

# Illinois Natural History Survey

## **ANNUAL REPORT**

**FY2006**



Illinois Natural History Survey (INHS) scientists study the plants and animals of Illinois and how they interact among the variety of ecosystems throughout the state. Through its research and other activities, the Survey fosters intelligent and responsible management of the biological resources of Illinois and public appreciation of the state's natural heritage. INHS is recognized as among the premier state natural history surveys. Founded in 1858, the Survey, now a division of the Illinois Department of Natural Resources, is headquartered on the campus of the University of Illinois at Urbana-Champaign. Its collections of plant and animal specimens are among the oldest in North America.

**Photos:**

All nature photographs throughout the report are by Michael Jeffords, INHS.

Photograph of INHS Chief David Thomas courtesy of Illinois Department of Natural Resources

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The Illinois Natural History Survey (INHS) had another very productive year of fulfilling its mission of research, education, and outreach on natural resource issues despite continued tight budget times. The General Revenue Fund (GRF) budget for the INHS in FY'06 was \$3.75 million, the lowest since FY98. This represents about a 22% reduction in buying power. Our state-supported headcount has been reduced by 13% since 2001, and is now 59.26, plus three for our Used Tire Fund mosquito program.

Fiscal year 2006 (July 2005–June 2006) was the first year in the last three that we were able to give pay increases to staff. All staff received a 3% increase in September 2005 and another 1% on July 1, 2006 (to match the 4% given by the state in December 2005 to all nonunion state employees). Promotional increases were also given to some staff last fall, as were limited special increases for staff that assumed greater responsibilities through newly defined jobs. Despite these increases we have had trouble staying competitive in our salaries, and have lost a number of staff who left for higher paying positions (both within and outside the state of Illinois).

We completed the move of our administrative offices, library and Center for Wildlife and Plant Ecology out of the Natural Resources Building and into the I-Building, located in the University of Illinois South Research Park in late November

and early December 2005. The move has provided us with better space, more conference and meeting rooms, and a larger atrium where we can display some of our state's natural resources (including a bison that we acquired from the university when they disbanded the museum in the Natural History Building). A dedication for the building was held at the conclusion of our meeting with the Board of Natural Resources and Conservation on February 16, 2006. Our library had an open house to celebrate its completion on May 12, 2006.

While our move to the I-Building was very positive news, the halt in progress on a new building for our Center for Biodiversity and INHS and UIUC biological collections was a disappointment. The university in February 2006 pulled some money from the project when it became apparent to them that they no longer had a strong need for our space in the Natural Resources Building. The preliminary design and work by Cannon Design, Inc. was



David L. Thomas, Chief

stopped, and since then the project has been on hold. There is still about \$6.8 million in the project budget, and the hope is that a Phase-1 facility to hold a portion of our collections and associated staff might still be built. An internal review of options has been initiated by the UI Facilities and Services staff early in FY'07.

## MESSAGE FROM THE CHIEF

Another building project that has moved forward more slowly than we

would like is the National Great Rivers Research and Education Center field station. While design of the facility is basically complete, and some funding for infrastructure development is available, the project awaits both federal and state capital funds to be brought to fruition. Meanwhile Lewis and Clark Community College has provided facilities and resources to help keep the coalition of partners and the work of the center on track. New staff have been hired over the last year and the student intern program continues to expand. This is an exciting program in which to be involved and it brings us closer to realizing our goal of a nationally and internationally recognized facility focused on large river research and education.

Our researchers continue to successfully bring in outside grants and contracts, and besides pushing the frontiers of basic natural resource science, they also continue to address topics of immediate importance to the state. Research on West Nile

Virus (WNV) by our Medical Entomology Program is a case in point. We have now gathered over five years of WNV data in the state and some of the data on birds have yielded interesting results. The American Crow population in Illinois continues to decline, about 14% a year since the arrival of WNV in 2001. They apparently are not building up an immunity to the virus. In addition, other species such as chickadees, titmice, and Blue Jays are also experiencing large population declines since the arrival of the virus. Those birds that probably represent the majority of birds fed upon by mosquitoes (American Robin, Northern Cardinal, House Sparrow and Mourning Dove) have not shown population declines.

Some of the other studies being conducted on invasive species are described briefly below.

**\*Studies of Invasive Soybean Aphids:** A seven-state suction trap network was set up to monitor relative abundance and distribution of the soybean aphid in the Midwest, and the weekly data were placed on the NC-IPM Web page <http://www.ncipmc.org/traps/>. September and October catches of fall migrant aphids will be used to predict general population levels of the aphid in the following years.

**\*Studies on Corn Pests:** Western corn rootworms, which are major pests of corn in Illinois, have changed their behavior to include soybean fields as well as cornfields as egg-laying sites. Scientists studying this shift in egg-laying behavior have found that failure of crop rotation to manage this pest has been a result of this changed behavior and that the biotype that lays eggs in soybean fields has begun to spread in corn-growing areas in Illinois. **\*Studies on Pests in GMO Crops:** A method was developed for tracking insect movement in transgenic (GMO) crops to measure the movement of mate-seeking western corn rootworm males between transgenic and refuge (nontransgenic) areas within cornfields. This provided a method to assess the success of non-transgenic refuges as sources of mates for females that were feeding in the transgenic portions of the cornfields in Illinois.



The I-Building, new headquarters for the INHS in Champaign.

**\*Studies on Gypsy Moth Invasion in Illinois:**

Several years of research on the biology and host specificity of a group of fungal pathogens (microsporidia) of the gypsy moth led to a favorable ruling from EPA and USDA APHIS in September 2005 for release of three species of these natural enemies in Illinois to help regulate gypsy moth populations. A release is planned for May of 2007 in isolated woodlots in northern counties where gypsy moth has invaded.

**\*Invasive Species Monitoring:** Scientists participated in the USDA Cooperative Agriculture Pest Survey program to survey and monitor invasive insect and plant species in Illinois. These efforts identify early invaders so that control efforts can be put into place for purposes of eradication.

**\*Studies on Control of Invasive Weeds:** Invasive weeds that have been introduced into Illinois without their natural enemies can destroy natural environments by out-competing native species. Studies are underway to understand the nature of spread and to develop biological control programs to limit the spread and effects of invaders such as garlic mustard, teasel, purple loosestrife, and other species.

**\*Contaminant Levels in Asian Carp:** With proposals before the state to develop protein extraction facilities using invasive Asian carp, the issue is whether these fish are safe to eat. To address this question, Survey researchers looked at contaminant levels in 15 silver carp and 15 bighead carp. Several individuals were found that showed mercury levels that would trigger consumption advisories.

Some other highlights of our research over the last year are listed below. Individual projects are listed by center in this report, and each center has provided an overview of their research and activities for the year.

**\*Wildlife Disease Surveillance and Research Team Established for Illinois:** Dr. Nohra Mateus-Pinilla and Dr. Jay Diffendorfer, in collaboration with four scientists at the UIUC Department of Animal Sciences and Veterinary Diagnostics lab, received a Federal Aid to Wildlife Restoration Grant to establish a wildlife disease surveillance and research team for Illinois. The team and lab, in part, will work closely with the Illinois Department of Natural Resources (IDNR) to monitor and quantify Chronic Wasting Disease and other wildlife diseases in natural ecosystems

**\*The INHS Center for Biodiversity** received continued outstanding support from the National Science Foundation (NSF) with seven active grants during the year, highlighted by a new grant to database the Hymenoptera (ants, wasps, and bees) collection (Colin Favret, PI), and a new NSF PEET (Partnerships for Enhancing Expertise in Taxonomy) Award to study and train students in the systematics of leafhoppers, spittlebugs, planthoppers, and cicadas (Chris Dietrich, PI).

**\*The Illinois Comprehensive Wildlife Conservation Plan** was submitted to the US Fish & Wildlife Service. INHS staff, working closely with other IDNR staff, submitted and received federal acceptance for the Illinois plan. Illinois was among the first states in the nation to submit and receive acceptance of these state-wide plans required for receiving State Wildlife Grant funds through the US Fish and Wildlife Service.

**\*Stoneflies of Illinois:** Dr. Ed DeWalt reviewed the extensive database on stoneflies in Illinois and found that 2 species had gone extinct and 20 were extirpated from the state. This 28.6% loss is higher than for either mussels (20.8%) or fish (6.4%).

Despite tight budgets we have remained successful in obtaining outside grants and contracts. In FY06 we had a total of 339 active research projects. We had 113 contracts awarded during the fiscal year for a total value of \$10.8 million. This was off somewhat from previous years, and reflects in part the overall loss in headcount we have experienced during the last three years. But grant and contract expenditures during FY'06 amounted to \$12.8 million, higher than in the previous year.

Finally, we have looked hard at our organizational structure to find ways of streamlining our administration and put more resources into research positions. Our senior managers and Assistant to the Chief for Administration worked over many months to explore various options. I have chosen the two-division option as the way we will go, with Research Leaders providing science oversight and coordination for our various disciplines. The divisions being proposed are Biodiversity and Ecological Entomology, and Ecology and Conservation Sciences. These changes will be implemented in FY07 and discussed in more detail in our next annual report.

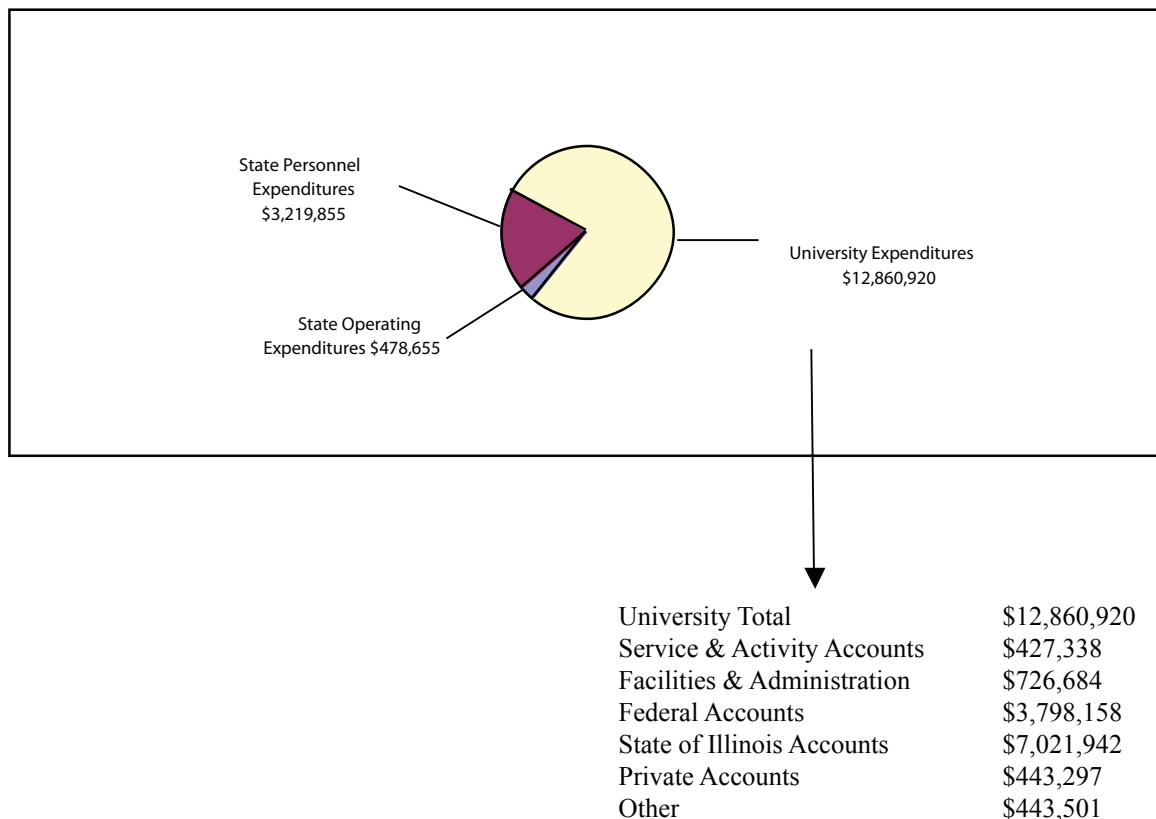
While these last few years have been tough on all of the state science institutions, I still remain confident that we can come out of these times as an even stronger institution. We continue to explore ways of recognizing and rewarding excellence, and of finding ways of maintaining our productive staff. We have hired over the last few years some outstanding young scientists, and will be doing other searches in the coming year for research scientists who can expand and strengthen our areas of expertise. We will also be looking for an experienced Division Director who can provide us additional leadership and experience. As always, we thank our various constituents for their continued support.

To view an on-line list of this year's INHS Research Projects and Publications, please access:

<http://www.inhs.uiuc.edu/annualreports/annualreports.html>



## FINANCIAL STATEMENT



## INHS Activities Totals for FY2006

### Outreach

- \* Schools, K-12: 138
- \* Colleges: 68
- \* Conferences and Symposia: 185
- \* Clubs and Private Organizations: 106
- \* State and Federal Agencies: 104

**Committees and Boards Served—151**

### Outside Publications Produced

- \* Peer-reviewed Scientific—129
- \* Technical Reports—133
- \* Miscellaneous—67

**Research Projects—339**

# INHS

## PUBLIC SERVICES

### INHS Library

Elizabeth Wohlgemuth

The Illinois Natural History Survey (INHS) Library serves a wide range of users. As a State Agency Library it strives to meet the diverse research needs of the Survey scientists and staff members. However, the INHS Library is also a departmental library at the University of Illinois at Urbana-Champaign, so students, faculty, and staff are frequent patrons. The public is also welcome to visit the library. The INHS Library's holdings are part of the UIUC's on-line catalog and can be accessed on the library's home page at <http://www.library.uiuc.edu/nhx>.

It was a busy year for the library. The first half of the year was spent preparing to move the collection and addressing last-minute design and furniture details. The majority of the collection was vacuumed and cleaned. Anna FitzSimmons left the library's employ in October to work with the Illinois Newspaper Project. In January Librarian Susan Braxton joined the staff. Susan was a reference librarian at the Milner Library at Illinois State University in Normal.

The library moved to the I-Building in the University of Illinois South Research Park in early December and is an attractive and welcoming space. The Library had an open house in May that was very well attended. Chief David Thomas and University of Illinois Librarian Paula Kaufmann spoke.

The collection includes over 46,000 books and bound journals providing national and international coverage on all aspects of natural history. There are

approximately 672 current journal subscriptions. The majority of the library's \$83,000 materials budget is applied to journal subscriptions and electronic article databases. This year the INHS library added 4 new journal and newsletter titles and 517 new books to the collection. Some of these books and journals were purchased, others were received through the exchange program or as donations from generous staff members and library supporters. The INHS Library Endowment that was created in 2003 has increased to almost \$25,000. Jessica Beverly, in addition to maintaining the INHS online journal database and the circulation responsibilities, added 339 bound journals to the collection.



The INHS Library offers a number of services for library users. A reference librarian is always on hand to help people find the information that they need and there is an ongoing library instruction program. Susan Braxton manages our photocopying service with the help of Liz Day and Clayton Williams. This year we received 153 requests for 427 articles. Also, personalized Current Content searches are available to library users.



## INHS Collections

Geoffrey Levin

The Illinois Natural History Survey scientific collections have been called Illinois' biological memory. Totalling more than 8 million specimens and dating back almost 150 years, the collections and their associated data are the most complete documentation of the state's flora and fauna available anywhere. For several groups of organisms, including amphibians and reptiles, insects, fishes, mollusks, and mammals, the Survey manages collections that are among the 15 largest in the nation. The collections continue to grow as staff survey and monitor the state's plants and animals and conduct scientific studies on specific taxonomic groups. Specimens also come from researchers at other institutions that do not maintain collections themselves.

The collections are regularly used to recognize threatened and endangered species, determine the arrival and spread of exotic species, provide baseline data for ecological restoration projects, assess habitat quality over time and space, locate populations of medical or economic importance, and conduct scientific research advancing our understanding of the state's plants and animals. The Survey's collections are heavily used by Survey scientists, scientists at other institutions, educators, and members of the general public. Visitors to the collections in the last year included students from several primary and secondary schools, students

and faculty from colleges and universities, scientists from museums, and staff from environmental organizations and governmental agencies. Specimen loans and collection-associated data were sent to about 70 colleges, universities, museums, and other public and private institutions and organizations throughout the nation and the world.

A major focus of our work continues to be getting all our collection data into Internet-accessible databases so that this resource is readily available to policy makers, resource managers, scientists, and the public. Although most of the collections are fully databased, much of the insect collection is not. We made an important step toward completing data computerization this year through a National Science Foundation grant to database the Survey's 300,000 Hymenoptera (ants, bees, and wasps) specimens. That project, together with National Science Foundation grants to integrate data from the Survey's amphibian and reptile and mollusk collections into multi-institution distributed databases, made good progress this year.

In addition, we continue to host staff working on the Orthoptera Species File Online, an international project led by Survey affiliate Dr. David Eades that provides Internet-accessible information on the systematics, distribution, and biology of grasshoppers, katydids, crickets, and their relatives. This exciting partnership enhances the work of the Survey and Dr. Eades by bringing together expertise on systematics, collections, and information technology.

Collection	Size	Specimens Accessioned	Loans		Queries	Visitors
			Number	Specimens		
Amphibians/Reptiles	21,451	395	5	39	10	12
Annelids	324,500	2000	2	10	6	5
Birds	1,873	0	3	35	3	1
Crustaceans	82,068	4,509	2	63	8	5
Fish	841,282	5,247	18	1317	69	14
Insects	6,500,000	19,160	34	19,603	11	110
Mammals	1,093	0	0	0	5	0
Mollusks	116,244	926	4	38	10	9
Plants	293,032	5,808	5	63	10	12
<b>Total</b>	<b>8,181,543</b>	<b>38,045</b>	<b>73</b>	<b>21,168</b>	<b>132</b>	<b>168</b>

## **INHS Office of Education and Outreach**

Michael Jeffords

The outreach efforts associated with 2006 included both continuing and new projects that spanned the entire state of Illinois. The activities that are ongoing include the following:

- The Illinois Steward Magazine is edited by Survey editor Tom Rice and has Michael Jeffords as staff photographer and Susan Post as staff writer. Collectively they contributed 10 articles, the majority of the photographs, and most of the editing for the 4 issues of this award-winning publication,
- The final full-color CTAP report on the Shawnee Hills Assessment area was completed and printed.
- An Illinois Wilds Institute for Nature class was taught at the Henry N. Barkhausen Wetlands Center, with 35 participants enjoying the 3-day workshop.
- Over 200 popular talks and programs were given by INHS staff to a variety of audiences across Illinois.
- The Mobile Science Center received funding from BP, Inc., Mr. Charles Helm was hired to staff the vehicle that is designed to bring science to small city and rural school districts across Illinois. The vehicle made over 30 visits and reached nearly 25,000 children and adults with its exhibit on Arthropods Across Illinois.
- With funding from the US Fish & Wildlife Service a new exhibit was constructed for the MSC on the Cache River, its wetland habitats and its biodiversity. The exhibits are currently on display at the Barkhausen Wetlands Center in southern Illinois.
- An exhibit showcasing the work of the Emiquon Corps of Discovery was designed and constructed and was on display for seven months at the Dickson Mounds Museum, near Havana.
- A new Corps of Discovery was created in far southern Illinois, centered around the Cache River and its wetlands. Twenty-nine individuals attended four all-day Saturday workshops learning to aesthetically document the landscape of the region and its biodiversity.
- The new interactive wetland education web program was completed and is currently housed on the

INHS website. The program is designed to acquaint individuals with all aspects of Illinois wetlands.

### **New Activities for FY 2006**

- With significant funding from Exelon/ComED, INHS staff were able to purchase, develop exhibitry, and fabricate the exhibits for a new Traveling Science Center designed to serve the northeastern part of Illinois. A new staff member, Jen Mui, was hired for the vehicle which is housed at Tricounty State Park, Bartlett. During the first three months of operation the vehicle traveled to over 20 sites and was visited by some 3,000 children.
- INHS helped to decommission the exhibit from the UI Natural History Museum and was able to obtain significant exhibit materials for the creation of a small museum in the foyer of the INHS's I-Building. Included in this material was a full size bull bison mount. A new diorama was created for this specimen, thought to be from the Columbian Exposition of 1890. In addition to the bison, exhibits were created on INHS' first Chief, Stephen Forbes, and on Mushrooms of Illinois. Creation of new exhibits is an ongoing project.
- INHS produced a set of exotic invasive species cards for a new project in the Chicago region that uses volunteers to help detect new infestations of these invasive species.

The INHS Outreach Program continues to seek new and innovative ways to acquaint and involve the citizens of Illinois in the science and issues confronting us during this, the early years of the 21st Century. Our programs are all based on sound science and succeed in putting the citizens of Illinois in direct contact with the science and scientists of Illinois.

### **Total INHS Outreach Activities**

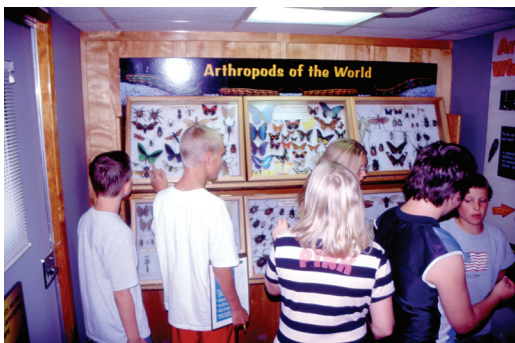
- \* Schools, K-12: 138
- \* Colleges: 68
- \* Conferences and Symposia: 185
- \* Clubs and Private Organizations: 106
- \* State and Federal Agencies: 104

## Two INHS Science Centers on Wheels Available to Visit Anywhere in the State

The **Traveling Science Center** serves northern Illinois schools and communities. For more information contact: [tsc@inhs.uiuc.edu](mailto:tsc@inhs.uiuc.edu) or 224-324-0199.



The **Mobile Science Center** is available to visit small communities and Illinois schools anywhere in the state south of Interstate 80. For more information: contact [msc@inhs.uiuc.edu](mailto:msc@inhs.uiuc.edu).



Even the exhibits can be mobile and easily changed for specific audiences and events.

## INHS Publications Office

Charlie Warwick

### Revamped INHS Publications Committee

During FY2006 the INHS Publications Committee was restructured into the following functional areas:

1. *Science editor*—an INHS researcher (Jeff Levengood) whose sole focus is to ensure the scientific integrity and quality of all manuscripts submitted to INHS for publication through professional external reviews and feedback from INHS researchers.
2. *Managing editor*—pubs office staff (Charlie Warwick) to coordinate development and production of INHS in-house publications approved by the committee.
3. *Advisory group*—representatives from INHS Library, Publication Office, Business Office, Distribution Office, Education Outreach Office, and research divisions to make recommendations on pricing, production quantities, funding, inventory, marketing, and distribution.

### Publications Committee Initiatives

- **consolidation of pubs inventory**—pubs have been stored in several venues including the I-Building, the Natural Resources Building (NRB) attic, the NRB Green house complex, and the pole barns. With assistance from INHS Operations and Maintenance, the Human Resources Office, and the Distribution Office, good progress has been made in moving all publications inventory to the I-Building. Thus, the logistics of storage and distribution are being simplified and expedited.
- **reduction of pubs inventory**—in addition to consolidating inventory, the Publications Committee has recommended a procedure to reduce the amount of inventory in order to free up office and storage space for other vital INHS functions. The procedure includes reducing the number of copies of newly printed publications, reducing excessive inventory of previously printed publications by sales and volume discounts, and by donating extra inventory to educational institutions.
- **storage of archival copies of each publication in the INHS Library**—to provide a permanent “archival” collection of all INHS pubs that will not be on loan but will be available to staff, scholars, and the public for historical research.
- **digitization of all INHS pubs**—to ensure continued availability of out-of-print publications and to

fulfill the mandates of the Illinois State Library’s Electronic Document Initiative that requires all state agencies to provide electronic versions of each publication that they produce. INHS Library and Publications Office staff have been trained in creating publications metadata and transferring electronic versions of INHS publications to the state library.

### Cooperative Projects

- The INHS Library and Publications Office submitted a grant proposal to Illinois State Library seeking funding for resources (equipment, supplies, manpower) to digitize INHS Publications and the 23,000+ images of the INHS Image Archives, and to store the original images in archival quality media.
- The INHS Web Committee, Library, and Publications Office are developing procedures to link digitized INHS publications and images to the Internet allow the public to order INHS products from our Web site.

### Publications Produced and in Development During FY2006

- INHS Bulletin 37(3&4): *Black-crowned Night-Herons of the Lake Calumet Region, Chicago, Illinois*
- INHS Bulletin 37(5): *Review of the New World Genera of the Leafhopper Tribe Erythronerini*
- INHS Reports Newsletter (4 issues)
- Biological Notes 142: *The Ground Skink, Scincella lateralis, in Illinois*
- INHS Manual 11: *Field Guide to the Skipper Butterflies of Illinois*
- INHS Manual 12: *Field Guide to Mammals of Illinois*
- Diagnostic cards of exotic and invasive species
- Poster of characteristic plants and animals in Illinois’ Natural Divisions

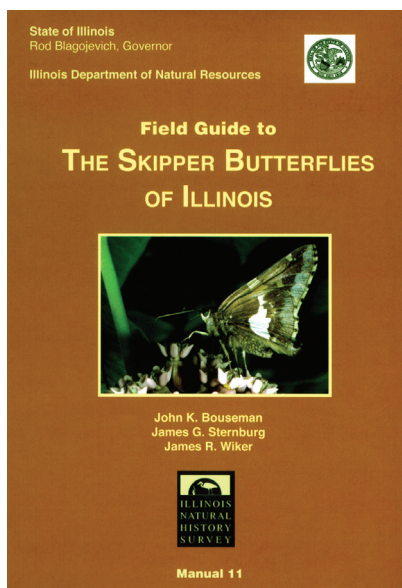
### ARTICLES AUTHORED BY INHS RESEARCHERS DURING 2005

In addition to publications produced by INHS, our researchers contribute a significant number of articles to prominent scientific journals throughout the world as well as technical and research reports to government agencies on the state and federal levels. The table below illustrates the types and numbers of publications produced by INHS researchers during 2005.

### Outside Publications Statistics

Scientific—129  
 Technical Reports—133  
 Miscellaneous—67

## Recently Printed INHS Publications



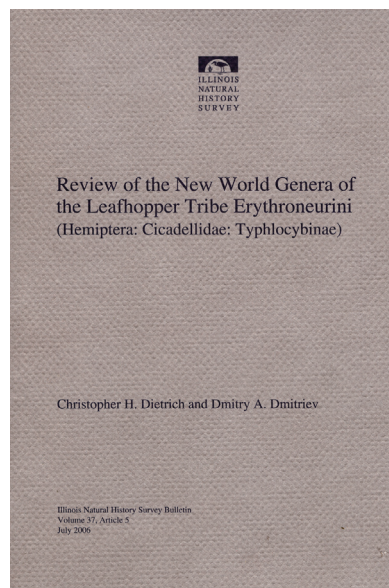
INHS Manual 11—*Field Guide to The Skipper Butterflies of Illinois*

by  
J.K. Bouseman, J.G. Sternburg, & J.R. Wiker  
viii + 200 pp.  
hardback  
5.75 X 8.25 inches  
\$19.95 per copy

A new field guide to accompany previous INHS best sellers *The Field Guide to Butterflies of Illinois* and *Field Guide to Silkmoths of Illinois*. Contains more than 400 color photos plus species accounts and color distribution maps of Illinois' skippers.

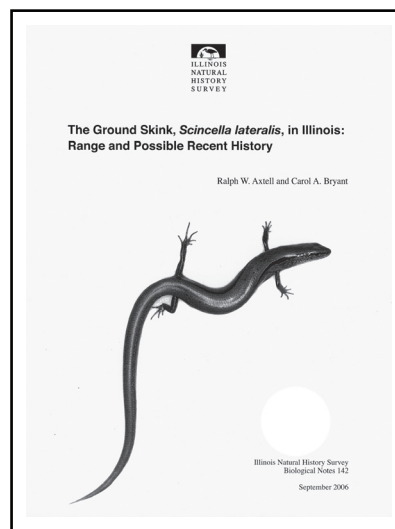
### Ordering information for all publications:

Contact: Vickie Bohlen—(217) 333-6880  
pubs-sales@inhs.uiuc.edu  
Illinois Natural History Survey  
I-Building  
Distribution Office  
1816 S. Oak St.  
Champaign, IL 61820



INHS Bulletin 37(5):119–190, *Review of the New World Genera of the Leafhopper Tribe Erythroneurini*

by  
C.H. Dietrich & D.A. Dmitriev  
paperback  
6.75 X 10 inches  
\$10 per copy



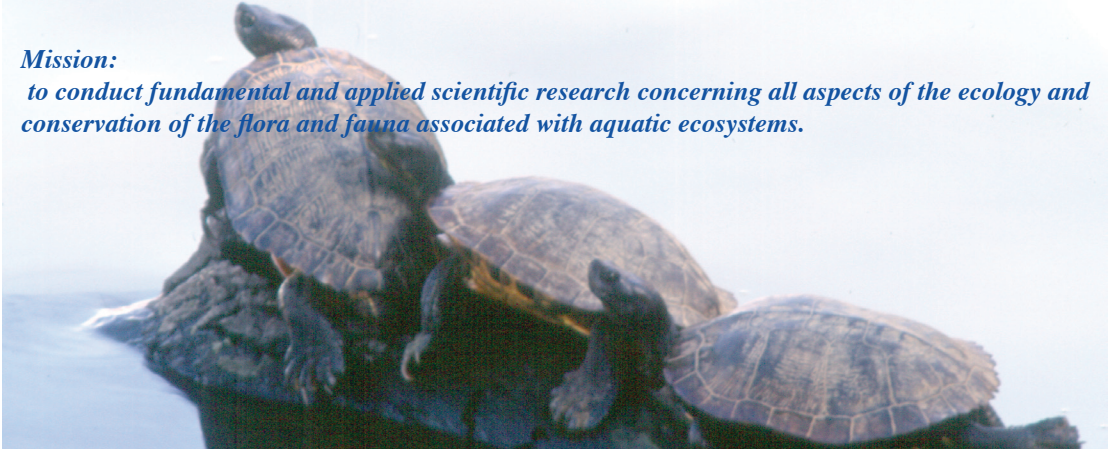
INHS Biological Notes #142, *The Ground Skink, Scincella lateralis, in Illinois: Range and Possible Recent History*

by  
R.W. Axtell & C.A. Bryant  
paperback  
8.5 X 11 inches  
\$7 per copy

# Center for Aquatic Ecology & Conservation

**Mission:**

*to conduct fundamental and applied scientific research concerning all aspects of the ecology and conservation of the flora and fauna associated with aquatic ecosystems.*



To achieve our mission, the scientific and research staff from the center investigate a wide range of questions on what aquatic ecosystems look like and how they work. These questions are especially relevant in Illinois where we observe a high level of ecological disturbances. Therefore, our scientists conduct their work in a wide variety of conditions at varying scales (from individual populations to entire ecosystems) to gain an effective understanding and a clear picture of Illinois' aquatic legacy.

Approximately half of our scientists and their staffs are permanently located at one of six remote field stations: the Illinois River Biological Station in Havana; the Lake Michigan Biological Station at Zion; the Kaskaskia Biological Station at Sullivan; the Great Rivers Research Station at Brighton; the Sam Parr Biological Station at Kinmundy; and, the Ridge Lake Station near Charleston. This network of field stations covers every major type of aquatic ecosystem in the state and enlivens the opportunity for intensive, year-round research, monitoring, and inventory not otherwise possible.

**The Illinois River Biological Station (IRBS)** conducts long-term ecological monitoring and research on the Illinois River and its tributaries. The Illinois River basin, which covers nearly two-thirds of the land area in Illinois, has a unique “urban headwater” in the Metropolitan Chicago area which includes the Chicago Waterway. This waterway serves as both a sanitary and barge canal ultimately connecting the Mississippi and St. Lawrence River basins. The Chicago Waterway is an engineered connection joining two previously separated ecosystems, the Great Lakes and Mississippi River System. Be-

cause of the threat posed by a number of invasive species interchanging between these two systems, such as Asian carp, round goby, and zebra mussel, the Illinois River has become a central focus for research designed to understand the affects of invasive species on native biota and ecosystem functions, and design management tools to stop the further spread of invasive species.

**The Lake Michigan Biological Station (LMBS)** is the flagship aquatic research laboratory for all of Lake Michigan. Located on the lake shore in the center of the Milwaukee-Chicago-Gary metropolitan corridor, the station is capable of studying aquatic ecology literally within eyesight of nearly 8 million people. The station conducts research on processes that shape and change near-shore fish and invertebrate communities; yellow perch physiology and energetics to help understand the boom and bust cycles of this recreationally and ecologically important species; and intensively monitors the fate of lake trout restoration efforts in the southern part of the lake.

**The Kaskaskia Biological Station (KBS)** is located on the banks of Lake Shelbyville, one of three large U.S. Army Corps of Engineers storage reservoirs in the south-central part of the state. Aside from its storage function, Lake Shelbyville is a mecca for recreational fisheries. Scientists study the predator and forage communities to more deeply understand the biological flow of energy through the food web with special focus on top predators of importance to anglers and the often-ignored middle portion of the food web.

**The Great Rivers Field Station (GRFS)** is located on the Illinois side of Metropolitan St. Louis with easy access to the Mississippi River at Pool 26 as well as the confluence of the Mississippi, Missouri, and Illinois rivers. The Upper Mississippi River System, which includes both the Upper Mississippi and Illinois rivers, is the focus of an intensive long-term research and monitoring program designed to assess ecosystem changes associated with operation of commercial navigation on these rivers, known as the Long Term Resource Monitoring Program (LTRMP). The GRFS and IRBS are two of six field stations associated with this program, which is a major partnership among five state agencies, the USACOE, the USGS and USFWS. Furthermore, the GRFS conducts a broad range of research focused on understanding the ecology of river-floodplain ecosystems and designing effective resource management strategies. GRFS is also a key component of the newly created National Great Rivers Research and Education Center (NGRREC) whose goal is to focus individual and institutional efforts on gaining better scientific knowledge about great river ecosystems. The central cooperators in NGRREC (INHS, University of Illinois, and Lewis and Clark Community College) hope that NGRREC will do for great rivers what Woods Hole and other oceanographic institutes have done for the science of oceanography.

**The Sam Parr Biological Station (SPBS)** provides a launching site for our work in the southern portion of the state, but also provides us with facilities and the capacity to conduct controlled or manipulative experiments in pond settings. SPBS boasts a series of one-acre and sub-acre ponds that can be set up and drained on a very rapid schedule. Current experiments are addressing how individual nesting success in largemouth bass contributes to the overall recruitment in a population. Other experiments are examining the ecological causes for why some adult bluegill populations exhibit high physical quality while others are typical of lower quality or “stunting.”

**The Ridge Lake Station** is the site of North America’s longest continuous creel fishing lakes. Through a reservation-based system of controlled-access fishing, virtually every fish that is caught in the lake can be measured and released along with specific data about conditions in the lake as well as the anglers themselves.

Whether through field stations or through facilities in Champaign, CAEC participated in over 50 research projects listed at <http://www.inhs.uiuc.edu/annualreports/annualreports.html>.

These projects have culminated in more than 30 technical publications in peer-reviewed journals, continuing our record of high productivity and reputation as a national leader in aquatic ecological research. We look forward to the next year to continue this tradition of excellence and scientific service to our many state and federal partners, and more importantly, to the aquatic resources and citizens of the State of Illinois.

## **Outreach Activities, Projects, and Publication Statistics**

Number of research projects—67

Numbers of publications—

\* Scientific: 37

\* Technical Reports: 24

\* Miscellaneous: 12

Number of outreach activities—

\* Schools, K-12: 5

\* Colleges: 10

\* Conferences and Symposia: 13

\* Clubs and Private Organizations: 17

\* State and Federal Agencies: 19

Number of committees/boards served by center staff—27



# Center for Biodiversity



**Mission:**

*The mission of the Center for Biodiversity is to obtain information on the diversity of life through research in systematic biology, and through the acquisition and maintenance of natural history collections and their associated databases. This information is provided to the people of Illinois, policy makers, and the scientific and educational communities through publications, education, and outreach.*

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The Center for Biodiversity's primary research focus is systematics, the science of understanding the diversity of living organisms, classifying them according to their evolutionary relationships, and developing tools for their identification. We are fortunate to have an outstanding staff that maintains a strong and diverse research program, including work on fungi, flowering plants, amphibians and reptiles, birds, crayfish, fish, insects, mussels, and worms. Much of our work involves basic systematics research relevant to the state's plants and animals. The results of this work are essential to conserving our natural resources, because if we do not know what species are here, where they are found, and how to identify them, we cannot understand their biology and how to manage them effectively. In addition, staff conduct inventories on high-quality natural areas throughout the state and on federal properties nationwide, providing information necessary for the management of these habitats and the species they support. Other impor-

tant components of the center's work are studies of threatened or endangered species and invasive exotic species, often in cooperation with others at the INHS or other institutions. Staff in the Center for Biodiversity also provide curatorial and management support for the Survey's scientific collections, described elsewhere in this Annual Report, and for the zoological collections at the University of Illinois at Urbana-Champaign.

Center staff share their expertise with a wide variety of audiences. Research results appear in scientific and popular publications and in technical reports to government agencies and other organizations. Staff also make presentations to scientists, agency staff, K-12 and college students, and the public. They also regularly consult with other Illinois Department of Natural Resources staff and with representatives of federal agencies like the Fish and Wildlife Service, the Forest Service, and the National Park Service. Several of our scientists also serve as members of or consultants to the Illinois Endangered Species Protection Board, the Illinois Nature Preserves Commission, U.S. Forest Service advisory panels, and state and federal endangered species recovery teams.



## **Significant Accomplishments During FY2006**

- Authoring more than 30 articles published in national and international, peer-reviewed scientific journals;
- Presenting more than 120 talks or other presentations to scientific organizations, agency staff, schools, and the public, in addition to teaching several courses at the University of Illinois;
- Obtaining more than \$3 million in external funding, including more than 10 grants from the National Science Foundation.
- Providing training and research experience to undergraduate and graduate students who will form the next generation of systematists.

Examples of some of our major research programs appear elsewhere in this Annual Report.

Geoffrey Levin, Center Director

## **Outreach Activities, Projects, and Publication Statistics**

Number of research projects—94

Numbers of publications—

- \* Scientific: 33
- \* Technical Reports: 19
- \* Miscellaneous: 24

Number of outreach activities—

- \* Schools, K-12: 25
- \* Colleges: 12
- \* Conferences and Symposia: 46
- \* Clubs and Private Organizations: 21
- \* State and Federal Agencies: 18

Number of Committees/Boards served by center staff—41



# Center for Ecological Entomology



## ***Mission:***

***The Center for Ecological Entomology serves the people of Illinois, policy makers, and the scientific and educational communities by investigating and resolving entomological problems and issues in four critical areas: agriculture, medicine, natural environments, and urban landscapes. The Center provides scientifically based information leading to an understanding and appreciation of our natural heritage and the wise preservation, management, and utilization of Illinois' natural resources.***

Entomologists in the Center for Ecological Entomology conduct research on a broad array of topics including studies on exotic and native pest species in agricultural and natural environments, as well as studies of beneficial and other nonpest insects. The diversity of research is represented by a variety of projects carried out by center scientists. From research and monitoring activities, recommendations are developed for control of harmful insects as well as for conservation of native and beneficial insects and other invertebrate species. Center staff also participate in educational efforts for producers, policy makers, and the public and contribute to biological, ecological, and taxonomic knowledge for the benefit of the public and the greater scientific community.

Projects conducted in 2005 have provided important information to the scientific community, as well as to state officials and the public. The Medical Entomology Program headed by Robert Novak determined that the major West Nile Virus (WNV) vectors in central Illinois are *Culex pipiens* and *Culex restuans*. The team developed a real-time DNA amplification technique to detect West Nile Virus vectors, which will help to determine the role of

these and other mosquito species in WNV transmission and target specific control measures, ensuring that infections of humans can be minimized through science-based management recommendations.

Studies on several aspects of the transition from conventional to certified organic food crop production are in progress. Cathy Eastman and colleagues have completed a transition regime that compares low, medium and high management intensities during the three years that are required for organic certification. In the fourth year, the entire research plot will be planted in one crop and the different management practices for the previous three years evaluated based on such parameters as weeds, soil nutrient availability, soil invertebrate communities, and the relationship among soil fertility, plant health, and insect/disease pressure.

Eli Levine found that adult western corn rootworms (WCR) observed feeding on soybean leaves in the field tested positive for bean pod mottle virus. While transmission efficiency in soybeans was much lower for WCR than for the bean leaf beetle (the primary vector of the virus), the percentage of WCR testing positive was as high as 95% in some

counties, suggesting that transmission could occur in the field.

Joseph Spencer developed a novel tool to study a recently acquired behavior of WCR movement to soybean fields to lay their eggs, thus circumventing the rotation of corn as a management tool.

Adult beetles feeding on transgenic corn were identifiable as positive for the insect-specific toxin the corn produces, providing a marker to study movement from corn to soybeans. Spencer has used this information to suggest that appropriate WCR refuges would be narrow in-field strips or adjacent refuge blocks to allow a thorough genetic mixing of toxin-susceptible refuge populations and potentially resistant populations in the transgenic fields.

The center welcomed an excellent weed biological control scientist, S. Raghu, in May of 2005. Raghu is currently studying the ecology and biological control of noxious invasive weeds including garlic mustard, an exotic species that is among the most significant invasive plants of eastern deciduous forests; purple loosestrife, a species for which successful control by *Galerucella* beetles may be related to seasonal abundance of two different beetle species on loosestrife populations; teasel, for which exploration in the native range for natural enemies is underway; and leafy spurge, an invasive Eurasian perennial that is spreading rapidly through forest preserves and natural areas throughout the greater Chicago region.

David Soucek is studying the effects of military smokes and obscurants, known to contain oils and toxic/carcinogenic chemicals, on habitats harboring threatened and endangered plant and animal species. While vertebrate and insect species were not affected by a year of activity at the site, significant mortality occurred in the population of *Daphnia*, small crustaceans that are an important food source for other aquatic animals. Soucek is also generating data to determine safe sulfate levels in water, as well as evaluating the effects on birds of ingesting insects that are exposed to sediments contaminated with organic and inorganic industrial and sewage wastes in the Calumet region of Chicago, IL.

Northern Illinois counties are on the leading edge of an invasion of the European gypsy moth, a defoliator of oak and willow trees. Lee Solter completed a series of laboratory and field tests to determine the host range of three microsporidian pathogens (related to fungi) of the gypsy moth that do not occur in U.S. populations. A proposal to release these

natural enemies was submitted to the U.S. Environmental Protection Agency, USDA Animal and Plant Health Inspection Service, and the State of Illinois in late 2005. Release is slated for May 2007.

David Voegtlin and colleagues have established an impressive network of suction traps around the Midwest that is being used to monitor the flight and population density of populations of the soybean aphid, an exotic, recently invading pest. The traps also provide a unique opportunity to evaluate other aphid populations, both pest and nonpest, and several species not previously known to occur in the Midwest region have been identified. Voegtlin continues to explore the regions where the soybean aphid is native for natural enemies that might be used as biological control agents against this pest.

Additional projects include Gail Kampmeier's work on taxonomic database development, the Cooperative Agriculture Pest Survey headed by Illinois coordinator, Kelly Cook, and publications and education programs designed by Susan Post. Center entomologists are committed to serving their Illinois constituency by providing research data for scientific and outreach publications, participating in educational efforts at all levels, providing identification services, and participating in the leadership of their respective disciplines nationally and internationally.

## **Outreach Activities, Projects, and Publication Statistics**

Number of research projects—44

Numbers of publications—

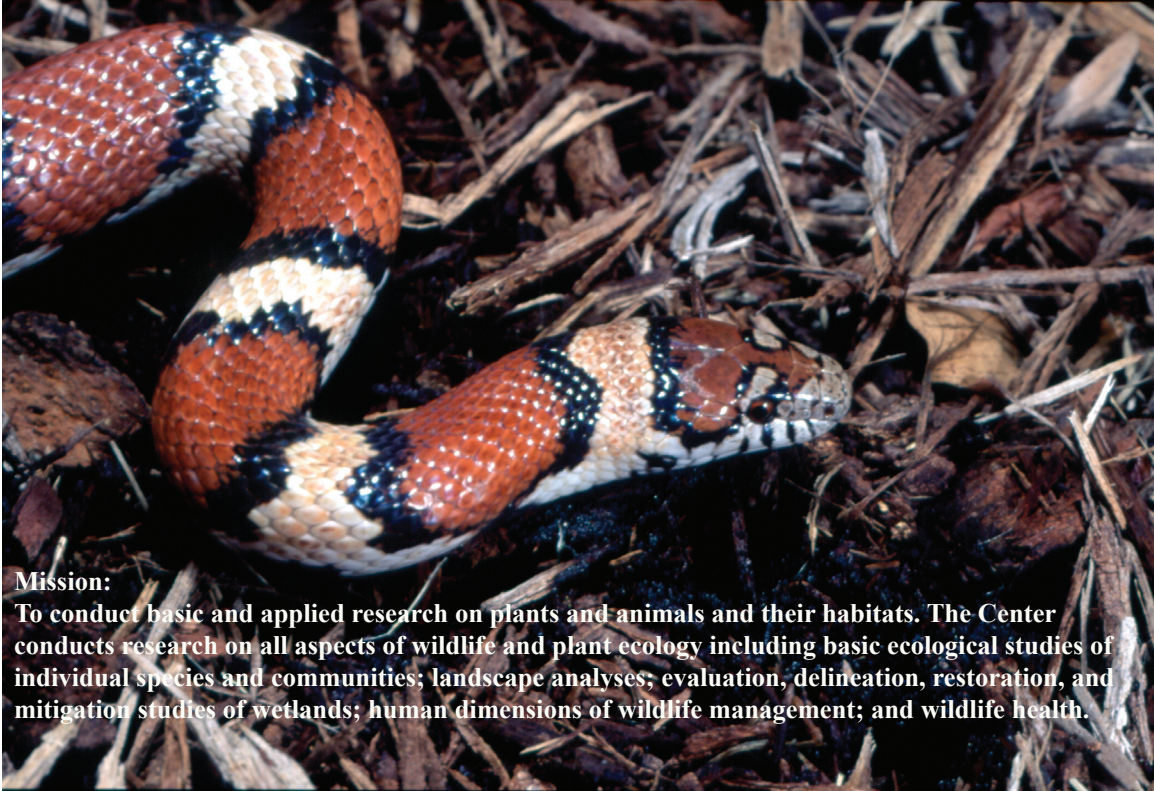
- \* Scientific: 31
- \* Technical Reports: 24
- \* Miscellaneous: 15

Number of outreach activities—

- \* Schools, K-12: 95
- \* Colleges: 9
- \* Conferences and Symposia: 42
- \* Clubs and Private Organizations: 4
- \* State and Federal Agencies: 8

Number of committees/boards served by center staff—48

# Center for Wildlife and Plant Ecology



## Mission:

To conduct basic and applied research on plants and animals and their habitats. The Center conducts research on all aspects of wildlife and plant ecology including basic ecological studies of individual species and communities; landscape analyses; evaluation, delineation, restoration, and mitigation studies of wetlands; human dimensions of wildlife management; and wildlife health.

The Center for Wildlife and Plant Ecology (CWPE) includes four teams supported by grants and contracts, staff at three field stations, and professional and research scientists in Champaign and Springfield. CWPE scientists published 28 peer-reviewed scientific papers in 2005, as well as 66 technical reports and a variety of popular articles. CWPE staff participated in 236 professional and outreach activities, including 44 presentations of research results at scientific meetings and conferences, 50 presentations to school groups, colleges and universities, and over 120 presentations to public or private interest groups. Scientists and technical staff in CWPE brought in about \$3 million in grants and contracts. CWPE truly is an outstanding scientific resource for the state of Illinois. A list of over 130 research projects conducted by CWPE staff during the past fiscal year can be seen at <http://www.inhs.uiuc.edu/annualreports/annualreports.html>.

The Wetlands Team, led by Dr. Allen Plocher, surveys soils and plants and develops assessments of Illinois wetlands in association with Illinois Department of Transportation (IDOT) projects. The Biotic Surveys Team, led by Dr. John Taft, also works on IDOT projects, conducting sur-

veys for threatened and endangered plants, birds, and mammals. The Critical Trends Assessment Program (CTAP) Team, led by Dr. Brenda Molano-Flores, inventories and monitors plants, birds, and insects in selected habitats statewide and assesses patterns and trends in distribution and abundance (see CWPE Research Highlights). The Geographic Information Systems (GIS) Team, led by Liane Cordle, provides expertise in mapping and spatial analyses. Many members of these teams also conduct independent research, often related to their contract work, and are highly active in community and statewide outreach and conservation organizations.

Other professional and research scientists in CWPE also maintain high-caliber research programs. Dr. Nohra Mateus-Pinilla and Dr. Jay Diffendorfer have developed a strong and growing collaborative research program addressing Chronic Wasting Disease in white-tailed deer (see CWPE Research Highlights). Wildlife epidemiology has become a thriving program in CWPE in recent years under the direction of Dr. Mateus-Pinilla. Dr. Ron Larkin has been highly sought as a speaker on the impacts of wind turbines on bats and birds, and is explor-

ing use of radar technology to evaluate flight paths during migration. Bill Anderson continued to lead the Human Dimensions Program, which provides IDNR with Illinois hunter and trapper survey data needed for informed management. Avian ecology is a focus of research in CWPE. Dr. Jeff Hoover continued his long-term studies of migratory songbirds and bottomland forest restoration, Dr. Dave Enstrom and Dr. Mike Ward are using radio-telemetry and AM radio recorders/transmitters in some innovative studies of the ecology of Northern Cardinals, and Dr. Jeff Walk, Dr. Mike Ward, Steve Bailey, Dr. Jay Diffendorfer, and CWPE-affiliate Dr. Jeff Brawn have begun a major statewide bird survey (see CWPE Research Highlights). Dr. Walk also spearheaded development of Illinois' Comprehensive Wildlife Conservation Plan with major support from the CWPE GIS Team. The Illinois Plan was one of the first in the nation submitted to and approved by the U.S. Fish and Wildlife Service, receiving praise for its high quality. Re-named the Illinois Wildlife Action Plan, this document will provide the basis for many future conservation actions, and will open the door for an influx of federal support to Illinois in the form of State Wildlife Grants. Dr. Jeff Levengood investigated the effects of environmental contaminants on wildlife such as fish, birds, mussels, and amphibians. New and innovative statistical approaches for examining population trends in birds are being developed by Dr. Dan Niven, and landscape influences on the ecology of mammals and birds are being examined by Dr. Ed Heske and his students.

The Forbes Biological Station in Havana continued to be the premier institution for waterfowl research in Illinois. Dr. Josh Stafford and the Forbes team conducted aerial inventories of migrating waterfowl along the Mississippi and Illinois rivers, and completed many new analyses of population trends in waterfowl. Aaron Yetter, Facilities Manager of the Forbes Station, was President of the Illinois Chapter of The Wildlife Society in 2005. Dr. Steve Havera, former Director of the Forbes Station and distinguished emeritus of CWPE, was honored at the 2005 Governor's Conference on the Management of the Illinois River, receiving the 2005 Meritt Award from the Soil and Wa-

ter Conservation Society for his long-term service and contributions toward conservation in Illinois. At Lost Mound NWR in northwestern Illinois, Dr. Dan Wenny and colleagues studied the ecology of grassland birds, seed dispersal, and woody invasion of grasslands, the ecology of Swainson's hawk, and led numerous tours and outreach activities at this newly designated Important Bird Area. And at Midewin National Tallgrass Prairie in northeastern Illinois, Dr. Chris Whelan and colleagues continued research on trophic interactions among birds, insects, and plants, the behavioral ecology of birds in prairies and woodlands, and are developing plans for a large-scale, long-term experimental research program in prairie restoration. Much of the research at all three locations is relevant to ongoing restoration activities in prairies and floodplains, and will help guide future habitat restoration and management efforts in Illinois.

Finally, we had several changes in personnel in CWPE in 2005. Liane Cordle retired from our GIS Group after 30 years of service, and will be sorely missed. Diane Szafoni and Tari Tweddale will assume leadership of that group. Dr. Patrick Hubert left our Human Dimensions Group for a new job in Canada, and was replaced by Stacy Lischka, who will be our new human dimensions expert. Dan Busemeyer, Paula Sabatini, and Tina Grigg left our IDOT Wetlands Team and were replaced by botanist Jason Zylka, soil scientist Ian Draheim, and data manager Susan Gallo. Dr. Adrienne Edwards left our IDOT Biotic Surveys Group, and was replaced by botanist Michael Murphy. Also joining our Biotic Surveys Group were mammalogist Dr. Joe Merritt and vertebrate biologist Jean Mengelkoch. Matt Bowyer left the team at the Forbes



Station for a position with Missouri Department of Natural Resources, and was replaced by wildlife technician Randy Smith. Claudia Corlett-Stahl joined the staff of our front office in Champaign as a Financial Administrative Assistant. And Dr. Brenda Molano-Flores is leaving her position as CTAP Coordinator to become a full-time researcher in plant biology and restoration ecology in CWPE. Dr. Mike Ward will become the new CTAP Coordinator at the close of the field season in 2006. A year of changes; we welcome the new staff and look forward to another productive year in 2006. Visit our Web site <http://www.inhs.uiuc.edu/cwpe/index.html> to learn more about CWPE staff and our ongoing research.

### **CWPE Research Highlights**

- Dr. Norha Mateus-Pinilla and Dr. Jay Diffendorfer (both of CWPE), with Dr. Jan Novakofski and Dr. John Killefer (UIUC ), have developed a database containing information on over 21,000 tissue samples integrated it into a Geographic Information System (GIS). This database describes the spread of CWD through deer populations and helps determine if particular ages or sexes of deer are at higher risk for infection.

- The Critical Trends Assessment Program (CTAP) is concluding its second five-year cycle (2002–2006) of monitoring Illinois plants and wildlife. During this second cycle, CTAP biologists resampled over 600 randomly selected sites across Illinois, collecting data on plants, birds, and arthropods in forests, wetlands, grasslands, and streams. In addition, during this second cycle CTAP staff collected data on an additional 70 reference sites selected specifically to represent high-quality, benchmark examples of natural habitats that will aid in determining the current conditions of Illinois habitats.

- A bird survey conducted by Dr. Jeff Walk, Dr. Michael Ward, Steve Bailey, Dr. Jeff Brawn, and Dr. Jay Diffendorfer censused birds in all habitats throughout the state. This survey will provide further insights concerning which species are expanding or contracting their ranges and whether these changes are related to habitat loss/changes or other factors. One of the most important outcomes of this study will be the ability to determine which species are increasing or decreasing in abundance.

### **Outreach Activities, Projects, and Publication Statistics**

Number of research projects—134

Numbers of publications—

- \* Scientific: 28
- \* Technical Reports: 66
- \* Miscellaneous: 16

Number of outreach activities—

- \* Schools, K-12: 13
- \* Colleges: 37
- \* Conferences and Symposia: 44
- \* Clubs and Private Organizations: 64
- \* State and Federal Agencies: 59
- \* Other: 19

Number of committees/boards served by center staff—35



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