# *Integrating science, environmental education, public outreach, conservation, and capacity-building through hands-on bird ecology research at the Rio Mesa Center*

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**Purpose of research project:**

This project contributes to our understanding of local avian ecology and migrations at Rio Mesa Center (RMC), and will allow for analysis of the demographics of the bird communities to determine population trends for resident species. Furthermore, a central component of this project is to promote awareness and interest in biological research and conservation. We welcome and encourage participation by visitors to Rio Mesa in our bird banding operations, making this project a valuable educational resource for university staff and students.

**Why conduct this research at Rio Mesa?**

The RMC is located in a remote area of Utah that has a limited history of ornithological research. The Colorado River corridor serves as an important migratory flyway for birds in the intermountain west. Rio Mesa's location along the Dolores River, with lush riparian vegetation in an otherwise arid landscape, makes it an ideal location to monitor bird populations and migrations. Ornithological research at RMC is especially important given the critical value of riparian vegetation to Utah's avifauna (Parrish et al. 2007).

**Overview**

Birds are the best-known class of organism, comprise excellent environmental indicators, are relatively easy to monitor, and as charismatic flagship species, are met with excitement, enthusiasm, and interest by people worldwide (Sekercioglu, 2012). Therefore, long-term bird conservation monitoring initiatives that integrate research, community involvement, capacity-building, outreach, environmental education, and local job creation provide some of the best examples of holistic biodiversity-monitoring programs (Latta and Faaborg, 2009), including in Utah (Parrish et al., 2007). This is particularly the case for programs that involve mist netting and bird banding, the labor-intensive nature of which actually benefits local communities by providing jobs (Sekercioglu, 2012). Bird research assistantships not only provide local employment and income, but local field technicians can also be valuable sources of traditional ecological knowledge (Berkes, 2004), environmental educators, ecotourism guides (Paaby et al., 1991), and important links between their communities and conservation scientists.

For conservation science, the value of long-term studies of avian community ecology and population dynamics are irreplaceable. Short-term studies provide variable snapshots in time. The ever-changing dynamics of bird populations (e.g. Newmark, 2006; Parrish et al., 2007; Kennedy et al., 2011; Stouffer et al., 2011) can only be revealed by systematic, long-term studies that should cover at least 3–5 and ideally 10 consecutive years (Faaborg et al., 2007; Parrish et al., 2007). Long-term mark-recapture studies make it possible to estimate survivorship population change, and other critical variables that not only illuminate bird ecology (e.g. Blake and Loiselle, 2002; Peach et al., 2001; Sodhi et

al., 2011), but also provide essential data for conserving birds effectively (Newmark, 2006; Parrish et al., 2007). This is especially the case for climate change, whose effects on birds and ecosystems are expected to be severe (Sekercioglu et al., 2008; Cox, 2010; Wormworth and Sekercioglu, 2011; Sekercioglu et al., 2012), but little research has been done on these long-term effects (Sillett et al., 2000; Harris et al., 2011; Sekercioglu et al., 2012). Equally important for conservation, bird banding programs are vital for capacity-building, education, public outreach, and raising awareness. The hands-on nature of bird banding makes it possible for students, decision-makers, journalists, and other local people to observe birds up close, to learn about the conservation challenges birds and other organisms face, and to make concrete, personal connections to the increasingly-abstract concept of biodiversity (Louv, 2008). Unfortunately, the remarkable and cost-effective potential of bird banding to combine research, conservation, education, public outreach, and income generation has been mostly neglected by the global conservation community and funding agencies (Latta and Faaborg, 2009), and successful government programs (e.g. Sekercioglu et al., 2012; Parrish et al., 2007). Bird banding research is also essential to bird conservation by providing the key demographic data on long-term bird population declines from climate change, habitat loss, introduced species, and other anthropogenic impacts. Riparian habitats are arguably Utah's most important bird habitat (Parrish et al., 2007) and no long-term bird research has been conducted at the university's Rio Mesa Center (RMC), making this study a priority.

I propose to build upon my lab's pilot bird-banding study at the RMC in the past year. This has been a tremendous success, contributing to our understanding of local avian ecology, serving as a valuable educational resource for university staff and students, and helping to promote awareness and interest in biological research and conservation. At RMC, we have captured 1104 birds of 54 species, banded 805 unique individuals, and documented 88 new species, nearly tripling the RMC bird list from 48 to 136 species. Building upon these valuable community ecology data will enable analyses of the demographics of the bird populations to determine population trends for resident species. We have also been cooperating with other labs in the biology department, including the Clayton-Bush and Ehrlinger labs, providing bird parasite and feather samples for their respective research.

Augmenting the scientific value of this research are the excellent educational and environmental outreach components of this work. Long-term research projects that integrate community involvement, outreach, and environmental education are regarded as the most effective means of promoting interest in biology and conservation. To date, numerous groups and individuals have visited our bird-banding operations including Moab journalists, the University's Shoshone-Goshute Youth Language Program, Turkey's National Television (http://www.youtube.com/watch?v=lrP0pzBxtos), and a National Geographic photography and video crew. This research also provides many opportunities for undergraduate students, over a dozen of which have been involved involved.

However, throughout the world, finding funding for new banding and bird monitoring operations is extremely difficult, even though data from monitoring effects of global change on birds become more valuable with each passing year. In addition to its scientific value, the hands-on nature of bird banding also makes it very important for education, public and media outreach, and conservation. In the past two years, our lab has spent the most person-days of any lab doing biological research (as well as environmental

education and public outreach) at the RMC. With this grant, we will be able to build upon the pilot dataset that we have accumulated over the past year and will provide a venue for University of Utah classes and personnel that visit Rio Mesa to learn about biological research and conservation in remote and beautiful settings.

**Objectives**

This is an ornithological study of species composition, community ecology, and population dynamics of the RMC land bird community. The focus will be using mark-recapture methods to investigate the understory bird community most effectively sampled by mist nets. This is the start of a long-term bird monitoring and education project that will involve University of Utah students and the public. The RMC's location next to a crucial desert riparian corridor makes this an ideal site for long-term ornithological research, monitoring, education, and outreach. Ornithological research at RMC is especially important given the critical value of riparian vegetation to Utah's avifauna (Parrish et al. 2007). Our objectives are to:

1. Investigate the community ecology of RMC's understory birds, including their relative abundances, demographic composition, and age/sex distributions.
2. Study the long-term changes in the RMC bird community, especially with respect to climate, using mark-recapture techniques by banding birds with unique bands. As a riparian zone in an arid area, the RMC bird community should be particularly sensitive to climate change and climate-related shifts in species are expected over time.
3. Provide ornithological education and outreach to the public and the University of Utah students, expose them to ornithological fieldwork, and train highly motivated and committed students in mist netting, bird banding and avian ecology research.

**Methods**

Mist netting and banding birds enable the quantification of long-term changes in the bird community and to measure the increases and declines in the populations, survivorship, productivity, and other demographic parameters of various bird species using mark-recapture methods and analytical techniques such as the program MARK. We will be using 12 m X 2.5 m ground nets that mostly capture songbirds, which will be banded and released unharmed. The MAPS (Monitoring for Avian Survivorship and Productivity) station research protocol will be used (http://www.birdpop.org/MANUALS.HTM). Nets will be placed in flat locations near the Dolores River. Locations will be chosen to minimize any clearing of the vegetation. Our methodology is based on that outlined by Parrish et al. (2007): "'Constant Effort' mist net surveys will be carried out in accordance with Ralph et al. (1993) and protocols established for the Monitoring Avian Productivity and Survivorship (MAPS) Program (De Sante et al. 1995). Mist net sampling at selected sites will be conducted within 10 to 12 ten-day 'blocks' each year, from March through November. A standard mist net survey consists of 10 mist nets, each net measuring approximately 3 meters high and 14 meters long when fully extended. Nets are opened within 30 minutes of official sunrise and operated for six hours each, for a total of approximately 60 net hours per individual

survey. Some or all nets may be closed early during any given sampling effort when high temperatures, rain, or high winds develop that could cause injury or death to the birds. Each bird captured will be banded with a U.S. Fish and Wildlife Service numbered leg band and released. Data collected from captured birds will include species, age, sex, weight, wing length, an assessment of fat content, an assessment of breeding condition, an assessment of feather wear and molt condition, time of capture, and general observations.”