CW JOURNAL

Best Practices in Conservation and Restoration

Volume 2 • Number 2
July, 2004

In This Issue

Chicago WILDERNESS

Are people learning to work towards conservation solutions? How is awareness taught and how are the results measured? Doug Widener discusses how the Education and Communication Team is defining and measuring biodiversity literacy.

Towards a Biodiversity Literate Public

Doug Widener
Chicago Academy of Sciences and its
Peggy Notebaert Nature Museum

This is an exciting time for Chicago Wilderness. The coalition is in the midst of a strategic planning process that will chart the direction of the coalition for years to come. Chicago Wilderness is also gearing up for its first *State of the Region Report Card*, which will describe the progress we have made as a coalition in promoting, protecting, and preserving our region's rich biodiversity, and which will establish important baselines for measuring our progress in the future. Given these two milestones, it is time to consider how effective our existing work has been, and what new strategies, tools, and resources the coalition needs in order to achieve the goals outlined in the *Biodiversity Recovery Plan*. In light of the strategic planning process and the development of the inaugural report card, the Education and Communication Team is addressing these questions.

A central goal of the work of Chicago Wilderness identified in the *Recovery Plan* is to ensure that the importance of our region's biodiversity is communicated to its citizens, so that they are equipped with the awareness, knowledge, attitudes, and skills necessary to support and contribute to regional conservation efforts. To encourage public support and involvement in biodiversity preservation, restoration, and management we must both engage new audiences and communicate as effectively as possible with our current audience. Indeed, a goal of equal importance to the number of acres restored or protected is the number of people who actively understand and support our region's biodiversity through their individual actions and civic involvement. As the *Recovery Plan* aptly states, "the future of our native landscapes depends upon the support and involvement of our citizenry."

But how do we gain the support of our region's diverse population? Like the rich diversity of plants, animals, and ecosystems represented throughout Chicago Wilderness, the region is also diverse in terms of its human residents. If we are to succeed in reaching a broader audience, we need to better understand the cultural, spiritual, and socio-economic factors that influence the values and decisions of various constituencies, and then develop specific education and communication strategies tailored to these audiences. In terms of engaging people on biodiversity, one size does not fit all.

Reports from the Biodiversity Project—a Madison, Wisconsin organization that conducts national public opinion research on

biodiversity, and develops collaborative strategies to increase public awareness and engagement—indicate that many potentially sympathetic audiences are largely left out of current education and communication efforts on biodiversity. These include senior citizens, minorities, persons from lower income brackets, young adults, persons of faith, and urban residents. As a case in point, public opinion research conducted by the firm Belden and Russonello (1996) on behalf of the Biodiversity Project found that lower income urban residents—especially African Americans and Latinos—were more likely to support the statement "maintaining biodiversity is important" than other groups.

Beyond the need to engage wider audiences on biodiversity-related issues, conservation organizations also need to more carefully consider how to present the topic of biodiversity in a way that is understandable, and that leads people to care and to act. In the 1996 Biodiversity Poll, only two out of ten respondents said they were familiar with the term biodiversity. However, once biodiversity was explained, 87 percent said that maintaining biodiversity was important. While this level of support is encouraging, the poll also found that much of the support quickly eroded away when other concerns like jobs, property rights, or human convenience were considered. Forty-eight percent of respondents stated that jobs were more important than habitats, and a similar percentage said that it is okay to eliminate some species when other issues are involved. Additionally, while most people seemed to grasp the idea of interconnectedness and interrelationships in natural systems on a conceptual level, this appreciation did not translate to respondents being able to recognize and respond to threats to biodiversity through lifestyle changes or public policy (Biodiversity Project 1998).

As a part of the 1996 Biodiversity Poll, respondents were asked to reflect on a series of values associated with protecting biodiversity. Of the values tested, the most favorable included: responsibility to future generations (stewardship), respect for God's creation, responsibility to family, and appreciation for the beauty of nature. Communication and education tools that incorporate these values are likely to motivate the public to take positive actions relating to biodiversity preservation. Further, the mechanisms by which we educate and communicate about biodiversity need to clearly connect the importance of biodiversity to people's lives if they are to realize that biodiversity preservation is more than just something we should do; it is something we *need* to do in order to ensure our own health and well being and that of future generations. As we know, ecosystems provide many valuable services necessary for maintaining life on earth—clean air, clean water, balanced weather patterns, etc. Additionally, many plants (animals too) have been shown to have potential for curing or mitigating a variety of illnesses. Many more wait to be discovered. Protecting biodiversity means protecting the health of this and generations to come. According to the Biodiversity Project (1999), communication and education tools need to relate these and other benefits that biodiversity protection provide to humanity if we are to effectively move beyond "preaching to the choir" to engaging larger numbers of people in supporting biodiversity actively.

Chicago Wilderness has responded to many of the issues raised above. Communicators and educators have been trained on how to develop messages for various audiences. The Education and Communication Team and Sustainability Team have implemented projects that have worked with various communities and groups to relate regional biodiversity to their lives and cultures. While these and other projects have allowed

Chicago Wilderness to begin to broaden its reach, much more work is needed. An important step in this effort is to establish a common baseline definition of biodiversity literacy. Establishing a common baseline definition of biodiversity will help Chicago Wilderness to better determine the effectiveness of existing Chicago Wilderness biodiversity education and communication tools and projects, to identify gaps in programming, and to propose new tools and projects to fill these gaps in order to establish a greater understanding of our region's biodiversity among its citizens.

Much of the groundwork for defining biodiversity literacy has already been laid. Environmental educators from around the world have adopted a five-component continuum for environmental education first outlined at the 1975 UNESCO meeting held in Tbilisi, Georgia. Known as the Tbilisi Declaration, the five components of environmental education build upon one another and include:

1. *awareness* of the environment and environmental issues;
2. *knowledge* and understanding of the environment and environmental issues;
3. *attitudes* and values that establish a feeling of concern for the environment and environmental issues;
4. *skills* that are necessary to identify, investigate, and contribute to the resolution of environmental issues; and
5. *participation* in activities that lead to the resolution of environmental issues.

The current education programs and tools of Chicago Wilderness are aligned to these five components, as are the environmental education programs offered by many individual Chicago Wilderness member organizations.

The five components of environmental education also serve as the basis of the National Project for Excellence in Environmental Education, a multifaceted undertaking of the North American Association for Environmental Education (NAAEE) that seeks to determine what it means to be environmentally literate. As a part of the project, NAAEE has compiled several complimentary resources including:

- interdisciplinary student academic standards for environmental education;
- guidelines for the preparation and continued professional development of environmental educators;
- guidelines for creating effective environmental education materials;
- a series of educator resource guides to high quality, existing environmental education materials; and
- a training workbook to assist educators in utilizing the project's resources.

As highlighted earlier, the work of the Biodiversity Project has also produced a wealth of tools and resources for understanding public opinion about biodiversity, identifying new audiences for biodiversity conservation, and developing effective education and communication strategies for engaging the public on biodiversity.

With these resources and others as a basis, the Evaluation Task Force of the Education and Communication Team is currently engaged in a three-phased project to establish a baseline of common characteristics that typify individuals who are already considered to be biodiversity literate. Once established and tested, these characteristics—the types of awareness, knowledge, attitudes, skills, and related actions that persons who are biodiversity literate exhibit—will be compiled into a set of essential features that comprise biodiversity literacy. These features, in turn,

can then be used as the basis for the development of communication and education tools to better understand the current level of the region's biodiversity literacy, to examine the extent to which existing education programs and communication tools contribute to developing this literacy, and to identify areas where increased communication effort or additional educational programming is needed.

The task force is currently engaged in an initial set of interviews with 25 biodiversity experts (selected with input from the other Chicago Wilderness teams) using a set of criteria based on the five essential components of environmental education and the complementary work of NAAEE, the Biodiversity Project, and other groups. The interview process examines the awareness, knowledge, attitudes, skills, and active participation of experts in various fields of biodiversity including education, science, land management, public policy, and communication to provide a wide range of responses. Common themes from interviews will be extracted to develop an initial set of parameters that contribute to a person's biodiversity literacy.

The parameters developed will be tested through the development of a survey to be administered to a larger group of 120 representative experts from biodiversity-related fields. Survey recipients will be selected with input from other Chicago Wilderness teams. The survey will allow the project team to assess the initial pool of biodiversity literacy characteristics against those of the larger group. Survey responses will be analyzed using factor analysis to determine the common elements among the survey responses. These common elements will then be compared to those identified in national resources on environmental and biodiversity literacy, including the efforts of NAAEE and the Biodiversity Project, to identify any gaps between the project's findings and those of these national projects. The initial list of biodiversity literacy characteristics will then be shared with the various teams of Chicago Wilderness to determine if additions or changes need to be made to the characteristics so that they accurately reflect a comprehensive definition of biodiversity literacy. These results will be then be formulated into a common baseline set of essential features that define biodiversity literacy. These features will be categorized using the five essential components of environmental education—awareness, knowledge, attitudes, skills, and participation.

The project team will then work with members of the Education and Communication Team to develop a matrix based on these essential features of biodiversity literacy. This matrix will be used to correlate Chicago Wilderness' existing educational efforts to the essential features to determine the extent to which Chicago Wilderness' current tools and programs address these features. This will provide a starting point for identifying gaps in programming or in audiences served, and for planning new projects and tools to fill these gaps. The project team will also host a curriculum-mapping workshop for Chicago Wilderness members so that those members can then use the same mapping technique to analyze their own programming against the matrix.

The project team will also meet with the Chicago Wilderness director of communications and representatives from the State of the Region Report Card working group to review the essential biodiversity literacy features and incorporate them, as appropriate, into the public opinion polling planned for the Report Card Project. Administered regularly over time, this public opinion polling will measure the region's biodiversity literacy longitudinally, and help to determine the effectiveness of current and future Chicago Wilderness efforts at improving biodiversity literacy.

The timeliness of this project could not be better. I am excited for the project, for its findings, and for the groundwork it will lay in helping to connect our region's diverse citizenry with the rich biological diversity we as residents of Chicago Wilderness are so fortunate to live among.

Doug Widener
Vice President, Education
Chicago Academy of Sciences and its Peggy Notebaert Nature Museum
Chair, CW Education and Communication Team

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How have the high quality prairies fared over the last 25 years? Marlin Bowles and Michael Jones re-sampled 62 sites to find out and to investigate the effects of fire.

Long-Term Changes in Chicago Region Prairie Vegetation in Relation to Fire Management

Marlin Bowles, The Morton Arboretum and
Michael Jones, Christopher Burke Engineering

Abstract
To understand long-term change in Chicago region prairies, in 2001 we re-investigated 62 prairie stands that were originally sampled in 1976 by the Illinois Natural Areas Inventory. For those sites with fire-management records, we correlated changes in species richness, composition and structure with the frequency at which the sites were burned over time. About 77% of all prairies remained intact, and, with the exception of many railroad prairies, most of the surviving sites are now protected. The majority of stands with fire records had been burned less than 40% of the time. With respect to change in species richness, higher quality prairies tended to be stable, while lower quality prairies increased in richness, presumably in response to fire management. We also found that alien species and woody vegetation increased across all sites, and that native species richness tended to decline as woody vegetation increased. Fire frequencies of about 50 %, i.e. biennial burning, appear necessary to maintain composition and structure of mesic and wet-mesic prairies, and few sites were burned at this rate. This appears to be causing long-term deterioration of many sites, and we propose that increased fire management will be needed to maintain these important natural areas.

Introduction

Vegetation monitoring

Monitoring prairies in a management context is an important objective for Chicago Wilderness scientists and land managers because this vegetation is vulnerable to changes in species richness, composition and structure when natural fire processes are altered (Leach & Givnish 1996, Bowles et al. 2002). It is common knowledge that burning is required to maintain tallgrass prairie (e.g. Collins & Glenn 1988, Collins & Wallace 1990). However, few studies have monitored the condition of Chicago region prairies in light of their management histories, and little specific information is available on fire frequencies needed to maintain species richness, composition and structure of this vegetation.

In this paper we report on our investigations of long-term vegetation change in high quality Chicago region prairies in

relation to fire management. Baseline data collected by the Illinois Natural Areas Inventory (INAI) in 1976, as well as available management records, provided an opportunity for us to assess these changes. During the 2001 growing season we re-investigated 62 prairie stands that were originally sampled and ranked as grade A or B by the INAI in the Chicago region of northeastern Illinois (Bowles et al. 2003). White (1978) defined grade A as stable or undisturbed and grade B as late-successional following human disturbance. Some ecologists would define grade A as late-successional. The study sites occurred across dry habitats to wet-mesic habitats on silt–loam, sand, gravel, and dolomite substrates, with 25 grade A sites and 37 grade B sites, 33 of which had fire-management records. Our objectives were to 1) determine the present condition of these stands, 2) assess their vegetation changes since 1976, 3) correlate these changes with the frequencies at which they were burned over time, and 4) project vegetation trends and management needed to maintain these important natural areas. In particular, we were interested in learning how vegetation change corresponds to differences between grades (A vs B) and habitats (dry/dry-mesic vs mesic/wet-mesic).

Methods

All stands were sampled for species presence in 20 to 30 ¼-m^2 plots along transect lines that we surveyed to approximate original transect locations mapped by the INAI. We analyzed change over time in these sites using Species Richness Indices (Bowles et al. 2000), which include the total number of native species sampled (Sn), the average number of native species per plot ($\bar{x}$Rn), the Native Richness Index (NRI = Ln(Sn)*($\bar{x}$Rn), and an alien index (AI) representing the alien proportion of total species richness. For the 33 stands with fire-management records, we correlated change in species richness with how frequently the stands had been burned. We used two additional measures to assess temporal change in relation to fire. First, to determine how stand composition had changed, we calculated the percentage of species shared between the 1976 and 2001 data sets for each stand. We expected that grade A stands would stabilize with greater fire frequencies, which would be reflected by greater percent similarity within more frequently burned stands. We expected that grade B stands would not stabilize because greater fire frequencies should promote species replacement as they shift toward grade A conditions. For an additional measure of vegetation change, we calculated an index of compositional structure represented by the ratio of the relative abundance of woody to graminoid vegetation (W/G ratio). This ratio is usually less than 1.0, as grasses are structurally dominant in prairie. It increases as either woody presence increases or as grass and sedge presence decreases, which

	Dry/ Dry-Mesic		Mesic/ Wet-Mesic		Total		
Grade	A	B	A	B	A	B	A + B
1976	19	19	6	18	25	37	62
2001	19	11	5	13	24	24	48
% loss	0	42.1	16.7	27.8	4.0	35.1	22.6

Table 1. Abundance and percent loss of grade A and B prairies sampled by the INAI in 1976 and re-sampled in 2001.

represents a reduction in the fuel matrix needed to maintain prairie vegetation structure. We expected that greater fire frequencies would be associated with a decrease in this ratio.

Results and Discussion

Status and management of sites

In 2001, 77.4% of the original INAI prairie stands were relocated; only one of 25 grade A stands was lost, but 35.1% of the grade B sites had been destroyed (Table 1). This difference probably reflects greater interests in preserving higher quality sites, as well as public ownership of many of these sites at the time of the INAI. However, several grade A prairies on private land, such as the Wheeling Prairie, were destroyed during the inventory before they could be sampled. The loss of many grade B sites also represents a missed opportunity for restoration management. Many high quality railroad prairies remain unprotected and most appeared to have been rarely burned. These sites are refuges for undisturbed prairie vegetation that was maintained by fire through the 1960's (Harrington & Leach 1989), and still represent important benchmarks with potential for landscape linkage across parts of the Chicago region.

Our analysis of fire management records found that 54% of the sites were burned more than 20% of the time, a rate of 4 or more burns in 20 years. However, more than 80% of the sites were burned less than 40% of the time, a rate of less than 8 burns in 20 years. Species richness usually exceeded 10 native species per ¼ m^2 plot for the highest ranking stands in 2001. But this measure varied with both soil moisture and texture and tended to be lower for dry and dry-mesic sand prairies and for dolomite prairies (Table 2). The highest ranking sites were a mesic silt–loam prairie and a wet-mesic sand prairie, which averaged over 17 native species per ¼ m^2 with Native Richness Index values exceeding 70.

Change in native and alien species richness

Significant positive or negative changes in native species richness per plot occurred between 1976 and 2001 in more than 60% of all prairies, with a greater proportion of these sites

Table 2. Highest ranking sites by drainage and substrate for INAI prairies based on species richness indices calculated from 2001 data. Sn = total native species sampled, x̄Rn = average number of species/plot, NRI = Ln(Sn) x̄Rn.*

Site	County	Drainage	Substrate	Sn	x̄Rn	NRI
Belmont Prairie	DuPage	Dry-mesic	Silt-loam	56	14.50	58.37
Somme Prairie	Cook	Mesic	Silt-loam	72	17.67	75.57
Lyons Prairie	Lake	Wet-mesic	Silt-loam	49	13.05	50.79
Illinois Beach State Park	Lake	Dry	Sand	26	8.43	27.47
Illinois Beach State Park	Lake	Dry-mesic	Sand	57	10.84	43.83
Powderhorn Lake	Cook	Mesic	Sand	62	14.50	59.84
Spring Bluff	Lake	Wet-mesic	Sand	62	17.05	70.37
Murray Prairie	Kane	Dry	Gravel	39	14.20	52.02
Chicago Ridge	Cook	Mesic	Gravel	50	12.61	49.33
DesPlaines Conservation Area	Will	Dry-mesic	Dolomite	33	10.20	35.66
Lockport Prairie	Will	Wet-mesic	Dolomite	47	9.35	36.00

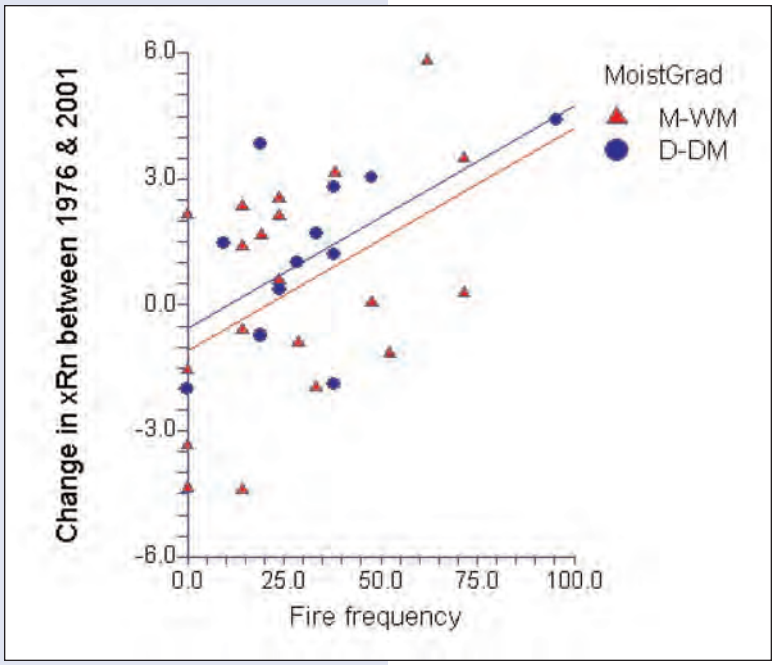

Figure 1. Change in plot richness of native species is positively correlated with fire frequency in mesic/wet mesic (r^2 = 0.2071, P = 0.0438) and in dry/dry mesic (r^2 = 0.3518, P = 0.0326) prairies.

increasing in this measure. These changes also varied with site grade, as only a small proportion of grade A sites increased in richness, while more grade B sites increased in richness. These differences seem intuitive, as grade B sites would have a greater potential to increase in native species richness with management, whereas grade A sites should be near maximum levels of native taxa. When burned sites were examined for change over time in relation to fire frequency, native species richness increased with increasing fire frequency (Figure 1). Our regression models predict that burning about 10% of the time would prevent a loss of species richness in dry/dry-mesic prairies, but burning at 20% is needed to maintain species richness in mesic/wet-mesic prairies. More frequent burning is probably needed in mesic and wet-mesic prairies because they accumulate litter at faster rates than drier sites. This appears to be good news, as most sites were burned more than 20% of the time.

We also found a significant increase over time in abundance of alien species in grade A and B prairies (Figure 2), and this change was not affected by fire frequencies. This was surprising, as burning is thought to reduce abundance of the alien blue grasses *Poa pratensis* and *P. compressa* (Bowles & Jones 2002), which are frequent in our study sites. However, other alien species such as the grass *Agrostis alba* and the buckthorn *Rhamnus frangula* also increased, and factors we did not measure may be affecting the abundance of alien species.

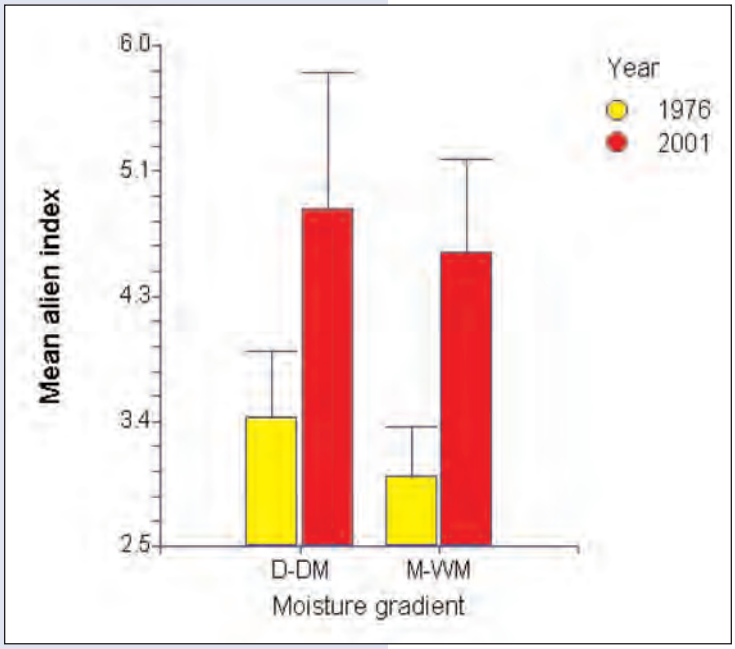

Figure 2. Abundance of alien plant species increased over time in dry/dry-mesic and in mesic/wet mesic prairies (P < 0.0001).

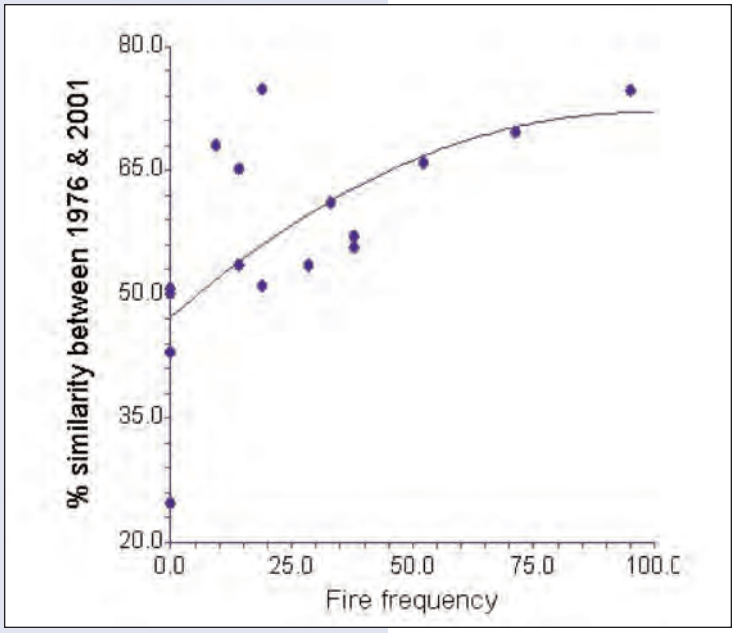

Figure 3. Percent similarity between 1976 and 2001 increased with increasing fire frequency in grade A prairies (r^2 = 0.5147).

Change in composition and structure

Composition of grade A and B prairies responded differently to fire over time. For grade A stands, greater fire frequencies since 1976 corresponded to greater similarity in species composition between each 1976-2001 data set, with 65% similarity achieved by 50% fire frequency (Figure 3). Thus, higher fire frequencies appear to stabilize native species composition in late-successional grade A prairies, while lower fire frequencies may de-stabilize them. Similarity within grade B stands did not have a significant response to fire (r^2 = 0.0137, P = 0.6956), indicating that they did not stablilize with greater fire frequency. This makes sense if fire-managed grade B stands are undergoing changes in composition, as well as increasing in native species richness.

The ratio of woody to graminoid vegetation increased significantly since 1976 in both grade A and grade B prairies, indicating a significant shift in vegetation structure (Figure 4). Change in the W/G ratio was negatively correlated with native species richness in mesic/wet-mesic stands (Figure 5), indicating that native species richness declines as vegetation structure deteriorates in these prairies. This relationship did not hold in dry/dry-mesic stands (r^2 = 0.019, P = 0.6531). Change in the W/G ratio was also negatively correlated with fire in mesic and wet-mesic stands (Figure 5), but not in dry and dry-mesic stands (r^2 = 0.0029, P = 0.8691). In this case, our regression model predicts that burning at 65% of the time (13 burns in 20 years) is needed to prevent an increase in woody vegetation or a decline in grasses in mesic and wet-mesic prairies. The lack of a significant relationship between fire frequency and change in this ratio in dry and dry-mesic prairie suggests that they do not require burning as frequently as do mesic and wet-mesic stands, or that more data are needed.

The effects of long-term fire-exclusion at the species level can be seen by examining changes in unburned mesic prairies, which underwent undesirable decreases and increases in

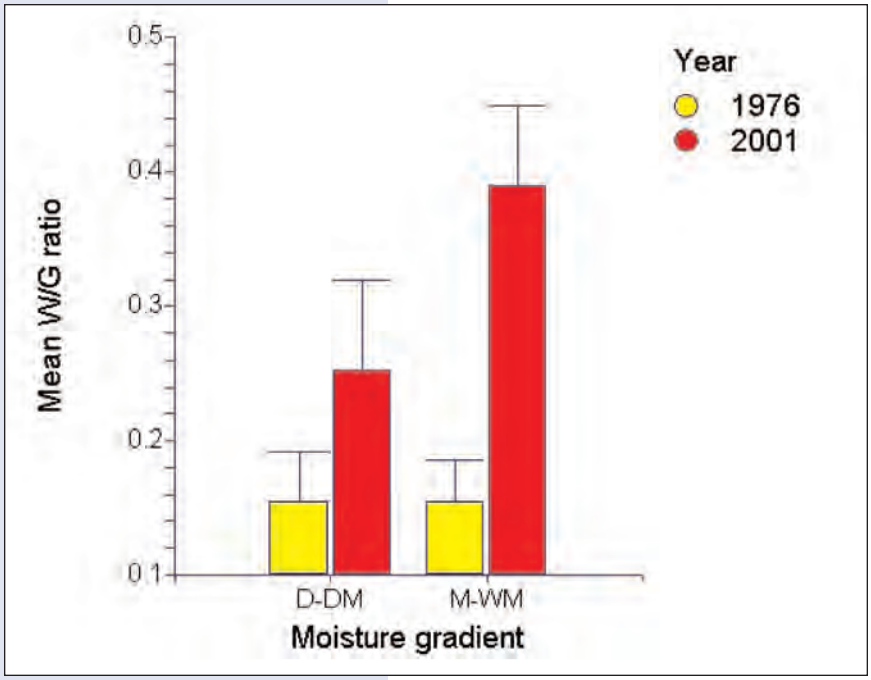

Figure 4. The ratio of woody to graminoid species increased over time in dry/dry-mesic and in mesic/wet mesic prairies (P = 0.0058).

Habit	Decreasing species	1976	2001
G	*Sorghastrum nutans*	55.00	1.45
G	*Sporobolus heterolepis*	58.33	10.14
F	*Allium cernuum*	58.33	5.80
F	*Lithospermum canescens*	21.67	2.90
F	*Physostegia virginiana*	18.33	0.00
F	*Ratibida pinnata*	36.67	10.14
F	*Solidago riddellii*	21.67	0.00
F	*Solidago rigida*	31.67	2.90
Habit	**Increasing species**	**1976**	**2001**
W	*Cornus racemosa*	3.33	49.28
F	*Helianthus grosseserratus*	2.67	33.33
F	*Solidago altissima*	1.67	46.38
F	*Solidago graminifolia*	0.00	20.29

Table 3. Plot frequencies of decreasing and increasing species in unburned mesic prairies between 1976 and 2001. All changes are significant with Chi-square analysis. Habitat: G = graminoid, F = forb, W = woody.

species composition (Table 3). Decreasing species included the characteristics prairie grasses *Sorghastrum nutans* and *Sporobolus heterolepis*, as well as a number of characteristic forbs. The increasing species were gray dogwood (*Cornus racemosa*), sawtooth sunflower (*Helianthus grossesserratus*), tall goldenrod (*Solidago canadensis*), and grass-leaved goldenrod (*S. graminifolia var. nuttallii*). This change in composition portends multiple threats to the quality of prairie vegetation. It represents a shift toward an increasing W/G ratio, which reduces the fuel base needed to maintain vegetation structure, a decline in indicator prairie grasses and forbs that signals a loss of biodiversity, and an increase in generalist species that are not fire-adapted and tend to dominate unburned prairies by spreading rhizomatously and overtopping smaller fire-adapted prairie species.

Conclusions

Our results indicate that a large proportion of high quality prairies has been protected and managed since completion of the INAI. When we use native species richness to evaluate the condition of these sites, most appear to have been either stable or to have increased in richness. In this case, burning at 10-20% of the time (depending upon landscape moisture gradient position), appears to appears to prevent loss of species richness. However, much greater burning frequencies (e.g. 50% or more) may be required to maintain composition and structure of high quality prairies, and less than 20% of the study sites were burned at this rate. Our subset of fire-managed sites represents about half

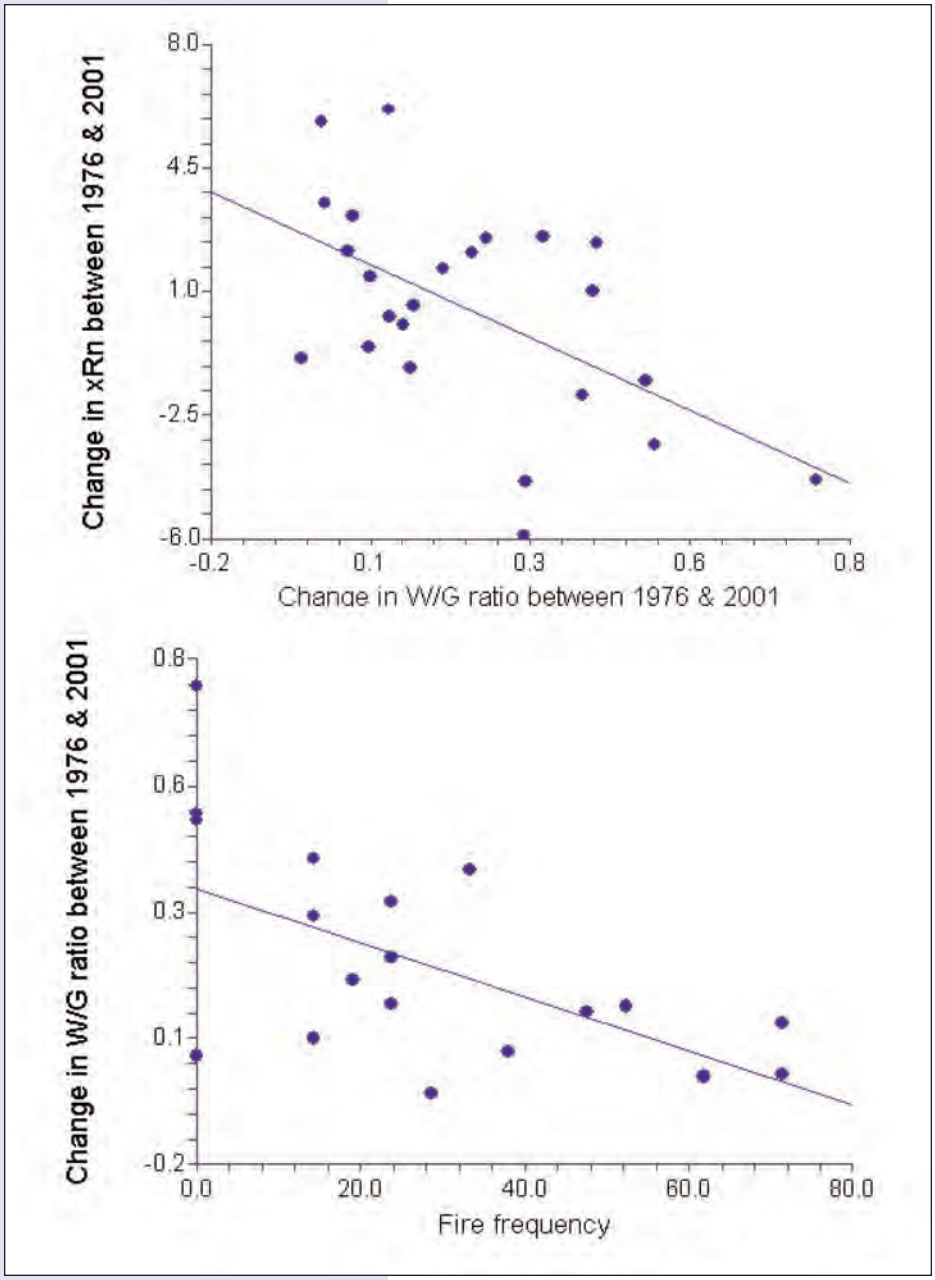

Figure 5. Upper: the plot richness of native species decreased over time as the ratio of woody to graminoid species increased in mesic/wet-mesic prairies ($r^2 = 0.3711$, $P = 0.0044$). Lower: the ratio of woody to graminoid species decreased over time with increasing fire frequency in mesic/wet-mesic prairies ($r^2 = 0.3246$, $P = 0.0009$).

of the total number of study sites; many of the remainder may have had even less frequent burning. As a result, our data suggest a long-term trend of deteriorating structure and composition, especially in mesic/wet-mesic prairies. The increased fire frequencies needed to reverse this deterioration will require careful application to prevent loss of fire-sensitive invertebrates that appear to require two consecutive years without fire to recover to pre-burn population levels (Panzer 2002, Pascoe 2003). Resolving this apparent conflict should be an important future objective of Chicago Wilderness managers and scientists. One solution may lie with rotating burned and unburned patches to enhance re-colonization after fire. However, this becomes more difficult on isolated small prairie remnants. Restoration of buffer areas to enlarge prairie preserves can enhance this approach. Similar strategies may apply for prairie-nesting birds, many of which also require unburned nesting habitat, as well as large habitat area (Herkert 1994).

Our data represent samples taken twice in a 25-year period and linked by fire frequencies. Clearly, more repeated sampling in relation to fire treatments is needed to better understand how burning maintains prairie species composition and structure. However, these data provide testable management prescriptions that predict that 1) native species richness can be maintained with fire frequencies of about 10-20%, depending upon habitat, 2) burn frequencies of 65% are needed to maintain vegetation structure in mesic/wet-mesic habitat, and 3)

burn frequencies of about 50% are needed to stabilize grade A vegetation, and may enhance successional recovery of grade B vegetation. There are also other environmental factors that may be interacting with fire to affect changes in native and alien species composition. Increased browsing levels from increasingly larger deer numbers in Illinois are probably contributing to loss of forbs (Anderson et al. 2001), as well as increasing native generalist species such as the goldenrod *Solidago canadensis* (Anderson et al. *in press*), and possibly aliens. Altered hydrology and increasing sedimentation and pollution rates are linked with negative changes in wetlands, especially increased abundance of invasive species (e.g. Keddy 2000). These factors, as well as elevated nitrogen levels could be affecting the abundance of alien and native species in Chicago region prairies.

Acknowledgments

For support, we thank the Illinois Department of Natural Resources Wildlife Preservation and Conservation-2000 funding programs, the Chicago District of the U.S. Army Corps of Engineers and CorLands, and the Chicago Wilderness and Illinois Conservation Foundation for administering USDA Forest Service and US Fish & Wildlife Service funds. Staff of the Illinois Nature Preserves Commission, Illinois DNR, the Forest Preserve or Conservation Districts of DuPage, Cook, Kane, Lake, McHenry and Will counties, Lake Forest Open Lands, the Downers Grove Park District, and many private landowners and stewards provided much assistance and management data, as well as permission to visit sites. We also thank the Illinois DNR, as well as the original INAI staff, for providing the original INAI data, and Christopher Dunn, John Taft, Noel Pavlovic, Jenny McBride and Roger Anderson for review, discussion or technical assistance.

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Are invasive species taking over the woods? As part of the Woods Audit, 239 randomly selected plots from across the region were sampled to determine the quality of and threats to Chicago Wilderness' wooded communities.

The State of our Wooded Lands: Results from the Chicago Wilderness Woods Audit

Karen Glennemeier
Science Coordinator, Audubon-Chicago Region

Abstract
In 2002 and 2003, a team of 140 professional and volunteer plant monitors collected detailed vegetation data in 238 sample plots in the upland forests, woodlands, and savannas of eight Chicago Wilderness counties. The data tell us that the current state of our wooded lands is poor; only 18% of the plots were rated as good or excellent quality, while 82% were rated as fair or poor floristic quality. We can use these data to track our progress at wooded lands restoration, describe and prioritize threats for management, and estimate costs of wooded lands restoration for outside funding sources.

This paper is being offered to the *Chicago Wilderness Journal* at an early stage of analysis because the questions raised are central to the mission of Chicago Wilderness and need widespread exposure and discussion as policy and plans for wooded lands conservation are developed.

Introduction and Objectives

The *Biodiversity Recovery Plan* (Chicago Region Biodiversity Council 1999) prioritized the natural communities of Chicago Wilderness (CW) in terms of their global and regional significance and the degree to which they are losing native biodiversity. In the *Recovery Plan*, the region's oak woodlands were placed as one of the highest conservation priorities. Woodlands are defined by CW as forested areas that developed under a canopy cover of 50-80%.

For thousands of years, these rich woodland ecosystems were characterized by well-spaced, expansive oak trees, a carpet of wildflowers and grasses, and diverse wildlife. But now, the problems of fire suppression, habitat fragmentation, loss of major predators, and encroachment of invasive species have caused severe degradation of these globally-rare ecosystems and a loss of native biodiversity.

The *Recovery Plan* outlined a vision for the recovery of the woodlands. This vision included viable reproduction of native oak and other woodland trees and shrubs, the regeneration of a rich, diverse herbaceous layer, and the reduction of invasive species to levels that allow native plants to sustain themselves over time.

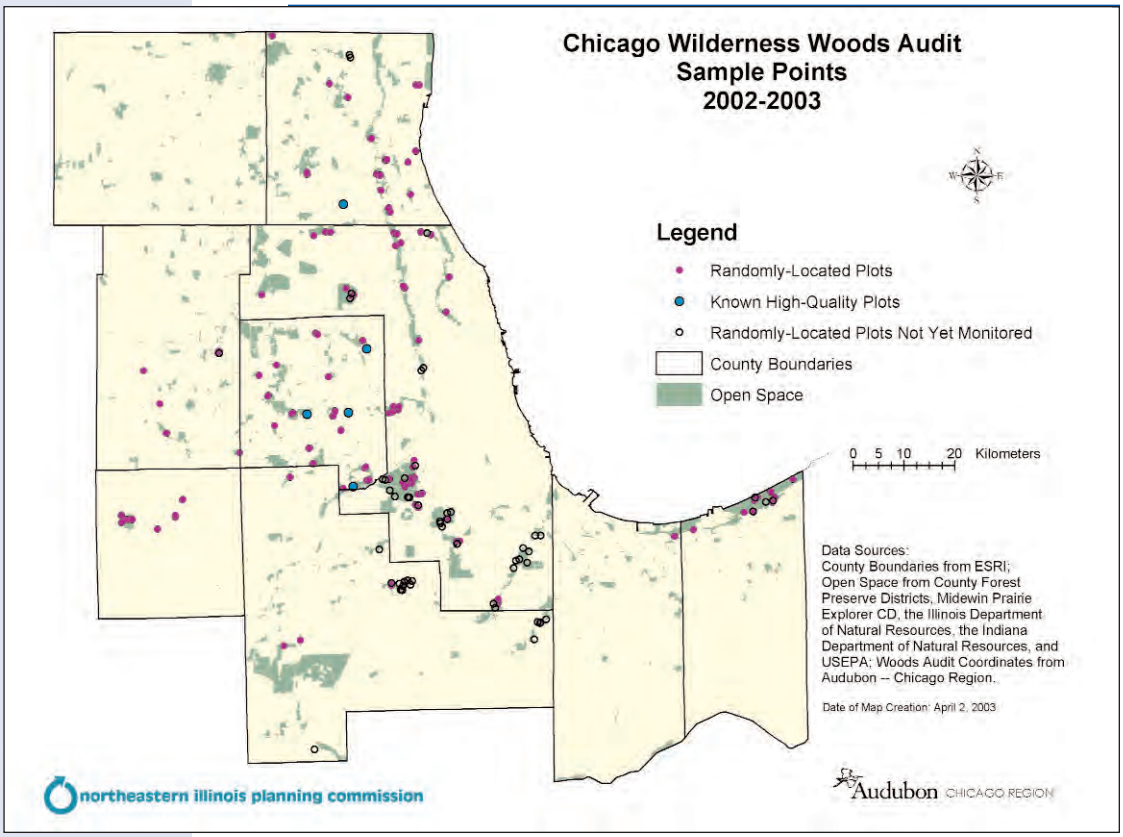


Figure 1. Woods Audit plot locations.

In 2001, CW began a process called 'Conservation Design' to provide a specific blueprint for restoration of CW woodlands. The blueprint outlined the specific threats facing our woodlands, the strategies required to address these threats, and measurable goals for threats eradication. The Conservation Design process also gathered the collective expertise of the region's scientists and land managers to develop a quantitative vision for the year 2025. The goal is to restore 70% of the region's woodlands to a healthy state, with specific acreage goals for different types of woodlands, such as bur oak (*Quercus macrocarpa*) and white oak (*Q. alba*).

To begin tracking our progress toward this vision, we needed to assess the current state of CW woodlands. The CW Woods Audit was the first region-wide assessment of CW wooded lands. Its objective was to provide scientifically sound and statistically rigorous data to tell us: (1) the state of CW wooded lands, (2) the nature and extent of threats to wooded land biodiversity, and (3) the differences in woods health and threats among various types of woods and within different geographic areas of the CW region.

Methods

We established sample locations (Figure 1) using a random method, based on the sample universe of upland forest and

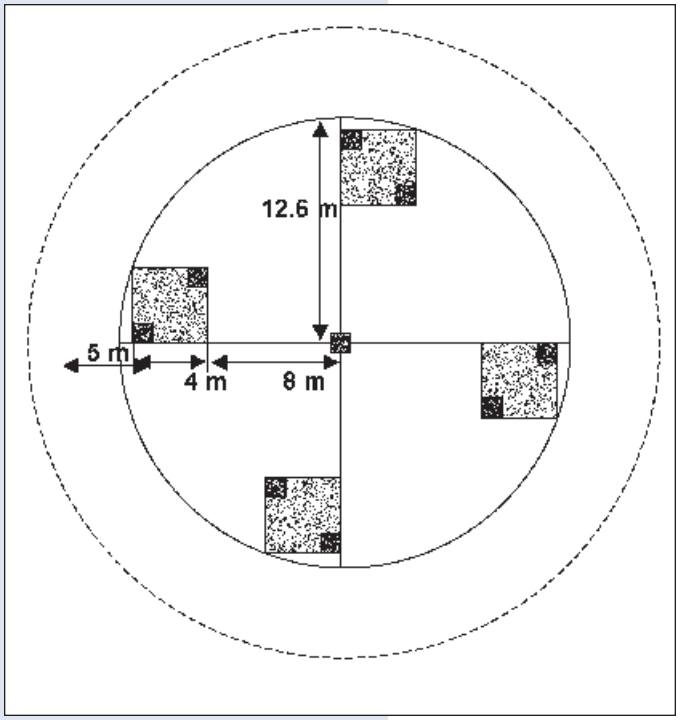


Figure 2. Sample design for Woods Audit. The 0.05 ha circular plot included 4 m x 4 m shrub and sapling sampling plots (large squares) and 0.25 m² quadrats for sampling the herbaceous layer (small squares). These measurements all were nested within a 0.1-ha circular plot for larger (20+ inch DBH) trees. Plot measurements are not drawn to scale.

savanna identified in the 1997 CW/NASA land cover dataset. We refer to the sample universe as the 'wooded lands' of CW, to reflect the inclusion of upland forest and savanna. It was not possible to distinguish woodlands from other upland wooded lands with this dataset. The number of points in each county was proportionate to that county's acreage of wooded lands. Land managers in DuPage and Lake Counties in Illinois selected several sample points that they determined to be high quality woodland plots, to serve as reference points for defining woods quality.

In July and August, 2002-2003, 140 volunteer and professional plant monitors collected data at 238 randomly-located points and 11 points identified as high quality. Sixty-four of these points were sampled in 2002 as a pilot study, to enable us to refine the sampling protocol before completing the full study in 2003.

Monitors established a 0.05 ha (500 m²) circular plot at each sample location (Figure 2). Within the circle we identified the species and measured the circumference of all trees greater than 3-inches diameter at breast height (DBH). Within four subplots of 4x4 m² in size, we counted stems of all woody plants less than 3-inches DBH and greater than one meter tall. Within nine 0.25 m² quadrats, we identified the species and estimated the percent cover of all herbaceous plants and all woody plants less than one meter tall, and we estimated percent bare ground. We also identified and measured all large trees (at least 20-inches DBH) within a 5-meter-wide band around the outside of the circle, to increase our sample size for large trees. Thus, the plot size for large trees was 0.1 ha, with all other measurements nested within this larger circle.

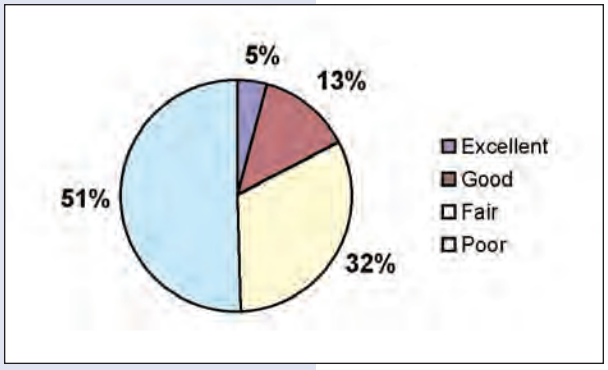


Figure 3. Floristic Quality of Woods Audit plots. (Percentages don't add up to 100 because of rounding.)

Results and Discussion

Overall, CW wooded lands were characterized by few high quality plots, an abundance of invasive species, and a changing character of the woodlands from oak-dominated to that dominated by invasive species.

Most of the plots ranked fair or poor for floristic quality, with few good or excellent floristic quality plots (Figure 3). Quality was defined by the Floristic Quality Index (FQI) within ¼ m² quadrats. The FQI ranks species according to their fidelity to high quality habi-

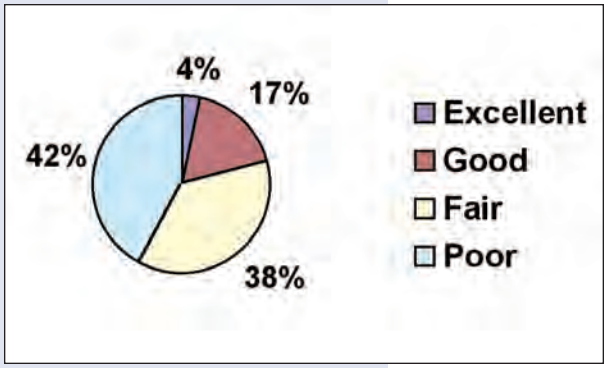


Figure 4. Overall quality of oak woods plots. (Percentages don't add up to 100 because of rounding.)

tat and combines these ranks with a measure of species diversity (Swink and Wilhelm 1994).

An important goal of the Woods Audit was to develop a definition for wooded lands quality that can be used region-wide. Using quadrat FQI is helpful because FQI is a measure that has widespread use and an understood meaning. However, it is an incomplete picture of the woods. A more complete index of quality would include some measure of historic tree reproduction and prevalence of invasive species.

Quality Grade	Data from Woods Audit Plot					
	Quadrat FQI	Canopy Trees	Invasives Frequency	Invasives Average Cover in Quadrats	Invasives Average # of Stems in 4x4 Subplots	Invasives Total Basal Area of 3-6-inch DBH Size Class
Excellent = 4	>9	Present in 3-4 size classes	Present in 0 out of 9 quadrats	0%	0 stems	0 in
Good = 3	7-9	Present in 2 size classes	Present in 1-3 quadrats	1-4%	1-2 stems	9-46 in
Fair = 2	4-6	Present in 1 size class	Present in 4-6 quadrats	4-14%	2-9 stems	47-271 in
Poor = 1	<4	Present in 0 size classes	Present 7-9 quadrats	14-50% (50=max)	9-57 stems (57=max)	272-1600 in (1600=max)

Table 1. A draft definition of wooded lands quality based on CW Woods Audit data. The four invasives categories were averaged to get a 1-4 Invasives score. Then the FQI, Canopy Trees, and Invasives categories were averaged to get an overall quality score. For the Canopy Tree category, the tree data are divided into the following size classes: 3-6-inch DBH, 7-9-inch, 10-12-inch, 13-19-inch, and 20+-inch. The 20+-inch size class determines which trees are considered the canopy species for that plot. Presence of the canopy species in the smaller size classes determines the quality rank. Invasives in quadrats and 4x4 plots defined as Rhamnus sp., Lonicera maackii, Lonicera tatarica, Alliaria petiolata, and Rosa multiflora. Invasives in 3-6-inch category defined as the genera Acer, Prunus, Lonicera, Rhamnus, and Fraxinus. Grade cutoffs for the last three invasives categories were based on the geometric means of exponentially distributed data.

Table 1 describes an example of an index that is more comprehensive. Using this index gives us the quality rankings shown in Figure 4. For this analysis, we included only those plots that contained large trees, so that we could include some measure of historic tree reproduction. We restricted the analysis to oak plots, since these are the types of woods of greatest concern. Again, we see mostly poor and fair quality plots. When we restrict the FQI-based analysis to oak plots, we get 6% excellent, 7% good, 34% fair, and 53% poor quality, respectively. We welcome input on this draft definition of wooded lands quality, with a goal that CW adopt regionally consistent working definitions.

For this analysis, we defined invasive trees as the genera maple (*Acer*), cherry (*Prunus*), honeysuckle (*Lonicera*), buckthorn (*Rhamnus*), and ash (*Fraxinus*). However, not all species are equally invasive in all habitats. For example, maple and ash may be more invasive in bur oak woods than in red oak (*Q. rubra*) woods. We also may need to be more specific within genera, such as excluding wild (American) plum (*Prunus Americana*) from the invasive species list. Although wild plum was unlikely to be a major part of the current data set, we hope that its prevalence will increase as the wooded lands improve. Again, we welcome input on this proposed list of invasive species, including those defined as herbaceous or shrubby invasive species in Table 1, with a goal that CW adopt regionally consistent working definitions.

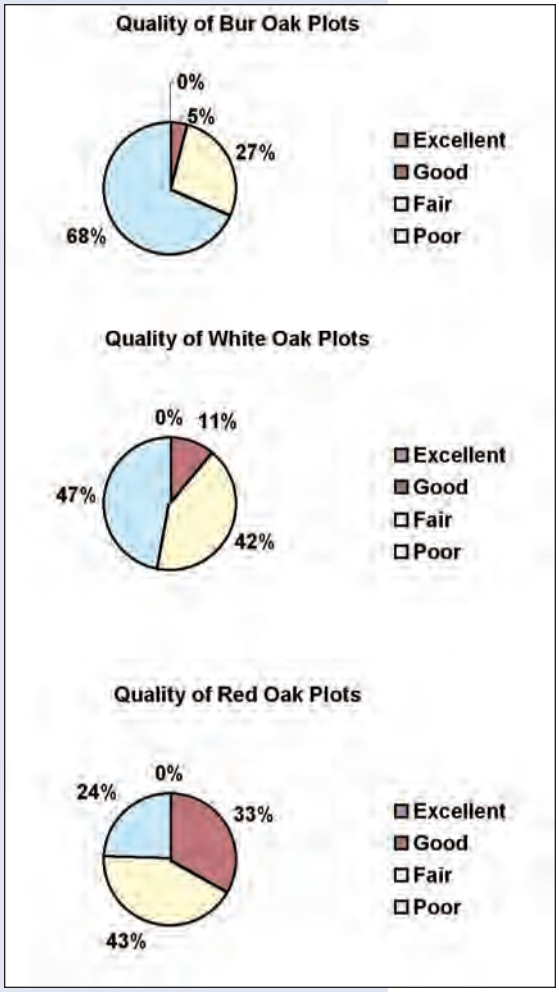


Figure 5. Quality of different types of woods.

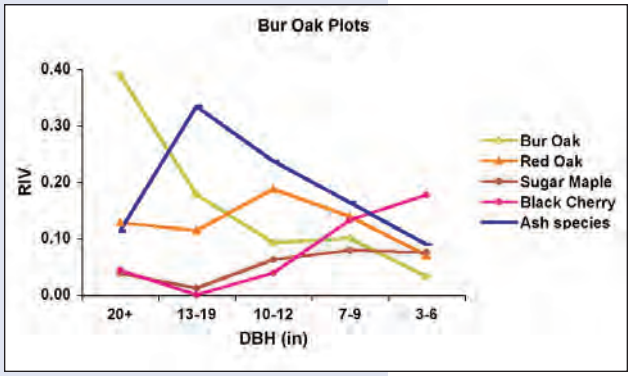
The Woods Audit also quantified the extent of various threats to wooded lands, such as the prevalence of invasive species. For example, the data allowed us to estimate that overall we have 558 stems (sapling size) of buckthorn (*Rhamnus cathartica* and *R. frangula*) per acre, which means more than 26 million stems in the woods of CW overall. Looking at individual counties, we found that Cook, DuPage, and Lake Counties had the greatest number of buckthorn stems. These are the three northernmost counties in the study, suggesting a strong geographic pattern.

We also stratified the data by the type of woods found in each plot, based on the species identity of the large, historic (20+-inch DBH) trees. We found that red oak plots were generally in better shape than bur oak and white oak plots, although overall quality for red oak plots still ranked mostly 'fair' and 'poor' (Figure 5). As one moves from bur to white to red oak woods, the degree of shade tolerance increases (Curtis 1959), and thus the vulnerability to degradation by some species of invasive trees decreases.

Our data show red oaks and ash species replacing bur and white oaks over time (Figure 6). Black cherry (*P. serotina*) was the most common species in the smallest size class within bur and white oak plots. This species has had little success establishing as a canopy species in our woods and thus may never replace the historic canopy trees. However, black cherry is contributing to increased shade in the woods and thus represents a serious threat to oak reproduction. Sugar maple (*A. saccharum*) also is a significant invader whose relative importance is increasing over time. It is a slow grower and will likely become an important part of the canopy of our historic oak woods without management intervention.

Black oak (*Q. velutina*) plots were the highest quality plot type (see Figure 7). Black oak woods are generally characterized by sandy soils, which are more resistant to invasive species and subsequent degradation than are the woods of non-sandy soils. They are also more prone to drought and wildfire, both of which lend increased resistance to invasive species.

It should be noted that under current conditions of fire suppression, it is a likely hypothesis that 20+-inch DBH trees are the historic trees of the site or those under the influence of which the community's soils and biota developed. However, for many sites in the Public Land Survey, most trees, including the oaks, were smaller than 20 inches. It is likely that as the current older trees die and fire regimes promote restoration,



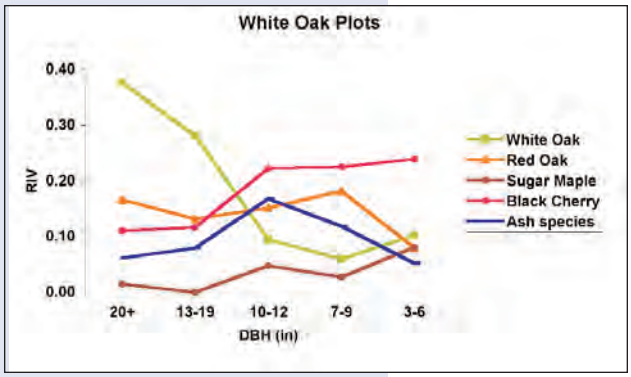


Figure 6. Relative Importance Values of trees in different size classes, within bur oak and white oak plots.

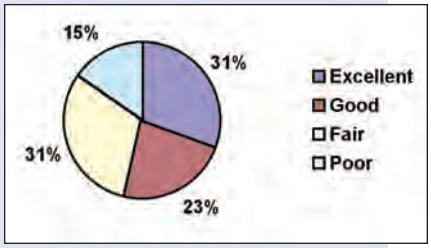


Figure 7. Quality of black oak plots.

this method of determining historic tree species for a plot will become obsolete.

Many plots in this audit contained no large trees because the plot fell in an area of unassociated woody growth (assemblages of invasive trees, not a historic woodland) or in a savanna. Because savannas have fewer trees than woodlands or forests, our plots were more likely to miss the large trees in savanna habitats. It is therefore likely that savanna tree reproduction is not well represented in the current study. Revisions to the Woods Audit protocol may be necessary to assess the reproduction of historic trees in savanna communities.

A useful application of the data collected in this study is to estimate how much it will cost to restore CW wooded lands, to reach our goal of 70% healthy woodlands. Based on satellite data, we have 42,574 acres of upland forest, woodland, and savanna in the Illinois counties of CW, plus Indiana Dunes National Lakeshore and State Park. Therefore, 29,802 acres would have to be restored by 2025 to reach our goal of 70% healthy wooded lands. This study found only 21% of oak woods, or 8,941 acres, to be of good or excellent quality, which leaves 20,861 acres to be restored over the next two decades. Two unofficial but informed estimates of restoration costs are $500 per acre and $4,023 per acre, or a total of approximately $10M to $84M to reach our goal. Using the Floristic Quality Index alone provides even lower estimates of healthy wooded lands (18% or 13% healthy, as reported above), and thus higher cost estimates for reaching the 70% goal.

An important task for the CW coalition may be to develop a solid, defensible estimate of restoration costs that we can use to seek large scale funding for wooded lands restoration. Funders want to see data that show the extent of the problem, a reliable estimate of the amount of work to be done, and an authoritative method of evaluating success. Assigning a reliable cost estimate will help us make a strong case to external funders.

Conclusions

The CW Woods Audit provides scientifically sound data to document the extent and nature of degradation within the region's wooded lands. With this data, CW can pursue large scale funding to improve our ability to restore these lands. We

also encourage Chicago Wilderness members to use the data to describe the problem to the citizenry and to public decision makers. As we refine our definition of quality, we will make the updated results available to CW members. We welcome suggestions for additional analyses, or requests for analyses that would speak especially strongly to a particular group of people. The data are readily available to all CW members by contacting Karen Glennemeier at kglennemeier@audubon.org.

Acknowledgments
Thanks to Wayne Lampa, John Taft, Roger Anderson, and William Alverson for help designing this project; Joy Marburger, Ken Klick , Scott Kobal, and Linda Masters for assisting with planning, training, and organization; Tony Mastracci, John Dollard, Lisa & David Beckwith, Joy Marburger, and Barbara Birmingham for help with data entry; John Taft, Roger Anderson, Stephen Packard, Marlin Bowles, Wayne Lampa, Doug Ladd, Don Waller, Tom Rooney, David Baker, and Ken Klick for help with data analysis and interpretation; and the USDA Forest Service, National Aeronautics and Space Administration, State and Private Forestry, U.S. Fish & Wildlife Service–Chicago Region Field Office, National Fish and Wildlife Foundation, and Grand Victoria Foundation for providing funding.

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Prairie on the Move

Mary Ochsenschlager
St. Charles Park District

Moving prairie remnants is always a last resort, but when it cannot be avoided some agencies have come up with creative ways to approach it. Read on to find out how the St. Charles community moved one-half acre of prairie to save it.

Local prairie enthusiasts have known about several high-quality prairie remnants along the Union Pacific Railroad west of Geneva in Kane County for years. In the early 1990s, Fox Valley Land Foundation obtained permission from the railroad to manage and collect seeds on these prairie remnants. As development moved west, Metra's plans for extended commuter rail service to LaFox and Elburn included laying a third track, a direct threat to the preservation of these remnant prairies. Fortunately, the Fox Valley Land Foundation came up with a bold plan to save the plants in these prairies—by moving them!

Planning for the prairie move began in 2001. Metra hired an ecological contractor, Applied Ecological Services, to develop plans and prepare bid documents. The contractor then worked with the U.S. Army Corps of Engineers (COE) to negotiate an agreement whereby the prairies could be moved as part of Metra's mitigation requirements. The COE required that they be moved to a public-land site where they could be protected and managed. The closest qualifying site was the St. Charles Park District's Campton Hills Park. The Park District agreed to receive the transplants, which consisted of ¼ acre each of both dry-mesic and wet prairie communities.

A number of special challenges and stipulations had to be met:

- The relocation site needed to be accessible by maintenance vehicles, and it could not have adjacent sensitive areas that might be negatively impacted by the prairie move.
- A contractor would be needed to prepare the receiving site.
- A maintenance and monitoring plan for the prairie was required.
- Areas damaged during the move had to be restored.
- Areas of the remnant prairie infested with aggressive weeds had to be marked for exclusion from the move.
- Access to the prairie remnants required planning and landowner contact.
- Additional mitigation requirements had to be negotiated with the COE.

In the fall of 2002, preparations began on the land. A group of volunteers organized by the Fox Valley Land Foundation collected seed from the railroad prairie remnants and then processed and saved them for overseeding at the new location. Among the species collected were leadplant (*Amorpha canescens*), rough blazing star (*Liatris aspera*), northern dropseed (*Sporobolus heterolepis*), rattlesnake master (*Eryngium yuccifolium*), several *Silphiums*, and

Figure 1: Adapted Bobcat® for picking up sod.

Figure 2: Picking up prairie sod.

smooth blue aster (*Aster laevis*). The seeds were kept in cold storage during the winter. At the wet prairie receiving site, workers removed enough soil to equal the estimated amount being moved into the site. They removed soil from those areas most heavily infested with common reed (*Phragmites australis*), a major invasive at the site. The Park District applied Roundup® herbicide to the area receiving the upland prairie. Difficult access to one of the railroad prairies required negotiations with private landowners; fortunately, the owners granted permission to cross their property with machines and dump trucks.

That winter the ground froze early and deep, to over 18", which made it impossible to move the prairie. The spring brought wet conditions, which once again precluded the move. Acceptable conditions for the move did not occur until June 2003.

The general contractor for the larger Metra project subcontracted the prairie move to A. E. Frasz Inc., a local excavator, and an excellent choice. The owner, Drew Frasz, had a keen interest in native landscapes and restoration, and took it as a personal challenge to do the best job possible. To prepare for the move, he modified two Bobcat® loaders to pick up the sod, and two others to lay the sod back down. In addition, he made dozens of pallets with e-z-rase®, board material to make them slippery and to allow the prairie sod to slide off easily.

The Bobcat® loaders designated to pick up the sod were fitted with eight wide tines (Figure 1), which the operator slipped under the sod (Figure 2). This operation produced a layer of prairie sod approximately 4'x 4' x 10", without precutting. The process went very smoothly. The cut pieces of sod were placed on the pallets, loaded onto one of three flatbed trucks, and hauled to Campton Hills Park. At the receiving site, differently modified Bobcat® loaders picked up the pallets. These Bobcat®

Figure 3: Specially modified forks

loaders (Figure 3) had forklift attachments modified with pieces of bent rebar at the ends. The tines were inserted in the pallets and then hydraulically moved outward so that the bent rebar could hold the pallet in place while the sod slid off. This process also went smoothly.

Although the operation was successful, the team did encounter some problems during the move:

- To access one of the railroad prairies it was necessary to cross a private cornfield. The owner had originally agreed to a winter move. Due to the change in plans, the trucks and machines had to cross the field while the crop was present. Fortunately, the owner gave permission to cross if the losses were reimbursed; however, in the end he made that loss a gift to the project.
- Too much area was excavated for the wet prairie sod; consequently, it was necessary to refill some areas, which became susceptible to weeds and harder to restore.
- A lateral drain tile (apparently missed in an earlier drain tile removal project) that was still transporting water made the wetland hard to access. The tile had to be plugged before the machines could lay the sod.
- It was impractical to transplant the dry-mesic prairie far from the wet prairie because of logistical issues with the machines. The team quickly prepared an area for the dry-mesic prairie right next to the wet prairie. A. E. Frasz, Inc. was willing and able to scrape off several inches of soil from the site. They hauled the excess soil away.
- Many of the prairie sod squares were not tucked together closely, which encouraged weeds and caused root desiccation. It also made the prairie extremely difficult and dangerous to walk in. To solve that problem, the Fox Valley Land Foundation sent out a call for volunteers, who along with Park District staff filled the cracks with excess soil—a laborious job, especially in hot weather.
- The biggest challenge was that during the entire move, and for several days afterwards, the transplanted prairies desperately needed watering due to 90°+ temperatures. One-half acre of land doesn't sound like much until you start to water it! Park District staff immediately reopened the drain tile and started hauling water from the nearest water hydrants, a mile away, but their 300-gallon tanks were too small for the job. Once again, subcontractor, Drew Frasz, came to the rescue. He rented and filled a 6,000-gallon

tanker and hauled it to the site. He asked an adjacent neighbor, the Illinois Youth Center, for permission to hook up to their water system, and the Center staff graciously agreed. Finally, Park District staff called the St. Charles Fire Department, which provided 1,000 feet of hose.

Park District staff continued to water the prairie three times a week for the rest of the summer and into the fall. At first many plants wilted, but they soon recovered. Seeds and plugs were planted in bare spots. Plugs were donated by Midwest Groundcovers and included sweet flag (*Acorus calamus*), swamp milkweed (*Asclepias incarnat*), New England aster (*Aster novae-angliae*), Tussock sedge (*Carex stricta*), spotted Joe-pye weed (*Eupatorium maculatum*), great blue lobelia (*Lobelia siphilitica*), and several others. Prairie forbs and grasses bloomed all season in 2003, including little blue stem (*Andropogan scoparius*), smooth blue aster, prairie coreopsis (*Coreopsis palmate*), pasture rose (*Rosa carolina*), and Canadian milk vetch (*Astragalus canadensis*). The next growing season will tell how well the transplants fared over the winter. Metra hired a contractor to monitor species richness and weed levels, and to maintain the prairie for five years. Maintenance activities will include weed control and burning, in addition to restoring the areas damaged by the trucks and machines.

This successful "move the prairie" project was intense, frustrating, and exhilarating for all involved. There are high hopes that most of the plants will survive and thrive in their new site, and that the lessons learned from this unique situation will benefit future restoration efforts.

Where does biodiversity occur on the landscape and what areas still need protection? The Chicago Wilderness Green Infrastructure Vision provides the first pictorial vision of the Biodiversity Recovery Plan.

Chicago Wilderness Green Infrastructure Vision

Dennis Dreher

Abstract
The Chicago Wilderness *Biodiversity Recovery Plan* has won state and national awards for its farsighted approach to regional biodiversity protection. This project takes a step beyond the *Recovery Plan* by mapping an on-the-ground vision of what could and should be protected in our landscape. This green infrastructure vision identifies 1.8 million acres of resource protection areas. Acquisition, conservation easements, greenway connections, restoration, and conservation development principles are recommended as key tools to achieve this vision. It is planned that the vision be widely disseminated to Chicago Wilderness members and regional decision-makers for implementation.

Introduction and Background

"Imagine a region…filled with life…
Where the evening air is rich with bird calls and the scent of flowers…
Where children splash and play in clean creeks, and peer below the surface of the water at fish and other aquatic creatures…
Where people learn to gently and respectfully enter back into a positive relationship with the nature that surrounds them…
And where rare plants, animals and natural communities are nurtured back to health and offered a permanent home next to our own – to the benefit of our health and our economy—in pre serves large enough to sustain them forever."

So begins the summary of the *Biodiversity Recovery Plan*. The *Recovery Plan* contains an ambitious and far-ranging series of recommendations for achieving this vision. It describes what must be done to protect, restore, and manage our precious natural landscapes. What it doesn't do, however, is identify or map where the most important biodiversity conservation needs and opportunities exist within this land that we call Chicago Wilderness.

The purpose of this project was to create a visionary, regional-scale map of the Chicago Wilderness region that reflects both existing green infrastructure (e.g. forest preserve holdings, natural area sites, streams, wetlands, prairies, and woodlands), as well as opportunities for expansion, restoration, and connection. The broader goal was to bring the *Biodiversity Recovery Plan* to life in a more meaningful and visually accessible way for Chicago Wilderness members and outside audiences. This

project has developed a series of macro-scale maps that are, in a sense, a visual interpretation of the *Recovery Plan's* broad recommendations for protection, preservation, and restoration.

This concept of a mapped green vision evolved from an invitation to participate in a workshop with a group called Chicago Metropolis 2020, a nonprofit organization created by the business-led Commercial Club of Chicago. It was the desire of Metropolis 2020 to create a "conservation" scenario in its development of a new plan for the Chicago Region. Chicago Wilderness agreed to participate, sending nearly 40 experts to an all-day workshop to identify important, regional scale landscapes in northeastern Illinois that should be protected from development because of their biodiversity value. The resultant maps and recommendations were presented to the Chicago Wilderness Steering Committee, which provided a very favorable response. The Steering Committee encouraged the creation of a larger scale green infrastructure vision—extending into southeast Wisconsin and northwest Indiana—that could be endorsed by the coalition as a Chicago Wilderness vision.

Because "green infrastructure" is a commonly used term with various potential meanings, it is important to define it. In the context of this project, green infrastructure is:

> *"The interconnected network of land and water that supports biodiversity and provides habitat for diverse communities of native flora and fauna at the regional scale. It includes large complexes of remnant woodlands, savannas, prairies, wetlands, lakes, stream corridors and related natural communities. Green infrastructure may also include areas adjacent to and connecting these remnant natural communities that provide both buffers and opportunities for ecosystem restoration."*

The mapping of green infrastructure through a series of connected large "resource protection areas" was clearly not intended to suggest precise plans for acquisition or restoration areas. However, it was thought that this mapping could stimulate the many ongoing local conservation efforts at the community and watershed scale by offering the implicit support of Chicago Wilderness for regional and local conservation actions.

To summarize,

"This project is an attempt to develop a first draft, map-based, regional-scale vision for biodiversity protection and restoration.

This project is not a detailed, site-specific acquisition or conservation design plan for the region. Nor is it an attempt to identify the numerous additional small scale opportunities for biodiversity conservation that exist at the municipal and neighborhood scale."

Work Methods

This project focused on three principal tasks:

1. Developing a three-state, Chicago Wilderness regional map that identified macro-scale opportunities for biodiversity protection and restoration. These opportunities were mapped as recommended "resource protection areas."
2. Identifying specific *protection techniques* for each resource protection area, including: acquisition, conservation easements, restoration, greenway connection, and conservation development.

3. Identifying simple *guidelines for conservation development*, recognizing that urban/suburban development inevitably will occur in or adjacent to many of the recommended resource protection areas.

To identify recommended resource protection areas, the project built upon the previously mentioned all-day workshop in 2002 between Chicago Wilderness members and Metropolis 2020. That workshop identified a series of recommended regional-scale "resource protection areas" throughout northeastern Illinois.

Before conducting similar mapping workshops in Wisconsin and Indiana, the project team considered preliminary recommendations from a group within the Chicago Wilderness Science and Land Management Team that addressed the issue of "bio-geographic" (versus "political") boundaries. The "political" boundaries previously recognized by Chicago Wilderness generally followed the six-county Northeast Illinois Planning Commission (NIPC) region in northeastern Illinois, and extended only minimally into Wisconsin and Indiana. The recommended "bio-geographic" boundaries, in contrast, extended several counties into Wisconsin and Indiana, following watersheds and related natural features rather than political lines.

Subsequently, resource protection polygons were identified through several workshops in Indiana and Wisconsin, as well as the collar counties in Illinois outside the 6-county NIPC region (i.e., Boone, De Kalb, Kendall, Grundy, and Kankakee). The workshops followed procedures similar to those used in the original Chicago Wilderness/Metropolis 2020 workshop. For each of the referenced workshops, appropriate representatives of Chicago Wilderness member organizations (e.g., those with a good knowledge of on-the-ground biodiversity resources) were invited to participate. In total, approximately 80 individuals were involved.

The workshop methodology utilized very large maps developed using geographic information system (GIS) databases. Natural resource coverages included wetlands, floodplains, streams, rivers, lakes, woodland, grassland, natural areas, watersheds, publicly owned natural lands, major roads, and county boundaries, as well as those specific coverages available in individual states that added useful knowledge. Based on this information, the workshop participants identified biodiversity protection and restoration opportunities, at the macro scale, consistent with the recommendations of the *Biodiversity Recovery Plan*. The *Recovery Plan* recommends that a high priority be given to identifying and preserving important but unprotected natural communities, especially those threatened by development, and to protecting areas that can function as large blocks of natural habitat through restoration and management. More specifically, the *Plan* recommends:

1. creation of large preserves;
2. creation of community mosaics;
3. protection of priority areas, especially remaining high-quality sites;
4. protection of any large sites with some remnant communities; and
5. protection of land that connects or expands existing natural areas.

In this macro-scale context, the participants focused on landscape complexes and corridors of at least 500-1000 acres.

Results

Based on the workshop process described above, recommended resource protection areas were identified in a broad swath extending from southeast Wisconsin, through northeastern Illinois and encompassing northwest Indiana. More specifically, the geographic extent for resource protection included three major areas:

1. starting from the north, southeastern Wisconsin extending up through the South Unit of Kettle Moraine State Forest, the upper Fox River, and several important tributaries to Lake Michigan;
2. continuing south to include northeastern Illinois extending beyond the six-county NIPC region to include much of the Kishwaukee and lower Fox Rivers, Goose Lake Prairie, the Kankakee River, and Kankakee Sands; and
3. ending in the southeastern region of Chicago Wilderness to include northwestern Indiana extending south from the Indian Dunes to the Kankakee River corridor and east to the Galien River in Valparaiso County.

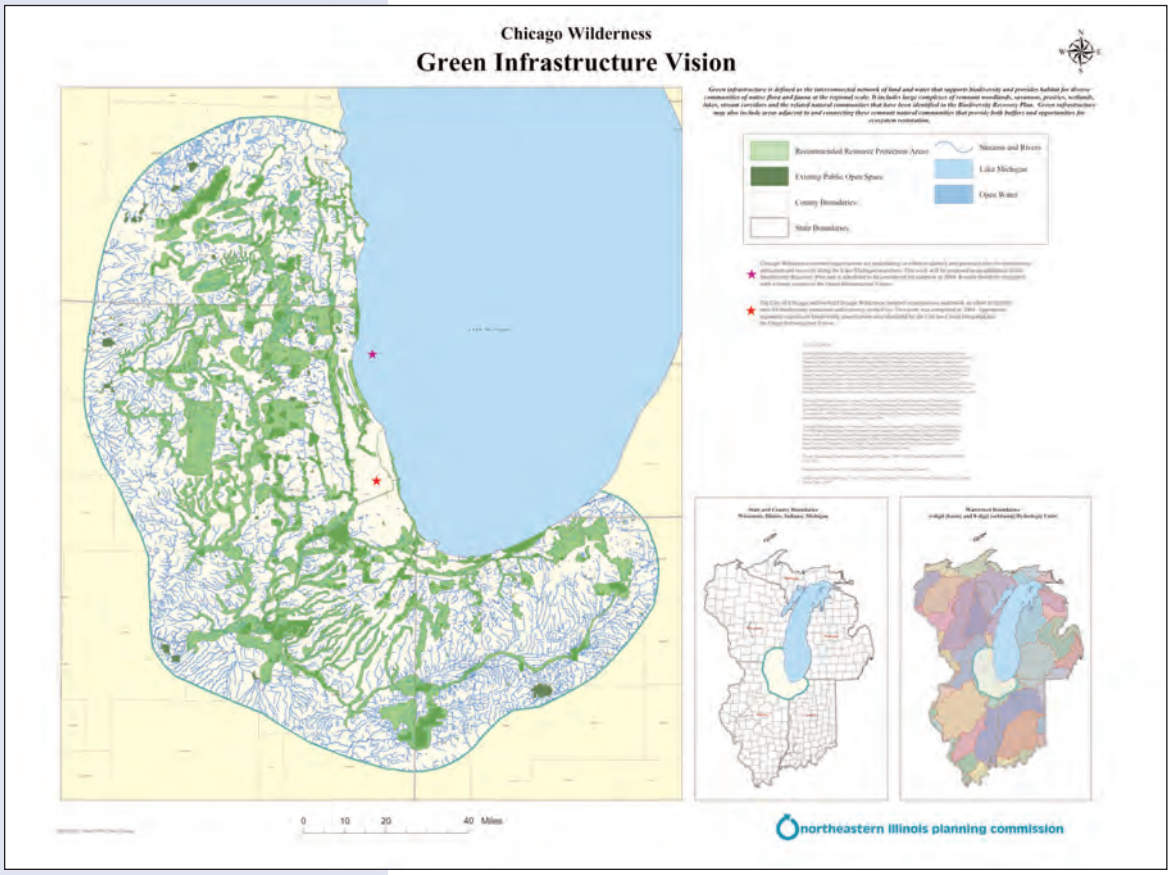

Figure 1

Maps of the green infrastructure vision for the entire Chicago Wilderness region as well as for the individual states may be found at the following links: entire region http://www.nipc.cog.il.us/green_vision/RRPA_FINAL_Chicago.pdf; northeastern Illinois http://www.nipc.cog.il.us/green_vision/IL_RRPA_FINAL_Chicago.pdf, northwestern Indiana http://www.nipc.cog.il.us/green_vision/IN_RRPA_FINAL_Chicago.pdf, and southeastern Wisconsin http://www.nipc.cog.il.us/green_vision/WI_RRPA_FINAL_Chicago.pdf. The green infrastructure vision for the whole region is shown in Figure 1. In total, over 1.8 million acres of recommended resource protection area were identified and mapped within the broader 6+ million acre "Chicago Wilderness" assessment area. It is notable that over 360,000 acres of protected "natural" public lands currently exist within this region.

For each of the identified resource protection areas, workshop participants identified the special natural features of the area. They also recommended conservation approaches, including: acquisition, conservation easements, greenway connections, and restoration. Workshop participants also made recommendations about appropriate development within resource protection areas, ranging from no new development to limited conservation development. These recommendations are detailed in the full report.

To give some flavor for the types of resource protection areas identified, and the recommended conservation strategies, several representative areas are summarized below.

Kettle Moraine, Southern Unit—Walworth, Jefferson, and Waukesha Counties, Wisconsin: At over 30,000 acres, this recommended resource protection area contains one of the largest public open spaces in the Chicago Wilderness region. Kettle Moraine is a designated Wisconsin State Legacy Place containing a remarkable variety of large woodland, savanna, prairie, and wetland habitats. It contains numerous designated natural areas, critical species habitat sites, and hosts several ongoing large-scale restoration efforts. The recommended conservation approaches include additional acquisition, conservation easements, continued restoration, and implementation of conservation development approaches for any development happening around the periphery of the protected public lands.

Boone Creek Complex—McHenry County, Illinois: This recommended resource protection area is largely private land, but contains some of the most biodiverse landscapes in northeastern Illinois. It contains a large woodland/savanna complex, high quality fens and sedge meadows, and a high quality cold-water stream with silt intolerant fish. While there has been some recent public acquisition of natural lands, this area is unique for its high concentration of conservation easements and dedicated nature preserves on private land. The recommended conservation approaches include additional acquisition and conservation easements, wetland restoration in large drained hydric soil zones, and identification and protection of ground water recharge zones for fens and sedge meadows. Recommended development controls call for low-intensity, conservation-designed residential development only, with no development in hydric soil zones. These recommendations are being promoted through a recently adopted watershed plan.

Lake Calumet Region—Cook County, Illinois: This recommended resource protection area contains a complex mix of natural areas hosting threatened and endangered

species, highly degraded habitats, and adjacent industrial land in the midst of a large urban complex. It has been the subject of a comprehensive, long-term planning process spearheaded by the City of Chicago and other Chicago Wilderness members. Conservation recommendations emphasize wetland and prairie restoration, greenway connections along the Calumet and Grand Calumet Rivers and to Wolf Lake, and additional public land acquisition. The recommendations also call for industrial redevelopment utilizing conservation design approaches that fully mitigate hydrologic and water quality impacts.

Kankakee River/LaSalle Fish and Wildlife Area—Western Lake and Newton Counties, Indiana: This is one of numerous identified sections of the Kankakee River corridor that cumulatively form the southern boundary of the Chicago Wilderness region. This largely rural area contains numerous sensitive species sites and threatened or endangered species within its river corridor, wetland, prairie, savanna, and floodplain forest communities. Recommended conservation approaches include additional public land acquisition, conservation easements, restoration, and greenway connections to the Kankakee Sands complex and to upstream and downstream reaches of the river.

Recognizing that development will continue to occur within many of the recommended resource protection areas, it was decided that recommendations were needed for "conservation development" that would be compatible with biodiversity protection and restoration. The recommendations are based on the premise that, in order to be truly sustainable, development must not only protect the natural environment but must improve systems degraded by past disturbances. Based on this philosophy, the following principles were identified:

1. Minimize the total consumption of land, particularly the creation of impervious surfaces, by new development.
2. Utilize existing infrastructure by maximizing infill and redevelopment.
3. Maintain and reestablish functional natural systems: soils, plants, water.
4. Minimize disturbance of soil structure and topography.
5. Develop landscapes sustainably, utilizing a diversity of native plant species.
6. Manage precipitation as a resource close to where it falls, not as a disposable waste product.
7. Utilize the landscape to naturally filter and infiltrate runoff before it leaves the development site.
8. Eliminate adverse off-site and downstream effects of runoff and wastewater.
9. Maximize, interconnect, and restore natural open space.
10. Maximize opportunities for local access to open space.
11. Establish administrative and financial mechanisms for the long-term management of the natural elements of developed sites.

Subsequent to the development of these recommendations, a separate Chicago Wilderness project developed a draft set of "Sustainable Development Principles for Protecting Nature in the Chicago Wilderness Region." These principles, which were approved in March 2004, were adopted by reference.

The context for applying sustainable development principles is critical to the achievement of the goals of the green infrastructure vision. The three general situations that are addressed are development within recommended resource protection

areas, development within watershed of high quality streams or lakes, and all other development. To address possible development within the recommended resource protection areas specific recommendations were made regarding whether and how development should be accommodated. Where conservation development is the recommendation, the principles and techniques outlined above should be implemented to the fullest extent practicable. In particular, development should be designed and tailored to the specific natural resource characteristics of the identified resource protection area.

For development within watersheds of high quality streams or lakes it was determined that it will be critical that it be done following stringent conservation development principles. While all of the listed conservation development principles are important, several should be emphasized in the protection of high quality aquatic systems. In particular, site design and stormwater management must be done in a manner that maximizes both natural recharge of rainfall and runoff and effective filtering of runoff pollutants. Construction site soil erosion and sediment control also are critical. Sustainable, alternative wastewater planning and treatment/discharge approaches are essential to protecting high quality systems. Protection and restoration of extensive naturally vegetated buffers of at least 100 feet along the periphery of stream, lake, and wetland edges is critical.

Throughout the broader Chicago Wilderness region, in urban, suburban, and rural edge settings, there are strong arguments for conservation development. Depending on the intended land use and site characteristics and constraints, all other developments can and should follow appropriate elements of conservation design that are selectively tailored to each individual property.

Conclusions and Final Recommendations

This project, with the input of over 80 individuals representing Chicago Wilderness organizations and resource agencies, has identified a 1.8 million acre, three-state vision for large-scale biodiversity protection and restoration. Identified resource protection areas range from those already protected by traditional local and state acquisition programs, to those protected by private landowners, to those that are largely unprotected at this stage.

Conservation recommendations are provided for each resource area, ranging from acquisition to restoration. Implementation of these recommendations will require the active engagement of all Chicago Wilderness members as well as watershed groups, ecosystem partnerships, and decision-makers in local and state government.

The results of this project have been presented to and endorsed by the Chicago Wilderness Council and the relevant teams. It is now recommended that the green infrastructure vision be broadly disseminated to Chicago Wilderness members and regional decision-makers. To further that end, NIPC is preparing a work plan for documentation and dissemination of the vision.

Dennis Dreher was the Principal Water Resources Engineer for NIPC during the course of this project. Having recently retired, he is now doing private consulting.

Acknowledgements
This project benefited from a unique collaboration of numerous Chicago Wilderness members whose names are listed in the final report. The author served as project manager. Jennifer Welch of NIPC performed most of the data collection, mapping, and GIS analysis for the project. Also providing data and mapping assistance was Laura Barghusen of NIPC. Finally, numerous agencies and organizations (listed in the final report) shared data and maps used in this project.

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How does one teach stewardship to school-aged children? Read on to find out how Mighty Acorns teaches restoration to more than 8,000 children.

Mighty Acorns: Fostering a Personal Connection to Nature Through Stewardship

Colleen Kulesza
Max McGraw Wildlife Foundation
Center for Conservation Education

Abstract
The Mighty Acorns® youth education program began in 1993 with the goal of helping young people in the Chicago metropolitan area become land stewards and citizen scientists, as well as learn the value of biodiversity. The program brings over 8,000 children to a variety of Chicago Wilderness (CW) natural areas three times a year for three consecutive years in elementary school, 4th through 6th grade. During each field trip they learn about biodiversity, participate in stewardship, and explore wild places. Since its inception, the program has blossomed into a tremendous force of education and stewardship that spans all of the Chicago Wilderness counties. In the last 11 years, the partnering agencies in CW that offer this program have worked together to improve and expand the curriculum, partnership, student base, and supplemental products. Future goals of the program include exporting the model to other counties, states and even other countries and adding a wetland section to the curriculum.

Background

Ten years after the Volunteer Stewardship Network (VSN) began in 1983, a group of VSN members in Chicago Wilderness began to wonder if they were reaching the younger generation with their mission of preserving and restoring native habitats of Illinois. Together with The Nature Conservancy (TNC) and the Forest Preserve District of Cook County (FPDCC) they conceived of the Mighty Acorns® program. The mission, developed in 1993, is "to introduce young people in the Chicago metropolitan area to nature through stewardship and exploration in a way that fosters a personal connection to our natural areas" (Mighty Acorns® Program Manual, 2000 p. 2). The vision involved three seasonal visits to a Chicago Wilderness location over multiple school years. The program was primarily conducted on FPDCC lands by volunteers of the VSN.

In 1998 a generous grant of $300,000 from the Grand Victoria Foundation was awarded to expand the program. A full-time program director was hired and new partners were sought.

Grant funding helped purchase tools for restoration and educational activities, paid for bussing children to natural areas, and partner planning meetings. With this support, agencies were able to incorporate the Mighty Acorns® program into their slate of offerings. Today, there are 18 participating Chicago Wilderness agencies which encompass more than 80 schools, 300 teachers, countless volunteers, and over 8,000 students involved in the program. Approximately 70% of these students come from at-risk or underserved schools. Children who attend these schools do not have the same level of access to natural areas as those that are not poverty stricken. These grant funds also made it possible to begin development of a strong, thematic curriculum. Over 30 individuals including volunteers, classroom teachers, and non-formal educators worked together to create the first edition of the Mighty Acorns® Program Manual published in 2000. The manual consists of pre and post visit activities, on-site lessons, guidance for restoration activities in each season, and topics for exploratory hikes.

Since 2002, Chicago Wilderness has been supporting the partnership with $20,000 annually. There is no longer a full-time director managing the program. Most of those duties have been delegated to various partners who volunteer their time. A part-time assistant has been employed to track progress and enable the partners in their continued work to improve the program. The funds from CW support the Web site, newsletter, curriculum revisions, professional development, and summer camp. The annual budget for the Mighty Acorns® partnership went from approximately $75,000 in 1998 to $20,000 today.

The reduction in general funding has not reduced the number of students involved. Individual partners now seek financial support for the program at their sites. Tools need to be replaced, materials get worn out and busses still need to be hired to get children to their natural area. This dedication to the program by the partners demonstrates its strength and ability to make a difference in the students who participate.

Rationale

Children in American culture today, whether rural or urban, are far removed from the natural landscape. They are often more familiar with the diversity of video game characters or weapon styles than the diversity of life in their own neighborhoods (Nabhan, 1994). The goal of Mighty Acorns® is to help these youth create a personal connection with the natural world around them. It takes more than just a short field trip to change values and attitudes towards the natural world. It requires immersion in the resource and hands-on experiences of the student through a high quality environmental education program. The curriculum was developed based on the widely accepted objectives of environmental education as defined in the Tbilisi Declaration of 1977, drawn from Defining Environmental Education (Disinger, 1994).
The categories of environmental education objectives are:

- awareness—to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems;
- knowledge—to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems;
- attitudes—to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection;

- skills—to help social groups and individuals acquire the skills for identifying and solving environmental problems; and
- participation—to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems. (p.21)

It is the progression through these levels that will truly have an impact on a student's values and behaviors. Many environmental education programs focus on the first two objectives: awareness and knowledge. They are easily addressed in short field trips. However, if you wish to instill a life long change of attitudes and behaviors, it has been proven that you must involve the student in an activity that uses skills to create a change in their environment (Zelezny, 2001). As a means of reaching these objectives, the strategy of experiential education was employed when developing the Mighty Acorns® curriculum. Experiential education is learning by doing and involves personal experiences, reflection, and exploration of values (Adkins, 2002).

The Program

The Mighty Acorns® curriculum is comprised of three levels for grades four through six and meets Illinois state standards developed by the Illinois State Board of Education. Each level includes educational activities that take place before, during and after field visits to an adopted CW natural area. Each level involves discussion of biodiversity but there are key foci for each level as well. Level one, for fourth graders, focuses on adaptations and interrelationships. Level two deals with competition and interdependence. Level three focuses on biodiversity: what is it, how we impact it both negatively and positively, and how we value it.

Mighty Acorns® is distinguished by its comprehensive format and multiple field trips throughout a year. During each school year, students visit the same natural area in autumn, winter and spring. Each visit includes participation in an interactive curriculum lesson, an exploratory hike and a restoration activity. If a school is involved in Mighty Acorns® at all three levels, by the time a child leaves elementary school they will have visited the same natural area nine times, learned key issues in biodiversity and conservation and had a tremendous impact on the land itself. The best teacher is often the demonstrated impact. Fourth graders who cut buckthorn in the winter and planted plugs and seeds of native grasses and forbs in the spring of 2001 are now seeing the fruits of their labor in the spring of 2004 as graduating sixth graders.

Every summer, approximately 70 students that participated in Mighty Acorns® have the option to attend a week-long summer camp at Indiana Dunes Environmental Learning Center (IDELC). The children continue learning key concepts from the curriculum, participate in restoration activities, explore and enjoy just being outdoors in a natural area. They meet other children from different parts of the Chicago Wilderness region who are doing the same activities in school and start to understand their integral place in caring for natural resources.

The Partnership

Mighty Acorns® is much more than a curriculum; it is a partnership of dedicated education professionals. The program isn't sold or handed out freely. Each participating agency has signed a Partner Agreement that states they will continue to uphold

the core values of the Mighty Acorns® program as a whole. In order for the program to be called 'Mighty Acorns®', it must be presented such that it preserves these core values: students are involved with stewardship activities; they work in small groups; and they visit the same site three times a year; once in autumn, winter and spring. In addition, the agency is dedicated to having staff members work within the partnership to improve and enhance the program through task forces.

The current leadership model is based on four task forces: curriculum and assessment, professional sevelopment and networking, nature camp, and communications. In addition to these task forces, there is a governing board that overseas the current work of the partnership and develops a vision for future growth and activity. Each task force developed goals and objectives for the first three years after their inception in 2001.

The curriculum task force has developed pre- and post-visit assessments for the classroom teachers. The assessments were based on the curriculum, and help determine how effective it has been in increasing the knowledge of the students. They are also currently revising the first edition of the program manual. After using the curriculum for four years, the partners have discovered more effective ways to teach concepts, errors in some activities and received feedback from teachers on ways to improve the quality of the curriculum. One strong suggestion has been the addition of a wetlands segment (the current manual focuses on forests and prairies primarily).

The professional development task force plans the quarterly partner meetings and provides workshops and learning opportunities for the partners. The task force has also facilitated the sharing of the unique ways some partners use the curriculum. These improvements are being used by the curriculum task force in their revisions. Every January the partners gather for an intensive weekend retreat that focuses on a primary need of the program or partnership. The first retreat was dedicated to the development of work plans and the 2004 retreat focused on creating a wetlands section of the curriculum.

The nature camp task force created a weeklong curriculum for those who attend camp at the IDELC. The camp has been offered consistently for the past 5 years. Staff from the partner agencies have volunteered during the week to run programs and serve as camp counselors. A current goal is to offer multiple summer experiences throughout the region so that more children can participate. A supplemental student journal was developed and is used during the camp at the IDELC and will be used at others offered throughout the region.

A quarterly newsletter, The Seedling, and a Web site (www.mightyacorns.org), that is updated regularly are the primary concerns of the communications task force. The task force's goal is to connect with teachers, volunteers and the general public to relay information about the program and the partnership. The website will be expanded to have a downloadable PDF version of the newsletter and sections of the program manual.

Lessons Learned

Along the path from a dedicated group of VSN volunteers with a vision to educate children, to a $300,000 grant to help the program grow, to a self-sustaining work group with a small budget of $20,000 there have been some hurdles to overcome.

When a project is new, many people will be on board to help and work extra hours. Seeing the fruition of these long hours is satisfying as well as exhausting. With the inevitable loss of the full-time director, the partnership started to falter. People's confidence in their abilities to take on the responsibilities of the director waned. After months of dedicated work, we proved to ourselves that it could be done. Sometimes partners leave the program for budgetary reasons or agency mission changes. These departures often left the other partners feeling abandoned. But new partners continue to approach the working group or are actively sought. The task forces are thriving again and producing quality products.

The most challenging aspect of the program continues to be funding of individual programs. Money to bus school children to natural areas has become the biggest need overall. Each agency has found grants or sponsors and some have had to start charging for the program. Some schools were lost due to this financial challenge while others were so dedicated to Mighty Acorns® that they found money to continue their program. Teachers who leave a participating school often bring the program to their new school, thus expanding our reach. Although the partnership and program has gone through growing pains, Mighty Acorns® is again on an upswing and there is renewed energy in the working group.

The most important aspect of Mighty Acorns® is the impact we have had on the children and the land. A high school student who volunteered for the program is now a college junior and remembers activities in the program and is hoping to incorporate them into her student teaching. Seventh graders run into naturalists from their Mighty Acorns® site and remember the activities and restoration they did in elementary school. Fifth and sixth graders routinely comment on the demonstrable impact they had with their restoration activities. These benefits far outweigh any challenges the partnership has and they continue to motivate us.

Colleen Kulesza is the Director of Education at the Max McGraw Wildlife Foundation's Center for Conservation Education and the chair of the Mighty Acorns® Board. You can reach her at ckulesza@mcgrawwildlife.org

If you are interested in volunteering with the Mighty Acorns® program, you can contact any of the participating agencies listed on the website at www.mightyacorns.org or contact the Mighty Acorns® Assistant, Kelli Parke, at kparkemaassistant@hotmail.com

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Book Review

Hunting for Frogs on Elston: Essays by Jerry Sullivan, Illustrated by Bobby Sutton

Reviewed by Laurel Ross

> *"And the big secret of Chicago is that we have more of that kind of nature than almost every other city in the country. Seattle has mountains in the distance but its city and county parks ain't much. Thanks to our forest preserves I will actually be able to see and hear the vast changes that the coming spring will inaugurate."*
>
> —Jerry Sullivan in Field and Street

In my experience, when something I know well is interpreted by a journalist, the result is a much-diminished version of that thing. That is decidedly not true of the essays Jerry Sullivan produced biweekly for years for the *Chicago Reader*, many of which are collected in this lovely volume. The thing about Jerry Sullivan's writing about nature in the Chicago region is that he was not an outside observer. As a birder, a hiker and a student of just about everything connected to the natural world, he was authentically of that world. These are true stories of the Chicago region's wild nature and of the many remarkable people who have made original contributions to the preservation effort here.

I believe that his writing was one of the forces that created the unique community of conservationists in northeastern Illinois, which we now call Chicago Wilderness. For years people from all parts of Chicagoland could pick up the *Reader* and read about other folks like them who were doing original and exciting work to preserve some aspect of our rich local natural world. We discovered through his column that we were not alone in our passion and many were inspired to do even more. This palpable feeling of community is one of the major reasons that the ambitious endeavor called Chicago Wilderness has been able to succeed.

When Jerry died a couple years ago, a few of us looked into the possibility of the publication of some of his essays. I confess I was not sure they would hold up to the test of time. But rereading these columns today I still learn things and I am still charmed by his use of language. For example, describing restoration volunteers, Jerry wrote: "...in the great American tradition of empirical-minded tinkerers, Edisons of ecology. They experiment knowledgably until something works, and the theoreticians can figure it out later."

Written in the first person and without pretension, the essays in *Hunting for Frogs on Elston* are lessons without lectures. Some of his topics—fire management, deer culling, and brush removal—are among the hardest questions the conservation world has had to answer to uninformed and sometimes hysterical critics who saw these treatments as an attack on nature. Many other pieces are engaging, unsentimental descriptions of worlds we didn't know we were fascinated by—sedges, bird feathers, sludge worms.

Why should the Chicago Wilderness audience buy and read this book? In a nutshell, here's why:

1. It's fun. You may find yourself laughing out loud.
2. It's real. Jerry was a guy who nearly perfectly translated experience into words.
3. You'll learn things about nature. (He's the same guy who wrote the *CW Atlas of Biodiversity*!)
4. The artwork is superb and transcendent. Bobby Sutton has the rare combination of a sense of humor and an accurate eye for nature.
5. You may find great stories about friends and colleagues in its pages.
6. Some of the proceeds will benefit Chicago Wilderness.

That's it. Jerry Sullivan was a friend, and Bobby Sutton is a friend too, which means I am not qualified to objectively review this book, only to lead you to it with high praise.

Books may be purchased for $25 by contacting Catherine Bendowitz at (312) 580-2137 or cbendowitz@chicagowilderness.org.

Web Site Review

vPlants: A Virtual Herbarium of the Chicago Region

Robert Sullivan
Robert Van Lonkhuyzen
Environmental Assessment Division
Argonne National Laboratory

vPlants (www.vplants.org) is an on-line searchable herbarium providing specimen data and digital images for plants of the Chicago region. The site is a joint effort of Morton Arboretum, The Field Museum, and the Chicago Botanic Garden, funded by the Institute of Museum and Library Services, an independent Federal grant-making agency. The site provides access to information and photos for thousands of plant specimens (reportedly to exceed more than 100,000 specimens eventually) from the herbaria of the three contributing institutions. The site is intended to provide both professionals and the general public access to plant specimen data and high-resolution imagery. According to the Field Museum's Web site (www.fieldmuseum.org/research_collections/ecp/coll_tools.htm), the integrated collections of the three institutions accessible through the vPlants Web site constitutes the largest regional flora available online in the U.S.

While there is some background information provided on the site, vPlants is essentially a Web-enabled front end to a massive database of plant records and photos. vPlants users can locate plant specimen records and photos by browsing hyperlinked lists of plant families/genera (1245 genera in 171 families listed currently), or by using simple or advanced search tools.

The family/genus lists are straightforward and easy to use. The simple search tool allows users to search for records by family, genus, species epithet, and common name, while the advanced search tool expands the capabilities to include searching by collector, collection date, and locality (state, county, city, or township, range, section). In our test, the search tools performed well, were fast (on a high-speed connection), accepted word stems on most fields, and returned results for nearly every plant name (including common names) we entered.

A typical initial search return lists plants by genus and species (hyperlinked), followed by family, common names, and synonymous Latin names. From this list, the user selects the link

for a plant of interest to get a secondary search return with a detailed listing of specimens for that plant species. The user then selects an individual specimen link to see the actual plant record, which may include a low-resolution image of the specimen. This image is in turn linked to one or two high-resolution images in two possible formats—JPG or MrSID. MrSID images can be viewed with a free software plug-in only (available for download through a link) but the viewer allows interactive panning and zooming of images, which is quite useful. Image quality in either format is very good, allowing minute examination of specimens. Other data returned for a particular specimen include location and collector information for the specimen.

vPlants is an extremely useful site for persons needing access to herbarium data. One of the authors is a plant ecologist who uses vPlants routinely. While not a total replacement for on-site visits to the "physical" herbaria, access to vPlants has saved the author many herbarium trips that typically require at least a half a day each. The reduced "cost" of using the herbaria through vPlants has allowed the author to increase the use of herbarium information in his work. The site provides simultaneous access to the collections of all three institutions, facilitating comparisons of specimens that would be otherwise impossible. Opening two browser windows allows direct side-by-side comparisons of plant specimens. Searching by synonymous names is quite useful, as is the ability to locate specimens by locality of collection, which is impractical in a "physical" herbarium.

vPlants is a well-designed and well-executed Web site with only minor weaknesses. The following areas could benefit from improvement. Most pages on the site have little or no explanatory or introductory text; while the "bare bones" approach is not a problem for experienced herbarium users, new or inexperienced users (and Web site reviewers!) would benefit from better explanation of the vPlants project, the vPlants site, and the tools and information it contains. Search returns are not "paged" to limit the number of search returns on a page; one query we entered returned several hundred records on one Web page, which bogged down performance considerably. The date search feature would be strengthened by using date qualifiers that allow searching before or after a specified date, and specification of a date range for searches. There are some minor usability issues as well: the initial search return page has rows of hyperlinked field entries that all point to the same destination page; in other locations, underlined text is not hyperlinked. In both cases, the vPlants site does not adhere to generally accepted behavior for Web sites.

It's obvious that the design and development of the vPlants virtual herbarium site was an enormous undertaking, requiring significant planning and prolonged effort. That effort has already paid off handsomely, but vPlants is a work in progress, with more and better capabilities on the way. Information on the site suggests significant improvements to come, including the addition of plant and fungal species; species pages with distribution maps and habitat and ecology descriptions; and the addition of other cooperating institutions.

Overall, vPlants saves users valuable time while expanding their ability to use herbarium data effectively. vPlants integrates the unique capabilities of the Web and database technology to provide easy and quick access to a vast quantity of useful information to users at remote locations. It's a great example of "using the right tools for the right job", and we look forward to the enhancements planned for the next few years that promise to make a great tool even better.

Do you have important research or a great success story that you believe your Chicago Wilderness colleagues would find interesting and useful? These guidelines explain what we're looking for and how to submit an article.

Chicago Wilderness Journal Guidelines to Authors

About the *Chicago Wilderness Journal*

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.

This journal is:

- A forum for sharing important results and lessons learned through biodiversity conservation work,
- An interdisciplinary publication that features a mix of articles in each issue from the fields of science, land management, education, communication, and sustainability,
- An online journal, published three times a year, guided by an editorial board made up of Chicago Wilderness members and coalition staff.

This journal is not:

- A peer-reviewed journal,
- A forum of advocacy or political positions,
- A newsletter with event announcements,
- A means of presenting biodiversity issues to the general public.

What we're looking for in an article

Submissions will be considered from the volunteers and employees of Chicago Wilderness member organizations, and from participants in Chicago Wilderness Teams and projects. Articles should report on the results of a Chicago Wilderness project, workshop, roundtable, or the results of such work performed by an individual Chicago Wilderness member organization. While the emphasis of this publication is on Chicago Wilderness members and affiliates, submittals from outside the membership that are relevant to the Chicago Wilderness audience will also be considered. The topic should

pertain to biodiversity conservation in this region. Articles should emphasize the lessons learned and interpretation of data, rather than methodology or simply reporting of results.

Questions to answer in the article include:
- Why did you undertake the project and what did you do?
- What did you learn from the experience? What do your results tell you?
- What are the practical or applied implications of the work – both in your field and in other fields?
- Based on what you learned what do you recommend to Chicago Wilderness members?

Note that articles don't necessarily need to tell a success story; if valuable lessons were learned from an unsuccessful project, please consider submitting an article.

Target audience

The target audience for this journal is the volunteers and employees of Chicago Wilderness member organizations, and participants in Chicago Wilderness Teams and projects. To meet the needs of this broad audience, articles should:
- Emphasize practical implications,
- Be easy to read and interesting, not overly technical and full of jargon,
- Be short but refer to additional sources of information for interested readers,
- Help readers feel connected to other Chicago Wilderness members,
- Offer readers information and resources that will help them carry out their jobs.

Article format

Please submit your article as a Microsoft Word or WordPerfect file. Articles should be three to five pages in length (approximately 450 words per page if there are no pictures or graphics). Pictures and graphics are welcome and encouraged, but the editorial staff will make final selections! Graphics files can be submitted at 300 dpi, actual size or larger. JPG files are the preferred format for graphics. The journal can accommodate sidebars, so please indicate if there are quotes or charts that you would like set out from your article.

All articles must include the following components:
- A short abstract of several sentences that will quickly capture the reader's attention,
- A description of the work you did and why you did it,
- Results and implications for Chicago Wilderness partners.

Beyond these requirements, articles may follow a variety of outlines as suggested by these examples:

Traditional scientific research format:
- Abstract
- Objectives
- Methods
- Results and Discussion
- Conclusion/Recommendations/Implications
- References

Report on outcome of a workshop:
- Abstract
- Rationale for workshop; reasons to learn more about topic
- Main points made at workshop
- Insights gained from talks and discussions
- Conclusions and final recommendations

Description of the development of educational tool or product:
- Abstract
- Rationale for project
- Brief description of final product (e.g. curriculum, model policy)
- Lessons learned from development process
- Recommendations to others attempting similar work
- Recommendations on use of product

Submission procedures

Authors can submit either an article or a query to Elizabeth McCance at emccance@chicagowilderness.org. Queries should include a thorough abstract of the intended topic. Articles and all accompanying graphic files should be submitted electronically to Elizabeth. Be sure to include the author's contact information. Submissions can also be saved on a disc and mailed to Elizabeth at 8 South Michigan Ave., Suite 900, Chicago, IL 60603.

Although articles will be accepted on an ongoing basis for consideration in all upcoming issues, a rough schedule of deadlines follows:
- For March issues: first drafts will be due the second Friday of the preceding December,
- For July issues: first drafts will be due the second Friday of the preceding April,
- For November issues: first drafts will be due the second Friday of the preceding August.

Authors are welcome to submit articles that have already been published, as long as the article contains specific implications for Chicago Wilderness, and the author observes copyright law and has obtained the appropriate permissions for reprinting. If your submission has been published elsewhere, please indicate where and when it was published so we can note this in the journal.

The journal's editorial board recommends that if possible, authors should work with their internal PR departments for assistance in translating specialized information into material that is accessible to a more general audience. In addition, members of the journal's editorial board will partner with authors to adapt the style and format of articles to be most useful to the broad Chicago Wilderness audience.

For more information, contact Elizabeth McCance at (312) 580-2138.

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
- Kathy Maloney, The Morton Arboretum
- 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.