

OFFICE OF RESOURCE CONSERVATION

State of Illinois

Grant Proposal

PROJECT TITLE: Defining expectations for mussel communities in Illinois wadeable streams

PROJECT NUMBER: T-82-R-1

DATES: August 1, 2013 – January 31, 2015

NEED:

The focus of the Illinois Wildlife Action Plan (IWAP, State of Illinois 2005) is to link people and resources to meet identified wildlife and habitat goals. Activities to meet these goals are informed by the distribution of certain species, and their habitats, that are deemed important by the public and resource managers. These Species in Greatest Need of Conservation (SGNC) were selected for the IWAP to be indicative of the diversity and health of Illinois' Wildlife and to assist with guiding management activities to reach conservation goals.

Illinois' SGNC were selected using eight criteria that were evaluated using a combination of objective information (e.g., T&E listing) and professional judgment. However, much of the information and analysis used for these decisions has been updated since the list was developed. For example, mussel species were evaluated using data from the IDNR BIOTICS database (2004) and distribution maps from the INHS mussel collections (1999). Since that time, a large state wide mussel survey has been undertaken with hundreds of additional locations surveyed (T-53-P-001).

Illinois' Wildlife Action Plan identifies several mussel species as critically important in various Natural Divisions. For example, the Grand Prairie Natural Division assessment (IDNR 2005 pg 134) identifies snuffbox, sheepnose, salamander mussel, slippershell mussel, purple wartyback, spike, black sandshell, kidneyshell, and elktoe as critical species. Salamander mussel is also identified as a critical species in the Northeastern Morainal Natural Division, and snuffbox is also identified in the Southern Till Plain assessment. Despite the mussel surveys that have been conducted in wadeable streams throughout Illinois over the past four years (T-53), gaps in information about these critical species remain.

The IWAP calls for periodic revisions and updates to measure progress and to include new and emerging issues. Evaluations of the status, distribution, and stresses to Species in Greatest Need of Conservation were expected to occur at 2- to 5-year intervals (Table 9, pg. 272, IWAP). To date no systematic evaluation of the 29 mussel SGNC has been undertaken, although a large amount of additional information has been collected throughout the state. We will provide the first statewide evaluation and update of mussel SGNC since the IWAP was developed.

This project will provide a timely update of the status of mussel SGNC and additional information useful for updating the Streams Campaign and priority places for actions such as Conservation Opportunity Areas. Consolidating and updating existing collections information will allow for the development of statewide maps indicating locations of mussel species that will allow managers to better identify at risk populations and the habitats that support them.

An IL DNR Mussel Database application developed under federal aid project (T-12-P-1) has proven to be very useful for the collection and compilation of field-based sampling. It is the only application available to IL DNR with the primary function of collecting and storing mussel community sampling data and habitat information (comparable to IL DNR's fish database). Over the years since its original development, the database has seen a huge increase in usage and some of its shortcomings, as well as its dated platform, require revisions to maintain its functionality.

OBJECTIVES:

Job 1. Update knowledge of Illinois' 29 mussel Species in Greatest Need of Conservation (SGNC) in areas where locality or recruitment information are incomplete by October 2014.

- 1.1 Define expected levels of recruitment for mussels SGNC in at least 10 sites by October 2013.
- 1.2 Assess geographic range of at least three mussels SGNC that are new species to Illinois or have newly discovered populations outside of their known historic range in the state by December 2013.
- 1.3 Assess status of at least two mussel SGNC that have not been recently observed from some portion of their historic ranges by October 2014.
- 1.4 Assess habitat suitability and host availability at a minimum of five sites for selected mussel SGNC by October 2014.

Job 2. Status revision and update for the 29 Illinois' mussel Species in Greatest Need of Conservation by January 2015.

- 2.1 Review at least 40 mussel species using established criteria for listing as SGNC by April 2014.
- 2.2 Update and revise the status, objectives, and stresses listed for at least the current 29 mussel SGNC by August 2014.
- 2.3 Prepare a report that summarizes changes to Status, Objectives, and Stresses of Illinois' mussel SGNC by August 2014.

Job 3. Develop a list of at least five suggested Actions for the Streams Campaign in the IWAP that focus on mussel conservation by August 2015.

Job 4. Develop species distribution model for at least 30 Illinois mussel species found in wadeable streams by April 2014.

Job 5. Enhance the data entry and export functionality of IDNR's master mussel database by April 2014.

- 5.1 Build a web-based data entry application that will allow multiple biologists to enter data into the mussel database by April 2014.
- 5.2 Develop a data extraction tool and at least two summary reports that pull data directly from the master database by April 2014.

EXPECTED RESULTS AND BENEFITS:

This project will update knowledge of mussel Species in Greatest Need of Conservation (SGNC) in areas where locality or recruitment information are incomplete. Additionally it will reevaluate mollusk species for listing as SGNC (Appendix I) and provide an update and revision of the status, distribution, and stresses to mollusk SGNC (Appendix II) appropriate for a revision of the Illinois Wildlife Action Plan.

We will develop updated distribution maps for each mussel species, and will model potential species presence. Distribution maps and modeled expectations can assist with revisions or updates to conservation or recovery plans (T&E species). All maps will be made available through the IDNR Wildlife Action Plan website.

This project will also highlight existing knowledge gaps in species information and monitoring programs for mussels throughout Illinois.

This project will transform the existing mussel sampling database from a user-specific application to a web-based application. The results will be more user-friendly, will reach more staff, and will result in a single compiled database (versus the several individual databases that require periodic merging and clean-up). With the addition of the statewide mussel surveys in the last few years, it has become apparent that database enhancements are needed to enable biologists and agency staff across the state to enter and access mussel data. A web-based database that is interagency accessible would alleviate the need for separate databases for each biologist and enable easy compilation of data for reports and analysis of this data in future projects. Individual mussel biologists and surveyors will not be required to have special software on their computer to use, input data, or view reports. Additionally, these reports may be accessible to a wider audience over the web.

APPROACH:

Job 1. Update knowledge of Illinois' 29 mussel Species in Greatest Need of Conservation (SGNC) in areas where locality or recruitment information are incomplete by October 2014.

- 1.1 Define expected levels of recruitment for mussels SGNC in at least 10 sites by October 2013.

The Illinois Department of Natural Resources uses a Mussel Community Index (Szafoni 2002) to rate mussel communities collected at a site on a given date. Currently the Index comprises four metrics: species richness, intolerant species, abundance, and reproduction. Scores from each metric are

summed to generate a total index score, which is then interpreted as the resource value of the mussel community. Resource Value is defined as the statewide significance of the mussel assemblage at the sampling station.

The four metrics included in the index and the data ranges used to score them were determined from data collected during the 1999 and 2001 field seasons through uniform sampling at over 93 stations in 5 major watersheds that included a wide range of stream quality, size, and substrate. All sampling was performed in wadeable streams or wadeable portions of larger rivers and was based on visual observation and hand grab sampling. The distribution of each parameter over all sampling sites was graphed and metrics were assigned based on natural breaks in the frequency distributions.

During T-53, over 900 consistently-collected mussel community samples were taken throughout the state. Notably, few sites throughout the state had detectable mussel recruitment as determined from the percentage of the number of live species recorded that are represented by individuals less than 30mm in length or with 3 or fewer growth rings. Smaller (i.e., younger) mussels are harder to locate by hand grab methods and large sample sizes can be needed to accurately assess population reproduction. Therefore, we propose to assess recruitment at selected sites and compare results of the standard IDNR sampling protocol to other methods of recruitment sampling. We plan to randomly select wadeable sites, and then stratify selected sites by substrate size and type/size of mussel. At chosen sites, we will conduct timed surveys (recording recruitment) and follow the time search with excavated quadrats to compare observed recruitment by method. The results of these sampling procedures will determine how level of recruitment estimated by the two sampling methods are related and whether recruitment estimates by the standard protocol can be used as a reliable index.

1.2 Assess geographic range of at least three mussels SGNC that are new species to Illinois or have newly discovered populations outside of their known historic range in the state by December 2013.

New species - Recent samples in the Wabash Border and Shawnee Hills natural divisions have detected two putative species, *Lampsilis hydiana* and *Anodontooides cf. ferrusacianus*, not currently recognized as Illinois species. Location of additional populations would confirm these species are present in Illinois. In this project, we will sample approximately twenty sites in the Cache River, Ohio River tributaries and Big Muddy using visual and hand-grab methods following established IDNR protocols. Mussels will be identified to species, sexed, aged, and returned to the stream. Dead and relict shells will be identified, recorded, and voucher specimens collected. Habitat information such as stream size, bottom substrate, and depth will be collected.

Outlier populations – During the T-53 project, little spectaclecase were found in the Shawnee Hills Division/Lesser Shawnee Hills Section of the Cache River. These records were outside of the known Illinois range for the species. During this project, we will sample selected streams in the Shawnee Hills, Coastal Plains and Ozark Southern divisions to determine the extent at which little

spectaclecase exceeds its known range. If additional records are found, they could create a continuum of the species from the previously known disjunct populations of the Wabash/Ohio River drainage and southeastern Missouri drainages.

1.3 Assess status of at least two mussel SGNC that have not been recently observed from some portion of their historic ranges by October 2014.

In Job 2, we expect to identify several mussel SGNC that have not been recently observed (potentially extirpated) from some portion of their historic range (i.e., specific watershed). However, it is unknown whether these species are, in fact, extirpated or they simply have not been recorded during recent collections. Despite the considerable sampling effort conducted in T-53 and other special mussel surveys conducted by the Illinois Natural History Survey and Illinois Department of Natural Resources, it is possible that populations of these species remain in locations that have not been recently sampled (e.g., > 10 years). If many species have not been recently observed from some portion of their historic range, we will limit the scope of this objective by selecting a subgroup of species that: 1) inhabit wadeable streams, 2) have not been observed during the past decade from at least one HUC8-sized watershed, and 3) those declining in statewide population abundance.

Selected sites will be sampled using visual and hand-grab methods following established IDNR protocols. Mussels will be identified to species, sexed, aged, and returned to the stream. Dead and relict shells will be identified, recorded, and voucher specimens collected. Habitat information such as stream size, bottom substrate, and depth will be collected.

1.4 Assess habitat suitability and host availability at a minimum of five sites for selected mussel SGNC by October 2014.

The Streams Campaign of the Wildlife Action Plan seeks to maintain populations of mussels at all currently-occupied locations or re-establish them at 50% or more of historic locations where suitable habitat persists or can be restored (IDNR 2005). Throughout this project, we will identify known historic range of mussels (Job 2) and predicted suitable locations based on landscape-level features (Job 4). In this objective, we will conduct field surveys at a minimum of five locations to determine the suitability or restoration potential of specific sites. These surveys will be conducted to determine habitat suitability along with fish host availability. Other available sources, including recently created distribution maps for Illinois fish species (Cao et al. unpublished data), will be used to determine fish host availability.

Job 2. Status revision and update for the 29 Illinois' mussel Species in Greatest Need of Conservation by January 2015.

The primary objective of this project is to provide information for the direct refinement and revision of the status, objectives, and stresses for mollusk Species in Greatest Need of Conservation listed in Appendix I and Appendix II of Illinois' Wildlife Action Plan (State of Illinois 2005). The revised appendixes

will be included in the updated Illinois Wildlife Action Plan that will be submitted to U.S. Fish and Wildlife Service for acceptance by October 2015. We will assemble information from existing databases and incorporate an expert review panel to revise and update the list of Species in Greatest Need of Conservation and associated status, objectives, and stresses for Illinois' mussel species.

2.1 Review at least 40 mussel species using established criteria for listing as SGNC by April 2014.

We will reevaluate mussel species using the eight criteria established in the IWAP (Appendix I). The revised mussel SGNC list will be included in the updated Illinois Wildlife Action Plan that will be submitted to U.S. Fish and Wildlife Service for acceptance by October 2015.

Each mussel species in Illinois will be reviewed using the criteria developed for SGNC listing in the existing Action Plan. The initial evaluation of mussels for the IWAP focused on Criteria 1-3 with no information recorded for Criteria 4-8 for any of the species in Appendix I (State of Illinois 2005). Particular attention will be paid to the most recently available listed conservation status (criteria 1 and 2), species rarity (population size, density, and range) and declines in abundance or distribution from historical levels (criteria 3) where such information is available. We will evaluate current species distribution and available abundance data (criteria 5 and 6) using recently collected data and collections records as well as assessing other factors that may provide evidence of conservation concern for poorly known species (criteria 8). Habitat associations will also be attributed for each species where information allows.

Threatened and endangered species status (T&E) and global conservation rank (G1, G2, G3) will be updated using current information from IDNR BIOTICS database and NatureServe Explorer. INHS and IDNR Mollusk Collections data will be georeferenced within an existing GIS framework and used to describe historic and recent distributions. Data will also be included from recent surveys (T-32, T-53) and efforts will be made to obtain additional information from regional academic and museum collections (e.g., University of Michigan Museum of Zoology, Field Museum). Maps of known historic and current (<10 years) distributions will be developed for all mussel species using the latest available information from IDNR/INHS mollusk collections databases and other sources. Mussel data based on recent collections (T-53), primarily at intensive basin survey sites, will be used to determine relative abundance and evaluate changes in these statistics as a measure of population status over time where data are available.

2.2 Update and revise the status, objectives, and stresses listed for at least the current 29 mussel SGNC.

We will use a combination of quantitative data analysis and expert review (e.g., survey of Action Team Members and state authorities on mussels and their aquatic habitats) to update and revise the status, objectives, and stresses for mussels SGNC. The revised status, objectives, and stresses for mussel SGNC will be included in the updated Illinois Wildlife Action Plan that will be submitted to U.S. Fish and Wildlife Service for acceptance by October 2015.

We will use quantitative methods, as described in Metzke et al. 2012, to provide information on population status, habitat and population stresses for mussels where appropriate data are available. The status (N, Trend, Listing) of each species will be based on the distributions and relative abundances derived in 2.1. This update will include the identification of knowledge gaps in assessment information for these species.

2.3 Prepare a report that summarizes changes to Status, Objectives, and Stresses of Illinois' mussel SGNC by August 2014.

We will provide a final report that includes documentation and draft updates of the mussel SGNC (Appendix I) and their Status, Objectives, and Stresses (Appendix II) for approval by the IDNR and the Wildlife Action Plan Team.

Job 3. Develop a list of at least five suggested Actions for the Streams Campaign in the IWAP that focus on mussel conservation by August 2015.

The IDNR and their conservation partners will be reviewing and revising IWAP over the next two years; the revised document will be submitted to US Fish and Wildlife Service by October 2015. The focus of Illinois' revision will be to repackage the goals and actions currently scattered throughout the document into the Campaign sections. Priority locations for work, currently in the Natural Division assessments, will be moved to the appropriate locations within each Campaign.

During this project, we will use the information learned from T-53 to provide specific recommendations for actions needed to promote mussel conservation in the Streams Campaign of the Wildlife Action Plan. These recommendations will be included in the updated Illinois Wildlife Action Plan that will be submitted to U.S. Fish and Wildlife Service for acceptance by October 2015. Additionally, the results from the recruitment analysis (Job 1.1), assessment of new species or current locations outside of historic ranges (Job 1.2), assessment of species not recently observed (Job 1.3), and assessment of habitat suitability and host availability (Job 1.4 and Job 4) will be used to refine the goals and actions in the Streams Campaign to support mussel conservation and identify priority places for work.

Job 4. Develop species distribution model for at least 30 Illinois mussel species found in wadeable streams by April 2014.

A major goal of Illinois' Wildlife Action Plan is to protect existing populations of species of concern and their habitats. Since state agencies have limited resources available for extensive field surveys, modeling approaches have been advocated for delimiting species distributions for conservation planning. These approaches generally use summaries of landscape features derived from geographic information systems (GIS) and known locations of species to identify similar areas on the landscape.

We will compile available landscape variables including surficial geology, elevation, slope, aspect, land cover, various soil parameters, and climatic data. When available, additional data will be added to

support modeling of specific habitat requirements necessary for individual species. Species locational data will come from INHS mollusk database.

Based on natural landscape variables and species location information (INHS collection and recent state survey), we will use MaxEnt (Phillips et al. 2006, Phillips and Dudik 2008) to predict the historic ranges of individual species. We will also use Random-Forests regression to model the relative abundance of individual species based on the recent statewide survey data collect by T-53. Both modeling approaches rank the relative importance of environmental variable (including stressors) for the predictions.

Prior to model calibration, we will set aside a subset of sites that were well sampled in history and use these to validate the predictions of MaxEnt (Phillips et al. 2006, Phillips and Dudik 2008). These sites provide the best possible approximation to the natural occurrences of species. To validate the predictions of Random Forests, we will reserve a subset of sites that were sampled multiple times. In this way, we can assess the accuracy of the abundance predictions against sampling variability. Modeled distributions will be reviewed by Illinois mussel experts to ensure the results are reasonable and useful.

The resulting species models will be used to update the status and habitat extent within Appendix II, which were completed originally using best professional judgment of taxa experts and state biologists.

We will also use recently created distribution maps for Illinois fish species (Cao et al. unpublished data) to perform a GIS based assessment of overlap between populations of mussels and their known host species. The results of this work will be used to provide specific recommendations for actions needed to promote mussel conversation in the Streams Campaign of the Wildlife Action Plan.

Job 5. Enhance the data entry and export functionality of IDNR's master mussel database by April 2014.

5.1 Build a web-based data entry application that will allow multiple biologists to enter data into the mussel database by April 2014.

In 2007, the IDNR and INHS partnered and used State Wildlife Grant funds (T-12) to develop a mussel database that is used to store several parameters of mussel community samples including demographic data, sex and reproductive state, and size and age distributional data as well as sample site habitat data. The desktop database has been used by multiple biologists since its creation to capture the results of mussel surveys taking place across the state. Because of IDNR's need to have one master database, individuals copy their desktop databases once per year and provide to IDNR's IT database manager. He combines the individual databases into one master SQL database, which resides on a state server. As more biologists in Illinois collect mussel data, there is a need to move away from desktop databases to web-based data entry that is directly received by the master SQL database. In this job, we will contract a database developer at the University of Illinois to develop the necessary web-based data entry mechanism.

5.2 Develop a data extraction tool and at least two summary reports that pull data directly from the master database by April 2014.

The current PC-based mussel database generates reports for Mussel Community Index (Szafoni 2001) and Element Occurrence Records, which are provided to IDNR's Natural Heritage program. When the web-based data entry mechanism is complete in Job 5.1, there will no longer be a need to support the desktop application. Before we abandon the desktop application, we need to have data extraction tools and summary reports generated that pull data directly from the SQL master database. In this job, we will contract a database developer at the University of Illinois to recreate the necessary reports.

LOCATION:

This 1.5 year project will be completed by staff of the Illinois Natural History Survey and University of Illinois in Champaign in cooperation with the IDNR Watershed Protection Section/ Office of Resource Conservation located in Springfield. Mussel sampling will be performed at numerous field locations statewide.

PROJECT SCHEDULE:

	08/13-10/13	11/13 – 01/14	02/14 – 04/14	05/14-07/14	08/-14-10/14	11/14-1/15
Job 1. Update knowledge of Illinois' 29 mussel SGNC in areas where locality or recruitment information are incomplete.						
1.1 Define expected levels of recruitment for mussels SGNC in at least 10 sites.	x					
1.2 Assess range of at least three mussels SGNC that are new species to Illinois or have populations outside of their known historic range in the state.	x	x				
1.3 Assess status of at least two mussel SGNC that have not been recently observed from some portion of their historic range.				x	x	
1.4 Assess habitat suitability and host availability at a minimum of five sites for selected mussel SGNC.				x	x	
Job 2. Revise and update status for 29 Illinois' mussel SGNC.						
2.1 Review at least 40 mussel species using established criteria for listing as SGNC.	x	x	x			
2.2 Update and revise the status, objectives, and stresses listed for at least the current 29 mussel SGNC.			x	x	x	
2.3 Prepare a report that summarizes changes to Status, Objectives, and Stresses of Illinois' mussel SGNC.				x	x	x
Job 3. Develop a list of at least five suggested Actions for the Streams Campaign in the IWAP that focus on mussel conservation.		x			x	
Job 4. Develop species distribution model for at least 30 Illinois mussel species found in wadeable streams.	x	x	x			
Job 5. Enhance the data entry and export functionality of IDNR's master mussel database.						
5.1 Build a web-based data entry application that will allow multiple biologists to enter data into the mussel database.	x	x	x			
5.2 Develop a data extraction tool and at least two summary reports that pull data directly from the master database.	x	x	x			

BUDGET:

Job 2 and 3 are planning and have 25% match requirement. Jobs 1, 4, and 5 are implementation and have a 35% match requirement. Estimated budgets by type (i.e., implementation and planning) are included.

PROJECT BUDGET Expense Line Item	Jobs 2 and 3 Year 1				Jobs 2 and 3 Year 2			
	On Campus Request	Off Campus Request	INHS/ UIUC Match	Total	On Campus Request	Off Campus Request	INHS/ UIUC Match	Total
Salaries and Wages								
Professional	\$30,690	\$15,300	\$3,808	\$49,798	\$15,534	\$6,560	\$1,671	\$23,765
Total Salaries and Wages	\$30,690	\$15,300	\$3,808	\$49,798	\$15,534	\$6,560	\$1,671	\$23,765
Fringe Benefits								
Professional @ 44.67%	\$13,709	\$6,834	\$1,701	\$22,245	\$6,939	\$2,930	\$746	\$10,616
Total Fringe Benefits	\$13,709	\$6,834	\$1,701	\$22,245	\$6,939	\$2,930	\$746	\$10,616
Total Salaries, Wages, and Fringe Benefits	\$44,399	\$22,134	\$5,509	\$72,042	\$22,473	\$9,490	\$2,417	\$34,380
Total Travel	\$150	\$50	\$0	\$200	\$75	\$41	\$0	\$116
Total Materials & Supplies	\$200	\$100	\$0	\$300	\$150	\$100	\$0	\$250
Contractual Services - General	\$500	\$225	\$0	\$725	\$225	\$125		\$350
Subcontract(s)	\$0			\$0				\$0
Total Contractual Services	\$500	\$225	\$0	\$725	\$225	\$125	\$0	\$350
Telecommunication Services	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Equipment (each item \$5000 and more)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Direct Costs	\$45,249	\$22,509	\$5,509	\$73,267	\$22,923	\$9,756	\$2,417	\$35,096
Modified Total Direct Costs (MTDC)*	\$45,249	\$22,509	\$5,509	\$73,267	\$22,923	\$9,756	\$2,417	\$35,096
F&A (20% Direct Costs)	\$9,050	\$4,502		\$13,552	\$4,585	\$1,951		\$6,536
F&A Assessed by UIUC/INHS (58.6% on campus, 24% off campus)			\$3,228	\$3,228			\$1,416	\$1,416
F&A Assessed by IDNR 21.96%								
INHS Unrecovered F&A On campus (20% vs. 58.6%)			\$17,466	\$17,466			\$8,848	\$8,848
INHS Unrecovered F&A Off campus (24%-20.0%)			\$900	\$900			\$390	\$309
Total Proposed Project Budget	\$54,299	\$27,011	\$27,104	\$108,413	\$27,508	\$11,708	\$13,071	\$52,287
Percentage of Project Costs (No Exemptions - Reduced F&A Rate)	75.00%		25.00%		75.00%		25.00%	

PROJECT BUDGET Expense Line Item	Jobs 1, 4, & 5 Year 1					Jobs 1, 4, & 5 Year 2				
	On Campus Request	Off Campus Request	INHS/ UIUC Match	IDNR Match	Total	On Campus Request	Off Campus Request	INHS/ UIUC Match	IDNR Match	Total
Salaries and Wages										
Professional	\$43,276	\$21,800	\$15,191	\$7,000	\$87,267	\$19,968	\$11,990	\$7,114	\$3,600	\$42,672
Total Salaries and Wages	\$43,276	\$21,800	\$15,191	\$7,000	\$87,267	\$19,968	\$11,990	\$7,114	\$3,600	\$42,672
Fringe Benefits										
Professional @ 44.67%	\$19,331	\$9,738	\$6,786	\$0	\$35,855	\$8,920	\$5,356	\$3,178	\$0	\$17,453
Total Fringe Benefits	\$19,331	\$9,738	\$6,786	\$0	\$35,855	\$8,920	\$5,356	\$3,178	\$0	\$17,453
Total Salaries, Wages, and Fringe Benefits	\$62,607	\$31,538	\$21,977	\$7,000	\$116,122	\$28,888	\$17,346	\$10,292	\$3,600	\$60,125
Total Travel	\$4,500	\$2,000	\$0		\$6,500	\$4,500	\$2,000	\$0	\$0	\$6,500
Total Materials & Supplies	\$400	\$150	\$0		\$550	\$400	\$150	\$0	\$0	\$550
Contractual Services - General	\$325	\$200			\$525	\$175	\$100	\$0	\$0	\$275
Subcontract(s)	\$20,000				\$20,000					\$0
Total Contractual Services	\$20,325	\$200	\$0		\$20,525	\$175	\$100	\$0	\$0	\$275
Telecommunication Services	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Equipment (each item \$5000 and more)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Direct Costs	\$87,832	\$33,888	\$21,977	\$7,000	\$150,697	\$33,963	\$19,596	\$10,292	\$3,600	\$67,450
Modified Total Direct Costs (MTDC)*	\$87,832	\$33,888	\$21,977	\$7,000	\$150,697	\$33,963	\$19,596	\$10,292	\$3,600	\$67,450
F&A (20% Direct Costs)	\$17,566	\$6,778			\$24,344	\$6,793	\$3,919			\$10,712
F&A Assessed by UIUC/INHS (58.6% on campus, 24% off campus)			\$12,878		\$12,878			\$6,031		\$6,031
F&A Assessed by IDNR 21.96%				\$1,537	\$1,537				\$791	\$791
INHS Unrecovered F&A On campus (20% vs. 58.6%)			\$33,903		\$33,903			\$13,110		\$13,110
INHS Unrecovered F&A Off campus (24%-20.0%)			\$1,356		\$1,356			\$784		\$784
Total Proposed Project Budget	\$105,399	\$40,666	\$70,144	\$8,537	\$224,716	\$40,755	\$23,515	\$30,216	\$4,391	\$98,877
Percentage of Project Costs (No Exemptions - Reduced F&A Rate)	65.00%		31.11%	3.89%		65.00%		30.56%	8.57%	

PROJECT BUDGET Expense Line Item	Project Total				Total
	On Campus Request	Off Campus Request	INHS/ UIUC Match	IDNR Match	
Salaries and Wages					
Professional	\$109,468	\$55,650	\$27,784	\$10,600	\$203,501
Total Salaries and Wages	\$109,468	\$55,650	\$27,784	\$10,600	\$203,501
Fringe Benefits					
Professional @ 44.67%	\$48,899	\$24,859	\$12,411	\$0	\$86,169
Total Fringe Benefits	\$48,899	\$24,859	\$12,411	\$0	\$86,169
Total Salaries, Wages, and Fringe Benefits	\$158,367	\$80,508	\$40,194	\$10,600	\$289,670
Total Travel	\$9,225	\$4,091	\$0	\$0	\$13,316
	\$0	\$0			
Total Materials & Supplies	\$1,150	\$500	\$0	\$0	\$1,650
	\$0	\$0			
Contractual Services - General	\$1,225	\$650	\$0	\$0	\$1,875
Subcontract(s)	\$20,000	\$0	\$0	\$0	\$20,000
Total Contractual Services	\$21,225	\$650	\$0	\$0	\$21,875
Telecommunication Services	\$0	\$0	\$0	\$0	\$0
Equipment (each item \$5000 and more)	\$0	\$0	\$0	\$0	\$0
Total Direct Costs	\$189,967	\$85,749	\$40,194	\$10,600	\$326,511
Modified Total Direct Costs (MTDC)*	\$189,967	\$85,749	\$40,194	\$10,600	\$326,511
F&A (20% Direct Costs)	\$37,993	\$17,150			\$55,143
F&A Assessed by UIUC/INHS (58.6% on campus, 24% off campus)	\$0	\$0	\$23,554		\$23,554
F&A Assessed by IDNR 21.96%	\$0	\$0		\$2,328	\$2,328
INHS Unrecovered F&A On campus (20% vs. 58.6%)	\$0	\$0	\$73,327		\$73,327
INHS Unrecovered F&A Off campus (24%-20.0%)	\$0	\$0			\$3,430
Total Proposed Project Budget	\$227,961	\$102,899	\$140,506	\$12,928	\$484,293

PERSONNEL:

The personnel funds requested in this project will fund one research scientist and two technical scientists for the project duration each year. However, other INHS and IDNR personnel listed below will be providing technical expertise to the project.

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

Bob Szafoni
IDNR - Division of Natural Heritage
Phone: (217) 348-0175
email: Robert.szafoni@illinois.gov

Corresponding Principal Investigator for Job 1:
Kevin Cummings
Illinois Natural History Survey
1816 S. Oak
Champaign, IL 61820
Phone: (217) 333-1623
email: ksc@inhs.uiuc.edu

Corresponding Principal Investigator for Jobs 2 and 4:
Yong Cao, Ph.D.
Illinois Natural History Survey
1816 S. Oak
Champaign, IL 61820
Phone: (217) 244-6847
email: yongcao@uiuc.edu

Corresponding Principal Investigator for Jobs 3 and 5:
Ann Marie Holtrop
Illinois Department of Natural Resources
One Natural Resources Way
Springfield, IL 62702
Phone: (217) 785-4325
email: ann.holtrop@illinois.gov

Additional staff involved in this project at the same location includes:

Leon Hinz, Ph.D.
Illinois Natural History Survey/ IDNR Watershed Protection Section

Phone: (217) 785-8297
email: leon.hinz@illinois.gov

Brian Metzke
Illinois Natural History Survey
Phone: (217) 557-9251

Andrew Hulin
IDNR Watershed Protection Section
Phone: (217) 528-2031

RELATIONSHIP TO OTHER GRANTS:

T-12-P-1: An IL DNR Mussel Database application developed under this grant and it has proven to be very useful for the collection and compilation of field-based sampling. Over the years since its original development, the database has seen a huge increase in usage. Some of its shortcomings, as well as its dated platform, require revisions to maintain its functionality.

T-53-P-001: During this project, over 900 consistently-collected mussel community samples were taken throughout the state at wadeable streams. The data collected in T-53 will be used to 1) select sites to investigate recruitment; 2) evaluate listing criteria; 3) update the status, objectives, and stresses; and 4) identify specific recommendations in the revised IWAP to promote mussel conservation.

COMPLIANCE:

The IDNR will use its CERP (Comprehensive Environmental Review Process) as a tool to aid the Department in meeting NEPA compliance for the projects 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 (see the enclosed Comprehensive Environmental Review Process documents).

All work identified in this proposal is believed to be covered by categorical exclusions (see attached NEPA Checklist for details) with no known exceptions. If exceptions to the categorical exclusions are identified or if the scope of the work materially changes during the execution of the proposed project, the Federal Aid Division of the USFWS will be contacted to determine if additional NEPA compliance actions are needed.

All planned activities will also be in compliance with the Endangered Species Act. All determinations and documentation will 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.

A series of reports will be written that analyzes the mussel data collected together with other information gathered as part of F-67-R Job 101.1. These reports will characterize stream conditions as a reference for each basin and will be available to the public. Data collected through this project will be made available to the public through the INHS collections database and/or the IDNR SSD. IDNR staff will be available to the public to provide additional explanation to enhance the understanding of mussel data and its use for evaluating Illinois streams.

BUDGET JUSTIFICATION:

Personnel Services: We request funds to support one research scientist and two technical scientists for the project duration. The research scientist will be located in an IDNR office and the two technical scientists will be located at INHS in Champaign. The salaries of Kevin Cummings and Yong Cao, used for INHS cost sharing, are paid from the Illinois Natural History Survey operating funds and are at no cost to the sponsor. IDNR will also provide staff salary time as match.

Fringe Benefits: These funds are needed in accordance with the monies budgeted for personnel services above.

Travel: Travel funds are needed to reimburse staff for travel expenses encountered while sampling mussel communities, as well as presenting research findings at professional scientific meetings, including the Illinois American Fisheries Society meeting to be held in Bloomington, Illinois in March 2014.

This project will require significant travel for one field crew (3 staff members) during the field seasons. Vehicle costs were estimated at 500 miles per week per crew at \$0.50 per mile for 6 weeks (\$1500); Hotel costs were estimated for two rooms per crew at \$90 per night (2 rooms), three nights per crew each week for the 6 week field season (\$3,240). Food costs were estimated at \$98 per person each week for the 6 week field season (\$1,764). Travel during the field season totals \$6,504 per year. This project will use the effective University of Illinois mileage reimbursement rate found at <http://www.fs.uiuc.edu/campusservices/gcp/carpool/carpool.cfm> at the time of mileage accrual in order to recoup costs from future gasoline price increases. Travel expenses incurred for professional meetings (for 3 staff members) would include one room at \$70.00 per night for two nights (140.00) and vehicle costs of 120 miles at \$0.50 per mile (\$60.00) for a total of \$200.00 in travel expenses.

Supplies/commodities: Supply funds are needed to provide minimal support for field supplies.

Contractual: These funds are needed to subcontract University of Illinois for database work. Additionally, these funds may be used to pay for software or copying services that will be incurred when furnishing the sponsor with copies of the final report, or to reimburse staff for conference registration fees. Attendance at conferences will directly benefit the project by the professional and assistant

scientists receiving feedback from other professionals on ways to improve sampling methods and data analysis.

LITERATURE CITED:

Illinois Department of Natural Resources. 2005. The Illinois Comprehensive Wildlife Conservation Plan and Strategy, Version 1.0. Illinois Department of Natural Resources, Springfield, Illinois. 380 pp.

Metzke, B.A., L.C. Hinz, Jr., and A.C. Hulin. 2012. Status Revision and Update for Illinois' Fish Species in Greatest Need of Conservation. Illinois Natural History Survey Technical Report 2012(19).

Phillips, S.J., Anderson, R.P., and Schapire, R.E. 2006. Maximum entropy modeling of species geographic distributions. *Ecological Modelling* 190: 231–259

Phillips, S.J. and Dudik, M. (2008) Modeling of species distributions with Maxent: new extensions and a comprehensive evaluation. *Ecography* 31: 161–175.

Szafoni, R. E. 2002. Freshwater mussel classification index: identifying mussel assemblages of statewide significance. *Ellipsaria* 4:20-21.

T-12- P-1 State Wildlife Grant Project. Bob Szafoni IDNR project manager, R. Edward Dewalt and Kevin Cummings principal investigators. Illinois Statewide Mussel Database: Enhancement and Maintenance.

T-53-P-001 State Wildlife Grant Project. Bob Szafoni IDNR project manager. Investigating Mussel Communities in Wadeable Illinois Streams.