

Proposal Entitled:

Assessing Vulnerability of Coolwater Habitats in Illinois Wadeable Streams.

For Submission To:

Illinois Department of Natural Resources
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Submitted by:

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Make Award: 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: \$ 180,000
Project Period: 1 September 2013 – 31 August 2015

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Executive Summary

Title: Assessing Vulnerability of Coolwater Habitats in Illinois Wadeable Streams.

Applicant information: Illinois Natural History Survey, Prairie Research Institute, UI

Goals/ Objectives:

1) Identify coolwater habitats and associated fish species on Illinois' wadeable streams; 2) Characterize thermal and flow regimes under current conditions and scenarios describing landcover and climate change; 3) Assess vulnerability (sensitivity and exposure) of thermal and flow regimes to landcover and climate changes for coolwater reaches; 4) Examine potential changes in fish species distributions and connectivity of their associated habitats; 5) provide annual and final reports that include an assessment of vulnerability to alterations in landcover and climate projected to occur in Illinois.

Proposed Grant Period: 1 September 2013 – 31 August 2015.

Amount Requested: \$ 180,000

State(s) and Partners Involved: IL Dept. Nat. Resources/ IL Natural History Survey

Key Habitats Addressed: Wadeable Stream Habitat.

Summary Statement: Thermal and hydrologic regimes in running waters are an expression of regional climate acting on local watershed characteristics. Change in either of these interactors is expected to alter these regimes and associated habitats impacting the biological assemblages dependent on them. We have used previous work describing the hydrologic (T-2) and thermal character (T-13) of wadeable streams to characterize stream segments into types throughout the state (T-75). Cooperative efforts have also developed a land transformation model (T-2) and attributions of downscaled climate change models for Illinois. This study will use these data to assess the vulnerability (exposure and sensitivity) of coolwater stream habitats, and associated fish species, to potential changes in regional and local landcover and climate. Outputs will include maps depicting existing and potential habitat extent and species distributions, and an assessment of the relative vulnerability of existing habitats and populations to change associated with potential alterations in landcover and climate.

Estimated Cost:

	Total Federal	Total INHS Non-Federal	Total IDNR Non-Federal	Total Cost
Year One Funding	\$90,000	\$20,939	\$27,523	\$138,462
Year Two Funding	\$90,000	\$20,939	\$27,523	\$138,462
Total Funding	\$180,000	\$41,878	\$55,046	\$276,924

INHS will provide in-kind match of \$41,878 during the project period. Staff salary (\$20,000), benefits (\$8,934) and F&A (\$6,944) along with unrecovered F&A (\$6,000) will be provided during the two year project period. IDNR in-kind match (salary, benefits, F&A) will provide an additional \$55,046 during the project period.

Project Title: Assessing Vulnerability of Coolwater Habitats in Illinois Wadeable Streams.

Need:

A major theme of the Illinois Wildlife Action Plan (IWAP) is to maintain populations in historic locations and to re-establish them where suitable habitat persists. This theme is expressed as a goal for many species groups as “Populations of all currently occupied locations are maintained and re-established at 50% or more of historic locations where suitable habitat persists or can be restored” (State of Illinois 2005, p.41). To achieve this goal we require information describing both current and historic locations of populations of Species in Greatest Need of Conservation (SGNC) as well as the distribution of existing suitable habitat. Recent work has focused on updating the status of Illinois’ Fish SGNC including developing statewide maps of distribution (Metzke et al. 2012). While these efforts described current and historic locations of fish SGNC they did not evaluate habitat conditions at these stream reaches.

Sowa et al. (2007) developed a threat index for Missouri streams that included catchment characteristics expected to influence flow or thermal regimes. An index of cumulative disturbance was developed by Esselman et al. (2011) to provide a national assessment of river fish habitats that included attributes of landuse character (e.g., developed lands, agriculture) as primary measures of disturbance. Both these efforts used anthropogenic activities (e.g., percentage of urban land) at the landscape scale to summarize potential disturbance to stream reaches as a method of describing current status. The IWAP Stream Habitat goals include identifying “Land alterations that contribute to unnatural water level fluctuations, flow regimes and alter temperatures in rivers and streams” (State of Illinois 2005, p. 50) and “System-wide limiting factors for representative native species or communities, including altered disturbance regimes (hydrology, connectivity), excessive sedimentation, thermal pollution, ...” (State of Illinois 2005, p. 50). Progress toward these goals requires a description of current conditions as well as an evaluation of how major landscape drivers influence their status. Flow character (Poff et al. 1997) and water temperature (Allen & Castillo 2007) dominate the habitat template of streams and rivers. Characteristic patterns of flow (Seelbach et al. 2011) and temperature (Wehrly et al. 2009) can be described using landscape based modeling. These approaches use watershed based summaries of landscape character with field-based measurements to estimate instream habitat condition (Wehrly et al. 2006). We have developed similar models that describe aspects of the current flow regime and thermal condition for Illinois streams (Holtrop et al. 2006, Hinz et al. 2011, Seelbach et al. 2011).

These types of models when applied regionally can be used to investigate relationships between the characteristics of the watershed (e.g., landcover and climate), stream habitat, and fish assemblages (Nelson & Palmer 2007, Lyons et al. 2009, Zorn et al. 2011). Model output can be used not only to define current status but also to describe expected conditions under a variety of scenarios based on changing landscape or climatic features. The IWAP describes an approach where “These models will produce region-wide

summaries of current ecological status, and coupled with a land transformation model, will provide risk assessments for the river systems of the upper Midwest” (State of Illinois 2005, p. 116). Our regional partners in Wisconsin (Lyons et al. 2010) and Michigan (Wiley et al. 2010, Zorn et al. 2012) as well as others (e.g., Nelson et al. 2009) have applied this approach to evaluate both landscape and climate alterations to fish assemblages and in-stream habitats. With the exception of a pilot effort in the Kaskaskia River (Holtrop et al. 2006) this approach has not been used in Illinois.

The IWAP Streams Campaign identifies “restoring coolwater streams” and associated fauna as an Action Item due to the perceived rarity and vulnerability of these habitats (State of Illinois 2005, p.63). Fisheries managers have described coolwater streams as those that contain both coldwater and warmwater fauna (Lyons et al. 2009, Wehrly et al. 2003). Previous work suggests that coolwater stream reaches are relatively uncommon in Illinois (~20% of randomly selected sites statewide were cool) and contain a distinct fish assemblage (Hinz et al. 2011). As these streams contain suitable thermal habitats for a broad array of species even small changes in temperature can lead to significant changes in the observed thermal regime and associated fauna (Nelson et al. 2007, Lyons et al. 2010, Wiley et al. 2010). Walk et al. (2011) assessed a suite of Illinois SGNC for vulnerability to climate change including fish associated with coolwater. Many of these fish species were determined to be vulnerable to climate change both due to exposure to higher temperatures and the relative rarity of their preferred habitat. A similar conclusion was drawn by the Critical Trends Assessment Program suggesting that in Illinois streams the “recovery of sensitive aquatic organisms will be delayed because of the distances between remaining populations” (State of Illinois 2005, p. 39).

This study will use available and new information to assess the vulnerability (exposure and sensitivity) of coolwater stream habitats, and associated fish species, to potential changes in regional and local landcover and climate. By identifying a rare and vulnerable habitat type and assessing its current and potential future condition, we will address key information gaps identified in the IWAP and provide information required to prioritize management activities that support coolwater stream fauna.

Objectives:

The primary objective of this project is to assess the vulnerability (sensitivity and exposure) of coolwater habitats and their associated fish species in greatest need of conservation to potential alterations in watershed landuse and climate. We will address the following major questions in this project:

- (Q1) How vulnerable are existing coolwater habitats and the fish species that are dependent upon them? (See Objective 3 and Objective 4 for details.)
- (Q2) Are coolwater habitats functionally isolated in Illinois or can fish species move between them to maintain their populations? (See Objective 4 for details.)

Objective 1: Identify coolwater habitats (reaches) on wadeable streams in Illinois and their associated fish species in greatest need of conservation. Existing information for over 50,000 stream reaches will be examined during the first nine months of the project (details are described in Job 1 and the Project Schedule).

Objective 2: Characterize thermal and flow regimes of identified coolwater reaches under current conditions and several scenarios describing changes to landcover and climate. Stream segments identified as potential coolwater reaches will be characterized with existing data during the 2nd and 3rd quarter of the first project year. We estimate that 10-20% of all stream reaches in Illinois will be identified as potential coolwater segments (Hinz et al. 2011). A subset of these reaches (~20/year) where recent observations are unavailable will be assessed during field visits and using instream temperature monitoring during the spring and summer of each project year (details are described in Job 2 and the Project Schedule).

Objective 3: Assess the vulnerability (exposure and sensitivity) of coolwater reaches to potential landcover and climate changes based on their thermal and flow regimes. Vulnerability assessment will be conducted for all identified coolwater reaches in the second year of the project after completion of the initial thermal and flow characterization in Job 2 (details are described in Job 3 and the Project Schedule).

Objective 4: Examine potential changes in fish species distributions and connectivity of habitats associated with landcover and climate change scenarios. We will examine potential shifts in the distribution of streams habitat for 10-15 fish species during the second year of the project (details are described in Job 4 and the Project Schedule).

Objective 5: Write reports and manuscripts. 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 in cooperation with the IDNR Watershed Protection Section/ Office of Resource Conservation located in Springfield.

Job 1: Identify coolwater habitats (reaches) on wadeable streams in Illinois and their associated fish species in greatest need of conservation.

We will supplement field based temperature records and model output from previous projects (Hinz et al. 2011, Metzke et al. 2012) with new information to identify coolwater reaches on wadeable streams throughout Illinois. Stream reaches that have been identified with coolwater or transitional thermal regimes will be selected for further assessment in subsequent jobs. Existing community fish collections will be evaluated for similarity with coldwater and coolwater guilds previously identified (Hinz et al. 2011,

Metzke et al. 2012). Stream reaches with these assemblages will also be selected for further assessment.

Job 2: Characterize thermal and flow regimes of identified coolwater reaches under current conditions and several scenarios describing changes to landcover and climate.

Previously developed water temperature (Wehrly et al. 2003; Hinz et al. 2011) and exceedance flow models (Seelbach et al. 2011) will be used to characterize the thermal and flow regimes of stream segments identified in Job 1. We will apply watershed summaries from an existing Illinois specific land transformation model (LTM) (<http://ltm.agriculture.purdue.edu/ILWIMI/default.htm>) to the temperature and flow models to characterize habitat conditions under LTM projections for 2025 and 2050 (Holtrop et al. 2006). Similar methods will be applied using regionally downscaled climate change model output available for Illinois. The approach will be similar to that used by Wiley et al. (2010) for the Muskegon River basin in Michigan although the base models differ.

In addition, we will document the thermal character of stream reaches with coolwater and transitional fish assemblages where such data are lacking by placing temperature monitors using methods developed for Illinois streams (Hinz et al. 2011). Temperature monitoring will also occur at 20-40 stream reaches where coolwater species have historically been present but have been absent from recent collections or where no recent collection efforts have been made (Metzke et al. 2012). Where recent fish sampling has not occurred we will make efforts to locate the target coolwater species using a backpack electrofishing unit and/or minnow seines.

Job 3: Assess the vulnerability (exposure and sensitivity) of coolwater reaches to potential landcover and climate changes based on alterations of thermal and flow regimes.

Vulnerability of coolwater stream reaches to a change in condition will be examined using the characterizations developed in Job 2. Exposure of coolwater stream reaches to landcover and climate change will be described by proportional changes from the currently defined condition (landcover attributes and climate summaries) within the local and total upstream watersheds. We will examine how the temperature and flow models respond to changes in landcover (e.g., proportion of urban landcover) and climate (e.g., mean precipitation, summer air temperature) bracketed around the LTM and the downscaled climate scenarios. Sensitivity to landcover and climate alterations will be assessed based on the observed behavior of the existing temperature and flow models at coolwater reaches. The magnitude of change required to dramatically alter the thermal or flow regime will be used as a measure of sensitivity. We will examine the influence of these alterations on a statewide stream classification being developed as part of an existing project (T-75-R-001: Hierarchical Framework for Wadeable Stream Management and Conservation; see also Warner et al. 2010). This statewide

classification uses stream size, thermal regime (Cold, Cool/Transitional, Warm), and hydrologic regime (low flow water yield) to characterize stream reaches throughout Illinois. The change in landcover or climate required to shift a stream into a different hydrologic or thermal class will be used as an index of sensitivity to landcover and/or climate change.

Job 4: Examine potential changes in fish species distributions and connectivity of habitats associated with landcover and climate change scenarios.

Previous work has identified several fish species as coolwater obligates (Brown Trout, Longnose Dace, Brook Stickleback, Mottled Sculpin) or associated with coolwater conditions (e.g., Southern Redbelly Dace, Fantail Darter, Blacknose Dace, Common Shiner, Brook Stickleback, Smallmouth Bass, Stonecat) in Illinois wadeable streams (Hinz et al. 2011). We will examine the overlap in known distributions of these species (Metzke et al. 2012) with habitat distributions associated with the land transformation and climate model outputs derived in Job 2. Differences in overlap between current and projected fish presence and coolwater habitat will be used as one measure of vulnerability to landscape and climate changes.

A second measure of vulnerability will be derived using species specific distribution models developed for coolwater species previously identified (Hinz et al. 2011; Metzke et al. 2012). We will develop species distribution models for key fish species with Maxent (Phillips 2004, Phillips et al. 2006, Phillips et al. 2008) using GIS derived summaries of watershed character and regional climate. Differences between models developed using current conditions and those associated with the LTM and climate downscaling will be used as a measure of vulnerability to change.

We will use a connectivity analysis (Hinz et al. 2011) to describe fragmentation of coolwater habitats (Job 2) and key species population distributions (identified above) under current conditions and conditions based on landscape alteration and climate change scenarios. The degree of fragmentation and the extent of coolwater conditions will be a third measure of vulnerability to landscape and climate change.

Job 5: Write reports and manuscripts.

Provide annual and final reports that include the results of the habitat vulnerability and fish species vulnerability assessments. We will include maps depicting the current and anticipated extent of coolwater habitat for wadeable streams in Illinois, projected changes in coolwater fish distributions, and a relative ranking of exposure and sensitivity to landscape and climate alteration.

Anticipated Outcomes and Benefits/Products:

This project will provide a vulnerability assessment for coolwater stream reaches and their associated fish Species in Greatest Need of Conservation to potential changes in landcover and climate. Exposure to landcover alteration and climate change will be examined by comparing current condition with an existing statewide landcover transformation model and downscaled regional climate data. We will use Illinois specific models for stream temperature and exceedance flows to evaluate sensitivity of stream reach types to several scenarios describing statewide landcover alteration and climate change. Similar evaluations will be made to describe potential changes in the distribution of fish Species in Greatest Need of Conservation associated with coolwater habitats. Results of these efforts can be used to prioritize conservation and management activities, direct monitoring and assessment, and assist with revision of the IWAP.

Expected outputs associated with this project include:

1. Verification of existing stream habitat models (Q and Temp) and classification of coolwater and transitional stream reaches plus associated fish assemblages.
2. Statewide and reach scale assessment of Exposure and Sensitivity of coolwater stream habitats to landcover and climate changes.
3. Evaluation of extent of fragmentation of coolwater habitats under existing conditions and under landcover and climate changes.
4. Maps of current and expected distribution of coolwater habitat conditions.
5. Maps of coolwater fish distributions under landscape and climate scenarios.

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Budget Year 1

PROJECT BUDGET Expense Line Item	Year 1			Total
	Request	INHS Match	IDNR Match	
SALARIES & WAGES				
Professional (INHS)	\$44,500	\$10,000	\$0	\$54,500
GRA - academic yr				\$0
GRA - summer (no classes)				\$0
Professional (IDNR) includes fringe			\$22,567	\$22,567
Student Hourly - full time student				\$0
Non-student hourly	\$6,000			\$6,000
Total Salaries & Wages	\$50,500	\$10,000	\$22,567	\$83,067
FRINGE BENEFITS				
Professional @ 44.67%	\$19,878	\$4,467	\$0	\$24,345
GRA - ac yr @ 5.99%	\$0	\$0	\$0	\$0
GRA - summer (no classes) 13.64%	\$0	\$0	\$0	\$0
Professional (IDNR) included above	\$0	\$0	\$0	\$0
Student Hourly - full time student 0.14%	\$0	\$0	\$0	\$0
Non-student hourly @ 7.79%	\$467	\$0	\$0	\$467
Total Fringe Benefits	\$20,345	\$4,467	\$0	\$24,812
Total Salaries, Wages, & Fringe Benefits	\$70,845	\$14,467	\$22,567	\$107,879
TRAVEL				
Out of state				\$0
In state	\$2,000			\$2,000
Total Travel	\$2,000	\$0	\$0	\$2,000
MATERIALS & SUPPLIES - General	\$1,655			\$1,655
Total Materials & Supplies	\$1,655	\$0	\$0	\$1,655
CONTRACTUAL SERVICES - General	\$500			\$500
Conference Registration Fees				
Total Contractual Services	\$500	\$0	\$0	\$500
TELECOMMUNICATION SERVICES				\$0
EQUIPMENT (each item \$5000 +)				\$0
Total Direct Costs	\$75,000	\$14,467	\$22,567	\$112,034
Modified Total Direct Costs (MTDC)	\$75,000	\$14,467	\$22,567	\$112,034
F&A (20% MTDC)	\$15,000			\$15,000
F&A (INHS 24% MTDC; IDNR 21.96%)		\$3,472	\$4,956	\$8,428
Unrecovered F&A (20% vs. 24%)		\$3,000	\$0	\$3,000
Total Proposed Project Budget	\$90,000	\$20,939	\$27,523	\$138,462
	65.0000%	15.1226%	19.8774%	

Budget Year 2

PROJECT BUDGET Expense Line Item	Request	Year 2		Total
		INHS Match	IDNR Match	
SALARIES & WAGES				
Professional (INHS)	\$44,500	\$10,000	\$0	\$54,500
GRA - academic yr				\$0
GRA - summer (no classes)				\$0
Professional (IDNR) includes fringe			\$22,567	\$22,567
Student Hourly - full time student				\$0
Non-student hourly	\$6,000			\$6,000
Total Salaries & Wages	\$50,500	\$10,000	\$22,567	\$83,067
FRINGE BENEFITS				
Professional @ 44.67%	\$19,878	\$4,467	\$0	\$24,345
GRA - ac yr @ 5.99%	\$0	\$0	\$0	\$0
GRA - summer (no classes) 13.64%	\$0	\$0	\$0	\$0
Professional (IDNR) included above	\$0	\$0	\$0	\$0
Student Hourly - full time student 0.14%	\$0	\$0	\$0	\$0
Non-student hourly @ 7.79%	\$467	\$0	\$0	\$467
Total Fringe Benefits	\$20,345	\$4,467	\$0	\$24,812
Total Salaries, Wages, & Fringe Benefits	\$70,845	\$14,467	\$22,567	\$107,879
TRAVEL				
Out of state				\$0
In state	\$2,000			\$2,000
Total Travel	\$2,000	\$0	\$0	\$2,000
MATERIALS & SUPPLIES - General	\$1,655			\$1,655
Total Materials & Supplies	\$1,655	\$0	\$0	\$1,655
CONTRACTUAL SERVICES - General	\$500			\$500
Conference Registration Fees				
Total Contractual Services	\$500	\$0	\$0	\$500
TELECOMMUNICATION SERVICES				\$0
EQUIPMENT (each item \$5000 +)				\$0
Total Direct Costs	\$75,000	\$14,467	\$22,567	\$112,034
Modified Total Direct Costs (MTDC)	\$75,000	\$14,467	\$22,567	\$112,034
F&A (20% MTDC)	\$15,000			\$15,000
F&A (INHS 24% MTDC; IDNR 21.96%)		\$3,472	\$4,956	\$8,428
Unrecovered F&A (20% vs. 24%)		\$3,000	\$0	\$3,000
Total Proposed Project Budget	\$90,000	\$20,939	\$27,523	\$138,462
	65.0000%	15.1226%	19.8774%	

Budget Full Project

PROJECT BUDGET Expense Line Item	Request	Project Total		Total
		INHS Match	IDNR Match	
SALARIES & WAGES				
Professional (INHS)	\$89,000	\$20,000	\$0	\$109,000
GRA - academic yr	\$0	\$0	\$0	\$0
GRA - summer (no classes)	\$0	\$0	\$0	\$0
Professional (IDNR) includes fringe	\$0	\$0	\$45,134	\$45,134
Student Hourly - full time student	\$0	\$0	\$0	\$0
Non-student hourly	\$12,000	\$0	\$0	\$12,000
Total Salaries & Wages	\$101,000	\$20,000	\$45,134	\$166,134
FRINGE BENEFITS				
Professional @ 44.67%	\$39,756	\$8,934	\$0	\$48,690
GRA - ac yr @ 5.99%	\$0	\$0	\$0	\$0
GRA - summer (no classes) 13.64%	\$0	\$0	\$0	\$0
Professional (IDNR) included above	\$0	\$0	\$0	\$0
Student Hourly - full time student 0.14%	\$0	\$0	\$0	\$0
Non-student hourly @ 7.79%	\$934	\$0	\$0	\$934
Total Fringe Benefits	\$40,690	\$8,934	\$0	\$49,624
Total Salaries, Wages, & Fringe Benefits	\$141,690	\$28,934	\$45,134	\$215,758
TRAVEL				
Out of state	\$0	\$0	\$0	\$0
In state	\$4,000	\$0	\$0	\$4,000
Total Travel	\$4,000	\$0	\$0	\$4,000
MATERIALS & SUPPLIES - General				
Total Materials & Supplies	\$3,310	\$0	\$0	\$3,310
CONTRACTUAL SERVICES - General				
Conference Registration Fees	\$1,000	\$0	\$0	\$1,000
Total Contractual Services	\$1,000	\$0	\$0	\$1,000
TELECOMMUNICATION SERVICES				
EQUIPMENT (each item \$5000 +)	\$0	\$0	\$0	\$0
Total Direct Costs	\$150,000	\$28,934	\$45,134	\$224,068
Modified Total Direct Costs (MTDC)	\$150,000	\$28,934	\$45,134	\$224,068
F&A (20% MTDC)	\$30,000			\$30,000
F&A (INHS 24% MTDC; IDNR 21.96%)		\$6,944	\$9,912	\$16,856
Unrecovered F&A (20% vs. 24%)		\$6,000	\$0	\$6,000
Total Proposed Project Budget	\$180,000	\$41,878	\$55,046	\$276,924
	65.0000%	15.1226%	19.8774%	

Location:

This project will be completed by INHS staff in Springfield with the assistance of IDNR staff in Springfield.

Compliance:

A final report will be prepared at the end of the project. Results will be made available to the Illinois Department of Natural Resources, the Wildlife Action Plan Team, and to other interested parties upon request.

Budget Justification:

IDNR Project Support: This project supports the IDNR's Wildlife Action Plan. To promote coordination with IDNR personnel, primary project staff will be located at the IDNR headquarters in Springfield. The IDNR will provide project staff office space and other supplies and items necessary to support the project. Examples include telephone, computer support (e.g., printer, network, and email access), motor pool, etc.

Salaries and Wages: We request a total of \$89,000 to support one full time and one part time research scientist for the duration of the project. We also request a total of \$12,000 to support one summer hourly worker in each year of the project to assist with site visits and data entry. The salary of Leon Hinz used for cost sharing is paid from INHS operating funds and is at no cost to the sponsor. The salaries of Ann Holtrop and Andrew Hulin will be used for cost sharing and are paid from IDNR operating funds and are at no cost to the sponsor.

Fringe Benefits: We request a total of \$40,690 in Fringe benefits in accordance with those budgeted for wages. Fringe benefits will be paid at a rate of 44.67% for INHS Professional staff, and 7.79% for hourly staff of INHS. Rates have been negotiated by the University of Illinois at Urbana/Champaign. Fringe benefits for IDNR staff used as match are included as part of *Salaries and Wages* recorded as an hourly rate.

Travel: We request a total of \$4,000 to reimburse staff for expenses encountered while making site visits to coolwater habitats and presenting research findings at meetings. These funds will support two sampling trips each spring and summer for monitoring water temperature and stream assessment. In addition, we plan to present research findings at a regional meeting (e.g., Annual Meeting of the Illinois Chapter of the American Fisheries Society) to obtain feedback from partners and researchers doing similar work. Lodging and per diem will be reimbursed for two staff members during each sampling trip at the appropriate State rates.

Materials & Supplies: We request a total of \$3,310 to purchase waterproof temperature data loggers and provide support for general office supplies and sampling gear associated with expected project activities.

Contractual Services: We request \$1,000 for Contractual Services over the project period. These funds are needed for software licensing, and to reimburse staff for conference registration fees necessary to present research findings at a regional professional meeting. Presentations at professional meetings inform the scientific community, resource managers, and the public of ongoing work allowing for peer review and public input/comment of project work.

Equipment: We request no funds for equipment.

Facilities and Administrative Costs: We request \$30,000 to offset facilities and administrative costs at the rate of 20% of direct costs. Rates have been negotiated by the University of Illinois at Urbana/Champaign.

Personnel:

The personnel funds requested in this project will fund one full time research scientist and one part time research scientist to conduct analysis and manage the project. Additional funds will support an hourly worker to assist with 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:

Ann Marie Holtrop
IDNR Watershed Protection Section
phone: (217) 785-4325
email: ann.holtrop@illinois.gov

Additional personnel involved in this project at the same location include:

Leon C. Hinz Jr., Ph.D.
Illinois Natural History Survey
Prairie Research Institute
University of Illinois Champaign-Urbana
phone: (217) 785-8297
email: leon.hinz@illinois.gov

Brian A. Metzke
Illinois Natural History Survey
phone: (217) 557-9251
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Jodi Vandermyde
Illinois Natural History Survey
phone: (217) 782-4438
email: jodi.vandermyde@illinois.gov

Relationship to Other Grants:

This project builds on of previous work funded through Illinois' State Wildlife Grant program and other funding sources. Development of statewide stream attributes (T-3-R-001), landscape based hydrologic (T-2-R-001) and water temperature models (T-13-R-001) form the background layers upon which the assessment will be based. Some coolwater stream reaches have been identified through direct monitoring while coolwater conditions have been associated to other reaches using a multiple regression based model of summer stream water temperature (T-13-R-001). Using observed and modeled water temperatures we have examined affinities of fish species to summer thermal regimes in Illinois streams (T-13-R-001). We have also assessed the current status and mapped the historical and current distributions for these fish species (T-68-R-001). These data have been used to classify wadeable stream segments throughout Illinois based on their size, hydrology (low flow yield), and thermal character (T-75-R-001).

A land transformation model was developed for Illinois as part of a regional collaboration with neighboring states (MI, WI) and will be used to assess potential changes in landcover within study watersheds (T-2-R-001 and T-3-R-001). Regional climate data and climate change model outputs are being attributed to Illinois watersheds as part of an INHS project funded by the Upper Midwest and Great Lakes Landscape Conservation Cooperative (DeWalt et al. 11-03: Predicting Climate Change Effects of Riverine Aquatic Insects Using Museum Data and Niche Modelling).

This study will use these data to assess the vulnerability (exposure and sensitivity) of coolwater stream habitats, and associated fish species, to potential changes in regional and local landcover and climate. Outputs will include maps depicting existing and potential habitat extent and species distributions, and an assessment of the relative vulnerability of existing habitats and populations to change associated with potential alterations in landcover and climate.

Project Schedule:

	09/13 – 12/13	01/14 – 03/14	04/14 – 06/14	07/14 – 08/14
Job 1.	X	X	X	
Job 2.		X	X	X
Job 3.				
Job 4.				
Job 5.				X

	9/14 – 12/14	01/15 – 03/15	04/15 – 06/15	07/15 – 08/15
Job 1.				
Job 2.			X	X
Job 3.	X	X	X	X
Job 4.	X	X	X	X
Job 5.				X