Proposal Entitled

Insects as Indicators of Habitat Quality, Ecological Integrity and Restoration Success in Illinois Prairies, Savannas and Woodlands

For Submission To:

Illinois Department of Natural Resources
Paul Vehlow
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Springfield, Illinois 62702-1271

Submitted by:

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Make Award To: The Board of Trustees of the University of Illinois
c/o Office of Sponsored Programs and
Research Administration
1901 S. First Street, Suite A
Champaign, IL 61820

Amount Requested: $ 299,999
Project Period: 1 August 2014 – 31 July 2017

Sam W. Heads, Principal Investigator Illinois Natural History Survey	Brian Anderson, Director Illinois Natural History Survey
David W. Richardson, AVCR/Director Sponsored Programs & Research Admin. University of Illinois	Peter Schiffer Vice Chancellor for Research University of Illinois

Executive Summary

Title: Insects as Indicators of Habitat Quality, Ecological Integrity and Restoration Success in Illinois Prairies, Savannas and Woodlands
Applicant Information: Board of Trustees of the University of Illinois

Goals/Objectives:
(1) Identify representative prairie, savanna and woodland habitats in IL and their associated grasshopper, butterfly, cicada and tiger beetle species; **(2)** Establish monitoring programs for these taxa at selected sites throughout the state; **(3)** Identify and characterize those species and species assemblages that are potentially valuable as indicators of habitat quality and ecological integrity; **(4)** Develop tools to assess the success of IDNR restoration efforts in these habitats; **(5)** Provide annual and final reports that include detailed assessments of the utility of the focal taxa together with the assessment of the vulnerability of such habitats.

Proposed Grant Period: 1 August 2014 – 31 July 2017
Amount Requested: $ 299,999
State(s) and Partners Involved: IL Dept. Nat. Resources, IL Natural History Survey
Key Habitats Addressed: Prairies, Savannas, Woodlands

Summary Statement: To date, the evaluation of habitat quality in IL prairies, savannas and woodlands has focused almost entirely on botanical surveys with measures of quality relying only on baseline floristic data. In contrast, very little, if any, work has been done to assess the ecological integrity of IL grassland and woodland habitats utilizing invertebrate indicator taxa. This is surprising given the astonishing diversity of terrestrial invertebrates in such habitats and their corresponding sensitivity to environmental change. With this in mind, invertebrates—insects in particular—can be valuable indicators of habitat quality and ecosystem integrity. In grassland biomes, four groups of insects stand out as useful indicator species: (1) grasshoppers (Orthoptera: Acridoidea); (2) butterflies (Lepidoptera: Rhopalocera); (3) cicadas (Hemiptera: Cicadoidea); and (4) tiger beetles (Coleoptera: Carabidae). These familiar and charismatic taxa combine ecological sensitivity and high overall abundance with ease of collection and identification, making them excellent candidates for use as indicators. Moreover, grasshoppers and butterflies have consistently been shown to represent other invertebrate and plant taxa very effectively in grasslands and woodlands around the globe. We propose to utilize these groups as indicators of habitat quality and ecological integrity in Illinois grasslands and woodlands, identifying both individual species and species assemblages that can be used to evaluate these habitats. Deliverables will include: (1) significant quantitative baseline data concerning the diversity, abundance and species richness of the focal taxa in the aforementioned habitats; (2) identification of species and species assemblages with indicator utility; and (3) metric indices and other tools for the assessment of habitat quality and restoration success in the habitats of interest.

Estimated Cost:

	Total Federal	Total INHS (Non-Fed)	Total Cost
Year One	$ 99,695	$ 53,679	$ 153,374
Year Two	$ 99,595	$ 53,628	$ 153,223
Year Three	$ 100,709	$ 54,229	$ 154,938
Total Funding	$ 299,999	$ 161,536	$ 461,535

INHS will provide in-kind match of $161,536 during the project period. Staff salary ($28,688), benefits ($12,319), F&A ($24,030) and unrecovered F&A ($96,499) will be provided during the three year project period.

Project Title: Insects as Indicators of Habitat Quality, Ecological Integrity and Restoration Success in Illinois Prairies, Savannas and Woodlands T-92-R-1

Need

One of the driving tenets of the Illinois Wildlife Action Plan (IWAP) is the maintenance of populations in historic locations (i.e. remnant habitat) and their re-establishment where suitable habitat exists and/or can be restored (State of Illinois 2005). If the goals of the IWAP are to be realized, then efforts must be made not only to document and describe both current and historic locations, but to rapidly assess the quality of the habitat in those areas and the integrity of the ecosystems they support. Such assessments are essential for effective management of natural areas—both original and restored—and are particularly important when considering not only the ecological requirements of Species in Greatest Need of Conservation (SGNC) but also in identifying the spatial distribution of suitable habitat within their range. Revision of the IWAP is currently underway with efforts focused on reassessing the status of terrestrial invertebrate SGNC. However, the mega-diversity of terrestrial invertebrates is a considerable obstacle in achieving the goals of the revision and renders any attempt to generate a complete list of species extraordinarily difficult if not impossible.

To date, the evaluation of habitat quality and management success in Illinois prairies, savannas and woodlands has relied almost entirely on vegetation-based assessment methods (e.g. Taft *et al*. 2006). However, recent studies have demonstrated that some groups of terrestrial invertebrates—arthropods in particular—respond to management measures differently than plants (Panzer *et al*. 1995; Panzer 2002; Harper *et al*. 2000; Swengel and Swengel 2007; Wallner *et al*. 2011) and suggest that vegetation-based measures of habitat quality (e.g. species richness, Shannon-Wiener index, floristic quality index, etc.) may not be able to detect negative impacts of management on these taxa (Wallner *et al*. 2013). Arthropods—insects in particular—comprise the most diverse group of organisms in terrestrial habitats (Grimaldi and Engel 2005; Gullan and Cranston 2005) and play vital roles in the function of terrestrial ecosystems, such as pollination, nutrient cycling and energy flow (Speight *et al*. 1999; Schowalter 2006; Whiles and Charlton 2006). With this in mind, we propose a project that will focus on identifying a number of insect species and species assemblages that are potentially useful as indicators of habitat quality and ecological integrity in three key terrestrial habitat types in Illinois: (1) prairies; (2) savannas; and (3) woodlands.

Objectives

The primary objective of this project is to identify those species and species assemblages within the focal taxa (namely, grasshoppers, butterflies, cicadas and tiger beetles) that are potentially valuable as biological indicators. These data will then be used together with a monitoring program, to develop tools for the assessment of habitat quality, ecological integrity and restoration success in IL prairies, savannas and woodlands. We will address the following major questions in this project:

(Q1) Which species and species assemblages within the focal taxa (grasshoppers, butterflies, cicadas and tiger beetles) are valuable as indicators of habitat quality and ecological integrity in IL prairies, savannas and woodlands?

(Q2) How can these species and species assemblages be used to develop habitat quality indices that are informative within the context of monitoring and the assessment of restoration success in IL prairies, savannas and woodlands?

Objective 1: Identify at least three representative prairie, savanna and woodland habitats in IL and their associated grasshopper, butterfly, cicada and tiger beetle species (focal taxa). This will be completed by December 2014. Existing data from sites identified in the Illinois Natural Areas Inventory (INAI) and Critical Trends Assessment Program (CTAP) will be reviewed during the early stages of the project in order to help identify potential sites for more detailed study (details are described in Job 1 and the Project Schedule).

Objective 2: Establish monitoring programs relevant to IDNR managers and Citizen Science Groups (e.g. Master Naturalists) for the focal taxa in IL. Setup of the monitoring programs will be completed by the 31 May 2015 with monitoring running throughout the duration of the project. Sites for continual monitoring will be identified following completion of Objective 1 in order to ensure coverage of all salient habitat types and qualities (details are described in Job 2 and the Project Schedule).

Objective 3: Identify and characterize those species and species assemblages of the focal taxa (four groups comprising grasshoppers, butterflies, cicadas and tiger beetles) that are potentially valuable as indicators of habitat quality and ecosystem integrity in IL prairie, savanna and woodland environments. This will be completed by 31 July 2017 (details are described in Job 3 and the Project Schedule).

Objective 4: Develop at least one tool for each habitat to assess the success of IDNR restoration efforts in IL prairies, savannas and woodlands using the identified species/assemblages by 31 July 2017 (details are described in Job 4 and the Project Schedule).

Objective 5: Write reports and manuscripts. Quarterly and annual reports and a final report will be provided at the time specified in the grant agreement (details are described in Job 5 and the Project Schedule).

Approach

This study will be completed by staff of the Illinois Natural History Survey located in Champaign in cooperation with both the Farmland and Prairie and Forest and Woodlands Illinois Wildlife Action Plan (IWAP) campaigns, based at IDNR in Springfield.

Job 1: Identify representative prairie, savanna and woodland habitats in IL and their associated grasshopper, butterfly, cicada and tiger beetle species.

We will identify at least three sites for each habitat for detailed study through assessment of data concerning prairie, savanna and woodland localities from the Illinois Natural Areas Inventory (INAI) and Critical Trends Assessment Program (CTAP) as well as data from previous field investigations carried out by the PIs and information provided by IDNR. We will select a number of field sites representing all relevant habitats and a broad spectrum of qualities in order to better assess relationships of indicator species and species assemblages with habitat quality and restoration levels (i.e. successional stage). Where historical data is available (e.g. from CTAP), these will be included in the analysis.

Job 2: Establish monitoring programs relevant to IDNR managers and Citizen Science Groups (e.g. Master Naturalists) for the focal taxa.

Monitoring programs will be established comprising standardized quantitative sampling of the focal taxa at each of the selected field sites. Transects will be identified at each of the field sites and targeted sampling methods will be used to sample each of the focal taxa. These will include the following:

Method 1: Sweep netting for grasshoppers. This is by far the best method for sampling grasslands in prairies, savannas and woodlands and will comprise sweeping along the predefined transects with a standardized net diameter and bag size. The number of sweeps per transect will be recorded in order to calculate collecting effort per sample. Each sample will be collected in its entirety and sorted back in the lab. Specimens will be preserved either in alcohol or dried and pinned as appropriate.

Method 2: Timed transect walks for butterflies. This is the most efficient method of recording butterfly species and abundance in prairies, savannas and woodlands and comprises a number of individuals walking a predefined transect for a set amount of time and recording each butterfly species and the number of individuals encountered. As the vast majority of butterfly species in Illinois can be identified by sight, this method negates the need for collecting large numbers of specimens and minimizes impact on local populations. In addition to the timed walks, a number of voucher specimens will be collected with aerial nets and subsequently dried and pinned.

Method 3: Timed active collecting for cicadas. Sweep netting is not appropriate for collecting cicadas as they are easily disturbed and fly away from the transect as investigators sweep towards them. We will collect them by actively seeking them out and securing them with nets or by hand. In order to make the cicada surveys more quantitative, the searches will be carried out for a fixed period of time within a predefined sampling area and collecting effort calculated. Specimens will be preserved either in alcohol or dried and pinned as appropriate.

Method 4: Pitfall trapping for tiger beetles. Like cicadas, tiger beetles are easily disturbed and readily fly away from pursuers. While some specimens may be captured during the sweep net sampling, the most effective method of collecting tiger beetles is the use of pitfall traps. These traps will be set at randomized locations within the sampling area and will comprise six 12 ounce plastic cups sunk into the ground at 50 cm intervals with three cups either side of 1 m long aluminum drift fence. A few ounces of preservative will be added to the bottom of each cup which will then be covered with a guard to prevent access by mammals and other vertebrates.

In addition to the above, baseline floristic/vegetation data will be compiled for all survey sites. All data collected as part of the project will be compiled in a relational database for statistical analysis and copies of the data will be made available to IDNR. Voucher specimens will be deposited in the INHS insect collection. Digitized copies of field notes will also be archived at INHS. If and when threatened and endangered species are encountered, Element Occurrence Records will be provided to the IDNR Natural Heritage Database.

Outreach Component

We propose to include a Citizen Scientist component to this project. Because the focal taxa are possible to identify by non-scientists, we will develop a corps of trained volunteers who will assist in the overall monitoring effort across the state. Because of the large number of potential sites, this citizen monitoring corps would greatly facilitate the continuation and success of this project. We will partner with the UI Extension's Master Naturalist Program—participants now undergo a 12-week training course on various aspects of Illinois's natural history (including entomology)—and then must provide a set number of volunteer hours each year. We will use these new Master Naturalists as skilled habitat monitors. INHS staff will produce identification materials for each group of insects and provide training to those Master Naturalists who agree to participate (we anticipate several hundred). Currently there are at least 12 Master Naturalist training programs across the state, and we anticipate many more in the near future.

Job 3: Identify and characterize those species and species assemblages that are potentially valuable as indicators of habitat quality and ecosystem integrity.

Specimen data collected and compiled during Job 2 will be analyzed in order to identify those species and species assemblages that are indicators of habitat quality and restoration success. This effort will focus not only on identifying species/assemblages

that are indicative of high quality habitats, but also on identifying assemblages that are indicative of particular successional stages observed during habitat restoration. Analyses will include calculation of coefficient of conservatism (CC) for all species for use in the later development of quality indices.

Job 4: Develop tools for the assessment of restoration success.

Once indicator species/assemblages have been identified, we will develop a number of tools that can be used to assess habitat quality with the specific aim of establishing the progress/success of restoration efforts. These tools will include metric indices that can be used to establish the quality of prairie, savanna and woodland habitats as well as provide data concerning the integrity of the ecosystems they support. In order to maximize comparability between our indices and those already in use for floristic assessments, we anticipate using standardized approaches similar to those developed by Wallner *et al*. (2013) for Auchenorryncha. The latter method utilizes two index permutations calculated using the following equations:

(1) $$Quality\ Index\ 1 = meanCC\ \times \sqrt{Spp.}$$

in which:

meanCC = Mean coefficient of conservatism value for all species encountered per sampling effort (e.g. site, transect, plot).
√Spp. = Square root transformation of total no. species encountered at the site sampled.

(2) $$Quality\ Index\ 2 = \sum\left[\left(\frac{n_i}{N}\right) \times\ CC_i\right]\ \times \sqrt{Spp.}$$

in which:

n_i = Total number of individuals for species *i*.
N = Total number of individuals for all species.
CC_i = Coefficient of conservatism for species *i*.
√Spp. = Square root transformation of total no. species encountered at site sampled.

In addition to the metric indices, we will also generate identification tools for use by IDNR personnel involved in land management and restoration. These tools will involve field guides allowing the identification of the indicator species by non-experts.

Job 5: Write reports and manuscripts.

Provide annual and final reports that include the results of monitoring efforts and progress in development of indices and other tools for the assessment of restoration success in focal habitats. We will include maps depicting the sites included in the monitoring plan along with comprehensive lists of taxa recorded (to include vegetation data) and their abundance and distribution.

Anticipated Outcomes and Benefits/Products

This project will provide tools for the assessment of habitat quality and ecological integrity in IL prairies, savannas and woodlands as well as a means for utilizing these data to gauge the success of restoration efforts in these habitats. Monitoring programs will be set up for the focal taxa (grasshoppers, butterflies, cicadas and tiger beetles) at select sites throughout the state and baseline diversity, abundance and species richness data generated. Indicator species and species assemblages will be identified for each of the aforementioned insect groups and coefficient of conservatism calculated for use in the development of metric indices. These data will be used to provide tools for the assessment of habitat restoration in prairie, savanna and woodland habitats in IL.

1. Documentation and monitoring of grasshopper, butterfly, cicada and tiger beetle species in select IL prairie, savanna and woodland habitats.
2. Generation of standardized, quantitative baseline diversity, abundance and species richness data for these species occurring in these habitats.
3. Identification of species and species assemblages that are indicative of habitat quality and ecological integrity in these habitats.
4. Development of metric indices utilizing these species/assemblages in assessing habitat quality and restoration success.
5. Documents including identification tools and images of all species and maps of their distribution within the state.

Useful Life: N/A

Geographic Location: This project will be completed by INHS staff in Champaign-Urbana.

Personnel:

The personnel funds requested in this project will fund one full-time graduate research student to coordinate fieldwork, supervise hourly workers and analyze data. Additional funds will support hourly workers to assist with both field-based and lab-based aspects of the project. Other INHS and IDNR personnel listed below will provide additional support to the project.

The following personnel from IDNR Office of Resource Conservation (ORC), One Natural Resources Way, Springfield, IL 62702 will manage this project:

Stan McTaggart
IDNR Division of Wildlife
Phone: (217) 528-6623
E-mail: stan.mctaggart@illinois.gov

The following personnel from INHS, University of Illinois at Urbana-Champaign, 1816 S. Oak St., Champaign, IL 61820 are involved in this project:

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Program Income: N/A

Budget Year 1

PROJECT BUDGET	Year 1		
Expense Line Item	**Request**	**INHS Match**	**Total**
SALARIES & WAGES			
Professional (INHS)		$9,533	$9,533
GRA – academic yr	$20,775		$20,775
GRA – summer (no classes)	$6,930		$6,930
Student Hourly – part-time student	$7,200		$7,200
Student Hourly – full-time student	$9,600		$9,600
Non-student Hourly	$9,600		$9,600
Total Salaries & Wages	**$54,105**	**$9,533**	**$63,638**
FRINGE BENEFITS			
Professional (INHS) @ 42.94%		$4,093	$4,093
GRA – academic year @ 6.36%	$1,321		$1,321
GRA – summer (no classes) @ 14.01%	$971		$971
Student Hourly – part-time student @ 7.79%	$561		$561
Student Hourly – full-time student @ 0.14%	$13		$13
Non-student Hourly @ 7.79%	$748		$748
Total Fringe Benefits	**$3,614**	**$4,093**	**$7,707**
Total Salaries & Fringe Benefits	**$57,719**	**$13,626**	**$71,345**
TRAVEL			
In State	$21,360		$21,360
Total Travel	**$21,360**		**$21,360**
MATERIALS & SUPPLIES			
General Materials & Supplies	$4,000		$4,000
Total Material & Supplies	**$4,000**		**$4,000**
Total Direct Costs	$83,079	$13,626	$96,705
Modified Total Direct Costs (MTDC)	$83,079	$13,626	$96,705
F&A (20% MTDC)	$16,616		$16,616
F&A (INHS 58.6% of Match) On Campus		$7,985	$7,985
Unrecovered F&A (20% vs. 58.6%) On Campus		$32,068	$32,068
Total Proposed Project Budget	**$99,695**	**$53,679**	**$153,374**

Budget Year 2

PROJECT BUDGET	Year 2		
Expense Line Item	**Request**	**INHS Match**	**Total**
SALARIES & WAGES			
Professional (INHS)		$9,524	$9,524
GRA – academic yr	$21,414		$21,414
GRA – summer (no classes)	$7,138		$7,138
Student Hourly – part-time student	$7,200		$7,200
Student Hourly – full-time student	$9,600		$9,600
Non-student Hourly	$9,600		$9,600
Total Salaries & Wages	**$54,952**	**$9,524**	**$64,476**
FRINGE BENEFITS			
Professional (INHS) @ 42.94%		$4,090	$4,090
GRA – academic year @ 6.36%	$1,362		$1,362
GRA – summer (no classes) @ 14.01%	$1,000		$1,000
Student Hourly – part-time student @ 7.79%	$561		$561
Student Hourly – full-time student @ 0.14%	$13		$13
Non-student Hourly @ 7.79%	$748		$748
Total Fringe Benefits	**$3,684**	**$4,090**	**$7,774**
Total Salaries & Fringe Benefits	**$58,636**	**$13,614**	**$72,250**
TRAVEL			
In State	$21,360		$21,360
Total Travel	**$21,360**		**$21,360**
MATERIALS & SUPPLIES			
General Materials & Supplies	$3,000		$3,000
Total Material & Supplies	**$3,000**		**$3,000**
Total Direct Costs	$82,996	$13,614	$96,610
Modified Total Direct Costs (MTDC)	$82,996	$13,614	$96,610
F&A (20% MTDC)	$16,599		$16,599
F&A (INHS 58.6% of Match) On Campus		$7,978	$7,978
Unrecovered F&A (20% vs. 58.6%) On Campus		$32,036	$32,037
Total Proposed Project Budget	**$99,595**	**$53,628**	**$153,223**

Budget Year 3

PROJECT BUDGET	Year 3		
Expense Line Item	**Request**	**INHS Match**	**Total**
SALARIES & WAGES			
Professional (INHS)		$9,631	$9,631
GRA – academic yr	$22,057		$22,057
GRA – summer (no classes)	$7,353		$7,353
Student Hourly – part-time student	$7,200		$7,200
Student Hourly – full-time student	$9,600		$9,600
Non-student Hourly	$9,600		$9,600
Total Salaries & Wages	**$55,810**	**$9,631**	**$65,441**
FRINGE BENEFITS			
Professional (INHS) @ 42.94%		$4,136	$4,136
GRA – academic year @ 6.36%	$1,403		$1,403
GRA – summer (no classes) @ 14.01%	$1,030		$1,030
Student Hourly – part-time student @ 7.79%	$561		$561
Student Hourly – full-time student @ 0.14%	$13		$13
Non-student Hourly @ 7.79%	$748		$748
Total Fringe Benefits	**$3,755**	**$4,136**	**$7,891**
Total Salaries & Fringe Benefits	**$59,565**	**$13,767**	**$73,332**
TRAVEL			
In State	$21,359		$21,359
Total Travel	**$21,359**		**$21,359**
MATERIALS & SUPPLIES			
General Materials & Supplies	$3,000		$3,000
Total Material & Supplies	**$3,000**		**$3,000**
Total Direct Costs	$83,924	$13,767	$97,691
Modified Total Direct Costs (MTDC)	$83,924	$13,767	$97,691
F&A (20% MTDC)	$16,785		$16,785
F&A (INHS 58.6% of Match) On Campus		$8,067	$8,067
Unrecovered F&A (20% vs. 58.6%) On Campus		$32,395	$32,395
Total Proposed Project Budget	**$100,709**	**$54,229**	**$154,938**

Budget Full Project

PROJECT BUDGET	Project Totals		
Expense Line Item	**Request**	**INHS Match**	**Total**
SALARIES & WAGES			
Professional (INHS)		$28,688	$28,688
GRA – academic yr	$64,246		$64,246
GRA – summer (no classes)	$21,421		$21,421
Student Hourly – part-time student	$21,600		$21,600
Student Hourly – full-time student	$28,800		$28,800
Non-student Hourly	$28,800		$28,800
Total Salaries & Wages	**$164,867**	**$28,688**	**$193,555**
FRINGE BENEFITS			
Professional (INHS) @ 42.94%		$12,319	$12,319
GRA – academic year @ 6.36%	$4,086		$4,086
GRA – summer (no classes) @ 14.01%	$3,001		$3,001
Student Hourly – part-time student @ 7.79%	$1,683		$1,683
Student Hourly – full-time student @ 0.14%	$39		$39
Non-student Hourly @ 7.79%	$2,244		$2,244
Total Fringe Benefits	**$11,053**	**$12,319**	**$23,372**
Total Salaries & Fringe Benefits	$175,920	$41,007	$216,927
TRAVEL			
In State	$64,079		$64,079
Total Travel	**$64,079**		**$64,079**
MATERIALS & SUPPLIES			
General Materials & Supplies	$10,000		$10,000
Total Material & Supplies	**$10,000**		**$10,000**
Total Direct Costs	$249,999	$41,007	$291,006
Modified Total Direct Costs (MTDC)	$249,999	$41,007	$291,006
F&A (20% MTDC)	$50,000		$50,000
F&A (INHS 58.6% of Match) On Campus		$24,030	$24,030
Unrecovered F&A (20% vs. 58.6%) On Campus		$96,499	$96,499
Total Proposed Project Budget	**$299,999**	**$161,536**	**$461,535**

Budget Justification:

Salaries and Wages: We request a total of $85,667 to support a graduate research assistant (GRA) during both the academic year and the summer for the duration of the project. The GRA will oversee the fieldwork and monitoring programs as well as undertake the analyses described in the proposal. We also request the following amounts to support hourlies: $21,600 to support one part-time undergraduate student hourly during the academic year to assist with lab work (sorting and processing samples, entering data, etc.); $28,800 to support two full-time undergraduate hourlies during the summer to assist with fieldwork and sampling; $28,800 to support non-student hourlies who will undertake Lepidoptera monitoring throughout the project. The total request for salaries and wages is $164,867. The salary of PI Heads used for cost sharing is paid from INHS operating funds and is at no cost to the sponsor.

Fringe Benefits: We request a total of $11,053 in fringe benefits in accordance with those budgeted for wages. Fringe benefits will be paid at a rate of 6.36% (academic year) and 14.01% (summer, no classes) for the GRA, 7.79% for the part-time undergraduate student hourly, 0.14% for the full-time undergraduate student hourlies, and 7.79% for the non-student hourlies. Fringe benefits from INHS professional staff (PI Heads) used as match are paid at a rate of 42.94% from INHS operating funds and are at no cost to the sponsor. Rates have been negotiated by the University of Illinois at Urbana-Champaign.

Travel: We request a total of $64,079 for in-state travel. This will be used to cover the costs incurred through the use of INHS fleet vehicles ($0.50/mile) and to reimburse staff for expenses incurred (lodging and per diem at the in-state rates: lodging = $70/night; per diem = $32/day) while visiting field sites to undertake sampling and monitoring work during the field season. We plan to spend an average of 30 days in the field each year, generating expenses of $2,100 and $960 per person in lodging and per diem respectively. The field crew will number six people, resulting in total lodging and per diem expenses of $12,600 and $5,760 respectively. Adding to this $2,000 to cover approximately 4,000 vehicle miles results in estimated annual fieldwork costs of $20,360. We have included an additional $1,000 to cover incidental and additional travel for any extra fieldwork, bringing the total annual fieldwork cost to $21,360.

Materials and Supplies: We request a total of $10,000 to purchase equipment for use during the project: $4,000 during the first year to cover the costs of set-up (i.e. purchase of computer equipment necessary for data processing and analysis, as well as fieldwork consumables) and $3,000 each year thereafter for the purchase of consumables (e.g. vials, ethanol, containers, field notebooks, etc.) and any necessary replacement of field equipment (e.g. broken sweep nets, etc.).

Contractual Services: We request no funds for contractual services.

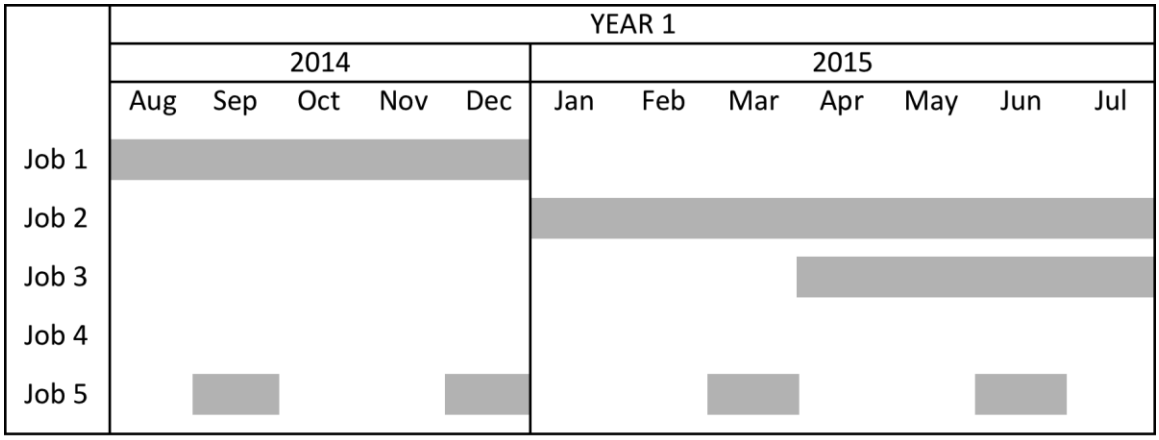
Equipment: We request no funds for equipment.

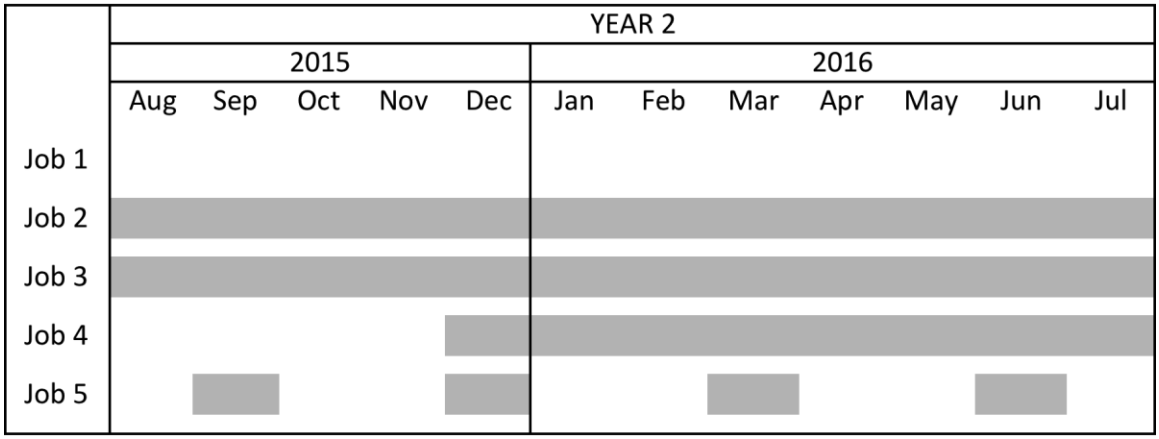
Facilities and Administration: We request $50,000 to offset facilities and administrative costs at the rate of 20% of modified total direct costs. Rates have been negotiated by the University of Illinois at Urbana-Champaign.

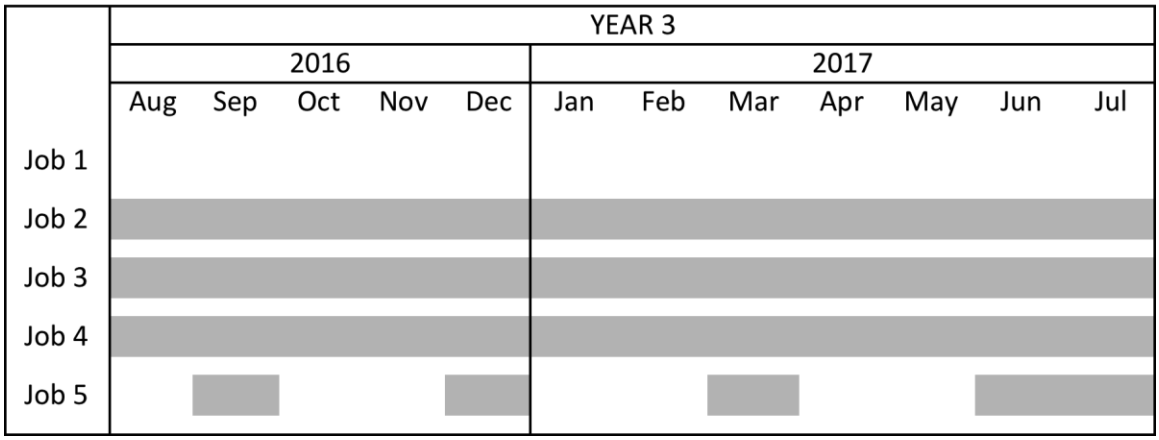
Multipurpose Projects: N/A

Relationship To Other Grants: N/A

Project Timeline:







(i) **Substantial in Character and Design**

The project statement describes a need consistent with the -State Wildlife Grants (SWG); states a purpose and sets objectives, both of which are based on the need; uses a planned approach, appropriate procedures and research; and is cost effective.

(ii) **Compliance**

The IDNR will use its CERP (Comprehensive Environmental Review Process) as a tool to aid the Department in meeting NEPA compliance for the project outlined under this grant proposal. It is the Department's policy to require CERP applications for all land disturbing activities unless those activities are covered by CERP exemptions.

All planned activities will also be in compliance with the Endangered Species Act. All determinations and documentation will be in accordance with the current established U.S. Fish and Wildlife Service protocols for section 7.

All planned activities will be in compliance with the National Historic Preservation Act and the Council on Historic Preservation Act. All determinations and documentation will be in accordance with the terms of the Programmatic Agreement, as amended, effective September 23, 2002.

When applicable, those planned activities which involve a floodplain and/or jurisdiction wetlands will be done in accordance with Presidential Executive Orders 11988 and 11990.

When applicable, those planned activities which involve programs and/or site improvements will be done in accordance with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act.

When applicable, those planned activities which involve the use of pesticides, herbicides or other comparable chemicals will be done in accordance with current state and federal regulations to assure the safe and legal application of those chemicals. All chemicals will be applied in accordance with the manufacturers label instructions. All persons applying chemicals will be licensed by the Illinois Department of Agriculture as a chemical operator along with a licensed applicator, in accordance with Illinois state law.

(iii) **Literature Cited**

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