ILLINOIS NATURAL HISTORY SURVEY

Reports

ILLINOIS
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Institute of Natural Resource Sustainability

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INSIDE

INHS Library Open House Celebration

On October 28, 2010, the Illinois Natural History Survey Library Committee held an open house celebrating the John K. Bouseman Natural History Survey Library Endowment Fund. The celebration honored everyone who had contributed to the fund over the years and provided an opportunity for people to visit the library and view the collection. Numerous items were on display including rare books, endowment materials, prints, and photographs. A silent auction was held for three original prints from the *Banks Florilegium Tierra del Fuego* plates (see http://www.facebook.com/pages/Banks-Florilegium/108376322520596#!/pages/Banks-Florilegium/108376322520596?sk=wiki), with all proceeds going to the endowment. The event was very well attended and we were able to raise an additional $4100, bringing the fund's total to $51,500.

Recent INHS publications were given away as door prizes to five lucky attendees. The *Field Manual of Illinois Mammals*, by Joyce Hofmann, proved to be the favorite title selected by door prize winners.

Retired INHS Director David Thomas (left), current Director Brian Anderson (center), and retired Director Lorin Nevling (right). Photo by M. Wetzel, INHS

Botanical prints on display during the INHS Library open house. Photo by Beth Wohlgemuth, INHS

The INHS Library Collection

The current collection of about 65,000 volumes includes a wealth of materials covering Illinois natural history, plants, animals, ecology, conservation, habitat restoration, wildlife, and natural resources. Of the collections 500+ active subscriptions (print and on-line), many of the journal runs begin with volume one. The collection also includes numerous rare books and folios, an archive of INHS publications, and many resources unique to Illinois.

The INHS Library collection began taking shape even before the Natural History Society received its charter in 1861 in Bloomington, Illinois. Society founder Cyrus Thomas formed a library committee, which immediately began to assemble a library of scientific literature. The library was provided for in the society's charter and one of the committee members was a librarian. By 1860 they had already procured 300 volumes.

The INHS Library collection has moved a few more times since then—the most recent move was November 2005 to the I-Building (now called the Forbes Natural History Building) in the UI South Research Park. The attractive new library has spacious reading areas, three public computer terminals available for users to search the Internet or access the library's catalog and electronic resources, and rooms dedicated to rare books, archives, and special collections. Electric compact shelving provides space for future growth.

Today the Illinois Natural History Survey Library is in

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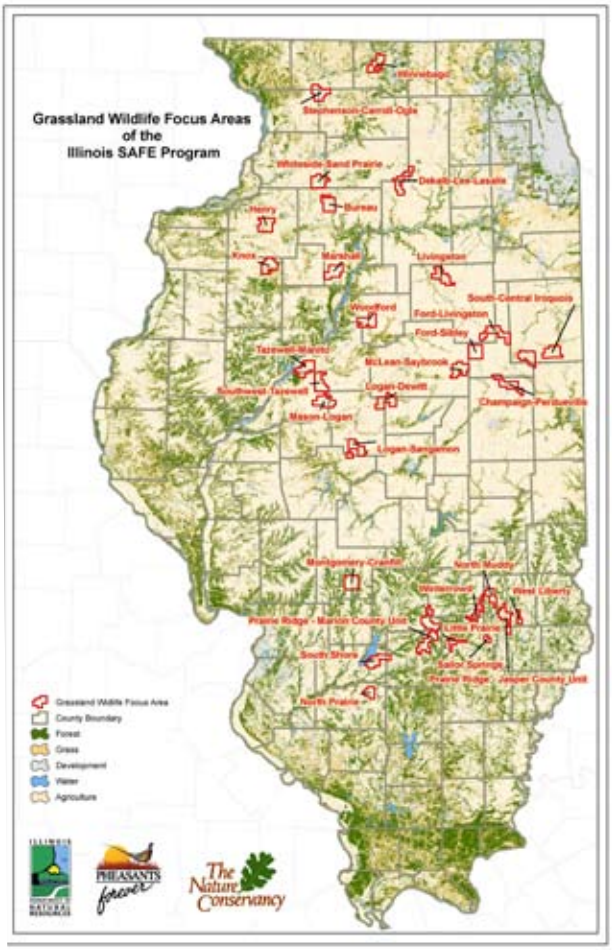
A Strategic Approach to Establishing Grasslands in Illinois (SAFE)

SAFE or State Acres For Wildlife Enhancement is an extension of USDA's Conservation Reserve Program (CRP). Unlike other practices within the CRP, which often have a soil erosion or water quality emphasis and are available statewide, SAFE is intended to address priority wildlife conservation issues, and only lands in certain focus areas are eligible for enrollment in SAFE and its special incentives. While SAFE is a USDA program, in Illinois the guidelines for SAFE were developed by the Illinois Department of Natural Resources (IDNR), Pheasants Forever, The Nature Conservancy, and Illinois Audubon Society to achieve the goals of the Farmland & Prairie Campaign from the Illinois Comprehensive Wildlife Conservation Plan.

There are 22 SAFE areas in Illinois where farmers receive rental payments and other incentives to convert agricultural fields to grasslands. The rationale for this is based on the ecology of grassland animals. Grassland animals tend to be area sensitive, residing in areas with large fields and generally preferring landscapes with large amounts of grassland. Therefore, while CRP may be scattered throughout Illinois, the 22 SAFE sites were selected to concentrate grasslands in core areas, many of which are "anchored" by publicly owned grassland. The ultimate goal is to develop grassland landscapes.

From the beginning, researchers from the Illinois Natural History Survey, along with many other agencies, have been meeting to coordinate the rare opportunity to both establish grasslands in agricultural landscapes and to monitor how animal communities respond to this establishment. The IDNR via the Pittman-Robinson Fund provided a grant to the Illinois Natural History Survey and the Department of Natural Resources and Environmental Sciences (NRES) at the U of I to monitor how birds and small mammals respond to the creation of grasslands via SAFE.

Since 2008, 7,000 acres of grasslands have been established by SAFE. While this is a great start, the Illinois SAFE program is authorized to enroll 20,300 acres. One of the factors restricting the program is simply education, letting the farmers know about this program. Because of this, the IDNR along with Pheasant's Forever have hired biologists to facilitate the enrollment of lands into this program. And, as to be expected, the program has been more successful in some areas than others. For example, the SAFE area in Tazewell County has enrolled approximately 1,500 acres, while less than 100 acres have been enrolled in Winnebago County. While we hope to enroll 1,000 acres in all sites, these differences do provide a good opportunity to investigate how effective SAFE is in restoring grassland animal communities.



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We have been monitoring these SAFE fields for two years. Because these fields are coming out of crop production, the grasslands tend to be sparse, However, in many locations, we have documented rapid colonization by grassland birds. Grassland species preferring more open, sparse grasslands (Grasshopper Sparrow) have shown a strong response to the program and we expect that as these grasslands mature they will benefit the entire suite of grassland birds including Ring-necked Pheasants, Henslow's Sparrows, and Eastern Meadowlarks. Dr. Robert Schooley (UI-NRES) and his students have been monitoring the response of small mammals to SAFE and they have found a similar strong response.

The current landscape of Illinois is dominated by agriculture and it is likely that agriculture will dominate Illinois into the future; therefore, it is imperative that we understand the ecology of animals living in this landscape. Previous research has suggested that a "shotgun" approach to establishing grasslands may only have limited success (i.e., the continued decline of grassland birds). SAFE is a focused program with specific goals, which will provide the kind of program needed for effective conservation in Illinois. In addition, this program brings together many agencies involved in very different aspects of managing our lands and natural resources. While it is still too early to know, we hope that by involving multiple agencies, taking a focused approach, and monitoring the effects of the program, we will provide a roadmap for other conservation efforts in Illinois, including redirecting USDA programs to more effectively deliver measurable wildlife benefits.

Michael P. Ward, UIUC and Jeff Walk, The Nature Conservancy

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Homer Buck — *In Memoriam*

Former INHS aquatic biologist Homer Buck passed away on April 30, 2010. He is survived by his wife Ruth, three daughters, a son, and eight grandchildren.

Homer began his career at INHS on February 1, 1956 and conducted most of his research at the INHS Sam Parr Field Station in Kinmundy. He became director of the field station in 1964. There, he supervised a wide range of studies in experimental ponds and small reservoirs. In 1976, Homer participated in the FAO Technical Conference on Aquaculture in Kyoto, Japan, followed by an eight-week tour of various centers of aquaculture in Asia and Europe. He conducted a special study for the National Science Foundation in Taiwan.

On the grounds of the Fin and Feather Club near Dundee, IL, Homer supervised construction of 15 one-acre ponds as a cooperative project among the INHS, Illinois Department of Conservation, and the North American Wildlife Foundation.

Prior to his tenure at INHS, Homer conducted research for the Oklahoma Game Commission and the U.S. Army Corps of Engineers at Fort Worth, TX.

Homer served in the U.S. Marine Corps in World War II as a bomber pilot in the Philippines, and during the Korean War as a helicopter pilot. He graduated from San Jacinto High School, Houston, TX, in 1938, earned a B.S. from Texas A & M University in 1943, and his Ph.D. from Oklahoma State University in 1951. He held memberships in the American Fisheries Society, the World Mariculture Society, and the American Society of Limnology and Oceanography.

Photo from INHS Image Archives.

During his career, Homer gave a number of presentations and invited papers to international conferences and symposia. He served as chairman of the Small Catfish Farmers and Catfish Farmers Economic Workshop in 1978 and led a symposium on Aquaculture and Agriculture at the University of Hawaii in 1979. In 1970, he was awarded the "Most Significant Paper in Volume 99" of the *Transactions of the American Fisheries Society*. He was author and co-author of many articles in scientific journals throughout his career. He continued to write and publish nearly until his death. His final article appeared in the December 2009 issue of *World Aquaculture*.

Homer traveled extensively throughout his life, visiting 39 countries on 4 continents and all 50 states.

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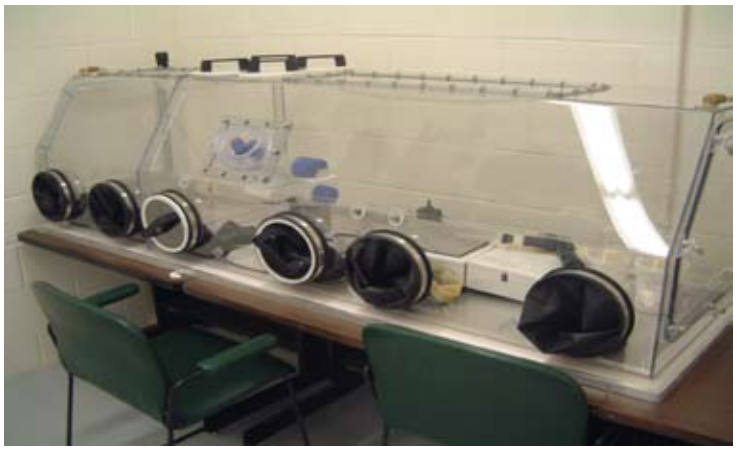
What Doesn't Kill Mosquitoes Makes Them More Dangerous

Arthropod-borne virus (arbovirus) diseases, particularly those transmitted by mosquitoes (e.g., dengue, yellow fever, West Nile Virus [WNV]), remain major threats to human and animal health and are important contributors of negative socio-economic development in many countries around the globe. Dengue alone accounts for more than 50 million clinical cases annually, and the combined burden of all mosquito-borne arboviral infections is likely many times higher. Despite intense efforts to eradicate or contain these arboviruses, international travel and business have been the gateway for rapid expansion of emerging and resurgent mosquito-borne infectious diseases. West Nile Virus is an example of how fast an arbovirus can spread across North America. After its introduction into New York City in 1999, few thought the virus would survive the winter in the northern latitudes, yet within five years WNV became an endemic seasonal threat from the Atlantic to Pacific coasts. Human vaccines are typically not available for most arboviruses, so the main disease management strategy is to reduce vector populations, primarily by larvicides and adulticides.

Current data indicate that each year, more than 5 billion kilograms of pesticides are devoted to pest and vector control around the world. The United States alone accounts for one-third of this total; 70% of which is used for agricultural purposes. In addition to direct application of pesticides in wetlands to control mosquitoes, aquatic habitats are also contaminated with pesticides through surface runoff from treated agricultural lands. In fact, pesticide pollution from agricultural areas is regarded as one of the greatest causes of contamination of ground water. Many species of mosquitoes breed in transient and permanent water bodies within and around agricultural areas and may be exposed to both target and non-target pesticide contamination. Furthermore, urban residential use of pesticides is relatively high for turf, ornamental, and vegetable treatments. Contamination of common mosquito container habitats around the home is probably common. Because today's pesticides have shorter half lives and do not bioaccumulate, pervasive use of pesticides was previously considered of little or no ecological consequence. However, recent studies suggest that low concentrations of pesticide can cause serious ecological disturbances. One of the research focuses at the Illinois Natural History Survey Medical Entomology Laboratory (MEL) is discovering significant changes in adult mosquito fitness and ability to transmit viruses due to exposure of larvae to low concentrations of pesticides.



Glove box used to separate blood-fed from unfed female mosquitoes and to dissect blood-fed mosquitoes that survive the 14-day virus incubation period. Photo by Ephantus Muturi

The presence of a pesticide in an aquatic environment, even at low concentrations, can be an additional stress that interacts with other ecological stressors (e.g., larval competition, food quality and quantity, temperature) to produce unexpected results. One of my research objectives is to study how exposure of mosquito larvae to pesticides in the presence of other environmental stressors alters the resulting adult mosquito abundance, longevity, and ability to transmit arboviruses. I work with four model vector species; *Aedes aegypti*, *Aedes albopictus*, *Culex pipiens*, and *Culex restuan*s. These mosquitoes are typically found in containers and although they have different life histories and habitat preferences, they sometimes occur together in these habitats. I found that stressful environments increase the sensitivity of mosquito larvae to toxicants and that larval exposure to sublethal concentrations of a toxicant induce changes that modify adult mosquito fitness (e.g., adult longevity, size) and vector competence for arboviruses. However, these results are species specific.

In a study to determine how intraspecific competition among larvae and low concentrations of malathion alters *Ae. aegypti* and *Ae. albopictus* adult life history traits and competence for Sindbis virus, we manipulated two larval densities (low, high) and two malathion concentrations (0 and 0.04 parts per million) and exposed the resulting females to an infectious blood meal. For both species, competition and the presence of malathion reduced survival to adulthood. The presence of malathion eliminated the negative effects of competition, which resulted in lengthened development time and smaller sized adults. For *Ae. aegypti*, but not *Ae. albopictus*, high competition conditions and the presence of malathion independently led to twofold increases in virus dissemination from the midgut to other tissues. It remains to be seen how reductions in adult mosquito populations through the direct lethal effects of pesticides combine with altered vector competence among surviving mosquitoes to alter transmission of diseases. However, these results indicate that biotic interactions may reverse the impact of pesticides on mosquito-borne disease. Other studies are required to document this phenomenon under field conditions, but these results are a starting point to evaluate how pesticide use interacts with biotic factors in nature to influence parameters important to mosquito-borne diseases.

Ephantus Muturi, INHS

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