. Although the alien buckthorn increased across all stand types, it remained at low densities and appears not to have caused the wide-scale loss of shrubs.

Management challenges

Although the INAI described these forests as "old growth" or "old second growth," structural changes indicate that they are temporally unstable and will require fire management to prevent further decline and to restore former levels of structure and diversity. Effective fire management may be difficult because of the advanced degree of change in these forests and because we lack specific information on their pre-settlement structure and the fire processes that maintained them (Anderson 1991; Mendelson 1998). There is experimental evidence that reduction of canopy cover and competing saplings increases oak survival and regeneration (Crow 1992; Lorimer et al. 1994). However, larger trees that contribute to canopy shade may be fire-resistant, and modeling suggests that major fire disturbance may be needed for regeneration of oak stands (Will-Wolf & Roberts 1993). These results raise relevant questions for Chicago region old-growth forests—most importantly, can fire be used to maintain oak-dominated old-growth structure that promotes oak regeneration in canopy gaps and maintains a forest shrub-layer? The direct impact of different fire frequencies and intensities on forest ground layer vegetation is also unknown, and fire may promote the spread and persistence of the alien garlic mustard (*Alliaria petiolata*) in forests (Bowles et al. 2000; Luken & Shea 2000). The effect of fire on forest interior birds is an important concern, as some species appear to decline with increasing fire frequency—probably due to reduction of shrub layer and leaf litter habitats (Blake 2005). Potential fire effects on forest invertebrates are also an important concern, and there are almost no relevant data available from Midwest forests. For example, species richness of springtails (*Collembola*), which are forest litter dwelling arthropods, is reduced by burning, although some species may prefer burned areas (Brand 2002). Many factors other than fire can affect stand successional trajectories. For example, loss of American elm (*Ulmus americana*) to Dutch elm disease in wet-mesic stands may promote increases of either shrubs (Dunn 1986) or maple saplings (Bowles et al. 2003). Control of deer herds is apparently critical, as continued over-grazing may prevent recovery of woody and herbaceous species (Anderson 1994), and can reduce bird nesting habitat (DeCalesta 1994). These are difficult management decisions that should be tested by sound experimental approaches and more frequent monitoring than at 20-year intervals.

Marlin Bowles is a Plant Conservation Biologist at The Morton Arboretum. He can be reached at mbowles@morotnarb.org

Michael Jones is a Botanist with Christopher B. Burke Engineering, Ltd. He can be reached at ecobot@sbglobal.net

Jenny McBride is GIS specialist at The Morton Arboretum. She can be reached at jmcbride@mortonarb.org

Tim Bell is Professor of Botany at Chicago State University and Research Associate at The Morton Arboretum. He can be reached at tbell22@csu.edu

Christopher Dunn is Executive Director for Research Programs at the Chicago Botanic Garden. He can be reached at cdunn@chicagobotanic.org

Acknowledgements
We thank Chicago Wilderness, the Nancy Ryerson Ranney Leadership Grants Program, the Forest Preserve Districts of Cook, DuPage, Kane, and Will counties, and The Illinois Conservation Foundation for funding this work. We also thank the Illinois Department of Natural Resources for permission to use INAI data, and INAI director John White and staff for collecting original data. We also thank the Illinois Nature Preserves Commission and many landowners for permission to conduct this study, as well as agency personnel, site stewards, and volunteers for assistance with various aspects of this project. Finally, we thank John Dwyer, George Ware and reviewers for their thoughtful comments.

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Lessons Learned from the Chicago Wilderness Strategic Planning Process

Elizabeth McCance, Chicago Wilderness
Susan Parks, Parks Consulting Group LLC

Learn from the successes and challenges faced by Chicago Wilderness in undergoing its strategic planning process in this article by Elizabeth McCance and Susan Parks.

By late 2004, the Chicago Wilderness consortium was nearing its 10th anniversary, and had grown substantially both in number of members and scope. Because the last strategic planning exercise occurred more then five years earlier, the Steering Committee felt it was time to revisit the original mission and develop a plan to guide the consortium for the next 20 years. It therefore authorized resources to update the consortium's strategic plan. This article is an account of the planning process that Chicago Wilderness used, and an assessment of what worked well and not so well in order to come up with some lessons learned and recommendations for others who embark on a strategic planning process.

Chicago Wilderness Case Study

In our assessment of the Chicago Wilderness consortium's strategic planning experience, we identified six areas that presented challenges. These areas may present potential challenges for others as well. In response to each challenge, we developed a planning process solution, shown in Table 1. In the remainder of this article, we describe what we did to implement each of the solutions to our challenges and what we learned as we went through the process.

Potential Challenges	***Planning Process Solution***
Obtaining input from everyone throughout the process takes time and is costly.	Defined roles and divided tasks
Actively engaging everyone in all aspects of the strategic plan is unwieldy and impractical. Additionally, not everyone has all of the same information or the "big picture" necessary to make strategic decisions.	An iterative planning process, used in each phase of the project.
Meeting scheduling and logistics.	Project pace
Information—not enough or overload.	Information synthesis and management
Tendency to wordsmith and get "bogged down" on language.	Definition of terms and use of ground rules
Many strategy projects don't get beyond the vision and mission stage, where the real work begins.	Multiple end products

Table 1: Challenges commonly experienced in strategic planning and our solutions to these challenges.

Defined Roles

We created a set of clearly defined roles to maximize input, inclusion, and information gathering while balancing the cost of involving everyone in everything. Every Chicago Wilderness member fit into one of the following roles (and therefore was involved in some way):

- Leadership—the governing bodies responsible for making decisions and implementation (the Chicago Wilderness Steering Committee and Executive Council) that received updates and provided feedback and direction during scheduled meetings throughout the year.
- Core team—the small group (fewer than 12 people) in charge of making decisions based on the gathered information. The members were nominated by the Steering Committee in order to ensure a good representation of the consortium as a whole and a broad array of viewpoints.
- Point-people / project managers—two people (the authors of this article) were assigned to manage the overall project and do a lot of the "grunt" work. When dealing with so much information and so many different sources of input, someone must distill and synthesize the wealth of information before a core team can make any reasonable decisions. It was critical to do this work between meetings. In addition, having the information presented as several options instead of raw data made the core team meetings more fruitful.
- Key opinion leaders—this group of over 20 individuals represented the consortium in several ways—key funders, founding members, land managers, and other respected thought leaders. Their perspective, expectations, and feedback were sought in the early stages of the process through interviews.
- Members—all members were encouraged to provide ideas and feedback through a variety of ways, including a web-based survey, team meetings, and the CW Congress.
- Consultant / facilitator—this person was hired to bring planning methodology, meeting facilitation, outside expertise, and neutrality to the process. This person also served as one of the point people / project managers.

Through implementing this system, we learned the following:

An effective and appropriate core team is critical.

The core team assembled for the Chicago Wilderness process really enabled the process to move forward. In strategic planning it is not enough to have just any group of individuals assigned to the task; you need the "right" individuals. The members of our core team were committed to the process, knowledgeable about Chicago Wilderness, sincere, gave thoughtful analysis on all aspects, and had a positive attitude. These characteristics enabled the group to move forward in a productive manner. It was important to give the core team enough time and opportunity to get to know one another, function well together as a group, and debate ideas. Once this working relationship was established, the core team moved through the various assignments in an efficient yet thoughtful manner. Each member took the process seriously, was dedicated to achieving a successful outcome, and committed to doing the work. Without such a core team, the process would not have been possible.

There needs to be a dedicated, single point of responsibility within the organization Not only is a "point person" needed, but in addition to the consultant, there should a

single responsible person from the organization. This person needs to be allowed sufficient time to work extensively on the project. Having a person in the organization also provides direction to the consultant, and ensures that the consultant does not leave at project completion with all the useful knowledge. An ideal candidate for this point person is someone who knows the necessary details about the organization and has the ability to execute the plan once it is done.

The roles of the team chairs, team members and other resources critical to implementation need careful definition

We tried to anticipate who the key players would be in the implementation phase and then the best ways to bring them into the process. We conducted several brainstorming and feedback sessions at team meetings throughout the process, and we soon recognized that the consortium would rely heavily on the teams as collective groups to implement parts of the strategy. Thus, after the initial parts of the plan—vision, mission, and basic beliefs—were defined, we included the team chairs with the core team to work on the long term objectives. At the time the team chairs were brought into the process, their role on the team was still unclear, and considerable time was needed to bring them up to speed. Later in the process, we were better able to identify an appropriate role for the teams, which was to flesh out the details of the strategies and the short-term objectives. Once this role was defined, the team chairs' ability to effectively provide meaningful input increased.

The role of staff should be expanded

There was also confusion about the role of Chicago Wilderness staff. Early on, the core group desired that the process should not be staff-driven, and invited one staff representative to serve on the core team. However, we realized later that this was a mistake. While it is important that the process incorporate many different and broader viewpoints than those brought by staff, ultimately it is the staff that has to implement the resulting plan. Staff therefore participated actively in a variety of ways, including team meetings, core team meetings, and transition planning.

A broader resource team would have provided better and more efficient validation of drafts

In hindsight, we would have benefited from a "resource team," comprised of representatives from each team, all staff, and key opinion leaders (i.e. the group that was interviewed to review drafts and provide feedback throughout the process). This process would have kept more people in the loop and done some validity checking while at the same time kept the core team small and efficient. Members of the resource team could have been as active or inactive as they desired but it would have given more people the opportunity to see the whole process develop.

Iterative Process Model Used in All Phases

The phases that we went through for the Chicago Wilderness strategic planning were as follows:

- Phase 1: Develop / refine vision, mission, and basic beliefs
- Phase 2: Create long-term objectives
- Phase 3: Develop structure and organizational processes
- Phase 4: Plan transition to implementation

Each phase built on the prior phases and got progressively more detailed. We employed proven strategic planning methods, using a smaller group to develop the

higher level, Phase 1 and 2 pieces, and then involved additional people in implementation details of the strategy. While the wider consortium continued to act as resources at every phase, progressively more people were involved with the core team and helped to make decisions.

To ensure as much participation as possible during these phases, we used the following iterative process model:

- Cast the net widely to gather information
- Analyze and synthesize the information, and create drafts, using Chicago Wilderness conduits to pass information back and forth, and to test ideas
- Validate the drafts by getting reactions and directions from the Chicago Wilderness leadership
- Go back to gathering more information

From using an iterative process model, we learned the following:

An iterative approach at every phase is a necessary success factor.
While it was crucial to involve people early in the process, it was just as important to keep going back to various groups to test ideas and options. We employed our iterative approach at every phase of the process, but we could have made the validation and idea testing components of the iteration even stronger, for example, by sending draft documents to a larger group of people throughout the process, to keep a larger group informed of the detail, solicit additional feedback, and gain commitment to the plan.

The transition phase does not happen automatically.
By the time the implementation and transition phase start, people working on the strategy are tired, and their "real jobs" are vying for their attention. Yet, this phase is critical for the strategy to be realized. It takes a lot of work and involves collaborating with many people to sort out the details, and having the time and resources to do it well needs to be planned for in advance. To resolve this, we "retired" the core team, and created several smaller groups to work on specific aspects of transition, such as the 5-year project pipeline, internal processes such as decision-making committees, and operational issues such as budget and staff.

Project Pace
Chicago Wilderness expected that the strategy project would be complete in one year. The core team met monthly, but for several reasons, a conference call was sometimes held between meetings to keep the process moving forward. First, long periods between working meetings makes it difficult for the core team to stay focused on the issues and decisions. Second, the longer the process takes, the greater the risk of "scope creep" and dwelling on non-strategic issues. In terms of project pace, we recommend the following:

Set a standard calendar for core team working sessions
Given the number of time and resource constraints and the need to keep up momentum, organizing the flow of the process and work sessions can be very difficult. Our mistake was scheduling each work session on an ad-hoc basis. A calendar with standing meetings and conference calls would have ensured core team attendance and kept us on a tighter schedule. Whatever the proper meeting

arrangement turns out to be, the emphasis should be on working sessions and not meetings.

Allow sufficient time for start-up
It took a long time for the Chicago Wilderness group to formulate its mission, because the core team took longer to establish a fully productive working relationship than anticipated. Despite the extra time spent in this phase, it was important because it meant that the whole group was on-board for all subsequent work.

Keep moving forward
Sometimes a group can get bogged down over specific items, but it is important to keep moving forward. In our case, the core team came up with a fairly unmanageable list of long-term objectives. Because it was important to capture all of the ideas and to keep moving forward, we maintained this list into the next few steps. Later, as we gained fresh perspective, we were able to go back and refine the list.

Information Synthesis and Management
We used several tools to gather information—one-on-one interviews, facilitated brainstorming sessions with the Chicago Wilderness teams, and an on-line survey to which more than 470 people responded. Lessons learned from this process include:

The interviews and on-line survey were effective, efficient, and cost effective tools
To gather preliminary information, the initial interviews and the on-line survey worked well. These strategies achieved two important functions. They involved a large number of members from across the consortium early on in the process, making them feel that they were a part of the strategic planning from the beginning. Secondly, they produced a tremendous amount of initial information for the core team to work with. They accomplished this without having the core team grow to an unmanageable size. Almost every issue that the core team had to grapple with was identified in this initial information gathering stage.

On-going synthesis of information and communication to the larger group is key
While we feel the initial information gathering process worked well, the synthesis and summary of the information, as well as on-going information exchange could have been improved. While it is important to compile all ideas and to keep working members as informed as possible, at some points we felt that we bombarded the core team with too much information. A major portion of the project manager's effort should be to synthesize and distill the information, and then distribute only the products of that work to the core team.

Well-defined Terms and Ground Rules
Ground rules are an important aspect of any group process. The most important ground rule in our case was to agree that we would not wordsmith, but rather come to agreement on concepts. This does not mean that no wordsmithing occurred; it was important particularly in the early phases of developing the mission and vision to clarify the concepts. However, discussions about particular words were kept to a minimum. As long as everyone understood the concept, we moved on.

A couple of things helped us to stick to this ground rule. We agreed that our written statements were drafts for internal use only, and that they would be edited by communications professionals prior to public distribution beyond the consortium. Additionally, we wrote explanatory paragraphs for each objective. Having the extra explanation allowed a greater comfort level with the one-sentence objectives that were written. Based on our experience we recommend the following:

Ground rules are important tools
Some ground rules (come prepared to meetings, respond within a week to drafts) can be established at the front-end of the project. Others (such as the "ban" on wordsmithing) should be jointly agreed to when the need arises during the project. Once a ground rule has been adopted, the consultant needs to consistently invoke it, and the planning team needs to be disciplined enough to follow it.

Terms must be clearly defined
Strategic planning is filled with terminology, and we made the mistake of not clearly defining the terms at each and every step. Oftentimes groups would struggle to come to consensus because the terms used meant different things to different people. As the process moved along, we got better at defining terms, which helped everyone to be "on the same page."

Multiple End Products
As we worked through the planning process, it became clear that several distinct products were emerging: 1) the long-term direction and focus for the consortium, 2) the priorities and projects in terms of collaborative work, and 3) the operational considerations for implementing the plan. These became: the strategic plan, the five year project pipeline, and the Chicago Wilderness handbook, respectively.

The lesson from this experience is:

While the deliverables should be defined and approved up front, the organization of the final end-products will emerge from the planning process.
It is important to define and approve the end products of strategic planning in the beginning of the project to give direction and focus to the process, yet there also needs to be some flexibility to fine tune these products, based on what emerges during planning. For the plan to be useful to the organization, we recommend being open to a variety of emerging end-products and formats that may make more sense, given the resulting information. The **strategic plan**, which included information ranging from the mission to the long-term objectives, with some short-term objectives given as examples of the how work would be implemented, gave the consortium something that encompassed our collective ideas. Equally important is the five year **project pipeline** (the process by which projects are identified, prioritized and funded to achieve the short term objectives). The five year project pipeline starts with the short-term objectives and moves down to specific action steps, which allows for a living, changing document, and means that more people can get involved in the strategic planning process even after the official yearlong planning process is complete. Finally, the **handbook** product allowed us to separate out the strategic framework from the organizational structure and process information. While we agreed up front to work to produce all this information, the idea of developing three different products did not emerge until late in the process.

Conclusion

In summary, there are several critical success factors that should be carefully considered when an organization enters into a strategic planning process.

- *An effective and appropriate core team.* Carefully craft a core team that has the knowledge and commitment to carry the processes forward.
- *Carefully defined roles for participants and other resources critical to implementation.* It is important to understand who will implement the plan once it is achieved and structure a process to include these participants in appropriate roles and places.
- *An iterative approach at every phase is a necessary success factor.* An iterative approach ensures participation and inclusion, integration of information received, and fewer "surprises" at the end of the project because of on-going involvement.
- *A process that balances time constraints and work momentum.* Use tools like work session calendars to keep the process moving, and to keep team members informed of deadlines. Remember to plan for both start-up time and transition work.
- *On-going synthesis of information and communication.* Construct a suitable process of information gathering and exchanges that allows both for input and idea validation, but that doesn't overwhelm participants. The level of information given to a participant should be based on the role that person plays in plan implementation.
- *End-products compatible with emerging information.* Define the products based on what emerges from the process and adapt accordingly; it may not be suitable to develop a single product.

Chicago Wilderness members greatly benefited from this process in that both the mission and vision were re-affirmed and more strategic short-term steps were defined. The process enabled all members to contribute to a larger, regional vision and develop a cohesive detailed strategy enabling member organizations to work together strategically. Furthermore, the process brought to light various organizational issues that could be dealt with constructively to build a more effective consortium.

Elizabeth McCance is the director of conservation for Chicago Wilderness and may be contacted at emccance@chicagowilderness.org and Susan Parks is president of Parks Consulting Group, sparks@parkscg.com

By observing insect pollinator activity on prairie plants in a reconstructed prairie, Dee Huie, Sue Sheehan, and Rod Walton make several recommendations regarding pollinator populations.

Plant-Pollinator Associations in Reconstructed Prairies at Fermilab

Rod Walton, Dee Huie, and Sue Sheehan
Fermi National Accelerator Laboratory

Abstract
We observed prairie plants at Fermi National Accelerator Laboratory (Fermilab) for insect pollinator activity. Our results indicate that insect diversity on targeted plants has decreased from previous studies at Fermilab and is much lower than what has been historically observed for these plant species elsewhere. No insect species were observed from the Andrenidae, Bombyllidae and Conopidae families and few species were observed from Anthophoridae. According to historical data these all should have been present as important pollinators. Within the Apidae family, we noted a greater abundance of *Bombus impatiens*; however, observations of other members of this genus remained low. Given the potential negative impacts of decreased pollinator diversity on plant reproduction, we recommend that pollinators continue to be monitored at Fermilab and that future research be conducted to determine whether corrective measures are necessary to restore pollinator populations.

Introduction

The long-term success of prairie reconstructions depends upon creating not only a rich community of plants, but also a highly diverse and interacting fauna. In the case of highly specialized plant communities like prairies, pollinating insects play a significant role in establishing a complex, sustainable, and functioning ecosystem. It is therefore important to know whether relatively recent prairie reconstructions are attracting a robust suite of pollinators.

In June 1975 the first seeds were planted in the Fermi National Accelerator Laboratory prairie reconstruction site. Since that time, continuous monitoring of the plant community has provided valuable information pertaining to large-scale prairie restorations (Betz 1997). However, with the exception of a limited insect survey conducted from 1986 to 1988 (Panzer and Stillwaugh 1990) and a bumblebee survey in 1993 (Franzen 1993), little data has been collected on the prairie's insect community.

To better understand insect pollinator diversity in the reconstructed prairie at Fermilab, we surveyed insect floral visitors of targeted plants during the 2003 and 2004 growing seasons. For comparison, we also surveyed floral visitors in both a remnant Fermilab prairie and a prairie reconstruction at

the nearby Peck Farm Park. We compared these observations to historical accounts of insects in Midwestern prairies from the early twentieth century and from more recent accounts between 1986 and 2002.

Study Sites

Fermi National Accelerator Laboratory is located 30 miles west of Chicago in Batavia, Illinois. With an on-site prairie remnant and more than 1,200 acres of reconstructed prairie ranging in age from three to thirty years, Fermilab is an ideal place to study pollinator utilization of a prairie reconstruction. Our study focused on three "Ecological Land Management (ELM)" tracts, designated by Fermilab as ELM 1, 23, & 25. We chose these tracts because of the abundance of targeted plants. All sites were reconstructed from previously farmed land except for ELM tract 23, which is a prairie remnant located along railroad tracks on the north side of the property. ELM 1 is a large (~385 acres) prairie reconstruction, which includes smaller areas that have been planted at different times from 1975 to 1985. For this study, two small areas (9 and 16 acres) within ELM 1 were sampled. ELM 23, the prairie remnant, is approximately 18 acres. ELM 25 is a large, varied reconstruction of about 350 acres; a very small portion was used for this study. The prairie reconstruction at Peck Farm Park, which is operated by the Geneva Park District, is ten years old and approximately 130 acres in size. The park is located approximately three miles west of Geneva, Illinois and eight miles northwest of Fermilab. While there are more than 200 plant species growing at Fermilab, fewer species are present at the newer Peck Farm prairie. Prescribed burning is used as a management tool in all Fermilab tracts and at Peck Farm. Fermilab prairies are burned every 2 – 5 years, depending on weather and available resources. The relevant areas in ELM 1 and 25 were last burned in 2004, and in ELM 23 in 2002. The prairie at Peck Farm was last burned in 2002, although small portions of the study area were burned in 2003 and 2004.

	June	July	August	September
FLOWER				
Penstemon digitalis	x	x		
Asclepias syriaca		x		
Physostegia virginiana		x	x	
Veronicastrum virginicum		x	x	
Allium cernuum		x	x	x
Desmodium canadense		x	x	x
Eryngium yuccifolium		x	x	x
Lythrum alatum		x	x	x
Monarda fistulosa		x	x	x
Gentiana andrewsii			x	x
Gentiana flavida			x	x
Gentiana quinquefolia			x	x

Table 1. Targeted plant flowering phenology, arranged from early to late-blooming species.

Methods

We chose 12 plant species for observation during the 2003 and 2004 growing season based on varied flower phenology (Table 1) and flower morphology. During each growing season of the study, we observed at least 12 individuals of each species for a five-minute period and recorded all insect floral visitors. We collected representative specimens of all insect visitors and preserved them for later identification. Insects were observed

Insect Orders	Insect Families	Fermilab 2003-2004	Graenicher 1907	Robertson 1929	Pearson 1932	Evans 1986	Betz 1997	Petersen 1997	Clinebell 2002
Hymenoptera	Andrenidae		x	x					x
	Anthophoridae	x		x	x			x	x
	Apidae	x	x	x		x	x	x	x
	Colletidae	x	x	x					x
	Halictidae	x		x	x	x		x	x
	Megachilidae	x	x	x	x	x			x
	Sphecidae			x					x
	Vespidae	x		x			x		x
Diptera	Bombyliidae		x	x					
	Calliphoridae	x							
	Conopidae		x	x					
	Muscidae	x		x					
	Syrphidae	x	x	x					
	Tachinidae			x					
Coleoptera	Anthocoridae	x							
	Cantharidae	x							
	Carabidae	x							
	Cerambycidae	x							
	Chrysomelidae	x		x					
	Curculionidae	x		x					
	Meloidae	x		x					
	Nitidulidae	x							
	Phalacridae	x							
	Scarabaeidae	x		x					

Table 2. Presence of insects, identified to Family, observed by historical studies in the region. Studies are cited in full at the end of this paper.

under 3x magnification to assess pollen load. We tabulated pollinator-plant pairs and compared the current Fermilab distribution of pollinators to the expected distribution based on previous literature (Graenicher 1907; Robertson 1929; Pearson 1932; Evans 1986; Betz 1997; Petersen 1997; Clinebell 2002). Our objective was to determine whether there were significant differences. Although we intended to make statistical comparisons between current pollinator observations and those from previous studies, this proved infeasible because each study employed different methods and assumptions.

Initially, we also planned to compare pollinator activity between the Fermilab prairie reconstruction and both the prairie remnant and the Peck Farm prairie. We made two trips each year to the Peck Farm prairie, but small floral population sizes and the lack of targeted plant species limited the amount of data collected, making meaningful comparisons difficult. In 2003, only three of the targeted plant species were found in the remnant and in 2004 only four species were found. Observations were done on all located individuals but only the population of *Gentiana andrewsii* was large enough to gather significant data. We pooled data from Peck Farm and the Fermilab prairie remnant with that from the reconstructed sites.

Results and Discussion

We qualitatively compared the occurrence of plant-pollinator pairs from this study to literature values obtained from earlier studies (Table 2) to determine major differences. However, it

should be noted that strictly speaking, the previous studies are not comparable to the current study, or to each other. For example, although we were able to make observations of three *Gentiana* spp., little historical information was available on this family. The only records found were Robertson's observation (1929) of *Gentiana andrewsii*, and the only pollinator he observed was *Bombus pennsylvanicus*. Further observations need to be done before any conclusion can be drawn about pollinators of these species.

We observed *Baptisia leucantha, Tradescantia ohiensis* and *Zizia aurea* but did not include the data since our study began after initial blooming in 2003. The small amount of data collected at Fermilab on *B. leucantha* actually indicates more diversity of pollinators than historically reported. No historical data were available for *T. ohiensis*. However, data collected on *Z. aurea* suggest that there is far less family-level diversity at Fermilab than would be expected based on the literature. Observations on *Z. aurea* were made only in 2004 which might account for the lack of insects observed. Nevertheless, because many bees attracted to *Z. aurea* are believed to specialize in plants of the family Umbelliferae, they are more likely to be lost when a habitat is disturbed.

Apidae spp.	A c	A s	B l	D c	G a	G f	G q	L a	M f	P d	P v	V v	Total
A. mellifera	2			2	1	6	4		14	1	8	24	62
B. affinis											1		1
B. auricomus									1				1
B. bimaculatus												2	2
B. fervidus					1						2		3
B. griseocollis							1						1
B. impatiens	4			11	10	8	5	1	8	2	11	4	64
B. pennsylvanicus							1						1
B. vagans		1								1		1	3
Bombus spp.							3		2		2	1	8

Table 3. Distribution of Apis mellifera and eight species of Bombus from the present study. Plant species are as follows: Ac= Allium cernuum, As= Asclepius syriaca, Bl=Baptisia leucantha, Dc=Desmodium canadense, Ga=Gentiana andrewsii, Gf=G. flavida, Gq=G. quinquefolia, La=Lythrum alatum, Mf=Monarda fistulosa, Pd=Penstemon digitalis, Pv=Physostegia virginiana, Vv=Veronicastrum virginicum.

Hymenoptera

We undertook a closer examination of families within the order Hymenoptera (bees and wasps), especially the family Apidae (Table 3), which includes *Bombus spp.* (bumble bees) and *Apis mellifera* (honeybee). These species are currently the most important pollinators in the Fermilab prairie. Even though some other insects were found in greater numbers, *Bombus* spp. and *A. mellifera* are uniquely adapted for carrying large pollen loads. Many of the collected specimens of these species had full pollen baskets and numerous grains of pollen clinging to their body hairs.

Historically, *Apis mellifera* has not been considered a significant prairie pollinator, yet in this study we found them in large numbers at Fermilab. According to Reed (1995), honeybees were generally rare in the Minnesota prairie she observed, and when they were present, they visited the invasive white and yellow sweet clovers. Petersen (1997) indicated that he rarely encountered *A. mellifera* during his observations at the College of DuPage prairie, less than 10 miles from Fermilab. Franzen (1993) found that *Apis mellifera* constituted only 7% of the Apidae in her study at Fermilab, but in the current study 43% of Apidae we observed belonged to this species. Two factors may have contributed to the large numbers found recently at Fermilab. In the past, domestic honeybee hives were located at the site. These bees may have established wild colonies that have increased in size. In addition, periodic outbreaks of invasive sweet clovers in the prairie may have attracted *A. mellifera* in greater numbers.

Of the identified *Bombus* on the targeted plants in this study, 85% were *B. impatiens*. In Franzen's (1993) study of *Bombus* at Fermilab, only 25% of *Bombus* individuals were *B. impatiens*. The disproportionate number of *B. impatiens* found in this study indicates a reduction in diversity of the *Bombus* genus over the last ten years. The incidence of *B. impatiens* in this study far exceeded what was observed in earlier studies. Only 14% of all *Bombus* noted by Evans (1986), 25% by Clinebell (2002), and 0% by Petersen (1997) were *B. impatiens*. Petersen indicated 42% *B. fervidus* and 44% *B. bimaculatus*, whereas Franzen (1993) pooled *B. auricomus* and *B. pennsylvanicus* and 40% fell into this group. In the current study only 4% were *B. fervidus*, 2% were *B. bimaculatus* and 4% were *B. auricomus* or *B. pennsylvanicus*. The low number of *Bombus* species may be due to competition from the large numbers of *A. mellifera*. During Franzen's study (1993) at Fermilab, parasites were observed on several individuals of *B. auricomus* and *B. pennsylvanicus* and some researchers have suggested there is a decline in *Bombus* diversity throughout the country due to parasitism (Cameron, Thorp, pers. comm.).

Robertson (1929) and Clinebell (2002) found a large number of species within the Andrenidae family on some of the targeted plants. Graenicher (1907) also mentions Andrenidae as "principle pollen distributors" but none of these species were observed at Fermilab during this study. This decline may be due to the loss of prairie habitat since according to Pearson (1932) "practically all prairie Andrenidae are oligoleges of restricted plant groups". Oligoleges are bees which visit one or a few related plants for pollen.

We also observed less diversity among species in the Anthophoridae family (cuckoo bees, digger bees, carpenter bees), among which, numerous individuals of *Ceratina spp.* and *Xylocopa virginica* were observed. However, only two other single specimens in this family, one *Nomada spp.* and one *Mellicodes bimaculata* were collected. The only member of this family observed that was a significant pollinator was *Ceratina* spp. Yet Robertson (1929) and Pearson (1932) found a number of different species in the Anthophoridae family on targeted plants. It was noted that *X. virginica* individuals were robbing nectar by piercing the sides of corollas, so their effectiveness as pollinators is doubtful.

Historically, a number of species from the family Megachillidae (leaf-cutting bees) were found on all targeted plants (except for *Gentiana* spp). However, only eight individuals in this family were collected in our study.

Wasps were very scarce on the plants observed at Fermilab. Of particular note is the absence of wasps in the family Sphecidae (digger wasps). Robertson (1929) found a number of Sphecidae on targeted plants including *Eryngium yuccifolium*, which Clinebell (2002) stated were preferred by Sphecid wasps. It should be noted that in a survey conducted by Panzer and Stillwaugh (1990) the Sphecid wasp was absent from Fermilab but present in a nearby prairie in West Chicago.

Non-Hymenoptera

Diptera (flies) also includes many important pollinator species. According to Curran (1965), flies play an extremely important part in the pollination of flowers—second only to bees. By far the greatest number of flies observed in this study was from the family Syrphidae (syrphid flies). Four specimens from the family Muscidae (house flies, stable flies, etc.) were also collected. Robertson (1929) noted the presence of both Syrphid and Muscoid flies on targeted plants. However, the absence of Bombyliidae (bee flies) and Conopidae (thickheaded flies) specimens in this study is interesting in light of both Robertson's (1929) and Graenicher's (1907) observations of a number of different species from these families on targeted plants. In the Panzer and Stillwaugh (1990) survey, Bombyliidae were observed on the West Chicago prairie but not the Fermilab prairie; Conopidae were not mentioned. Since the presence of the Bombyliidae was confirmed at the West Chicago Prairie in the late 1980s, it is possible that this family of insects has gone undetected at Fermilab or is still missing. Because of the lack of historical data on pollinating flies, it is difficult to speculate whether or not there has been a decline in the overall population.

There is disagreement in the literature over how important Coleoptera (beetles and weevils) are as plant pollinators. Beetles from the family Chrysomelidae were present on ten of the twelve targeted plants in our study. *Altica* spp. and *Accalymma vittatum* were present in very large numbers. Therefore, it is probably safe to assume that they are at least incidental pollinators. Soldier beetles (Cantharidae) and milkweed beetles (Cerambycidae) were also present in large numbers. These beetle families were all noted by Robertson (1929). Only a few families of Coleoptera mentioned in the historical data were not found in this survey. Each was associated with only a single targeted plant species and probably are not significant as missing pollinators. In any case, there are insufficient data to draw any firm conclusions.

Lepidoptera (butterflies and moths) are also important plant pollinators. The historical literature mentions the families Pieridae, Nymphalidae, Lycaenidae, and Papilionidae as pollinators of some of the targeted plants in this study. Very few Lepidoptera were observed on the targeted plants with the exception of *Vanessa cardui* (Nymphlidae) on *Gentiana quinquefolia*. *Vanessa cardui* was observed only in 2003 when this butterfly species was abundant. The specimens collected did not have much pollen on them. Because of the fluctuating population sizes of Lepidoptera and the fact that the targeted plants are not dependent on Lepidoptera for pollination, no conclusions are possible without more detailed studies.

Conclusion

We believe that this is the first such review of literature aimed at assessing the pollinator community on a reconstructed prairie in this region. Because of the short length of this study it is impossible to make a definitive statement that pollinators are missing from the Fermilab site. However, there are strong indications that insect

diversity is lower than expected, based on the literature. The diversity among *Bombus* species has obviously decreased at Fermilab since the 1993 research (Franzen 1993).

Our observations suggest many interesting possibilities, indicating the need for more research in this area. We encourage additional studies at other prairie reconstructions in the region to support or refute our findings. Given the potential lack of pollinators in restored prairies, research should also investigate the need and feasibility of pollinator introductions. Furthermore, with regards to the prairies at Fermilab and Peck Farm Park, we offer the following recommendations for future study:

- Continue to monitor Fermilab's *Bombus* population and evaluate collected bees for parasites.
- Determine whether insects from the families Andrenidae, Anthophoridae, Bombyliidae and Conopidae are missing and what effect their absence would have on prairie succession.
- Continue to survey the remnant Fermilab prairie for pollinators.
- Survey *Gentiana* spp. for pollinators and conduct research to determine whether enough pollinators exist at Fermilab to maintain their populations.
- Monitor *Zizia aurea* for pollinators to determine if any of the specialist insects associated with this plant are present.
- Continue to survey Peck Farm for pollinators.

Dee Huie is a docent at Lederman Science Education Center at Fermilab. She can be contacted via email at dhuie@fnal.gov

Sue Sheehan is a docent at Lederman Science Education Center at Fermiab. Shecan be contacted via email at sheehan@fnal.gov

Rod Walton is an environmental consultant at Fermilab, and directs the Fermi National Environmental Research Park. He can be contacted via email at rwalton@fnal.gov.

Acknowledgements

We would like to thank Chicago Wilderness for supporting this research with a small Grant FWS 0301, and Universities Research Association, Inc. for providing matching funds. Thank you to the taxonomists: Robert Jean, Dept. of Life Sciences, Indiana State University, Terre Haute, IN; Sam Droege, USGS Patuxent Wildlife Research Center, Beltsville, MD.; F. Christian Thompson (Syrphidae), Norman E. Woodley (Calliphoridae), Communications and Taxonomic Services Unit, Systematic Entomology Laboratory, USDA-ARS-PSI Beltsville, MD. Also, we would like to thank Robert Lootens and Elizabeth Quigg of Fermilab and finally the members of the North American Pollinator Protection Campaign who responded to e-mail requests suggesting resources used in this work.

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The 2040 Regional Framework Plan

Swasti Shah
Urban Design and Planning Studio of HNTB Corporation in Chicago

Hoping to guide the Chicago region's future land use and development decisions, Swasti Shah explains how the 2040 Regional Framework Plan sets out that vision.

The Need for a Regional Plan

The six-county northeastern Illinois region is at the heart of a thriving tri-state metropolis that stretches around Lake Michigan from north of Milwaukee to east of Valparaiso, Indiana. By the year 2040, the population in the six counties alone could approach 11 million people—a 30% increase over the year 2000 population of 8.1 million. The tremendous growth forecast is indicative of a healthy economy and the high quality of life that attracts new residents to the region.

While this growth presents countless opportunities for the region, it also creates significant challenges. An additional 3 million people will generate demand for new housing and create new demands on existing infrastructure, necessitating extensive improvements. However, due to limited funds, the region will have to choose carefully which infrastructure investments to make first. Also, the resultant growth pressure on existing open areas will have to be balanced with the need to preserve the natural environment.

The region is poised for growth and in response, the Northeastern Illinois Planning Commission (NIPC) developed the 2040 Regional Framework Plan. The Framework Plan will guide the region's future land use and development and coordinate local plans and regional-level decisions.

The Making of the Regional Plan: Envisioning 2040

The northeastern Illinois region has over 8 million residents, 272 municipalities, more than 1,200 units of government and is spread over the six-county metropolitan Chicago area. NIPC recognized that in order to create a truly regional plan that would benefit all parts of the region, the planning process itself would have to be collaborative and inclusive from the beginning. Therefore, in 2001, an intensive public participation process was undertaken to engage our citizenry from all walks of life and all parts of the region, in a regional dialogue to develop a shared vision of the future.

Nearly 4,000 people, including the general public, business owners, community leaders, public officials and planners at all levels participated in 200 local and regional workshops and meetings organized by Common Ground across northeastern Illinois. In order to successfully engage large groups of participants in a meaningful discussion, and to support

consensus-based decision making, state-of-the-art decision support technology was used at all the workshops and meetings. Trained facilitators led and recorded the discussion at every table, and networked computers and wireless key pads were used for instant polling of the participants to gauge the level of agreement or disagreement on any issue under discussion.

Common Ground started with a series of leadership workshops held in twelve different locations around the region to engage local business and civic leaders and elected officials. Almost 900 people attended these workshops and identified issues and challenges which were reviewed and prioritized in a regional forum that convened people from the entire region in a single location. Approximately 850 people of diverse ages and races attended the forum and 275 people made a commitment to continue participation in preparing a regional vision. These volunteers, working in small working groups over a period of seven months, and often meeting virtually through web conferencing, analyzed the issues and drafted regional goals covering different topic areas. NIPC then conducted several more workshops to gather feedback on the regional goals from a larger audience. This additional public review resulted in revisions and additions to the goals which were then endorsed by the Commission in March 2003.

A special effort was made to reach out to the traditionally under-represented groups such as African Americans, Latinos and youth by enlisting the help of community organizations like the Latinos United and by holding some workshops in neighborhoods with a high percentage of these groups.

The 52 regional goals cover a wide range of issues from education, water supply, and transportation, to taxation. All goals are deeply inter-related, and reflect the participants' desire for a better, stronger future. The 52 goals were summarized into five core themes which together form the heart of the Regional Framework Plan:

Theme 1. Livable Communities – The region will be characterized by communities with diverse populations, accessibility to jobs, pedestrian friendly residential and commercial areas, and economically diverse housings. All the region's residents will have access to high-quality open space and recreation opportunities, convenient public transportation, and excellent, equitable schools, health care, social services, and cultural amenities.

Theme 2. Diversity – The region will view its racial, ethnic, and cultural diversity as an asset and will be characterized by inclusive communities and neighborhoods and by equity in the distribution of opportunities and resources.

Theme 3. Natural Environment – The quality of the region's air, water, land and other natural resources will be preserved and enhanced by public and private action and by an environmentally literate populace.

Theme 4. Global Competitiveness – The region will have an internationally competitive economy, supported by a diversity of businesses and workers with the skills, tools and infrastructure needed to succeed. Jobs and business opportunities will be equitably distributed throughout the region.

Theme 5. Collaborative Governance – The public's business will be done by governments that cooperate effectively and incorporate public involvement.

Since these goals were written by the participants themselves, they have a high sense of ownership for the plan vision that is based on these goals.

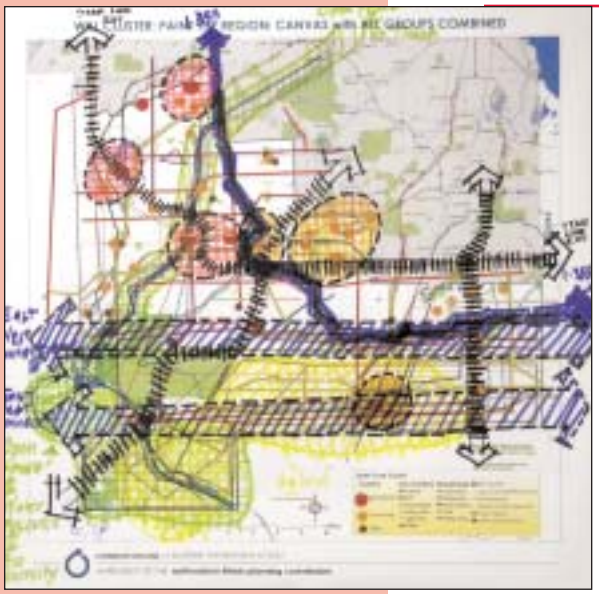
The Making of the Framework Plan: Translating the Regional Vision

The next step in the planning process involved the creation of a framework plan that would guide future development in the region consistent with the regional goals and vision developed by the people.

Common Ground convened another round of workshops with clusters of municipalities, ten in suburban areas and three within the City of Chicago. Elected officials from municipalities, local, county, and regional planners covering land-use, transportation and environmental planning, and other constituents came together in these workshops to create a desirable future plan for 2040. They worked in small groups using an interactive, web-based planning tool called "Paint the Region" to "paint" their vision for the future. They identified places where they wanted to see concentrations of development, the transportation connections needed to interconnect them, and the natural and open areas that should be preserved and conserved. The tool, based on Geographic Information Systems (GIS) technology, provided participants with several layers of mapped information that they could refer to as they created their plan for the future. The existing and planned transportation network, major natural features like streams and lakes, existing open spaces and regional plans were some of the layers that the participants found especially useful. Technology made it possible to collect and store vast amounts of complex information in an electronic format suitable for further analysis and to gain instant feedback from the participants. These tools were also well received—post-workshop evaluations filled out by the participants generally showed a high degree of enthusiasm for the advanced technologies being used by NIPC.

The plan, as it was being made, was projected on a large screen for the entire group to see easily. At the end, plans from all the different groups were projected on a central screen so that the participants could review commonalities and differences, and vote on them using wireless keypads.

The plans produced in these workshops were analyzed by Common Ground staff, and synthesized into a common vision



Common Ground staff analyzed and synthesized the outputs from the cluster workshops to create a single vision map.

map for each cluster and for the entire region through a series of cluster and regional synthesis meetings with regional advocates and practitioners. Regional plans like land-use, transportation and forest preserve district plans from the six counties, the Regional Transportation Plan by Chicago Area Transportation Study (CATS), and the Green Infrastructure Vision by Chicago Wilderness served as important inputs in the planning process. The recommendations from the cluster workshops were supplemented by the research and recommendations included in these plans to make the 2040 Framework Plan Map as comprehensive as possible. This map was shared with land-use, transportation and environmental planners from across the region for further review and refinement.

At every step, Common Ground made an effort to keep the planning process transparent and inclusive so that the resulting plan would be a plan for the entire region prepared in a truly regional effort.

The 2040 Regional Framework Plan

The Vision of the 2040 Regional Framework Plan is based on the 52 goals and the five core themes that represent the aspirations of the people for the future of the region:

"Northeastern Illinois will be a region of livable communities, built on the diversity of its people, known for its healthy natural environment, globally competitive, and governed collaboratively."

The plan presents a regional framework made up of three primary elements that together achieve Common Ground goals and vision—centers, corridors and green areas. The plan seeks to accommodate the millions of new residents and jobs by directing as much growth as possible toward *centers* that are supported by infrastructure and connected to the region and one another by a series of major multi-modal transportation *corridors*. The region also includes important *green areas*, or natural resources that must be protected. The Policy Map depicts the centers of regional significance in 2040, the major transportation corridors connecting them, and shows how these centers and corridors can be surrounded by an integrated network of green areas.

The region offers a variety of lifestyle choices to its residents ranging from urban living in the heart of downtown Chicago to a quiet, rural life nestled in the natural environment of outlying suburban counties. The unique environments in centers across the region make it a more attractive place to live. Recognizing this, Common Ground defined five center types for 2040—global center, metropolitan center, community center, town center and hamlets.

The Framework Plan calls for strengthening transportation connections between centers within the region and strategic connections to centers outside the six-county area. Expanding the region's transit system to improve connectivity and creating more walkable mixed-use environments are also significant components of the Plan's transportation policy for the future that are aimed at reducing congestion and increasing choice. Five types of corridors are considered in the Plan—highways, arterials, rail / bus rapid transit, heavy rail and water transport corridors. By providing good multi-modal transportation connections between the region's largest centers, and well-designed pedestrian and bike facilities, the need for automobile trips can be reduced in the future, thereby easing the ever-increasing congestion on roadways.

The plan calls for preserving the region's natural resource assets or "green areas" that may include agricultural land, forest preserves, open space and biodiversity areas, trails and water resource areas. Green areas, ranging in size and function from small parks to large savannas, and from small creeks to large lakes, are all central to Common Ground's vision of preserving a healthy, natural environment for the region and creating livable communities. Natural resources contribute greatly to quality of life. They are important for health and well-being, provide recreational opportunities, maintain the vital functions of natural systems and also contribute directly to a sustainable economy. The plan's policy of guiding growth towards centers and strengthening transportation connections between them is crucial to protecting green areas.

Implementing the Plan

The plan outlines several initiatives and measures for implementing the recommendations and realizing the Vision set forth by the residents of the region. NIPC, as the regional planning agency, will be an important steward in the process; however, successful implementation will require regional cooperation and a common focus among the 272 municipalities to maximize the region's assets and minimize the disadvantages. The plan promotes "community-based regionalism," the idea that local communities maintain most of their traditional authority but commit to work collaboratively with one another.

Historically, NIPC has collaborated closely with civic and business organizations as its "partners" in planning. Working through the Chicago Wilderness consortium, NIPC worked closely with a number of partners on the Biodiversity Recovery Plan and the Green Infrastructure Vision. NIPC will continue to strengthen and expand these partnerships and work with the local governments for greater consistency and coordination in planning at all levels in the region. NIPC and CATS will continue the work started during Common Ground to bring land-use and transportation planning in the region closer together. By establishing closer links and providing more direct inputs from a visioning and planning exercise like Common Ground into the Regional Transportation Planning process, we can ensure that our infrastructure investments are reflective of people's aspirations for the region's future.

Recognizing that most local land-use decisions in Illinois are made by local governments, a significant part of plan implementation is built on strategies for application at the local level that support the plan's goals and recommendations. Promoting compact, mixed-use development, promoting walking and bicycling as alternative travel modes, and protecting water resources are examples of strategies, that if implemented at the local level, will benefit the local communities as well as the region as a whole. The plan identifies 16 such strategies that are voluntary but

will hopefully be seriously considered by local governments as they plan for their communities. NIPC will offer technical resources and capabilities to assist communities in implementing these strategies.

Lessons Learned and Implications

Even though conducting public participation activities for planning in a region of this size is a daunting task, through Common Ground, NIPC has demonstrated that it is feasible. Common Ground was able to leverage technology to reach out to more people than in any previous planning process in the region, and to involve them actively in making the plan. The collaborative process helped produce a Plan that is reflective of the diversity in the region. Also, because the general public had direct involvement in several significant aspects of the plan, they developed an increased awareness and a stronger sense of commitment towards the regional perspective advocated by the Framework Plan.

Common Ground workshops, where neighboring municipalities worked together to plan for a desirable future, have generated a spirit of collaboration and regionalism that we hope will grow stronger, and will influence local planning efforts. NIPC will continue to assist local communities, and will work with its partner agencies to ensure coordination and consistency in planning efforts in the region.

The need for collaborative planning at a larger regional level was reiterated throughout Common Ground. The future of our region is closely linked with the future of our neighboring counties in Illinois and in southeast Wisconsin and northwest Indiana. Planning efforts like the Green Infrastructure Vision prepared by Chicago Wilderness to identify opportunities for biodiversity recovery and protection within the tri-state area are steps in the right direction. Regional collaboration on other critical issues like adjacent land-uses, transportation connections, watershed and water resource management issues is also urgently needed. Building on the foundation laid by the Tri-State Accord of 2002,[1] NIPC will work toward regional consensus on these issues.

Implementing the Framework Plan will be an on-going process for the region. NIPC will develop a regional "report card" of performance indicators to measure the region's progress on implementation. The report card will illustrate how the region is moving towards its goals, and will identify matters that require greater effort so that the region can assemble the resources necessary to bring about positive change.

Acknowledgements

The Illinois Department of Transportation (IDOT) is the primary sponsor of Common Ground. Other financial contributions have come from local government contributions to NIPC, the Chicago Community Trust, the Gaylord and Dorothy Donnelley Foundation, and the Grand Victoria Foundation.

Swasti Shah, AICP, is an urban planner in the Urban Design and Planning Studio of HNTB Corporation in Chicago. She has been providing consulting services to NIPC for its Common Ground project since May 2003. For further information regarding the 2040 Regional Framework Plan, please visit the NIPC website at www.nipc.org or contact Hubert Morgan, Common Ground Program Manager at 312.454.0400 or by e-mail at bertie@nipc.org.

[1] *In April 2002, NIPC, CATS, the Southeastern Wisconsin Regional Planning Commission, and the Northwestern Indiana Regional Planning Commission signed a "Tri-State Accord" to serve as a forum for tri-state planning.*

Status of Amphibians and Reptiles in Savanna Habitats and Savanna Mosaic Communities of the Chicago Wilderness Region

Robert Brodman, Saint Joseph's College, Indiana
Thomas Anton, Field Museum, Independent Consultant
Karen Glennemeier, Audubon – Chicago Region
Paula Seth, Saint Joseph's College, Indiana
David Didion, Saint Joseph's College, Indiana
Amy Luksus, Saint Joseph's College, Indiana

Ensuring proper ecological management depends upon having scientific data, and in this article several researchers discuss their findings about the status of amphibian and reptile populations at Savanna and Savanna Mosaic Communities in Chicago region.

Abstract
We conducted in-depth surveys of amphibians and reptiles at 15 savanna and savanna mosaic communities within the Chicago Wilderness region. We found 30 species of amphibians and reptiles including 15 species that are considered to be of high conservation value. Two-thirds of the savanna sites surveyed had Herpetofauna Quality Index values that were high or very high. The data will be used to determine the distribution and status of species and to provide base-line data that are necessary to design management plans to conserve and foster the recovery of native biodiversity in a unique and threatened community. The data will also be used as benchmarks to evaluate the success of our conservation by design for savanna amphibians and reptiles.

Background
In recent decades, amphibians and reptiles have declined worldwide (Wake 1991; Houlahan et al. 2000; Gibbons et al. 2000; Stuart et al. 2004). Local declines often involved species that use savanna habitats; however, these unique habitats have largely been developed or degraded in the Chicago region. Much of the savanna and savanna mosaic habitat that remain in the region has not been surveyed to determine the distribution and status of savanna amphibians and reptiles. In order to develop a scientific base for ecological management, to conserve biodiversity, and to evaluate the successes of management to improve native biodiversity, we need to collect rigorous population data throughout the region.

Project goals and Objectives

Our first goal was to conduct in-depth surveys of amphibian and reptile populations at a minimum of 12 sites with savanna or savanna mosaic communities throughout the Chicago Wilderness region in 2004. We began surveys at 15 sites in Will and Lake Counties in Illinois, and Jasper, Newton,, and Lake Counties in Indiana. These surveys provide base-line data that will be used to evaluate the current status of species in these habitats and to test some of the assumptions of the Chicago Wilderness Conservation Design for Savanna Herpetofauna. This study will improve the scientific basis of ecological management to protect a globally and regionally important community, and to restore and manage natural communities to achieve ecological health and sustain native biodiversity in the region. The data collected in this study are needed to evaluate future successes of management practices that are designed to sustain or improve the biodiversity of savanna amphibians and reptiles.

Our second goal was to include a citizen scientist program that would develop citizen awareness and understanding of local biodiversity of savanna amphibians and reptiles, and would involve citizens in our biodiversity conservation program. This will help foster a sustainable relationship between society and nature that will enrich the quality of the lives of informed citizens in the region.

Methods

We conducted in-depth surveys at 15 savanna sites in five counties from April to October 2004. The sites were Middlefork Savanna, Daniel Wright, Wadsworth and Ryerson preserves in Lake County, Illinois; Goodenow Grove, Braidwood, Sandridge and Raccoon Grove preserves in Will County, Illinois; Hoosier Prairie in Lake County, Indiana; Conrad Savanna Nature Preserve in Newton County, Indiana; and Teft Savanna, Stoutsburg Savanna, a Nature Conservancy property, a private property (Bruce's Pond), and the field station at Saint Joseph's College in Jasper County, Indiana. These sites were chosen because they currently protect savanna habitat or savanna mosaic communities.

Prior studies in the region suggest that a combination of survey techniques are necessary to evaluate amphibian and reptile communities (Brodman 2003) and that to detect rare species, 60 person-hours of effort is needed (K. Mierzwa, Earthtech, pers. observation). We surveyed a minimum of 60 person-hours with combined techniques (visual searches, dip-net, seine, minnow traps, turtle traps, frog call surveys, cover boards and drift fence) at 12 of the sites. Each of these sites was visited on a minimum of eight dates that included four frog call surveys. A total of 209 visits and 1115 person-hours of effort were made while conducting surveys at the 15 sites. Surveys were primarily conducted by two expert herpetologists (Brodman and Anton), an experienced naturalist (Seth) and two trained students (Didion and Luksus). In addition, 59 citizen scientists were educated about local amphibian and reptile biodiversity and contributed to 504 person-hours assisting in the field with data collection.

Results

We heard frog choruses of nine species at 46 breeding ponds (Table 1). We captured and observed a total of 5728 amphibians and reptiles with 1115 person-hours of surveys (Table 2). We found a total of 30 species of amphibians and reptiles. Although nine species of frogs were observed, more than half of the individuals were chorus frogs (*Pseudacris triseriata*) and green frogs (*Rana clamitans*). More than 95% of the four species of salamander that we observed were blue-spotted salamanders

(*Ambystoma laterale*) and tiger salamanders (*Ambystoma tigrinum*). Although we only found 193 individual reptiles, they represented 17 species. More than half of those found were eastern garter snakes (*Thamnophis sirtalis*) and six-lined racerunners (*Cnemidophorus sexlineatus*).

County	Site	pc	pt	rp	hv	ba	bf	rcl	rct	ac
Will	Sandridge	1	4		1	2		1	2	
Will	Braidwood	1	7		6	6		5	5	3
Will	Goodenow		1	1		1		1	1	
Will	Raccoon Grove		2			4				
Lake, IL	Daniel Wright					1		1	1	
Lake, IL	Middlefork		1		1	1			1	
Lake, IL	Ryerson	1	1		1	1			1	
Lake, IL	Wadsworth	4				3				
Jasper	Bruce's Pond	1		1	1		1	1	1	
Jasper	SJC Field Station	2	2	1	1	2	2	2	2	
Jasper	Stoutsburg Savanna				1	1				
Jasper	Teft Savanna pond 1	11	10	4	5	1		4	1	
Jasper	TNC	1	1	1						
Lake, IN	Hoosier Prairie	2	3	1	3	2				
Newton	Conrad Savanna	3	3		3	1	1	1		

Table 1. Results of Frog Call surveys. Values are the number of breeding sites used by each species at each site. Species are: pc = spring peeper, pt = chorus frog, rp = northern leopard frog, hv = eastern gray treefrog, ba = American toad, bf = Fowler's toad, rcl = green frog, rct = bullfrog, ac = cricket frog

We used an index of abundance that equates the per effort numbers observed or captures with varying techniques following Brodman (2003) (Table 2). Relative population abundance was categorized using the Karns (1986) ordinal index of breeding chorus intensity on a scale of one to five. The relative abundance of amphibians and reptiles were also categorized on an ordinal scale from one to five using the formula Ln (5 x number of captures or observations / person-h or trap-week), where the index value must be at least one if at least one individual of a species was observed or captured. This index is based on abundance per effort and factors in varying techniques used during surveys.

The sites with the greatest relative abundance were Teft Savanna, Braidwood, Conrad Savanna, Saint Joseph's College Field Station and Goodenow Grove (Table 2). Goodenow Grove, Braidwood, Conrad Savanna, Teft Savanna, Bruce's Pond and the Saint Joseph's College Field Station had the greatest species richness. Sites with low species richness and

relative abundance included Stoutsburg Savanna, Wadsworth, and the Jasper County Nature Conservancy property.

County	Site	pc	pt	rp	hv	ba	bf	rcl	rct	ac	al	at	am	nv	cp	cs	tc	ts	tp	tr	ns	ck	sd	so	pm	hp	ev	ov	cc	cns	oa	total	p*hr
Jasper	Teft Savanna	316	50	36	11	1		267	1		193	263		9	1			1	1												1	1151	94
Will	Goodenow	41	311	82		19		144	198		259	13	19		3		1	25		4	5	3	19				3	2				1151	83
Lake, IN	Hoosier Prairie	65	625	51	37	125	1	77								1		8					3	2								995	71
Lake, IL	Middlefork		39	181		326		206	44						2			10													808	60
Will	Sandridge	23	7	80	24			204	5			1						1														345	69
Will	Braidwood	4	69	74	6			13	26	6		2		6	1			1								1	1	2	32	5		249	84
Jasper	Bruce's pond			2				220				21			1			1	1				1						1			248	94
Lake, IL	Daniel Wright					123		32	51		1				1			1														209	60
Will	Racoon grove	1	136	24				14	22		5	4																				206	72
Jasper	SJC Field Station			5		49	40	24				13				1		10							1							143	60
Lake, IL	Ryerson		5		3			102										1														111	60
Newton	Conrad Savanna	22	27		6		1								1			9					4		2	5	4		1	6	1	89	94
Lake, IL	Wadsworth		18					2																								20	60
Jasper	TNC			1														1														2	94
Jasper	Stoutsburgh					1																										1	60
	Species totals	472	1287	536	87	644	42	1305	347	6	458	317	19	15	10	2	1	69	2	4	5	3	27	2	3	6	8	2	4	38	7	5728	1115

*Table 2. Results of terrestrial and aquatic surveys. The values are the number of each species that were observed in visuals surveys and searches under cover objects or captured using nets, seines, minnow traps, turtles traps and drift fences with funnel traps. P*hr is the total number of person-hours and trap-days surveyed at each site. Species are: pc = spring peeper, pt = chorus frog, rp = northern leopard frog, hv = eastern gray treefrog,ba = American toad, bf = Fowler's toad, rcl = green frog, rct = bullfrog, ac = cricket frog, al = blue-spotted salamander, at = tiger salamander, am = spotted salamander, nv = eastern newt, cp = painted turtle, cs = common snapping turtle, tc = eastern box turtle, ts = eastern garter snake, tp = western ribbon snake, tr = plain's garter snake, ns = northern water snake, ck = Kirtland's snake, sd = brown snake, so = red-bellied snake, pm = bullsnake, hp = eastern hognose snake, ev = western fox snake, ov = smooth green snake, cc = blue racer, cns = six-lined racerunner, oa = slender glass lizard.*

One of the goals of the Chicago Wilderness Conservation Design for Savanna Herpetofauna was to find several indicator species whose presence at a site could be used to assess the health of the savanna ecosystem. We used the Conservation Index Value (CIV) scores developed by Mauger and Anton for each species of amphibian and reptile known to use savanna habitat based on its distribution and abundance in the region, habitat dependency, population attributes and trends, landscape scale and influences, and conservation status. These scores were summed for all species found at a site to determine the Herpetofauna Quality Index (HQI). The CIV and HQI were developed for the Chicago Wilderness Conservation Design for Savanna Herpetofauna (2001).

The sites in our study with the highest HQI scores were Braidwood, Conrad Savanna, Goodenow Grove, and Teft Savanna (Table 3). A total of nine of our survey sites scored very high (> 10) HQI values and Ryerson scored high (HQI = 9-10). Middlefork Savanna, Daniel Wright, Wadsworth and the Jasper County Nature Conservancy property scored fair (HQI = 4-6) and only Stoutsburg Savanna scored in the poor (HQI = 1-3) category.

We found 15 species of amphibians and reptiles that have high CIV ratings in savanna habitats. Most notably we found

Kirtland's snakes (*Clonophis kirtlandii*), spotted salamanders (*Ambystoma maculatum*), smooth green snakes (*Opheodrys vernalis*), and Eastern box turtles (*Terrapene carolina*) at Goodenow Grove and cricket frogs (*Acris crepitans*) at Braidwood. Other species that we found with high CIV ratings were spring peepers (*Pseudacris crucifer*) at 12 sites, eastern gray treefrogs (*Hyla versicolor*) at 10 sites, blue-spotted salamanders and Fowler's

County	Site	pc	pt	rp	hv	ba	bf	rcl	rct	ac	al	at	am	nv	cp	cs	tc	ts	tp	tr	ns	ck	sd	so	pm	hp	ev	cc	cns	oa	RA	HQ	ISR
Will	Braidwood	1	4	1	3	3		2	2	3		1		1	1			1								1	1	1	1	1	28	35	17
Newton	Conrad Savanna	4	4		2	5	2	2							1			1					1		1	1	1	1	1	1	28	33	15
Will	Goodenow	1	3	2		2		2	2		3	1	1		1		1	1		1	1	1	1				1				26	29	18
Jasper	Teft Savanna	5	3	3	3	2		3	2		2	3		1	1			1	1											1	31	25	14
Jasper	Bruce's pond	4		2	3		1	3	2			1			1			1	1				1					1		21	20	12
Jasper	SJC Field Station	4	3	2	2	4	3	4	2			1				1		1							1						28	19	12
Lake, IN	Hoosier Prairie	5	4	2	2	3	1	2								1		1					1	1							22	16	11
Will	Sandridge	1	4	2	2	2		3	2			1						1													17	11	9
Will	Racoon grove	1	3	1		2		1	1		1	1																			11	11	8
Lake, IL	Ryerson	4	2		2	1		4	2									1													16	9	7
Lake, IL	Middlefork		3	3	2	3		3	2						1			1													18	6	8
Lake, IL	Daniel Wright					4		3	3		1				1			1													14	5	6
Lake, IL	Wadsworth	3	3			3		1																							10	5	4
Jasper	TNC	4	2	2														1													9	5	4
Jasper	Stoutsburg Savanna				1	2																									3	4	2

Table 3. Index of relative abundance of amphibians and reptiles from call surveys and other surveys corrected by person-hours of effort. RA = sum of relative abundance, HQI = herpetofauna quality index, SR = species richness. Species are: pc = spring peeper, pt = chorus frog, rp = northern leopard frog, hv = eastern gray treefrog,ba = American toad, bf = Fowler's toad, rcl = green frog, rct = bullfrog, ac = cricket frog, al = blue-spotted salamander, at = tiger salamander, am = spotted salamander, nv = eastern newt, cp = painted turtle, cs = common snapping turtle, tc = eastern box turtle, ts = eastern garter snake, tp = western ribbon snake, tr = plain's garter snake, ns = northern water snake, ck = Kirtland's snake, sd = brown snake, so = red-bellied snake, pm = bull-snake, hp = eastern hognose snake, ev = western fox snake, ov = smooth green snake, cc = blue racer, cns = six-lined racerunner, oa = slender glass lizard.

toads (*Bufo fowleri*) at four sites each, blue racers (*Coluber constrictor*) and slender glass lizards (*Ophisaurus attenuatus*) at three sites each, and eastern newts (*Notophthalmus viridescens*), bullsnakes (*Pituophis melanoleucus*), eastern hognose snakes (*Heterodon platirhinos*) and six-lined racerunners at two sites each.

We used regression analysis to determine which species' abundance best explain the species richness, relative abundance and HQI of amphibians and reptiles in our sample of 15 savanna sites. A stepwise multiple regression model indicates that the relative abundance of three species, western fox snakes (*Elaphe vulpine*), tiger salamanders and green frogs, explains 88% ($r = 0.94$, $p < 0.001$) of the variation in species richness among sites. A second multiple regression model indicates that the relative abundance of two species, eastern garter snakes and slender glass lizards, explains 67% ($r = 0.82$, $p = 0.001$) of the variation in the overall relative abundance among sites. A third stepwise multiple regression model indicates that the relative abun-

dance of four species, western fox snakes, tiger salamanders, Fowler's toads, and eastern gray treefrogs, explains 97% ($r = 0.98$, $p < 0.001$) of the variation of HQI scores among sites. A final stepwise multiple regression model indicates that the relative abundance of five species, western fox snakes, eastern gray treefrogs, blue-spotted salamanders, Fowler's toads, and bullsnakes, explains 96% of the variation in HQI + species richness + relative abundance among sites.

Conclusions

We achieved our goal to conduct in-depth surveys of amphibians and reptiles in at least 12 sites with savanna or savanna mosaic communities throughout the Chicago Wilderness region. These surveys provided base-line data that will be used to assess the current status of species in these habitats and to field test the HQI developed in the Conservation Design for Savanna Herpetofauna. We found that 60% of the sites surveyed had very high HQI scores and only one site out of 15 had an HQI score that was poor. The data collected in this study are needed to evaluate future successes of management practices that are designed to sustain or improve the biodiversity of savanna amphibians and reptiles.

The presence and relative abundance of western fox snakes, eastern gray treefrogs, Fowler's toads, tiger salamanders, blue-spotted salamanders, bullsnakes, slender glass lizards, eastern garter snakes, and green frogs were associated with high HQI scores and high amphibian and reptile biodiversity. All of these species, with the exception of the slender glass lizard, are relatively easy for non-experts to find. Therefore, we suggest that these species are useful indicators of high quality savanna habitat for amphibian and reptile biodiversity.

While some of these indicator species prefer woodland or sparsely wooded habitat and others prefer prairie and open habitat, most of these species prefer habitats with moist or dry sandy soil or loose soil (Minton 2001; Pope 1964) and with semi-permanent wetlands (Brodman et al. 2003). The outstanding feature of much of the habitat surveyed in this study is the combination of oak forest, oak savanna and prairie on loose sandy soils (Lindsey et al. 1969).

Additional in-depth surveys of savanna habitats are needed in the Chicago Wilderness Region to determine if the HQI values that we obtained in this study are representative across the region. We will seek additional grants to fund surveys in other locations within the Chicago Wilderness Region in 2006 and 2007. Follow up surveys will be needed to determine if savanna habitats that are actively managed for biodiversity result in improved HQI scores over time.

Robert Brodman is chair and professor of Biology at Saint Joseph's College in Rensselaer, Indiana. He can be reached at bobb@saintjoe.edu.

Tom Anton is a Herpetologist for the Field Museum in Chicago and also works as an Independent Consultant. He can be reached at tanton2963@aol.com.

Karen Glennemeier is the Conservation Science Coordinator for Audubon in the Chicago Region. She can be reached at kglennemeier@audubon.org.

Paula Seth, David Didion, and Amy Luksus are former and current Saint Joseph's College students who can be reached through Dr. Brodman.

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Book Review

Dune Boy: The Early Years of a Naturalist

Edwin Way Teale
Bibliopola Press; 1st edition 2002
Reviewed by Catherine Bendowitz

When I received the book *Dune Boy: The Early Years of a Naturalist* in the mail, I eagerly ripped open the packaging only to see what I thought was a children's book (in part due to its child-like chapter drawings and typeface that reminded me of grammar school books). After verifying that this was indeed the correct book, I sat down to begin what was to become a wonderful journey that has been shared by many others, both children and adults, since it was first published in 1943.

Dune Boy is a classic book about the Chicago Wilderness area. The book chronicles the "out-of-door" adventures of young Edwin Way Teale, who was a noted naturalist writer. Teale penned more than twenty books about various aspects of the natural world during his lifetime, 1899-1980. He is considered by many to rank among John Muir, Henry David Thoreau, and John Burroughs as one of the best and most influential nature writers in America.[1]

According to *Dune Boy*, Teale's life-long love affair with nature derived from experiences had during summers at his grandparent's farm in the dunes region. It's those experiences he records in the book, each experience a distinct chapter that might make the book a compilation of short stories if not for the common theme of nature threaded throughout.

Each chapter's adventures are narrated through the voice of the young Edwin, thus making it easy to understand how children have been able to identify with the character and become absorbed into his world. Even as an adult, I felt as if I was experiencing all of Edwin's adventures with him from the thrill of flying to the crushing disappointment of failed entrepreneurship. Aside from providing the reader with vivid images of life on a turn-of-the-century farm in northwestern Indiana, one of the book's main agendas appears to be educating the reader about the natural world. This is done through what might be considered subliminal messaging.

[2] *Excerpt taken from http://naturewriting.com/edwinway.htm*

In the author's remembrance, stories are told in such an enthralling manner that I was left wondering what exactly a Whippletree looked like or where I could taste wintergreen berries. I found mention of at least ten species of trees, fifteen species of bird, as well as various insects and reptiles; how wonderful that a storybook divulges so much information about the flora and fauna found in our region and does so in such a compelling manner that makes the reader feel connected to the landscape.

However, underneath the adventures and educational musings lie the not-so-hidden ideals and ruminations of the older Edwin who wrote this book about his childhood. The author notes several perspectives on the world including feelings about human nature: "the world would be a much better place if all the people in it possessed [conciliatory and gentle] attributes...but unfortunately they do not" (p.8), "[one's] action during commonplace days [gives] a key to [one's] action during emergencies" (p.91), and "..it takes perspective to see ourselves in relation to the world at large" (p. 12); and opinions about why nature is so important: "[there is] the need to be sensitive to the color and poetry of Nature…in a world of constant struggle" (p.25). These and other tidbits of wisdom spring up throughout the book and add to it another, more adult, dimension.

In the end two elements really connected me to the book. First, I was able to relate to some of author's experiences, for when I was younger I too: fervently wished to be Native American, picked strawberries with my grandfather, scribbled away in journals, and so on. Second, Teale used such vivid language to describe the natural world that I couldn't resist being pulled into the story as the dunes became "hills of gold shining in the sun" (p. 2), serpents were "…crawling creatures that walk on their ribs…" (p. 61), swallows were "graceful, swift shuttling of flight, with bright, twittering cries" (p.116), and the cedar tree stood as "a dark and slender spire" (p.255). A sign of a good book is one in which the reader hopes to continue the adventure with the hero, and that is exactly how I felt when I finished.

Since reading this book, I have asked my local libraries to obtain a copy of *Dune Boy* with the recommendation to classify it under both adult and children's literature. My only regret is that I did not know of, and therefore did not read this book when I was child, for it surely would have inspired me to create my own "out-of-door" adventures.

Catherine Bendowitz is the Conservation Program Coordinator for Chicago Wilderness and may be contacted at cbendowitz@chicagowilderness.org.

Web Site Review

Donors Forum of Chicago

Review by Robert Sullivan
Argonne National Laboratory

The choice of the Donors Forum of Chicago Web site (www.donorsforum.org) for this review addresses two key concerns of many CW consortium members: successfully running a non-profit organization, and obtaining grant money to fund CW-related activities. The Donors Forum of Chicago is an association of Chicago-area grantmakers that provide resources for grantmakers, grantseekers, nonprofit organizations, and others seeking information about the nonprofit and philanthropic sector. The Donors Forum Web site supports this mission by providing a wide variety of resources, including much useful information about obtaining grants, in a site that is generally well designed and easy to use. This review covers major features of the site, but focuses on the information relating to grants, and concludes with some suggestions for additional online resources relating to grantwriting.

Forum Members and Partners

The Web site states that the Donors Forum of Chicago is a community of nonprofit, consultant and grantmaking organizations that is working together to strengthen, advance and protect the nonprofit sector. Accordingly, Forum participants fall into three categories: Donors Forum Members (more than 200 grantmaking institutions); Associate Members (individuals who advise others concerning their financial and philanthropic goals); and Forum Partners (nearly 1,200 nonprofit organizations of all sizes and types, from Chicago and the suburbs, working in fields ranging from arts, education, and the environment to advocacy, human services, and health). A good number of Chicago Wilderness member organizations are currently Forum Partners, which costs between $100-$500 annually, and entitles the organization to a variety of services, including enhanced capabilities on the Web site.

Web Site Features and Services

The Forum provides resources for both grantmakers and grantseekers, and these separate audiences are reflected in both the content and the layout of the Web site. Much of the site's content serves both audiences through a common menu, but a simple selection from the home page leads to customized content for either audience, proving quick and convenient access to the most useful information.

Main menu items include:

- **Calendar** for grantmakers (password restricted), non-profit workshops, and other events;
- **Resources**, such as the Grantseekers Toolbox, the Illinois Funding Source, and research and trends;
- **Donors Forum Library** with information about the Forum's bricks and mortar research library, but including a searchable online catalogue;
- **Publications** for both grantmakers and grantseekers published by the Forum;
- **Public policy** information, including nonprofit-related Congressional activities, federal and state issues, many useful public policy links, and information on advocacy and lobbying; and
- a **Newsroom** featuring press releases, the E-Forumnotes online newsletter, and recent personnel changes at local foundations and nonprofits.

Other menu items include:

- **Public Trust Initiative**, containing information on best practices for non-profit management;
- **Member and Partner Links** to Forum member and partner Web sites;
- **E-Newsletter Signup** to receive monthly updates on philanthropy research, legislative updates, and notices of Donors Forum workshops and publications;
- **Members and Partners Only** link to special content and services.

Beyond the menus, the Home page includes **Quick Links** to important content, and **What's New** links to recent news of interest. The site also includes a useful site map and a simple search tool available from every page (though marred by sponsored links). All-in-all, the Donors Forum Web site is loaded with high-quality content, and it is a well-planned and well-executed site.

Next, I'll focus on some especially useful resources offered on the Donors Forum Web site.

Grantseekers Toolbox

The Grantseekers Toolbox provides an easy-to-use step-by-step guide to the fundraising process. By posing a series of questions to the user, the Toolbox allows the user to select a path through the steps in fundraising that correspond to the user's organization and situation, e.g. an individual seeking a scholarship will be presented with different steps and resources than a recognized tax-exempt nonprofit organization. This is a great time-saver because it spares the user from wading through information that doesn't apply to them. The language used is easy to understand, and frank in tone, as evidenced by the opening line: "You are here because you're looking for funding." When technical terms are used, a mouse click brings up a pop-up box with a well-written glossary.

The Grantseekers Toolbox addresses several important aspects of the grantseeking process: different types of funding needs, different types of funding providers, researching potential funders and donors, making contact with donors, and writing grant proposals. The information is basic and probably most useful to those new to the fundraising process, but the Toolbox pages are linked to many off-site resources that both beginners and experienced grant writers should find useful. While some pages could be fleshed out more and others need better transitions to the next step in the process, overall, the Grantseekers Toolbox takes users through a lot of useful information efficiently,

Research and Trends
The **Research and Trends** page is a very long (~175 entries!) but useful list of PDF and Web links to a variety of articles concerning charitable giving, trends in philanthropy, research on non-profits and related topics, as well as links to relevant periodicals. The links are annotated, which is very helpful, and the pain of scrolling is eased somewhat by a linked index at the top of the page. It's obvious that careful thought went into the selection of resources, and the annotations are well written. It should be noted that many of the linked resources are targeted at grantmakers rather than grantseekers, but the page is loaded with interesting reading for anyone seeking the "big picture" when it comes to giving trends, public policy, and nonprofits.

Illinois Funding Source
The Donors Forum Web site offers online access to two databases, collectively known as the Illinois Funding Source. These databases are available only by paying a subscription fee between $80 and $500 annually, depending upon the number of users and subscription option chosen. The Illinois Funding Source is comprised of the Fundersource and the Grantsource databases. FunderSource is a searchable directory of 2800+ Illinois oundations, and GrantSource is a research database that indexes over $3.2 billion in grants dollars awarded by local funders. Collectively, the two databases offer:

- Searchable foundation listings (by name, type, budget, interests, type of grants, etc.);
- Searchable grant listings (by foundation, support type, beneficiary, recipients, etc.);
- Current information and updates, including details on newly established foundations, new staff, and guidelines; and
- Details on small foundations, family foundations, and corporate giving programs.

While these databases are only available to subscribers, a PowerPoint tutorial for both databases is available for downloading that will give prospective users a good idea of the contents of the databases and the available search queries. Users may also request a three-day trial database subscription for "test-driving" purposes. If paying for a subscription isn't an option, a very limited but free searchable database of grants is provided for all users.

Conclusion
The Donors Forum of Chicago Web site is an excellent resource for nonprofits and for those seeking information on obtaining grants, particularly those who are just starting out. There is a great deal of information on the site, but I had only minor problems navigating through it all. The content is well targeted to the audiences, and well written: I had no trouble understanding the content on any page. The information resources that I reviewed seemed to be of high quality, and relevant to the tasks at hand. I did not encounter bad links or other malfunctions while using the site.

My criticisms are few and minor. The different "views" of the site created for grantmakers and grantseekers confused me a few times, and some topics (e.g. grant writing) were covered in less depth than I would have liked. Some resources that should be Web-enabled (e.g. job postings) are apparently not yet on the site. I was disappointed in being denied access to the databases without subscribing, and also to be asked to pay for so many publications. However, I can't argue with the idea of Web commerce, and my guess is that the products are worth the asking price. Fortunately,

there is plenty of free content on the Donors Forum of Chicago Web site that makes it well worth visiting.

Other Online Resources
Looking for more? Try the following Web sites:

- **The FoundationCenter** (fdncenter.org): Similar to the Donors Forum in terms of resources, but a larger site, and with no local focus;
- **Federal Grants Wire** (federalgrantswire.com): A free resource for federal grants, government grants and loans;
- The **Grant Source Library** at UNC-Chapel Hill (research.unc.edu / grantsource): Includes many links to online grantwriting resources;
- **Grassroots Fundraising Journal** (www.grassrootsfundraising.org): An online journal devoted to grassroots fundraising;
- **Federal Grant Opportunities** (www.fedgrants.gov): Bare bones search interface to federal grant opportunities.

Robert Sullivan is a Program Manager in the Ecological & Geographical Sciences Section of the Environmental Assessment Division at Argonne National Laboratory. He can be reached at sullivan@anl.gov.

About the *Chicago Wilderness Journal*

The *Chicago Wilderness Journal* is published by the Chicago Region Biodiversity Council (Chicago Wilderness) on its member web (www.chicagowilderness.org/members) site three times per year, in March, July and November.

An editorial board made up of scientists, sustainability professionals and communication specialists from Chicago Wilderness member organizations guides the production of each issue in accordance with the mission of the journal and the goals of Chicago Wilderness.

Board members are:
- Kristopher Lah, U.S. Fish and Wildlife Service
- Cathy Maloney, Prairie Club
- William Peterman, Chicago State University
- Robert Sullivan, Argonne National Laboratory

Support is provided by the following Chicago Wilderness staff members:
- Catherine Bendowitz
- Irene Hogstrom
- Elizabeth McCance
- Chris Mulvaney
- Michael Pond

Mission of the Chicago Wilderness Journal:
1. Facilitate the sharing of results and lessons learned from member-initiated projects and activities, including coalition-funded projects, team activities or the work of individual member organizations that would be useful to the wider membership;
2. Through easily consumable articles discuss practical implications, interpret data, and/or make recommendations about issues within the areas of science, land management, sustainability, education, and communication in the Chicago region;
3. Foster a sense of community among Chicago Wilderness members and improve members' ability to communicate with diverse audiences.

For information on how to submit articles or queries, please refer to the Guidelines to Authors posted on the journal's home page. For other inquiries about this publication, please contact Elizabeth McCance at emccance@chicagowilderness.org.

The *CW Journal* has been made possible by the generous support of the USDA Forest Service and the USDI Fish and Wildlife Service.