Bottomland Forest and Canebrake Management to Improve Habitat Quality for Understory Bird Species of Greatest Conservation Need

Although some forest management may benefit understory birds of conservation need in the Southeast, there is no consensus on what specific prescriptions need to be implemented to reverse declining population trends. We propose an Adaptive Management Project and will monitor the response of birds before and after the implementation of replicated management alternatives (Desired Forest Conditions). Here, we request funding for the post-manipulation sampling of managed forest stands that will allow us to asses the benefits of specific prescriptions to several avian species of Conservation Need.

Project Leader
James Bednarz, Ph.D. (Title: Professor of Wildlife Ecology)
Department of Biological Sciences
Arkansas State University
P.O. Box 599
State University, AR 72467-0599
jbednarz@astate.edu
870-972-3320
870-972-2638 (FAX)

Graduate Researcher Field Coordinator
Amy Wynia
Arkansas State University
Amy.wynia@smail.astate.edu
870-680-8475

Project Partners: U.S. Fish and Wildlife Service
Dennis Sharp, Project Leader, Dennis_Sharp@fws.gov, 870-282-8205

U.S. Forest Service
Kathryn Furr, Zone Wildlife Biologist, kfurr@fs.fed.us,
(870) 269-3228

Arkansas Game and Fish Commission
Marin Blaney, Habitat Coordinator, mblaney@agfc.ar.us, 877-967-7577

U.S. Army Corps of Engineers
Troy W. Morris, Troy.W.Morris@usace.army.mil, 501-324-6230

Total Project Cost: $201,263

Total Amount of SWG Money Requested: $130,700

Total ASU Match: $70,562 (35.06% match)

Source of Matching Funds: Salary and fringe benefits = $31,991
Indirect Costs = $38,571

A**. Need:** This project primarily addresses "Adaptive Management Projects: Phase Two Conservation Actions." Specifically, several graduate students and I were supported by SWG grant funds (2004-2008) to examine the habitat needs and demographic relationships of the Swainson's Warbler (*Limnothlypis swainsonii*), a species of critical conservation concern throughout the U.S., as model species for birds dependent on early-successional stage or understory forest habitat. This research was enormously successful in filling information gaps and resulted in several recommendations for management to benefit understory birds species of conservation concern, and at this time, produced 14 peer-reviewed publications in international conservation journals (e.g., Anich et al. 2009, 2010, Brown et al. 2009, Benson et al. 2009, 2010a, 2010b). Here, we propose to implement a replicated, full-scale manipulative study with the collaboration of the primary land-management agencies in Arkansas to test the effects of proposed forest management prescriptions on Swainson's Warblers and associated understory avian species of conservation concern. Thus, this project specifically integrates the Arkansas Wildlife Action Plan with land-use and natural resource management by multiple agencies, including the Arkansas Game and Fish Commission (AGFC), U.S. Fish and Wildlife Service (USFWS), and U.S. Forest Service (USFS). Critically, this proposed project emphasizes an ***Adaptive Management*** approach, whereby agencies, in close collaboration with researchers, implement management that is evaluated by accurate monitoring and this information will then feedback to adjust future management actions. Although we will sample all forest species of birds in our managed and control plots, this project should specifically benefit Swainson's Warblers, Hooded Warblers (*Wilsonia citrina*), Kentucky Warblers (*Oporornis formosus*), White-eyed Vireos (*Vireo griseus*), and Cerulean Warblers (*Dendroica cerulea*). Secondly, we propose to implement experimental burning and bush-hogging treatments to declining canebrakes and to monitor the responses of the vegetation and forest birds.

Swainson's Warblers are uncommon and local throughout their breeding range, and are ranked as a species of high conservation priority throughout the Southeast (e.g., Hunter and Collazo 2001, La Sorte et al. 2007). This species has a Partners in Flight priority conservation score of 20, and only Ivory-billed Woodpecker (*Campephilus principalis***)** and Bachman's Warbler (*Vermivora bachmanii*), both of which are extinct or on the verge of extinction, are ranked as higher conservation priorities in the Mississippi Alluvial Valley (Partners in Flight 2007).

Moreover, the key species involved in this study, Swainson's Warblers, Hooded Warblers, Kentucky Warblers, White-eyed Vireos, and Cerulean Warblers, are high-profile species of great interest to birdwatchers and wildlife observers. Our past research on Swainson's Warblers has received strong support from local Audubon groups and birdwatchers, and international attention from conservation and scientific organizations (e.g., Anich et al. 2009, anonymous 2009, Benson et al. 2009, 2010b). This proposed Phase II management study in Arkansas will likely attract additional national and local interest and will further publicize and raise the profile of the Arkansas Action Plan with elected officials, interested parties, and the general public.

Our previous SWG supported research produced results that allow us to make management predictions for a range of understory-dependent bird species of conservation concern (Anich et al. 2009, 2010, Brown et al. 2009, Benson et al. 2009, 2010a, 2010b). Several other species of conservation concern are dependent on densely-vegetated forest understories and appear to have a preference for cane (*Arundinaria giganiea*) dominated habitats (Bednarz et al. 2005, Brown et al. 2009); this structure is associated with increased habitat occupancy, smaller home-range size, and is selected for nest sites by Swainson's Warblers (Brown et al. 2009, Benson et al. 2010a, Anich et al. 2010). However, to test our predictions and determine optimal management strategies for these understory-dependent bird species, a replicated, experimental management approach is needed.

Here, we propose to implement full-scale, management treatments to enhance populations and vital reproductive rates for understory-associated bird species of conservation concern. To increase light penetration and stimulate growth of a dense understory (Wilson et al. 2007), we plan to work with the AGFC, USFS, USFWS, and US Army Corps of Engineers (COE) to implement three different treatments: (1) a no-harvest control, (2) a variable selection harvest to produce Desired Forest

Conditions (DFCs; Wilson et al. 2007), and (3) a more aggressive shelterwood treatment. We will apply these treatments on >20-ha stands or plots within relatively high-elevation forests that contain relatively sparse cane growth. The DFC treatment would involve variable tree selection to provide stands with a basal area of 60–70 ft^2/acre, an overstory canopy cover of 60–70%, with ≥25% of trees in older age classes, and other characteristics. The shelterwood treatment will consist of thinning to ~50% canopy closure throughout the stand. These treatments will be implemented in a randomized block design with one stand of each treatment at four different locations (total = 8 manipulated and 4 control stands).

In addition, we propose to implement a small-scale management experiment to evaluate cane response to burning and bush-hogging. This experiment will consist of four replicated 0.5–1.0 ha plots of four different treatments: (1) a control with no management, (2) a burn treatment, (3) a bush-hogging treatment, and (4) a treatment with bush-hogging followed by a burn. Within each of these plots, we will establish 4 permanent vegetation sampling points, where we will sample aspects of understory structure, including cane density and height. We will also sample birds using point counts three times during the breeding period.

In 2010, we received funding from the USFWS and USFS to begin pre-treatment sampling, and have identified 4 study blocks including Trusten Holder Wildlife Management Area (THWMA); Rattlesnake Ridge (RSR), Scrubgrass Bayou (SGB), both located in the White River National Wildlife Refuge (WRNWR); and Saint Francis National Forest (SFNF). At each study area, we established an approximately 72 ha study block divided into three 24 ha subplots (300×800 m^2) for sampling and forest management manipulation. In addition, we identified and have begun pre-treatment sampling in four degraded cane patches; 2 located at SFNF, and 2 at WRNWR. We anticipate receiving additional funding from bout USFWS and USFS to complete the pre-management sampling in 2011.

B. **Objectives of the SWG component of this project:**

1. Implement post-management bird and vegetation sampling at all 12 selected experimental forest management stands for 2 years (2012 and 2013).
2. Implement post-management bird and vegetation sampling at all 16 subdivided experimental declining canebrake plots for 2 years (2012 and 2013).

C. **Expected Results and Benefits to Species of Concern:** Management to achieve desired forest conditions is predicted to enhance populations of avian species (Wilson et al. 2007, Twedt and Somershoe 2009) especially for birds dependent upon understory vegetation (e.g., Swainson's, Kentucky, and Hooded warblers). However, this proposed management represents a hypothesis that has not been tested. Other ongoing assessments of the validity of this management hypothesis involve using point-count sampling which produces estimates with high variation and limited accuracy (e.g., Schieck 1997, Howell et al. 2004, Kissling and Garton 2006). Furthermore, density estimates alone have been known to be misleading as far as assessing quality habitat for many species (Van Horn 1983). Our study will provide accurate assessments of the reproductive success response of multiple avian species of conservation concern based on large sample sizes of nests (Benson et al. 2010a). Thus, the proposed study should provide a rigorous test assessing if proposed DFCs will enhance avian populations of conservation concern, and importantly, will allow us examine the affects of alternative management approaches on bird communities and on avian reproductive success. In addition, we will be able to evaluate how adjustments may be made in current management guidelines to further enhance the population vital rates of bird species of concern.

We will also evaluate the affects of several management approaches suggested to stimulate and to enhance the development of canebrakes, a critically endangered ecosystem type within bottomland forests (Noss et al. 1995). Specifically, we will assess the short-term and long-term effects of burning, bush-hogging, and the combined management of burning and bush-hogging on degraded cane patches. This research will directly lead to the development of management protocols to improve canebrakes

that may be utilized by the AGFC, USFS, USFWS, COE, and other resource management agencies within the Mississippi Alluvial Valley and throughout the Southeast.

D. **Approach:** While working with cooperators to apply treatments, we are currently evaluating the avian community and nest success for 2 years (2010 and 2011) prior to implementation of management. We are assessing both numerical and demographic responses of birds through (1) point counts in treated and control stands and (2) nest searching and monitoring. In each stand, we have established 4 or 5 point count sampling stations and repeated counts 3 times during each breeding season (Hamel et al. 1996). We will record all individuals identified by sight or sound and place individuals into distance categories. To account for variation in detection probability between species and treatments, we will analyze data for relatively common species with program DISTANCE (Buckland et al. 2001), and use occupancy modeling for rare species (MacKenzie et al. 2005).

Because demography is likely a better indicator of habitat quality than density or presence of a species, we will also search stands for nests throughout each breeding season in order to determine productivity. We will focus our efforts on understory-nesting species and will monitor nests every 1–4 days to determine nest fate, number of fledged young, and intensity of Brown-headed Cowbird (*Molothrus ater*) parasitism. A sub-sample of nests would be monitored with digital video cameras to assess primary predators (Benson et al. 2010b) and feeding rates at nests, which may be used to assess prey availability within the different experimental sites.

To evaluate changes in habitat structure with treatments, we will establish 4-5 permanent 0.04 ha sampling plots in each managed stand and sample habitat structure using a modified BBIRD protocol (Martin et al. 1997). Likewise, we will sample habitat around the nests of the most-commonly found species to investigate links between habitat structure and reproductive performance. We will also collect data on landscape attributes (e.g., edge density) to evaluate the affect of these features on avian abundance and reproductive success (see Benson et al. 2010a).

This proposal addresses only the post-treatment portion of this study which would complete the first stage of this proposed project. The pre-treatment data has been collected in 2010, and a second season pre-treatment sampling will be implemented in 2011. For the long term, I plan to seek future funding and sample both 8–9 years after treatments, and 12–13 years after treatments. Although we expect rapid responses by some understory-dependent species, we predict a positive response by Hooded and Swainson's warblers 8–13 years after management (Twedt and Somershoe 2009).

E. **Location of Work:** This research and management project will be conducted in the Mississippi Alluvial Plain ecoregion. Specifically, we propose to work in the White River National Wildlife Refuge (WRNWR), the St. Francis National Forest (SFNF), and Trusten Holder Wildlife Management Area (THWMA) in Arkansas, Desha, Lee, Monroe, and Phillips counties, primarily in high Mississippi River bottomland forest habitat.

F. **Budget: 24 months (1 January 2012 to 31 December 2013)***

Salary and benefits	$102,966	
Tuition for graduate students	13,500	
Travel	26,800	
Supplies	7,544	
Total operating expenses	$150,810	
Indirect costs	50,453	
Total Costs	**$201,263**	
Amount requested from SWG		**$130,700**
In-kind match from ASU		**70,563**
Total project cost		**$ 201,263**

***A 2-month project extension would be required to allow us to implement this proposed project in the spring and summer of 2012 and 2013, and to prepare a final report at the end of 2013.

Qualifications:

James Bednarz, Ph.D., Professor of Wildlife Ecology, will manage the overall project and work closely with graduate students coordinating the field portion of this project. Jim will work with students in developing field data collection protocols, collecting the data, participating in the analysis and interpretation of the data and contributing to the writing of the report. 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 49 journal articles or monographs, provided 8 contributions to books, 10 papers to conference proceedings, 4 published book reviews, and completed 68 funded project reports.

Amy Wynia, M.S. Student, will be the Graduate Researcher Field Coordinator during summer of 2011, and will analyze data as part of her Master's thesis. Amy is a Certified Wildlife Biologist and obtained a B.S. with Honors in Wildlife and Conservation Biology and Botany Minor in 2007. Amy was the Field Coordinator for this study during summer 2010 and worked on the selection of the four study areas used for this project. Additionally, Amy conducted point counts, nest searches, nest monitoring, camera deployments, and vegetation sampling for this study in 2010. Her previous avian ecology research experience includes constructing Piping Plover enclosures and conducting behavioral observations, quantitatively measuring habitat quality of different serial stages of forest for Ruffed Grouse and using radio telemetry to track grouse. Amy also completed a Senior Honors Project Entitled: "Importance of Early Successional Forest for Wildlife in Southern New England." Recently, Amy assisted with a Migratory Passerine Banding Project in northeastern Arkansas, where she extracted passerines from mist nets, banded and took a variety of measurements of passerines.

Ph.D. and M.S. Students. Students will be recruited if funds are awarded. Students will be competent ornithologists and analytical biologists, with previous B.S. and M.S. degrees in Wildlife Biology or Ecology, and with experience and interest in avian sampling, analytical techniques, and conservation science.

Appendix: Literature Cited

Anich, N.M., T.J. Benson, and J.C. Bednarz. 2009. Estimating territory and home-range sizes: do singing locations alone provide an accurate estimate of space use? *Auk* 126:626-634.

Anich, N.M., T.J. Benson, and J.C. Bednarz. 2010. Factors influencing home-range size of Swainson's Warblers in eastern Arkansas. *Condor* 112:149-158.

Anonymous. 2009. Birdsongs Belie Territory. The Wildlife Professional 3:13.

Bednarz, J. C., P. Stiller-Krehel, and B. Cannon. 2005. Distribution and habitat use of Swainson's warblers in eastern and northern Arkansas. Pages 576–588 *in* Ralph, C. J., and T. D. Rich (Eds.). Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference, Volume 1. USDA Forest Service General Technical Report PSW-GTR-191.

Benson,T.J,. N.M. Anich, J.D. Brown and J.C. Bednarz. 2009. Swainson's Warbler nest-site selection in eastern Arkansas. *Condor*. 111:694-705.

Benson, T.J., N.M. Anich, J.D. Brown, and J.C. Bednarz. 2010a. Habitat and landscape effects on brood parasitism, nest survival, and fledgling production in Swainson's Warblers. *Journal of Wildlife Management*. 74:81-93.

Benson, T.J., J.D. Brown, and J.C. Bednarz. 2010b. Identifying predators clarifies predictors of nest success in a temperate passerine. *Journal of Animal Ecology*. 79:225-234.

Brown, J. T.J. Benson, and J.C. Bednarz. 2009. Vegetation characteristics of habitat occupied by Swainson's Warblers at the White River National Wildlife Refuge, Arkansas. *Wetlands* 29:586-597.

Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers, and L. Thomas. 2001. Introduction to Distance Sampling. Oxford University Press, London, England.

Hamel, P.B., W.P. Smith, D.J. Twedt, J.R. Woehr, E. Morris, R.B. Hamilton, and R.J. Cooper. 1996. A land manager's guide to point counts of birds in the Southeast. USDA Forest Service, General Technical Report SO-120.

Howell, C.A., P.A. Proneluzi, A.L. Clawson, and J. Faaborg. 2004. Breeding density affects point-count accuracy in Missouri forest birds. *Journal of Field Ornithology* 75:123-133.

Hunter, W.C., and J.A. Collazo. 2001. Partners in Flight South Atlantic Coastal Plain Bird Conservation Plan. American Bird Conservancy, The Plains, Virginia.

Hunter, W.C., D.N. Pashley, and R.E.F. Escano. 1993. Neotropical migratory landbird species and their habitat of special concern within the Southeast Region. Pages 159–171 *in* D.M. Finch and S.W. Strangel (Eds.), Status and management of Neotropical migratory birds. USDA Forest Service General Technical Report RM-229, Fort Collins, Colorado.

Kissling, M.L., and E.O. Garton. 2006. Estimating detection probability and density from point-count surveys: a combination of distance and double-observer sampling. *Auk* 123:735-752.

La Sorte, F. A, Thompson, F. R. III, Trani, M. K., and T. J. Mersmann. 2007. Population trends and habitat occurrence of forest birds on southern national forests, 1992-2004. Gen. Tech. Rep. NRS-9.

Newton Square, Pennsylvania: U.S. Department of Agriculture, Forest Service, Northern Research Station. 260 p.

Martin, T. E., C. R. Paine, C. J. Conway, W. M. Hochachka, P. Allen, and W. Jenkins. 1997. BBIRD Field Protocol. Montana Cooperative Wildlife Research Unit, University of Montana, Missoula.

MacKenzie, D.I., J.D. Nichols, J.A. Royle, K.H. Pollock, J.E. Hines, and L.L. Bailey. 2005. Occupancy estimation and modeling: inferring patterns and dynamics of species occurrence. Elsevier, San Diego, California.

Noss, R.F., E.T. Laroe, III, J.M. Scott. 1995. Endangered ecosystems of the United States: a preliminary assessment of loss and degradation. U.S. Department of Interior, Washington, D.C., USA. National Biological Service, Biological Report 28.

Partners in Flight. 2007. Partners in Flight Species Assessment Database. [Online] Available at http://www.rmbo.org/pif/pifdb.html.

Peters, K.A. 1999. Swainson's Warbler (*Limnothlypis swainsonii*) habitat selection in a managed bottomland hardwood forest in South Carolina. M.S. Thesis, North Carolina State University, Raleigh.

Platt, S.G. and C.G. Brantley. 1997. Canebakes: an ecological and historical perspective. Castanea 62:8-21.

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Iñigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. Partners in Flight North American landbird conservation plan. Cornell Lab of Ornithology. Ithaca , New York . 84 p.

Schieck, J. 1997. Biased detection of bird vocalizations affects comparisons of bird abundance among forested habitats. *Condor* 99:179-190.

Twedt, D. J., and Scott G. Somershoe. 2009. Bird response to prescribed silvicultural treatments in bottomland hardwood forests. *Journal of Wildlife Management* 73:1140-1150.

Van Horn, B. 1983. Density as a misleading indicator of habitat quality. *Journal of Wildlife Management* 47:893-901.

Wilson, R. R., K. Ribbeck, S. L. King, and D. J. Twedt, editors. 2007. Restoration, management and monitoring of forest resources in the Mississippi Alluvial Valley: recommendations for enhancing wildlife habitat. Lower Mississippi Valley Joint Venture Forest Resource Conservation Working Group, Vicksburg, USA. [Online] Available at http://www.lmjv.org/bookshelf.htm