Illinois is known as the Prairie State, yet what is the quality of our remaining grasslands? Karen Glennemeier provides insight into the state of our grasslands.

The State of our Grasslands: Results from the Chicago Wilderness Grassland Audit

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Abstract
In 2005, a team of 61 professional and volunteer plant monitors collected detailed vegetation data in 1,614 quadrats, at 84 randomly-selected locations within the protected grasslands of six Chicago Wilderness counties. The data tell us that the current state of our grasslands is poor, although there is potential for much improvement. Twenty-eight percent of the quadrats were rated as good or excellent, while 72% were rated as fair or poor, based on native mean Coefficient of Conservatism values. Evaluated on the basis of the Floristic Quality Index, only 10% of quadrats rated good or excellent, with 90% fair or poor. We can use these data to track our progress at grassland restoration, describe and prioritize threats for management, and estimate the costs of grassland restoration.

Introduction and Objectives

Prairies once covered much of the Chicago Wilderness region, as well as the Midwest landscape. But today, less than one one-hundredth of one percent (0.01%) of original Illinois prairie remains in "Grade B or A" quality according to the Illinois Natural Areas Inventory (White 1978). In addition to original high quality remnants, the CW region has many grasslands that have been preserved as natural land but that are in varying degrees of degradation. Many grasslands are former agricultural lands (which themselves are former prairies) that have gone fallow and, in some cases, provide habitat for declining grassland birds, reptiles, amphibians, and other wildlife. Some of this fallow acreage is being restored to natural prairie. Other grassland sites are degraded prairies that have become overgrown with woody and herbaceous invasives and have lost much of their original biodiversity. The main threats to these and other natural grasslands are fire absence, habitat fragmentation, loss of major predators (leading to overpopulation of white-tailed deer), and encroachment of invasive species.

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. The *Recovery Plan* placed the highest conservation priority on the region's prairies. The CW region contains some of the best remaining examples of original prairie in the world, making

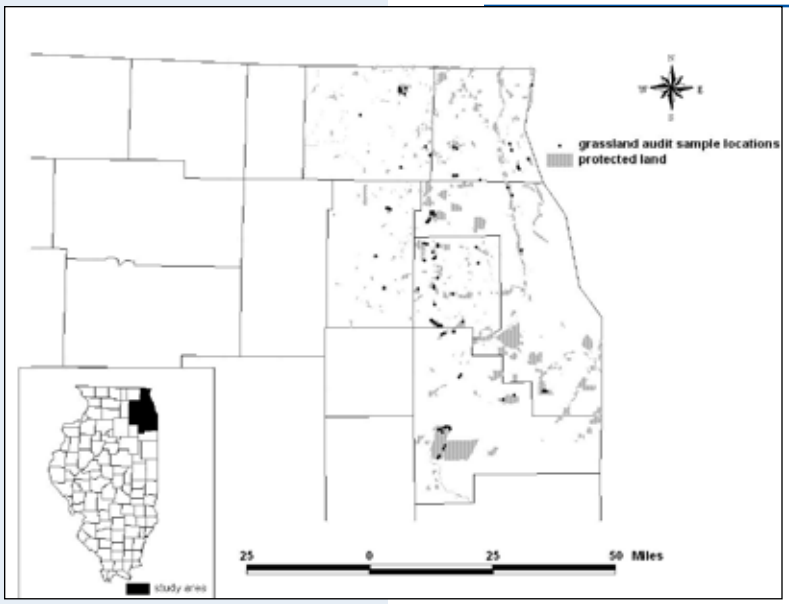

Figure 1: Grassland Audit sample locations.

prairie conservation in our region a globally significant endeavor.

The *Recovery Plan* outlined a vision for recovery of the prairies. This vision included viable populations of all prairie species and prairie types (fine-textured, sand, gravel, and dolomite) and the maintenance of ecological integrity through the return of landscape-scale processes such as fire, hydrology, and gene flow.

To begin tracking our progress toward this vision, we needed to first assess the current state of CW prairies and grasslands. The *State of Our Chicago Wilderness: A Report Card on the Health of the Region's Ecosystems*, released in 2006, found little data to document the current state of prairies. The 2003 CW Woods Audit provided the Report Card's only quantitative data on the region-wide status of upland wooded lands. The Grassland Audit was intended to provide similar, quantitative data on the state of CW prairies. It was the first region-wide assessment of these ecosystems in Chicago Wilderness. Its objective was to provide scientifically sound and statistically rigorous data to tell us (1) the state of CW grasslands, and (2) the nature and extent of threats to grassland biodiversity. We included fallow agricultural fields, degraded prairies, and any other protected grasslands in our study because much of the land that is restorable to prairie is currently in one or more of these degraded states.

One important limitation of the Grassland Audit is that we only sampled vegetation, so our quality assessment is based purely on floristic data. However, grasslands that are poor in plant biodiversity can be important to animal biodiversity, especially for birds and reptiles. The ideal quality assessment system would consider both animals and plants. Given the logistical challenges to such an approach, we began with the more practical task of assessing the vegetative quality of CW's protected grasslands. Separate studies have examined the region-wide status of grassland birds . Another ongoing study is examining the characteristics of native vegetation in areas of high grassland bird diversity in an attempt to improve our understanding of how to restore prairies for both plants and birds. Data from this study are currently being analyzed, and a report should be available next year.

Methods

We randomly established sample locations (Figure 1), based on the sample universe of prairie and 'unassociated grassy'

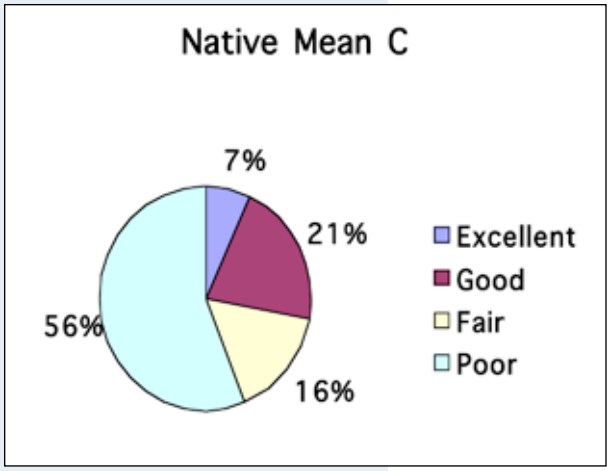

Figure 2: Quality of Grassland Audit quadrats, based on the Mean Coefficient of Conservatism (Mean C) for native species. Plots classified as 'excellent' were defined as having a quadrat Mean C > 4.5. 'Good' quadrat Mean C was 2.5 - 4.5, 'fair' quadrat Mean C was 1.5 – 2.5, and 'poor' quadrat Mean C was < 1.5. This scale was based on the parameters developed by Wayne Lampa and Gerould Wilhelm for DuPage County.

habitat identified in the 1997 CW/NASA land cover dataset (Wang and Moskovits 2001). We refer to the sample universe as the 'grasslands' of CW, to reflect the inclusion of degraded grasslands as well as remnant and restored prairies. The number of points in each county was proportionate to that county's acreage of grasslands.

In July and August 2005, 61 volunteer and professional plant monitors collected data at 84 randomly located transects in six CW counties. Monitors walked a 100-m transect and collected data at twenty $^1/_4$ m^2 quadrats along the transect. From the start point, monitors walked five meters in the direction of the transect and then drew a random number from a bag, indicating the number of meters (from 0 to 5) to walk to the right or left of the transect line, where they placed a quadrat frame. Moving off of the transect line provided better dispersion and greater independence among quadrat samples. Within each quadrat, monitors identified all plant species, estimated the percent cover of all herbaceous plants and all woody plants less than one meter tall, and estimated percent bare ground. The total number of quadrats was 1,614 (For some transects, not all 20 quadrats could be sampled due to physical barriers or to changing habitat—for example, from grassland into mowed lawn).

Using mean Coefficient of Conservatism value (Mean C) to define quality, quadrats with Mean C > 4.5 were classified as 'excellent.' 'Good' quadrat Mean C was 2.5 - 4.5, 'fair' quadrat Mean C was 1.5 – 2.5, and 'poor' quadrat Mean C was < 1.5. The C-value is a number from 0 to 10 that has been assigned to each plant species found in Illinois. The native species that most typically occur in badly degraded habitats, along with all non-native species, have been assigned C-values of 0. At the other end of the spectrum, species found only in remnant natural areas have been given C-values of 10 (Taft et al. 1997). It is generally held that an area with high Mean C, even if currently degraded, has high conservation potential due to the continued presence of conservative species.

Using the Floristic Quality Index (FQI) to define quality, quadrats with FQI > 11 were classified as 'excellent.' 'Good' quadrat FQI was 8-11, 'fair' quadrat FQI was 4-7, and 'poor' quadrat FQI was < 4. The FQI combines Mean C with a measure of species diversity (Taft et al. 1997).

Additional quality analyses were performed by weighting Mean C and FQI by species' percent cover within quadrats. Next, woody species were assigned a C-value of zero, with the exception of the woody prairie species *Ceanothus americanus, Amorpha canescens, and Salix humilis.*

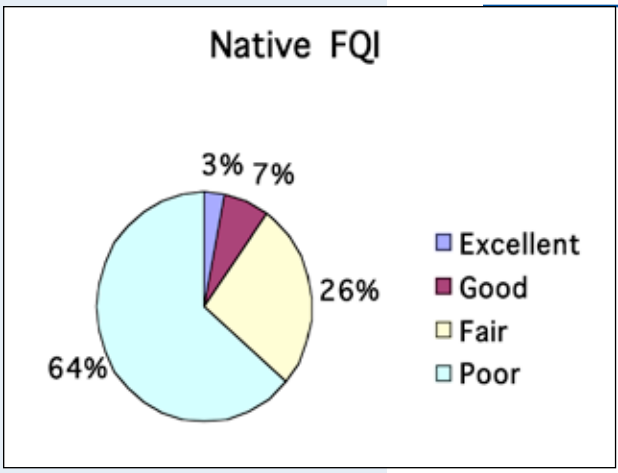

Figure 3: Quality of Grassland Audit quadrats, based on the Floristic Quality Index (FQI) for native species. Quadrats classified as 'excellent' were defined as having a quadrat FQI > 11. 'Good' quadrat FQI was 8-11, 'fair' quadrat FQI was 4-7, and 'poor' quadrat FQI was < 4. Scale was developed using data from the 1976 Illinois Natural Areas Inventory sampling of Grade A and Grade B prairies, provided by the Illinois DNR, Natural Heritage Database Program and Marlin Bowles of the Morton Arboretum.

Rank	Species	Sum of Cover	Percent of Total Cover
1.	*Solidago altissima*	13,167	9.7
2.	*Poa pratensis*	12,073	8.9
3.	*Bromus inermis*	11,273	8.3
4.	*Festuca elatior*	8,864	6.5
5.	*Phalaris arundinacea*	8,797	6.5
6.	*Poa compressa*	8,492	6.3
7.	*Daucus carota*	5,538	4.1
8.	*Solidago canadensis*	5,346	3.9
9.	*Cornus racemosa*	2,759	2.0
10.	*Andropogon gerardii*	2,724	2.0
11.	*Agrostis alba*	2,590	1.9
12.	*Rhamnus cathartica*	1,841	1.4
13.	*Solidago sp.*	1,832	1.4
14.	*Bromus japonicus*	1,745	1.3
15.	*Aster pilosus*	1,309	1.0
16.	*Cirsium arvense*	1,258	0.9
17.	*Melilotus alba*	1,242	0.9
18.	*Solidago nemoralis*	1,207	0.9
19.	*Dactylis glomerata*	1,191	0.9
20.	*Fragaria virginiana*	1,080	0.8

Table 1: Relative abundance of the twenty most abundant species. Sum of cover is the percent cover for that species within the _ m2 quadrat, summed for all 1,614 quadrats. Percent of total cover is the sum of cover for that species divided by the total cover for all species, all quadrats.

Results and Discussion

The condition of CW grasslands was generally fair or poor. When Mean C was considered, only 28% of quadrats ranked 'good' or 'excellent' (Figure 2). When species richness also was considered by looking at the Floristic Quality Index (FQI), this number decreased to 10% (Figure 3).

Twenty-eight percent of Grassland Audit quadrats ranked 'good' or 'excellent' according to Mean C, which suggests that, of approximately 58,000 total acres of grassland in Chicago Wilderness, we have 16,000 acres of prairie that have the potential to be high quality, because they have the species characteristic of high quality prairies. The remaining 42,000 acres can also be restored but will take more remedial efforts, including the seeding of native species.

The fact that grassland condition was poorer when looking at FQI compared to Mean C suggests that even where conservative species exist, overall species diversity is low. Thus, even the 16,000 acres of "high potential" grasslands will require sustained effort if we are to return them to high quality prairies.

When Mean C and FQI were weighted according to the abundance of each species within the quadrat, the overall assessment of CW grasslands did not change substantially compared to the unweighted Mean C and FQI assessments, respectively (Figure 4). When we assigned all invasive woody species a C-value of zero, on the basis that prairies are considered to have less than 10% tree cover and that these woody species are a threat to prairies (Chicago Region Biodiversity Council 1999), quality scores decreased somewhat although they remained in the same range as the original analysis. This result reflects that finding that woody species were present in 30% of Grassland Audit quadrats.

In addition to invasion by woody species, CW grasslands face other threats. For example, 13% of Grassland Audit quadrats contained reed canary grass (Phalaris arundinacea). Where reed canary grass was present, its average quadrat cover was 41%. Of the 20 most abundant species in CW grasslands, 13 were non-native, and six were species that require active control through restoration and management (Table 1). The most abundant species we found was tall goldenrod (Solidago altissima and S. canadensis).

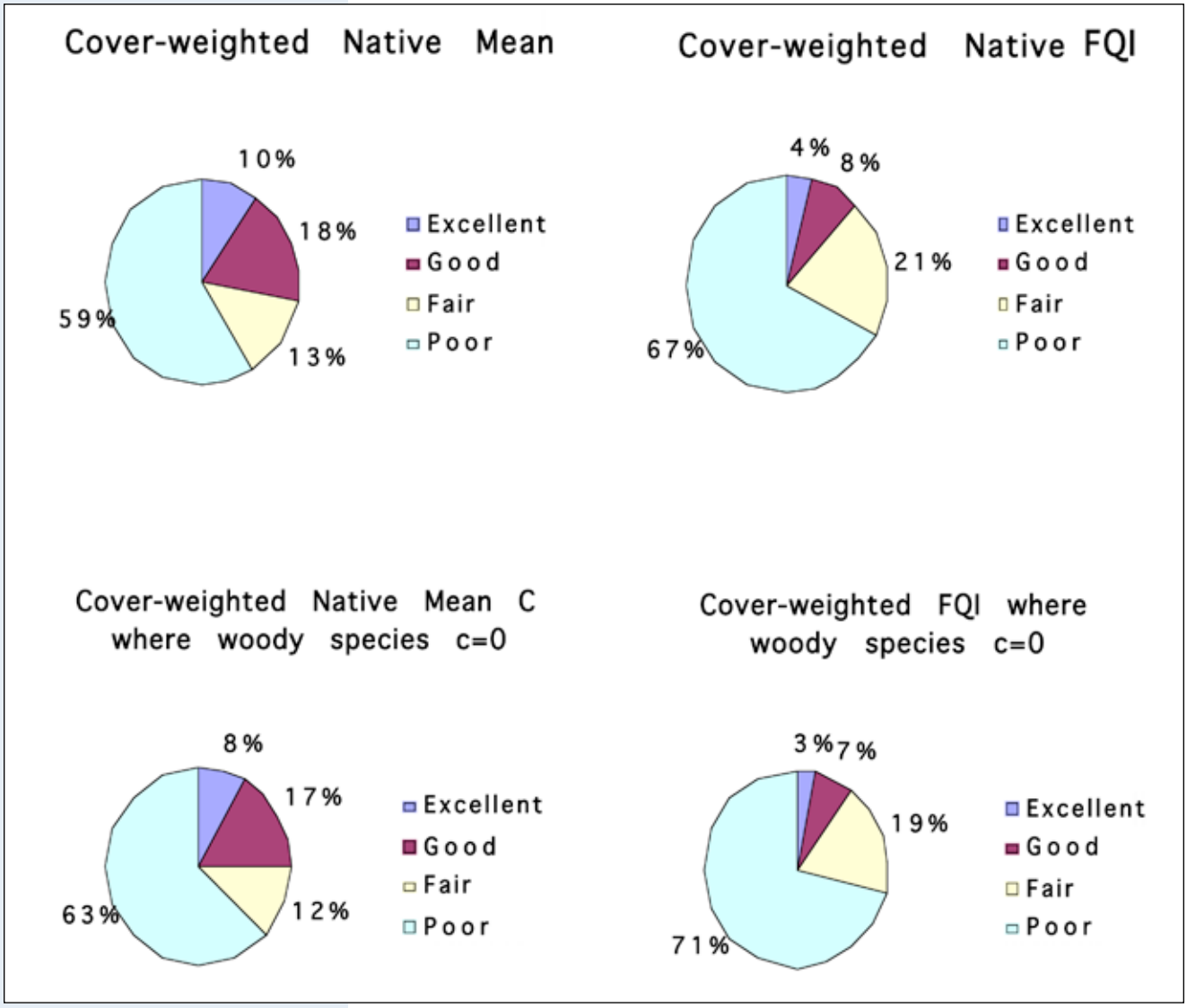

Figure 4: Quality of Grassland Audit quadrats when Mean C and FQI were weighted by species' percent cover within quadrats, and when woody species were assigned a C-value of zero (with the exception of the woody prairie species Ceanothus americanus, Amorpha canescens, and Salix humilis).

Conclusions

Quantification of the threats to CW grasslands allows us to allocate our restoration and management resources where they are most needed. It also allows us to track our progress over time as we address specific threats to these communities. The CW Grassland Audit, when repeated in future years, will allow us to track our overall progress at restoring our grasslands.

With these 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. 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.

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