

**FY 2004 State Wildlife Grant (SWG)
Grant Proposal**

PROJECT #: **T-13-P-001** Amendment #3

PROJECT TITLE: Evaluating water temperature, habitat, and fish communities in candidate coolwater streams in Illinois.

START DATE: November 1, 2004

END DATE: February 28, 2011

NEED: No change.

OBJECTIVES: No change.

EXPECTED BENEFITS AND RESULTS:

The main outcome of this project will be a map of validated coolwater stream segments along with mapped areas of potential coolwater stream segments that stakeholders can use for planning, protections, and restoration efforts. This work will also allow the full range of expected thermal conditions in Illinois wadeable streams to be mapped. Of the fish species in greatest need of conservation (SGNC), 13 are considered to be indicators of coolwater habitat. The presence of coolwater indicator species in samples of fish communities suggests the presence of cool water, yet more field-based information is needed to validate this assumption. Characteristic fish assemblages will be identified for each major thermal regime type (Coldwater, Coolwater, Warmwater) in Illinois wadeable streams. This information will help inform revisions of the Wildlife Action Plan's assessment of all fish SGNC in wadeable streams. Currently few streams in Illinois have continuous temperature data. Without these data, resource managers are unable to accurately identify the existing thermal conditions within the areas they work. Therefore, targeting restoration practices to obtain a more natural thermal regime (e.g., riparian buffers) or to improve instream conditions (e.g., flow, instream vegetation) cannot take place without an adequate understanding of the dynamics of documented thermal regimes. Through this study, we will identify landscape and channel conditions that can be used to identify potential coolwater stream segments when temperature data are not available. This information will be essential for focusing survey and restoration efforts toward areas that could support the 13 fish SGNC referenced above as well as fish SGNC characteristic of cold and warm water habitats. This work may also provide valuable information for managing other aquatic organisms such as mussels and aquatic insects that may be associated with different thermal regimes.

Additionally, this study lays the groundwork for adjusting water quality standards (e.g., dissolved oxygen) based on stream conditions rather than on statewide standards. Likewise this study could be a significant part of any future efforts by the State to revise or update use designations and associated water quality standards. Similar efforts have been used in Michigan and Wisconsin to inform water quality decision making (Groundwater Conservation Advisory Council 2007, Zorn et al. 2008, Lyons et al. 2009). Finally, it will help managers understand conditions that create and maintain coolwater streams, thereby helping to target best management practices in areas where it is appropriate to restore thermal conditions.

APPROACH:

This study will be completed by staff at the Illinois Natural History Survey located in Springfield, whom will work closely with IDNR staff involved in developing and implementing the Department's CWCP. The roles and responsibilities of Survey and IDNR staff will be identified through a memorandum of understanding.

JOB 1. Review list of candidate coolwater streams and identify a subset of streams for validation.

The candidate coolwater streams were identified by using fish species known to prefer cool water and the potential presence of ground water at the site. However, sufficient temperature data were unavailable to verify the candidate coolwater streams. Further, changes in stream condition from upstream to downstream require extrapolating data from a sampled reach, yet it is not known the extent of stream for

which this is applicable. Therefore, we will select a subset of streams for detailed validation, which is described in Job 2. The selection of these streams will be based on several variables including areas of concern identified by the CWCP and geographic distribution statewide.

JOB 2. Characterize the thermal regime, habitat (e.g., channel morphology), and vegetation in each stream identified in Job 1.

To more fully understand the relationship between habitat and biota and to obtain a longitudinal profile of temperature, continuously recording temperature loggers will be placed at multiple sites in each stream identified in Job 1. At each site receiving a temperature logger, rapid vegetation surveys and habitat information including width and depth and will be collected. **We will also evaluate the thermal conditions within and between reaches in the vicinity of coolwater sites. A series of temperature loggers will be set upstream, downstream, and in adjacent reaches near sites with known thermal characteristics.** These data will be used to validate the spatial extent of coolwater conditions.

JOB 3. Determine availability and applicability of other data to predict additional coolwater streams.

One variable used in the identification of candidate coolwater stream was the presence of indicator coolwater fish species. However, there are many streams in Illinois that have not been sampled for fish and therefore were not included in the initial analysis. Therefore, we will investigate the predicted fish communities that were generated by the fish model created for the CWCP for the presences of coolwater fish communities. Additionally, we will identify concentrations of potential ground water discharge that could support coolwater communities.

Coolwater streams can be defined as having suitable temperatures for both warmwater and coldwater species. This complexity makes it difficult to directly predict coolwater fish assemblages and their distributions without high levels of uncertainty. An alternative approach is to use coldwater and warmwater species distributions to define coolwater conditions. We will use an existing state-wide fish database and expected summer temperatures based on an empirical model to develop numerical criteria for distinguishing coolwater conditions from coldwater and warmwater conditions in wadeable streams. Coolwater temperatures will be defined having an upper bound based on the warmest temperature that coldwater fish occur and a lower bound based on the coldest temperature at which warmwater fish occur (Lyons et al. 2009).

JOB 4. Characterize a subset of streams identified in Job 3.

Rapid habitat and vegetation surveys will be conducted along a sampling reach at a subset of streams identified in Job 3. In each selected reach, fish will be sampled using one or more standard IDNR gear(s) and will be processed using IDNR procedures (IDNR 2001). Additionally, a temperature logger will be placed in each sampling reach to further characterize stream conditions.

Temperature will also be monitored at approximately 30 sites selected using a stratified random sampling procedure to further describe the extent of coolwater conditions state-wide. These data will also be used to validate methods of determining the initial coolwater candidate status and the alternative methods developed in JOB 3.

JOB 5. Conduct macroinvertebrate sampling at a subset of sites.

At a limited number of sites sampled in Jobs 2 and 4, we will sample macroinvertebrates. Similarly to fish, macroinvertebrate assemblages change with varying thermal conditions. Therefore, the presence of certain coolwater taxa will lend additional support the identification of coolwater stream segments. Samples will be collected using the most appropriate gear, sorted, and identified to the lowest level practicable.

JOB 6. Compile and analyze data and write a report.

A map of validated coolwater stream segments along with mapped areas of potential **coldwater, coolwater, and warmwater** stream segments will be distributed via paper copies and posted on the CWCP's website. A report including descriptions of habitat conditions, temperature regimes, and biota that comprise coolwater streams will be written. **This report will include a description of expected fish assemblages in each major stream thermal regime type (Coldwater, Coolwater, Warmwater) in Illinois.** Although Illinois' CWCP is due before this project will be completed, the information gathered

through this effort will be essential for refining the plan. The current plan identifies information about coolwater streams as a data gap. This is an important data gap to fill because 13 of the fish species in greatest need of conservation are considered to be indicators of coolwater habitat. Because little is known about the characteristics comprising coolwater stream habitat in Illinois, targeting appropriate protection or restoration efforts for these species is limited. The information gained in this project will help focus survey and restoration efforts toward areas that could support the 13 SGNC referenced above.

PROJECT SCHEDULE:

Tasks Defined by Job	09/2005	03/2006	06/2006	09/2006	12/2006
Job 1.	X	X			
Job 2.			X	X	X
Job 3.					X
Job 5.			X	X	X

Tasks Defined by Job	01/2007	03/2007	06/2007	09/2007	12/2007
Job 3.	X	X			
Job 4.			X	X	X
Job 5.			X	X	X

Tasks Defined by Job	01/2008	03/2008	06/2008	09/2008	12/2008
Job 4.	X	X			
Job 6.			X	X	X

Tasks Defined by Job	01/2009	03/2009	06/2009	09/2009	12/2009
Job 2.		X	X		
Job 4.	X	X	X		
Job 6.	X			X	X

Tasks Defined by Job	01/2010	03/2010	06/2010	09/2010	2/2011
Job 2.		X	X		
Job 3.	X	X	X		
Job 4.		X	X		
Job 6.	X			X	X

PERSONNEL:

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

Joel Cross
Head, Office of Resource Conservation - Watershed Protection Section
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Additional staff involved in this project at the same location include:

Ann Marie Holtrop
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Leon Hinz, **Ph.D.**
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Damon Stotts
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Other staff involved in project include:

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this amendment Yong Cao will be the new PI and Leon Hinz will be the new Co-PI.

ESTIMATED PROJECT COSTS:**PROJECT BUDGET - Year 1****Effective Dates: 10/01/05 - 12/31/06**

Object Categories	Federal Request	INHS Cost Share	Total
Salaries and Wages			
Professional	<u>\$43,000</u>		<u>\$43,000</u>
John Epifanio (10%)		<u>\$7,580</u>	<u>\$7,580</u>
Damon Stotts (11%)		<u>\$8,043</u>	<u>\$8,043</u>
Fringe Benefits			
\$43000 @ 32.37%	<u>\$13,919</u>		<u>\$13,919</u>
\$7580 @ 32.37%		<u>\$2,454</u>	<u>\$2,454</u>
\$8043 @ 32.37%		<u>\$2,604</u>	<u>\$2,604</u>
Total Salaries, Wages, and Fringe Benefits	<u>\$56,919</u>	<u>\$20,680</u>	<u>\$77,599</u>
Travel	<u>\$5,000</u>		<u>\$5,000</u>
Supplies			
Equipment \$500-\$4,999 (computer)	<u>\$2,500</u>		<u>\$2,500</u>
Expendable supplies	<u>\$6,300</u>		<u>\$6,300</u>
Total supplies	<u>\$8,800</u>		<u>\$8,800</u>
Contractual Services	<u>\$4,500</u>		<u>\$4,500</u>
Equipment >\$5,000	<u>\$0</u>		<u>\$0</u>
Total Direct Costs	<u>\$75,219</u>	<u>\$20,680</u>	<u>\$95,899</u>
Modified Total Direct Costs (MTDC)*	<u>\$72,719</u>	<u>\$20,680</u>	<u>\$93,399</u>
Indirect Costs			
20%	<u>\$15,044</u>		<u>\$15,044</u>
44.3%		<u>\$4,445</u>	<u>\$4,445</u>
24%		<u>\$2,555</u>	<u>\$2,555</u>
Unrecovered F&A		<u>\$2,409</u>	<u>\$2,409</u>
Total Project Costs	<u>\$90,263</u>	<u>\$30,089</u>	<u>\$120,352</u>
Percentages	<u>75.00%</u>	<u>25.00%</u>	<u>100.00%</u>

Summary of project costs:

Federal request:	<u>\$ 90,263.00</u>
State match:	<u>\$ 30,089.00</u>
Total project cost:	<u>\$120,352.00</u>

PROJECT BUDGET - Year 2
Effective Dates: 01/01/07 - 12/31/07

<u>Object Categories</u>	<u>Federal Request</u>	<u>INHS Cost Share</u>	<u>Total</u>
Salaries and Wages			
Professional	\$87,000		\$87,000
John Epifanio (11%)		\$8,445	\$8,445
Damon Stotts (25%)		\$19,050	\$19,050
Fringe Benefits			
\$87000 @ 32.37%	\$28,162		\$28,162
\$8445 @ 32.37%		\$2,734	\$2,734
\$19050 @ 32.37%		\$6,166	\$6,166
Total Salaries, Wages, and Fringe Benefits	\$115,162	\$36,395	\$151,557
Travel	\$7,000		\$7,000
Supplies			
Equipment \$500-\$4,999 (computer)	\$0		\$0
Expendable supplies	\$3,500		\$3,500
Total supplies	\$3,500		\$3,500
Contractual Services	\$6,000		\$6,000
Equipment >\$5,000	\$0		\$0
Total Direct Costs	\$131,662	\$36,395	\$168,057
Modified Total Direct Costs (MTDC)*	\$131,662	\$36,395	\$168,057
Indirect Costs			
20%	\$26,332		\$26,332
44.3%		\$4,952	\$4,952
24%		\$6,052	\$6,052
Unrecovered F&A		\$5,266	\$5,266
Total Project Costs	\$157,994	\$52,666	\$210,660
Percentages	75.00%	25.00%	100.00%

Summary of project costs:

Federal request: \$157,994.00
State match: \$ 52,666.00
Total project cost: \$210,660.00

PROJECT BUDGET - Year 3
Effective Dates: 01/01/08 - 12/31/08
Object Categories

<u>Object Categories</u>	<u>Federal Request</u>	<u>INHS Cost Share</u>	<u>Total</u>
Salaries and Wages			
Professional	\$87,000		\$87,000
John Epifanio (10%)		\$7,880	\$7,880
Damon Stotts (25%)		\$19,050	\$19,050
Fringe Benefits			
\$87000 @ 32.37%	\$28,162		\$28,162
\$7880 @ 32.37%		\$2,551	\$2,551
\$19050 @ 32.37%		\$6,166	\$6,166
Total Salaries, Wages, and Fringe Benefits	\$115,162	\$35,647	\$150,809
Travel	\$5,000		\$5,000
Supplies			
Equipment \$500-\$4,999 (computer)	\$0		\$0
Expendable supplies	\$2,000		\$2,000
Total supplies	\$2,000		\$2,000
Contractual Services	\$6,500		\$6,500
Equipment >\$5,000	\$0		\$0
Total Direct Costs	\$128,662	\$35,647	\$164,309
Modified Total Direct Costs (MTDC)*	\$128,662	\$35,647	\$164,309
Indirect Costs			
20%	\$25,732		\$25,732
44.3%		\$4,621	\$4,621
24%		\$6,052	\$6,052
Unrecovered F&A		\$5,146	\$5,146
Total Project Costs	\$154,394	\$51,467	\$205,861
Percentages	75.00%	25.00%	100.00%

Summary of project costs:

Federal request: \$154,394.00
State match: \$ 51,467.00
Total project cost: \$205,861.00

PROJECT BUDGET - 3 Year Summary
Effective Dates: 01/01/06 - 12/31/08

<u>Object Categories</u>	<u>Federal Request</u>	<u>INHS Cost Share</u>	<u>Total</u>
Salaries and Wages			
Professional	\$217,000		\$217,000
John Epifanio (5%)		\$23,903	\$23,903
Damon Stotts (4%)		\$46,143	\$46,143
Fringe Benefits			
\$217000 @ 32.37%	\$70,243		\$70,243
\$23905 @ 32.37%		\$7,737	\$7,737
\$46143 @ 32.37%		\$14,936	\$14,936
Total Salaries, Wages, and Fringe Benefits	\$287,243	\$92,719	\$379,962
Travel	\$17,000		\$17,000
Supplies			
Equipment \$500-\$4,999 (computer)	\$2,500		\$2,500
Expendable supplies	\$11,800		\$11,800
Total supplies	\$14,300		\$14,300
Contractual Services	\$17,000		\$17,000
Equipment >\$5,000	\$0		\$0
Total Direct Costs	\$335,543	\$92,719	\$428,262
Modified Total Direct Costs (MTDC)*	\$333,043	\$92,719	\$425,762
Indirect Costs			
20%	\$67,109		\$67,109
44.3%		\$14,017	\$14,017
24%		\$14,659	\$14,659
Unrecovered F&A		\$12,822	\$12,822
Total Project Costs	\$402,651	\$134,217	\$536,868
Percentages	75.00%	25.00%	100.00%

Summary of project costs:

Federal request: \$402,651.00
State match: \$134,217.00
Total project cost: \$536,868.00

PROJECT BUDGET Amendment 2	Federal	INHS	IDNR	
Expense Line Item	Request	Match	Match	Total
Salaries and Wages				
Professional	\$82,000	\$40,000	\$21,515	\$143,515
Grad Res Asst ac yr				\$0
GRA - summer (no classes)				\$0
Student Hourly - part time				\$0
Student Hourly - full time student	\$0			\$0
Non-student hourly or Off-campus	\$0			\$0
Total Salaries and Wages	\$82,000	\$40,000	\$21,515	\$143,515
Fringe Benefits				
Professional @ 32.88%	\$26,962	\$13,152	\$7,074	\$47,188
Grad Res Asst ac yr @ 6.10%	\$0	\$0	\$0	\$0
GRA - summer (no classes) 13.75%	\$0	\$0	\$0	\$0
Student Hourly - part time 7.75%	\$0	\$0	\$0	\$0
Student Hourly - full time student 0.10%	\$0	\$0	\$0	\$0
Non-student hourly or Off-campus @ 8.98%	\$0	\$0	\$0	\$0
Total Fringe Benefits	\$26,962	\$13,152	\$7,074	\$47,188
Total Salaries, Wages, and Fringe Benefits	\$108,962	\$53,152	\$28,590	\$190,703
Travel				
Out of state				\$0
In state	\$2,500			\$2,500
Foreign				\$0
Total Travel	\$2,500	\$0	\$0	\$2,500
Materials & Supplies - General (computer)	\$2,500			\$2,500
Publication Fees (reprints/page charges)				\$0
Total Materials & Supplies	\$2,500	\$0	\$0	\$2,500
Contractual Services - General (software)	\$2,500			\$2,500
Subcontract(s)				\$0
Lease/rental (with written contract)				\$0
Tuition Remission (56% GRA)	\$0	\$0	\$0	\$0
Total Contractual Services	\$2,500	\$0	\$0	\$2,500
Telecommunication Services				\$0
Equipment (each item \$5000 and more)				\$0
Total Direct Costs	\$116,462	\$53,152	\$28,590	\$198,203
Modified Total Direct Costs (MTDC)*	\$116,462	\$53,152	\$28,590	\$198,203
F&A (20% Direct Costs)	\$23,292			\$23,292
F&A (44.2% Total Direct Costs)		\$23,493		\$23,493
F&A (22.16% Total Direct Costs)			\$6,335	\$6,335
Unrecovered F&A (20% vs. 44.2%)		\$28,184		\$28,184
Total Proposed Project Budget	\$139,754	\$104,829	\$34,925	\$279,508
Percentage of Project Costs	50.0000%	37.5048%	12.4952%	

Summary of project costs (Amendment 3):

Federal request: \$139,754
State match: \$139,754
Total project cost: \$279,508

Summary of project costs (total):

Federal request: \$542,405
State match: \$273,971
Total project cost: \$816,376

LITERATURE CITED:

Groundwater Conservation Advisory Council. July 2007. Report to the Michigan Legislature in response to 2006 Public Act 34. Michigan Department of Natural Resources, Lansing.

Illinois Department of Natural Resources (IDNR). 2001. Fisheries stream sampling guidelines. Illinois Department of Natural Resources - Division of Fisheries, Springfield, Illinois.

Illinois Environmental Protection Agency (IEPA). 2004. Illinois water quality report - 2004: Clean water act section 305(b) water resource assessment information. Illinois Environmental Protection Agency - Bureau of Water, Springfield, Illinois.

Lyons, J., T. Zorn, J. Stewart, P. Seelbach, K. Wehrly, and L. Wang. 2009. Defining and characterizing coolwater streams and their fish assemblages in Michigan and Wisconsin, USA. North American Journal of Fisheries Management 29: 1130-1151.

Pickering, Q. H. 1950. Distribution of the fishes of the smaller streams of northwestern Illinois. Master's thesis, University of Illinois. 172 pages.

Wehrly, K. E., M. J. Wiley, and P. W. Seelbach. 1998. Landscape-based models that predict July thermal characteristics in lower Michigan rivers. Michigan Department of Natural Resources, Fisheries Research Report 2037, Ann Arbor.

Wehrly, K. E., M. J. Wiley, and P. W. Seelbach. 2003. Classifying regional variation in thermal regime based on stream fish community patterns. Transactions of the American Fisheries Society 132:18-38.

Zorn, T. G., P. W. Seelbach, E. S. Rutherford, T. C. Wills, S. Cheng, and M. J. Wiley. 2008. A landscape-scale habitat suitability model to evaluate effects of flow reduction on fish assemblages in Michigan streams. Michigan Department of Natural Resources, Fisheries Research Report 2089, Ann Arbor.

BUDGET JUSTIFICATION:

IDNR Project Support: This project supports the IDNR's development, **implementation, and revision** of a statewide comprehensive wildlife habitat conservation plan (CWCP) that will better direct protection and management efforts as well as staff resources. To promote coordination with the CWCP team, staff working under this contract will be staffed at the IDNR headquarter building in Springfield. The IDNR will provide project staff office space and other supplies and items necessary to support the project. Examples include phone, computer support (e.g., printer, network, and email access), motor pool, etc.

Personnel Services: We request funds to support staff members who will be documenting location and conditions of coolwater streams in Illinois. The salaries of **Yong Cao**, John Epifanio and Damon Stotts, used for cost sharing, are paid from INHS operating funds and **are** at no cost to the sponsor.

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 conducting field work and presenting research findings at professional scientific meetings.

Supplies/commodities: Supply funds are needed to provide minimal support for items needed for field work and printing large-format maps. Expensed equipment funds are needed to purchase a computer.

Contractual: We require these contractual funds to renew **SAS and other** software, which is necessary for completing the project. Additionally, these funds are needed to reimburse staff for conference registration fees; during these conferences (e.g., Midwest Fish and Wildlife Conference) staff will present progress on the project. Contractual funds may be used to pay for identification of the fish and macroinvertebrates that will be collected during this study. Finally, contractual funds are needed to pay for copying services that will be incurred when furnishing the sponsor with copies of the final report.

Facilities and Administrative Costs: John Epifanio and **Yong Cao** are located on-campus so the F&A rate on **their** salaries **are** at the on-campus rate. Damon Stotts is located at an off-campus site so the F&A on his salary is at the off-campus rate.