Butterfly Monitoring: Twenty-five Years of Citizen Science in Illinois and Beyond

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In the wake of the Illinois Natural Areas Inventory of 1975-1978, an in-depth survey of the state's remaining parcels of native vegetation, a movement emerged to restore damaged remnants of these few remaining natural areas. In the Chicago region, many of these efforts were spearheaded by The Nature Conservancy (TNC) and made extensive use of nonprofessional volunteers to undertake various aspects of the work (Stevens, 1995). The primary focus of many of these early activities was on the plant communities, and included practices such as removing invasive vegetation, replanting with seeds of native species, and conducting prescribed burns.

As these activities progressed through the mid 1980s, TNC land managers began to turn more of their attention to the faunistic components of these remnants. In particular, the question of the effects of the standard management practices of that time on animal communities attained prominence. TNC consulted with various researchers studying different taxa with the goal of developing methods for monitoring various animal groups. It was TNC's aim to use the same kind of volunteer labor that had been performing the restoration activities to conduct the monitoring.

Butterflies were identified as a particularly promising group to work with, partly because a robust method for tracking long-term changes in butterfly populations already existed. In the mid 1970s, British lepidopterist Ernie Pollard had developed a protocol for a walking survey that could be performed by trained enthusiasts who did not necessarily have a formal education in science. (Pollard 1975) This method, now referred to as a Pollard transect or Pollard walk, became the basis for the British Butterfly Scheme (Pollard and Yates, 1994). Pollard's protocol was modified to accommodate specifics of species diversity and phenology in Illinois, and in 1987 the Illinois Butterfly Monitoring Network (IBMN) was born.

The specifics of the IBMN protocol have changed little since 1987 (Panzer et al. 2003). Volunteers, individually or in pairs, are assigned to sites. A walking route, designed to traverse the site's major habitat types and management units, is laid out (Figure 1). Routes are designed to require between 45 minutes and two hours to walk. During the survey the monitor walks at a constant pace, counting all butterflies observed within 20 feet of them. A minimum of six such surveys is performed between the last week in May and the first week of August each year.

The IBMN has been a very successful program. Beginning with seven volunteer monitors in 1987, the program has grown to provide data from nearly 100 distinct survey routes annually in Illinois and northwest Indiana (Figure 2). The growth of the IBMN over time has required program managers to cope with the issues of a large data set, a geographically far flung program, and advances in technology that have occurred over the more than 25 years that the program has been in existence. These two issues are related in that the technological advances have played multiple roles in managing the growth of the network and the data set.

While the problems of managing this large data set have been growing, so have the solutions. When the IBMN was founded in 1987, no provision was made for electronic storage of data. Fortunately the program began electronic storage just a couple of years later, before amount of archived data that required entry into the computer became too great. By the end of the 1990s all of the IBMN data were stored in a FileMaker Pro database.

As of 2014, there are over 11,000 surveys recorded in the database. As of 2014, there are over 11,000 surveys recorded in the database. Data have been submitted from over 200 distinct transect routes, and more than 120 species of butterflies have been recorded. Sites that have been monitored range from the shores of Lake Michigan to the banks of the Mississippi River and

from the Wisconsin border to the suburbs of St. Louis, as well as a growing number of sites monitored in northwest Indiana.

Initially, volunteers all submitted paper forms to the program managers, who then typed the information into the database. As the network grew, this task became increasingly onerous and time consuming. In 2004, one of the IBMN volunteers developed an online platform for data entry. By 2006, over 90% of the data was submitted directly online.

Beginning in 1995, other networks modeled on the IBMN have formed. Today, butterfly monitoring networks now operate in twelve states. All of these programs share similar challenges for data management. In 2012 a new, NSF- funded program called the Socio-environmental Synthesis Center (SESYNC) was looking to facilitate collection and use of citizen-generated environmental data. In May of that year they convened a meeting of organizers of various citizen science projects that involve butterflies. Among those attendees who run programs that use data collection protocols similar to the IBMN's, the development of a common database emerged as a particularly pressing need.

SESYNC took up this challenge, and has been working with the various butterfly monitoring network leaders to facilitate the development of a national online data entry and storage system. We partnered with the Butterflies and Moths of North America (BAMONA) project, as they have considerable experience in handling large quantities of citizen-generated data. Our goal was to generate the new database, now called PollardBase, in three phases.
Phase I of PollardBase went live in April of 2014. Monitors in Illinois and other states are now able to submit their data to PollardBase, and the 2014 data have been pouring in. As of July 1, over 150 census surveys have been reported from Illinois and Indiana. Phase II of the development, beginning in the fall of 2014, will transfer the 27 years' worth of historic data into PollardBase. Beginning in the winter of 2014-2015, we will begin developing tools so that visitors to the site will be able to visualize the data and perform simple analyses of trends.

In addition to technological changes involving data storage, the significant advances in digital mapping technology allow for analysis of the data in ways that were not anticipated by the program designers in the late 1980s. At the moment, we are using digital mapping technology to maintain permanent records of the various Pollard Transect routes in the network. Using handheld GPS devices and Google Earth we have succeeded in creating digital maps for about half of the Pollard transects in the Illinois database (for example, see Figure 1). We hope to have completed the mapping process by the end of 2015.

Figure 1. Pollard transect for monitoring butterflies at Bluff Spring Fen nature preserve in Elgin, Illinois

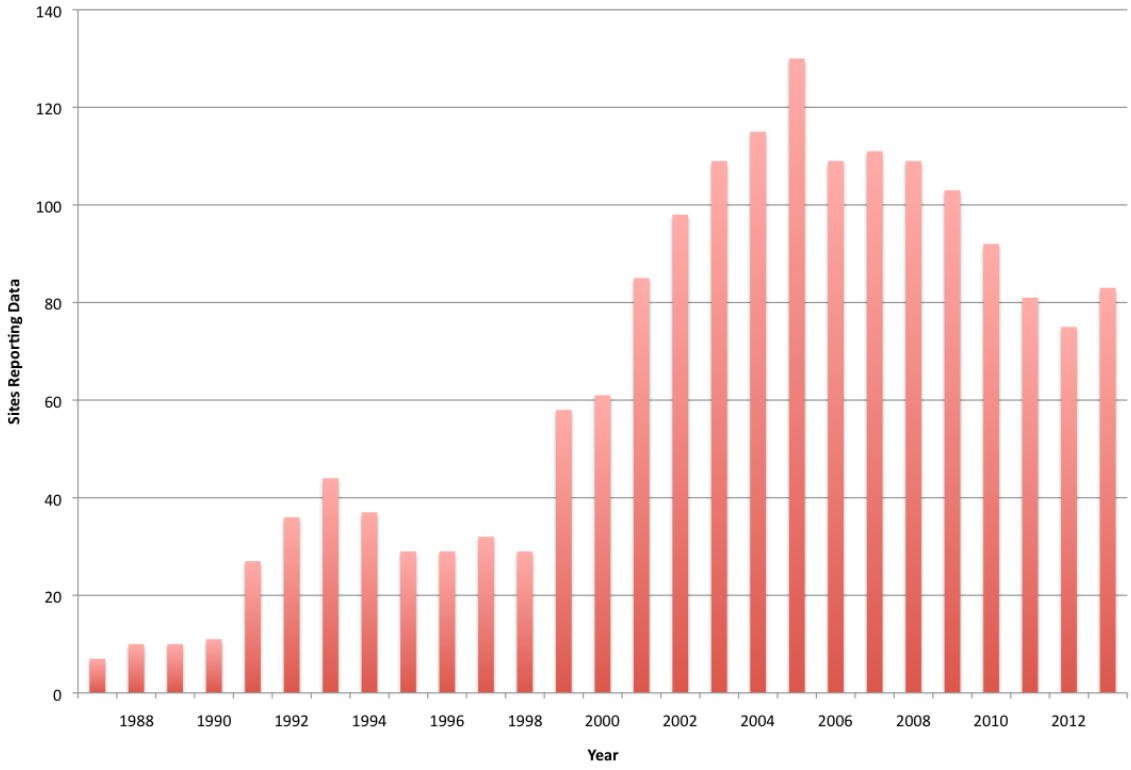

Figure 2. Number of sites reporting data via the Illinois Butterfly Monitoring Network

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