Project Summary

Project Title: Identifying Regional Priority Areas for Focusing Conservation Actions in Streams and Grasslands: Conservation Planning.

Applicant information: Illinois Natural History Survey

Principle Investigators: Yong Cao, Leon Hinz

Purpose and Objectives: The primary purpose of this project is the direct refinement and revision of the Illinois Wildlife Action Plan by defining and incorporating priority areas for streams and grasslands based on regional distributions of selected mussel and bird Species in Greatest Need of Conservation (SGNC). We also aim to inform the revision of our partner state's Action Plans by providing a regional lens that can be used to update status, distribution, and regional conservation needs for state prioritizations of selected SGNC.

Objective 1. Integrate regional species distribution models and associated data.
Objective 2. Identify regional conservation focal areas for streams and for grasslands.
Objective 3. Assess current status of Conservation Opportunity Areas (COA) at conserving project grassland and stream SGNC regionally and identify where gaps exist.
Objective 4. Complete final report and provide species distribution and conservation focal area maps to partner states for inclusion into revised State Wildlife Action Plans.

Proposed Grant Period: October 1, 2014 – September 30, 2015

Amount Requested (Planning Grant): INHS will provide in-kind match of $22,107 during the project period from staff salary and associated benefits plus unrecovered F&A.

	Total Federal	Total Non-Federal	Total Cost
Year One Funding	$66,320	$22,107	$88,427

States and Partners Involved: Illinois Department of Natural Resources, Illinois Natural History Survey, Indiana Department of Natural Resources Division of Fish and Wildlife, Michigan Department of Natural Resources, Wisconsin Department of Natural Resources, and Upper Midwest and Great Lakes Landscape Conservation Cooperative

Summary Statement:

This project will identify priority conservation areas using a regional perspective for selected stream and grassland species in greatest need of conservation (SGNC) for incorporation into State Wildlife Action Plans. Project outputs will include maps of proposed Regional Priority Areas, identification of gaps in current conservation network coverage, and identification of regional distribution patterns of selected SGNC. The results of this project will be incorporated into the Action Plan revision process in Illinois and partnering States (IN, MI, WI).

Identifying Regional Priority Areas for Focusing Conservation Actions in Streams and Grasslands: Conservation Planning.

Project Number:

Need:

The Illinois Department of Natural Resources and their conservation partners have begun a formal review and revision of the State Wildlife Action Plan to fulfill the US Fish and Wildlife Service requirements associated with initial Plan acceptance. Illinois' Wildlife Action Plan (IWAP) has been a key tool in aiding the conservation of Species of Greatest Need of Conservation (SGNC) at the state level. However, species of conservation interest seldom respect political boundaries and successful long-term conservation planning will require regional efforts for many species.

During the Illinois Action Plan revision process a subset of focal species will be identified that are: 1) in need of conservation action over the next decade to address declines in distribution, population size, or habitat quality or quantity; 2) sensitive to the priority conservation actions implemented through the Campaigns; 3) amenable to monitoring given current staffing levels and existing sampling techniques; and 4) representative of other species occupying their habitat.

In order to effectively select these focal species, we need to document the status and trends of Illinois SGNC and their habitats, as well as impending threats. Recently an extensive review of Illinois fish SGNC was conducted (T-68), and similar reviews are underway for mussels (T-82) and non-mussel invertebrates (T-88). While these projects have or will provide essential information for updating species information in Appendix I and II of Illinois' Action Plan, they have been focused solely on locations within Illinois.

In our revised Action Plan, we desire to add a regional lens to our selection of focal species. Agency staff tasked with updating State Wildlife Action Plans in neighboring states (Indiana, Michigan, Wisconsin), and regional Landscape Conservation Cooperative staff (Upper Midwest and Great Lakes-LCC, Eastern Tallgrass Prairie and Big Rivers-LCC) have collectively agreed on the need to develop a regional lens. This project and the companion project are designed to assist these efforts by identifying regional conservation priority areas for selected stream and grassland species of conservation need in Illinois and partnering states (IN, MI, WI).

Many streams throughout the Midwest have been severely degraded associated with development for human needs (e.g., agriculture, water supply, flood reduction) and the introduction of exotic and invasive species. Although some high quality examples remain throughout the region, many streams have water quality and sediment impairments that have impacted populations of SGNC that are dependent on running water habitats (e.g., crayfish, fish, insects, mussels). Our efforts here will focus on selected freshwater mussels and their associated fish hosts.

Across the Midwest region, most historic native grassland complexes have been severely degraded or lost due to conversion to agriculture or other human uses, or from altered disturbance regimes leading to vegetative succession. As a result many grassland natural community types are regionally or globally imperiled (e.g., lakeplain mesic sand prairie, mesic prairie). Remaining grasslands, while largely degraded, and still important habitats for many SGNC in Illinois and neighboring states. Our efforts here will focus on selected grassland bird species.

Purpose and Objectives:

The primary purpose of this project is the direct refinement and revision of priority areas for grassland and stream SGNC based on their regional distributions. We aim to further revise the Illinois Wildlife Action Plan and inform the revision of the partner state Action Plans by providing a regional lens that can be used to update status and distribution of selected SGNC, and prioritize conservation actions in areas of regional importance.

Objective 1. Integrate regional species distribution models and associated data with regional geospatial databases for conservation planning and modeling.
Objective 2. Identify at least two regional conservation focal areas for grasslands and two for streams using the identified conservation priorities, including selected species distribution models, with a Marxan modeling approach.
Objective 3. Assess current status of Conservation Opportunity Areas (COA) at conserving grassland and stream SGNC regionally and identify where gaps exist.
Objective 4. Complete final report and provide species distribution and conservation focal area maps to partner states for incorporation into revised State Wildlife Action Plans.

Anticipated Outcomes and Benefits:

By completing the objectives of this grant, progress will be made towards updating the Illinois Wildlife Action Plan, as well as providing guidance on regionally important areas to focus conservation actions for updates to partnering states' Action Plans. This work will directly benefit at least nine representative regional terrestrial and aquatic conservation targets (SGNC) in Illinois and partnering states.

Expected outputs associated with this project include:

1. Maps of regional species distributions of currently listed species in IL, IN, MI, and WI.
2. Maps of regional conservation focal areas for streams and grasslands.
3. Map of gaps between existing COAs and those necessary to conserve representative stream and grassland SGNC across the region.
4. Suggested modifications to Illinois and Wisconsin COAs for incorporating regional needs of stream and grassland SGNC.
5. Suggested COAs for Michigan and Indiana for incorporating regional conservation needs of stream and grassland SGNC.

Approach:

Job 1. Integrate regional species distribution models and associated data with regional geospatial databases for conservation planning and modeling.

With the assistance of our regional partners we will integrate information on existing state conservation priorities, COAs, and species distribution models developed from our companion project into our GIS infrastructure. These data will be used to inform the conservation planning in subsequent jobs.

Job 2. Identify at least two regional conservation focal areas for grasslands and two for streams using the identified conservation priorities, including selected species distribution models, with a Marxan modeling approach.

In an effort to identify regional conservation focal areas for grasslands and streams, we will use information developed in Job 1 as inputs to Marxan software (Ball et al. 2009, Watts et al. 2009). Marxan produces conservation areas by optimizing the aggregation of individual planning units to meet a desired number of conservation targets. It is flexible enough to allow the user to enforce including planning units within existing protected areas, minimize fragmentation of planning units, or including a cost for each planning unit that can be minimized (e.g., cost of purchasing the land or obtaining an easement). Marxan starts with a random selection of planning units and goes through a number of iterations, removing and replacing planning units to arrive at an optimal solution. Any given Marxan solution will be different than a previous solution. We will use at least 1,000 Marxan runs for each of the analyses we conduct, sum the number of times a given planning unit is part of a solution, and then create a final solution from those planning units most often part of an optimal solution.

The regional extent of the species distribution model outputs will determine the bounds on the regional conservation focus areas. This in turn will determine the appropriate resolution or size of the individual planning units used in the conservation focal area analysis (i.e., smaller planning units can be used in a smaller area). After completing the species distribution models we will use the spatial extent of the distribution models, the needs of the individual state agencies, and a literature review to determine the appropriate spatial resolution (i.e., geographic area) of the planning units.

We will develop regional conservation focal areas for streams and grasslands using the project focal species as conservation targets. Additionally, conservation targets from combinations of species or individual species from the habitat groups may be developed to explore their use as management tools. We may find that one or two species effectively captures the conservations need for a group of species.

The Wildlife Action Plans in Illinois, Indiana, Michigan, and Wisconsin are organized by habitats. In Illinois, seven campaigns (including Farmland and Prairie, Forest and Woodland, Streams, and Wetlands) provide the structure by which conservation actions are grouped. In Indiana, eight major habitat types such as grasslands, wetlands, and forests are categorized, and some of these are further divided. In Michigan, broad habitats such as grasslands are subdivided

into more detailed types, such as prairie and savanna. Similarly in Wisconsin, the habitats addressed by this project are broader categories of natural community types identified in their Plan. The resulting conservation focal areas created in Job 2 will be used by each state to refine their State Wildlife Action Plan by providing a regional context within which to prioritize conservation actions for these habitat types and species. In Illinois, the Farmland and Prairie Campaign has promoted conservation actions toward grasslands birds in priority SAFE areas. The focal areas identified in this job will be compared to the existing SAFE areas and additional focal areas will be considered. The Streams Campaign currently has very limited priorities for work, and the results of this job will be incorporated into the Campaign during the Wildlife Action Plan revision.

Job 3. Assess current status of Conservation Opportunity Areas at conserving grassland and stream SGNC regionally and identify where gaps exist.

Currently Illinois and Wisconsin have designated Conservation Opportunity Areas within their State Action Plans although Indiana and Michigan do not. Regionally, Chicago Wilderness has a Green Infrastructure Plan that covers portions of each of the four states. In order to assess the efficacy of existing COA and Green Infrastructure plans at conserving project SGCN in grassland and streams, these conservation planning areas will be compared with the conservation focal areas identified in Job 2 to identify potential gaps in coverage within these efforts.

In addition the focal areas for streams and grasslands defined in this project can provide a framework for Michigan and Indiana to define COAs, as well as provide an opportunity for all partnering states to consider how COAs or focal areas align across state boundaries. Overlays of existing COAs and Green Infrastructure Plans with focal areas identified in this project will be provided to IDNR and our project partners.

Job 4. Complete final report and provide species distribution and conservation focal area maps to partner states for inclusion into revised State Wildlife Action Plans.

A final report describing the development of conservation focal areas for grassland and stream focal species, the assessment of existing COAs will be prepared and distributed to each of the partnering states. Additionally, geospatial databases containing all pertinent information collected, summarized, or developed during the project will be provided to partners for use in updating their Wildlife Action Plans.

Literature Cited:

Ball, I.R., H.P. Possingham, and M. Watts. 2009. Marxan and relatives: Software for spatial conservation prioritization. Chapter 14: Pages 185-195 in Spatial conservation prioritisation: Quantitative methods and computational tools. Eds Moilanen, A., K.A. Wilson, and H.P. Possingham. Oxford University Press, Oxford, UK.

DeWalt, R.E., Y. Cao, L. Hinz and T. Tweddale. 2009. Modelling of historical stonefly distributions using museum specimens. Aquatic Insects 31(suppl. 1): 253-267.

Esselman, P.C., D. M. Infante, L. Wang, D. Wu, A.R. Cooper and W.W. Taylor. 2011. An Index of Cumulative Disturbance to River Fish Habitats of the Conterminous United States from Landscape Anthropogenic Activities. Ecological Restoration 29: 133-151.

Liaw, A. and M. Wiener (2002). Classification and Regression by randomForest. R News 2(3), 18—22.

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

Watts, M.E, I.R. Ball, R.R. Stewart, C.J. Klein, K. Wilson, C. Steinback, R. Lourival, L. Kircher, and H.P. Possingham. 2009. Marxan with Zones: software for optimal conservation based land- and sea-use zoning, Environmental Modelling & Software (2009), doi:10.1016/j.envsoft.2009.06.005

Useful life:

Not applicable to this project.

Geographic Location:

This project will be completed by INHS staff in Champaign and Springfield with the assistance of IDNR in Springfield and our partners in IN, MI, and WI.

Personnel:

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

Ann Marie Holtrop, Action Section Head
IDNR – Watershed Protection Section
Phone: (217) 785-4325
Email: ann.holtrop@illinois.gov

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

Dr. Leon C. Hinz Jr. (Co-Principle Investigator)
Illinois Natural History Survey
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James Renn, Illinois Wildlife Action Plan Coordinator
IDNR – Watershed Protection Section
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Email: james.renn@illinois.gov

Stan McTaggart, Farmland and Prairie Campaign Coordinator
IDNR – Division of Wildlife
Phone: (217) 558-6623
Email: stan.mctaggart@illinois.gov

Additional personnel involved in this project at other locations include:

Dr. Yong Cao (Co-Principle Investigator)
Illinois Natural History Survey
1826 South Oak Street
Champaign, IL 61820
Phone: (217) 244-6847
Email: yongcao@illinois.edu

Program Income:

Not applicable to this project. No income will be generated through these efforts.

Budget:

PROJECT BUDGET Expense Line Item	Project Total Request	Match	Total
SALARIES & WAGES			
Professional	$36,500	$341	$36,841
Total Salaries & Wages	**$36,500**	**$341**	**$36,841**
FRINGE BENEFITS			
Professional @ 42.94%	$15,673	$147	$15,820
Total Fringe Benefits	**$15,673**	**$147**	**$15,820**
Total Salaries, Wages, & Fringe Benefits	$52,173	$488	$52,661
TRAVEL			
Out of state	$2,194	$0	$2,194
Total Travel	**$2,194**	**$0**	**$2,194**
MATERIALS & SUPPLIES - General	$500	$0	$500
Total Materials & Supplies	**$500**	**$0**	**$500**
CONTRACTUAL SERVICES - General	$400	$0	$400
Total Contractual Services	**$400**	**$0**	**$400**
TELECOMMUNICATION SERVICES	$0	$0	$0
EQUIPMENT (each item $5000 +)	$0	$0	$0
Total Direct Costs	$55,267	$488	$55,755
Modified Total Direct Costs (MTDC)	$55,267	$488	$55,755
F&A (20% MTDC)	$11,053		$11,053
F&A (58.6% MTDC)		$286	$286
Unrecovered F&A (20% vs. 58.6%)		$21,333	$21,333
Total Proposed Project Budget	**$66,320**	**$22,107**	**$88,427**
	75.0000%	25.0000%	

Budget narrative:

Salaries and Wages: We request $36,500 for one full time salaried employee who will be hired to assist with integration of distribution models, identification of conservation focal areas, and assessing the status of COAs at conserving grassland and stream SGNC.

Fringe Benefits: We request $15,673 in fringe benefits in accordance with those budgeted for wages. Fringe benefits will be paid at a rate of 42.94% for Professional staff; rates have been negotiated by the University of Illinois Urbana/Champaign.

Travel: We request a total of $2,194 to reimburse staff and collaborators for expenses associated with coordination meetings and workshops. We anticipate three multiday coordination meetings that will require travel to partnering states. These funds will be used to cover food, lodging, and mileage using the appropriate allowable state rates.

Materials and Supplies: We request a total of $500 to provide support for consumable project supplies associated with expected project activities.

Contractual Services: We request $400 for contractual services for software licensing over the project period.

Equipment: We request no funds for equipment.

Facilities and Administration Costs: We request $11,053 to offset facilities and administrative costs at the rate of 20% of modified total direct costs. Rates have been negotiated by the University of Illinois at Urbana/Champaign.

Cost Share: Yong Cao, will contribute a portion of his time to this project at no cost to the project. However, his efforts will serve as cost share. Additionally, we will use unrecovered F&A (difference between the negotiated 20% rare vs. the on-campus 58.6% rate) as cost share.

Multipurpose Projects:

Not applicable to this project.

Relationship to Other Grants:

Status revision and update for Illinois' fish Species in Greatest Need of Conservation (T-68). This project developed geospatial data and distribution maps using available records from museum collections and state-wide monitoring programs as well as updated the status of fish SGNC in Illinois. We will use results from this project to assist with modeling distributions of fish species that act as hosts for the focal mussel species selected for this project.

Defining Expectations for Mussel Communities in Illinois Wadeable Streams (T-82). This project will refine and update mollusk species in greatest need of conservation and develop distribution models for some mussel species in Illinois. We will use results of this project to assist with modeling distributions of the focal mussel species selected for this project.

Identifying Regional Priority Areas for Focusing Conservation Actions in Streams and Grasslands. (UMGL-LCC FY 2013, X-3-R-1). Grant secured by Ann Holtrop (IDNR) from UMGL-LCC to be used to fund species modeling and conservation prioritization.
The LCC grant (X-3-R-1) was accepted under the condition that additional funding from the state of Illinois would be used to complete the project. The budget justification within X-3-R-1 specifies that IL DNR SWG Funds will be used as part of the project (see Appendix 1). T-94-R-1 will provide the additional funding to allow the larger project to be completed. Appendix I describes the entire project, but does not specify which tasks will be completed with LCC and State Wildlife Grant funds. Appendix II describes which tasks will be completed by Illinois Natural History Survey personnel with the LCC funds. The T-94 proposal specifies which tasks will be completed by INHS personnel using IL SWG funds. Together, T-94 and Appendix II will complete the objectives described in Appendix 1 (i.e., X-3-R-1).

Project Schedule:

Job	10/14 – 12/14	1/15 – 3/15	4/15 – 6/15	7/15-9/15
1. Integrate regional data	**x**	**x**		
2. Identify regional conservation focal areas	**x**	**x**	**x**	
3. Assess status of COAs and identify gaps		**x**	**x**	**x**
4. Coordination and Reporting		**x**	**x**	**x**

General:

The project statement describes a need consistent with the State Wildlife Grants (SWG) program; states a purpose and sets objectives, both of which are based on the need; uses a planned approach, appropriate procedures, accepted principles of research, and is cost effective.

Compliance:

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

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

The activities supported by this grant for this project statement do not involve any other federal compliance issue.

Appendix 1. Project Proposal, X-3-R-1, that was funded by the UMGL LCC. The project schedule is being amended to align with T-94.

Upper Midwest & Great Lakes LCC Request for Funding in Fiscal Year 2013

Is this a continuation or new project? (please check one) **__Continuation _x_New**

Project Title: *Identifying Regional Priority Areas for Focusing Conservation Actions in Streams and Grasslands*

Project Coordinator ***(who is applying):***
Name*: Ann Marie Holtrop*
Affiliation*: IL Department of Natural Resources*
e-mail*: ann.holtrop@illinois.gov*
Phone number*: (217) 785-4325*

Project PI(s): ***(who is going to conduct the work; e-mail; phone number)***
Leon Hinz; leon.hinz@illinois.gov; (217)785-8297
Yong Cao; yongcao@illinois.edu;(217)244-6847

Additional Partners: ***(name, affiliation)***
Teri Tweddale, Illinois Natural History Survey

A. NEED*:*

Illinois, Indiana, Michigan, and Wisconsin are beginning formal review and revisions of our State Wildlife Action Plans, which is required by US Fish and Wildlife Service to be completed at no more than ten years after Plan acceptance. These Action Plans have been a key tool in aiding the conservation of Species in Greatest Need of Conservation (SGNC) at the state level. Since the writing and subsequent acceptance of state Action Plans, Landscape Conservation Cooperatives have been created and have fueled the desire to work collaboratively across state boundaries and agencies.

In the revised Action Plans, each state has expressed interest in selecting focal/priority species to better target conservation actions, and in adding a regional lens to the selection of these species. However tools that provide the needed regional context are lacking in the Midwest. The Wildlife Action Plans in Illinois, Indiana, Michigan, and Wisconsin are organized by habitats. In Illinois, seven campaigns (including Farmland and Prairie, Forest and Woodland, Streams, and Wetlands) provide the structure by which conservation actions are grouped. In Indiana, eight major habitat types such as grasslands, wetlands, and forests are categorized, and some of these are further divided. In Michigan, broad habitats such as grasslands are subdivided into more detailed types, such as prairie and savanna. Similarly in Wisconsin, the habitats addressed by this project are broader categories of natural community types identified in their Plan. Across the upper Midwest region, native grassland complexes have been severely lost due to development, conversion to agriculture, or lack of disturbance leading to vegetative succession. Those remaining are degraded, and many natural communities under the grassland

habitat type are imperiled or critically imperiled across the region or globally (e.g., lakeplain mesic sand prairie, mesic prairie). Similarly, streams throughout the Midwest have been severely degraded due to development, agriculture, dams, and the introduction of invasive species. Although some high quality examples remain throughout the region, many streams have water quality and sediment impairments. This project will begin the development of needed regional tools by identifying suitable habitats for selected SGNC across IL, IN, MI, and WI and developing regional conservation focal areas for grasslands and streams.

B. OBJECTIVES

- Objective 1. Develop regional species distribution models for at least five terrestrial grassland SGNC, and at least four freshwater mussel Species in Greatest Need of Conservation (SGNC) and their associated fish hosts.

- Objective 2. Identify at least two regional conservation focal areas for grasslands and two for streams using the distributions of species from Objective 1 and a Marxan modeling approach.

- Objective 3. Assess current status of Conservation Opportunity Areas at conserving grassland and stream SGNC regionally and identify where gaps exist.

- Objective 4. Complete final report and provide species distribution and conservation focal area maps to partner states for inclusion into revised State Wildlife Action Plans.

C. APPROACH:

Approach 1. Distribution Modeling

Working with grassland and stream taxa experts across IL, IN, MI, and WI, we will identify habitat needs for each of the selected SGNC. Candidate grassland species we will evaluate in this project are: Henslow's sparrow (*Ammodramus henslowii*; IL, IN, WI, MI), Grasshopper sparrow (*Ammodramus savannarum*; IL, MI, WI), Northern harrier (*Circus cyaneus*; IL, IN, MI, WI), Least weasel (*Mustela nivalis*; IL, IN, MI), Frosted elfin (*Callophrys irus*; IL, IN, MI, WI), Short-eared owl (*Asio flammeus*; IL, IN, MI, WI), and Poweshiek skipperling (*Oarisma Poweshiek*; IL, MI, WI). Candidate stream species we will evaluate include: Snuffbox (Epioblasma triquetra; *IL, IN, MI, WI*), Ellipse (*Venustaconcha ellipsiformis*; IL, IN, MI, WI), Salamander mussel (*Simpsonaias ambigua*; IL, IN, MI, WI), Purple Lilliput (*Toxolasma lividus*; IL, IN, MI), and Slippershell (*Alasmidonta viridis*; IL, MI, WI). Distributions of host fish species for each of these mussels (e.g., logperch *Percina caprodes* for snuffbox) will also be modeled and included in later analyses.

After we identify the habitat requirements of each species, we will compile available region-wide, spatially explicit, environmental data from various sources and create a library of environmental variables that are seamless across political boundaries. Recent efforts have developed state-wide (e.g., DeWalt et al. 2009) and regional (e.g., Great Lakes Aquatic Gap, http://www.glsc.usgs.gov/main.php?content=research_GAP_riverine&title=Aquatic%20GAP0&menu=research_NCE_GAP; National Fish Habitat Partnership's Assessment, Esselman et al. 2011) datasets that can be used for these purposes. Useful variables include 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 state databases including natural heritage databases, as well as collections and museum records.

Using the spatial data library and species location information, we will create species distribution models. We will use MaxEnt (Phillips et al. 2006) and randomForest (Liaw and Wiener 2002) modeling packages to examine similarities and differences in the model outputs. In addition to a presence/absence prediction, both modeling packages will provide the relative importance of each environmental variable in predicting likely or not likely habitat. The spatial extent of the modeling will be limited to the state boundaries of the four states partnering on this grant. However, some distribution models may be at a smaller geographic scale depending upon the known species distributions.

The species distribution models will not be verified with field testing under this project. Both modeling packages provide measures of model performance that we will use to evaluate to determine model effectively. Additionally, when there are adequate location data available for both modeling and testing, we will reserve a random subset of the location data to test the model outputs. Modeled distributions will be reviewed by wildlife and fish biologists and associated taxonomic experts within each state to ensure the results are reasonable and useful.

In addition to being used to meet Objective 2, the resulting species models will be used by each state to refine their State Wildlife Action Plan by providing a regional context within which to consider the distribution of the species. Specifically in Illinois, the resulting 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. In MI these modeling results will refine terrestrial species maps, which are currently done by county, and will help focus survey efforts.

Approach 2. Regional Conservation Focal Areas

In an effort to identify regional conservation focal areas for grasslands and streams, we will use the species distribution models as an input to Marxan software (Ball et al. 2009, Watts et al. 2009). Marxan produces optimal conservation focus areas by examining the amount of each conservation target within every planning unit and the percentage of the total conservation targets one choses to "preserve". The user can select other variables such as forcing planning units within existing protected areas to be in the result, clumping of planning units, or including a cost variable for each planning unit.

Marxan starts with a random selection of planning units and goes through a number of iterations, removing and replacing planning units to arrive at an optimal solution. Any given Marxan solution will be different than a previous solution. We will use at least 1,000 Marxan runs for each of the analyses we conduct, sum the number of times a given planning unit is part of a solution, and then create a final solution from those planning units most often part of an optimal solution. After completing the species distribution models we will use the spatial extent of the distribution models, the needs of the individual state agencies, and a literature review to determine the appropriate spatial resolution (i.e., geographic area) of the planning units.

We will develop regional conservation focal areas for grasslands and streams using the associated species as conservation targets. Additionally, conservation targets from combinations of species or individual species from the habitat groups will also be developed to explore their use as management tools. We may find that one or two species effectively captures the conservation need for a group of species.

Approach 3. Conservation Opportunity Areas

Currently Illinois and Wisconsin have Conservation Opportunity Areas defined, whereas Indiana and Michigan do not. Additionally, Chicago Wilderness has a Green Infrastructure map that covers parts of each of the four states. In order to assess the efficacy of existing COA and Green Infrastructure at conserving SGCN in grassland and streams, these conservation planning areas will be compared with the conservation focal areas identified in Approach 2 and gaps will be identified.

The focal areas defined in this project for grassland and streams will provide a framework for Michigan and Indiana to define COAs, as well as provide an opportunity for all four states to consider how COAs or focal areas align across state boundaries. Using GIS, we will overlay existing COAs for IL and WI with the results from Approach 2, and will work with state partners to identify opportunities for new COAs that cross state lines. The resulting conservation focal areas created in Approach 2 will be used by each state to refine their State Wildlife Action Plan by providing a regional context within which to prioritize conservation actions for these habitat types and species

Approach 4. Reporting

Illinois will submit a comprehensive report of all activities that address each objective conducted by or on the behalf of all States that receive funding to the WSFR Regional office by the required performance reporting period. Additionally, species distribution and conservation focal area maps will be provided to each partner state for inclusion into revised State Wildlife Action Plans.

D. EXPECTED RESULTS & BENEFITS:

By completing the objectives of this grant, progress will be made towards updating each state's Wildlife Action Plan to include updated species status that includes regional distribution. Additionally, revised state Action Plans will include regionally-important conservation areas that are currently unavailable. This work will directly benefit at least nine representative terrestrial and aquatic SGNC that are common across the partnering states.

E. DELIVERABLES:

6. Maps of regional species distributions of currently listed species in IL, IN, MI, and WI.
7. Maps of regional conservation focal areas for streams and grasslands.
8. Map of gaps between existing COAs and those necessary to conserve representative stream and grassland SGNC across the region.
9. Suggested modifications to Illinois and Wisconsin COAs for incorporating regional needs for stream and grassland SGNC.
10. Suggested COAs for Michigan and Indiana for incorporation regional conservation needs for stream and grassland SGNC.
11. A final report, submitted as an Illinois Natural History Survey Technical Report, will be submitted at the end of the project.

We will work closely with taxa experts and the Wildlife Action Plan coordinators in each state to ensure the project is progressing in a useful and timely manner. Three face to face meetings throughout the project are preferred, but conference calls and webinars will be held if travel by our partners is limited. Additionally, we will communicate frequently with the UMGLLCC

Science Coordinator to ensure that we are developing a useful tool for incorporating regional conservation into state plans.

F. SCHEDULE:

Objective	10/13-12/13	1/14-3/14	4/14-6/14	7/14-9/14
5. Create regional distribution models and deliver data to partner states	x	x		
6. Identify regional conservation focal areas and deliver data to partner states		x	x	
7. Assess status of COAs and identify gaps			x	x
8. Complete and deliver final report				x

G. BUDGET & JUSTIFICATION:

The $35,000 requested from UMGLLCC will be used in conjunction with $66,320 provided by Illinois DNR through the FY'13 Illinois State Wildlife Grant Program to jointly fund the total project. Illinois will seek a separate FY'13 SWG project through the USFWS Region 3 Office for the IDNR part of this project. Illinois will contribute $31,849 in no-federal funds to match the FY'13 SWG funds. Non-federal funds are staff time and allowable indirects.

- ***Provide Line-Item Descriptions here for costs entered in Budget Worksheet:***

  - Salaries (including fringes): Title: $10,000 GIS Analyst, $10,000 from project management and model application, and $36,000 for 12-month technician.
  - Equipment (including IT): none requested
  - Contractual Services: licensing software
  - Materials and Supplies: general office supplies
  - Travel: reimburse staff and collaborators for expenses associated with coordination meetings and workshops
  - Publication Costs: none requested
  - Indirect Costs: A rate of 21.96% was assessed by IDNR on LCC money. A rate of 20% is assessed by the Illinois Natural History Survey on IDNR SWG funds.

BUDGET TABLE. Provide costs for each category listed below. Add columns for additional years (e.g., Out-year 2 (FY 2015)).

Cost category	Previous year(s)	FY 2013 (this request)	IL DNR SWG Funds	Total

Personnel (salaries/wages)	0	20,405	36,500	56,905
Fringe benefits	0	8,762	15,673	24,435
Travel	0	0	2,194	2,194
Materials & supplies	0	0	500	500
Contractual	0	0	400	400
Other (specify below)	0	0	0	0
Indirect costs	0	5,833	11,053	16,886
Total LCC funds requested	0	35,000		
Match (in-kind or cash)	0		22,107	

H. PRINCIPAL INVESTIGATOR QUALIFICATIONS

Include curriculum vitae (CV) for each principal investigator (no more than two pages). CV pages do not count against the application length.

Appendix II. Project Proposal that delivers the money that IDNR received through Appendix I to INHS personnel to complete the work. This proposal identifies the tasks of Appendix I that will be funded by the LCC.

Project Title: Identifying Regional Priority Areas for Focusing Conservation Actions in Streams and Grasslands: Distribution Models

Applicant information: Illinois Natural History Survey

Principle Investigators: Leon C. Hinz Jr., Yong Cao

Purpose and Objectives: The purpose of this project is to meet resource collection and management decision needs by updating and developing information required for State Wildlife Action Planning. To meet this need we will develop regional distribution models for selected stream and grassland species within Illinois, Indiana, Michigan, and Wisconsin. Project output will be formatted for use in defining regional priority areas for conservation planning within the study area associated with these habitats in a companion project.

> **Objective 1.** Develop regional geospatial databases by incorporating species occurrences and other conservation targets for modeling and planning.
>
> **Objective 2.** Develop regional species distribution models for at least, four freshwater mussel Species in Greatest Need of Conservation (SGNC) and associated fish hosts plus at least five grassland SGNC.
>
> **Objective 3.** Complete final report describing model development and results for focal species, and provide species distribution maps to IDNR to include in the State Wildlife Action Plan revision.

Proposed Grant Period: October 1, 2014 – September 30, 2015

Amount Requested: $35,000

States and Partners Involved: Illinois Department of Natural Resources, Illinois Natural History Survey, Indiana Department of Natural Resources Division of Fish and Wildlife, Michigan Department of Natural Resources, Wisconsin Department of Natural Resources, and Upper Midwest and Great Lakes Landscape Conservation Cooperative

Summary Statement:

This project will identify suitable habitat locations and develop regional distribution models for selected stream and grassland species in IL, IN, MI, and WI. Project output will provide required inputs for developing regional conservation focal areas for stream and grassland habitats and will begin the development of needed regional planning tools. The results of this work will be provided to IDNR and partner States to be used in the Wildlife Action Plan revision process.

Identifying Regional Priority Areas for Focusing Conservation Actions in Streams and Grasslands: Distribution Models

Project Number:

Need:

The Illinois Department of Natural Resources and their conservation partners have begun a formal review and revision of the State Wildlife Action Plan to fulfill the US Fish and Wildlife Service requirements associated with initial Plan acceptance. Illinois' Wildlife Action Plan (IWAP) has been a key tool in aiding the conservation of Species of Greatest Need of Conservation (SGNC) at the state level. However, species of conservation interest seldom respect political boundaries and successful long-term conservation planning will require regional efforts for many species.

During the Illinois Action Plan revision process a subset of focal species will be identified that are: 1) in need of conservation action over the next decade to address declines in distribution, population size, or habitat quality or quantity; 2) sensitive to the priority conservation actions implemented through the Campaigns; 3) amenable to monitoring given current staffing levels and existing sampling techniques; and 4) representative of other species occupying their habitat.

In order to effectively select these focal species, we need to document the status and trends of Illinois SGNC and their habitats, as well as impending threats. Recently an extensive review of Illinois fish SGNC was conducted (T-68), and similar reviews are underway for mussels (T-82) and non-mussel invertebrates (T-88). While these projects have or will provide essential information for updating species information in Appendix I and II of Illinois' Action Plan, they have been focused solely on locations within Illinois.

In our revised Action Plan, we desire to add a regional lens to our selection of focal species. Agency staff tasked with updating State Wildlife Action Plans in neighboring States (Indiana, Michigan, Wisconsin), and regional Landscape Conservation Cooperative staff (Upper Midwest and Great Lakes-LCC, Eastern Tallgrass Prairie and Big Rivers-LCC) have collectively agreed on the need to develop just such a regional perspective. This project and the companion project are designed to assist these efforts by identifying regional conservation priority areas for selected stream and grassland species of conservation need in Illinois and partnering States (IN, MI, WI).

Many streams throughout the Midwest have been severely degraded associated with development for human needs (e.g., agriculture, water supply, flood reduction) and the introduction of exotic and invasive species. Although some high quality examples remain throughout the region, many streams have water quality and sediment impairments that have impacted populations of SGNC that are dependent on running water habitats (e.g., crayfish, fish, insects, mussels). Our efforts here will focus on selected freshwater mussels and their associated fish hosts.

Across the Midwest region, most historic native grassland complexes have been severely degraded or lost due to conversion to agriculture or other human uses, or from altered

disturbance regimes leading to vegetative succession. As a result many grassland natural community types are regionally or globally imperiled (e.g., lakeplain mesic sand prairie, mesic prairie). Remaining grasslands, while largely degraded, and still important habitats for many SGNC in Illinois and neighboring States. Our efforts here will focus on selected grassland bird species.

Purpose and Objectives:

The purpose of this project is to meet resource collection and management decision needs by updating and developing information required for State Wildlife Action Planning. To meet this need we will develop regional distribution models for selected stream and grassland species within Illinois, Indiana, Michigan, and Wisconsin. Project output will be formatted for use in defining regional priority areas for conservation planning within the study area associated with these habitats in a companion project.

Objective 1. Develop regional geospatial databases for modeling and planning purposes by incorporating existing feature classes (e.g., landcover, surficial geology), focal species occurrences, and locations of other conservation targets.

Objective 2. Develop regional species distribution models for at least four freshwater mussel Species in Greatest Need of Conservation (SGNC) and their associated fish hosts plus at least five grassland SGNC.

Objective 3. Complete final report describing model development and results for focal species and provide species distribution maps for the project area. These data will be used for defining regional priority areas for conservation in the companion project.

Anticipated Outcomes and Benefits:

Distribution models from this project will be used as direct inputs to derive regional conservation focal areas for stream and grassland habitats in IL, IN, MI, and WI as part of our companion project. Regional focal areas will assist individual States within the study area to revise and update sections of their State Wildlife Action Plans that pertain to streams and grassland habitat types and for the focal species.

Expected outputs associated with this project include:

12. Geospatial databases containing existing focal species locations, modeled focal species habitat distributions, and other conservation targets within the study area.
13. Maps of expected regional species distributions for focal stream and grassland species in IL, IN, MI, and WI.

Approach:

Job 1. Develop regional geospatial databases by incorporating existing focal species occurrences and other conservation targets for modeling and planning.

With the assistance of our regional partners in Indiana, Michigan, and Wisconsin we will identify and aggregate existing GIS feature classes and distributional records for focal species throughout the study region into geodatabases compatible with ArcGIS. Additional information on state specific conservation target locations (e.g., existing conservation lands, priority species of concern) will also be incorporated into the modeling databases for later use.

Job 2. Develop regional species distribution models for at least four freshwater mussel Species in Greatest Need of Conservation (SGNC) and their associated fish hosts plus at least five grassland bird SGNC.

A major goal of State Wildlife Action Plans is to protect existing populations of SGNC and their habitats, and to direct conservation actions toward species and their habitats before they reach critical levels of concern. 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.

Working with stream and grassland taxonomic experts across IL, IN, MI, and WI, we will identify broad-scale habitat requirements for each of the selected SGNC. Candidate stream species we will evaluate include: Snuffbox (Epioblasma triquetra; *IL, IN, MI, WI*), Ellipse (*Venustaconcha ellipsiformis*; IL, IN, MI, WI), Salamander mussel (*Simpsonaias ambigua*; IL, IN, MI, WI), Purple Lilliput (*Toxolasma lividus*; IL, IN, MI), and Slippershell (*Alasmidonta viridis*; IL, MI, WI). Distributions of host fish species for each of these mussels (e.g., logperch *Percina caprodes* for snuffbox) will also be evaluated and included in later analyses. Candidate grassland species will include Henslow's sparrow (*Ammodramus henslowii*; IL, IN, WI, MI), Grasshopper sparrow (*Ammodramus savannarum*; IL, MI, WI), Northern harrier (*Circus cyaneus*; IL, IN, MI, WI), Short-eared owl (*Asio flammeus*; IL, IN, MI, WI), and at least one other species depending on available data.

After we identify the habitat requirements of each species, we will compile available region-wide, spatially explicit, environmental data from various sources and create a library of environmental variables that are seamless across political boundaries. Recent efforts have developed state-wide (e.g., DeWalt et al. 2009) and regional (e.g., Great Lakes Aquatic Gap, http://www.glsc.usgs.gov/main.php?content=research_GAP_riverine&title=Aquatic%20GAP0&menu=research_NCE_GAP; National Fish Habitat Partnership's Assessment, Esselman et al. 2011) datasets that can be used for these purposes. Useful variables include 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 state databases including natural heritage databases, as well as collections and museum records.

Using the spatial data library and species location information, we will create species distribution models. We will use either the MaxEnt (Phillips et al. 2006) or the Random Forest (Liaw and Wiener 2002) modeling packages, dependent on the suitability of range-wide data. Where appropriate we will use both modeling packages to examine similarities and differences in the model outputs. In addition to a presence/absence prediction, both modeling packages will provide the relative importance of each environmental variable in predicting likely or not likely habitat. The spatial extent of the modeling will be limited to the state boundaries of the four States partnering on this grant. However, some distribution models may be at a smaller geographic scale depending upon the known species distributions

The species distribution models will not be verified with field testing under this project. Both modeling packages provide measures of model performance that we will use to evaluate to determine model effectively. Additionally, when there are adequate location data available for both modeling and testing, we will reserve a random subset of the location data to test the model outputs. Modeled distributions will be reviewed by wildlife and fish biologists and associated taxonomic experts within each state to ensure the results are reasonable and useful.

In addition to being used to meet Objective 2, the resulting species models will be used by each state to refine their State Wildlife Action Plan by providing a regional context within which to consider the distribution of the species. Specifically in Illinois, the resulting 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. In Michigan these modeling results will assist with refinement of grassland habitat species maps, which are currently done by county, and will help focus survey efforts.

Job 3. Complete final report describing model development and focal species distribution maps for the project area.

In addition to a final report we will provide information to our partners on expected distributions for each state within the project area. Data developed in this project will also be provided to our companion project for use in developing conservation priority areas.

Literature Cited:

DeWalt, R.E., Y. Cao, L. Hinz and T. Tweddale. 2009. Modelling of historical stonefly distributions using museum specimens. Aquatic Insects 31(suppl. 1): 253-267.

Esselman, P.C., D. M. Infante, L. Wang, D. Wu, A.R. Cooper and W.W. Taylor. 2011. An Index of Cumulative Disturbance to River Fish Habitats of the Conterminous United States from Landscape Anthropogenic Activities. Ecological Restoration 29: 133-151.

Liaw, A. and M. Wiener (2002). Classification and Regression by random Forest. R News 2(3): 18—22.

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

Useful life:

Not applicable to this project.

Geographic Location:

This project will be completed by INHS staff in Champaign and Springfield with the assistance of IDNR in Springfield and our partners in IN, MI, and WI.

Personnel:

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

Ann Marie Holtrop, Acting Section Head
IDNR – Watershed Protection Section
Phone: (217) 785-4325
Email: ann.holtrop@illinois.gov

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

Dr. Leon C. Hinz Jr. (Principle Investigator)
Illinois Natural History Survey
Phone: (217) 785-8297
Email: leon.hinz@illinois.gov

Stan McTaggart, Farmland and Prairie Campaign Coordinator
IDNR – Division of Wildlife
Phone: (217) 558-6623
Email: stan.mctaggart@illinois.gov

Additional personnel involved in this project at other locations include:

Dr. Yong Cao (Co-Principle Investigator)
Illinois Natural History Survey
1826 South Oak Street
Champaign, IL 61820
Phone: (217) 244-6847
Email: yongcao@illinois.edu

Program Income:

Not applicable to this project. No income will be generated through these efforts.

Budget:

PROJECT BUDGET **Expense Line Item**	**Project Total**
SALARIES & WAGES	
Professional	$20,405
Total Salaries & Wages	**$20,405**
FRINGE BENEFITS	
Professional @ 42.94%	$8,762
Total Fringe Benefits	**$8,762**
Total Salaries, Wages, & Fringe Benefits	$29,167
TRAVEL	
Total Travel	**$0**
MATERIALS & SUPPLIES - General	$0
Total Materials & Supplies	**$0**
CONTRACTUAL SERVICES - General	$0
Total Contractual Services	**$0**
TELECOMMUNICATION SERVICES	$0
EQUIPMENT (each item $5000 +)	$0
Total Direct Costs	$29,167
Modified Total Direct Costs (MTDC)	$29,167
F&A (20% MTDC)	$5,833
Total Proposed Project Budget	**$35,000**

Budget narrative:

Salaries and Wages: We request $20,405 to support a portion of the salaries of two professional staff members to develop geodatabases and conduct distribution modeling.

Fringe Benefits: We request $8,762 in fringe benefits in accordance with those budgeted for salaries. Fringe benefits will be paid at a rate of 42.94% for professional staff; rates have been negotiated by the University of Illinois Urbana/Champaign.

Travel: We request no funds for travel.

Materials and Supplies: We request no funds for Materials or Supplies.

Contractual Services: We request no funds for Contractual Services.

Equipment: We request no funds for Equipment.

Facilities and Administration Costs: We request $5,833 to offset facilities and administrative costs at the rate of 20% of modified total direct costs. Rates have been negotiated by the University of Illinois at Urbana/Champaign.

Multipurpose Projects:

Not applicable to this project.

Relationship to Other Grants:

Status revision and update for Illinois' fish Species in Greatest Need of Conservation (T-68). This project developed geospatial data and distribution maps using available records from museum collections and state-wide monitoring programs as well as updated the status of fish SGNC in Illinois. We will use results from this project to assist with modeling distributions of fish species that act as hosts for the focal mussel species selected for this project.

Defining Expectations for Mussel Communities in Illinois Wadeable Streams (T-82). This project will refine and update mollusk species in greatest need of conservation and develop distribution models for some mussel species in Illinois. We will use results of this project to assist with modeling distributions of the focal mussel species selected for this project.

Identifying Regional Priority Areas for Focusing Conservation Actions in Streams and Grasslands. (UMGL-LCC FY 2013). Grant secured by Ann Holtrop (IDNR) from UMGL-LCC to be used to fund species modeling and conservation prioritization (this and companion project).

Identifying Regional Priority Areas for Focusing Conservation Actions in Streams and Grasslands: Conservation Planning – T-94. This companion project will allow completion of the larger project to develop regional conservation priority areas for stream and grassland habitats based on mussel and bird SGNC. Companion grant submitted to Illinois State Wildlife Grant Program.

Project Schedule:

Objective	10/14 – 12/14	1/15 – 3/15	4/15 – 6/15	7/15-9/15
Develop regional geospatial databases	x	x		
. Develop regional distribution models	x	x	x	
. Coordination and Reporting		x	x	x

General:

The project statement describes a need consistent with the State Wildlife Grants (SWG) program; states a purpose and sets objectives, both of which are based on the need; uses a planned approach, appropriate procedures, accepted principles of research, and is cost effective.

Compliance:

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

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

The activities supported by this grant for this project statement do not involve any other federal compliance issue.