

**FY 2004 State Wildlife Grant (SWG)
Grant Agreement - Annual Work Plan**

PROJECT #: T-13

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

NEED:

This is a “planning grant” that will be used to help refine Illinois’ Comprehensive Wildlife Conservation Plan (CWCP).

Coolwater streams have mean temperatures of 19°C - < 22°C (Wehrly et al. 2003). In the upper Midwest, thermal regime in streams is primarily the result of differences in groundwater accretion among stream segments (Wehrly et al. 1998). Unlike other upper Midwestern states that have substantial groundwater contributions to streams, much of the flow comprising Illinois streams is derived from overland runoff. Limited groundwater in Illinois and the dominance of overland runoff particularly through open agricultural fields results in elevated water temperatures in streams. Therefore, coolwater streams are a declining resource in Illinois, which makes them particularly important for protection through the Illinois Department of Natural Resources’ CWCP process. Coolwater streams are a required habitat for true coolwater fish species like sculpin, and also provide recreational opportunities for anglers targeting fish like smallmouth bass that prefer cooler sections of warmwater streams.

Historically, presence of coolwater streams in Illinois has been considered limited to a few streams bordering Wisconsin and in isolated areas known for receiving extensive groundwater inputs. In 1950, Pickering conducted a survey of coolwater streams in northwestern Illinois. However, to our knowledge, no statewide assessment had been conducted prior to a candidate list that was generated for the CWCP. As part of the process for developing the CWCP, a candidate list of coolwater streams was developed by staff at the Illinois Department of Natural Resources (IDNR) - Watershed Protection Section and the Illinois Natural History Survey (INHS) - Center for Aquatic Ecology. A list of fishes indicative of cool waters was developed and species distributions were mapped. Using a geographic information system, fish distributions were overlain on a map of potential groundwater (i.e., Darcy’s Model). Candidate cool water stream reaches were identified where correspondence occurred between locations of indicator cool water fish and groundwater. In the candidate list, several stream reaches in central and southern Illinois were identified, thereby indicating that more coolwater stream reaches may occur in Illinois than originally thought.

Although Illinois has an extensive database of fish samples, it is impossible for all stream miles to be surveyed.

Therefore, many streams were not included in the candidate list simply because no fisheries data existed from these streams. The streams included in Illinois’ candidate list of coolwater streams were identified because of the presence of indicator fish species and ground water potential. Although these data indicate cooler waters, more field-based information including water temperature data is needed to formally document the extent of cool water. Until the

thermal profile of coolwater streams and other contributing factors such as riparian cover and instream vegetation that comprise these systems are formally documented, our understanding of coolwater systems will remain a data gap in Illinois' CWCP. To better understand the occurrence or potential occurrence of coolwater stream habitats and associated biota, the following study is proposed.

OBJECTIVES:

1. Review list of candidate coolwater streams and identify a subset of streams for validation.
2. Characterize the thermal regime, habitat (e.g., channel morphology), and vegetation in each stream identified in Job 1.
3. Determine availability and applicability of other data to predict additional coolwater streams.
4. Characterize conditions at a subset of streams identified in Job 3.
5. Conduct macroinvertebrate sampling at a subset of sites.
6. Compile and analyze data and write a report.

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. 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. Currently few streams in Illinois have continuous temperature data. Without these data, resource managers are unable to accurately identify the presence of true coolwater conditions. Therefore, targeting restoration practices to improve 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 coolwater systems. 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. This work may also provide valuable information for managing other aquatic organisms such as mussels and aquatic insects that may be dependent upon cooler waters.

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. Finally, it will help managers understand conditions that create coolwater streams, thereby helping to target best management practices in areas where it is appropriate to restore marginal areas.

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. 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.

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.

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 coolwater 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. 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 |

PERSONNEL:

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

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LITERATURE CITED:

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.
- 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.

BUDGET JUSTIFICATION:

IDNR Project Support: This project supports the IDNR's development 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 John Epifanio and Damon Stotts, used for cost sharing, are paid from INHS operating funds and is 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 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 is located on-campus so the F&A rate on his salary is 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.