



CHICAGO BOTANIC GARDEN

January 31, 2015

Mr. John Wilker
Program Manager
Illinois Department of Natural Resources
One Natural Resources Way
Springfield, IL 62702

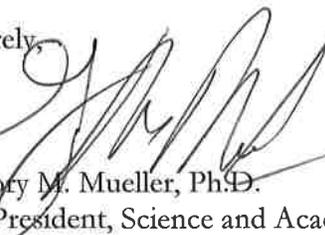
Dear Mr. Wilker:

On behalf of the Chicago Botanic Garden, I am pleased to submit this report on 2014 Plants of Concern activities in northeastern Illinois. The Garden is truly grateful for your long-term partnership and support. The Research Assistant funded by this grant is a critical part of the program's success, providing support for data collection, management, and analysis, as well as volunteer outreach and support.

Plants of Concern continues to grow in the number of volunteers and partner agencies engaged, and continues to collect and disseminate critical and viable rare plant data. This data has tangible effects, allowing managers and the state to make decisions about rare flora based on quantitated information. With your help, we are offering an important resource for the development of monitoring and conservation protocols, and developing the capacity of citizen scientists to be effective environmental stewards.

The final invoice will be submitted subsequent to this report. In addition to the electronic version attached here, a hard copy of the final invoice, two hard copies of the report, and a CD containing a digital version of the report will be mailed to you. If you have questions about the program or this report, please contact me at (847)835-8226. We welcome your comments.

Sincerely,



Gregory M. Mueller, Ph.D.
Vice President, Science and Academic Programs

cc. Lamma Parrack
Conservation Grant Administrator
Illinois Department of Natural Resources

Plants of Concern: Standardized Rare Plant Monitoring With Trained Volunteers

Final Report to
Illinois Department of Natural Resources, Illinois Wildlife Preservation Fund

Grant #13-L02W

**Chicago Botanic Garden
January, 2015**

*Covering the grant period from July 19, 2013 through December 31, 2014
with comparative discussion from 2001-2012*

Submitted by:

Rachel Goad, Manager of Plants of Concern (Principal Investigator)¹
Anna Braum, Research Assistant, Plants of Concern
Bianca Rosenbaum, Conservation Data Manager

¹1000 Lake Cook Rd., Glencoe IL, 60660; rgoad@chicagobotanic.org; 847-835-6927

www.plantsofconcern.org

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PLANTS OF CONCERN: CONCEPT AND OBJECTIVES

This report covers the period July 19, 2013 through December 31, 2014 with detailed analysis of the 2013 season in relation to previous seasons, as well as a preliminary account of the 2014 season. Final 2014 numbers are not yet available.

Launched in 2001, Plants of Concern (POC) is a long-term rare plant monitoring initiative unique to the region in its use of standardized monitoring protocols used by trained citizen scientists. The program has completed 14 years of monitoring and has accumulated a substantial base for analyzing long-term data on a significant number of species and Element Occurrences (EOs).

Species monitored by POC were initially selected from the 1999 *Chicago Wilderness Biodiversity Recovery Plan's* priority list, because they were state endangered or threatened and considered by regional land managers and ecologists to be significant within the Chicago Wilderness region. POC staff and landowners have since decided that any listed plant was eligible to be included in the program. Non-listed "species of concern" have been added when individual landowners express interest in tracking them. These rare species usually have a coefficient of conservatism index of 9 or 10 (Swink and Wilhelm, 2004). Through 2013, POC monitored 122 listed and 109 rare species. In 2014, an additional four species were added, three of which are state listed.

The primary geographic area covered by POC from 2001-2006 included the six counties of northeast Illinois, with one site in Kankakee County. In 2009, four sites from Kendall County were added. By 2012, POC was working in 8 northeastern IL counties. Because of POC's Chicago Wilderness affiliation, 14 sites have been added in northwest Indiana and six sites in southeast Wisconsin beginning in 2007 (see GIS Map, Attachment 1). This report will focus on Illinois counties and species with reference to the entire program.

POC incorporates the following interrelated elements, all equally important to its success and recognition as a unique and valuable long-term monitoring program:

- Monitoring rare plants, particularly state-listed species, over time using a standardized census protocol (plant numbers, population area, GPS coordinates, threats, and management activities) on populations on a regional basis (Attachment 2). Select species have been targeted for more intensive "Level 2" demographic monitoring that supports projects coordinated by CBG researchers assisted by volunteers.
- Monitoring rare species in relation to management activities as reported by both monitors and land managers to form a feedback loop for short- and long-term adaptive management responses (Attachments 3a, b and c).
- Analyzing the long-term POC dataset for an increased understanding of population trends in relation to management activities and to invasive species and other threats.
- Training volunteers as citizen scientists to leverage agency resources for monitoring rare species and to create an informed conservation constituency.
- Working in partnership with public and private landowners, land managers, and agencies, through an Advisory Group (Attachment 4) and ongoing correspondence and consultation to generate a shared approach to regional monitoring.
- Submitting monitoring data to landowners, the Illinois Natural Heritage Database (for listed species) and the Illinois Nature Preserves Commission (for species monitored in Nature Preserves).

In 2013, two full time staff members, Manager Susanne Masi and Research Assistant Rachel Goad, managed the overall POC program. In 2014 Rachel took over program management, and Research Assistant Anna Braum was hired. Two other seasonal research assistants focused on work at Midewin National Tallgrass Prairie on a POC-based monitoring program, and with the Forest Preserve District of Cook County monitoring effort, respectively. An ACI (Associated Colleges of Illinois) intern and an REU student assisted POC in summer 2014.

PLANTS OF CONCERN IN THE PUBLIC EYE

Plants of Concern's collaborative relationships extend across the Chicago Wilderness region and beyond; the program is now nationally recognized as a viable model for a citizen science-based monitoring program. POC's website is its most visible facet and a critical tool for the program, serving as a resource for existing monitors and a point of contact for the public. Additional information about POC's outreach activities and recognition are found in the Citations section.

Plants of Concern Website

The POC website (www.plantsofconcern.org) was created in 2003 and serves as a tool for outreach and recruitment, as well as providing access to monitoring resources such as downloadable monitoring forms and the volunteer manual, password-protected data access and submission, and plant information. There are six menu sections on the website, with two that include sub-sections. Bolded sections were added or updated in 2014.

- Home - contains introductory paragraphs about the POC program.
- About POC
 - About Us - shares background information about the program, its goals and achievements and statistics from previous years.
 - Funders - provides a list of partner websites and programs that have funded POC.
 - POC Staff - lists the entire POC staff and contact information.
- News & Events - displays articles about the program, as well as event announcements for workshops, plant outings and meetings.
- Forms & Protocols lets monitors download up-to-date monitoring forms, land management forms, and guidelines and instructions on GPS usage, and pacing and population estimation guidelines. The Plants of Concern Volunteer Manual is also available for download in this section.
- Plant Resources
 - **Monitored Species Gallery** - consists of individual pages for each plant monitored by POC as well as photos by Carol Freeman, volunteers, and staff, and artistic renderings by scientific illustrator Nancy Klaud, as well as links to various plant resources. Bloom times and conservation status are now integrated into the species gallery.
 - **Additional Resources** - provides a list of links to other plant resources related to POC, plant identification, local plant conservation, and a list of useful print resources.
 - **Artists** - showcases artists who have worked with POC to highlight rare species.
- My POC Account - allows monitors the opportunity to view and submit their monitoring forms online and allows land managers to view the monitoring and land management forms pertaining to all of the sites they manage. In 2014, the following features were added to this portion of the website:
 - **Assignment module**
 - Can be accessed by approved partner agency staff and POC staff to track volunteer assignments.
 - **On-the-fly mapping of individual assigned populations**
 - **Population status**
 - Allows POC to track extirpated and historic records more directly

Website goals for 2015 are as follows:

- New resources added to communicate the impact of data collected to monitors and the public
- Flagging of introduced populations
- Improved Land Management data entry portal
- Interactive mapping of monitored species for each user
- Export data with shape files
- Basic visual statistics for each land manager account

SUMMARY: CUMULATIVE MONITORING RESULTS 2001 – 2013

In 2013, POC’s 13th year, the program held relatively steady in measures of accomplishment and participation. The number of monitored subpopulations increased from 2012, and the number of monitored EOs recovered to 2011 levels. Nearly half (43%) of all EOs monitored in previous years were also monitored in 2013. In 2013, 79 new EOs were monitored. The Illinois Natural Heritage Database tracks 1048 EOs of 182 listed species in seven northeast Illinois counties (July 2012). POC monitors 78% of the listed species that this agency records, in 699 EOs. Note that a single EO in the state database may correspond to several EOs in the POC database, which occur at more narrowly defined sites.

The following graph and table are discussed in detail in the remainder of the report and in Attachments 5-7. (Note: Statistics in the following figures, tables and attachments were derived from the POC database for analysis on several different dates starting November 2013 and may reflect minor discrepancies in numbers. Graphs from previous years may not correspond precisely due to late report submissions, merging of subpopulations and other factors).

Figure 1. POC accomplishments and participation for all years, 2001-2013. Includes IN and WI. See tables below.

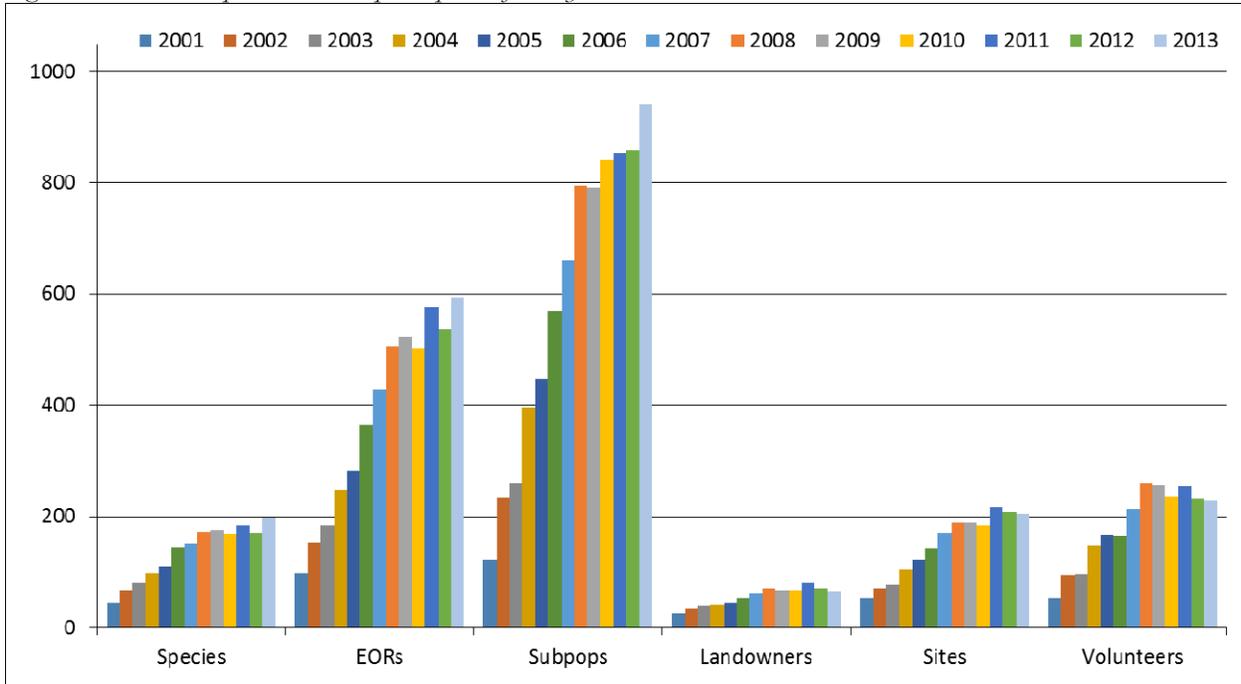


Table 1A. POC accomplishments and participation for all years, 2001-2013, including IN and WI.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Species+	45	66	81	98	109	144	150	172	176	169	183	171	198	288
EORs	98	153	183	248	282	365	430	507	523	501	576	536	594	1167
Subpopulations*	122	234	260	396	448	570	662	795	791	841	854	860	941	2038
Landowners	25	33	38	42	45	54	62	70	66	67	81	70	65	128
Sites	53	70	77	105	122	142	170	189	188	184	217	208	205	343
Volunteers	54	94	97	147	167	165	214	259	256	237	254	232	228	789

+ See Attachment 5 for species list.

*A subpopulation is defined as a grouping of a species within the same EO that is tracked separately because it is located more than 50 meters from another grouping, or because the grouping is within a different management unit or habitat.

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Table 1B. POC accomplishments and participation for all years, 2001-2013, in northeastern Illinois only.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Species++	45	66	81	98	109	142	142	162	164	164	175	161	194	250
EORs	98	153	183	248	282	362	410	485	492	485	560	519	587	1107
Subpopulations*	122	234	260	396	448	567	627	750	716	811	820	838	932	1897
Landowners	25	33	38	42	45	52	57	65	63	65	73	62	61	118
Sites	53	70	77	105	122	140	163	182	182	180	204	195	199	323
Volunteers	53	92	95	144	163	155	195	229	230	223	235	210	214	724

++ Includes 130 IL listed and 120 rare, non-listed species.

*A subpopulation is defined as a grouping of a species within the same EO that is tracked separately because it is located more than 50 meters from another grouping, or because the grouping is within a different management unit or habitat.

2001-2013 cumulative EOs monitored (listed and non-listed), by IL county:

Cook	265
DuPage	187
Kane	75
Kankakee	12
Kendall	11
Lake	350
McHenry	138
Will	67
<hr/> Total	<hr/> 1105

THE VOLUNTEER COMPONENT OF POC: CITIZEN SCIENTISTS

Volunteers are critical to POC's success. Each major agency working with POC has one or two staff, usually a volunteer coordinator, and/or ecologist assigned to work with POC in recruitment, training, and field assistance of volunteers. These partnerships are critical to effective volunteer engagement and retention across the region.

Both public conservation agencies and private groups recognize the importance of leveraging volunteer resources for monitoring and management work. Citizen Science, now termed Public Participation in Scientific Research by the Citizen Science Central (based at the Cornell Lab of Ornithology), is increasingly acknowledged as a method for gathering reliable and valuable data, thereby greatly expanding potential for data gathering and scientific work and analysis.

Volunteer statistics

Table 2: Number of cumulative volunteers by county as of 2014 (Some monitors have assignments in more than one county).

Illinois		Wisconsin		Indiana	
Cook	330	Kenosha	16	Lake	14
DuPage	78	Walworth	13	LaPorte	4
Kane	79			Porter	12
Kankakee	13				
Kendall	14				
Lake	243				
McHenry	137				
Will	120				

New volunteers in 2013 (total: 56)

Cook: 29; DuPage: 5; Kane: 2; Kendall: 1; Lake: 19; McHenry: 7; Will: 12.
Average: 11 new volunteers per Illinois County.

Volunteer retention

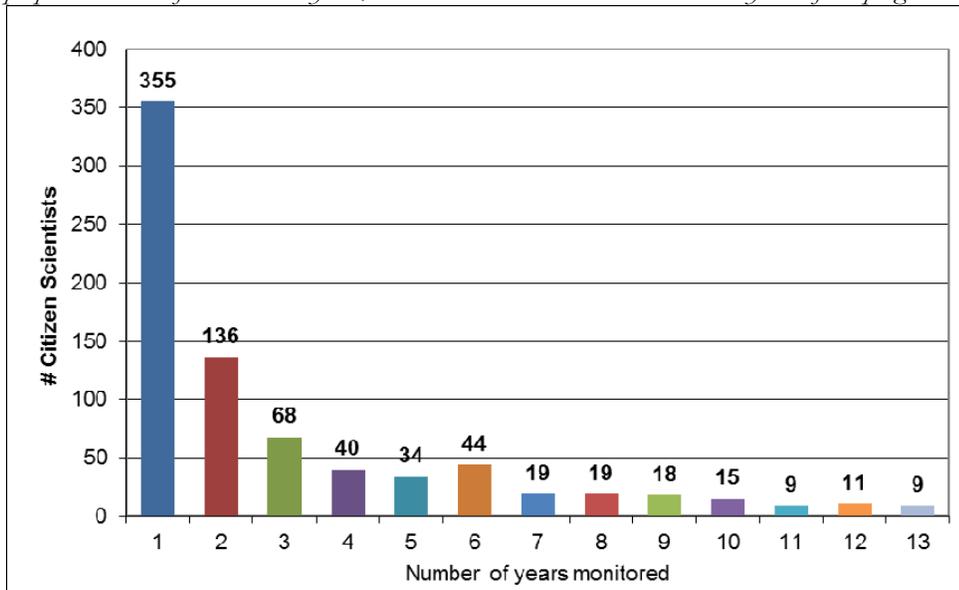
Retention from 2012 to 2013: 60% of those who monitored in 2013 were retained in 2013

Retention from 2001 to 2013: 38% of volunteers who monitored in 2001 monitored in 2012

Retention into 2013: 60% of volunteers who monitored in 2013 also monitored previously

Further, 51% of volunteers who monitored in 2013 had monitored for three or more preceding years, and 37% of volunteers who monitored at any time in the program did so for three or more years.

Figure 2. Number of citizen scientists who have monitored for 1-13 years. Many volunteers monitor for one year, but a high proportion return for additional years, and 9 volunteers have monitored in all years of the program.



Volunteer hours

Hours worked by POC volunteers may fall into one of the three following categories. Hours accumulated from 2012 are shown for comparison.

Hours volunteered	2013	2012
Field	1844	1826
Workshop training	420	432
Office	948	512
Total	3212	2770

Stewards as monitors

In 2013, 35 of 224 volunteer monitors were also volunteer site stewards, tasked with helping to manage a site in collaboration with the landowner. Overall, 96 POC volunteers have been site stewards.

Recruitment

Volunteers are recruited by agency volunteer coordinators and by current POC monitors through word of mouth. Other recruitment avenues include articles and announcements in stewardship newsletters, such as *The Habitat Herald* and Midewin’s *Tallgrass Telegraph*, *Grounds Cover* (the Garden’s volunteer newsletter), the

Chicago Environmental Network Website, and POC staff presentations at meetings such as Wild Things, Lake County Audubon, and Wild Ones. Training workshops are listed on the POC website and promoted through stewardship newsletters and email newsletters to previous, current and prospective POC volunteers.

Training

The two different formats for volunteer training each year are day-long workshops and in-field training. Three introductory workshops were offered in 2013 – two in Cook, and one each in Will and Kankakee Counties in Illinois. At these workshops, 68 volunteers learned POC program objectives and were trained in monitoring techniques for Level 1 protocols. In 2014, 85 volunteers attended three introductory training workshops held in McHenry, Cook, and Kane Counties. Representatives from county agencies presented information about rare plants monitored in their counties, guided volunteer assignments, and discussed the relationships between monitoring and management and the benefits of POC in relation to their work. The sensitivity and confidentiality of rare plant locations were stressed in training sessions, and new volunteers were required to sign a Confidentiality Form.

In response to a need to increase spatial data quality, POC developed and held a workshop on GPS use for POC volunteers at the Chicago Botanic Garden in September 2014. Sixteen volunteers attended, and after the workshop reported feeling 76% more knowledgeable about GPS and 88% more comfortable using GPS for POC. This training session will again be offered in 2015.

In the field, POC program staff, interns, agency ecologists, site stewards, or experienced volunteer monitors provided new monitors with additional field mentoring and orientation to the sites and populations. In addition, several monitoring forays led by POC staff and partner land managers are held each year at larger sites such as Illinois Beach State Park, Braidwood Dunes and Savanna, Lyons Woods, Lyman Woods and Hickory Creek Barrens, and often attract eight or more volunteers who seek additional training in monitoring protocols.

LEVEL 1 MONITORING DATA

All Level 1 monitoring data is entered into a PostgreSQL database developed with the PostGIS extension enabled. The database and website is managed by Bianca Rosenbaum, Conservation Science Information Manager. This system is an upgrade from a MySQL database established in 2012. The “back end” PostgreSQL interfaces with an entirely web-based “front end” coded in PHP. The move allowed POC’s database to become spatial and allows creation of spatial records ‘on-the-fly’. POC is now able to map all records on Google Maps as soon as a record is created. The host company backs up data on a daily basis. Data is entered on-line by volunteers and staff via the password-protected, role-restricted POC website. Volunteers must submit field/paper copies of their monitoring forms, but may also submit reports online. An effort to scan all paper forms into a digital archive has been underway. As of January 2015, 66% of all paper-submitted monitoring forms were scanned electronically for archival purposes.

Individual monitors can access their assigned monitoring reports online and only by means of a password. Online entry saves hours of manual data entry by program staff. Monitoring reports are reviewed for accuracy and completeness by POC staff and landowners, who have access to their own site reports. Data entry and review are typically completed in March, and reports are then submitted to the Illinois Natural Heritage Database, landowners for their respective sites, and the Nature Preserves Commission for nature preserves and land and water reserves.

The Level 1 analyses below reflect information based on subpopulation reports submitted through 2013. Many EOs have multiple subpopulations. For each category of analysis, only reports with data in the specified category were included in the percentages given. Forms marked NA (Not Applicable) or blank for particular fields were excluded from the percentages given in the analysis, but where possible, the percentages of the total forms that were excluded due to a NA answer are shown in order to provide a perspective on sample size.

Note that in the analyses presented, data for each year is not based on an equivalent set of populations. Each year, new populations/subpopulations are added to the program, and previously monitored populations/subpopulations may not be monitored in that year. Therefore, yearly increases or decreases in values do not reflect a cumulative change for the same group of populations.

These data reveal general levels of threats, management activity, and plant recruitment throughout POC populations. More direct assessment of change or trends is possible when the analysis is applied to the same group of populations over time; with up to 13 years of data on many populations, this analysis can yield robust data. As future resources and funding allow, POC will be able to undertake more detailed analysis.

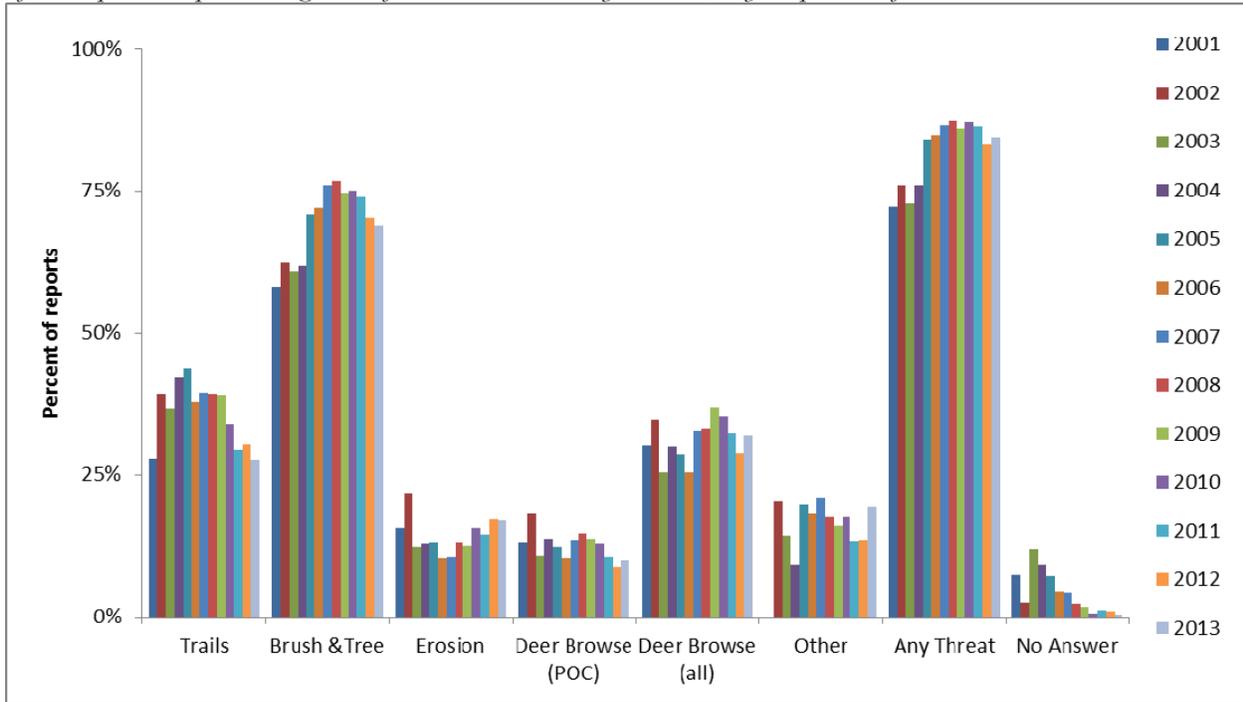
Population Threats

Updated November, 2014

The percentage of subpopulations that were impacted by at least one threat—invasive brush and trees, deer browse, erosion or trails—was between 72% and 87% from 2001-2013 (Figure 2). The number of populations experiencing any threat initially increased from year to year but has leveled out in recent years. The importance of recording threats to populations has been increasingly emphasized in POC training.

Only unauthorized trails were reported in 2001, so no value is indicated for authorized trails in 2001. Authorized and unauthorized trails were lumped into ‘trails’ for this analysis. In 2001 and 2002, no distinction was made between brush encroachment of less than or greater than 1 meter in height, so the two categories are combined in the figure. For most years, separated data is available for the lumped values. The ‘No answer’ category indicates the low percentage of reports for which no answer was given for this section.

Figure 3. The percent of subpopulations in each year with a given threat present. The analysis of threats presented here does not reflect the percent impact or magnitude of each threat recorded by monitors, only the presence of the threat.



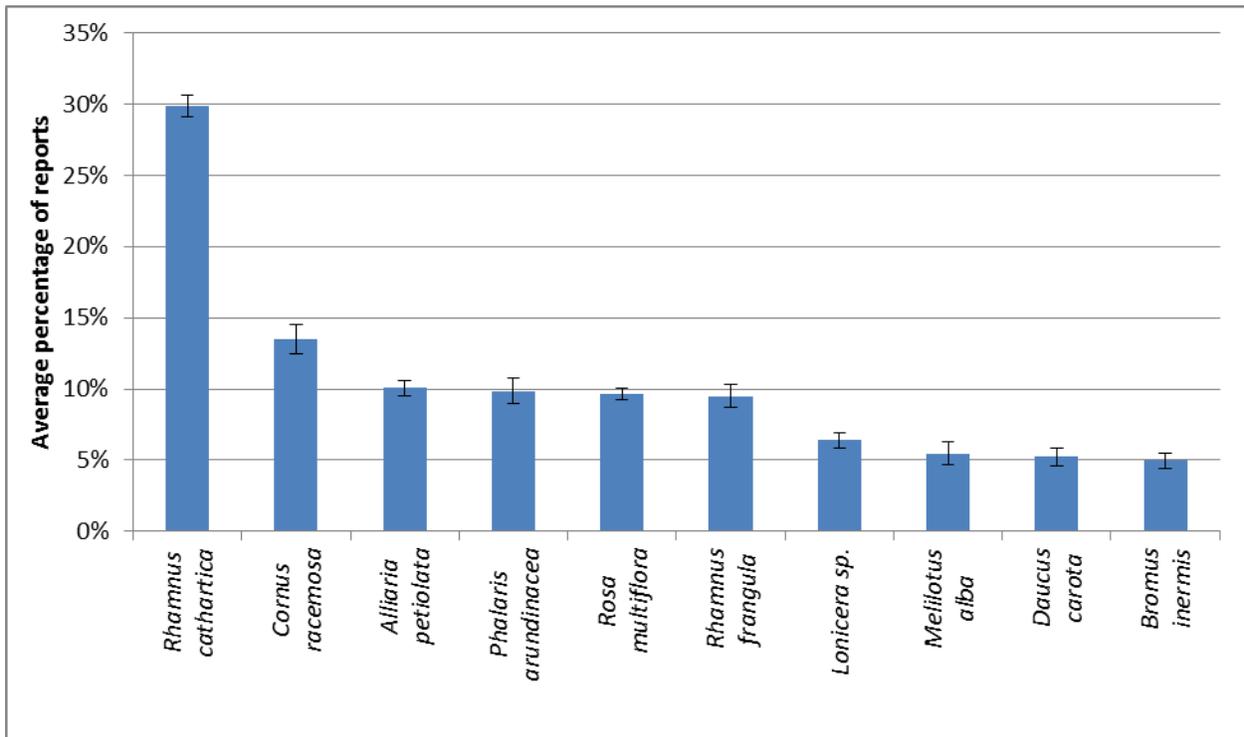
Invasive species

Updated November, 2014

Aggressive native and non-native invasive species pose a significant threat to rare plant populations. Figure 3 presents the average yearly percent of reports indicating presence of the top ten most reported invasive species. Note that these data do not incorporate the magnitude of effect these species are reported to have on POC-monitored populations.

Monitors have identified over 300 distinct species as invasive plants over 14 years, some of them native species. Identification of ‘invasive’ natives is often dependent on the habitat context. For instance, where *Cornus racemosa* forms dense stands in grasslands, it is considered invasive. Where it occurs in smaller abundances at woodland edges, it may be less problematic. Of all monitored subpopulations, 84% had at least one invasive species present in 2013 (similar to 86% in 2012).

Figure 3. Top 10 most reported invasive plant species documented by POC monitors from all years. Average percentage is based on the ratio of reports indicating presence of an invasive species to the total number of subpopulations with reports submitted that in each year. Error bars show plus and minus one standard error across 14 year dataset.



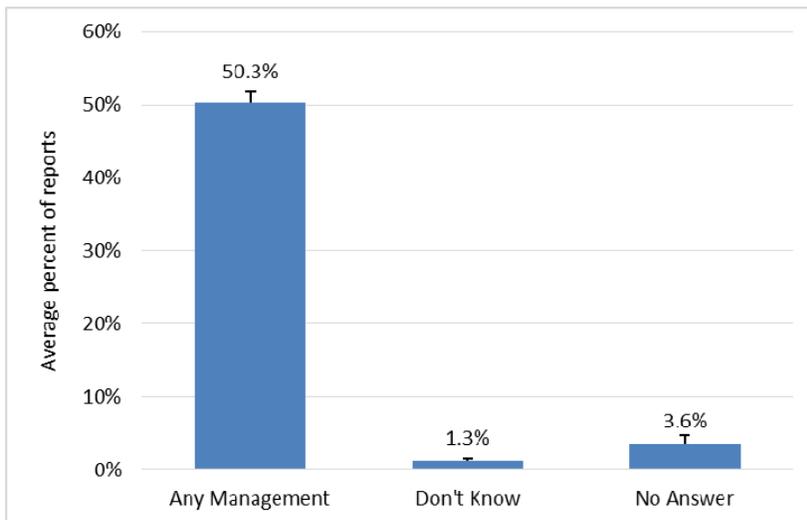
Management

Updated November 2014

On average, half of all POC populations are reported as managed in each year (Figure 4A). Only a small percent of submitted monitoring forms are left blank for this section, and just over 1% of reports indicate that the monitor does not know what management has occurred. Many POC monitors are also staff, stewards, or restoration volunteers at the sites they monitor, and these individuals have first-hand knowledge about management activities on-site. Management is categorized into four activities: prescribed burning, woody brush removal, removal of herbaceous invasive species, and mowing (Figure 4B). The first three are the most commonly reported management types. Based on 943 reports for 2013, monitors observed that an average of 40% of POC populations showed evidence of some type of management activity, with brush removal, herbaceous removal, and burning all noted in over 13% of reports, and only 2% of reports indicating mowing as a management strategy.

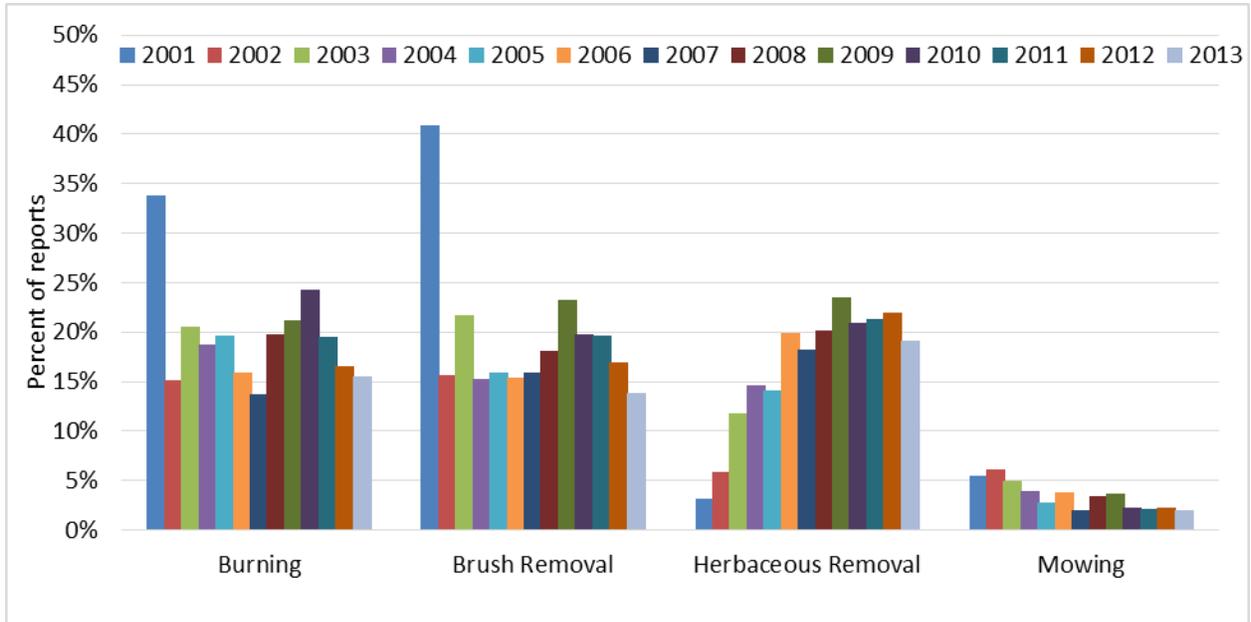
At the beginning of the program, reported management was variable for all management activities (Figure 4B). A notable decrease in reported burning and brush clearing occurred from 2001 to 2002, and this may have been due to volunteers largely being assigned to known species locations at sites that were under an active management schedule. The high percentage of mowing reported in 2001 was most likely due to monitors considering mowing for trail or roadside maintenance to be a management strategy. Since then, POC training has stressed the difference between mowing as a management strategy (i.e. to control invasives or brush or as a substitute for burning) and unintentional mowing of the population, as may occur along a mown trail side, which may pose a threat. Other management activities recorded in an open-ended text field without quantification include deer culling, fencing/deer exclosures, and hydrological modifications.

Figure 4A. Average percent of reports for all years where any management is reported, where 'don't know' is indicated for management, and where no answer is given.



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Figure 4B. Management observed by monitors for all years. Percentages for individual management techniques are based on only those reports for which a “yes” or “no” answer was given for each management activity (as observed or known by the monitor). The percent of reports with blanks or a “don’t know” response is shown in Figure 4A. Herbaceous invasive removal was not recorded in a field in 2001.



Spatial data management and analysis

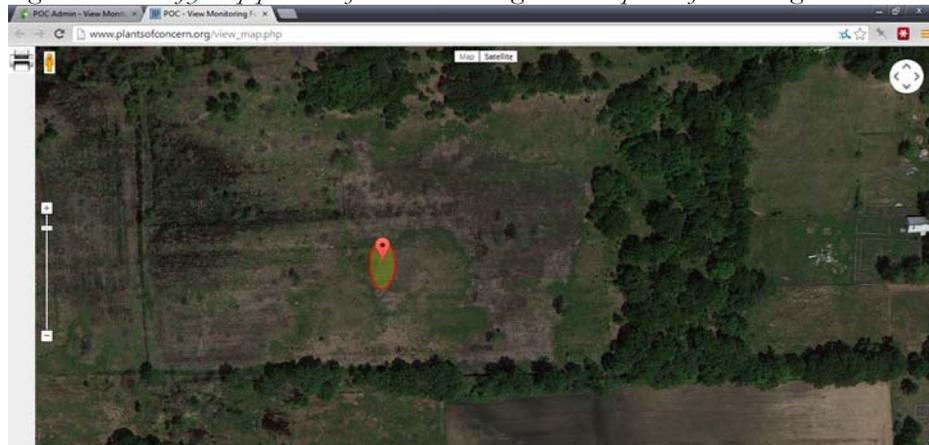
Progress in correcting and managing POC spatial data continued through 2013 and into 2014. The transition to a spatial database in 2012 has made POC point data more easily accessible, which facilitates error-checking of GPS records. Volunteer Rob VanDaal assisted POC staff in checking 1140 records that were identified as having potential errors (these represent 5% of all GPS records). Of these, 494 records required correction. Efforts are being undertaken to improve and establish data submission filters that will prevent entry of erroneous coordinates.

Data correction and additional filters improve the quality of POC's spatial dataset, which facilitates spatial data analysis. Land managers and conservation organizations increasingly use spatially referenced data to answer ecological questions, and the creation of the GIS lab at CBG in 2009 increased POC's capacity to collect, organize, and analyze spatial data. POC has collaborated with students in the REU (Research Experience for Undergraduates) program to analyze spatial data. The REU program is a National Science Foundation supported project that brings undergraduate science students to the Chicago Botanic Garden each summer to perform plant science research. POC has worked with two REU students on spatial analysis of POC data: Hazel Levine (2012) and Chris Wright (2013) (s 'Cirsium hillii' under Research Outgrowths for more details about Chris Wright's work). A niche identification analysis is currently being undertaken by POC staff and collaborating researchers to evaluate environmental characteristics of rare species locations. This work is a starting point to developing a more detailed understanding of the distribution of rare plant species.

Additional management of POC's spatial data will improve usability by program partners. Converting point data, which may consist of multiple records for each subpopulation, into a single polygon shapefile that can be attached to each monitoring report remains an important program goal. Ideally, an automated process will convert online-submitted point data into a polygon that is stored in the database and accessible to land managers. This process has proven challenging given the different combinations of points currently in the POC database, but POC staff continue to work towards this goal. Notably, the intern dedicated to Forest Preserves of Cook County (FPCC) has done this manually for the third year in a row, providing FPCC with GIS polygons of all monitored species in the district to assist with their management planning.

In 2013, 'on-the-fly' mapping of monitoring report data became available through the POC website. These 'on-the-fly' maps project a center point (averaged from all GPS readings on the report) surrounded by an ellipse whose axes are defined by north-south and east-west population distances supplied in the report (Figure 5). POC staff are working to expand mapping to enable viewing multiple subpopulations and sites, based on the authorized assignments of each user.

Figure 5. On-the-fly map produced from a monitoring record on plantsofconcern.org.



LAND MANAGEMENT DATA

Since 2002, POC has asked land managers to complete Land Management (LM) forms to supplement monitoring reports submitted by volunteers. (Attachments 3a, 3b, 3c). LM forms provide more detail on the types of management that take place both within the populations and onsite, as well as land use history. Land managers report activities in the area or management unit where the populations occur, but monitors often have a more precise understanding of how management affects specific population areas. Therefore, the two reports serve to complement each other.

POC requests that the first LM report include land use history, general management history prior to monitoring, information about adjacent land use, and whether the species in question has been introduced. Annually, managers are asked about population and site management during the past year, including burning, mowing, invasive species management, and deer removal. POC no longer asks for hydrological conditions such as drought or flooding, as these data can be derived from other sources. As data accumulates, the cycles of land management can be compared with population cycles in order to uncover the influence of management on rare plant populations.

POC staff has undertaken a concerted effort to gather LM reports and offer land managers alternate methods of completing the information, including an Excel spreadsheet using a single form for multiple species within a management area. Starting in 2012, online submission for LM reports was initiated. Cumulatively, POC has entered at least one report for 720 subpopulations or 30 % of the total subpopulations monitored in the database. Of the 242 forms entered in 2013 and 2014, 22% were entered online.

POC has not yet conducted a thorough analysis of the management data from LM forms due to limited staff resources and ongoing program priorities. Partnerships with researchers and graduate students have resulted in knowledge gains about individual species, and POC continues to look for partners to help examine population dynamics in response to management. Notably, a PhD student from St. Louis University, Holly Bernardo, is working with Plants of Concern to examine the effects of management on POC species, and evaluating the effectiveness of POC protocol to detect population changes in response to management.

Meanwhile, continued collection of management data is imperative. In order to fill in gaps in management information, POC staff have engaged some site stewards in completing LM forms. This reduces the burden on land managers and this information is submitted to the manager for final review. Some managers have already taken advantage of this steward submission alternative.

In addition to the management data recorded on the Level 1 reports, POC is aware of numerous and significant management responses to reports through anecdotal sources such as email correspondence, notes on the reports, and personal communication. Below are a few examples:

- At a forest preserve in Kendall County, a POC monitor noted the impact of invasive honeysuckle on the perimeter of a population and removed it in collaboration with the landowner
- At a Cook County site, long term trends show a population expanding significantly after management through burning began. This year a new high water mark was reached, with the population doubling in size and greatly expanding in area.
- In McHenry County, POC monitors found that two subpopulation of *Triglochin maritima* expanded significantly after prescribed burning of the habitat.

RESEARCH OUTGROWTHS

With a growing Level 1 data set and the involvement of the joint Chicago Botanic Garden-Northwestern University graduate program, and partnerships with students at University of Illinois at Chicago, and Loyola University, POC has increased the involvement of researchers in data analysis. These partnerships allow the POC dataset to be used in more analyses than staff members alone are able to undertake.

- ***Cirsium hillii***

In 2013, REU student Chris Wright, GIS lab manager Emily Yates, and POC staff created a habitat suitability model for rare gravel hill species *Cirsium hillii* and *Asclepias lanuginosa*. Using edaphic, land cover, and hydrological variables extracted from POC population locations, the research team evaluated where else in the region these species might grow successfully. Such suitability modeling may be useful in finding undiscovered populations, but is more likely to be useful in identifying locations appropriate for reintroduction.

- ***Liatris scariosa* var. *nieuwlandii***

Collaboration between POC staff and Northeastern Illinois University student Sara Whidden on an internship project to evaluate the spatial distribution and population dynamics of *Liatris scariosa* var. *nieuwlandii* are ongoing, but have determined that populations that have been burned and have lower incidence of brush encroachment tend to be more robust. A significant correlation was found between declining subpopulations and brush encroachment. Further spatial analysis will use soil and land cover values extracted from existing populations locations as a model of suitable habitat that can be compared across the region.

- ***Cypripedium candidum***

Anne Nies, Masters student at Northwestern University in the Plant Conservation Biology Program, used Plants of Concern data to evaluate population dynamics for *C. candidum*. She looked closely at three Level 2 data collection sites and found that the populations were in decline, that management was not correlated with population changes, and that reproductive effort was different between sites. In evaluating soils at these sites, she found that soil nutrients were positively correlated with mycorrhizal colonization of *C. candidum* root tissue. It seems that these populations of *C. candidum* are more strongly affected by site factors than by management regimes, and that site factors may mediate the effects of mycorrhizal colonization.

- ***Ravine floristics***

Ravine communities are a conservation priority in northeastern Illinois. Ravines flow directly into Lake Michigan, affecting water quality, and these fragile habitats host conservative native species, including species monitored by POC. In 2013, a rapid assessment technique was developed in collaboration with Openlands, the Alliance for the Great Lakes, and other partners. In 2014, REU student Jaileen Merced-Hoyos worked with POC staff to revise this technique. POC data was used to determine the species list for monitoring, and POC sites were sampled. Results from the revised rapid assessment were found to accurately represent ravine plant communities, with sampling completed in a much shorter period of time than the initial assessment.

LEVEL 2 DEMOGRAPHIC MONITORING UPDATE

Level 2 demographic monitoring of *Viola conspersa*, *Cypripedium candidum*, *Cirsium hillii* and *Tomanthera auriculata* was initiated in 2001 and completed in 2013. Individual tagged plants in permanent plots were tracked over time. Individuals of the annual species *T. auriculata* were newly tagged each year and followed from flowering to fruiting stages. In 2013, POC staff and volunteers conducted monitoring of all these species except *V. conspersa* because Chicago Botanic Garden scientist Pati Vitt had previously reached her research goal of collecting 11 years of demographic data. At least 12 years of data were collected for the other three species. In 2013, six plots of *C. hillii* and *C. candidum* were monitored, and five plots of *T. auriculata* were monitored. Researchers and graduate students will continue to work with the accumulated data.

PROGRAM EVALUATION

POC met or greatly exceeded nearly all the program objectives as outlined in the WPF proposal and listed below. Most have already been discussed in detail in the preceding text.

Objective 1

*Collect standardized monitoring data on rare plants (population size, location, threats, and management) on a cumulative 68% of northeast Illinois' Element Occurrences (EORs) of listed species. More detailed demographic data will also be collected in selected populations of *Cypripedium candidum*, *Cirsium hillii* and *Tomanthera auriculata*.*

From 2001-2013, POC had collected standardized monitoring data on a cumulative 699 EOs of threatened or endangered plant species in eight northeast Illinois counties. Of these, 48% (507 of 1048) have been issued an EO number by the Natural Heritage database. An additional 192 EO's are monitored by POC that have not yet been issued an EO number, bringing the estimated percentage of EOR's monitored to 67%. At present, POC has monitored 78% of the listed species in the Natural Heritage database for northeast Illinois.

In 2013, POC collected standardized monitoring data on 107 endangered and threatened Illinois species in 390 EOs (from 90 species in 335 EO's in 2012) and 89 rare, non-listed species in 204 EOs (from 78 species in 201 EO's in 2012).

In 2013, POC collected its last year of demographic data on *Cypripedium candidum* at four sites, on *Cirsium hillii*, at six sites, and on *Tomanthera auriculata* at five sites. Demographic monitoring for these species did not continue in 2014. The long-term dataset produced by this work was deemed sufficient by researchers partnering with POC to use the data.

Objective 2.

Educate adults about rare plants and rare plant monitoring by holding four volunteer training workshops and further supporting volunteers with training in the field. One workshop is scheduled in the Kankakee Sands area in hopes of recruiting volunteers specifically for sites in Kankakee County. The Garden will also attempt to increase the number of volunteers recruited in cooperation with landowners (approximately 30 new individuals across the region) for a total of more than 200 active volunteers projected in 2013 and 2014.

In 2013, 68 volunteers attended four training workshops, which took place at the Forest Preserve Volunteer Resource Center (Cook County), Midewin National Tallgrass Prairie (Will County), the Chicago Botanic Garden (Cook County), and at Hopkins Park Village Town Hall (Kankakee County). The Kankakee workshop was held in June and aimed at engaging a volunteer base specific to the Kankakee Sands region. (see Attachment 8 for Workshop Agenda). POC staff mentored volunteer monitors frequently in the field, and also held several group monitoring "forays", which were excellent mentoring opportunities in protocol usage and plant identification. In 2014, 69 volunteers attended three introductory training workshops which were held at Volo Bog (McHenry County), Sand Ridge Nature Center (Cook County), and Brewster Creek Lodge (Kane County). A new training session was developed to address knowledge gaps in using GPS for POC monitoring. Held in September 2014, 16 volunteers attended this workshop and reported feeling more confident and knowledgeable about taking GPS data after the workshop.

POC's goal of over 200 volunteers participating in the program was exceeded in 2013, with 228 total participants, 52 of these being new recruits. High levels of retention increase data reliability. The volunteer retention rate from 2012 to 2013 was 60%, and of the volunteers who monitored in 2013, over 50% had monitored for three or more years. A new requirement put in place by the Chicago Botanic Garden requires all POC volunteers to undergo a criminal background screening. POC is still working to ensure compliance by all monitors. At present, 58% of active POC monitors have submitted a background check authorization form.

Objective 3.

Collaborate with public and private landowners to retain them in the program recruit others into the POC monitoring fold, and place volunteer monitors on their sites. POC will in particular collaborate with the IDNR (Regional Heritage Biologists, Natural Heritage Database, Nature Preserves Commission, and Illinois Endangered Species Protection Board).

In 2013, POC worked with 65 public and private landowners to prioritize species and to place volunteer monitors at their sites. During the winter of 2013, POC held planning meetings with staff from six northeast Illinois Forest Preserve Districts, IDNR's Brad Semel, and the Chicago Park District to discuss the 2013 season volunteer assignments. Other landowners in the program and four site superintendents at IDNR-owned sites, were contacted through email and by phone to plan the 2013 monitoring season. (See Attachment 6 for a list of partner landowners.) Similar meetings were held in 2014.

POC continues to have a strong relationship with IDNR staff. John Wilker, Program Manager, Division of Natural Heritage, IDNR sponsor of the WPF POC grant, is a strong supporter of the POC program. Further, POC collaborated at Illinois Beach State Park in 2013 and 2014 with Heritage Biologist Brad Semel and held planning meetings regarding monitoring assignments at Illinois Beach State Park, Volo Bog, Moraine Hills State Park, and Chain-o-Lakes State Park. Semel received all 2013 monitoring reports for his sites, which he has used in management planning, and currently has web access to all reports for his sites. Semel also serves on the POC Advisory Group. In 2013, Duane Ambroz, who served at IBSP as the Illinois Coastal Management Program staff person, was actively involved in POC monitoring at that site and in the Waukegan area buffer to IBSP. Don McFall, Division Chief, Natural Heritage, is invited to Advisory Board meetings and is kept apprised of POC progress. Heritage Biologist Dan Kirk received all reports on sites within his region: Grant Creek Prairie, Blodgett Road Dolomite Prairie, and Des Plaines River Conservation Area, and has expressed interest in collaborating to monitor Kankakee area IDNR sites in 2015. Region 4 Administrator Maggie Cole has access to the POC database for all IDNR sites in her region. Joe Kath, Endangered Species Project Manager and his assistant Jennie Skufa, have also been included in POC correspondence and invited to the Advisory Group meeting. POC submitted all EOR reports for listed species to the Illinois Natural Heritage Database in 2013, as well as providing updates to records not monitored in 2013.

POC submitted permit applications and follow up monitoring reports for the 2013 monitoring season to the Illinois Nature Preserves Commission (INPC). Kelly Neal, Stewardship Project Manager for the Commission, also serves on the Advisory Group. POC also applied for permits on IDNR-owned sites to Mike Moomey, Assistant Chief, Natural Heritage. In addition, POC has occasional contact with INPC Field Representatives Steve Byers and Kim Roman over issues that arise in monitoring at sites within their regions. Kim Roman also serves on the Advisory Group. (See Attachment 10 for IDNR and Nature Preserve Sites monitored.)

Susanne Masi, POC manager, was an appointed member of the Illinois Endangered Species Protection Board through 2013, and she brought information about listed species from POC monitoring to the group. She also served as a Technical Expert Consultant for the 2014 listing of endangered and threatened species. This five-year listing process has extensively utilized POC data from northeast Illinois. Partially as a result of these data, 16 POC-monitored species will either be delisted, added to the list, or undergo status changes. Board Chair Dan Gooch also serves on the POC Advisory Group.

Objective 4.

Hold an advisory group meeting to assess progress and determine whether any changes should be made to the program.

Advisory Group meetings were held on December 13, 2013 and December 3, 2014. Minutes for each of these meetings are found in Attachment 9a and 9b.

Objective 5.

Record, organize, analyze, interpret and disseminate the collected data to better understand the state of rare plants in the region. POC will share the data by April of 2014 with state agencies and landowners that include management impacts on populations or concerns about the absence of management.

The first step in data management involves recording, organizing and disseminating POC monitoring reports. 2013 data have been shared with partner landowners and submitted to the Natural Heritage Database (for listed species) and to the Nature Preserves Commission (for plants monitored at Nature Preserve sites). In addition, landowners, Heritage Biologists and the Regional Administrator have ongoing access to the POC database through the POC website. This report, which includes the next step of data and program analysis and interpretation, will be shared with the Chicago Wilderness' task force on restoring nature, if requested. POC is a priority project for that group and enjoyed funding support from Chicago Wilderness through its former grant program for eight years. With permission from IDNR, this report will also be shared with partner landowners and members of the Advisory Group.

Examples of analysis and interpretation of POC data are provided in this report and more have been included in the presentations and posters that have been created for outreach and communication at various venues. As presented in this report, graduate students and other researchers have conducted and published research using POC data.

Objective 6.

Expand the impact of POC by exploring the possibility of exporting the program to another urban center of Illinois. Southern Illinois has been a region of particular interest, where The Nature Conservancy, Southern Illinois University in Carbondale, and the Southern Chapter of the Illinois Native Plant Society have expressed interest in the program. This collaboration is being actively explored for the 2014 season. The Garden is also collaborating with the USFS to expand the use of POC monitoring protocols and methodology nationally. The Garden will communicate the POC program to a broader professional and volunteer audience through participation in a regional or national conference.

As discussed in previous WPF grant reports, POC has explored the possibility of exporting the program to southern Illinois. Karen Tharp of the Illinois Nature Conservancy Volunteer Stewardship Network was an active proponent of this project, but her original plan to use an AmeriCorps volunteer to help establish the program did not materialize. In 2013 and 2014, POC continued discussions about expanding into southern Illinois with the Plant Biology Department at Southern Illinois University in Carbondale (PLB), with the southern chapter of the Illinois Native Plant Society (SINPS), and with John Wilker at Randy Heidorn of IDNR. Dr. Stephen Ebbs, interim chair of PLB at Southern Illinois University has expressed the commitment of that department to providing office space, administrative support, and herbarium access to POC if the program does become established in southern Illinois. The potential also exists for collaboration with professors and graduate students. POC staff are currently exploring options for funding such a project.

Efforts to expand the program within Kankakee County in the Kankakee Sands area bore fruit in 2013. A training workshop specifically targeting volunteer interested in POC monitoring in the Kankakee Sands area was held on June 15, 2013. POC has collaborated with The Nature Conservancy's Rob Littiken, land manager at Pembroke Savanna and other sites in the region, as well as with private landowner Marianne Hahn, to bring the program to the area. This effort resulted in the addition of 14 endangered, 2 threatened, and 7 rare species, 10 of which are totally new to the POC database. In 2015, POC has offered to lead monitoring efforts on Langham Island for the state endemic *Iliamna remota*, where newfound stewardship work by a Friends group associated with the Illinois Native Plant Society is restoring its habitat. POC has also been in touch with Kankakee River State Park staff about supporting monitoring efforts, and a training workshop will be held in Kankakee (Aroma Park) in 2015. The Kankakee expansion contributes to a greater understanding of this ecologically significant area, and provides important information for conserving its rare flora.

Within the Chicago region itself, the program has created active spinoffs that enhance the overall value of POC and at the same time, provide focus to targeted areas having rich flora and excellent restoration potential. POC's Midewin National Tallgrass Prairie rare plant monitoring program has been in place through a cost share agreement with the US Forest Service continuously since 2003. A second offshoot is the monitoring program along the lakefront and rare ravine ecosystems of Lake Michigan through several separate but related programs. POC has monitored at the Ft. Sheridan ravines and lakefront since 2003, through a partnership with the Lake County FPD and at McCormick Ravine since 2008, through collaboration with the Lake Forest Garden Club and the Lake Forest Open Lands Association. Since 2010, POC has worked at the Openlands Lakeshore Preserve in Highwood through a partnership between the Chicago Botanic Garden and Openlands designed to develop a comprehensive monitoring program to track and guide management. Further expansion of ravine monitoring to the Waukegan area occurred in 2012 through 2014 through a grant from the Great Lakes Restoration Initiative (GLRI) to the Waukegan Harbor Citizens' Advisory Group, who subcontracted POC to do rare plant monitoring and volunteer training. The Waukegan area is adjacent to Illinois Beach State Park, increasing the importance of monitoring its native flora. Another ravine monitoring project for 2012 and 2013 occurred through a subcontract from Sustain our Great Lakes (National Fish and Wildlife Foundation) awarded to the Alliance for the Great Lakes for a Northeast Illinois Ravine Restoration and Monitoring Program. POC conducted comprehensive rare plant monitoring and mapping for this project at Ft. Sheridan. Other ravines to the south are already monitored through POC's existing program, and the lakefront is monitored through the north suburbs and the Chicago lakefront. Thus, POC ravine and lakefront monitoring extends from Illinois Beach State Park to the Indiana state line.

POC has also had an impact beyond the Chicago region. POC staff were consulted about program structure, protocols, and volunteer engagement by Kevin Doyle, Botanist and Mapping Specialist with the Wisconsin Department of Natural Resources (WIDNR), who is setting up a state-wide rare plant monitoring program. Beginning in 2015, monitoring of POC populations in Wisconsin will be overseen by WIDNR. The Blue Mounds Area Project, which promotes restoration and stewardship on private lands in southwest Wisconsin has adapted POC protocol to conduct rare plant monitoring with volunteer citizen scientists. In 2013 they worked with multiple landowners, 26 volunteers and with Wisconsin DNR staff on 14 sites.

In July 2013, Susanne Masi was invited to present POC as a model citizen science program in a symposium dedicated to PPSR at Botany 2013 in New Orleans, LA. See listings below for additional presentations given.

Objective 7.

Continue to engage graduate students and other researchers in analysis and use of POC's long-term datasets.

In 2013 POC engaged numerous students and researchers to work with POC data. Multiple students from the Plant Biology and Conservation program, administered collaboratively by Northwestern University and the Chicago Botanic Garden, as well as students from other universities (UIC and Northeastern Illinois University in particular) have worked with POC. Some of the resulting research includes Anne Nies' work with mycorrhizae and *Cypripedium candidum*, Erin Vander Stelt's thesis on *Isoetes butleri* populations, Dan Fink's thesis on *Sarracenia purpurea*, and Eun Sun Kim's work on *Asclepias lanuginosa*. POC has also worked with REU (Research Experience for Undergraduates) students in 2012, 2013, and 2014. The REU program is funded by the National Science Foundation, and each year a number of students come to CBG to work on various research projects. These projects are discussed in greater detail in the Research Outgrowths section above.

CONCLUSION AND FUTURE DIRECTIONS

As this report demonstrates, the Plants of Concern program continues to grow and serve as an essential source of data on endangered, threatened, and rare plant species. POC data serves land managers and the program engages trained volunteers. Volunteers make meaningful contributions to the regional understanding of rare plant populations and become informed conservation advocates. Although in its infancy, the work initiated in Indiana and Wisconsin, which expands the program to the wider Chicago Wilderness region, has produced valuable baseline data. POC's diverse partnerships and program outgrowths attest to POC's influence and effectiveness, and collaborations with numerous students and researchers are leading to a greater understanding of rare plant population dynamics. POC provides up-to-date information to the Endangered Species Protection Board through the Natural Heritage Database, which is critically needed as evidenced by its use in the 2014 listing process.

In 2013 POC engaged over 200 volunteers in monitoring efforts across the region while also managing five separate program offshoots: Midewin, Cook County FPD, Openlands Lakeshore Preserve, Waukegan Harbor Areas of Concern, and Northeast Illinois Ravine Projects. In addition, considerable website and database development has occurred over the past three years, and these infrastructure updates will allow further expansion of the website as a tool and resource.

With Susanne Masi's retirement in 2013, Rachel Goad is now managing the program. Goad served as Research Assistant for the program for three seasons and has a strong grasp of program goals and processes. She is continuing to build partnerships with ecologists, land managers, agency staff, and volunteers to accomplish the goals of the program.

At present, the POC data reservoir is very large, housing 14 years of monitoring data, and examples of how the data can be analyzed are presented in this report. POC is making progress in its capacity to use GIS to show spatial relationships between populations and environmental factors and is developing the ability to analyze change in population locations and management activities over time. However, these data can be mined for far more analysis than POC staff can undertake with currently available resources. Further exploration of the data has great potential to benefit land managers as they make decisions to protect and manage rare plant populations as a parallel effort to managing communities. POC will continue to be a resource for researchers studying rare plant populations, and is already working with individuals from several institutions, as described in this report. These research partnerships, which maximize the benefits of POC, are only possible with the assurance of a stable long-term monitoring program.

POC's contributions and recognition on both a regional and national scale are many. As citizen science becomes more prominent on the national level, POC is regularly recognized as a successful and established monitoring program. One of the chief benefits of POC is the collaboration among the many partner agencies and volunteers in monitoring rare species. In addition to eight forest preserve districts, the US Forest Service, and IDNR, 118 other landowners have been involved in the program. Many of these would not otherwise have the resources to engage in a rare plant monitoring program. Most of these partners are also members of the Chicago Wilderness Alliance. POC has played a key role in helping to implement the Chicago Wilderness Biodiversity Recovery Plan.

The future and scope of POC are closely linked to funding. The regional benefits of the POC program have been demonstrated, and the long-term nature of the program underscores the necessity for continued, stable financial support. The grants listed below (in Citations) have supported POC's work on outside projects and the Chicago Botanic Garden continues to seek funding to support the program, but POC's core mission has long been supported by the IDNR Wildlife Preservation Fund. IDNR's support for POC has been vital to sustaining POC's ability to collect data and work with citizen scientists across the region. In turn, POC has served the state with extensive high quality data. It is our hope that this productive collaboration will continue into the future.

CITATIONS

January 2013 through December 2014

Reports and Publications:

2013

- Aaron, J. 2013. Plants of Concern: gender, conservation and tobacco root. *Prairie Telegraph*, September-October, p. 7.
- Alliance for the Great Lakes. 2013. Ravine rescues: yes, in your backyard – and all around the Great Lakes. *WaterMarks*. Fall, p. 1.
- Alliance for the Great Lakes. 2013. *Ravine and Bluff Vegetation of the Chicago Region. A Rapid Color Guide produced for the Ravine Rapid Assessment Toolkit*. Major contributions from R. Goad; also K. Keiger, S. Masi and D. Fink. March.
- Chicago Botanic Garden. 2013. Plants of Concern: A dedicated diverse group monitors rare and endangered plants. *Keep Growing, Chicago Botanic Garden Member Magazine and Program Guide*. Summer, pp. 20-21.
- Goad, R. 2013. Plants of Concern monitors keep an eye on bloom dates. *The Habitat Herald*. September, pp 6-7.
- Landgraf, Greg. 2013. *Citizen Science. Guide for families taking part in real science*. Huron Street Press (an imprint of the American Library Association. Chicago, IL; includes section on Plants of Concern).
- Masi, S. and E. Bialecki. 2013. Plants of Concern in Cook County, 2004-2012. Final report to the Forest Preserve District of Cook County. January.
- Masi, S. and J. Aaron. 2013. Rare Plant Monitoring at Midewin National Tallgrass Prairie, 2001-2012. Final report to the USFS, Midewin. January.
- Masi, S. and J. Aaron. 2013. Rare Plant Monitoring at Midewin National Tallgrass Prairie, 2001-2013. Final report to the USFS, Midewin. December.
- Masi, S. and R. Goad. 2013. *Plants of Concern Volunteer Manual, 2013*. March.
- Masi, S. and R. Goad. 2013. Final report to the Alliance for the Great Lakes for POC contact work on a Sustain our Great Lakes grant. December.
- Masi, S. and R. Goad. 2013. Final Report to Waukegan Harbor Citizens Advisory Group for POC contract work on a GLRI grant. December.
- Masi, S., R. Goad, Steffen, A. Collins. 2013. Openlands Lakeshore Preserve Monitoring Project. Report submitted to Openlands, February.
- Ramseyer, C. 2013. Summer Fun: The Search for Rare Plants Continues. *Blue Mounds Area Project Newsletter*. 16(2/3): pp. 1, 7. Article mentions POC as the model for their rare plant monitoring program.
- Vander Steldt, E. 2013. *Isoetes butleri* Engelm: genetic, environmental and ecological characteristics of Illinois populations. Masters thesis for the Program of Plant Biology and Conservation, Northwestern University and Chicago Botanic Garden. December.

2014

- Aaron, J. 2014. What does the Fox (glove) say? *Prairie Telegraph*. January-February, 2014, p.7.
- Braum, A. 2014. Management Helps Rare Plants. *Habitat Herald*. 15(2): 7.
- Goad, R. 2014. Permit reports to Illinois DNR and Illinois Nature Preserves Commission, Forest Preserve and Conservation Districts, for 2013 monitoring and research work at their sites.
- Goad, R. 2014. Yellow Trillium and a Changing Climate. *Habitat Herald*. September: 8.
- Goad, R. and A. Braum. 2014. *Plants of Concern Volunteer Manual*.
- Goad, R., A. Braum, J. Steffen, A. Collins, and C. Milstead. 2014. Openlands Lakeshore Preserve Monitoring Project, 2014. Final report to Openlands.
- Goad, R. and A. Braum. 2014. Final Report to Waukegan Harbor Citizens Advisory Group. Plants of Concern contract for USEPA Great Lakes Restoration Initiative grant.

- Goad, R. and J. Miller. 2014. Plants of Concern in Cook County, 2004-2014. Final report to the Forest Preserve District of Cook County.
- Goad, R., S. Masi, & P. Vitt. Long Term Projects and Retaining Citizen Scientists. In C. Lepczyk, T. Vargo & O. Boyle (Eds) Citizen Science in Ecology and Conservation: A Practitioners Guide. In review.
- Goad, R., and L. Widener. 2014. Monitoring rare plants at Midewin National Tallgrass Prairie: 2001-2014. Focus on the 2014 Monitoring Season. Final report to United States Forest Service at Midewin National Tallgrass Prairie.
- Masi, S. 2014. Notes from the field: Plants of Concern. *The Habitat Herald*. January, pp. 10-11.
- Masi, S. 2014. "EcoHeroes: 'Plants of Concern' recruits "citizen scientists" to help save rare plant life." Interview with Jerome McDonnell. Worldview. NPR. Natl. Public Radio. 18 February.
- Masi, S. and J. Aaron. 2014. Monitoring rare plants at Midewin National Tallgrass Prairie: 2001-2013. Focus on the 2013 Monitoring Season. Final report to United States Forest Service at Midewin National Tallgrass Prairie.
- Masi, S., and R. Goad. 2014. IBSP Southern Buffer Project Restoration Plants of Concern Monitoring Project. Report to Waukegan Great Lakes Restoration Initiative. January.
- Masi, S., and R. Goad. 2014. Plants of Concern: Standardized Rare Plant Monitoring Using Trained Volunteers. Report to the Illinois Department of Natural Resources. January.
- Widener, L. 2014. Plants of Concern: Amazing Annuals. *Prairie Telegraph* (Midewin). October-December: 3.
- Widener, L. 2014. Plants of Concern: Prairies and the People who Love Them. *Prairie Telegraph* (Midewin). July-September.

Other publications in 2013 and 2014 included email newsletters from POC to volunteers and announcements of training workshops in stewardship newsletters including *The Habitat Herald*, *Gatherings Online* (VSN), *Acorn - McHenry County Volunteer Newsletter*, *Prairie Telegraph*, and *Grounds Cover* (CBG).

Presentations, Posters, and Events involving Plants of Concern

2013 and 2014

- Aaron, J. and S. Masi. 2013. Plants of Concern: citizen science and long-term monitoring of rare plant species at Midewin National Tallgrass Prairie. Poster presented at Wild Things Stewardship Conference, University of Illinois Chicago, February 2.
- Goad, R. 2013. New Tools for Ravine Restoration: Improving Your Great Lakes Coastline: Vegetation Rapid Assessment. Webinar hosted by the Alliance for the Great Lakes. Available at: <http://www.greatlakes.org/ravinerestoration/toolkit>. April 25.
- Goad, R. 2013. Plants of Concern, a Regional Rare Plant Monitoring Program in Northeastern Illinois. Presentation to the Illinois Native Plant Society, Southern Chapter. November 8.
- Goad, R. 2014. *Plants of Concern: Monitoring in the Diverse Ecosystems of the Chicago Region*. Presentation to the Salt Creek Greenway Association. September 20, 2014
- Goad, R. and S. Masi. 2013. Plants of Concern, a citizen science-based monitoring program in Chicago Wilderness since 2001. Poster presented at Wild Things Stewardship Conference, University of Illinois Chicago, February 2.
- Masi, S. 2013. Attended Openlands 50th Anniversary Luncheon. Chicago. October 25.
- Masi, S. 2014. *Plants of Concern: Citizen Scientists monitor rare species*. Winter Trails and Naturalist Tales. Presentation for the University of Illinois Extension Master Naturalist Program. Severson Dells Nature Center, Rockford, IL. February 8.
- Masi, S. and R. Goad. 2013. Plants of Concern, Chicago Botanic Garden: a regional rare plant monitoring program, an overview. Presentation as part of invitational symposium on Public Participation in Scientific Research. *Botany 2013* conference, New Orleans, LA, July 27-31.
- Masi, S. and R. Goad. 2013. *Plants of Concern Volunteer Manual, 2013*. March.
- Masi, S. and R. Goad. 2013. Attended the joint celebration of Openlands and the Illinois Nature Preserves Commission. Openlands Lakeshore Preserve and Midwest Young Artists. May 6.

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- Plants of Concern staff. 2013. Conducted four POC volunteer training workshops. April and June.
- Plants of Concern staff. 2013-2014. Plants of Concern: volunteers monitor rare plants in a standardized regional program. Presentation of potential research opportunities to Northwestern University graduate students, Chicago Botanic Garden. November 22, 2013 and November 7, 2014.
- Plants of Concern staff. 2013 and 2014. POC information table for World Environment Day, Chicago Botanic Garden. June.
- Plants of Concern staff. 2013. POC information table at *A Behind the Scenes Tour*, Chicago Botanic Garden. October 22.
- Plants of Concern staff. 2013 and 2014. Presented Plants of Concern achievements at End of Season Monitoring Gathering. Thatcher Pavilion, Thatcher Woods, River Forest, IL. October.
- Plants of Concern staff and volunteers. 2013. Plants of Concern booth at Wild Things Stewardship Conference. University of Illinois Chicago, February 2.
- Strohm, J. 2013. Taught class on citizen science (including Plants of Concern) for the University of Illinois Extension Service. June 19. Strohm is the Kendall County Forest Preserve District POC liaison.
- Wright, C., R. Goad, E. Yates, J. Fant, and S. Still. 2013. GIS based spatial analysis of rare plant populations: modeling habitat suitability for gravel hill prairie species. Poster presented at 40th Annual Natural Areas Association Conference, Holiday Inn Chicago Mart Plaza, Chicago, IL, October 1-4. POC data for *Asclepias lanuginosa* and *Cirsium hillii* were used for this presentation.

Awards:

- Masi, S. 2013. North Branch Restoration Project recognition award (for Plants of Concern leadership and partnership with the North Branch, and exemplary life's work in conservation. January 26.
- Masi, S. 2013. Chicago Botanic Garden Employee of Distinction Award. For leadership of Plants of Concern and other professional achievements. November 13.
- Masi, S. 2014. Habitat Project Conservation Leadership Award from Audubon, Chicago Region (announced; to be awarded February 22, 2014)
- Plants of Concern and S. Masi. 2014. Forest Preserve District of Will County Partnership Award (announced; to be awarded March, 2014)

Community Service – POC Related

- Goad, R. Secretary of the Illinois Native Plant Society. (State and Northeast Illinois Chapter)
- Goad, R. Illinois Native Plant Society 2014 Annual Meeting Planning Committee Member. Meeting focused on native flora of the Kankakee Sands region and the Kankakee Mallow.
- Goad, R. Attended Annual VSN (The Nature Conservancy and Illinois Nature Preserves Commission) Gathering for Northern Illinois Groups, the Morton Arboretum, December 13, 2013.
- Goad, R. and D. Suarez. Served as field trip leaders for the 40th Annual Natural Areas Association Conference, Holiday Inn Chicago Mart Plaza, Chicago IL, October 1-4, 2013.
- Masi, S. Member, Illinois Endangered Species Protection Board.
- Masi, S. Endangered Species Protection Board Technical Expert Consultant (Plants).
- Masi, S. Co-chair of 40th Annual Natural Areas Association Conference field trip committee. Oct. 1-4, 2013. Chicago Mart Plaza, Chicago.
- Suarez, D. Co-leader, Habitat 2030 (ecological restoration group of 20 and 30-somethings, Forest Preserve District of Cook County). 2013.
- Suarez, D. Seed Collecting Coordinator, Deer Grove East, Forest Preserve District of Cook County.

Partnerships

POC continues to have active partnerships with the following regional groups and projects: The Habitat Project (Audubon-Chicago Region); New Invaders Watch List (Northeast Illinois Invasive Plant Partnership and the Forest Preserve District of Lake County); Chicago Wilderness Natural Resources Management Team; The Volunteer Stewardship Network of The Illinois Nature Conservancy; Alliance for the Great Lakes; Waukegan Harbor Citizens Advisory Group; Openlands; Midewin National Tallgrass Prairie; The Cook County Forest Preserves; Lake Forest Open Lands; Scientific Illustrator Nancy Klud; and the Carol Freeman Photography Endangered Species Project.

Grants: For Reported Grant Period and Pending

- 2012-2013. Sustain our Great Lakes (National Fish and Wildlife Foundation): Northeast Illinois Ravine Restoration and Monitoring Program project awarded to the Alliance for the Great Lakes. POC is a subcontracted partner in this grant.
- 2012-2014. Waukegan Area Citizen's Advisory Group, Great Lakes Restoration Initiative grant. POC is a subcontracted partner in this grant. 2015 potential.
- 2013. Sally Mead Hands Foundation grant.
- 2013-2014. Forest Preserve District of Cook County contract for a POC internship position. 2015 anticipated.
- 2013-2014. Garden Club of America.
- 2013-2014. Illinois Wildlife Preservation Fund grant
- 2013-2014. Openlands contract for monitoring work at Openlands Lakeshore Preserve. 2015 anticipated.
- 2013-2104. The Nature Conservancy's Volunteer Stewardship Network stewardship grant.
- 2014-2018. Cost-Share Agreement with the US Forest Service for monitoring work at Midewin National Tallgrass Prairie.
- 2014-2015. Toyota TogetherGreen Fellowship. For a yearlong project entitled, "Connecting citizen-scientists to results: fostering engagement in environmental stewardship".

ATTACHMENTS

1. GIS Map of POC Monitored Populations
2. Level 1 Monitoring Form
3. Level 1 Land Management Form Parts 1-3
4. Advisory Group Member Listing
5. Plants of Concern Species List
6. Plants of Concern 2001-2014. Counties, Sites, Landowners & Element Occurrences
7. Plants of Concern 2001-2014. Species EO Frequency by County, a Regional View
8. Example of a POC Training Workshop Agenda
- 9A. Advisory Group Meeting Minutes, 2013
- 9B. Advisory Group Meeting Minutes, 2014
10. Illinois Department of Natural Resources-owned and Nature Preserve Sites Monitored by Plants of Concern.
11. POC's official data request form
12. Chicago Botanic Garden's Plants of Concern Program Receives Illinois Wildlife Preservation Fund Grant. Press Release issued by the Chicago Botanic Garden, Sept. 15, 2012.
13. Photo image descriptions and photographer attributions (photos included separately as digital files)