

The distribution, status, and habitat affinities of Bewick's Wrens in Arkansas: citizen science and professional surveys

The purpose of this project is to determine the distribution, abundance, and habitat affinities of Bewick's Wrens (*Thryomanes bewickii*). We will employ a dual sampling approach by engaging citizen scientists in a statewide survey and compare these results to data based on random, systematic surveys conducted by a graduate student. We will estimate wren occupancy rate as a function of habitat characteristics at both the local and landscape scales. Knowledge of the distribution and habitat selection of Bewick's Wrens will help guide recovery actions for this high-priority, rapidly declining species.

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Total Requested: \$57,700

Total Match: \$61,371

A. Funding Priorities. This project addresses at least three funding priorities of the Wildlife Action Plan. This is a research project that engages citizen scientists in implementing a high priority action of Arkansas's Wildlife Action Plan and will lead to on-the-ground conservation of the focal species. Moreover, this project will widely publicize and raise the profile of the Wildlife Action Plan to a key and politically active stakeholder segment of the public, people interested in bird watching and wildlife observation. This will be accomplished by engaging this interested segment of the public directly in the survey design as citizen scientists. Specifically, the high priority objectives of this project are to determine the distribution, abundance, and habitat relationships of Bewick's Wrens (*Thryomanes bewickii*) in the state. Bewick's Wren is ranked as one of the highest single-species conservation priorities in Arkansas's Wildlife Action Plan.

B. Project Area. Surveys will be conducted throughout Arkansas in areas with suitable habitat, primarily in the northern and western parts of the state.

C. Conservation Priority. The specific conservation priority this project will address is to determine the distribution, abundance, and habitat affinities of Bewick's Wrens in Arkansas. The Bewick's Wren is declining across much of its range due to habitat modification, urbanization, and competition resulting from range expansion of the House Wren (*Troglodytes aedon*). In the eastern United States, it has been extirpated from most states and is considered vulnerable, threatened, or endangered in the remaining states (James and Green 2006). The eastern edge of the species' range currently occurs in Arkansas. In Arkansas, where it was once fairly common 60 years ago, it is now considered rare (James and Neal 1986; Arkansas Audubon Society 2004). Over the last 20 years scattered sightings have been reported throughout the state, but the full distribution and abundance are unknown. General surveys such as the Breeding Bird Survey and Christmas Bird Count provide inadequate data for rare species. Targeted surveys in suitable habitat are required to locate areas of concentration for further study and management. Management for the species may include habitat restoration, nest box supplementation, removal of House Wrens, and reintroduction (Kennedy and White 1997). However, before a recovery strategy can be implemented, we need to quantify the distribution and abundance of birds, understand their habitat relationships, and determine which factors limit the state's population (e.g., habitat, competition, predation).

D. Project Goals. By 2011, we propose to map the distribution of Bewick's Wren in Arkansas and determine habitat selection criteria using both a statewide citizen science survey and a random, systematic survey. We will (1) develop and test survey protocol, (2) construct a project web site, (3) promote the project and enlist volunteer citizen scientists, (4) collect data and support participants using a variety of tools, (5) analyze the data, and (6) report the results in both professional and popular outlets. The first six months will focus on tasks 1 and 2. The next six months will focus on tasks 3 and 4. The following three years will focus on tasks 4-6 along with continual refinement of protocol and solicitation of volunteers.

E. Methods. The citizen science portion of our surveys will be modeled after national and statewide citizen science surveys that have proven successful such as Audubon's Christmas Bird Count and Great Backyard Bird Count, Cornell Laboratory of Ornithology's Birds in Forested Landscapes and Golden-winged Warbler Atlas, and Arkansas Natural Heritage Commission's Tarantula Survey and Bumblebee Survey. The project will solicit volunteers from the bird watching community using a project website and other web sites, ARBIRD-L Arkansas bird discussion listserv, direct requests, and other avenues. Sources to be tapped include: nine state Audubon Chapters representing 2,300 members; Arkansas Audubon Society; professional natural resource managers; academia; high school students; and other interested groups. Volunteers will use the project's web site to sign up; download protocols, data forms, species identification materials, and vocalizations; request that materials be mailed; and subscribe to a project listserv. Each participant will choose at least two study sites that meet the general description for suitable Bewick's Wren habitat, i.e. brushy areas, thickets and scrub in open country, farmyards,

overgrown fields, and openings and edges of woodlands (Kennedy and White 1997). Participants will visit each site before 10:00 a.m. at least two times in a season (winter, spring migration, summer, or fall migration) for at least two seasons in a year. At each site surveyors will establish four or more survey points, depending on the size of the habitat patch. Survey points must be at least ¼ mile apart to avoid double-counting. Points may be placed on existing roads, trails, and rights-of-way. Citizen surveyors will record the exact location of each point using a GPS receiver or by marking a detailed topographic map, aerial photo, or Delorme atlas. At each point, they will conduct a 10-min point count using playback to elicit a response from upland wrens. The playback will have a prerecorded sequence of Bewick's Wren calls and songs, House Wren calls and songs, Carolina Wren (*Thryothorus ludovicianus*) calls and songs, mobbing calls from local resident birds, and silence. Bewick's Wrens are territorial and respond strongly to conspecifics and House Wrens throughout the year. The Carolina Wren is a common permanent resident that resembles Bewick's Wren and could potentially compete with Bewick's Wren for nesting substrates. Surveying for Carolina Wrens will help reduce participant frustration should they be unable to find the other two species, and may allow us to assess observer ability to detect and identify wrens.

During the survey participants will collect data on wren abundance, Bewick's Wren subspecies (*T. b. bewickii* or *T. b. cryptus*), breeding status (possible, probable, confirmed based on specified criteria), nest location if found, and general habitat characteristics within a 165-foot (50-m) radius of the survey point. Habitat characteristics include visual estimates of percent cover of dominant vegetation types (e.g. tree, shrub, and herbaceous), dominant vegetation height, and distance to nearest human-made structure.

Participants will submit their data either through the project's web site or by mailing completed data sheets and maps. Throughout the project, we will encourage and update participants as to project progress, answer their questions, and encourage them to share their experiences as well as interact with other participants through the project's listserv.

An Arkansas State University doctoral student and the Principal Investigators (Bednarz and Scheiman) also will conduct statewide breeding season surveys using similar protocols. In addition, the student will visit a random subset of occupied and unoccupied sites surveyed by volunteers to check observer quality and take more detailed habitat measurements following more technical B-Bird protocol (Martin et al. 1997) typically employed in research studies. This dataset can be compared to the citizen science dataset to test the efficiency and effectiveness of citizen science surveys. The Ph.D. student will monitor nests and conduct systematic local vegetation sampling and GIS analyses around all these sites.

We will estimate occupancy rate as a function of habitat characteristics at local and landscape scales. We will measure landscape characteristics, such as area and distribution of dominant habitat types, and distance to nearest urban area, using GIS coverages and program Fragstats (McGarigal and Marks 1995). Models that incorporate patch and landscape features can be used to predict a species' response to potential land-use change and habitat management practices. Over a long-term period of sampling, occupancy modeling should allow the development of a population viability model that depends on patch occupancy instead of difficult-to-measure demographic parameters. This aspect of the proposed study will probably require at least 4 yr of data collection. Because each survey point is visited at least twice, we can model detection probability as well. We will use program PRESENCE or MARK to model occupancy (MacKenzie et al. 2006) and test hypotheses about habitat and landscape relationships.

F. Measurable Products. Results will be reported in a peer-reviewed scientific journal, as well as in popular formats (e.g. Audubon magazine, Arkansas Wild, news articles, project web site, Arkansas Game and Fish Commission's web site) to raise awareness of this conservation issue and promote the

importance of citizen science. Knowledge of the distribution and habitat affinities of Bewick's Wrens will allow Arkansas Game and Fish Commission and its partners to delineate focal areas for more detailed studies, recovery actions (e.g., nest box supplementation) and habitat restoration (e.g., prescribed burning). This project will serve as a model for similar citizen science surveys across the species' shrinking eastern range.

G. Existing Resources. Audubon has the capacity for web development, database management, listserv creation, and citizen science survey design and implementation. Arkansas State University has the capacity for data and GIS analysis, and habitat modeling. Our partner organizations include: the Arkansas Game and Fish Commission, Arkansas Natural Heritage Commission, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Army Corps of Engineers, The Nature Conservancy, and the Arkansas Audubon Society. Project partners may contribute by indicating patches of suitable habitat, providing detailed maps to volunteers, and lending participants for surveys. Cornell Laboratory of Ornithology has agreed to provide logistical advice. We will seek additional funding from Arkansas Audubon Society, which awards grants for bird research in Arkansas. The statistical and other programs we require are free software or are available at the Avian Ecology Laboratory at Arkansas State University.

Schedule

July-December 2007: develop citizen science survey protocol, data sheets, species identification poster; playback CD, and other materials for project web site; test protocol in the field, construct project web site

January 2008: (and periodically throughout the project): Promote project to the public through press releases, presentations, ARBIRD-L listserv, and direct appeals to target audiences (e.g. EAST students, professional natural resource managers)

February-June 2008: project listserv begins; data collection begins; enter field-tested protocol into Natural Resources Monitoring Partnership; begin preliminary analyses; refine protocol

October 2008: provide progress report to the Arkansas Game and Fish Commission

April 2009: Ph.D. student presents preliminary results at Arkansas Academy of Science meeting

June 2009: update project web site and CWCS with results to date; announce preliminary results to public through press releases, magazine articles, and presentations

October 2009: provide second year progress report to Arkansas Game and Fish Commission

Deliverables Calendar

December 2007: Produce citizen science survey protocol, data sheets, species identification poster, playback CD, and establish web site.

October 2008: provide progress report to the Arkansas Game and Fish Commission and survey participants.

January—March 2009: Develop and submit proposal to fund final two years of Bewick's Wren survey and research project

October 2009: provide second year progress report to Arkansas Game and Fish Commission and survey participants.

H. Budget over 24 months:

Item	Audubon - Match	AGFC	Total
<i>Salary & Benefits</i>	\$8,640	\$20,000	\$28,640
<i>Operating Expense</i>			
Travel		\$1,880	\$1,880
Web site and listserv	\$17,086	720	\$17,806
<i>Capital Expense</i>			
Research supplies		\$1,400	\$1,400
<i>Indirect Costs</i>		2,400	2,400
Subtotal	\$25,726	\$26,400	\$52,126

Item	ASU – Match	AGFC	Total
<i>Salary & Benefits</i>	\$21,735	\$14,688	\$36,423
<i>Operating Expense</i>			
Travel		\$8,400	\$8,400
Per diem		\$3,000	\$3,000
<i>Capital Expense</i>			
Research equipment and supplies ¹		\$2,367	\$2,367
<i>Indirect Costs</i>	\$13,910	\$2,845	\$16,755
Subtotal	\$35,645	\$31,300	\$66,945

¹ - GPS receivers, binoculars, digital camera, batteries, maps, flagging, stakes, compasses, computer software, etc.

Project Total	\$119,071
Total Match	\$61,371
Total Requested from the State Wildlife Grant:	\$57,700

Budget Justification: We request consideration to receive more than the \$50,000 SWG funding limit. We developed this project to best meet the inventory and conservation needs of the Bewick’s Wren and to address the priorities of the Wildlife Action Plan. However, to implement the project described in this proposal that basically involves two significant studies: (1) the citizen science component that will involve substantial publicity, web site management, coordination, and interactions with the citizen volunteers involved in the survey; and (2) a complete professional biologist survey involving a Ph.D. student. Both components will provide data that will require relatively sophisticated analysis that will be primarily conducted by the Ph.D. student at ASU. To implement both integrated components of this study will cost more than the \$50,000 SWG limit. We request that this proposal be considered for funding with a budget above the limit.

Detailed ASU Budget (2 years)

Salary and Benefits

Ph.D. Assistantship	\$14,400
Benefits (2%)	<u>\$ 288</u>
Total Salary and Benefits	\$14,688

Travel

Mileage (20000 miles @ \$0.42)	\$ 8,400
Per diem (120 days @ \$25)	<u>\$ 3,000</u>
Total Travel	\$ 11,400

Supplies and Services

GPS receiver	\$ 300
Miscellaneous field supplies (maps, flagging, densitometer, etc.)	<u>\$ 2,067</u>
Total Supplies and Services	\$ 2,367

Total Direct Costs	\$28,455
Indirect Costs	<u>\$ 2,845</u>

Total Requested	\$31,300
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ASU Match

1 hour (4.2%) teaching reassignment for Bednarz over 2 years	6,012
Fringe benefits during academic year (24%)	1,443
Ph.D Assistantship	14,000
Benefits for assistantship (2%)	280
Total Direct Costs	21,735
Negotiated Indirect Cost rate for ASU is 46% of salaries and benefits, thus the remaining indirect costs will be applied as an ASU match	13,910
ASU Match Total	35,645

Detailed Audubon Budget (2 years)

Salary and Benefits

Salary (Dan Scheiman) \$20,000

Supplies and Services

Listserv - \$40/mo for 18 months \$ 720
 Species ID poster contracted to artist \$ 1,000
 Playback CD from Macaulay Library of Natural Sounds \$ 50
 Copies of playback CD for citizen scientists \$ 200
 Postage to send protocol packets and CDs to participants \$ 150
 Total Supplies and Services \$ 2,120

Travel

Mileage (2571 miles @ \$0.42) \$ 1,080
 Per diem (20 days @ \$40) \$ 800
 Total Travel \$ 1,880

Total direct costs \$24,000
 Indirect costs (10%) \$ 2,400

Total Requested \$26,400

Audubon Match

Administrative, Development, and Education support (\$30/hr × 4 hrs/mo × 24 mo × 3 staff members)	8,640
Web Site Development (Audubon National IT staff)	
Programming (admin, monitoring, security)	10,086
Database design and setup	3,000
Web development setup	2,000
Network setup	<u>2,000</u>
Web Site Subtotal	17,086
Audubon Match Total	25,726

Literature Cited

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- Kennedy, E. D., and D. W. White. 1997. Bewick's Wren (*Thryomanes bewickii*). In *The Birds of North America*, No. 315 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC USA.
- MacKenzie, D. I., J. D. Nichols, J. A. Royle, K. H. Pollock, L. L. Bailey, and J. E. Hines. 2006. *Occupancy estimation and modeling*. Academic Press, New York, NY USA.
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- MacGarigal, K., and B. J. Marks. 1995. *FRAGSTATS: spatial pattern analysis program for quantifying landscape structure*. USDA For. Serv. Gen Tech. Rep. PNW-351.

Qualifications:

James Bednarz, Ph.D., Professor of Wildlife Ecology, will manage the overall project and work closely with both the citizen science aspects of the survey (working with Scheiman) and the Ph.D. student, who will be primarily conducting the professional field survey, habitat and landscape analyses, modeling, and the comparison of the results of the citizen science and professional survey. Jim Bednarz has conducted research on six continents for over two decades emphasizing avian population ecology and conservation. Most of this work has been focused on birds of prey, woodpeckers, game birds, and songbirds. Topics of research have included effects of habitat and landscape fragmentation and other human activities on migratory bird population demography, impacts of hydroelectric development on wetland areas and wildlife, radiotelemetry and habitat use studies on a variety of wildlife species, development of endangered species conservation plans, completion of site suitability analyses (e.g., Mexican wolf), design of mitigation plans for habitat and wildlife populations, and basic questions about avian ecology. Jim has published 34 journal articles or monographs, provided 3 contributions to books, 10 papers to conference proceedings, 4 published book reviews, and completed 54 funded project reports.

Daniel Scheiman, Ph.D., Director of Bird Conservation, will be managing the citizen science aspects of the survey, as well as assist with study design, data analysis, and report writing. Dr. Scheiman received his B.S. from Cornell University, M.S. from Eastern Illinois University, and Ph.D. from Purdue University, all in wildlife ecology. He has over ten years of bird research experience and six research publications on topics such as bird-habitat relationships, population dynamics, and detection probability. Dr. Scheiman manages Arkansas' Important Bird Areas program, which promotes bird conservation at 24 sites around the state. He serves on the federal Ivory-billed Woodpecker Recovery Team and the Arkansas Quail Committee; both groups focus on population and habitat restoration of a declining species. In addition, he is a Christmas Bird Count compiler, state reviewer for the Great Backyard Bird Count, creator of a website of 100 common Arkansas birds, and travels throughout the state to lecture on bird conservation.

Ph.D. Student. Student will be recruited if funds are awarded. Student will be a competent ornithologist and analytical biologist with a B.S. and M.S. degree in Wildlife Biology or Ecology with experience and interest in avian sampling, analytical techniques, and conservation science.

Audubon has a long history of citizen science campaigns stretching back 107 years to the first Christmas Bird Count, and more recently with the initiation of the Great Backyard Bird Count in 1997. Data collected by thousands of volunteers across the continent each year allow researchers to study the long-term health and status of bird populations across North America. **Audubon Arkansas**, the state office of National Audubon, was founded in 2001. Our mission is to connect people with nature. Our efforts focus on hands-on field science experience and engaging students in long-term projects that include: protecting local watersheds, promoting native flora and fauna, and restoring native habitats.