# 2015 SCIENCE REPORT

**The Nature Conservancy in Illinois**

The Nature Conservancy
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Compiled and edited by Sarah Hagen, Allison Cisneros, Maria Lemke, Sally McClure, and Jeff Walk; March 2016.


**Front Cover**: Prescribed fire at Nachusa Grasslands. Photo by Andrew Simpson.

The goal of this report is to summarize and catalog the diverse array of research conducted by staff from The Nature Conservancy and on The Nature Conservancy's project areas in Illinois during 2015. Special thanks to the researchers listed throughout the document, and to the staff of The Nature Conservancy in Illinois who contributed information for this report.

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We also thank the members of the Science Advisory Committee of The Nature Conservancy in Illinois's Board of Trustees. Their insight, experience, and guidance have greatly improved the strength of our work.

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**Highlights from the 2015 Research Report:**

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# 2015 FEATURE

## ILLINOIS FIRE NEEDS ASSESSMENT: PREPARED FOR THE ILLINOIS PRESCRIBED FIRE COUNCIL

For many millennia, landscape scale fire has shaped the habitats of North America. The native flora and fauna have adapted to fire's selective force. When native people migrated to the continent, they increased the presence of fire on the landscape, utilizing fire as a tool and shaping the ecologies of the land. In more recent history, the prairies have been tilled, forests have been leveled and the fires have ceased. Today, the natural areas we have inherited are waiting for the return of restorative fires. Natural areas managers are working to literally carry the torch.

Prescribed fire is the most important stewardship practice in maintaining and restoring healthy landscapes. The health of natural areas depends on repeated application of large–scale fire; fire that will keep brush from taking the sunlight from woodlands, wetlands and grasslands. Without fire, natural areas become thickets of invasive brush with plants and animals languishing in unhealthy habitat.

To promote and expand the use of prescribed fire in Illinois, the Fire Council developed this statewide fire needs assessment. This is the first systematic report in Illinois documenting the number of acres being burned annually and identifying how many acres need to burn annually to promote ecosystem health. This snap shot review is a call to action for land managers, legislators and the general public.

The fire needs assessment demonstrates:

- Dramatically more acres need to be burned annually.
- Natural areas need to be managed with prescribed fire at a much higher frequency.
- Far too many degraded acres across the state are in need of fire, in combination with chemical treatment or mechanical removal of invasive vegetation to restore ecological integrity.
- Considerably more resources need to be allocated to prescribed fire programs.

### Current Use of Fire on Conservation Lands

In 2015, the Illinois Prescribed Fire Council solicited data from partner agencies and organizations throughout the state of Illinois as an initial step in creating the fire needs assessment. Specifically, the Council asked respondents for (1) total area of land ownership, (2) area in land cover/land use types not appropriate for prescribed fire (buildings, roads, lawns, row–crop, open–water etc.); (3) degraded, non–flammable acres (buckthorn/honeysuckle thickets, etc.); (4) "burnable" area; and (5) total area burned between June 2014 and May 2015.

Twenty–five responses were received, representing over 1 million acres. Respondents included federal, state, and local agencies, not–for–profit land trusts, a university and a private individual landowner. For reference, there are at least 1.3 million acres of conservation and parkland in Illinois, owned by more than 200 agencies, organizations, and individuals (source: Aaron Lange, The Nature Conservancy). The total does not include the more than 150,000 acres in permanent Wetland Reserve Program or Conservation Reserve Enhancement Program easements, but not otherwise in conservation ownership.

Key Findings:

- Of the 1,049,000 acres reported, some 24% were in fire–inappropriate land cover types (picnic areas, cropland, open water).
- Of the remaining 793,194 fire–appropriate acres, only 6% (50,789 acres) were burned during the survey year.
- 20% of conservation lands are too degraded to carry effective, healthy, needed fire. Chemical treatment and mechanical removal of invasive vegetation are needed in combination with prescribed fire to restore ecological integrity. Without committed and supported conservation efforts, these numbers will increase over time.

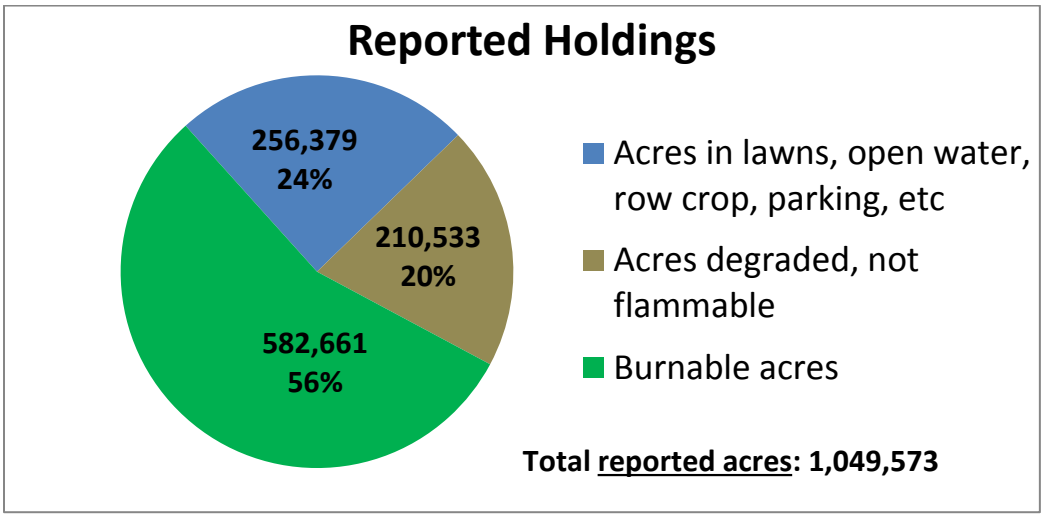



**Figure 1: The 25 survey respondents reported general conditions on over 1 million acres of conservation land holdings. Of these lands, approximately 24% are not natural/terrestrial habitat, 20% are degraded to the point that they will not burn and only 56% are considered healthy enough to burn.**

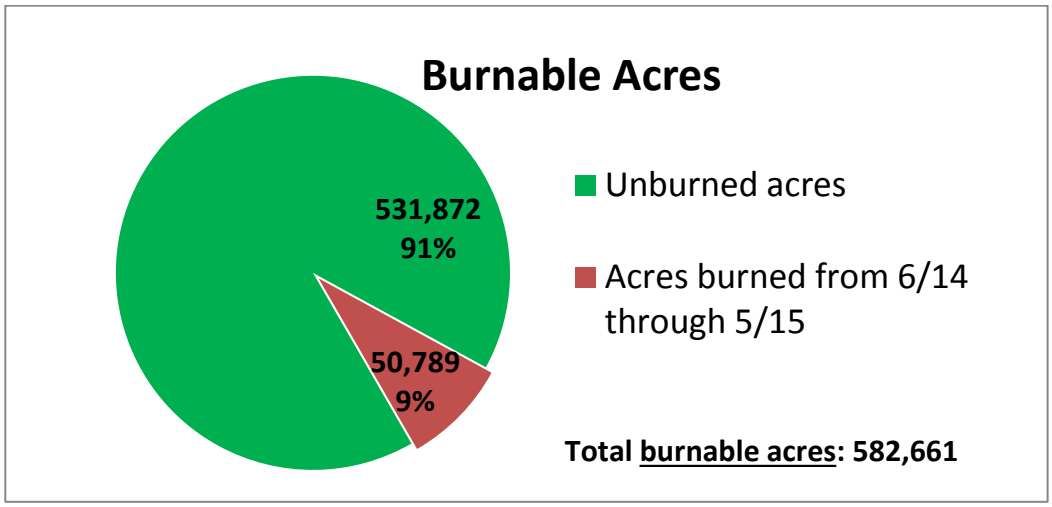



**Figure 2: Of the 582,000 acres of reported burnable acres, only about 9% (50,789 acres) was burned during the survey period. This translates to a roughly 11–year Fire Return Interval (FRI).**

## The Fire Gap on Conservation Lands

We surveyed fire managers and experts across the state (and received 24 responses), asking them to provide a range of fire return intervals (i.e., the frequency at which fire ought to return to an area) for 27 distinct habitat types as identified in the Illinois Natural Areas Inventory (INAI). We asked them to identify which communities were important to them as a fire manager, and to report the range of fire return intervals needed to restore or remediate degraded examples of each community type ("restoration" fire return interval), and the range of fire return intervals needed to maintain good quality examples of each community type ("maintenance" fire return interval).

Results suggest that fire managers recommended shorter fire return intervals during the restoration phase (most commonly 1–2 years in prairie communities, and 1–3 years in savanna, barren, woodland and forest communities), and longer fire return intervals to maintain communities (most frequently 2–4 years for prairies, 2–5 years for savanna, barrens/woodlands, and 3–10 years for forest communities).

To estimate the amount of prescribed fire that survey respondents would need to apply to restore or maintain ecological health of their land holdings, we applied the most frequently recommended ranges of fire return intervals (2–5 years) to burnable acres. Since area estimates of community types were not available from most respondents, we were not able to apply the recommended ranges of fire return intervals to specific community types. To achieve each example fire return interval, we calculated simple annual averages of prescribed fire that would be required (e.g., 2–year fire return interval = 50% burnable acres burned/year; for 5–year fire return interval = 20% burnable acres burned/year). We compared each of these fire return interval acreages to the acres reported burned from June 2014–May 2015, and calculated the shortfall in acres burned, if any, to achieve the target fire return interval ("Acres Short") as well as the percentage of the acreage burned to achieve the target fire return interval (% target burned).

**Table: Median Fire Return Intervals (FRI) for INAI habitat types in Restoration and Maintenance phases.**

| | Restoration Phase | | Maintenance Phase | |
|---|---|---|---|---|
| **INAI Community Type** | **Median Low FRI** | **Median High FRI** | **Median Low FRI** | **Median High FRI** |
| Dry upland forest | 2.5 | 4 | 4.5 | 7 |
| Dry–mesic upland forest | 2.5 | 4 | 5.5 | 6.5 |
| Mesic upland forest | 3 | 5.5 | 6 | 7 |
| Mesic floodplain forest | 4 | 5 | 4.5 | 15 |
| Wet–mesic floodplain forest | 5 | 8 | 12.5 | 15 |
| Wet floodplain forest | 7.5 | 7.5 | 10 | 12.5 |
| Flatwoods | 2.5 | 3 | 4.5 | 7.5 |
| Dry woodland | 1 | 3 | 3 | 5 |
| Dry–mesic woodland | 1 | 3 | 2 | 5 |
| Mesic woodland | 1 | 3 | 2 | 5 |
| Dry sand woodland | 1 | 3 | 3 | 5 |
| Dry mesic sand woodland | 1 | 3 | 3 | 5 |
| Dry/dry–mesic prairie | 2 | 2.5 | 2.5 | 4 |
| Mesic/wet–mesic prairie | 2 | 3 | 2.5 | 3.5 |
| Dry–mesic sand prairie | 2 | 2.5 | 3 | 5 |
| Mesic sand prairie | 2 | 2.5 | 2.5 | 4.5 |
| Hill prairie | 2 | 3 | 2.5 | 3.5 |
| Dry–mesic savanna | 2 | 2.5 | 3 | 4.5 |
| Mesic savanna | 2 | 2.5 | 2.5 | 4.5 |
| Dry–mesic barren | 2 | 3.5 | 3.5 | 5 |
| Swamp | 4 | 7 | 7 | 10 |
| Sedge meadow | 2 | 3 | 3.5 | 5.5 |
| Glade | 2.5 | 3.5 | 3.5 | 5 |
| Cliff/bluff/talus | 3 | 4 | 4 | 5 |
| Pastureland | 3 | 4 | 3.5 | 4.5 |
| Successional field | 2.5 | 3 | 3.5 | 6 |
| Tree plantation | 7.5 | 10 | 8.5 | 12.5 |

Key Findings:

- Respondents on average burned 52% of the acres needed in order to achieve a 3–year fire return interval on their respective holdings, effectively a 6–year fire return interval for burnable acres.
- To achieve a 3–year fire return interval across the state, **213,000 additional acres of conservation lands need to be burned annually** – 400% more than the 50,789 acres reported in the survey year.
- A few agencies and organizations were using prescribed fire at a pace to achieve a 2–4 year fire return interval.

## Statewide Fire Needs

To expand the scope of this fire needs assessment beyond the respondents and one million acres under their management, we estimated the total amount of annual prescribed fire that would be ecologically appropriate for the entire state, across all land ownership. This estimate was derived by applying the ranges of restoration and maintenance fire return intervals to the area of all fire–appropriate community types across the state, as mapped and defined by LANDFIRE.

LANDFIRE (Landscape Fire and Resource Management Planning Tools) is an innovative project designed to create and periodically update comprehensive vegetation, fire and fuel characteristics data using a consistent process for the entire United States. The LANDFIRE Program has created a fully integrated national data information framework that develops and improves vegetation and fuels data products based on the best available authoritative data and science in an all lands landscape conservation approach based on inter–agency/inter–organizational collaboration and cooperation.

To create a measure of current fire return interval within each vegetation community, we selected the low–end and high–end fire return interval ranges from each survey response into a single table and identified the median value. This value was then added to a table showing current acres of each vegetation type on the landscape. From here, we were able to calculate the recommended acres of each vegetation type that should be burned each year in order to maintain good examples of existing community types and in order to restore degraded examples of existing community types. This gave us a baseline against which to compare current on–the–ground fire practices within Illinois.

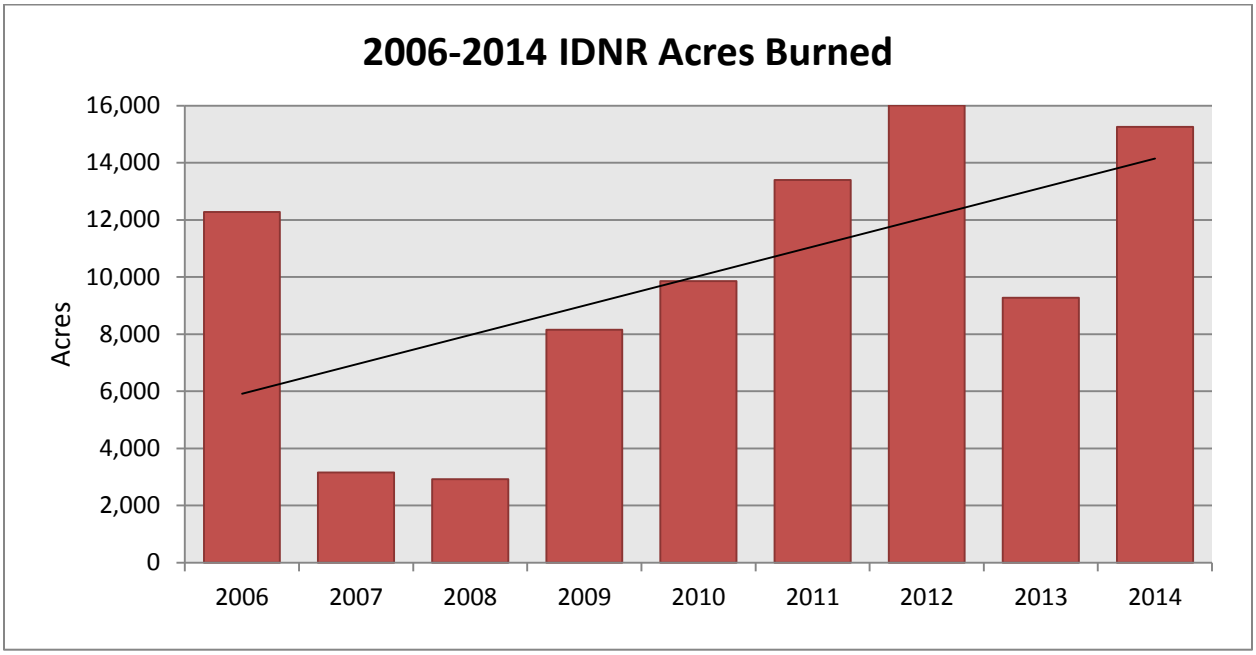
Key Findings:

- Within Illinois, there are some 8.5 million acres of fire–appropriate habitats, most of which is upland forest (2 to 5 year fire return interval) and grassland communities (2 to 4 year fire return interval).
- Nearly 1.9 million acres of prescribed fire would be required annually across all land cover types and land ownerships to maintain current ecological conditions statewide.
- To restore ecological conditions after decade of fire suppression and non–native species invasion, 3.6 million acres should be treated with fire each year across Illinois.
- Similar to (or more likely, worse than) conservation lands, a substantial fraction of habitat statewide is too degraded to carry fire. While fire is key to restoring ecological integrity of habitats across the state, it is not sufficient to achieve recovery, and must be accompanied by mechanical or chemical treatments.

## Fire Implementation: Successes and Challenges

There are many other examples of fire programs from varying agencies/organizations across the state that are increasing their annual acreages burned. The Illinois Department of Natural Resources is the largest landowner in the state of Illinois. Like many other large agencies, IDNR has numerous parcels of land of varying quality and size, a wide-ranging mission with an array

of shareholders and institutional limitations that go hand–in–hand with large bureaucratic organizations. In addition, budget issues within the State of Illinois have impacted the IDNR and all other aspects of state government. Despite these challenges, the IDNR has been able to achieve a trending increase in the number of acres burned over the past decade.



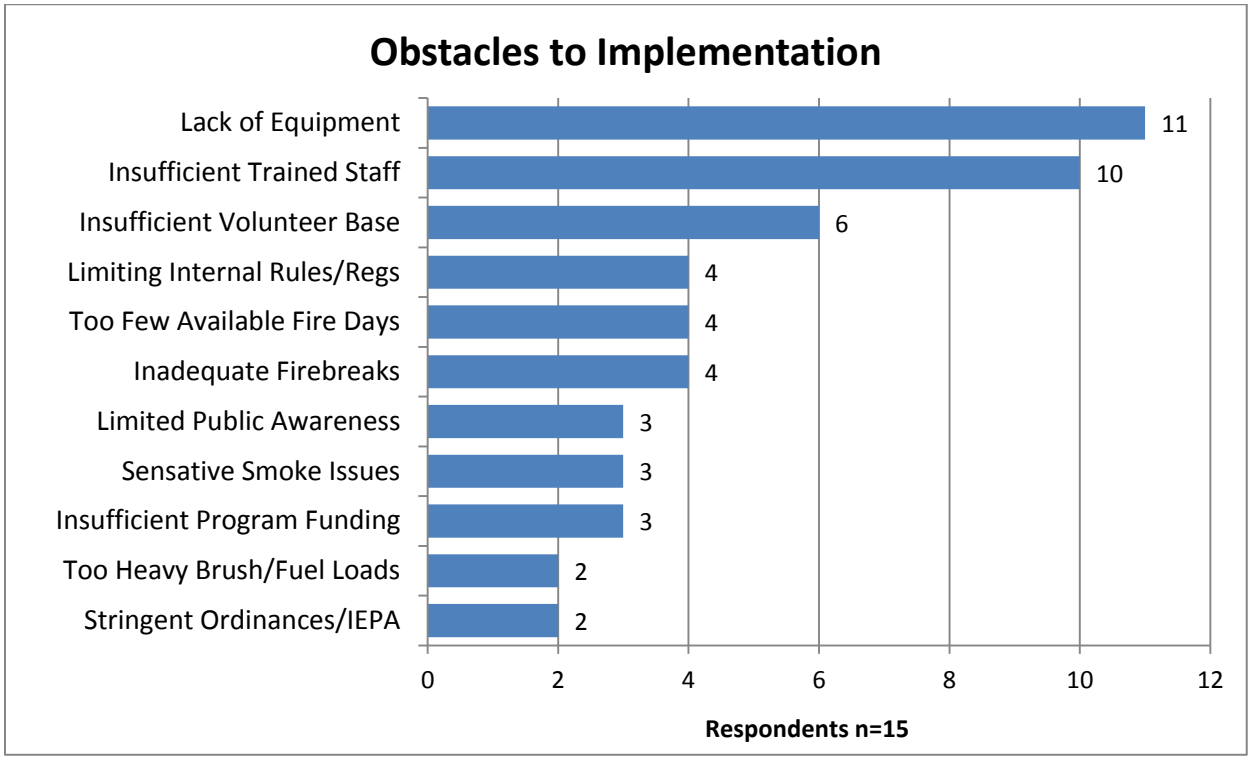

**Habits of Effective Prescribed Fire Programs**

- Annual burn reports are written that demonstrate what was done, what was not accomplished and suggest ways to improve the program
- Fire is viewed by the land owners as a vital stewardship activity
- Safe protocols are followed, crews have good maps and safety is seen as a priority
- All good fire weather days are used to put fire on the ground
- Burn units are as large as feasible with good and wide fire breaks
- Enough equipment is available to handle breakdowns and various contingencies
- Fire crews are motivated, trained, fit and empowered to put fire on the ground as often as possible
- A fire culture is encouraged, neighboring agencies are mentored, expertise is shared and a vision of sustainable fire programs for the entire region is envisioned

Robust and effective fire programs vary across the state and take many forms depending on the size of an agency/organization, the number and quality of managed acres and the amount of resources available to land managers. The Fire Council surveyed agencies and organizations, ranging for large statewide agencies to small non–profits, asking for the factors that limit their fire programs. Responses ranged from small challenges (*I need five more radios*) to big challenges (*I don't have enough trained staff*) to existential challenges (*Fire is not a priority for my organization/agency*).

While only three respondents stated that a lack of funding was an obstacle for implementing fire on the landscape, it can be reasonably assumed that nearly all agencies and organizations face limitations due to budgetary constraints. Increased prescribed fire budgets could help to alleviate the major challenges reported here of equipment and staffing shortages.

While no amount of budget increase can improve the weather or the number of available burn days, greater funding can make agencies better equipped, better staffed and more able to utilize marginal burn days. With increased budgets, land managers could allocate more resources to improving and expanding fire breaks, to training volunteers and to building partnerships with other agencies.




## Recommendations of the Prescribed Fire Council

In order to continually maintain and further restore the ecological health of Illinois' natural areas, a substantial increase in the use of prescribed fire needs to take place across the state. As demonstrated in this fire needs assessment, only 9% of burnable acres were managed with fire during the survey year, effectively an 11–year fire return interval for Illinois' most quality habitat acres. To meet a fire return interval of three years for these acres, nearly 145,000 additional acres need to be burned annually. To meet this challenge, a substantial increase in funding and resources must occur statewide.

Of over 1,000,000 acres represented in this report, over 200,000 acres (20%) were qualified as ecologically degraded. These areas are in dire need of active management and restoration – fire

in combination with chemical treatment or mechanical removal of invasive vegetation. To meet a fire return interval of three years for degraded and burnable acres, an additional 213,000 acres need to be burned annually. To meet this and other ambitious targets, the Illinois Prescribed Fire Council recommends the following for agencies and organizations across the state:

Funding: Prescribed fire programs urgently need considerable increases in budgets and funding in order to close the fire gap and effectively manage Illinois natural areas. It is imperative that the fire community clearly demonstrate to state leadership, agency administrators and the general public the profound importance of prescribed fire and the vital role it plays in managing Illinois' natural wonders.

Training and Mentoring: Promote a culture of fire wherein the use of prescribed fire is valued, supported & expected. It is essential for conservation groups to lead by example (modeling appropriate fire management for the public, private landowners, other organizations) and for the IDNR and USFS in particular to meet intra–agency fire targets to measurably close the overall fire gap on conservation lands. Agencies with fire experience and resources need to mentor inexperienced agencies and private landowners. Basic fire trainings should be offered to all staff with hands–on experience included.

Private Land Support: State and federal agencies with private lands programs need to put greater emphasis on fire management of wildlife habitat and natural areas. Habitat plans for private lands should be designed to make prescribed fire safe and efficient for the landowner. Governmental agencies need to empower their staff to lead and participate in prescribed fire on private lands.

Staffing: In Illinois, prescribed fire is a seasonal endeavor. Agencies need to direct permanent staff with various duties to support fire programs with tasks such as fire break creation/maintenance, equipment repair/maintenance, as well as filling out fire crews. Agencies of size need to have multiple roaming fire crews and hiring seasonal help will be necessary. In order to reach target fire return interval acres, there must be an "All Hands on Deck" mentality wherein agencies prioritize fire preparation and fire operations with additional staffing during prescribed fire season.

Volunteer Opportunities: Volunteers have been important additions to fire crews across Illinois for decades. Committed volunteers should be offered the same training and opportunities as paid staff. Volunteers can support a fire program in a variety of ways including maintenance of vehicles and pumper units, prepping fire breaks, assisting on the fire line, conducting citizen science and monitoring and by being strong vocal advocates in the community.

Equipment: Fire crews need to have access to low volume/high pressure (ten gallons per minute at over 200 psi) water sprayers bolted onto mobile utility vehicles and/or pickup trucks. Most fire crews need a minimum of three such units on a fire. To refill these water sprayers, backup water supplies need to be on site. This backup could be a large water tank on a trailer with a centrifugal pump to refill sprayers; or perhaps a pump set up in a pond or creek for refills. Other equipment

needs include portable radios, fire retardant suits and drip torches. To burn more acres, fire programs needs to be better equipped.

Burn Unit Design: Burn units should be large and follow well–marked property boundaries whenever possible. Working with neighbors may allow fire breaks to bypass obstacles such as steep terrain or wetlands. All habitat types should be included in the burn units. Fires should burn through woodlands, across wetlands and into prairies. Too many land managers and fire practitioners are repeat burning little prairies and not including adjacent habitats.

Fire Breaks: Effective fire breaks allow crew and vehicles safe and efficient control of the fire perimeter. Fire breaks should be free of brush, stumps and impassable wet areas when possible. Season long mowing of fire breaks keeps fuel loads down. For fire breaks mowed once, raking is effective to remove fuel from the break. In woodlands, leaves can be blown off the break with backpack or tractor mounted air blowers. Scratching in make shift, day of control lines may be sufficient in some cases but should be the exception, not the norm. Invest time and resources in durable, wide breaks that support safe and effective fire operations.

Available Fire Days: Managers must utilize every burn day possible. Agencies should do what is possible to limit meetings and deadlines due during these critical periods. Hunting programs should be designed to not interfere with fire operations. Agencies with hunting programs should rotationally burn areas or allow for portions of the preserve to be burned each year.

EPA Liaison: IDNR is in the best position to be liaison between the prescribed fire community and the Environmental Protection Agency as the EPA works to implement clean air standards.

Outreach: Agencies should use this assessment to educate and motivate their staff to close the fire gap. A companion slide presentation of this report is available. The assessment offers an opportunity for agencies to reach out to the general public through local media to advocate for prescribed fire. An example press release will be made available by the Fire Council.

Fire Action Plan: Agencies/organizations are encouraged to report back to the Illinois Prescribed Fire Council by October 2016 with a fire action plan to close the gap within respective agencies and organizations. The plan should include an annual assessment component.

Statewide Assessment: In 2019, the Illinois Prescribed Fire Council will update the statewide fire needs assessment. To improve the scale, scope and vision of the assessment, future needs include:

- Greater representation of counties/agencies/organizations state wide, including private lands which are effectively unrepresented currently
- Include budgets for prescribed fire programs
- Report fire data including number of burn days, largest single burn unit and crew size, etc.
- Breakdown of reported acres by INAI habitat types and restoration or maintenance phase
- Select random points in INAI sites and determine fire frequency at INAI sites

- Develop a mobile app or database to report fire operations including GIS data
- Assemble a bibliography of citations on fire ecology
- Work with the Midwest Fire Science Consortium

**Acknowledgements**
We wish to thank the staff from 25 various agencies and organizations who took the time to give us the data that we have requested.

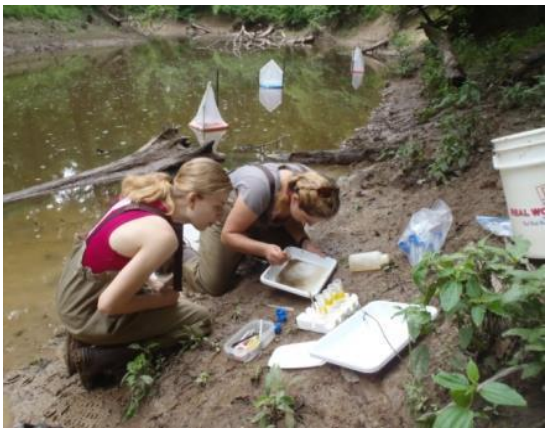
For a copy of this report, please visit:
Website: IL Prescribed Fire Council
Facebook: facebook.com/Illinois–Prescribed–Fire–Council

*Michael Saxton, Bill Kleiman, Sarah Hagen, Jeff Walk*

# 2015 Research at Project Sites

## CACHE RIVER

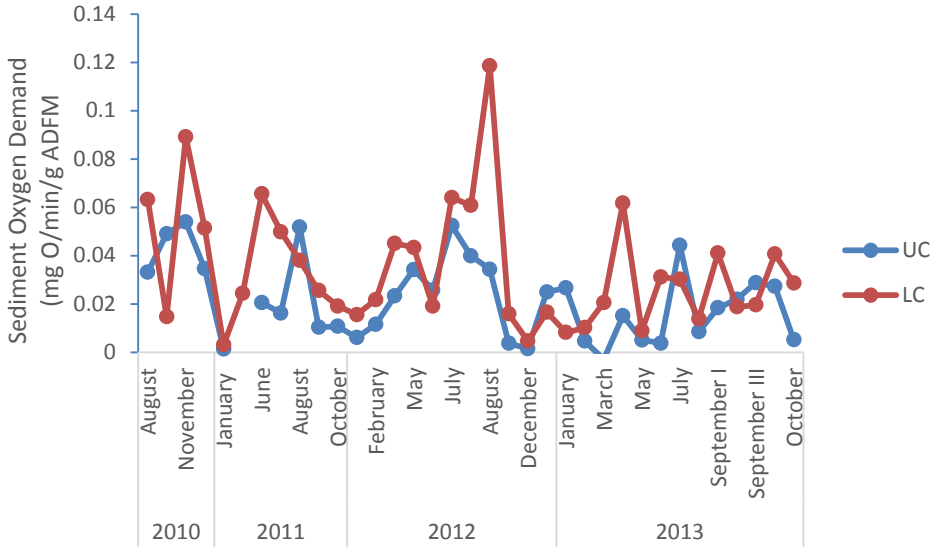
### Demonstrating the benefits of Stream Restoration to Aquatic Communities in the Cache River Basin



***Research Undergraduate Experience student, Alicia Beattie, left, and Post-doctoral Fellow, Heidi Rantala, right, collecting macroinvertebrates for Alicia's project during the summer of 2013.***

The Cache River watershed has been the site of numerous restoration efforts focused on reversing habitat loss and degraded water quality associated with human alterations of the watershed. Returning the stream hydrology to a more natural state by reconnecting the upper Cache River to the lower Cache River has been proposed, with the goal of benefiting in–stream communities. However, there are concerns about how re–connection will affect flooding and questions regarding the degree of biological benefits that will actually be realized. In response to this, we simulated reconnection to the upper Cache by pumping water into the lower Cache from the adjacent Buttonland Swamp. We focused on responses of dissolved oxygen but also predicted that macroinvertebrate community structure will change, with increases in diversity, abundance, biomass, and production of important groups such as filter–feeding caddisflies, which represent major food sources for many stream fishes.

Oxygen demand in the sediments from the lower Cache River had a higher sediment oxygen demand than those from the upper Cache River. Breakdown rates of leaf litter in the lower Cache River were significantly lower than breakdown rates in the upper Cache River. Flow in the LCR has been drastically reduced because of disconnection of the headwaters allowing a thick layer of duckweed to form across many reaches of this section of the river during low flow periods, reducing both dissolved $O_2$ and light penetration. Decreased light penetration further reduces oxygen levels by inhibiting photosynthesis of submerged vegetation, and duckweed does not contribute $O_2$ to the water column.




**Sediment oxygen demand (SOD) from benthic sediments in both the upper (blue line) and lower (red line) Cache River. Mean SOD is higher in the lower Cache River than the upper Cache River.**

Macroinvertebrate communities varied significantly between the upper and lower reaches of the Cache River, and the lower Cache River had more variability in macroinvertebrate production than the upper Cache. The upper Cache River had higher biomass of macroinvertebrate taxa that are associated with higher quality streams. There were also higher biomass values for passive filter–feeders, which rely on water movement for food delivery, and *Elmidae*, which are sensitive to low oxygen conditions.

*H. M. Rantala, and M. R. Whiles, Southern Illinois University*

## ILLINOIS RIVER: EMIQUON & MERWIN PRESERVE AT SPUNKY BOTTOMS

### Update on Emiquon Key Ecological Attributes

During pre–restoration planning, a series of meetings held with scientists and managers from The Nature Conservancy, universities, state and federal agencies, and other not–for–profit conservation groups produced a document in 2006 that specified Key Ecological Attributes (KEAs) and Indicators for selected Illinois River targets most relevant at Emiquon (*Boltonia decurrens*, riverine and backwater fishes, freshwater mussels, floodplain plant communities, waterfowl, and wading birds). This KEA document provides a framework to evaluate and guide restoration and management at Emiquon based on indicators for these targets such as: native vs. exotic fish assemblages, fish nursery and over–wintering habitat, waterfowl and shorebird feeding and nesting habitat, aquatic and moist soil community composition, and mussel feeding, reproduction, and composition. Modifications to KEAs and indicators were discussed and adopted in 2013 for several reasons: some indicators initially described with qualitative terms were given quantitative measures, desired ranges were established for indicators lacking them or given 'provisional' ranges, additional attributes have emerged as important indicators of system condition, and methodologies to measure some indicators have proven ineffective, impractical or unwarranted.

The KEAs and their indicators are documented on an Excel spreadsheet, which is updated at the end of each calendar year using data collected from multiple research studies at Emiquon by Forbes Biological Station, Illinois River Biological Station, University of Illinois at Springfield and the Conservancy. We analyzed the status of the KEAs over the last seven years to assess restoration and management results. On average, 71% (range 68%–75%) of all indicators were monitored at the Emiquon Preserve between 2008 and 2014. Status of aquatic vegetation KEA indicators fluctuated annually with changes in water depth and transparencies, and an average of 50% were classified as "in range" of the acceptable range of variation over the study period. Increased presence of Eurasian watermilfoil (*Myriophyllum spicatum*) beginning in 2010 and persistent dominance of cattails (*Typha latifolia, T. angustifolia*) exceeded the desired indicator ranges. An average of 62% of riverine and backwater fish indicators were "in range" during the study period. A positive trend over time of the numbers of fish indicators that were "in range" was associated with spawning and nursery KEAs specific to accessibility of the preserve to riverine fish after the levees were overtopped by a historic flood event in 2013. Waterfowl indicators classified as "in range" declined over time, averaging 52% during the study period. A sustained decline in waterfowl indicators associated with total and relative duck use days comprised the majority of the indicators that fell out of the desired ranges beginning in 2012, likely associated in part with reduced foraging and nesting habitat for migratory waterfowl after water levels increased inside the preserve in 2013. Conservation efforts to date are just the initial steps towards restoration of ecological integrity at the Emiquon Preserve with the next step being establishment of managed connectivity between the preserve and the Illinois River. Continued review of the KEAs, modification, and documentation in conjunction with a strategic monitoring program will provide critical information to guide relevant management decisions that can achieve restoration goals.

*Maria Lemke, Jeff Walk, & Doug Blodgett, The Nature Conservancy*

## Yellow Spring Instruments water quality monitoring at Emiquon Preserve

Water quality data are collected at Emiquon using monitoring equipment donated by Yellow Springs Instruments out of Yellow Springs, Ohio (YSI). Data collected include: dissolved oxygen, water temperature, turbidity, pH, conductivity, chlorophyll a, and water depth. Units are programmed to collect data every 15 minutes and transfer the data to an online storage site (EcoNet), which can be accessed through the internet. One to three YSI EcoNet units have been installed at Emiquon since 2005 in the main ditch near the pumping station. The YSI EcoNet unit located near the pumping station is also connected to a weather station that provides data on rainfall, wind speed and direction, barometric pressure, solar radiation, and air temperature.

*Maria Lemke & Sally McClure, The Nature Conservancy*

## Zooplankton

Zooplankton are animals that drift in the currents of oceans, seas, and freshwater systems. They are usually microscopic, although some can be seen with the naked eye. Some of the common types of freshwater zooplankton include rotifers, ostracods, copepods, and cladocerans. They play an important role in freshwater systems, both as consumers of algae and as valuable food resources for fish, waterfowl, and other organisms.

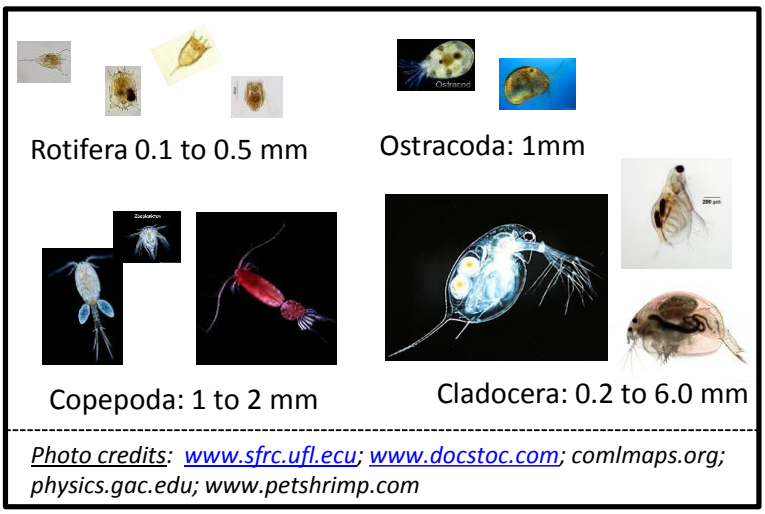



*Photo credits: www.sfrc.ufl.ecu; www.docstoc.com; comlmaps.org; physics.gac.edu; www.petshrimp.com*

In April 2013, water levels in the Illinois River reached historic flood heights that resulted in two contrasting levels of flooding at the Emiquon and Merwin preserves. Water overtopped the levees for several days at the Emiquon Preserve, inoculating the backwater site with river water, sediment, nutrients, and organisms; however, the levee was not breached during the flood. The levee was breached at the Merwin Preserve during the flood, resulting in an unmanaged connection with the Illinois River.

We measured zooplankton abundances and diversity from these two sites during the year following the 2013 flood. We hypothesized that the short–term inundation of the Emiquon Preserve by the Illinois River would increase zooplankton diversity with the introduction of nutrients and riverine zooplankton species; whereas, the massive inflow of river water into the Merwin Preserve would result in lower abundances and diversity.

Abundances were higher at the Emiquon Preserve than the Merwin Preserve on almost every sampling date (Figure 1).



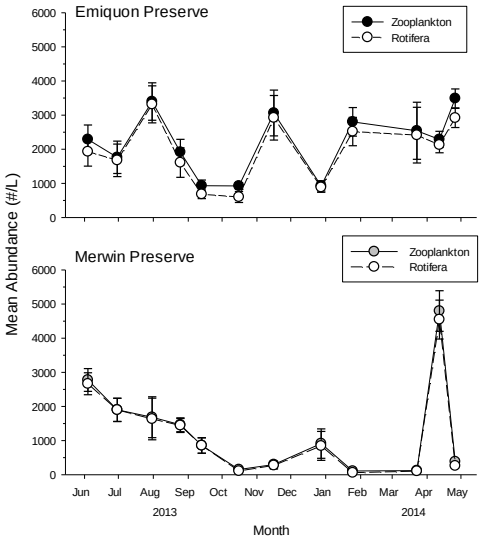



*Figure 1. Zooplankton abundances at Emiquon and Merwin preserves, 2013-2014.*

Zooplankton communities were comprised primarily of rotifers at both sites (83%–95% of total densities); however, cladocerans and copepods were much more abundant at the Emiquon Preserve than the Merwin Preserve throughout the year (Figure 2).

Mean annual diversity was higher at the Emiquon Preserve (0.82 ± 0.08) than at the Merwin Preserve (0.65 ± 0.08). Seasonal patterns of diversity were similar at both sites, with higher diversity in the spring and summer and a pronounced decline during the winter months (Figure 2). Higher diversity in the summer at the Emiquon Preserve was due to increased numbers of species, from 17 to 39 species between May and August 2013. During the period of lowest diversity, the zooplankton community was dominated by the rotifer, *Synchaeta spp*., which comprised 89% of total densities in November 2013. Similarly, *Synchaeta spp.* comprised 95% of total zooplankton abundances at the Merwin Preserve in November and December.

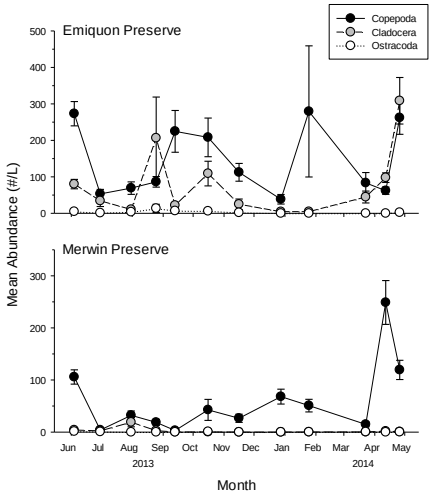



*Figure 2. Mean abundances of copepods, cladocerans, and ostracods at Emiquon and Merwin preserves 2013-2014.*

Data indicate that there were no apparent long-term effects on the zooplankton community at the Emiquon Preserve as there was no clear signal of an inundation of riverine zooplankton species and community composition did not change substantially from previous years (see 2014 Science Report). Additional sampling will be required to assess the river's influence on the zooplankton community at the Merwin Preserve. Preliminary analyses suggest that high nutrients from the river may increase algal production, which in turn may influence zooplankton diversity and community structure. Stay tuned.

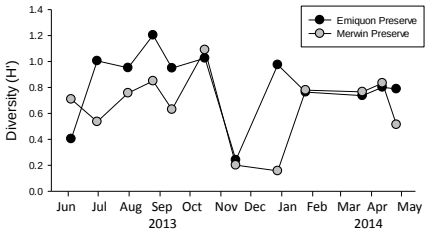



*Figure 3. Zooplankton species diversity at Emiquon and Merwin preserves 2013-2014.*

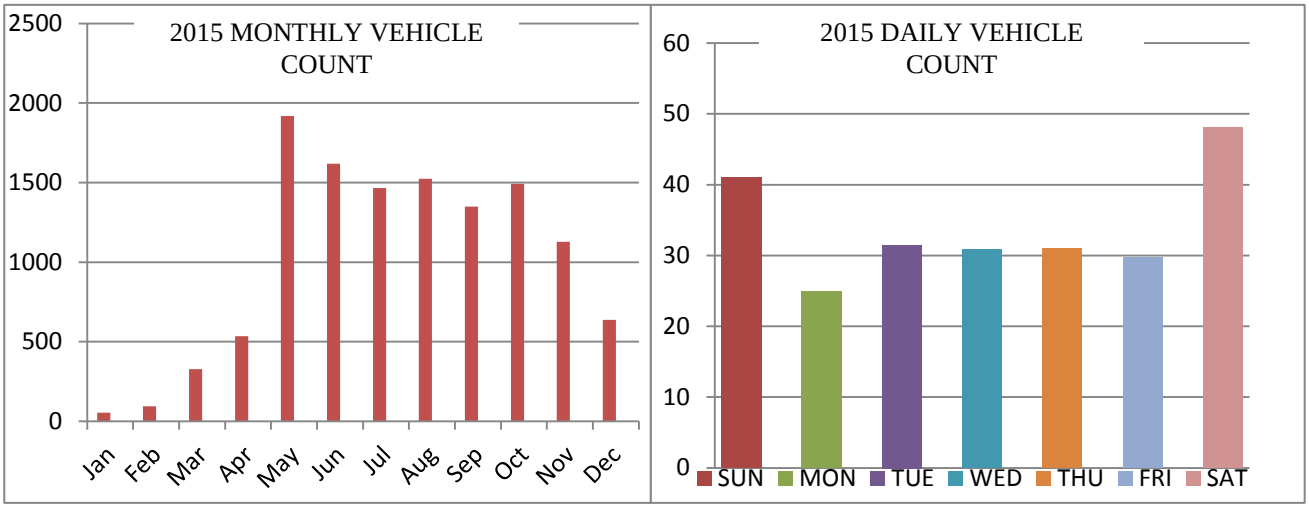
*Maria Lemke, The Nature Conservancy*

## Aerial Photography

Georeferenced, high–resolution (six inches per pixel) Color InfraRed (CIR) aerial imagery was collected in September 2015 for Spunky Bottoms and Emiquon Preserves by staff of the US Fish and Wildlife Service. Images were orthorectified and mosaiced by staff of the US Geological Survey's Upper Midwest Environmental Science Center. Processed imagery will be used as part of long–term monitoring to assess plant community changes at the sites and to provide feedback for adaptive management. The resulting information will also be used to further evaluate the effects of recent record floods on these two sites.

*Douglas Blodgett, The Nature Conservancy*

## Traffic counter




Due to the low snow amounts in December 2014 and January 2015, the Pico Vehicle Count Meter was left installed to count vehicle traffic at the Emiquon Preserve's Visitor Use Area every day in 2015. This data is from 1 January – 31 December 2015. We had a total count of 12,469 cars drive over the counter in that time period. The average weekday count was thirty cars with Tuesdays being the busiest. The average Saturday/Sunday count was 89 with Saturdays seeing the most vehicles. The graph below shows the daily vehicle count for each day Sunday through Saturday. The average weekly count was 290 vehicles and the busiest week was the week of June 5 with 473 vehicles.

The counter encountered some problems and had to be sent in for repairs from 20 – 27 April so traffic was not counted during this time and we are not sure if traffic was counted correctly prior to that for April. Highway 78/97 was closed due to flooding from 26 June – 7 July so traffic was lower due to road closure.

May was the busiest month with 1919 cars followed by June with 1618 cars. The graph shows the monthly vehicle count. The monthly average was 1200 cars.

*Cammy Smith, The Nature Conservancy*

## Fish and Aquatic Vegetation Monitoring

***Emiquon Preserve***

Historically, Thompson and Flag lakes were two of the most productive backwater lakes in the Illinois River Valley (Havera et al. 2003). However, both lakes were disconnected from the Illinois River and reduced to agricultural drainage ditches in the early 1900s. These former floodplain lakes became one of the largest farms in Illinois and remained disconnected behind levees and in agricultural production until 2006. The Nature Conservancy purchased this property in 2000 and began aquatic restoration in 2007. A group of Key Ecological Attributes (KEA's) were developed in 2004 by the Emiquon Science Advisory Council (i.e. The Nature

Conservancy and partners) to serve as the driving management tool, success criteria, and a basis for monitoring endpoints used in this document to describe the Emiquon restoration. Prior to the 2007 restoration, rotenone was applied to the agricultural drainage ditches to eradicate all fish species and allow a new start. The site was allowed to naturally fill through precipitation and >thirty native fish species were stocked based on historical records of both lakes (Havera et al. 2003). The Illinois Natural History Survey's Illinois River Biological Station has been monitoring the aquatic vegetation and fish communities since 2007. The resulting data is used to evaluate whether the project has been successful in restoring the property based on KEA goals (VanMiddlesworth and Casper 2014, 2015, VanMiddlesworth et al. 2014).The knowledge gained may aid in future management efforts at the Emiquon Nature Preserve and other floodplain restoration efforts.

Key Ecological Attributes (KEA's) for the fish and aquatic vegetation communities have been identified as indicators to evaluate the progress of the restoration efforts at Thompson and Flag lakes of The Nature Conservancy's Emiquon Nature Preserve. A total of 19 KEA criteria related to the aquatic vegetation and fish communities were monitored monthly between 4/21/2015–10/23/2015. Of those goals set by the Emiquon Science Advisory Council, 15 were met in 2015.

The 2015 water transparency values were within the desired range (Secchi depths no less than half the maximum water depth when a site is ≤1.5 m deep). Moreover, when 2015 results are compared to 2014, we see that the mean monthly transparencies for April–May were lower than the same period in 2014 while transparencies during June–October in 2015 were higher than the corresponding in 2014.

The aquatic vegetation community in 2015 continued to be dominated by native aquatic plant species. Two invasive aquatic plants including Eurasian watermilfoil (*Myriophyllum spicatum*) and curly–leaf pondweed (*Potamogeton crispus*) were the only non–native aquatic plant species collected and were among the many native aquatic plant species collected in 2015. Eurasian watermilfoil and curly–leaf pondweed were found at more sites and at a higher density than in 2014. An invasive submersed aquatic vegetation species known as Egeria was collected for the first time in 2014 since restoration but was not observed or collected in 2015. Invasive aquatic plant species will continue to be monitored closely in 2016.

The fish community in 2015 continued to be dominated by native species. Despite this, the KEA goal of collecting ≥25 native fish species was not met. However, native species richness continues to increase since restoration began. Perhaps more time may be needed for less abundant species to become established and/or additional stocking may be necessary in order to meet this goal. Bluegill dominated our catches in 2015 and although catches of other desirable native fishes including freshwater drum, grass pickerel, and longnose gar were low, they represented the highest catches for these species ever observed at the Emiquon Preserve. Of the 21 fish species collected, only one non–native species, the common carp was collected in 2015. The total catch of common carp in 2015 was lower than in 2014 and represented the lowest catch of this species since restoration. Also, five young–of–the–year (YOY) common carp (<100 mm) were collected in 2015. Invasive fish species will continue to be monitored closely in 2016.

*Aquatic Vegetation Collected and Observed Species – Thompson/Flag lakes*
We collected and/or observed 15 aquatic plant species (submersed, emergent, non–rooted floating–leaved, and rooted floating–leaved) at 175 out of 210 random sites in 2015. Community composition at vegetated sites was dominated by submersed aquatic vegetation (i.e. coontail, *Ceratophyllum demersum*), followed by 10 other submersed aquatic plant species. Emergent aquatic vegetation community composition was minimal at our sampling sites, but included unidentified *Typha* spp. (broad–leaved cattail, *Typha latifolia*, or narrow–leaved cattail, *Typha angustifolia*). In addition, one non–rooted floating–leaved aquatic plant known as *Lemnaceae* was represented by *Lemna* spp. Rooted floating–leaved species were represented by creeping water primrose (*Jussiaea lutea*) and American lotus (*Nelumbo lutea*). Curly–leaf pondweed (*Potamogeton crispus*) and Eurasian watermilfoil (*Myriophyllum spicatum*) were the only non–native species of aquatic plants collected in 2015. *Egeria Egeria densa* (newly found non–native species at the Emiquon Preserve in 2014) was not observed or collected in 2015. Water shield *Brasenia schreberi* was primarily observed throughout the northeast portion of Thompson Lake but was not present at our sampling sites in 2015.

*Total Fish Catch – Thompson Lake*
We collected 6,945 fishes representing 21 species and 10 families in 2015. Community composition was dominated by bluegill (*Lepomis macrochirus*) followed by gizzard shad (*Dorosoma cepedianum*), black crappie (*Pomoxis nigromaculatus*), largemouth bass (*Micropterus salmoides*), pumpkinseed (*Lepomis gibbosus*), unidentified young–of–the–year (YOY) *Lepomis* spp. (bluegill or pumpkinseed with lengths <40 mm), and golden shiner (*Notemigonus crysoleucas*). Approximately 15 other fish species made up the remainder of the total catch. Common carp (*Cyprinus carpio*) was the only non–native species collected. Fish species that either survived the rotenone, were unintentionally stocked, or were introduced from the Illinois River due to flooding included gizzard shad, common carp, shortnose gar (*Lepisosteus platostomus*), yellow bullhead (*Ameiurus natalis*), freshwater drum (*Aplodinotus grunniens*), black bullhead (*Ameiurus melas*), and bigmouth buffalo (*Ictiobus cyprinellus*).

*Aquatic Vegetation Sampling and Gear Effort – Thompson/Flag lakes*
We conducted aquatic vegetation sampling monthly at thirty random sites from May–September, 2015 at both Thompson and Flag lakes. These former floodplains were sampled as one water body that were spatially stratified into north, middle, and south units. We also sampled an additional thirty random sites (sixty total sites) in July and August during the peak of the growing season. The density of submersed aquatic vegetation (SAV) is based on percent coverage on a vegetation rake, while emergent, non–rooted floating–leaved, and rooted floating–leaved aquatic vegetation density is estimated by percent cover observed within a 2 m circle around the boat. All aquatic vegetation data was collected according to Yin et al. (2000).

*Fish Sampling and Gear Effort – Thompson Lake*
We conducted monthly fish sampling from April–October, 2015 at Thompson Lake using a multiple gear approach at both random and fixed sites. Flag Lake was not sampled due to shallow water depth and dense aquatic vegetation beds that foul our sampling gears. Fish sampling did not use the spatially stratified (north, middle, south) approach of the aquatic

vegetation sampling and instead consisted of 28 pulsed–DC boat electrofishing runs (15 minutes each), 28 fyke net sets (24 hours each), and 28 mini–fyke net sets (24 hours each) at shoreline or pseudo–shoreline (used for shoreline gear) sites. Seven tandem fyke net sets (24 hours each) and seven tandem mini–fyke net sets (24 hours each) were also deployed at open water (pelagic) sites. All gears were fished according to Gutreuter et al. (1995).

*Records to be kept*
Aquatic vegetation – site coordinates, water quality parameters from each site including Secchi, temperature, specific conductivity, dissolved oxygen, and depth, percent composition of submersed, emergent, rooted floating–leaved, and non–rooted floating–leaved vegetation.

Fish –site coordinates, water quality parameters from each site including Secchi, temperature, specific conductivity, dissolved oxygen, and depth, fish species identification, total number, total length, and weight.

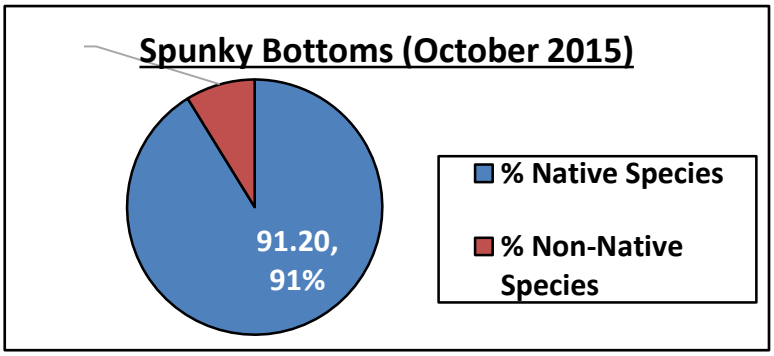
***Merwin Preserve at Spunky Bottoms***
The LTRM program has been conducting an annual one–day pulsed–DC boat electrofishing event at Spunky Bottoms during October, 1999–present. Due to a busy field season, T. D. VanMiddlesworth was asked to lead the electrofishing day for LTRM in 2015. As in past years, IRBS electrofished the only remaining/accessible water there was at Spunky, the pumphouse ditch. This was done on 10/21/2015. IRBS electrofished for one hour to cover the entire pumphouse ditch area of Spunky and lengths and weights of fish were taken. They found that the fish community based on their catches was primarily made up of native species (see Table 1 below). This was interesting because after the 2015 flood and prior to the electrofishing in October, they took a look at Spunky and used the mud motor to take 15 random rakes for vegetation throughout the pumphouse ditch and accessible ditches in August, 2015. IRBS did not collect or observe any aquatic vegetation types/species. However, hundreds of Silver Carp jumping were observed. When they returned in October to electrofish, it appeared that most of the Silver Carp died. Their carcasses were observed along the shoreline.

Table 1.

| **Common name** | **Scientific name** | **Family** | **No.** | **%** |
|---|---|---|---|---|
| gizzard shad | *Dorosoma cepedianum* | Clupeidae | 244 | 35.36 |
| freshwater drum | *Aplodinotus grunniens* | Sciaenidae | 124 | 17.97 |
| black bullhead | *Ameiurus melas* | Ictaluridae | 55 | 7.97 |
| bluegill | *Lepomis macrochirus* | Centrarchidae | 55 | 7.97 |
| western mosquitofish | *Gambusia affinis* | Poeciliidae | 52 | 7.54 |
| common carp | *Cyprinus carpio* | Cyprinidae | 43 | 6.23 |
| orangespotted sunfish | *Lepomis humilis* | Centrarchidae | 34 | 4.93 |
| white bass | *Morone chrysops* | Moronidae | 13 | 1.88 |
| yellow bullhead | *Ameiurus natalis* | Ictaluridae | 12 | 1.74 |
| bowfin | *Amia calva* | Amiidae | 9 | 1.30 |

| | | | | |
|---|---|---|---|---|
| common carp x goldfish | *Cyprinus carpio* x *Carassius auratus* | Cyprinidae | 9 | 1.30 |
| bigmouth buffalo | *Ictiobus cyprinellus* | Catostomidae | 8 | 1.16 |
| silver carp | *Hypopthalmichthys molitrix* | Cyprinidae | 8 | 1.16 |
| green sunfish | *Lepomis cyanellus* | Centrarchidae | 7 | 1.01 |
| brown bullhead | *Ameiurus nebulosus* | Ictaluridae | 3 | 0.43 |
| emerald shiner | *Netropis atherinoides* | Cyprinidae | 3 | 0.43 |
| shortnose gar | *Lepisosteus platostomus* | Lepisosteidae | 3 | 0.43 |
| channel catfish | *Ictalurus punctatus* | Ictaluridae | 2 | 0.29 |
| warmouth | *Lepomis gulosus* | Centrarchidae | 2 | 0.29 |
| black crappie | *Pomoxis nigromaculatus* | Centrarchidae | 1 | 0.14 |
| grass carp | *Ctenopharyngodon idella* | Cyprinidae | 1 | 0.14 |
| largemouth bass | *Micropterus salmoides* | Centrarchidae | 1 | 0.14 |
| river carpsucker | *Carpoides carpio* | Catostomidae | 1 | 0.14 |

690 fish were caught encompassing ten families and 22 species.




*T.D. VanMiddlesworth, Illinois River Biological Station*

**Population Estimates of Indicator Species**

Largemouth bass and black crappie are popular sportfish species, making their study and management a priority for many natural resource agencies and organizations. These species can be used as indicators of the relative quality of aquatic habitats, making them an invaluable resource for both managers and researchers assessing the effects of natural and anthropogenic disturbance in aquatic systems. As such, the Upper Mississippi River Restoration (UMRR) program has labeled both species indicators of ecosystem health, and the Illinois Department of Natural Resources (IDNR) monitors these species in lakes and reservoirs throughout the state, including the Emiquon Preserve.

*Objective* – Establish pre–reconnection population estimates for largemouth bass and black crappie to benefit TNC managers by allowing them to more precisely evaluate the status of sportfish populations within the Emiquon preserve prior to the managed reconnection with the Illinois River and subsequent water level management. Population estimates will allow for calculations of

sportfish density (as a function of water level), which would benefit managers once water levels are managed via the water–control structure, and allow for post–reconnection comparisons.

*Numbers of specimens and species collected, fate of specimens after collection, date collected and Preserve(s) from which they were collected:*
A total of 1,971 largemouth bass and 1,550 black crappie were marked individually with two floy tags (clear) to evaluate tag retention at the Emiquon Nature Preserve during May–October, 2015. Out of the total marked, we collected 84 largemouth bass recaptures and four black crappie recaptures. All fish collected were returned to the water immediately after recording length and whether they were marked or a recapture. Program R population estimate models suggest that largemouth bass population is at 21,090 and black crappie population is at 205,042. These values are not finalized and we are currently evaluating which population estimate models are best.

*Jason DeBoer, Illinois River Biological Station*

## Sportfish Dynamic Rate Functions

The purpose of this project was to investigate species–specific dynamic rate functions (i.e. reproduction/ recruitment, growth, annual mortality) and occurrence of intersex among largemouth bass, black crappie, and bluegill throughout the Illinois River and a disconnected backwater. Objective: document any differences in dynamic rate functions within selected species among the upper IL River, lower IL River, and the Emiquon Preserve.

The following was collected from the Emiquon Preserve; black crappie (n = 118), largemouth bass (n = 75), bluegill (n = 77). All specimens were collected in April and May 2015. They were then sacrificed and necropsies were performed to remove otoliths, gonads, and livers.The Emiquon Preserve was accessed by boat and minimal disturbances were made during fish collections; April 2nd, 7th, 8th, 21st, 27th, 28th and May 21st, 2015.The records kept include collection date, fish length, weight, sex, age, presence of intersex, and presence of parasites. This project took place throughout wetted sections of the Emiquon Preserve.

*Rich Pendleton, Illinois River Biological Station*

## Waterbird and Wetland Monitoring

*Forbes Biological Station Monitoring of Emiquon Preserve – 2015 (Preliminary)*
We monitored the response of wetland vegetation and waterbirds to restoration efforts at Emiquon during 2015 to evaluate restoration success relative to desired conditions under the relevant KEAs. Our primary efforts included evaluating: 1) abundance, diversity, and behavior of waterfowl and other waterbirds through autumn aerial counts and spring ground counts; 2) productivity by waterfowl and other waterbirds through brood counts; 3) plant seed and invertebrate biomass to estimate energetic carrying capacity for waterfowl during migration and breeding periods; and 4) composition and arrangement of wetland vegetation communities and associated cover types through geospatial covermapping.

*Waterfowl Abundance*

***Spring–Fall,*** 2015. We conducted 11 ground inventories from 13 February to 23 April and five aerial inventories from 12 March to 14 April 2015. Peak waterfowl abundance reached 90,852 during a ground inventory on 13 March and 25,170 on 18 March during an aerial inventory. We observed 25 species of waterfowl during spring (19 duck species, three goose species, and three swan species). Lesser snow geese were the most abundant species during ground inventories, accounting for 42% of total waterfowl abundance, followed by gadwall (18%) and lesser scaup (7%). Dabbling ducks were more abundant than diving ducks, accounting for 30% and 22% of the total waterfowl abundance, respectively. Spring waterfowl use–days (UDs) were 932,414 in 2015. Dabbling ducks (534,437 UDs) contributed 57% of the spring waterfowl use at Emiquon, while diving ducks (391,228 UDs) accounted for 42% of the use.

We conducted 16 aerial inventories at Emiquon from 31 August 2015 to 5 January 2016. We observed twenty species of waterfowl (17 duck species, two goose species, and an unidentified swan species) with a peak abundance of 55,986 on 22 October. Gadwall (21%) were the most abundant species, followed by ruddy ducks (17%), mallards (12%), northern shoveler (10.6%) and northern pintail (10.2%). Estimated waterfowl UDs at Emiquon totaled 2,633,174 during fall. Dabbling ducks (1,975,623 UDs) accounted for 75% of UDs, whereas 23% of waterfowl UDs was attributable to diving ducks (615,685 UDs).

*Non–Waterfowl Abundance*

***Spring–Fall,*** 2015. We documented 11 waterbird and raptor species during ground counts in spring 2015. Peak abundance of non–waterfowl species observed during ground inventories was 49,865 individuals on 1 April, whereas aerial inventories revealed a peak of 48,278 individuals on 14 April. American coots were the most common species observed and accounted for 98% and 99% of non–waterfowl abundance from ground and aerial inventories, respectively. American coot abundance peaked at 49,380 (47,815 via aerial inventories), while their overall use of Emiquon totaled 914,576 UDs.

American coots were the most abundant species during 16 aerial inventories in fall 2015. The peak estimate of American coots was 151,920 on 2 November. American coots (5,609,688 UDs) accounted for 99% of non–waterfowl use, followed by double–crested cormorants (0.7%) and American white pelicans (0.5%). American coots contributed 67% of all waterbird use (including waterfowl) during fall at Emiquon.

*Duck Behavior*

We conducted behavior observations ($n$ = 5,059) between 13 February and 23 April 2015. Species observed included canvasback, lesser scaup, redhead, common goldeneye, common merganser and gadwall. These species spent most of their time feeding (50%), followed by locomotion (25%) and resting (19%). Dabbling ducks spent 59% of their time feeding, while diving ducks spent 44% of their time feeding.

*Brood Observations*

We conducted fixed–point brood surveys ($n$ = 8) from 13 May to 27 August 2015 and observed

eighty waterbird broods comprised of eight species, including the state–threatened common gallinule. The most abundant broods recorded in 2015 were mute swans (*n* = 24) and Canada geese (*n* = 23). Brood observations peaked (*n* = 18) on 9 June.

*Aquatic Invertebrates*
We collected nektonic invertebrates via sweep net (*n* = 40 samples) on 12 August along the shores of Thompson and Flag lakes. We sampled invertebrates in wet upland, moist–soil, persistent emergent, hemi–marsh, and aquatic bed vegetation communities. Mean water volume sampled per sweep was 1.5 $m^3$. Invertebrate samples are being processed, and results will be available spring 2016.

*Moist–soil Plant Seeds*
We collected soil cores (*n* = 30) at the terminus of transect lines along the east shore of Flag Lake and the west shore of Thompson Lake on 25 September to estimate seed abundance (kg/ha) and energetic carrying capacity of moist–soil plants for waterfowl. Seed samples are being processed, and results will be available in spring 2016.

*Energetic Carrying Capacity*
We collected benthic core and box samples from random locations within each of four dominant vegetation communities: aquatic bed, hemi–marsh, persistent emergent, and open water (*n* = 80 samples) during 23–25 September to estimate total energetic carrying capacity for waterfowl from invertebrates, seeds, and plant material produced at Emiquon. Samples are being processed, and results will be available in spring 2016.

*Wetland Covermapping*
We mapped all wetland vegetation, open water and areas containing surface water in Thompson and Flag lake basins during 14–21 September 2015 to document changes in wetland area, plant species composition, and vegetation communities. We traversed east–west transects spaced at 500 m intervals on foot, ATV, or by boat and delineated changes in vegetation communities (e.g., moist–soil, hemi–marsh) using a handheld computer (Archer Field PC, Juniper Systems, Inc.) with global positioning system. We recorded plant species encountered along transect lines and delineated vegetation communities or other physical features outside transects. We will digitize wetland vegetation in ArcGIS 10.2 using field notes and GPS waypoints overlaid on high–resolution color infrared aerial photographs from U.S. Geological Survey (Upper Midwest Environmental Sciences Center, La Crosse, WI). The GIS cover layer will be completed in spring 2016.

*Types, dates, and locations of disturbances made on the Preserve*
All disturbances occurred on the Emiquon Preserve. We conducted weekly waterbird inventories during 13 Feb–23 Apr 2015 via 4x4 vehicles and fixed–wing aircraft. Aerial waterbird inventories were conducted weekly during 31 Aug 2015–5 Jan 2016. We conducted bi–weekly brood surveys using 4x4s, jon boats and ATVs at 4 fixed locations around the perimeter of Thompson and Flag lakes during 13 May–27 Aug 2015. We collected invertebrates via sweep net (*n* = 40 samples) on 12 August along the shores of Thompson and Flag lakes using an airboat. We collected 70 core samples and 40 aquatic macrophyte samples during 23–25 September 2015 via airboat. We mapped all wetland vegetation associated with Thompson and

Flag lakes during 14–21 September using ATVs, 4x4s, and an airboat.

Forbes recorded data from our spring waterbird surveys and tabulated them for TNC on a weekly basis. Moist–soil plant seed, aquatic vegetation, and aquatic invertebrate samples will be sorted, dried, and weighed in the lab. Duck behavior and brood observations have been tabulated and summarized and wetland vegetation community data will be digitized to create a covermap. All data will be presented to TNC in the form of an annual progress report.

*Chris Hine, Illinois Natural History Survey, Forbes Biological Station*

**Metabolizable Energy of Duck Foods**

The objective of this research at Emiquon was to determine the forage value of submersed aquatic vegetation (SAV) and possibly other aquatic vegetation by capturing ducks and conducting precision feeding trials to determine energetic value of foods.

Forbes collected Approximately five kg each of coontail (*Ceratophyllum demersum*), eurasion watermilfoil (*Myriophyllum spicatum*), sago pondweed (*stuckenia pectinata*), southern naiad (*Najas guadalupensis*), brittle naiad (*Najas minor*), American elodea (*Elodea canadensis*) across all sample visits. Vegetation was fed to ducks. No ducks were captured or eggs collected from the Emiquon Preserve in 2015. Forbes collected SAV on 7 and 15 September and 8 October 2015 from a boat to feed ducks. The results from feeding trials were kept.

*Heath Hagy, Illinois Natural History Survey, Forbes Biological Station*

**Nest Ecology of Waterbirds**

Forbes proposes to assess the nesting ecology of waterbirds and other wetland birds prior to a water drawdown (i.e., dewatering) of Emiquon Preserve during summer 2015 and following reflooding in subsequent years during the same months. The objectives are to passively quantify 1) nest density, 2) nest success, and 3) wetland characteristics nearby nests of waterbirds (primarily, American coots and sora). A major goal of this project is to provide research opportunities for senior–level undergraduate students under close supervision while evaluating the effects of water management on species of nesting wetland birds at the Emiquon Preserve, a unique Ramsar wetland of international importance.

*Heath Hagy, Illinois Natural History Survey, Forbes Biological Station*

**Spring Diving Duck Ecology**

The research project had a four part objective. Objective 1 was to determine the number and location of diving duck concentrations on the Illinois River Valley (IRV) during spring. This involved flying aerial surveys during spring to determine numbers and locations of diving ducks in the IRV. Forbes uses methods similar to their fall aerial inventories.

Objective 2 was to document distribution of diving ducks within wetlands in relation to habitat composition and quality. It is also to investigate and quantify behavior of lesser scaup and canvasbacks to estimate the functional response of these species to variation and habitat. Forbes performed behavioral observations on lesser scaup and canvasback flocks to determine proportion of time spent in various activities and dedicated to resource allocation. Flock locations were noted on aerial photos or measured using GPS and laser range–finders. Following behavioral observations, Forbes visited flock locations within the wetland to remove up to five benthic soil cores and nektonic net sweeps to estimate forage abundance (seeds and invertebrates).

Objective 3 was to capture and leg band lesser scaup and canvasbacks in the IRV, relatively little information exists on survival, distribution, and recovery rate of diving ducks, especially those that rely on IRV wetlands during spring. Forbes captured and affixed leg bands to lesser scaup and canvasbacks using swim–in traps baited with corn. This method is used successfully by diving duck researches on Pool 19 of the Mississippi River, and the staff at Forbes Biological Station have experience with this method.

Objective 4 was to experimentally collect lesser scaup and canvasbacks to determine foraging habitat condition, diet, and food selection. Blood and tissue samples were taken and the digestive tracts were preserved for subsequent laboratory analysis. Collection of a relatively small number of these birds allows concurrent determination of food use and selection, habitat quality relative to food use, stress levels, parasite loads, and other data vital to understand recent population fluctuations of these species of regional conservation concern.

Across species, male (41%) and female (43%) diving ducks spent similar proportions of time feeding and this was consistently the dominant activity across years. Total food biomass at foraging locations of diving ducks was similar across years of our study and was probably limited in most locations considering foraging thresholds and costs of foraging for diving ducks ($\bar{x}$ = 369.2 kg/ha, SE = 26.7, range = 332.1–501.4 kg/ha). Food density at random locations was similar to foraging locations. Diving ducks showed no indication of foraging patch selection based on densities of total food biomass, seed and tuber biomass, benthic invertebrate biomass, or nektonic biomass. When the data for both the Illinois and Mississippi Rivers were combined, less than half of the feeding locations had greater total food availability than random sites for both lesser scaup (0.45) and canvasbacks (0.49). Forbes collected and analyzed food habits of 262 lesser scaup and 41 canvasbacks in the Illinois and upper Mississippi river valleys. Generally, animal material was observed more frequently and at a greater percent aggregate mass than plant foods in both lesser scaup and canvasback. Notable food items of lesser scaup included dreissenid mussels, chironomids, sphaerid clams, amphipods, pondweed seeds, and millet seeds. Canvasbacks consumed principally animal matter, with mayflies, sphaerid clams, millets seeds, and wild celery tubers as the most common taxa.

A negative mean index of daily lipid dynamics (DLD), indicating foraging habitat quality, was observed in all regions and appeared to vary by region and location. Coarsely, DLD values and food biomass were greater in the central IRV than the Illinois and Mississippi river confluence or

Pool 19, but the relationship between DLD and overall food density was inconsistent among wetlands.

Forbes banded 7,535 lesser scaup and 44 canvasbacks during springs 2012–2015. Anecdotally, they noticed the proportion of juvenile and female scaup increased throughout spring migration each year. They recaptured 1,917 previously banded scaup at their trap locations in the spring of 2015. Forbes estimated that apparent stopover duration of recaptured lesser scaup during spring 2015 was 38% longer than spring 2014; however, apparent time spent during their stay was brief at 9.8 days.

*Aaron Yetter, Conner England, and Jeff Levengood, Illinois Natural History Survey*

## IDNR Fisheries Management

A main goal of The Nature Conservancy's Emiquon Preserve is the restoration and conservation of natural ecological processes and habitats that sustain native plant and animal communities of the Illinois River. A secondary goal is to maintain a sport fishery for native fish of the Illinois River flood plain. According with the IDNR/TNC cooperative fish management plan, the District fisheries biologist Rob Hilsabeck collected, stocked, and conducted other fishery related work and management as necessary. The work was conducted as agreed in the Fish management plan between the IDNR and The Nature Conservancy.

In 2015, the fish population in Thompson and Flag Lakes were surveyed by trapnets in April and D.C. boat electrofishing in October. The April trap netting survey used 24 net nights of effort using 1.5 inch mesh nets. 1,229 fish were sampled and represented 15 species and 1 hybrid. The October boat electrofishing survey used nine stations and a total on–time of 225 minutes. 853 fish were sampled and represented 15 species and 1 hybrid. The survival and recruitment of the state threatened, starhead topminnow was documented. Aa state endangered red spotted sunfish was also collected. The grass pike population continues to maintain a stable population. Increased recruitment was also observed for channel catfish and white crappie populations. The dense submerged aquatic vegetation maintained the diversity of the fish population in 2015. The largemouth bass, bluegill, black crappie, bowfin, spotted gar, shortnose gar, warmouth sunfish, pumpkinseed sunfish, golden shiner, gizzard shad, brown bullhead, black bullhead and starhead topminnow populations were stable in 2015. The total exotic fish collected in these surveys was common carp. The 2015 fall electrofishing survey continued to document a continued dramatic decrease in the number of carp collected per hour since the 2012 fall survey. In 2015, fish flesh samples were collected from common carp, bluegill, crappie and largemouth bass for contaminant monitoring. In 2016, IDNR fish management will involve trapnet and electrofishing surveys to document the evolving fish community, the potential collection of brood fish for stocking other restoration sites and the stocking of additional native fish species.

87 largemouth bass were transported to Citizen's Lake restorations for brood source on 4/2/2015. Two bowfin, two spotted gar, and two brown bullhead were transported to Bass Pro Shop in East Peoria for display in their large aquarium. Eight common carp, eight bluegill, and ten largemouth

bass were utilized for contaminant sampling on 4/2/2015. Ten black crappie were utilized for contaminant sampling on 10/13/2015.

*Rob Hilsabeck, Illinois Department of Natural Resources*

**CH4 and CO2 Measurement Using a Tower at Emiquon**

The project is aimed to measure methane and carbon dioxide emission from the restored wetland at Emiquon. The project is going well. The system has been operated normally. Except for a few incidents with CH4 analyzer, my graduate student Zachary Dolbeare has collected the important CH4 and CO2 flux data and other environmental data in the past. We plan to continue the efforts in 2016. The records to be kept include CH4 and CO2 flux data and environmental data such as temperature and water table.

*Hua Chen, University of Illinois Springfield*

**sPLA2 Investigation in Hymenoptera**

The objective of this project was to capture two to three sample specimens of aculeate Hymenoptera to screen their venom for sPLA2 activity. If activity was found, follow up with SDS–PAGE to identify potential sPLA2s for subsequent mass spectrometry characterization.

Forty-one individual wasps and bees were collected by net capture, frozen, dissected and stored in ethanol as voucher specimens. A nest of *Dolichovespula maculata* was removed 8 November 2015 from a tree near the Therkildsen Field Station and froze for future investigations. The entire nest and its individual members are frozen at present and will be dissected for venom harvest later this winter.

*Stephen Johnson, University of Illinois Springfield*

**Tallgrass Prairie Project**

Amy McEuen began a seedling addition experiment with six species of native prairie plants (see Table 1). All six of these were in the initial seed mix for the Emiquon prairie restorations so they are species TNC wishes to establish in these areas. The objective of this experiment is to see if species that are at the southern end of their range at the restoration site (labeled northern species, table below) will have poorer survival and reproduction than those that are at the northern end of their range (southern species). My hypothesis is that, with climate change, it will be easier for ecologists to reintroduce and establish southern species versus northern species. This is actually a very difficult hypothesis to test given all of the confounding factors other than distribution that can potentially affect establishment. I hope, however, at least to provide some preliminary data addressing this issue.

Design: Set up seedling addition areas (SAA) in management units 17 and 22 (Butt track). These two sites were chosen as they weren't impacted by the 2013 flooding and they differ in

their characteristics with 22 having moister soils near the pond at its southern edge. I set up one SAA at each site. Each SAA had 216 seedlings total (36 of each species) planted at 5 m intervals along an 18 x 12 grid. Seedling location was spatially randomized. Seedlings were purchased from Ion Exchange (http://nativewildflowersandseeds.com/). All seedling sizes were measured prior to planting and reproduction, survival, and growth were monitored biweekly through two growing seasons. Seedlings were planted in both areas on 5/26/15 and 5/27/15. Seedlings were measured bi to tri–weekly at dates indicated above. Seedling locations are marked with plastic knives, flagging, and tall wooden stakes.

| **Common name** | **Scientific name** | **Northern/Southern** |
|---|---|---|
| Anise Hyssop | *Agastache foeniculum* | Northern |
| Blue Mistflower* | *Conoclinium coelestinum* | Southern |
| Rattlesnake Master | *Eryngium yuccifolium* | Southern |
| Prairie Alumroot | *Heuchera richardsonii* | Northern |
| Ohio Goldenrod** | *Oligoneuron ohioense* | Northern |
| Wild Quinine | *Parthenium integrifolium* | Southern |
| | | |

*Listed on the TNC initial planting list under its synonym: *Eupatorium coelestinum* , Blue boneset

**Listed on the TNC initial planting list under its prior classification: *Solidago ohioense*

*Amy McEuen, University of Illinois Springfield*

## Natural History of Influenza Viruses in waterfowl

Cloacal swabs were collected from hunter-harvested waterfowl at Emiquon and were tested for the presence of influenza A virus using RRT–PCR and virus isolation techniques. All IAV isolates will be further characterized to identify HA and NA subtypes. Select isolates will undergo full-length genomic sequencing to gain understanding in the genomic movement and persistence of IAVs in a natural reservoir.

146 cloacal swabs were collected from hunter-harvested waterfowl including American green–winged teal, northern pintail, northern shoveler, blue–winged teal, gadwall, American coot, wood duck, ring–necked duck, and redheads. After collection, the swabs were frozen and transported to the laboratory at The Ohio State University of testing and long-term ultra–cold storage. Hunter harvested waterfowl were samples at Emiquon on the following dates: October 9, 24, 25, 27, 28, 29, 30, 31 and November 13, 2015. Information regarding the species, age, and sex of each bird will be kept along with weather and environmental conditions during the sampling session.

*Andrew Bowman, The Ohio State University*

## Semi–aquatic Mammal Habitat Use

This thesis project examined the site occupancy and habitat use of semi–aquatic mammals. Although semi–aquatic mammals are important furbearers in Illinois that provide recreational opportunities and economic benefits via fur trading, little has been studied about semi–aquatic

mammals in west–central Illinois, especially in a restored wetland complex such as Emiquon. Therefore, the objectives of this study are to determine the habitat features that promote semi–aquatic mammal use spatially and temporally.

882 trap nights were recorded from 3/01/2015 to 5/31/2015 with 49 species recorded in the Emiquon Preserve (EP) during that time. The 49 species documented in the EP represent 77% of all species documented in the entire Emiquon Wetland Complex during this study. Unfortunately, due to the flooding of the Illinois River only one season, out of three proposed, was surveyed. During this season (spring), muskrat was the most photographed semi–aquatic mammal and was captured at 100% of EP sites, beaver was the second most photographed semi–aquatic mammal and was documented at 30% of EP sites, river otter was the third most photographed semi–aquatic mammal and was documented at 50% of EP sites, and mink was the least photographed semi–aquatic mammal and was documented at 20% of EP sites. Data analysis is still on going at this point with a scheduled completion date in early May 2016.

**Table 1. Number of independent species pictures, percent of total pictures, and naïve occupancy of species documented in the Emiquon Preserve (3/01/15–5/31/15 [10 sites]).**
***Species photographs were considered independent if they were separated by at least 60 minutes**

| Species | # of pictures | Percent of total pictures | Naïve occupancy | Number of sites detected |
|---|---|---|---|---|
| Muskrat | 595 | 19.57% | 1.00 | 10 |
| American Coot | 510 | 16.77% | 1.00 | 10 |
| Coyote | 337 | 11.08% | 1.00 | 10 |
| Raccoon | 276 | 9.08% | 1.00 | 10 |
| Deer | 249 | 8.19% | 1.00 | 10 |
| Blue–winged Teal | 162 | 5.33% | 0.8 | 8 |
| Canada Goose | 157 | 5.16% | 0.9 | 9 |
| Red–winged Blackbird | 106 | 3.49% | 0.9 | 9 |
| Common Grackle | 97 | 3.19% | 0.7 | 7 |
| Northern Shoveler | 95 | 3.12% | 0.6 | 6 |
| Mallard | 90 | 2.96% | 0.9 | 9 |
| American Beaver | 53 | 1.74% | 0.3 | 3 |
| River Otter | 48 | 1.58% | 0.5 | 5 |
| Sora | 41 | 1.35% | 0.5 | 5 |
| Green–winged Teal | 37 | 1.22% | 0.4 | 4 |
| American Robin | 32 | 1.05% | 0.4 | 4 |
| Pied–billed Grebe | 22 | 0.72% | 0.5 | 5 |
| Virginia Opossum | 18 | 0.59% | 0.4 | 4 |
| Wood Duck | 18 | 0.59% | 0.8 | 8 |
| Great Blue Heron | 12 | 0.39% | 0.4 | 4 |
| Bald Eagle | 9 | 0.30% | 0.3 | 3 |

| | | | | |
|---|---|---|---|---|
| Black–crowned Night–Heron | 7 | 0.23% | 0.4 | 4 |
| Gadwall | 7 | 0.23% | 0.3 | 3 |
| Snow Goose | 6 | 0.20% | 0.4 | 4 |
| Ring–necked Duck | 5 | 0.16% | 0.3 | 3 |
| Green Heron | 5 | 0.16% | 0.4 | 4 |
| American Bittern | 4 | 0.13% | 0.1 | 1 |
| American White Pelican | 4 | 0.13% | 0.1 | 1 |
| American Mink | 4 | 0.13% | 0.2 | 2 |
| Wild Turkey | 4 | 0.13% | 0.2 | 2 |
| Double–crested Cormorant | 4 | 0.13% | 0.2 | 2 |
| Hooded Merganser | 3 | 0.10% | 0.1 | 1 |
| Killdeer | 3 | 0.10% | 0.1 | 1 |
| Eastern Cottontail | 3 | 0.10% | 0.1 | 1 |
| Red–tailed Hawk | 2 | 0.07% | 0.1 | 1 |
| Great Egret | 2 | 0.07% | 0.1 | 1 |
| Domestic Dog | 2 | 0.07% | 0.2 | 2 |
| Great Horned Owl | 1 | 0.03% | 0.1 | 1 |
| Bufflehead | 1 | 0.03% | 0.1 | 1 |
| Red–eared Slider | 1 | 0.03% | 0.1 | 1 |
| American Crow | 1 | 0.03% | 0.1 | 1 |
| Mourning Dove | 1 | 0.03% | 0.1 | 1 |
| Common Snapping Turtle | 1 | 0.03% | 0.1 | 1 |
| Least Bittern | 1 | 0.03% | 0.1 | 1 |
| Common Merganser | 1 | 0.03% | 0.1 | 1 |
| American Widgeon | 1 | 0.03% | 0.1 | 1 |
| Northern Harrier | 1 | 0.03% | 0.1 | 1 |
| Bobcat | 1 | 0.03% | 0.1 | 1 |
| Northern Water Snake | 1 | 0.03% | 0.1 | 1 |
| Total | 3041 | ---- | ---- | ----- |

**Table 2. Emiquon Preserve species accumulation curve from 3/01/2015 to 5/31/2015 (10 sites).**

| Day | # of species | Species |
|---|---|---|
| 1 | 2 | Coyote, Deer |
| 3 | 3 | Bald Eagle |
| 6 | 5 | Raccoon, Virginia Opossum |
| 9 | 6 | American Mink |
| 10 | 9 | Muskrat, American Beaver, Eastern Cottontail |
| 12 | 13 | Common Merganser, Gadwall, Ring–necked Duck, Mallard |
| 13 | 16 | American Coot, Snow Goose, Canada Goose |
| 14 | 18 | Red–winged Blackbird, American Crow |

| | | |
|---|---|---|
| 15 | 19 | River Otter |
| 16 | 20 | American White Pelican |
| 19 | 24 | Domestic Dog, Northern Shoveler, Green–winged Teal, Common Grackle |
| 20 | 25 | Mourning Dove |
| 23 | 26 | Wood Duck |
| 26 | 27 | Hooded Merganser |
| 28 | 29 | Blue–winged Teal, American Robin |
| 29 | 31 | Pied–billed Grebe, Great Blue Heron |
| 30 | 32 | Red–tailed Hawk |
| 37 | 33 | Northern Harrier |
| 38 | 34 | American Wigeon |
| 41 | 35 | Wild Turkey |
| 44 | 36 | Bufflehead |
| 45 | 37 | Sora |
| 46 | 38 | Great Horned Owl |
| 47 | 39 | Double–crested Cormorant |
| 48 | 41 | Killdeer, Bobcat |
| 49 | 44 | Alligator Snapping Turtle, Northern Water Snake, Red–eared Slider |
| 57 | 45 | Great Egret |
| 72 | 46 | American Bittern |
| 74 | 47 | Least Bittern |
| 76 | 48 | Green Heron |
| 77 | 49 | Black–crowned Night–Heron |

*Ryan Platte, University of Illinois Springfield*

**Bee Diversity at Emiquon**

This research took place at three different habitats located at the Emiquon Nature Preserve. There are two main objectives to this study: (1) to determine the diversity of native species in various habitat plots and (2) compare the species richness among the plots. The sampling technique included one collection period for each sampling month to determine which bee species are present and the time period they are present. Samples are still being processed, so the following information is approximated.

Number of specimens: 1000; Species collected: 20 identified at this point; Fate of Specimens: Specimens will be added to the university collection after identification. Species names, the location of the species, and the quantity of each species will complete the list of records kept. To date the processing of samples and research has not been completed entirely.

*Emma White, Western Illinois University*

## Morton Village Excavations

The purpose of the 2015 work was to ground truth an area subjected to magnetometer survey in 2014 that revealed the presence of seven prehistoric structures and about 40 pits in the cultivated field on the bluff east of Highway 78/97. Two 4x4–meter blocks were excavated in the area, and four prehistoric pits were found exactly where the magnetometer indicated they would be. One 4x4–meter block started in 2014 west of the highway in the main site area was also completed, resulting in the excavation of four additional pits.

Material excavated is at Michigan State University undergoing tabulation. A moderate quantity of prehistoric pottery, lithics, animal bone, and charred plant remains were recovered. Three 4x4–m blocks had the plow zone stripped with a backhoe on 5/19/15 and then exposed pits were hand excavated with shovels and trowels over the next three weeks. Photographs of excavations and paper feature forms documented the pit excavations, these records will be kept.

*Mike Conner, Dickson Mounds Museum*

## Microbial Ecology and Water Quality

The objective of this project was to document water quality parameters, take field measurements of the lakes and determine the microbial diversity in the approximate eighth year of restoration at Thompson Lake. Bi–weekly samples were taken of water and sediment (n=3). Water samples and sediment await extraction of DNA. Water quality analysis has been completed on all samples. Number of samples (9 months x 2 samples/month x 3 replicates = 54 samples; with about 600 species (bacterial OTUs, algae, protozoans) potentially present). Surface sediment (top 2 cm) was collected at three pelagic–profundal sites for the times listed. Water was collected at the same sites; degree of disturbance is judged minimal as the top sediments represent autochthonous input primarily.

*Mike Lemke, University of Illinois Springfield*

## Asian Carp Juvenile Habitat

The objective of this project was to determine what habitats larval and juvenile Asian carps are using based on biotic and abiotic characteristics at the abundance gradients of Asian carps as well as to determine if predators are consuming Asian carps. Juvenile Asian carps were investigated in shallow backwater habitats.

This project took place at the Merwin Preserve at Spunky Bottoms. 190 fish were collected on three sample dates (8/13, 9/9, 9/23); 16 species which includes one grass carp, one bighead carp and 41 silver carp. All specimens were released after capture. On September 9, and 23, 2015, there was a massive fish kill of adult and young of year silver carp, grass carp, sunfish, gizzard shad and mosquitofish. On the September 23, the fish kill was still lingering, and we cast netted some live common carp, *Moronidae* sp., bowfin, bluegill, mosquito fish, and bighead carp.

*Cari–Ann Hayer, U.S Geological Survey, Columbia Environmental Research Center*

## INDIAN BOUNDARY PRAIRIES

### Plants of Concern Monitoring at Indian Boundary Prairies

Launched in 2001, Plants of Concern is a long–term rare plant monitoring initiative unique to the region in its use of standardized monitoring protocols used by trained citizen scientists. A program of the Chicago Botanic Garden, Plants of Concern has completed 15 years of monitoring and has accumulated a substantial base for analyzing long–term data on a significant number of species and Element Occurrences. Monitors collected data on five state endangered or threatened species at four TNC–owned sites in the Indian Boundary Prairies: Gensburg Markham Prairie (including Markham East, North, and South), Paintbrush Prairie, and Sundrop Prairie.

Eared False Foxglove (*Tomanthera auriculata*) – 54 plants found at Paintbrush Prairie and 97 plants found at Gensburg Markham Prairie. Dropseed Prairie had no plants.

Grass Pink Orchid (*Calopogon tuberosis*) – No plants were found at any of the sites.

Narrow Leaved Sundew (*Drosera intermedia*) – No plants were found at any of the sites.

Mountain Blue–eyed Grass (*Sisyrinchium montanum*) – seven plants found at Paintbrush Prairie and 21 plants found at Sundrop Prairie.

Small Sundrops (*Oenothera perennis*) – seven plants were found at Markham Prairie South.

*Rachel Goad, Plants of Concern*

### Endangered Species Monitoring and Hand Pollination of Eastern Prairie White Fringed Orchid (*Platanthera leucophaea*)

Four volunteers monitored plants at three TNC–owned sites in the Indian Boundary Prairies. Volunteers tag blooming orchids with a numbered metal ID tag secured in the ground at the base of the plant. They collect demographic data (plant height, number of flowers, and number of leaves), record herbivory impacts, and record the number of blossoms hand–pollinated. In late summer and early fall, they record seed capsule development and, if approved previously by the Recovery Coordinator, they may collect pods to distribute at other sites (No seed capsule collection is anticipated for this field season).

2015 monitors Stuart Goldman, Gary Horn, Mary Anicich and Tony Merisko found one plant at Paintbrush Prairie, 24 plants at Markham Prairie Complex, and 12 plants at Sundrop Prairie.

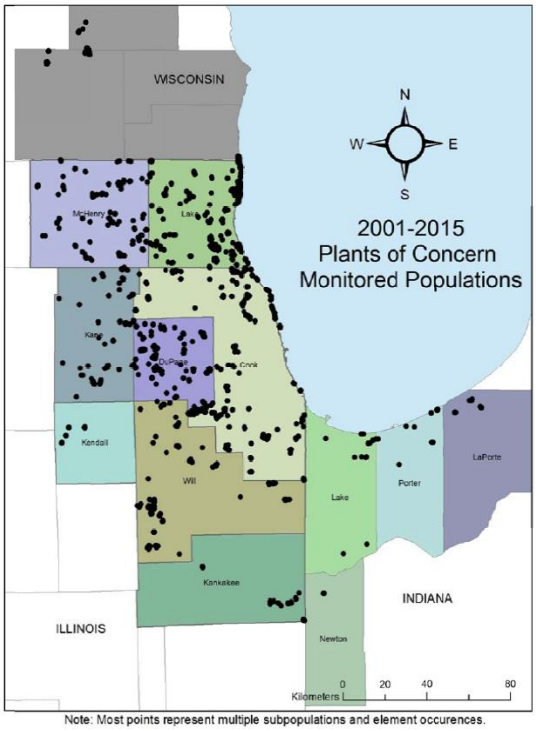
*Cathy Pollack, US Fish and Wildlife Service*

## KANKAKEE SANDS

### Plants of Concern

Since 2013, four POC monitors have collected data on seven (five state endangered, one state threatened, one regionally rare) species at five TNC–owned sites in the Kankakee Sands: Carl Becker, Hopkins Park Nature Preserve, Mskoda, Pembroke Savannah, and Talmadge Sand Forest. Volunteer involvement in Kankakee County is currently low, but growing. Kankakee Sands staff has been helpful in collecting baseline data on a number of populations, but Plants of Concern is seeking additional volunteer involvement. A training workshop held at Kankakee River Valley Forest Preserve District in 2015 recruited new monitors who expressed interest in involvement with future monitoring in Kankakee County.

In 2015, data for three state endangered and two state rare species were monitored at Kankakee Sands between April 21 and August 25.




*Rachel Goad, Plants of Concern*

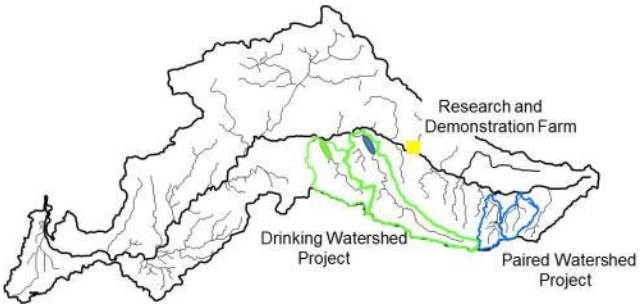
### Showy Partridge Pea (*Chamaecrista fasciculate)* Seed Collection

*Chamaecrista fasciculata* (partridge pea) seeds were collected at Pembroke Savanna and Carl N. Becker Savanna in 2015. Seeds were collected for field studies to be carried out on restored sites in 2016. Researchers also collected soil for nutrient analysis and conducted vegetation surveys for characterizing the different sites. Vegetation surveys and soil samples were taken at Pembroke Savanna on September 8, 2015 and at Carl N. Becker Savanna on September 9, 2015. Seeds were collected at both preserves on September 19, 2015 with fruits collected from 49 plants at Pembroke and 42 plants at Carl N. Becker.

*Diane Byers, Illinois State University*

## MACKINAW RIVER PROGRAM

The Mackinaw River maintains some of the highest quality streams in Illinois and provides habitat for 60–70 native fish and 25–30 mussel species. However, like much of the Midwestern United States, land use in the Mackinaw River watershed is primarily row crop agriculture with drainage patterns extensively modified by subsurface tiles that carry high nutrient loads directly from farm fields to nearby stream systems. In fact, Illinois has more total land area drained by tiles than any state in the Upper Mississippi River Basin and contributes some of the highest nitrogen and phosphorus flux to the Gulf of Mexico. The Mackinaw River Watershed Program currently consists of three projects that collectively address three overarching goals to: (1) Improve hydrology and water quality of the Mackinaw River watershed for mussels, fishes, and people who depend on it for water supply and recreation, (2) Reduce nutrient export from the Mackinaw River to downstream river systems, and (3) Develop a model for hydrologic and water quality improvements that is economically viable, compatible with agricultural production, and scalable across the Upper Mississippi River Basin.




### Paired Watershed Project


*Constructed wetlands in Upper Bray Creek*

The Nature Conservancy began research on how to improve water quality, restore a natural hydrology, and protect biodiversity at the 10,000–acre watershed scale in late 1999 using a paired watershed design in Bray Creek (treatment) and Frog Alley (reference) subwatersheds of the Mackinaw River. Through the implementation of specific best management practices and consistent monitoring of water quality, flow, and storm event export, we aim to determine the most effective methods to improve water quality and hydrology in these agricultural systems. Our past research has shown that common conservation practices (e.g., grassed waterways, stream buffers) are not enough to improve water quality or hydrology in these highly tile–drained agricultural watersheds, and we are currently testing how well wetlands that are constructed to intercept tile water will reduce nutrient exports from farmland to adjacent waterways.

The following is an update of the work by TNC and partners in 2015 for the Paired Watershed Project:

- Installation of a sixth wetland was completed in the fall of 2014 on private property near the headwaters of Bray Creek. Wetland plants established quickly after seeding water plantain and cattails. In 2015, the inlet and outlet of this wetland were instrumented with

automatic monitoring equipment that measures flow, nutrients, and sediments that will enable us to measure the wetland's effectiveness at reducing nitrates and phosphorus from tile drainage.

- Construction and seeding of a seventh wetland in the Bray Creek was completed in the fall of 2015.

- Biweekly baseline stream and storm event sampling continued in Bray Creek and Frog Alley watersheds, with samples analyzed for nitrogen, phosphorus, and suspended sediments. These data will be submitted for peer–reviewed publication in 2016.

- Automatic monitoring equipment located throughout each watershed continuously monitor stream hydrology and local weather–related measures such as rainfall, soil moisture, solar radiation, wind speed and direction, and air temperature.

- *Funding*: Funding for the Paired Watershed project in 2015 was provided by a federal grant to The Nature Conservancy received in 2012 from Farm Service Agency for $96,516 to support (a) water quality analyses to quantify and document nutrient removal effectiveness of CP39 wetlands at the site–specific and watershed–scale, and (b) economic analyses of the cost effectiveness of CP39 wetlands. Funding will support continued research in the Paired Watershed Project through March, 2016.

*Krista Kirkham, Maria Lemke, Ashley Maybanks, The Nature Conservancy*
*Bill Perry, Illinois State University*

**Research and Demonstration Farm**


*Wetland Research* – The Research and Demonstration Farm in Lexington, IL was established in 2004 to promote and demonstrate better management practices on a conventional farm. It is also a research site in which scientists from The Nature Conservancy and the University of Illinois at Champaign–Urbana are investigating the (a) overall effectiveness of constructed wetlands at reducing nutrients in agricultural runoff, (b) wetland to watershed ratio needed in tile–drained agricultural landscapes to significantly reduce nutrient exports from farmland to nearby streams and rivers, and (c) effectiveness of winter cover crops at reducing nitrogen loss to tile drainage systems. Cumulative results from the last eight years indicate that wetland to watershed ratios of 3%, 6% and 9% will remove 13–29%, 33–38%, and 42–46% of nitrate– nitrogen loadings, respectively. Orthophosphorus loadings were reduced by 45–78% in the smallest wetlands, and up to 91% in the largest wetlands.

Pennycress (Thlaspi arvense)
http://www.pestid.msu.edu/

*Cover Crop Research* – The Franklin Research and Demonstration Farm started its fifth year of cover crop seeding in 2015. In September, a winter cover crop of cereal rye was aerially seeded (90 lbs. /acre) into standing corn on 15 acres of the cropland that drains into the Gully wetland series. New in 2015 was an experimental cover crop of field pennycress (*Thlaspi arvense*) on 15 acres of the cropland that drains into the East wetland series. Pennycress was planted at the Farm by researchers from Arvegenix who have developed a genomics program to domesticate wild strains into a viable commercial crop. These researchers are interested to learn more about how pennycress might reduce nitrogen loss from tile–drained fields during the fall through spring. Arvegenix works with the USDA–ARS laboratory in Peoria, IL, which is credited with the development of pennycress in the early 2000's. Pennycress seeds typically contain 36% oil content that has ideal properties for use in biodiesel and aviation fuel. If established as a commercial crop, pennycress may provide (a) ecological benefits as a winter cover crop and (b) additional revenue to the producer.

Cover cropped sites are being used as treatment areas and the drainage area of the West wetlands serves as a reference (i.e., no cover crops) as we continue our research on the effectiveness of cover crops at reducing nutrient export from agricultural tiles. An herbicide treatment will be used in the spring of 2016 to kill the cereal rye in time for soybean planting.

*Outreach* – Conservancy staff host 14 tours in 2015 at the Research and Demonstration Farm. New visitors to the Farm included Illinois Senator Jason Barickman, Tyler Cravins (Legislative Assistant for U.S. Congressman Rodney Davis), and Zhao Peng (Chief Conservation Officer for TNC's China Program). Other tour attendees included freshwater scientists, media, university classes, TNC staff, local landowners and farmers, and agricultural interest groups.

*Ashley Maybanks, Krista Kirkham, Maria Lemke, The Nature Conservancy*
*Mike Wallace, Dave Kovacic, University of Illinois at Urbana-Champaign*

**Bloomington Drinking Watershed Project**

New wetland constructed in the Bloomington watershed in 2015

Nature Conservancy science staff are working with the City of Bloomington, Natural Resource Conservation Service, Soil and Water Conservation District, Farm Service Agency, University of Illinois, and Illinois State University to integrate research from the Paired Watershed Project and the Research and Demonstration Farm to address water quality concerns associated with local drinking water supply reservoirs of Lake Bloomington and Evergreen Lake. These two reservoirs supply

drinking water to roughly 80,000 people in the City of Bloomington, Illinois, and several surrounding townships. Land use in these two Mackinaw River subwatersheds that supply the reservoirs is 79–93% agricultural and the soils are extensively drained by agricultural tiles. The purpose of the project is to develop and evaluate the effectiveness of a watershed management program that bundles adaptive nutrient management (i.e., in–field practices) with constructed wetlands (i.e., edge of field practices) to reduce nutrient export and improve water quality. The goals are that the management plan will be (a) economically viable, (b) compatible with agricultural production, and (c) transferable to watersheds across the Upper Mississippi River Basin. Many of these constructed wetlands are enrolled in the Conservation Reserve Program's Farmable Wetlands Program (CP39) that pays up to 90% of the construction costs.

The following is an update of the work by TNC and partners in 2015 for the Bloomington Drinking Watershed Project:

- Two new wetlands were constructed in Money Creek watershed; one on City property funded by The Coca–Cola Company and the other on private farm ground.

- Monitoring equipment has been installed at the inlets and outlets of both wetlands, along with the two other CP39 wetlands that were completed in 2014.

- Designs for three new CP39 wetlands are completed and will be constructed in the spring of 2016.

- A Farmer Network nutrient management program has been supported through collaboration among TNC, the City of Bloomington, McLean County Soil and Water Conservation District, Natural Resources Conservation Service, and Environmental Defense Fund in Money Creek and Six Mile Creek watersheds. In 2015, 88 fields (approximately 5000 acres) were enrolled in the program (44 and 88 fields were enrolled in 2013 and 2014, respectively). The program provides farmers with learning–based education, evaluative tools (cornstalk and soil nitrate test, aerial imagery, replicated strip trials), and a networking forum for information exchange. On–farm evaluations provide real time data analyses to farmers on how fields respond to nutrients and the economic implications of nutrient applications. Using this program, farmers evaluate how to refine nutrient management, thus benefitting both the farmer and the environment.

- A subset of producers, landowners, and farm managers from the Farmer Network has been organized into an Agricultural Advisory Group (AAG) to advise how to scale up conservation in agricultural watersheds in a way that protects the environment and that makes economic sense to landowners and producers.

- Draft versions of financial models have been developed for a Bloomington Water Fund using construction costs of CP39 wetlands that have been installed to–date. These cost analyses will be updated as the last three CP39 wetlands are completed.

- A contract was completed with Conservation Strategies Consultants LLC (CSC) to

advance the development of a Bloomington Water Fund. Terry Noto (president of CSC) is an attorney and former consultant for Environmental Defense Fund. Mike Linsenbigler is former Deputy Director of the Conservation and Environmental Programs Division for Farm Services Agency in Washington, D.C.

- Workgroup meetings continue to be held monthly since 2011 to discuss progress and next steps of the project.

- Next steps: (a) Work with farmers to test out how reduction in fall nitrogen application affects corn yields (b) Develop and evaluate a watershed–scale management program (e.g., Water Fund) for sustainable nutrient reduction that integrates ecosystem services (i.e., payment for services) with the nutrient management program developed during this project, previous research, existing watershed plans, and current NRCS conservation programs (c) Further develop the Agricultural Advisory Committee that was started in 2014 comprised of farmers, landowners and agricultural community leaders to help direct and promote conservation program in the watershed (d) Secure future funding for monitoring, research, outreach and implementation in the watershed.

- *Funding*: Funding for much of the project had been provided by a federal grant through USDA–NRCS Conservation Innovation Grant program to the Conservancy for $536,000 that will help support this project through August 2016. Additional private funding used as part of the required dollar for dollar match for this grant has been is provided by Environmental Defense Fund/Walton Family Foundation, World Wildlife Fund/Coca–Cola Company, Monsanto, Grand Victoria Foundation, Mosaic Company, and GROWMARK Foundation.

*Maria Lemke, The Nature Conservancy*
*Jackie Kraft, McLean County Soil and Water District*
*Terry Noto, Conservation Strategies Consulting LLC*
*Kent Bohnhoff, Natural Resources Conservation Service*
*Rick Twait, City of Bloomington*
*Dave Kovacic, Mike Wallace, University of Illinois at Urbana-Champaign*
*Ashley Maybanks, Krista Kirkham, Jeff Walk, Bob Moseley, The Nature Conservancy*

## MIDEWIN NATIONAL TALLGRASS PRAIRIE (MNTP)

### Butterfly Monitoring at MNTP

TNC staff assists in recruiting volunteers, scheduling trainings, and compiling data for the butterfly–monitoring program at Midewin. The Illinois Butterfly Monitoring Network establishes the protocols. In 2015, five volunteers contributed a total of 58 hours for monitoring butterflies on three Midewin sites. Volunteers identified 42 different species of butterflies.

Data posted on Midewin's website at:
http://www.fs.usda.gov/detail/midewin/workingtogether/volunteering/?cid=stelprdb5368200

*Allison Cisneros, Kathryn Gorman, The Nature Conservancy*
*Doug Taron, Director of the Illinois Butterfly Monitoring, Peggy Notebaert Nature Museum*

### Frog and Toad Monitoring at MNTP

TNC staff facilitates this monitoring program in the areas of recruitment, training, and data compilation using Chicago Wilderness protocols. In 2015, 23 volunteers monitored frogs on 17 wetland sites on Midewin. These volunteers were trained to listen for the unique mating calls of eight different species of frogs during their breeding season. Midewin's dedicated force of frog monitors spent a total of 156 hours for training and on–site monitoring from mid–March to late July recording their observations. Along with identifying and quantifying the frog calls, monitors were asked to document conditions such as temperature, noise, wind, and sky clarity. Nighttime monitors often comment on other nocturnal wildlife experiences such as the call of snipes, nighthawks, soras, and bitterns.

Data posted on Midewin's website at:
http://www.fs.usda.gov/detail/midewin/workingtogether/volunteering/?cid=stelprdb5355893

*Allison Cisneros, Kathryn Gorman, The Nature Conservancy*
*Bill Glass, Ecologist, USFS-Midewin National Tallgrass Prairie*

### Plants of Concern Monitoring at MNTP

TNC staff assists in recruiting volunteers for the Plants of Concern program at Midewin. Plants of Concern is coordinated by the Chicago Botanic Garden (CBG) and is a rare plant monitoring program designed to gather data over time to learn population trends in relation to management practices. In addition to CBG volunteers, ten Midewin volunteers contributed 154 hours for training and field monitoring of ten rare plants. Among them are earleaved false foxglove (*Tomanthera auriculata*), white lady's–slipper (*Cypripedium candidum*), limestone or glade quillwort (*Isoetes butleri*) and Hill's thistle (*Cirsium hillii*).

*Allison Cisneros, Kathryn Gorman, The Nature Conservancy*
*Jennifer Durkin, Native Plant Specialist, USFS-Midewin National Tallgrass Prairie*
*Rachel Goad, Plants of Concern Manager, Chicago Botanic Garden*
*Kelly Hoffman, Plants of Concern Research Assistant, Chicago Botanic Garden*

## Floristic Quality Monitoring at MNTP

TNC staff is responsible for recruiting, entering data and coordinating logistics for this volunteer program. The CBG research assistant leads the individual monitoring dates. Midewin volunteers currently conduct these surveys at the South Patrol Road, Blodgett, and Rt. 66 prairie restoration areas.

Now that Midewin has good baseline data, volunteers will alternate the restoration areas monitored annually. Midewin will also add new restoration areas to this monitoring rotation. In 2015, 15 volunteers contributed 303 hours to monitoring these sites. Because of its high diversity, the Grant Creek Nature Preserve on the Des Plaines Conservation Area property was surveyed and analyzed in 2006 for its Floristic Quality Index (FQI) to serve as a goal for Midewin's sites.

Annual surveys will determine if Midewin's current restoration management processes are resulting in increased levels of species diversity. Site mean FQI values are listed in Table 1. Full data posted on Midewin's website at:
http://www.fs.usda.gov/detail/midewin/workingtogether/volunteering/?cid=stelprd3801501

**Table 1: Floristic Quality Monitoring Data**

| Site | 2006 FQI | 2007 FQI | 2008 (no data collected) | 2009 FQI | 2010 FQI | 2011 FQI | 2012 FQI | 2013 FQI | 2014 FQI | 2015 FQI |
|---|---|---|---|---|---|---|---|---|---|---|
| Grant Creek Natural Area – Des Plaines Conservation Area | 17.53 | - | - | - | - | - | - | - | - | - |
| Blodgett Road Dolomite Prairie | 10.65 | - | - | - | - | - | - | - | - | - |
| ExxonMobil | - | 7.37 | - | - | - | - | - | - | - | - |
| South Patrol Rd. | 8.36 | 9.89 | - | 12.70 | 14.09 | 13.95 | 13.83 | - | 12.65 | 12.38 |
| Rt. 66 | 4.66 | 6.28 | - | 9.19 | 9.97 | 10.58 | 10.70 | - | 10.89 | - |
| Blodgett Road Restored Area | - | 7.24 | - | - | 9.11 | 10.02 | 10.48 | 10.46 | - | 9.81 |

*Allison Cisneros, Kathryn Gorman, The Nature Conservancy*
*Jennifer Durkin, Native Plant Specialist, USFS-Midewin National Tallgrass Prairie*
*Rachel Goad, Plants of Concern Manager, Chicago Botanic Garden*
*Kelly Hoffman, Plants of Concern Research Assistant, Chicago Botanic Garden*

## Grassland Bird Survey at MNTP

Grassland bird monitoring has been going on prior to the legislation creating Midewin National Tallgrass Prairie while the land was still being managed by the Army. The Forest Service with help from partners has been increasing the amount of grassland habitat at Midewin. The Midewin staff, with help from TNC and IDNR staff, has been modifying the protocol to meet the expanded acres of grassland and to provide better estimates of the populations of grassland birds. The data below represents birds seen within a 100–meter radius survey points within five minutes and the data is presented as birds per 100 survey points. Prior to 2008, there wasn't an area dimension to the point counts and double counting of birds was much more likely. For rarer birds with small populations, it's possible to have no birds per 100 points on some occasions. For example, in 2014 upland sandpipers were seen before and after the survey count periods but not within. For those species with large enough populations to see trends, it appears the populations are stable, but there are fluctuations over time. The 2015 data was collected June 1–5.

**Table 2: Grassland Bird Survey Data**

| **Species** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** |
|---|---|---|---|---|---|---|---|
| | **Birds/ 100 pts** | **Birds/ 100 pts** | **Birds/ 100 pts** | **Birds/ 100 pts** | **Birds/ 100 pts** | **Birds/ 100 pts** | **Birds/ 100 pts** |
| Upland Sandpiper | 5.2 | 0.4 | 4.8 | 1.3 | 1.3 | 0.0 | 0.0 |
| Bobolink | 106.0 | 115.2 | 152.7 | 106.4 | 127.1 | 103.0 | 121.1 |
| Dickcissel | 238.8 | 189.6 | 244.3 | 231.1 | 167.2 | 214.8 | 198.0 |
| Grasshopper Sparrow | 152.6 | 127.8 | 159.0 | 99.7 | 94.0 | 117.2 | 109.2 |
| Eastern Meadowlark | 159.9 | 164.8 | 160.8 | 165.1 | 171.2 | 187.6 | 133.6 |
| Henslow's Sparrow | 20.3 | 35.9 | 36.6 | 41.7 | 20.7 | 27.2 | 30.9 |
| Savannah Sparrow | 21.1 | 25.9 | 21.6 | 15.4 | 24.2 | 10.1 | 17.1 |
| Vesper Sparrow | 0.4 | 0.0 | 0.7 | 5.8 | 1.0 | 1.2 | 0.0 |
| Sedge Wren | 1.7 | 3.0 | 1.1 | 3.2 | 0.3 | 0.0 | 0.0 |

*Allison Cisneros, Kathryn Gorman, Fran Harty, The Nature Conservancy*
*Bill Glass, Ecologist, USFS-Midewin National Tallgrass Prairie*
*Jim Herkert, Illinois Department of Natural Resources*

## Breeding Bird Monitoring at MNTP

TNC staff is responsible for recruiting, scheduling trainings, and entering data. Monitors surveyed their sites three – five times over the breeding season (mid–May to mid–July) and recorded all bird species they recognize by sight or song. Monitors create routes that cover the entire assigned area, which could be up to 300 acres each. In 2015, nine volunteers contributed a total of 85 hours for training and monitoring birds. In the breeding bird survey, volunteers identified 96 different species of birds on ten Midewin sites.

Data posted on Midewin's website at:
http://www.fs.usda.gov/detail/midewin/workingtogether/volunteering/?cid=stelprdb5365263

*Allison Cisneros, Kathryn Gorman, The Nature Conservancy*
*Bill Glass, Ecologist, USFS-Midewin National Tallgrass Prairie*

**RiverWatch Monitoring at MNTP**

TNC staff assists in recruiting volunteers and scheduling training for the RiverWatch program at Midewin. Illinois RiverWatch is coordinated by the National Great Rivers Research and Education Center (NGRREC). Volunteers are certified to collect and identify stream macroinvertebrates and other scientific data that is used to gauge long–term trends in stream health, develop land management strategies, and identify potentially degraded waters. In 2015, 15 volunteers spent 95 hours (including training and lab identification) on nine Midewin sites. Grant Creek received the highest quality RiverWatch score in 2015 according to the RiverWatch Newsletter, which mentioned that "this is likely because Grant Creek flows through Midewin National Tallgrass Prairie." The staff needs to be diligent with restoration and protection because there is probably outflow from the intermodal facility to Grant Creek.

*Allison Cisneros, Kathryn Gorman, The Nature Conservancy*
*Jeff Tepp, Hydrologist, USFS-Midewin National Tallgrass Prairie*

**Water Quality Monitoring at MNTP**

Several volunteers from Midewin's RiverWatch team have expanded their efforts to collect additional water quality data such as phosphate levels, turbidity, temperature, pH, dissolved oxygen, conductivity, nitrates, and velocity. In 2015, 14 volunteers spent 141 hours monitoring. This entails teams of three collecting physical and chemical measurements of stream flow twice a month from April to October. Currently there are five monitoring locations: three on Prairie Creek, one on Grant Creek and one on Jordan Creek.

*Allison Cisneros, Kathryn Gorman, The Nature Conservancy*
*Jeff Tepp, Hydrologist, USFS-Midewin National Tallgrass Prairie*

**Loggerhead Shrike Research**

The Loggerhead Shrike (Lanius ludovicianus) is one of two species of shrike found in North America and the only shrike endemic to the continent. Once a common species in pasturelands throughout North America, the species has experienced a 79% population loss since the mid–1960s – one of the "top ten" among the 341 species of North American land birds. The shrike is listed as endangered, threatened or of special concern in at least 26 states, including Illinois where it is listed as Endangered and was designated by Partners in Flight as a "common bird in steep decline." Further, Partners in Flight (PIF) identified the Loggerhead Shrike as one of nine focal species among short–distance migrant grassland birds in North America.

Midewin is a stronghold for Loggerhead Shrike in eastern North America and Illinois. The small, isolated shrike population that breeds in Midewin is one of the only remaining migratory

populations of the species in eastern North America and is the heart of the range of the eastern *migrans* subspecies. A long–term study of the population has been underway since 2005, with a goal of assessing population size, trend and age structure, monitoring reproductive success, assessing site re–use/fidelity, and population turn–over.

The population of Loggerhead Shrike in the Midewin National Tallgrass Prairie has ranged from four to thirteen breeding pairs annually since 2005. Nesting success has varied from a low of 55% (2007) to a high of 100% (2005 and 2012), with nest failures most often being a result of predation, in particular of eggs in first nesting attempts. Reproductive success appears to have an impact on population trend – population size decreases in years following those when reproductive success is low.

In total, breeding pairs have been located at 99 locations in Midewin from 2005 to 2015. Twelve (12%) of these sites were used in only one year of the eleven–year study period. The remainder (63%) has been used at least twice, with some being used for as many as ten years! In comparison with a longevity record of just over 12 years in the species, and an average lifespan of three to four years for shrikes in Midewin over the study period, it is clear that while site re–use is high, true site fidelity (i.e. use of the same site by the same individual in consecutive years) is much less common. In order to more clearly understand site re–use versus fidelity in Midewin, the banding effort transitioned from the use of one federal issue stainless steel band to a four–band (three plastic and one steel) colour–banding in 2014. Each bird receives two bands per leg in a unique combination, allowing individuals followed between years. The result from 2015 indicated a very low degree of site fidelity – only 6 (3:3 male: female) of the 21 returning birds were banded in 2014 (35% of the total colour–banded in 2014). Of these, 50% used the same breeding site (two females and one male). In each case, the returning bird was paired with a first–year breeder, thus no site occurrence of both site and mate fidelity was observed.

Re–use of sites appears linked to nesting success – sites at which young fledged in the year prior are more often re–used in subsequent years than those where nesting was unsuccessful. This suggests that shrikes use social cues when choosing a breeding site. Specifically, breeding pairs may assess site quality based on nesting success among neighboring territories, which impacts site choice in subsequent years. However, environmental process such as weather, and interspecific interaction, in particular predation, are important.

Ninety–one adult shrikes (60:58 male: female) were banded during the study period, representing up to 81% of the known population of shrikes in Midewin annually. Yet, follow–up survey work reveals a large proportion (25–81%) of unbanded birds at the start of each breeding season. Given the isolated nature of the population of Loggerhead Shrike in the Midewin, combined with results of dispersal distance from studies of the species elsewhere indicating an average natal

dispersal distance no more than ten miles and adult dispersal of half that, it is likely that most unbanded birds originated from or near Midewin.

In general, a greater proportion of breeders in their second, or later, breeding season (After Second Year, ASY) birds are male, which is not unexpected – male shrike establish and maintain a breeding territory each year, and should gain an advantage by re–occupying sites that are familiar to them. Conversely, females likely benefit by choosing the most–fit male, often judged by the size of the cache or impaled items on display. Thus, they are expected to disperse greater distances and comprise a small proportion of the SY cohort. However, with only one exception (2008), an equal or greater number of the SY birds (those born in the previous year and in their first breeding season) have been female. The low comparative return rate of young males may suggest lower over–wintering survival, indicating that population size will be impacted not only by reproductive success but also by threats faced during migration and the wintering season in this cohort.

*Amy Chabot, Avian Ecologist, Researcher*

**Midewin Deer Survey**

On February 5, 2015, several TNC staffers conducted an aerial survey for deer at Midewin. The weather and snow conditions were ideal for this type of survey and they were able to count 448 deer along with 28 coyotes, sixty wild turkey, one bald eagle, four harriers, and one rough–legged hawk.

*Allison Cisneros, Kathryn Gorman, Fran Harty, The Nature Conservancy*

## NACHUSA GRASSLANDS

### Evaluating arthropod community response to restoration along a chronosequence of restored tallgrass prairie

As part of a continuing multi–investigator research program examining the re–establishment of trophic interactions following tallgrass prairie restoration, this project studied the community re–establishment of two insect groups (ground beetles and dung beetles) and soil microbes (Bacteria, Archaea, and Fungi) following prairie restoration and bison reintroduction. Ground beetle sampling took place at sites throughout Nachusa Grasslands on 18 – 25 May, 8 – 15 June, and 24 – 31 August. Sampling was in the same sites marked with stars on the map. Dung beetle sampling took place on 19 – 26 May, 8 – 15 June, and 24 – 31 August at sites marked with circles on the map. Soil collection took place monthly from April through October in all plantings included in the ground beetle surveys, as well as a soybean field near the Thelma Carpenter Prairie.

Ground beetle sampling collected approximately 1,348 beetles of 35 species. Community analysis is ongoing, but combined with previous surveys in 2013 and 2014 clear patterns are emerging regarding the community assembly of these insects following prairie restoration. We hypothesize that the rapid growth of agricultural weeds that are prevalent in first–year plantings provide an enormous resource subsidy through their seed production. By the third year of a planting, this subsidy has been eliminated and beetle abundance (and richness) drop to levels comparable to older sites. An analysis of the trait composition of these communities, suggests that although the number of species present is not high, these species occupy a wide range of niches in the community and contribute to a variety of ecosystem functions such as arthropod predation and seed predation. Dung beetle sampling collected 339 beetles of at least five species. Identifications should be completed by the end of January 2016.

DNA extractions from soil samples are partially completed and will continue into spring 2016 with sequencing planned for summer 2016. Previous results from 2013 and 2014 have indicated that soil Bacterial and Archaeal community composition does converge with the soil communities in remnant sites over time, providing another criterion by which the prairie restorations at Nachusa could be considered successful.

*Nicholas A. Barber, Northern Illinois University*

### Effect of planting age and bison reintroduction on bee communities of a tallgrass prairie restoration

We sampled bee communities along a 26–year sequence of restored tallgrass prairie at Nachusa Grasslands to evaluate whether bee abundance, species richness, and community composition in restored habitat is similar to that of remnant prairie, and to investigate patterns in community development over time.

In 2015, we conducted eight rounds of sampling from May– August, collecting approximately

2000 bee specimens. Each sampling round consisted of passive bee sampling at restored prairie, remnant prairie, and nearby agricultural sites, as well as floral diversity and abundance surveys at each site. These data will be used to further our understanding of bee abundance, richness, and composition patterns over time at Nachusa. We will also use these data to test whether bison affect bee communities in restored prairie.

Based on data from previous years, we found that bee abundance and richness increased with restoration age from the low level of the pre–restoration (agricultural) sites to the target level of the remnant prairie within the first 2–3 years after restoration. Community composition of restorations converged on remnants within 5–7 years after restoration. These results show rapid recovery of the bee community following prairie restoration at Nachusa. Species replacement (in which a species present in one year/site is substituted by a different species in another year/site) was more important than richness effects (total number of species at a site increases or decreases over time) for structuring differences between bee communities of similarly aged restored sites.

*Bethanne Bruninga–Socolar and Sean Griffin, Rutgers University*

## Grassland Snake Ecology and Long–term Monitoring at Nachusa Grasslands

To assess the success of restoration and management, grassland snakes have been monitored at The Nature Conservancy's Nachusa Grasslands (Lee and Ogle Co., IL) since 2010. In 2015, Snakes were hand captured from under cover boards or when encountered opportunistically while on–site.

Cover boards were located in twelve restoration units constituting a chronosequence of restoration dates ranging from 1988 – 2012. Within each unit, 20 cover boards were deployed at 20 m intervals in two rows separated by 50 m. Additionally, 41 cover boards were deployed along the margins of wetland areas within the Tellabs Savanna. Cover boards were checked approximately weekly from April through October.

509 snake captures, including 95 within–year and between–year recaptures, were made. Seven species were encountered but most captures were of brown snakes (*Storeria* spp.), common garter snakes (*Thamnophis sirtalis*), and plains garter snakes (*Thamnophis radix*). Other species encountered included racers (*Coluber constrictor*), fox snakes (*Pantheropis vulpinus*), milk snakes (*Lampropeltis triangulum*), and Northern water snakes (*Nerodia sipedon*). Common garter snakes were most widely distributed, occurring at all 12 chronosequence units and Tellabs Savanna.

Dekay's brown snakes (*Storeria dekayi*) were found in eight of the 12 chronosequence units and Tellabs Savanna. Fox snakes were found in ten of 12 chronosequence units and Tellabs Savanna. Other species were restricted to one or two units each. Snakes were encountered throughout the active season from April–October.

Fox snakes were encountered more frequently in 2015 (with 65 captures) compared to previous

years (6 in 2013 and 12 in 2014). Two fox snakes were recaptured in a unit different from the one in which they were marked. One individual moved from Holland East to Thelma Carpenter, a straight–line distance of more than 2 km, between 26 June and 19 August 2015; another moved from Holland North to Holland West, a distance of about 0.6 km, between 2 July and 28 August 2015.

*Effect of Time since Restoration*. – Capture rate was positively correlated with years since restoration in *S. dekayi* in 2014 and 2015 (but not 2013) and in *T. sirtalis* in 2014 (but not 2013 and 2015). Capture rate was negatively correlated with years since restoration in *P. vulpinus* in 2015. Both time since restoration and subsequent management activities are expected to influence species occupancy and abundance.

*Tiger Salamander and Blanding's Turtle Observations*. –The tiger salamander (*Ambystoma tigrinum*) remains the only salamander documented at Nachusa Grasslands. Two individuals were observed on multiple occasions under separate cover boards at Thelma Carpenter. A nearby pond is a likely breeding site for this species. Blanding's Turtles (*Emydoidea blandingii*), a state endangered species, occur in small numbers at Nachusa Grasslands. Most recent observations come from the Tellabs Savanna unit where a complex of sedge meadows and buttonbush marsh provide suitable habitat. An adult female Blanding's Turtle was encountered within this unit on 26 June 2015. The turtle was moving overland along a 'two–track' within the unit, possibly in search of an oviposition site.

*Richard B. King, Northern Illinois University*

## Impacts of bison on grassland bird survivorship

Researchers sampled grassland bird survivorship at Nachusa Grasslands between May 11–July 24, 2015. A small depression (less than 2.5 cm deep) was made in the soil for each artificial nest to mimic natural ground nests. Eighty depressions were made. They found 45 nests of eight different species—Common Yellowthroat (*Geothlypis trichas*), Dickcissel (*Spiza americana*), Field Sparrow (*Spizella pusilla*), Grasshopper Sparrow (*Ammodramus savannarum*), Lark Sparrow (*Chondestes grammacus*), Mourning Dove (*Zenaida macroura*), Red–Winged Blackbird (*Agelaius phoeniceus*), and Song Sparrow (*Melospiza melodia*). Generally, field sparrows and song sparrows exhibited the highest survivorship rates, grasshopper sparrows exhibited the lowest, and the remaining species were about equal around the 50% mark.

We also measured nest density of all bird species both inside and outside of bison units at Nachusa grassland and determined that nest density tended to be higher on non–bison tracts (See figure below). However, mean nest survivorship was fairly comparable both inside and outside the bison units.

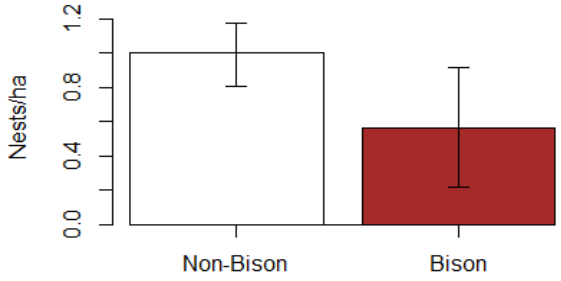



**Figure 1:** Nest density in 2015 in the non–bison tracts and tracts where bison are present.

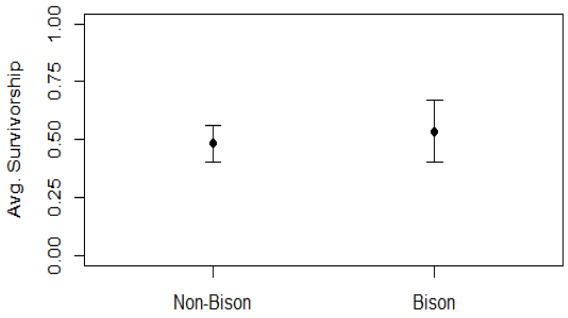



**Figure 2:** Mean nest survivorship ± 1SEM in 2015 in the non–bison units and units where bison are present.

Finally, we examined nest parasitization both inside and outside bison units and found that slightly more nest parasitization occurred outside of the bison units, although results were still fairly comparable both within bison units and outside of bison units.

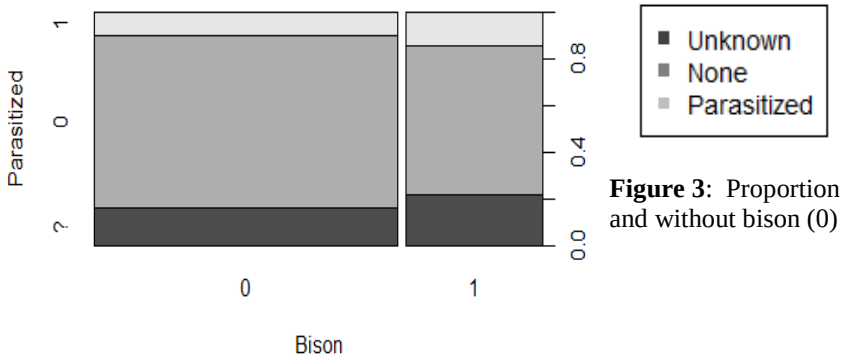



**Figure 3**: Proportion of nests parasitized in tracts with (1) and without bison (0) in 2015.

*Heather Herakovich, Northern Illinois University*

## Prairie Bush Clover (Lespedeza leptostachya) Survey at Nachusa Grasslands

Prairie bush clover, *Lespedeza leptostachya*, is a federally threatened species, which enjoys its largest presence in the southern most portion of the range at Nachusa Grasslands. Research conducted in 2015 was designed to determine the best locations to introduce new Prairie Bush Clover (PBC) populations, and to uncover greater insight into seed germination dynamics. Understanding patterns in seed germination will help determine how and when to use seeds to introduce PBC to new sites, as well as inform the management of these new populations in terms of prescribed burn intervals and the timing of new plantings.

Research explored relationships between plant size and litter for its effect on germination and establishment of young PBC plants. In addition, permanent plots established in 2000 were censused and demographic data, as well as vegetation data, were collected. In addition, censuses were conducted of all of the new introductions across the Nachusa Grasslands with the help of the Staff of the Chicago Botanic Garden's Plants of Concern. Survivorship during the course of

the summer appeared to be quite high and newly established seedlings in the permanent plots achieved total heights that had not been previously observed at this site. The increased height was likely due to the fact that these new plants never experienced the usual late summer drought, and were therefore able to continue growing until they became dormant. This increased growth will likely result in higher than usual survivorship and emergence rates in 2016.

*Pati Vitt, Chicago Botanic Garden*

## Wetland Turtle Surveys of Nachusa Grasslands, Lee County, Illinois

A turtle trapping survey was conducted at Nachusa Grasslands 12 through 21 May 2015. The primary goal was to continue and expand survey effort for Blanding's turtle (*Emydoidea blandingii*). In 2014, a survey was conducted with emphasis on determining if the yellow mud turtle (*Kinosternon flavescens*) occurred at Nachusa Grasslands, since the nearest records of the species was approximiately16–mi S/SW near the Green River Conservation Area. This year's survey provided an additional opportunity to reinforce our determination of absence made in 2014 for the yellow mud turtle.

There were 82 total turtle captures during this survey; 73 captures in traps and 9 incidental captures that include live hand captures or finds of shell remains. Of the 62 *C. picta* trap captures, 21 were female, 30 male and 7 were immature or juvenile. There were only three within–year recaptures (1–F, 2–M). There were seven total *C. serpentina* captures (1–F, 2–M, 5–J), but immature individuals were tallied with the juvenile category to conserve column field space. All five *C. serpentina* individuals ranged between 12 and 19 cm carapace length and were considered immature stage. There were five total trap captures of *E. blandingii*, three of them initial captures of new two unmarked female and one male, and a trap recapture of the 1L–2R female, initially captured unmarked basking. The third female tabulated as a new individual was a first–time capture in 2015 of an individual marked in last year's survey and technically would be considered a between–year recapture. This individual was 1L–1R female captured in T19 to southeast side of the main Biven's Pond, captured last year twice in the main Biven's Pond. The total trap captures are summarized by wetland site in Table 1.

| Species | NR | BP | WCS | ROW | TS | RP | Totals* |
|---|---|---|---|---|---|---|---|
| *Chrysemys picta* | **3** | **9** | **1** | **29** | **1** | **19** | **62** |
| *Chelydra serpentina* | **0** | **3** | **1** | **1** | **2** | **0** | **7** |
| *Emydoidea blandingii* | **0** | **1** | **0** | **0** | **4** | **0** | **5** |
| *Kinosternon flavescens* | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| Totals | **3** | **13** | **2** | **30** | **7** | **19** | **74** |

Table 1. Total captures of turtles in traps 12 through 21 May 2015. *Total captures include within–year recaptures; three *C. picta* at the RP site; one *E. blandingii* 1L–2R Female at TS site. Note that ROW total includes both the WROW and EROW pond traps, but no turtles were captured in the single trap set at WROW. The BPSW and BPSE sites are also lumped with the main Biven's Pond traps. Only two captures occurred at those peripheral, add–on marsh ponds for the BP site.

The nine incidental captures included the initial capture of *E. blandingii* female (marked 1L–2R) basking at Tellabs Savanna on 14 May, then two more subsequent recaptures of her on 17 and 18 May. She was basking in sedge growth on the northwest side of a linear buttonbush shrub swamp swale opposite side of where she was initially captured on 14 May and where T26 trap was set, but on 18 May she was cryptically basking entirely covered and obscured by overhanging sedge and forb growth, as well as dead culms from last year in the same general location as on the 17th, and only noticed when my boot bumped her shell as I was heading to check other traps in the west sector of the buttonbush swale (i.e. T29–31 traps).

There was an adult *C. serpentina* captured in shallows on the west side of Biven's Pond near T6 on 14 May and a huge male *C. serpentina* captured surface basking in shallows at far north side of EROW pond on 19 May, the CL which was approximately 36.5 cm in length and nearly 1/3 of posterior end of its tail recently bitten off. This individual and the tail injury were photographed. The other captures consisted of several shell remains of adult *C. picta* and an adult *C. serpentina* at Naylor Road. All incidental captures/finds are summarized in Table 2.

| Date | No. | Species | Sex | Site | Comments |
|---|---|---|---|---|---|
| 5/13/15 | 1 | Chse | U | NR | Shell remains SC–side of pond, collected as voucher. |
| 5/14/15 | 1 | Embl | F | TS | Adult female basking on matted sedges SE–side buttonbush swale near T26. |
| 5/14/15 | 1 | Chse | F | BP | Adult captured in shallows W–side of pond, CL=23.5 cm. |
| 5/14/15 | 2 | Chpi | U | BP | 2 shell remains on edge of berm 2–track path SW–side of pond, collected. |
| 5/16/15 | 1 | Chpi | U | BP | Shell remains found along grassy mudflats SE–side of pond, collected. |
| 5/17/15 | 1 | Embl | F | TS | Recapture of 14 May female marked 1L–2R, basking NE–side T26 swale. |
| 5/18/15 | 1 | Embl | F | TS | Recapture of 1L–2R female cryptically basking same gen location as on 17th. |
| 5/19/15 | 1 | Chse | M | EROW | Huge male surface basking at far N–end, 1/3 of tail bitten off, CL=36.5 cm |
| **Totals** | **9** | | | | |

Table 2. Incidental captures or finds made while setting or checking traps. Chse = *C. serpentina*; Embl = *E. blandingii*; Chpi = *C. picta*; NR = Naylor Rd; TS = Tellabs Savanna wetlands; BP = Biven's Pond; EROW = East Right–of–Way marsh pond; U = undetermined; F = female; M = Male.

Once again, *Chrysemys picta* (painted turtle) was the most abundant and widespread turtle species. There were a few painted turtles captured this year that had been notched last year, but data was not tabulated since there were so few between–year–recaps. Recapture rate of painted turtles was low, but not unexpected for a trapping session only ten days long; turtles can form a temporary aversion to the traps due to the handling and shell notching. There were noticeably few painted turtles captured at the Biven's Pond site, where three shell remains of *C. picta* were found, suggesting higher mortality for that pond, possibly resulting from prolonged winter ice–over.

*C. serpentina* was also widely distributed and captured in low numbers across most of the wetland sites. A few modest–sized immatures and at least one older juvenile indicate the species is reproducing with successful recruitment into the preserve–wide population.

*Emydoidea blandingii* is preserve wide in distribution, but its status is undetermined and is likely tenuous considering so few individuals, and that all are old adults and no immature or juveniles

of the species have been captured to date. The only Blanding's captured in the main preserve wetlands located near and to the south of the headquarters facility was a 1L–1R female captured last year twice at Biven's Pond and this year once at a smaller, separate marsh pond just to the southeast side of the main Biven's Pond. This is an old, melanistic adult female and palpation indicated she was not gravid. The shell remains of two individuals have been recovered in past years (one in 2013 and another in 2014), and the lack of captures of new individuals, suggests that whatever population occurred there in past is declining. Restoration of hydrology and wetland vegetation in these areas may provide habitat for the recolonization of adults elsewhere from within or outside the preserve, or immatures and juveniles if successful reproduction occurs in the future.

Four new individual Blanding's turtles were captured this year at the Tellabs Savanna wetlands complex. All were adults, including three females and one very large male. The females were older adults based on shell wear, but they were not melanistic. All were palpated and results indicated that they were gravid, though they were not late–stage carrying shelled–eggs. It is possible more individuals occur there and it would take an extended trapping session over 30–45 days or more to accurately determine how many individuals persist at Tellabs Savanna.

*Thomas G. Anton, The Ecological Consulting Group, LLC*
*David Mauger, Forest Preserve District of Will County*

**Project Baseline, a Living Plant Genome Reserve for the Study of Evolution**

We propose a national effort to systematically collect, preserve and archive seeds to be made available to future biologists for studies of evolutionary responses to anthropogenic and natural changes in the environment that will have occurred in the coming decades. For ~84 species with diverse life–history attributes, seeds will be collected from multiple populations in different habitats and climates across the species' geographic range and from numerous individuals per population. This sampling plan will capture both variation differentiating populations and genetic variation within populations. Seeds will be stored at the USDA National Center for Genetic Resources Preservation, a world–renowned germplasm repository.

In collaboration with seed storage experts at this facility, we will examine the critical assumption that genetic variation collected today will be well represented when stored seeds are grown out for future experiments. Thus, this work will contribute to the development of better methods to sample seed diversity, assess seed quality, and ultimately improve seed banking efficiency by reducing the requirement to monitor viability. This information will be useful for the USDA as well as other ex situ germplasm collections that include native plant species.

This project will capitalize on its natural public appeal to recruit and develop collaborations with science educators and land stewards at public and private reserves and parks. PIs will offer one free half–day workshop per year for regional school teachers, natural reserve docents and volunteers, and/or Federal and State agency staff, which will include development of classroom, schoolyard, and outdoor park activities involving seed collection and preservation. In addition,

we will offer public lectures that will introduce the concept of resurrection ecology as well as well as enhance awareness of issues concerning population persistence, natural selection, and evolution in an age of global change.

This project will provide job experience and mentoring to young people who may ultimately pursue scientific careers. The PIs all have a history of involving minorities and other traditionally underrepresented groups in research, and will continue to promote diversity by targeting these groups for paid, volunteer, and research–for–credit positions offered by this project. Collectively, our access to – and our success in recruiting — undergraduates representing Native American, Chicano, and Latino communities will ensure their engagement in this project and enhance their preparation for careers in basic or applied botanical, ecological, and evolutionary research.

In 2015, Project Baseline collected seed from nearly 400 populations of 45 species across the contiguous U.S. Seeds from over 35,000 maternal lines are currently being prepared and sent to the National Center for Genetic Resources Preservation (NCGRP) for long–term storage. At Nachusa Grasslands, seeds were collected from six species: *Ratibida pinnata* (yellow coneflower), *Rudbeckia hirta* (black–eyed susan), *Ambrosia artemisiifolia* (common ragweed), *Amorpha canescens* (leadplant), and *Asclepias syriaca* (common milkweed). This was the final collection year under the original Project Baseline NSF grant, but we are seeking additional funding to continue to grow this collection.

*Nicole Soper–Gorden, University of Minnesota Duluth*

**Habitat Selection of Reintroduced Bison at Nachusa Grasslands**

During the first year of study (October 2014–November 2015), we collected hourly location data from Lotek Iridium TrackM 3D and 4D collars placed on 7 bison prior to reintroduction. We have developed several hypotheses regarding bison habitat selection with The Nature Conservancy staff and our initial analysis focused on the hypothesis 1, that bison will preferentially select grasslands over other habitat types. Grasslands include remnant prairie, restored prairie, and unrestored grasslands. Other habitat types include wooded and residential. Bison use of each land cover type was divided into four seasons (winter, spring, summer, and fall) and compared to available habitat using a Chi–square test. Our preliminary analysis indicates significant preferential selection for two types of grasslands, remnant prairie and unrestored grasslands, but preferential selection against one type of grassland, restored grasslands in all seasons. For all seasons except fall, bison also preferentially selected for residential areas and against wooded areas. In fall, bison continued to select for remnant prairie, unrestored grasslands, and residential areas and against restored prairie; however, wooded area selection was not significant. Future analysis will include the development of a resource selection function to more thoroughly investigate other environmental and management–related variables that may influence habitat selection, including burn regime, planting restoration date, slope, aspect, and distance from anthropogenic structures.

*Julia C. Brockman and Clayton K. Nielsen, Southern Illinois University*

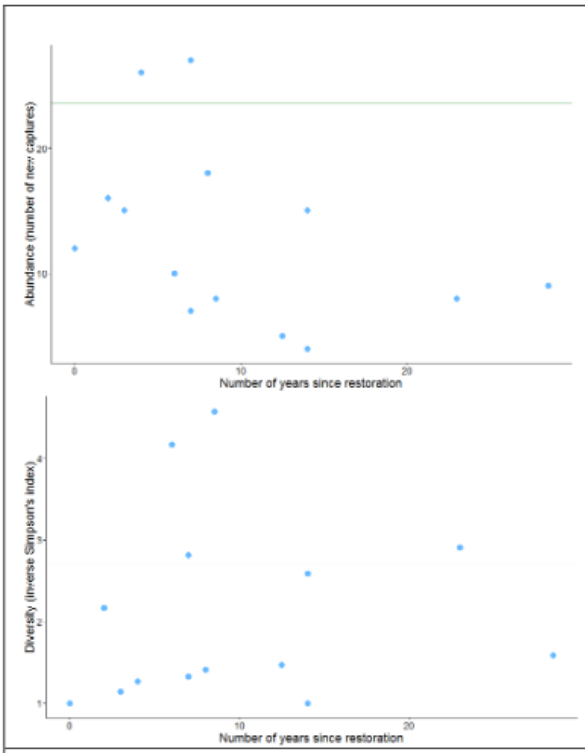
**Preliminary Inventory of Earthworms Occurring in Habitats at Nachusa Grasslands**

426 earthworm specimens representing eight species in four genera and one family – including one new state record, Bimastos welch – were collected from 23 Nachusa Grasslands sites between April 21 and October 7, 2015 (4 sites in April, and 19 sites in October). The other seven species we collected at NG this year are all European introductions common elsewhere in IL and in North America; none of the three Oriental introductions that have been recorded elsewhere in Illinois was present in samples we collected at NG in 2015. Specimens have been curated, and deposited in the INHS Annelida Collection in Champaign Illinois; metadata associated with these specimens are being integrated into the INHS Annelida Collection database. Our 23 sampling sites were scattered throughout the NG property in both counties; specific locality info will be included in our final report to Friends of Nachusa Grasslands.

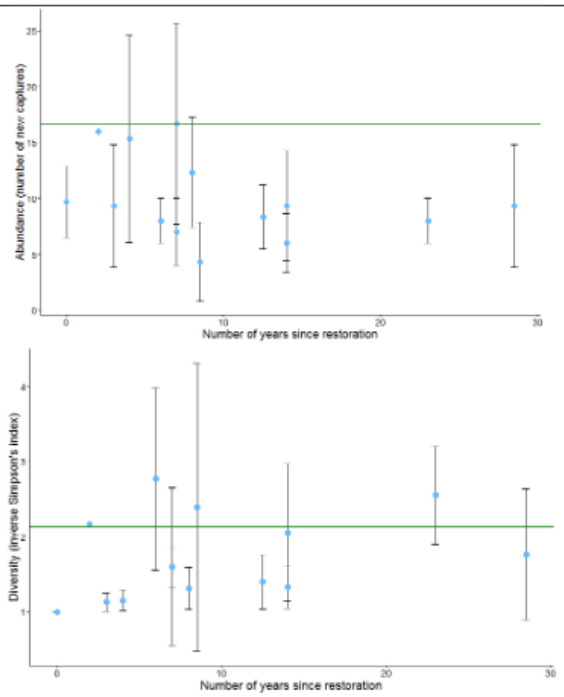
*Mark J. Wetzel, Illinois Natural History Survey*

**Small Mammal Research at Nachusa Grasslands**

This was the third year of mammal trapping at Nachusa Grasslands, and the goal was to get a sense for the diversity and abundance of small mammals along the chronosequence of study sites and with differential prescribed burning and grazing influence. We caught 227 animals over four trapping sessions between April and October 2015 for a total of seven species. We found no trends in diversity or abundance with time since restoration in 2015 (Figure 1, left panels) or over all study years (Figure 1, right panels). We also found that capture per unit effort is higher in burned versus unburned sites and that voles are found more frequently in unburned sites, which is surprising given their preference for thatch ground cover.




Small mammal abundance (top) and (bottom) diversity across the chronosequence at Nachusa Grasslands in 2015. Green lines are values for remnants, while the dot at 0 years since restoration is the value for agricultural field.

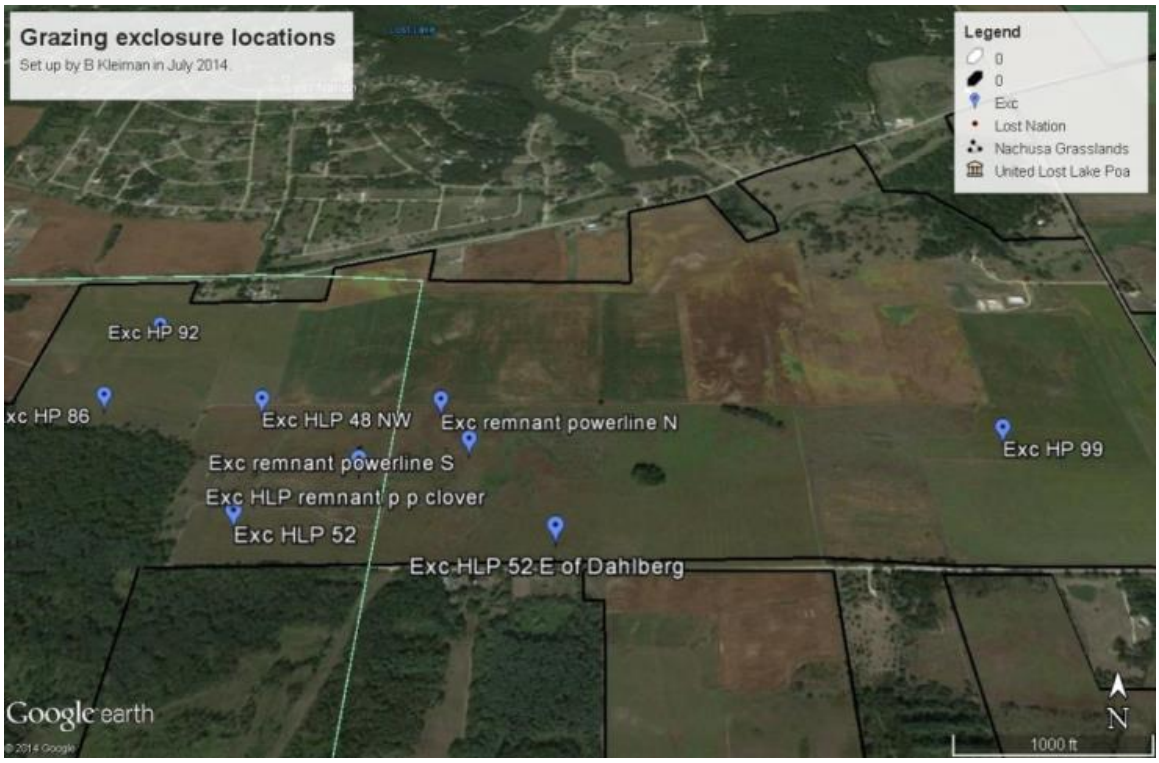



Average small mammal abundance (top) and diversity (bottom) across the chronosequence at Nachusa Grasslands for study duration. Green lines are values for remnants, while the dot at 0 years since restoration is the value for agricultural field.

*Holly Jones, Northern Illinois University*

**Soil Microbe Sampling at Nachusa Grasslands**

Soil samples were collected from the nine permanent grazing exclosures established on the north end of Nachusa Grasslands between May 5, 2015 and October 19, 2015. Soils were specifically sampled directly under cool season (*Elymus canadensis*) and warm season (*Schizycarium scoparium*) plants at key plant growth stages (e.g. emergence, bolting, senescence). Soil samples are being analyzed for C and N pools, microbial activity (extracellular enzyme assays), and microbial communities (DNA sequencing). Preliminary analysis of microbial activity indicates microbial activity under *Elymus canadensis* (C3 photosynthesis, cool season) was greater in June and July and microbial activity under *Schizycarium scoparium* (C4 photosynthesis, warm season) was greater in August and September. Data will be collected for a second year to verify seasonal patterns between multiple years.




*Elizabeth Bach, University of Illinois at Urbana–Champaign*

# Other Projects by Staff or Supported by The Nature Conservancy in Illinois

## THE CONSERVATION VALUE OF THREE AGRICULTURAL PRODUCTION SYSTEMS FOR BIRDS AND POLLINATORS

This agricultural biodiversity project stems from the Franklin Research and Demonstration Farm Project, located in Lexington, IL. To evaluate the Franklin farm's goal of restoring woodland, savanna, prairie and wetland habitats to increases the biodiversity of plants and animals within an agricultural landscape, bird and pollinator surveys were conducted across three farm production systems in the spring and summer of 2015. Bird surveys consisted of walking transects in cover crop fields in the spring and point counts in the summer. Pollinator surveys consisted of insect traps to target bees and walking transects to count butterflies in the summer. The three farm production systems were conventional, conservation, and organic. For the scope of this project, a conservation farm is defined as having three or more conservation practices utilized on the field at any time within the planting/growing season. All organic farms included in the study are certified organic through USDA accredited certification agencies.

*Bird Surveys*
Bird point counts were conducted between May 26 and July 8 on 20 conventional, 21 conservation, and 18 organic fields consisting mostly of corn and soybeans, but also eight wheat fields. A total of 3873 birds of 46 species were counted and bird abundance and species richness was compared across the three production systems.

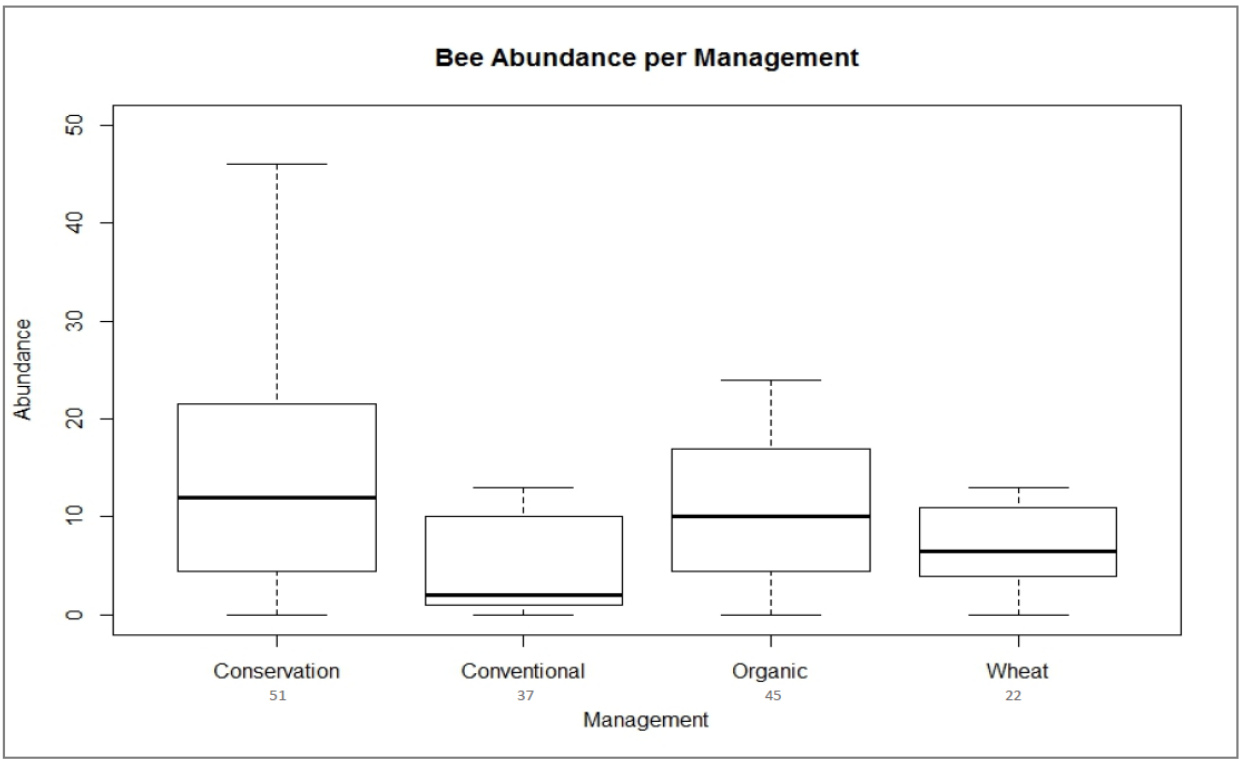
To assess bird density and diversity in cover crops fields, walking transect counts were conducted from March 16 to June 5. Transects were conducted for a minimum of 10 minutes, but no more than 1 hour. All birds seen or heard within the transect area were counted, while recording the angle to each bird off the transect route and the distance to the bird. The fields with cover crops consistently have more species with higher densities compared to the control treatments. To evaluate the influence of vegetation structure, four random vegetation plot surveys were conducted within the transect area. Transects and vegetation surveys were conducted on fields without cover crops as a control. Analysis of vegetation structure on bird densities and diversity has not been completed at this time.

Preliminary analysis of avian point count data suggests that conservation farm production systems support a more diverse and abundant population of birds than conventional and organic farm production systems. The preliminary data suggest that the increased vegetation and structural diversity of conservation farms is of great benefit to many bird species.

*Bee Surveys*
Insect traps were set between May 28 and July 26 in five corn and five soybean fields in each farm production system. Traps were also set on five wheat fields for comparison. A minimum of two traps were placed per field depending on the number of additional habitats in or adjoining

the field. Traps were placed in the cash crop, grassed waterways, along drainage ditches, field borders, conservation reserve (CRP) habitat, wetlands, and other waterways. Traps were set in the effective field middle (8–10 meters from field edge) for one day. In total, 163 traps were set and samples were collected from 159 of them. Bees were identified to genus level by October 2015 by Cassandra Wilcoxen. A total of 409 specimens were collected consisting of 15 genera and approximately 22 species. To compare relative bee abundance, the median number of bees per production system and wheat were calculated for all samples taken per field over the sampling period.

Preliminary analysis of the bee surveys indicates conservation production systems are beneficial to bee abundance and diversity. Various farm practices add additional foraging and nesting habitat for bees.




Median values of bee in organic, conservation, and conventional production systems with standard error bars. Wheat fields included for comparison. Number of samples per production system are below names.

*Butterfly Surveys*

Walking transects were carried out to measure butterfly abundance and diversity on the same fields insect traps were placed. Each field was surveyed twice from May 28 to July 17 for a minimum of twenty minutes, but no longer than thirty minutes. Each type of habitat within the field was walked, which could consist of the crop, field borders, CRP, and grass waterways. To calculate butterfly abundance by crop, each transect was treated as an independent sample and

transects were pooled per field to measure abundance by production system. 492 butterflies were counted and over 75% of butterflies encountered were considered agricultural pests.

Although butterfly abundance is higher in soybeans, conservation, and organic farm production systems, diversity does not differ as much. Bees and butterflies do pollinate soybeans, which the preliminary data supports, but butterfly diversity is depauperate overall.

*Cassandra Wilcoxen, University of Illinois at Urbana–Champaign*

## INVASIVE SPECIES STRIKE TEAM EVENTS

**Catching Fire Oak Restoration Workshop at Trail of Tears State Forest** – The Illinois Forestry Association (IFA) worked with a host of partners and field experts to offer a one–day workshop and tour at Trail of Tears State Forest focused on the restoration of oak forest ecosystems. The ISST attended the OAKtober event to learn more about the vital role oak tress play in Southern Illinois ecosystems.

**83rd Annual Summer Fire School & Midwest Wildfire Training Academy** – The Strike Team traveled to Jefferson City, MO in June of 2015 to attend the Midwest Wildfire Training Academy and continue working on their wildfire certifications. The training event was very beneficial in obtaining new knowledge and techniques when implementing prescribe burns throughout the 2015 field season.

**Ozark Hill Prairies Inventory** – In August, the Strike Team traveled to the Ozark Hill Prairies to inventory invasive and native plants with staff from the IDNR, INPS, USFS, SIUC, CWMA, and USFWS. Inventorying plant species here allowed for future management implications to be considered.

**Native Fern Workshop at Camp Ondessonk** – In the early fall of 2015, the ISST attended a wild fern workshop hosted by the Illinois Native Plant Society at Camp Ondessonk, a youth camp in Ozark, Illinois located in Johnson County. The workshop covered aspects of fern biology and botany that aid the ISST in identifying and understanding the ecology of southern Illinois' native, wild ferns.

**Native Grass Identification Workshop at Southern Illinois University of Carbondale** – The Illinois Native Plant Society hosted a native grass identification workshop on Southern Illinois University of Carbondale's campus. The strike team attended the training event in the late summer of 2015 to aid in the identification of native grasses while conducting treatments in the field.

*Caleb Grantham and Nick Seaton, The Nature Conservancy*

## CONSERVING NATURE'S STAGE

Climate change is creating an increasingly dynamic natural world by shifting species distributions and rearranging habitats. Consequently, conservationists need a way to identify important areas for protection that does not assume that the locations of existing plants and animals will stay the same. Rather than trying to protect diversity one species at a time, the key is to protect the different "stages" upon which the drama of nature unfolds. These stages are based strongly on geology and consist of recognizable geophysical settings such as coastal sands, limestone valleys, granite summits, or silt floodplains, that each support a distinct set of species. Conserving a range of physical environments offers an approach to conservation that protects a diversity of plants and animals under both current and future climates.

The number of plants and animals in each state is correlated with the number of geology types, the amount of limestone, the latitude, and range of elevation in the state. These geophysical factors form ecological regions across the landscape that support different species. Natural strongholds are places where the direct effects of climate change are moderated by complex topography and connected natural cover, and where the current landscape contains high quality biodiversity features. Natural strongholds can serve as a bridge to grant safe passage into the future for thousands of species. In these sites, species can find areas of suitable moisture and temperature within their local neighborhood. This allows resident species populations to remain strong and helps ensure that changes in the composition and structure of the communities will be more gradual.

With a changing climate, many places may become degraded and lose species, but some places will retain high quality habitat and continue to support a diverse array of plants and animals. Sites that have both complex topography and connected land cover are places where conservation action is most likely to succeed in the long term. Permanent conservation of the resilient areas should be prioritized to ensure they can continue to provide habitat for species.

This analytical process was pioneered in the northeastern US and successfully applied to the southeastern region, and mountain northwest. Thanks to a grant from the Doris Duke Charitable Foundation, this analytical process expanded to the Great Lakes and Great Plains ecoregions in 2015, with completion expected in 2017. Representatives from TNC chapters in the region and external partners are serving on a steering committee to help adapt the methodology to the unique settings of each ecoregion.

*Mark Anderson, Kim Hall, and Meredith Cornett, The Nature Conservancy*

## BIRD MONITORING AT PRAIRIE RIDGE STATE NATURAL AREA

To monitor changes in abundances of grassland birds and complement the annual greater prairie–chicken surveys conducted by the Illinois Department of Natural Resources, Jeff Walk has initiated two efforts at Prairie Ridge State Natural Area. A Christmas Bird Count, centered on the Jasper County area, was established in 1998. In 2005, 77 permanent census points were plotted

systematically throughout the area for standardized point–counts conducted each June, with assistance from staff of the Illinois Department of Natural Resources and Illinois Audubon Society. Aside from being the only Christmas Bird Count in Illinois to record prairie chickens, the count has set state records for high–counts of northern harriers and short–eared owls (including the highest Christmas Bird Count tally in North America in four years). Breeding season counts show small annual variation in abundances of the most common species: red–winged blackbirds, dickcissels, eastern meadowlarks, Henslow's sparrows, and northern bobwhite. The second year of a prairie chicken translocation project was on hiatus in 2015, due to the state budget impasse and failure of IDNR staff to obtain out–of–state travel permission. The project will resume in 2016 with Illinois Audubon Society paying transportation costs through the Southern Illinois University Flight School.

*Jeff Walk, The Nature Conservancy*

# Professional Publications

*(The Nature Conservancy staff and projects in **bold**)*


Baumann, K. A. 2015. Macroinvertebrate community responses to hydrologic extremes in the upper and lower segments of the **Cache River**, IL and implications for restoration efforts. Master's degree thesis. Department of Zoology, Southern Illinois University. Carbondale, IL.

Griffin, Sean. 2015. Conservation of native pollinators: effects of restoration on bee communities of a tallgrass prairie. Master's degree thesis. Rutgers University, New Brunswick, NJ. April 2015. *Research at **Nachusa Grasslands**.*

Griffin, S., B. Bruninga–Socolar, M. Kerr, J. Gibbs, R. Winfree. In review. Wild bee community change over a 26-year chronosequence of restored tallgrass prairie. *Restoration Ecology*. *Research at **Nachusa Grasslands**.*

Rantala, H. M., E. A. Scholl, B. Trushel, and M. R. Whiles. In review. Modeling ecological responses to a proposed stream restoration: relationships between flow and dissolved oxygen in a low gradient Midwestern river. *Environmental Management*. *Research at **Cache River.***

Scholl, E. A., H. M. Rantala, M. R. Whiles, and G. V. Wilkerson. In press. A quantitative framework for predicting biological responses to a proposed river restoration. *River Research and Applications. Research at **Cache River**.*

# Research Reports and Popular Publications

Goad, R. 2015. New Resources from Plants of Concern. *Gatherings, a newsletter of The Nature Conservancy's Volunteer Stewardship Network.* November/December 2015. *Work at **Indian Boundary Prairies** and **Kankakee Sands**.*

Goad, R. and A. Braum. 2015. Plants of Concern Volunteer Manual. *Work at **Indian Boundary Prairies** and **Kankakee Sands**.*

**Hagen, S.**, **A. Cisneros**, **K. Kirkham**, **S. McClure**, and **J. Walk**. 2015. 2014 Science Report. The Nature Conservancy in Illinois. 77 pages.

Hagy, H. M., A.P. Yetter, J. M. Osborn, M. M. Horath, C. S. Hine, D.R. McClain, Kristen M. Walter, A. D. Gilbert, T. J. Benson, J. M. Fox, and M. P. Ward. 2015. Illinois Waterfowl Surveys and Investigations W–43–R–62. Annual Progress Report. INHS Technical Report 2015 (39). 102pp + appendices. *Research at **Emiquon Preserve**.*

Hilsabeck, R. 2015. IDNR **Emiquon** Status Report 2015. Illinois Department of Natural Resources.

Hine, C., and H. Hagy. 2015. Banding's importance in the grand scaup of things. INHS Reports 413:23–24. *Research at **Emiquon Preserve**.*

Hine, C.S., H.M. Hagy, A.P. Yetter, and M. M. Horath. 2015. Waterbird and wetland monitoring at the **Emiquon Preserve**. Annual Report (FY14). INHS Technical Report 2015 (21). 67 pp

Hoffman, K. 2015. April Burn Makes Monitoring Easier. *Prairie Telegraph*. 19(3) p. 6.

Hoffman, K. 2015. Painting a Picture of the Prairie. *Prairie Telegraph*. 19(4) p. 7.

Kovacic, D. A. and M. P. Wallace. 2015. Bundling in–field and off–field wetlands construction and water quality analysis for the **Bloomington Drinking Watershed Project**. Wetlands Ecology Laboratory, University of Illinois, Champaign, Illinois.

**Kirkham, K. G.**, **A. R. Maybanks**, M. P. Wallace, and **A. M. Lemke**. 2015. Celebrating 10 years: a reflection on the history, science, and partnerships at the **Franklin Research and Demonstration Farm**. Annual report.

VanMiddlesworth, T. D. and A. F. Casper. The Nature Conservancy's **Emiquon Preserve** Fish and Aquatic Vegetation Monitoring Annual Report. INHS Technical Report 2015 (02).

# Presentations & Posters

*(The Nature Conservancy staff and projects in **bold**)*

## SPECIAL SESSION: CONNECTIVITY AND WATER LEVEL MANIPULATION FOR LARGE SCALE RESTORATION – COMPREHENSIVE ASSESSMENT OF THE RESPONSES OF THE EMIQUON PRESERVE

### 4TH BIENNIAL SYMPOSIUM OF THE INTERNATIONAL SOCIETY FOR RIVER SCIENCE 2015: RIVER CONNECTIVITY LA CROSSE, WI

Benedict, L. Alternative dynamic regime theory: large-scale community shifts in a newly restored lake across multiple community levels.

**Blodgett, K. D.** Restoration and reconnection of functional floodplain at The Nature Conservancy's **Emiquon and Merwin Preserves** along the Illinois River.

Casper, A. F. Successional dynamics of submerged aquatic vegetation – restoration, resiliency, and response to flooding.

Hagy, H. M., C. S. Hine, A. P. Yetter, M. M. Horath, and J.M. Osborn. The response of waterfowl abundance and diversity to floodplain habitat restoration.

Hine, C. S., H. M. Hagy, A. P. Yetter, M. M. Horath, and J. M. Osborn. The response of emergent marsh and wetland vegetation during 8 years of restoration: Implications for essential river floodplain habitat.

Hine, C. S. The response of emergent marsh and wetland vegetation during 8 years of restoration: implications for essential river floodplain habitat.

**Lemke, A. M.**, M. J. Lemke, J.R. Beaver, and C. Hinz. Zooplankton dynamics in the floodplain lakes at The Nature Conservancy's **Emiquon and Merwin Preserves** along the Illinois River, Illinois.

Lemke, M. J. Changes in the pelagic bacterial community in two Illinois River floodplain lakes under restoration.

VanMiddlesworth, T. D. and A. F. Casper. The Nature Conservancy's **Emiquon Preserve**: aquatic vegetation and fish community monitoring, 2007–2014.

VanMiddlesworth, T. D., G. G. Sass, T. W. Spier, B. A. Ray, and A. F. Casper. Biocontrol of invasive fish species using native predators in a large floodplain restoration.

Baker, K. S., C. A. Troxell–Thomas, and W. G. Pooler. Data management: File systems and metadata.

Barry, B. Near–term projects to enhance habitat for migratory birds and native wildlife and provide additional public use opportunities.

Baumann, K. A., E. A. Scholl, H. M. Rantala, and M. R. Whiles. Influence of climate variability on macroinvertebrate community structure in the **Cache River** following a legacy of hydrologic alteration.

Benedict, L., M. J. Lemke, F. Velho, L. C. Rodrigues, K. Dungey, A. Kent. Plankton community changes in the early restoration phase of Thompson Lake restoration, **Emiquon Preserve**, Il.

**Beverlin, J. C.** and **C. S. Smith**. People at **Emiquon**: Recreation and education.

**Beverlin, J. C.**, **K. Tharp**, and **K. Butler**. LEAF – The Nature Conservancy's leaders in environmental action for the future program in Illinois.

**Blodgett, K. D.**. Challenges, opportunities and current plans for managing The Nature Conservancy's **Emiquon Preserve**.

Bonjour, S., H. M. Rantala, M. G. Bennett, and M. R. Whiles. Constructed riffles affect community structure and diets of fishes in a Midwestern river. [Research on **Cache River**.]

Buss, C. D., H. Chen, and A. McEuen. Storage of soil organic carbon and total nitrogen in restored wetlands and croplands of Illinois: A chronosequence approach.

Chick, J. 2015. Lessons from the Swan Lake Habitat Rehabilitation and Enhancement project.

Fretueg, G. R., C. S. Hine, H. Hagy, M. M. Horath, A. P. Yetter, and J. Osborn. The energetic carrying capacity of the **Emiquon Preserve** for waterfowl.

Fritts, M. W., J. DeBoer, A. Fritts, K. Kellock, R. Bringolf, and A. Casper. Intersex condition in male Largemouth Bass from the Upper Illinois River waterway.

Green, V. Maintenance of willow shrub and scattered canopy by beaver herbivory in a floodplain forest near Davenport, Iowa.

Hine, C. S., H. Hagy, A. P. Yetter, M. M. Horath, and J. Osborn. Response of waterbirds and wetland vegetation relative to key Ecological Attributes at **Emiquon Preserve**, 2007–2013.

**Hobson, T. L.**, and **S. J. McClure**. **Emiquon Preserve** work plan and activities.

Hollenbeck, K. M., and T. F. Ting. Implementation of a monarch waystation at **Emiquon**.

Jen, D. Breeding ecology of waterbirds in a restored floodplain of the Illinois River.

Kent, A. Assessing the effects of land use change on microbial communities and their activities.

Kloppenborg, A., and S. P. Romano. Influence of canopy light penetration on Pink Turtlehead (Chelone obliqua) abundance in a floodplain forest.

**Lemke, A. M.**, J.R. Beaver, and C. Hinz. Zooplankton communities in unconnected and connected backwater habitats along the Illinois River, Illinois: 2013–14.

Lian, Y. Modeling in assisting real–time response and strategic planning to flooding risk along the Illinois River.

Lovvorn, J. Measuring and modeling food web support in highly transient ecosystems: River floodplains.

Marlin, J. Illinois River Backwater sediment: Physical and Chemical properties and potential uses.

**McClure, S. J.**, **T. L. Hobson**, **D. C. Perry**, T. D. VanMiddlesworth, L. E. Solomon, R. M. Pendleton, and A. F. Casper. The Nature Conservancy's **Merwin Preserve**: fish community monitoring, 1999–2014.

Miles, C., J. DeBoer, and M. Fritts. Factors affecting the growth of Largemouth Bass in the Upper Illinois River.

Pendleton, R. M., L. E. Solomon, and A. F. Casper. Long–term changes in the fish community structure in relation to Asian Carp establishment.

Pooler, W., and W. Herr. Invasive species phase one risk analysis.

Pooler, W., and H. Imker. Status of research data policies from funding agencies: Statements on access, archives, and sharing.

**Seaton, N.**, **C. Grantham**, and **T. Hobson**. Strategic management of priority invasive species: Coordinated control through the southern Illinois invasive species strike team.

Secchi, S. The role of policy in promoting sustainable floodplain management.

Simnor, A., T. F. Ting, and P. McDonald. Results from the first two years of an osprey recovery project in Illinois.

VanMiddlesworth, T. D., and A. F. Casper. The Nature Conservancy's **Emiquon Preserve**: Aquatic vegetation and fish community monitoring, 20017–2014.

Wiant. M. D. 2015. Historical overview of Illinois River Valley ecosystem service.

Whiles, M. 2015. Ecological responses to restoration efforts in the **Cache River**.

## THE 1ST ANNUAL NACHUSA GRASSLANDS SCIENCE SYMPOSIUM

*CO-HOSTED BY THE FRIENDS OF NACHUSA GRASSLANDS AND THE NATURE CONSERVANCY, FRANKLIN GROVE, IL*

*A time for every season: prairie microbes. Elizabeth Bach, PhD., Ecology and Evolutionary Biology – Post–doctoral Research Fellow, Illinois Natural History Survey.*
Dr. Bach is studying the functional role of prairie soil fungal communities in cycling and storing carbon and nitrogen in prairie ecosystems. Specifically, she proposes to contrast seasonal shifts in prairie fungal communities and fungal–driven C and N cycling in bulk soil and the rhizosphere of cool season and warm season plants. This research should generate a catalog of soil fungal diversity at Nachusa and integrate that information with nutrient turnover and carbon storage. Learning about the timing of microbial turnover of nutrients may lead to new management strategies that could enhance cool season plant competitiveness and overall plant diversity.

*Ground beetle richness results. Nicholas Barber, PhD., Ecology– Assistant Professor of Biology, Northern Illinois University.*
With Dr. Barber's supervision and as part of the Research Rookies Program, students are researching the impact of bison on dung beetle community assembly in restored and remnant tallgrass prairies. The underappreciated dung beetles play an important role in recycling nutrients in prairie ecosystems. The objectives of this project are to document the diversity of dung beetles in restored and remnant prairies, determine how the dung beetle communities change over time following restoration, and determine if bison impact this component of insect biodiversity.

*Bison Habitat Use. Julia Brockman – M.S. Candidate, Cooperative Wildlife Research Laboratory and Department of Forestry, Southern Illinois University.*
Ms. Brockman is studying bison habitat selection and assessing the effects of human presence on bison at Nachusa. She is collecting hourly GPS location data from collars on seven bison cows and overlaying that data on maps of remnant and restored plant communities and locations of human activity. She will also collect data on bison behavior at different locations and times of day. These observations should help managers develop strategies to optimally plan human/bison interaction, restoration goals, and burn schedules.

*Small Mammal Trapping. Angela Burke – M.S. Biology Candidate, Northern Illinois University.*
This project will attempt to quantify how changes in fire intervals and the presence or absence of bison affect small mammal populations in restored and remnant prairie. Live capture–mark–recapture methods are being used to measure small mammal diversity, abundance, and seasonal fluctuations in matched pairs of differently aged restoration sites and in remnant sites varying in bison presence/absence and fire frequency.

*Soil Microbe Effects on Restoration Success. Kim Elsenbroek, M.S., Biology, Indiana University Bloomington.*
The goal of this study was to advance understanding of the role of soil microbes in driving prairie community structure and dynamics and the success of prairie restorations. Results of studying soil inocula from remnant prairie vs. failed and successful prairie restorations using a whole soil inoculum mesocosm experiment in a greenhouse will be discussed. Also, assessed field patterns of microbial community diversity among the three types of prairie communities will be presented. The findings of these studies suggest management techniques that could improve restoration results.

*Wild bee community change over a 26-year chronosequence of restored tallgrass prairie. Sean Griffin – PhD Candidate, Ecology and Evolution, Rutgers University.*
The aim of this project with fellow PhD candidate, Bethanne Bruninga–Socolar, is to investigate how species and populations of bees, the most important pollinators in tallgrass prairie, respond to prairie restoration. Bee communities collected in prairie restorations of varying ages (1–25 years), remnant prairies, and agricultural areas will be compared with each other. Comparisons will be also be made between areas with and without bison. In addition to suggesting pollinator–friendly management strategies, this project will provide Nachusa with baseline data on bee populations on the preserve.

*Grassland Bird Nesting. Heather Herakovich – M.S. Biology Candidate, Northern Illinois University*.
Two years of data have been collected for this study of grassland bird density in 11 plots of land that range from 1–year post restoration to 26–years post restoration as well as remnant control prairies and agricultural field controls. Specifically, the researcher and her trained volunteers are measuring nest density and survivorship by marking each nest found, recording the number of eggs, calculating depredation rates, and determining survivorship of all marked nests. This will provide pre– and post–bison data on grassland bird density in both remnant and restoration sites.

*Ecological Impact of Bush Honeysuckle. Shannon McCarragher, PhD., Geography – Visiting Assistant Professor of Geography, Northern Illinois University.*
This interdisciplinary research explores the ecological impacts associated with the spread of *Lonicera maackii* (Amur honeysuckle), one of the most aggressive and abundant invasive species throughout the Midwest. The main goal of this research is to better understand how the encroachment of Amur honeysuckle impacts the Midwest native *Quercus alba* (white oak) population in an oak savanna restoration project at Nachusa with particular focus on mechanisms required for successful oak regeneration and recruitment (i.e. carbon assimilation, soil quality, soil moisture/ temperature, and plant available nutrients). Management recommendations based on findings from this research will be discussed.

*Vegetation Sampling Design for Nachusa Grasslands. Bill Kleiman, Project Director of the Nachusa Grasslands Preserve*.
Bill has been leading the effort to gather pre–bison baseline data in the South Bison Unit at Nachusa. The goal is to demonstrate what effects grazing has on the floristic quality of remnants and prairie plantings. These transect studies should help managers monitor both positive and negative disturbance caused by bison over time.

# Presentations & Posters (continued)

*(The Nature Conservancy staff and projects in **bold**)*

Anton, D. 2015. **Nachusa Grasslands** turtle trapping summary. Presentation to Friends of Nachusa Grasslands, 21 July 2015.

Barber, N. J. 2015. Ground beetle richness results were presented at the Ecological Society of America's annual meeting in Baltimore, MD, in August 2015. See https://eco.confex.com/eco/2015/webprogram/Paper52451. *Research at **Nachusa Grasslands.***

Benedict, M. M., and **A. M. Lemke**. 2015. Response of benthic macroinvertebrate communities to large–scale lake restoration. Presented at the seventh Annual Midwest Great Lakes Chapter Meeting of the Society for Ecological Restoration in Glencoe, IL. *Research at **Emiquon Preserve**.*

Benedict, M. M., and **A. M. Lemke**. 2015. Response of benthic macroinvertebrate communities to large–scale lake restoration. Presented at the Society for Freshwater Science Annual Meeting in Milwaukee, WI. *Research at **Emiquon Preserve**.*

**Blodgett, K. D.** 2015. Overcoming some ecological and societal challenges to restoring and sustaining functional floodplain at The Nature Conservancy. Presented at the 75th annual Midwest Symposium "Confronting centuries of change: restoration challenges for Midwestern Rivers" 75th Midwest Fish and Wildlife Conference, Indianapolis, IN. *Research at **Emiquon Preserve**.*

**Blodgett, K. D.** 2015. A Science–Friendly Water Control Structure for The Nature Conservancy's **Emiquon Preserve**. Presented at the American Fisheries Society Meeting. Illinois Chapter meeting at Pere Marquette State Park, IL.

**Blodgett, K. D.** 2015. Hydrodynamic modeling to evaluate the use of floodplain restoration projects to reduce flood peaks on the Illinois River. Innovations in Resilience: A Learning Exchange. The Nature Conservancy, Pensacola, FL. *Research at **Emiquon Preserve and Spunky Bottoms.***

Bruninga–Socolar, B., S. Griffin, M. Kerr, J. Gibbs, R. Winfree. 2015. Conservation of native pollinators: effects of restoration on bee communities of a tallgrass prairie. Presented at the **Nachusa Grasslands** Annual Science Meeting, 25 July 2015.

Bruninga–Socolar, B., S. Griffin, M. Kerr, J. Gibbs, R. Winfree. 2015. Conservation of native pollinators: effects of restoration on bee communities of a tallgrass prairie. Poster presentation at the Society for Ecological Restoration World Conference. Manchester Metropolitan University. Manchester, U.K. 26 August 2015. *Research at **Nachusa Grasslands.***

Burke, A. and H. Jones. 2015. Presentation on small mammal trapping at **Nachusa Grasslands**. Friends of Nachusa Grasslands Annual Meeting. 25 July 2015.

Burke, A. and H. Jones. 2015. Poster presentation on small mammal trapping at **Nachusa Grasslands**. Northern Illinois University Department of Biological Sciences Phi Sigma Research Symposium, April 2015.

Burke, A. and H. Jones. 2015. Poster presentation on small mammal trapping at **Nachusa Grasslands**. Natural Areas Association Conference.

Byers, D. L., T. M. Rippel, and R. W. Philips. 2015. Soil traits impact on female frequency of a gynodioecious prairie plant, *Lobelia spicata*. Presentations at Botany Society of America and other Botany 2015 meetings. *Research at **Kankakee Sands.***

Casper, A. F., 2014. Floodplain restoration in rivers: expectations, results, and controversies. Presented at the Department of Biology, University of Dubuque, IA. *Research at **Emiquon Preserve***.

Casper, A. F., 2015. Floodplain restoration in rivers: expectations, results, and controversies. Presented at the Sam Parr Biological Field Station, Kinmundy, IL. *Research at **Emiquon Preserve***.

Chen, H., S. Popovich, C. Buss, Z. Dolbeare, and B. Briddell. 2015. Carbon dynamics in restored wetlands from croplands—a case study of **Emiquon** floodplain restoration, Illinois, USA. Presented at the SER 6th World Conference, Manchester, UK.

Goad, R. 2015. Fourteen years of spatial data from Plants of Concern: what are we learning? Presentation at the Wild Things Conference, 31 January 2015. *Work at **Indian Boundary Prairies** and **Kankakee Sands***.

Goad, R. 2015. Plants of Concern: citizen scientists monitor rare plants in the Chicago region. Presentation at the Citizen Science Association Conference. San Jose, CA. 11 February 2015. *Work at **Indian Boundary Prairies** and **Kankakee Sands***.

Goad, R. 2015. Plants of Concern: citizen scientists monitor rare plants in the Chicago region. Presentation at the Indigenous Plant Symposium. Carterville, IL. 21 March 2015. *Work at **Indian Boundary Prairies** and **Kankakee Sands***.

Goad, R. 2015. Plants of Concern: monitoring rare plants in the Chicago region. Presentation to Northwestern Plant Conservation Biology Students, 13 November 2015. *Work at **Indian Boundary Prairies** and **Kankakee Sands***.

Goad, R. and C. King. 2015. Citizen science in service to conservation. Webinar for Toyota TogetherGreen, 8 September 2014. *Work at **Indian Boundary Prairies** and **Kankakee Sands***.

Griffin, S., B. Bruninga–Socolar, M. Kerr, J. Gibbs, R. Winfree. 2015. Wild bee community change over a 26-year chronosequence of restored tallgrass prairie. Presentation at the Entomological Society of America Annual Meeting. Minneapolis, MN. 18 November 2015. *Research at **Nachusa Grasslands.***

Hagy, H. M. and C. S. Hine. 2015. Biotic responders to floodplain connectivity: the tradeoffs. Presented at the Midwest Fish and Wildlife Conference, Indianapolis, IN. *Research at **Emiquon Preserve.***

Hagy, H. M., C. S. Hine, A. P. Yetter, M. M. Horath, and J.M. Osborn. 2015. Wetland quality for migrating waterfowl and river connectivity. Great Lakes Partners Meeting, Port Clinton, OH. *Research at **Emiquon Preserve.***

**Hobson, T. L.** 2015. **Emiquon project**/endangered species/water control/*Boltonia decurrens*. Presented for Endangered species biologists from the Midwest. Lewistown, IL.

Hollinshead, L. A., and S. R. Johnson. 2015. A Survey for Hymenopteran Venom sPLA2 Activity at **Emiquon** National Wildlife Refuge, Illinois Poster presented at "Breakfast of Research Champions" at UIS Homecoming.

**Grantham, C. and N. Seaton**. 2015. ISST was asked to present the Strike Team Model as a part of Invasive Species Awareness Month. The team presented their overall model during an online webinar hosted by Chris Evans during the February National Invasive Species Awareness Month (NISAW).

**Grantham, C. and N. Seaton**. 2015. Collector Presentation & Field Exercise at Rend Lake – the ISST presented their new mapping system via ESRI's Collector App at the Rend Lake Visitor's Center in June of 2015. Attendees present included RtRCWMA, SIPBA, IDNR, USFWS, and USFS representatives along with private parties and other interested folks within the Southern Illinois region. The team then led an infield exercise using the program and collecting data to offer attendees present a firsthand experience with the new app.

**Grantham, C. and N. Seaton**. 2015. Strike Team Model Presentation. Poster presentation at the Natural Areas Association Conference. Little Rock, AR. October 2015.

**Grantham, C. and N. Seaton**. 2015. Collector App Presentation at the 2015 Midwest Invasive Plant Network (MIPN) Conference. Indianapolis, IN. December 2015.

**Kirkham, K. G.** Coles County Cover Crops. 2015. Presented at the Coles County Cover Crop Workshop in Mattoon, IL.

**Kirkham, K. G.** Investing in Water: The Nature Conservancy's **Mackinaw River Program**. 2015. Presented at Illinois State University Human Ecology class in Normal, IL.

**Kirkham, K. G.** Careers and Professional Development Opportunities with The Nature Conservancy. 2015. Presented at the Personal and Professional Development for a Career in Science workshop at Illinois State University, Normal, IL.

**Kirkham, K. G.**, **A. R. Maybanks**, W. L. Perry, J. R. Kraft, M. P. Wallace, D. A. Kovacic, K. L. Bohnhoff, A. T. Noto, R. M. Twait, A. P. Capparella, M. Brown, M. Garthaus, and **A. M. Lemke**. 2015. Implementing Watershed Conservation Goals in an Agricultural Landscape through Innovative Partnerships, Education, and Community Engagement in the **Mackinaw River** Watershed, Illinois. Presented at the Soil and Water Conservation Society annual meeting in Greensboro, NC.

**Kirkham, K. G.** and **A. M. Lemke**. 2015. Adaptive Watershed Management for Control of Nutrient Loss in the **Mackinaw River Watershed**. Presented at the Governor's Conference on the Management of the Illinois River in Peoria, IL.

**Lemke, A. M.** 2015. The **Mackinaw River** Program: The Nature Conservancy's approach to improving water quality and protecting diversity in a highly agricultural watershed in Illinois. Invited presentation to The Asian Pacific Islander Organization & Women in NRCS 2015 Joint National Leadership Meeting in St. Louis, Missouri.

**Lemke, A. M.** 2015. The **Mackinaw River** Program: The Nature Conservancy's approach to improving water quality and protecting diversity in a highly agricultural watershed in Illinois. Invited presentation to The Nature Conservancy's Brown Bag series, Chicago, Illinois.

**Lemke, A. M.** and J. R. Kraft. 2015. **Mackinaw River** Drinking Watersheds Project: Designing a sustainable water quality protection program for Bloomington, Illinois. Invited presentation to the East Central Illinois Water Stakeholders Meeting in Hudson, Illinois.

**Lemke, A. M.** and J. R. Kraft. 2015. **Mackinaw River** Drinking Watersheds Project: Designing a sustainable water quality protection program for Bloomington, Illinois. Invited presentation to

**Lemke, A. M.** and J. R. Kraft. 2015. **Mackinaw River** Drinking Watersheds Project: Designing a sustainable water quality protection program for Bloomington, Illinois. Invited presentation to Illinois Nutrient Loss Reduction Strategy workshop at the 15th Biennial Governor's Conference on the Management of the Illinois River System in Peoria, Illinois.

**Lemke, A. M.** and J. R. Kraft. 2015. **Mackinaw River** Drinking Watersheds Project: Designing a sustainable water quality protection program for Bloomington, Illinois. Invited presentation to Kinship Conservation Fellows Conservation Webinar series

**Lemke, A. M.** 2015. Overview of the **Mackinaw River** Program. Invited presentation to the Upper Mississippi River Basin Leadership Summit in Minneapolis, MN.

Luzbetak, D. 2015. Preliminary analysis of 2014 **Nachusa Grasslands** ground beetle data. Presentation at the Northern Illinois University Department of Biological Sciences Phi Sigma Research Symposium, April 2015.

Luzbetak, D. 2015. Preliminary analysis of 2014 **Nachusa Grasslands** ground beetle data. Presentation at Northern Illinois University's Undergraduate Research and Artistry Day, April 2015.

McCravy, K., and E. White. 2016. Native Bee (Hymenoptera: Apoidea) Diversity and Habitat Associations at **Emiquon Preserve**. Presented at Waggoner Hall, Western Illinois University.

Osborn, J. M., H. M. Hagy, A. P. Yetter, M. M. Horath, and C.S. Hine. 2015. Diets and daily lipid dynamics of spring–migrating lesser scaup in the Illinois and Upper Mississippi river valleys. Presented at the Midwest Fish and Wildlife Conference, Indianapolis, IN. *Research at **Emiquon Preserve**.*

Osborn, J. M., H. M. Hagy, A. P. Yetter, M. M. Horath, and C.S. Hine. 2015. Diets and daily lipid dynamics of spring–migrating lesser scaup in the Illinois and Upper Mississippi river valleys. Presented at the Great Lakes Partners Forum, Port Clinton, OH. *Research at **Emiquon Preserve**.*

VanMiddlesworth, T. D., A. F. Casper, and N. N. McClelland. 2015. Aquatic vegetation and fish community monitoring at The Nature Conservancy's **Emiquon Nature Preserve**. Presented at the Biennial Governor's Conference on the Management of the Illinois River System, Peoria, IL.

VanMiddlesworth T. D. and A. F. Casper. 2015. The Nature Conservancy's **Emiquon Preserve**: aquatic vegetation and fish community monitoring, 2007–2014. Presented at the Illinois American Fisheries Society Meeting, Grafton, IL.

VanMiddlesworth, T. D., A. F. Casper, and N. N. McClelland. 2015. Aquatic vegetation and fish community response to restoration at The Nature Conservancy's **Emiquon Preserve**: implications for floodplain restoration and management. Presented at the Midwest Fish and Wildlife Conference, Indianapolis, IN.

**Walk, J. W.** 2015. Anticipated response of birds to bison grazing in Illinois. Wild Things Conference, Chicago, IL.

**Walk, J.W.** 2015. The **Emiquon** Restoration. Invited presentation to Restoration Ecology, Dr. James Miller; University of Illinois at Urbana-Champaign.

**Walk, J.W.** 2015. Science at The Nature Conservancy of Illinois. Invited presentation to National Science Foundation's Undergraduate Research Experience, Dr. Clay Nielsen and Dr. Sara Baer, hosts, Southern Illinois University, Carbondale.

**Walk. J.W.** 2015. The Nature Conservancy in Illinois. Invited presentation to Caterpillar Corporation, Executive Leadership Training Workshop. Peoria, IL.

**Walk, J.W**. 2015. The Nature Conservancy in Colombia. Illinois Chapter of The Nature Conservancy Brown Bag series, Chicago, IL.

**Walk, J.W.** 2015. Bringing Back the Bison: Restoring **Nachusa Grasslands**. Keynote address to Illinois Audubon Society Annual Meeting, Springfield, IL.

**Walk, J.W.** 2015. Bringing Back the Bison: Restoring **Nachusa Grasslands**. Invited presentation to lake-Cook Audubon Society, Highland Park, IL.

**Walk, J.W. 2015.** Incorporating native plants into wildlife-friendly gardens and landscaping. Invited presentation, Room and Board, Oak Brook, IL.

**Walk, J. W.** and **K. D. Blodgett**. 2015. A science–friendly water control structure for The Nature Conservancy's **Emiquon Preserve**. Illinois Chapter of the Wildlife Society. Champaign, IL.

Wetzel, M. J. 2015. Annelidically speaking. Invited Presentation to the 63rd Annual Meeting of the Society for Freshwater Science. Milwaukee, WI. 17 –21 May 2015. *Research at **Nachusa Grasslands.***

Wetzel, M. J. 2015. Status of our survey for earthworms at **Nachusa Grasslands**, Lee and Ogle Counties, Illinois. Invited presentation to the annual Friends of Nachusa Grassland board meeting, 25 July 2015.

Wetzel, M. J. 2015. Annelidically speaking in North America. Invited presentation to the 13th International Symposium on Aquatic *Oligochaete* (ISAO), sponsored by Masaryk University and convened in Brno, Czech Republic. 7 – 11 September 2015. *Research at **Nachusa Grasslands.***

Wetzel, M. J. 2015. Status of surveys for aquatic and terrestrial oligochaetes in Illinois, Michigan, and elsewhere in North America [including summary of our survey for earthworms at **Nachusa Grasslands**]. Invited presentation to the 29th annual meeting of the Florida Association of Benthologists. St. Petersburg College – Clearwater Campus. Clearwater, FL. 4 – 6 November 2015.

Yetter, A.P., H.M. Hagy, C.H. Hine, M.M Horath, J.M. Osborn, and D.R. McClain. 2015. Lesser Scaup leg banding in Illinois. Presented at the Great Lakes Partners Forum, Port Clinton, OH. *Research at **Emiquon Preserve.***

# Interviews & Media Coverage

*(The Nature Conservancy staff and projects in **bold**)*

Field Filters. The Progressive Farmer, Lynn Betts, February 2015. **Maria Lemke**, Dave Kovacic, and **Dave DeGeus** interviewed regarding wetlands and the **Franklin Research and Demonstration Farm**.

Bison to Roam Midewin Prairie Again. Chicago Tribune. 28 March 2015. Lauren Zumbuch reported on bison introduction to **Midewin National Tallgrass Prairie**, and interviewed **Jeff Walk**.

What Happens When You Reintroduce a Nearly–Extinct Species Back to Its Home? Modern Notion Daily. 12 May 2015. Dara Katz radio interview of **Jeff Walk** on prairies, bison and **Nachusa Grasslands**.

Back in Brown. CBS Evening News with Scott Pelley. 25 June 2015. Dean Reynolds interviewed **Bill Kleiman** and **Jeff Walk** at **Nachusa Grasslands**.

Extra: Conservation properties like Emiquon Preserve demonstrate the vitality wetlands can produce. Peoria Journal Star, Extra Edition: Illinois River: Life Lore, Work, Play. 25 June 2015. Leslie Renken interviewed **Doug Blodgett** about the **Emiquon** restoration.

Extra: A chance to flourish. Peoria Journal Star, Extra Edition: Illinois River: Life Lore, Work, Play. 25 June 2015. Leslie Renken interviewed **Doug Blodgett** about restoration projects in the Illinois River.

Extra: Hidden in the marsh. Peoria Journal Star, Extra Edition: Illinois River: Life Lore, Work, Play. 25 June 2015.Laura nightingale interviewed INHS scientist Heath Hagy and **Jeff Walk** about research on marsh birds at the **Emiquon Preserve**.

Water Control Project: Going, but on flood hold, **Emiquon Preserve**, Chicago Sun–Times. 28 June 2015. Dale Bowman covers progress on construction of the water control structure.

Where the Bison Now Roam. Northwest Quarterly. 1 September 2015. Jon McGinty interviewed **Cody Considine**, **Bill Kleiman** and **Jeff Walk** on the introduction of bison to **Nachusa Grasslands**.

Controversial Plan Aims to Restore Illinois Wetlands Like **Emiquon Preserve**. Chicago Tribune. 13 September 2015. Ted Gregory interviews **Doug Blodgett** on managed reconnection to the Illinois River at **Emiquon**.

Bringing Bison back to Restore the American Prairie. Al Jazeera America, *Tech Know*. 15 September 2015. Featuring staff and cooperating scientists studying the return of bison to **Nachusa Grasslands**.

**Emiquon** Structure to Control Water Levels. *Fulton County Democrat*. 23 September 2015. John Froehling interviews **Doug Blodgett** regarding the installation of the water control structure and water level management.

**Emiquon** Structure to Control Water Levels. *Mason County Democrat*. 30 September 2015. John Froehling interviews **Doug Blodgett** regarding the installation of the water control structure and water level management.

Plants of Concern Volunteers Restore Habitat for Rare Plants. *Chicago Tribune: Glencoe News*. 14 October 2015.

Plants of Concern Volunteers Restore Habitat for Rare Species. *Daily Herald*. 17 October 2015.

Plants of Concern Restores Habitat. *Daily North Shore*. 18 October 2015.

Bison roam once more in Northern Illinois. Chicago Life. November 2015. Article by Christopher Johnson features the return of bison to **Nachusa Grasslands**.

CBG Program Brings Citizens to Science. *Glencoe Anchor*. 16 November 2015.

Prairie state of mind: For NIU students, **Nachusa** is living lab Northern Illinois University Newsroom. 30 November 2015. Featuring research of Dr. Holly Jones and students at **Nachusa Grasslands**.

Bison Back East. OnEarth. Susan Cosier interviews staff and volunteers on the return of bison to **Nachusa Grasslands**.

Preserving our Natural Heritage: Plants of Concern Promotes Rare Species Conservation. *Keep Growing, Member Magazine of the Chicago Botanic Garden*. Fall Issue. pp. 34 – 37.

Plants of Concern: Conservation Agencies in Chicago Area Monitor Endangered, Threatened, and Rare Plants. *Scientific American.*