# Biosurvey News

The Newsletter of the Oklahoma Biological Survey
Spring 2008

Oklahoma Biological Survey


# Biological Survey Research: Tracking Birds With RFID

If you have ever set off the alarm in the grocery store because you walked out the door with something that was not properly demagnetized, then you are somewhat familiar with RFID, or "radio frequency identification." This same technology that brings the store manager running also is used by wildlife biologists to keep track of individual animals. The standard practice is to equip animals with small, rugged PIT tags (short for passive integrated transponder). When a PIT-tagged animal is recaptured, a reader unit can stimulate the tag to send out an identification code that is unique to that particular tag. The use of PIT tags is nothing new for wildlife managers tracking salmon or amphibians, but Eli Bridge and Jeff Kelly at the Oklahoma Biological Survey are developing new ways to use this technology to study birds.

*A PIT-tagged bird. Photo by Eli Bridge.*

Before coming to the Biological Survey, Dr. Bridge conducted a series of supplemental feeding experiments on Florida Scrub Jays. These studies involved strategically placing feeders in the field to provide food to specific birds and to determine how an abundant food source affected their stress physiology and timing of reproduction. Although these experiments yielded interesting results, it often was difficult to administer food only to targeted individuals. As the feeders were raided by hundreds of blackbirds as well as jays that were not to be supplemented, it became clear that a more sophisticated method of supplementation was needed. The solution was the "Smartfeeder," a battery-operated feeder that uses an RFID reader to recognize PIT-tagged birds and administer food according to programmed instructions. The smartfeeder also features a small balance to weigh the birds and datalogging equipment that keeps track of how much food each bird takes.

*A "Smartfeeder". Photo by Eli Bridge.*

But the use of RFID on birds does not end there. Although the science of ornithology is arguably over 3,000 years old, there remains considerable uncertainty about many basic aspects of bird life histories. For virtually all small migratory landbirds, we can only guess at how long they live in the wild and to what extent individuals move about during their lifetime. Much of what we do know comes from banding efforts in which numbered bands are placed on thousands of birds with the hope that a few will be caught again at some point to have their bands read. Needless to say, these recaptures are exceedingly rare. For birds marked with PIT tags, not only will it be unnecessary to catch a bird to identify it, but identification can be done automatically by RFID reading units incorporated into simple backyard birdfeeders. With a large number of these units relentlessly logging bird visits, there should be a substantial boost in the number of individuals that are "re-sighted," which will greatly improve our understanding of survivorship and dispersal.

A long-term goal is to recruit a large contingent of citizen scientists to help establish a network of RFID birdfeeders across the continent. If participation in such a program is high enough, we will be able to track migration routes and broad scale dispersal. This line of research will be presented at an upcoming meeting of the MIGRATE research network coordinated by Jeff Kelly. This meeting will bring together experts from throughout the world to discuss the use of new technologies to study bird migration and will be the first step toward implementing an RFID bird-tracking program.

-Eli Bridge

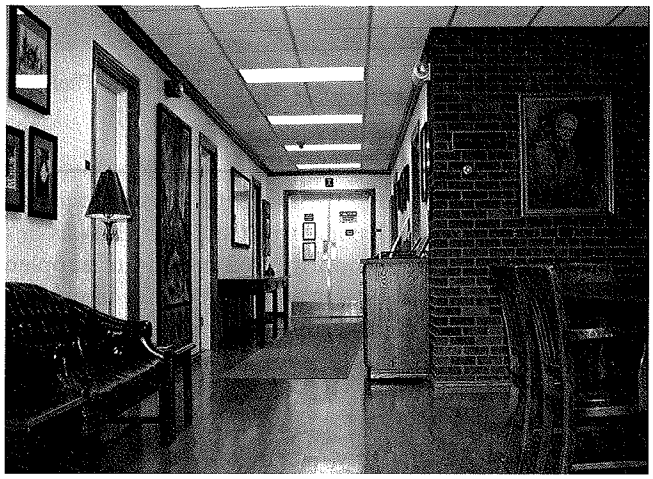
INSIDE THIS ISSUE:



# Renovation Completed for the George J. Goodman Foyer of the Bebb Herbarium

More than 60 guests joined together to rededicate the newly remodeled George J. Goodman Foyer of the Robert Bebb Herbarium on Sunday, October 27, 2007. The Goodman Foyer has been renovated top to bottom with new hardwood floors, oak trim throughout, textured and painted walls, new ceiling panels and lights, custom blinds for the windows, and numerous mounted and framed photographic prints. Photographs depict George Goodman and many of his colleagues, including George Lynn Cross, Norman Boke, Howard Larsh, William Penfound, Bill Weber, and a Department of Plant Sciences group photo taken in 1946. A large WPA-sponsored mural depicting the evolution of ferns and an oil portrait of George Goodman painted by family friend James Cobb also are displayed in the foyer and hang in places of honor.

More than $50,000 was raised during a three-year period to complete the project, which included donations from the College of Arts and Sciences, Oklahoma Biological Survey, Department of Botany and Microbiology, six corporate donors, and over 200 individuals. We thank these benefactors for their contributions to the renovation project. The widespread support among friends and colleagues demonstrated the high level of respect and admiration held for Dr. Goodman during his tenure as curator of the Bebb Herbarium from 1933-36 and from 1945-75. All donors are acknowledged on a plaque displayed permanently in the foyer.



*The renovated George J. Goodman foyer. Photo by Wayne Elisens.*

Future plans for the Goodman Foyer include additional displays of botanical artifacts, historical photographs of OU botanists and completion of a photographic "Wall of Curators" where images of herbarium curators are displayed alongside photos of Robert Bebb and his father, Michael Bebb, who was a well-known willow expert in the late 19th century. With a seating area and a conference table, the newly renovated Goodman Foyer is a comfortable venue for small meetings and for students to study amidst reminders of the history of botany at the University of Oklahoma.

-Wayne Elisens

## New on the Web

*Updated personnel pages

*Updated BioBlitz! pages for BioBlitz! 2008, including online registration

-Dan Hough

*Biosurvey News*
**Spring 2008**
Amy K. Buthod and Caryn C. Vaughn, editors

Biosurvey News is published twice each year and reports on the activities, programs and news related to the Oklahoma Biological Survey. We welcome readers' comments and suggestions. The Oklahoma Biological Survey is proud to be a unit in the College of Arts and Sciences at the University of Oklahoma.

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# Biological Survey Research: The Tree of Life

All living things -- from bacteria to whales and redwood trees -- are genetically related. This genetic relatedness is visualized as an immense evolutionary "Tree of Life", which provides the framework for our modern understanding of biology. The "Tree" displays the full diversity of life as well as revealing the history of similarities and differences among the lineages of organisms as these have changed through time. The Tree of Life is estimated to contain more than 10 million extant species, although less than 2 million of these have been described. Understanding the phylogenetic relationships on the Tree is critically important in areas as diverse as revealing the origins of disease, understanding the evolution of species communities and developing new traits for agricultural taxa. The National Science Foundation has made a major commitment to assembling the Tree of Life by funding groups of experts in molecular biology, morphology and computer science to investigate different branches on the Tree.

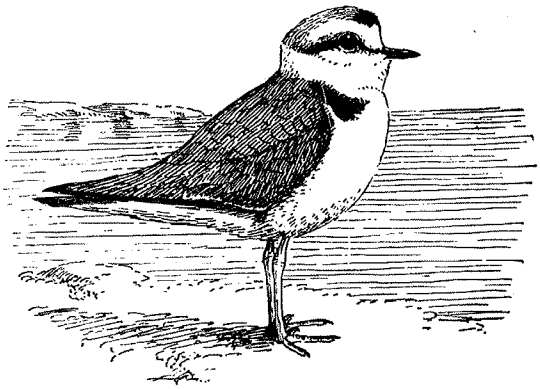
The Biological Survey is the home of the fish branch on the Tree of Life. Associate Professor Richard Broughton is the lead investigator of five-year, $3 million grant from NSF, entitled "Assembling the eutelost tree of life -- addressing the major unresolved problem in vertebrate phylogeny". Dr. Broughton leads a team of internationally recognized experts on fish evolution, including colleagues from the University of Kansas, University of Nebraska, University of Florida, Loyola University-Chicago, The Field Museum in Chicago, Old Dominion University and the Smithsonian Institution. The project is directed at understanding the evolutionary history and diversity of the world's fishes.

There are over 28,000 species of ray-finned fishes, more than all other species of vertebrates combined. Species in this group include virtually all economically important species (such as salmons, cods, basses, tunas), as well as important genetic and developmental model species (such as zebrafish, ricefish, stickleback, pufferfish). Although many fish groups are well-defined (e.g., taxonomic orders, suborders and families), the evolutionary relationships among those groups remain poorly known. The project will generate DNA sequences of 20 different genes from 1,500 species representing the range of fish diversity as well as describing approximately 450 anatomical characteristics from a subset of 300 of these species. The resulting massive data set will be analyzed using sophisticated phylogenetic methods on high-performance supercomputers to determine the pattern and timing of branches on the fish evolutionary tree. The project also will develop school curriculum materials for understanding evolution and phylogeny. The fish tree of life will be used as the conceptual framework in a work/activity book directed at middle school students to be published by the National Science Teachers Association Press.

-Rich Broughton

## Save the Date!

### BioBlitz! 2008 will be held at the Great Salt Plains State Park and the Salt Plains National Wildlife Refuge on September 12-13, 2008.



Great Salt Plains, Oklahoma

BioBlitz! 2008

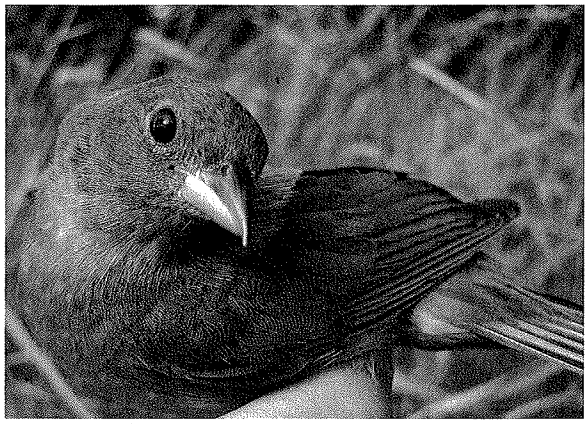
The Salt Plains is a speculator location for birding and wildlife viewing. In fact, the Salt Plains are so important to shorebirds that this year's T-shirt design includes the threatened Snowy Plover (*Charadrius alexandrinus*), which breeds on the salt flats on the refuge. The saline habitat and surrounding wetlands should be an excellent place for biologists to inventory a wide variety of species. Come join other volunteers in our inventory of the biodiversity of one of Oklahoma's unusual habitats. Scientists, educators, volunteers and dedicated enthusiasts from all across Oklahoma and the surrounding states will be identifying and counting as many species as possible in 24 hours.

Special volunteer opportunities are available this year! To learn more, call (405) 325-7658 or check out the web site at www.biosurvey.ou.edu. Click on the BioBlitz! button.

-Priscilla Crawford

# Graduate Student Research: Migration Behavior of the Painted Bunting

Anyone who has spent time walking around the woods or grasslands of Oklahoma in the spring has probably had the opportunity to observe a bird feeding its nestlings. You might even have helped a young nestling back into its nest after a spring storm. Many people find it hard to believe that a bird only three months old can fly hundreds to thousands of miles to its winter range. In fact, a species that breeds in Oklahoma, the painted bunting, spends its winters as far south as Costa Rica and completes this amazing journey all before its first birthday.



*An adult male Painted Bunting. Photo by Adam Fudickar.*

Painted buntings hatched as late as July in Oklahoma will embark upon their first journey south at only three months old. Weighing around 14 grams, these buntings travel by night and are guided by navigational systems biologists are only beginning to understand. The navigational tools that migratory birds can use include celestial maps, polarized light and magnetic inclination angle. As a part of my master's thesis research under the direction of Dr. Jeff Kelly, I am using the inherited migratory behavior of painted buntings to better understand timing of their first autumn migration. The instinct to migrate is so strong that first-year birds that have never migrated will essentially migrate in captivity, which allows me to monitor their activity in a way that would be very difficult in the wild. Small birds the size of painted buntings cannot support the weight of electronic tracking devices, so researchers must find other ways of following these birds as they migrate. Because individual birds are difficult to follow over even short distances, it is not clear from field observations whether a bird has begun migration or if it just moved to the next patch of oaks.

*A Painted Bunting nest. Photo by Adam Fudickar.*

In the summer of 2007, I hand raised seven hatchling painted buntings at the University of Oklahoma so that I could observe their first migration. These birds were exposed to the natural day length (photoperiod) of Oklahoma. The length of daily photoperiod is a cue that migratory birds use to begin migration. In late August and early September the captive birds began to exhibit migration behavior including rapid wing beating, flying up and down from a perch, and angling the beak upwards while beating wings. Painted buntings are nocturnal migrants, so to observe this behavior I used infrared cameras. Each night, two birds were videotaped for a six-hour period beginning one hour after sunset. A typical evening of migration can last four to six hours. During the daytime migrating birds consume more food because their nighttime flying requires large amounts energy. This is why a migratory bird can easily gain 50 percent of its body weight prior to migration.

The birds finished their migration behavior in early December. After watching hundreds of hours of video I have a good description of the timing and intensity of this migration behavior in captivity. On average, a captive bird exhibited migratory behavior for about a month and a half before stopping to molt its primary flight feathers. After spending a couple of weeks molting their feathers, the captive birds would begin to display migratory behavior again, and typically did so for around one more month. These observations are consistent with previous observations of wild painted buntings. Sightings of molting painted buntings in northwestern Mexico in early fall have led some to believe that the western population of painted buntings has an unusual molt pattern known as molt-migration. Molt-migrants interrupt their autumn migration to molt along the migratory path. This migratory strategy usually occurs in species whose breeding grounds do not have enough food to provide the energy birds need to molt or when there is a pulse of food at a stopover location on the way to wintering grounds. For western painted buntings, late summer monsoonal rains provide a pulse of food in northwestern Mexico, which might explain painted buntings stopping there to molt.

My observations of the migration behavior of captive painted buntings have led to new questions for future research. Specifically, I am interested in knowing if there are different migration strategies for different populations of painted buntings in Oklahoma and how strong the genetic component of the timing of painted bunting migration is. I am also interested in knowing if all painted buntings that breed in Oklahoma stop in northwestern Mexico during migration to molt their feathers. To answer these questions I am now analyzing stable isotope ratios of feathers from wild-caught birds that I hope will provide clues about the location of autumn molt.

So this summer when you see a young migratory bird, consider the journey that it will take this fall. It won't be long before they are preparing to fly south, perhaps thousands of miles, just to return to Oklahoma next spring to breed.

-Adam Fudickar

# BioBlitz! 2007 Results Possibly Include a New Species

One of the 1,009 species recorded during the annual 24-hour inventory of biodiversity on September 14 and 15, 2007, may be a new species of ant, believed to be in the genus *Monomorium*. David Donoso, zoology graduate student at the University of Oklahoma, collected the ant, which has been sent to experts for verification. According to Dr. Ken Hobson, entomologist and assistant professor of zoology at OU "[this] is one example of how many species new to science are waiting discovery in Oklahoma. At a time when we are beginning to acknowledge the value of the rich biodiversity we inherited in North America and when this diversity is slipping away, we have a great opportunity to document and preserve the richness that is still here."

*Hunting for intertebrates. Photo by Sheila Strawn.*

An opportunity to document the biological diversity of Wichita Mountains Wildlife Refuge was experienced by 140 biologists representing more than 20 organizations and schools. Volunteers, ranging from professional biologists to avid amateurs, climbed mountains, slogged through wetlands, turned over rocks and peered through microscopes to document 1,009 species. These species represent a wide spectrum of biological organization including fungi (28), lichens and moss (20), algae (75), vascular plants (322), aquatic invertebrates (47), terrestrial invertebrates (395), fish (12), amphibians and reptiles (18), birds (77) and mammals (15).

*BioBlitz! botanizing. Photo by Sheila Strawn.*

Local schools were invited to participate in an education program on the Friday before the inventory began. Environmental educators from a variety of organizations, including the Oklahoma City Zoo, Three Forks Nature Center and Quartz Mountain Nature Park set up outdoor learning stations through which students traveled and learned about many topics including natural history, species diversity, and edible and medicinal plants. The culinary highlight of the weekend was a catered brisket dinner provided by the Association of the Friends of the Wichitas.

-Dustin Woods

*Examining specimens. Photo by Sheila Strawn*

Oklahoma Biological Survey

# *Biosurvey News*

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## Biodiveristy: The Ozark chinquapin (*Castanea pumila* var. *ozarkensis*)

Perhaps readers are familiar with the story of the American chestnut tree, *Castanea dentata*. This rapidly-growing hardwood was once an important economic resource throughout the eastern United States, where it dominated over 200 million acres of forested land. The plant provided nuts for consumption and fine, light-weight wood for construction. Unfortunately, American chestnut was highly susceptible to blight -- a bark fungus accidentally introduced from Asia in the early 1900's. Billions of trees were killed, and today less than 100 larger trees survive.

Oklahoma has its own species of chestnut -- the Ozark chinquapin (*Castanea pumila* var. *ozarkensis*). This small, shrubby tree is found in a highly restricted area within the Ozark Plateau and Ouachita Highlands of eastern Oklahoma. Ozark chinquapin grows in upland oak-hickory forests and oak-pine forests in dry acidic soils on ridges and ravine slopes. Plants are usually less than 5.0 m in height, with crowns up to 6.0 m wide. Bark is gray to grayish brown in color, and leaves are 13 -20 cm in length, broadly lanceolate to oblong in shape, and coarsely toothed. Upper leaf surfaces are hairless and greenish-yellow. Produced from May through June, flowers are white, strongly-scented, and grow in a dense spike-like inflorescence. The plant is primarily wind pollinated, although its strong floral scent attracts many species of flies, bees and wasps. Fruits are produced in burrs with strong, hairy spines from June through September. Nuts are small, round and brown in color. Ozark chinquapin also has been affected by fungal blight (*Cryphonectria parasitica*).

*Flowers and leaves of the Ozark chinquapin. Photo by Bruce Hoagland.*

While it currently has no federal status, prior to 1996 the tree was a likely candidate for listing as endangered or threatened. Most Oklahoma examples grow in small groups that are stump sprouts from the roots of older, blighted trees, although individual seedlings have been noted. New plants will appear in areas that have been newly cleared, leading scientists to conclude that the plant gets established and survives as a long-lived seedling until the canopy opens up enough for growth and reproduction. Both new plant and stump sprouts are soon infected by the blight and die within approximately ten years.

-Amy Buthod