

# Illinois Natural History Survey

*Evaluating Water Temperature, habitat and fish communities in  
candidate coolwater streams in Illinois*

Annual Project Report 2006

Leon C. Hinz Jr. and Ann Marie Holtrop

Submitted to

Illinois Department of Natural Resources  
One Natural Resources Way  
Springfield, Illinois 62702

Illinois Natural History Survey  
Division of Ecology and Conservation Science  
1816 South Oak Street  
Champaign, Illinois 61820

November 2006



ILLINOIS  
NATURAL  
HISTORY  
SURVEY

Illinois Natural History Survey Technical Report 2006/10

**Illinois Natural History Survey  
Center for Aquatic Ecology and Conservation**

(July 30, 2005 - July 29, 2006)

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***Ecological Classification of Rivers for Environmental  
Assessment and Management:  
Stream Attribution and Model Preparation***

Annual Project Report 2006  
Project: T-13-P-001

30 July 2005 to 29 July 2006

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Dr. John Epifanio,  
Project Coordinator  
Illinois Natural History Survey

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Dr. David Thomas,  
Chief  
Illinois Natural History Survey

**PROJECT #: T-13-P-1**

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

**Summary:**

A major objective of this project is the development of a map of validated and potential coolwater stream segments that can be used in planning and management efforts for species in greatest need of conservation as defined in the Illinois Wildlife Action Plan. Work to date has focused on updating the information used to develop the candidate coolwater stream list and designing a sampling program that will allow us to define and validate potential coolwater streams segments in Illinois. Although the grant agreement was executed on 30 September 2005 staff did not begin full time work on this project until 16 July 2006. This report summaries work for the period ending 29 September 2006.

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

New information has become available since the initial candidate coolwater streams list was developed. Along with review of the candidate list we have used field-based and modeled water temperature summaries plus additional biological samples to develop a sampling and verification program for coolwater streams in Illinois (see Job 3).

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

Thirty additional electronic temperature recorders have been purchased to assess thermal regimes in candidate coolwater streams segments for our next field season. Temperatures will be monitored at selected sites beginning in early 2007.

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

Although no work was scheduled for Job 3 it has been given considerable attention to consolidate our efforts with stream characterization and field surveys. Temperature summaries from 75 logger records collected between 1999 and 2005 were classified as warm-, cool-, or cold-water based on the characteristics of the July Water Temperature (Wehrly et al. 1988). Thirteen (17%) of these sites had characteristics of cold/cool-water streams although many were in the region of transition between cool and warm waters (Figure 1). As part of our stream classification system project (State of Illinois 2004) these summaries were used with landscape based GIS catchment summaries (including potential ground water discharge) to develop multiple regression models that estimate summer water temperatures. These models were applied within our state-wide classification system as a preliminary assessment of the thermal

conditions within Illinois streams. Stream segments were given a thermal code based on the Minimum and Maximum July water temperatures derived from the model output. Cold/cool-water segments made up approximately 16% of the total number of coded segments state-wide (Figure 2). However most of these segments have not yet been verified with field based measurements. Additionally, these models did a poor job predicting water temperatures in small and/or relatively uniform catchments.

Coolwater fish species locations have been reviewed from several sources (e.g., Pikerling 1950, Rudey 1999) not directly used in the development of the candidate coolwater streams list. However, since these surveys were regional in focus and restricted primarily to the northwestern corner of Illinois there are still gaps in coverage. The Illinois Critical Trends and Assessment Program (CTAP) has provided data on the distribution of stoneflies collected during their annual sampling throughout Illinois. Many species within this Order (Plecoptera) of aquatic insects are associated with cooler water temperatures and high oxygen concentrations. Models to predict fish communities have been developed for the Illinois Wildlife Action Plan but have yet to be specifically evaluated for coolwater species.

Locations of the candidate coolwater streams plus additional coolwater fish and stonefly records were plotted on the results of the temperature modeling using our GIS database system. Overlapping areas were identified and will be targeted for verification during our next field season (Jobs 2, 4, 5).

Field based temperature data is still very limited in Illinois streams. We have virtually no information about the variability of water temperature between years since most of our records are for a single year or a single season. A subset of the sites with field based temperature records characteristic of coolwater streams will be used to examine inter-annual temperature variation. Loggers will be placed and maintained at locations where temperature summaries have provided evidence of coolwater conditions. Additional synchronized loggers will be stationed in adjacent stream segments to examine the longitudinal extent of these coolwater conditions.

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

No work was scheduled for Job 4. However, instream habitat surveys were conducted at twelve locations on tributaries of the Kishwaukee and Rock Rivers in McHenry, Boone, and Winnebago Counties. Fish sampling and logger placement did not occur in conjunction with these preliminary surveys in early September of 2006.

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

No macroinvertebrate sampling was completed on this Job since sites identified from an analysis of data sources from Job 3 have not been finalized by an appropriate sampling time. However, CTAP (Illinois Critical Trends Assessment Program) data for stonefly taxa have been reviewed and their locations added to our database. These data will form the basis for evaluating coolwater insect taxa at locations where our sampling does not occur. We will collect aquatic insects at stations selected for inter-annual monitoring plus additional stations with records of

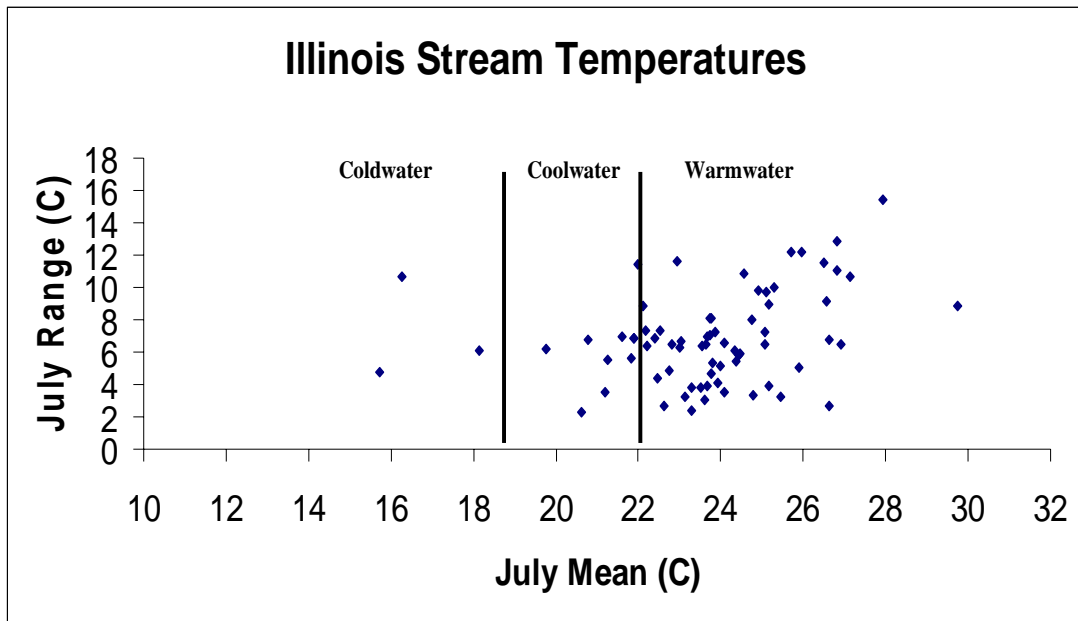
coolwater fish species that are not covered by CTAP. Macroinvertebrate sampling will occur using methods similar to those employed by the CTAP professional scientists with the goal of obtaining compatible samples focusing on stonefly taxa.

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

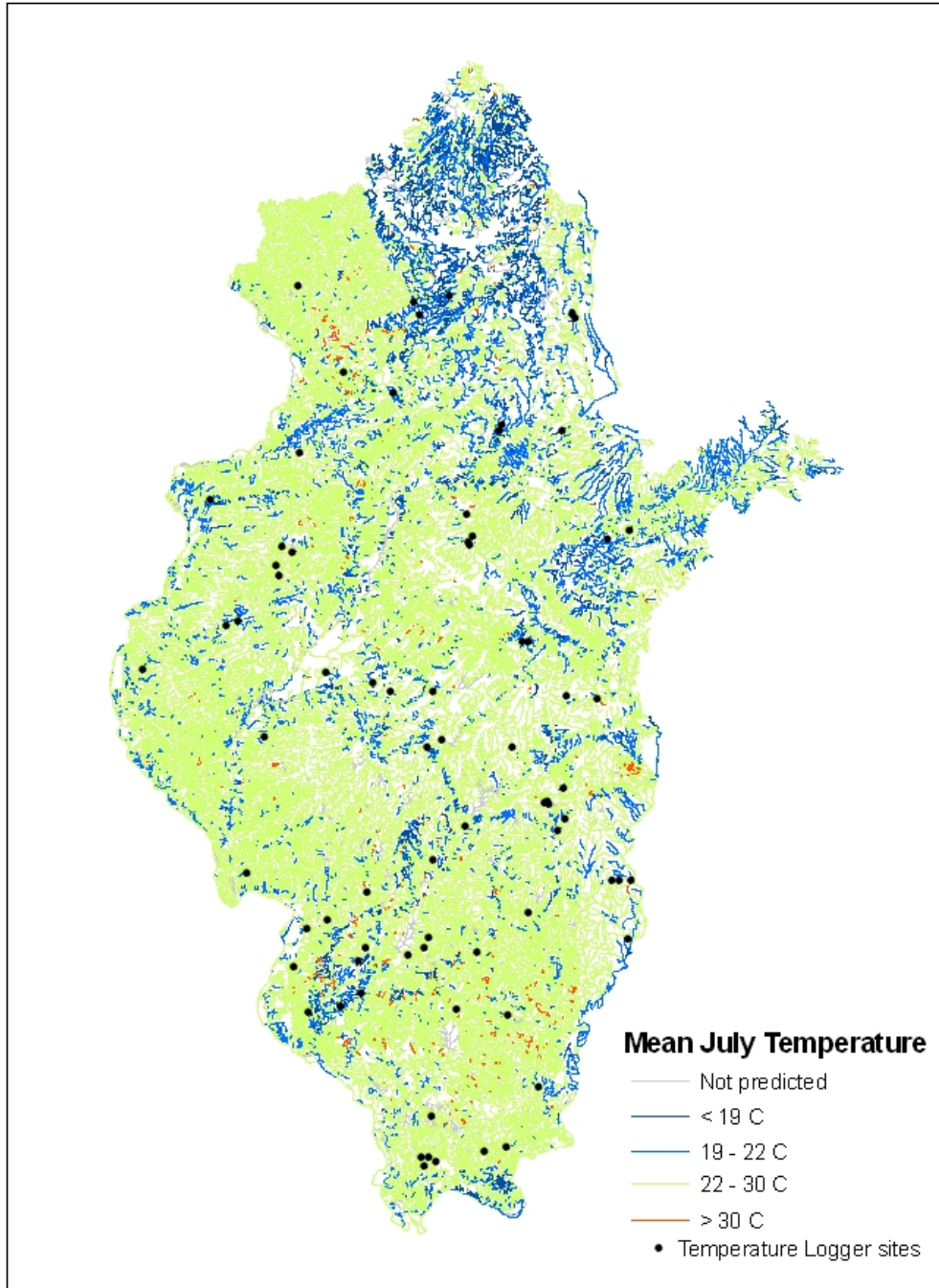
No work was scheduled for this Job.

**LITERATURE CITED:**

- Pickering, Q. H. 1950. Distribution of the fishes of the smaller streams of northwestern Illinois. Master's thesis, University of Illinois. 172 pages.
- Rudey, R. 1999. Northern Illinois Stream Study: A preliminary assessment of the potential of selected northern Illinois streams to support a self-sustaining trout population. The Illinois Council of Trout Unlimited, Highland Park, IL. 43 pages, 2 appendices.
- State of Illinois. 2004. Development of an Illinois Comprehensive Wildlife Conservation Plan and Supporting Information Systems. State Wildlife Grant Program (Federal Aid Project T-2-P-1).
- 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.



**Figure 1.** Summarized Illinois stream temperatures from loggers collected 1999 – 2005. This thermal classification considers streams with July Mean temperatures of 14-18 C as Coldwater, 19-21 C Coolwater, and >22 C as warmwater. These data were summarized in the same manner as those used for developing a thermal classification for Michigan streams that these classes are based upon. “July Mean” is the mean of the mean from three weekly [(max-mins)/2] extreme readings from the month of July and “July Range” is mean of the difference (Max.-Min.) for these same readings.



**Figure 2.** Modeled Summer Stream Temperatures