Update

share with wildlife

Working on Behalf of New Mexico's Wildlife • Winter/Spring 2009

A MOUSE WORTH JUMPING UP AND DOWN ABOUT?

Share with Wildlife project helps to clear the air about which jumping mouse is which

Photo by James N. Stuart.

A New Mexico meadow jumping mouse from Sugarite Canyon State Park near Raton, New Mexico.

New Mexico residents may be surprised to learn that our state does not have the most famous jumping mouse. That award goes to Colorado and Wyoming, where the Preble's meadow jumping mouse can be found. Preble's meadow jumping mouse (*Zapus hudsonius preblei*) is a subspecies of meadow jumping mouse that is listed as Threatened under the federal Endangered Species Act. But what gets it even more attention is where it lives—along riparian habitats and surrounding areas ranging from southeastern Wyoming to southern Colorado, including the area right along the edge of Colorado's Front Range where metropolitan Denver and other developed areas are situated. As you can imagine, this has led to some fairly intensive scrutiny of both development activities in and around the habitats of Preble's meadow jumping mouse, and of the mouse itself. A recent round of spirited discussion in the scientific literature debated the

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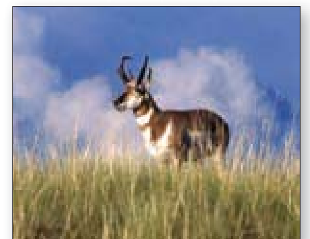

Update

WINTER/SPRING 2009

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Writer/Editor
CHUCK HAYES

Share with Wildlife Coordinator
CHUCK HAYES

E-mail:
chuck.hayes@state.nm.us

Typography/Design
Digital Imaging:

LESLIE K. COLEMAN

Photo by Dan Williams

BACK TO THE HIGH COUNTRY
Boreal Toads Return to New Mexico

Photo by James N. Stuart.

A young boreal toad from the reintroduction project at Trout Lakes.

On June 17, 2008, the New Mexico Department of Game and Fish, along with the Colorado Division of Wildlife and the U.S. Forest Service, released 4068 boreal toad tadpoles from stock raised in Colorado into a secluded pond in Trout Lakes, Rio Arriba County. Trout Lakes is one of three localities from which the Boreal Toad was once known, but the last confirmed sighting of the animal there was in 1978. The population was monitored twelve times subsequent to the release. Forty days after the initial release, all tadpoles that survived to that point had changed into toadlets and exited the pond itself, moving into the marshy areas nearby. One toadlet, an inch (25 mm) in size, was found over 550 ft (170 m) away from the release pond. The toadlets were last seen during the third week of September, over ninety days after their release, and by this time had almost doubled in size. The Department estimates 500 – 1,000 of the original tadpoles have made it out of the pond. The Boreal Toad Recovery Team will use lessons learned this year to plan for 2009, both in terms of the second release of tadpoles to the same pond and in terms of monitoring the success of this and other releases. According to Leland Pierce, the Department's terrestrial recovery plan coordinator, "The quality of the site turned out to be better than anything we might have imagined, and we are greatly encouraged by how many tadpoles survived to become toadlets, so we're all really excited by how the project is going. After all, it's not every day that you get a chance to return a native species to its home!"

Two other species of toad in New Mexico resemble the boreal toad, the Woodhouse's toad, *Bufo woodhousii*, and the Great Plains toad, *Bufo cognatus*. The Woodhouse's toad has a very long parotoid gland (the gland behind the eye) and cranial crests, whereas the boreal toad has a shorter, more oval parotoid, and lacks cranial crests between its eyes. The Great Plains toad also has cranial crests, and has large green splotches whereas the boreal toad is generally all black or dark gray-brown. The key difference is that the highest elevation for the Woodhouse's toad is 7,444 ft (2,269 m), and 6,233 ft (1,900 m) for the Great Plains toad, whereas the minimum recorded elevation in New Mexico for the boreal toad is 9,104 ft (2,775 m). Therefore, if someone spots a toad above 8,000 ft in Rio Arriba County, it is a boreal toad, whereas if someone spots a toad below 8,000 ft or in a different county, most likely it is not. For more information on these species or other amphibians or reptiles in New Mexico, be sure to consult the book *Amphibians and Reptiles of New Mexico* by Dr. William Degenhardt, Charlie Painter, and Dr. Andrew Price, by the University of New Mexico Press. And if you do find any high-elevation toads in New Mexico, please contact New Mexico Game and Fish and let us know—we can always use your help in restoring and retaining our diversity of native wildlife. ♦

PICKY ABOUT THEIR (FISH) NEIGHBORS

Sinkholes at Bitter Lake National Wildlife Refuge are home to two species of state-listed fishes: Pecos pupfish and Pecos gambusia. The sinkholes-turned-lakes on the refuge provide habitat for these two species and other native fishes, with combinations of different fishes inhabiting different sinkholes. **Dr. Wiebke Boeing** and **Kristin Swaim** collected and analyzed two years of data regarding abundance and condition of fishes in the sinkholes, and their relationship to both biological and physical variables.

Analyses to date have focused on the relationships between numbers and conditions of Pecos pupfish relative to characteristics of each sinkhole. The results have been somewhat surprising. Pecos pupfish have been found in significantly lower numbers in sinkholes where they occur with other fish species. The body condition of Pecos pupfish also appears to be negatively influenced by the presence of other fishes. Because all of the fish species examined were native and may have coexisted for thousands of years, it was somewhat unexpected that Pecos pupfish would appear to be negatively influenced by other fish neighbors. The cause of this negative interaction is not particularly clear, either. Pecos pupfish and Pecos gambusia (which was the most numerous species found in the sinkholes that Pecos pupfish shared with other fishes) have different diets and breeding habits. Pecos pupfish are largely bottom feeders whose meals consist primarily of diatoms and detritus. Pecos gambusia are surface feeders, and mainly feed at night on a diet of small insects. So neither fish species should be depleting or affecting the food source of the other. Breeding systems are also very different. Male Pecos pupfish defend breeding territories, and female pupfish deposit their eggs on bare rock, such as the shelves or ledges connected to the sides of the sinkholes. In contrast, Pecos gambusia don't maintain breeding territories, and give birth to live young. Pecos gambusia shouldn't be interfering with the breeding patterns of Pecos pupfish. However, it's possible that the pupfish don't know that, especially when they're all confined within the boundaries of the same sinkhole. If gambusia are spending most of their time near the surface, and pupfish are maintaining breeding territories on shallow rock ledges, the time and energy spent by pupfish chasing off gambusia might interfere with their reproductive efforts. This would fit with Boeing and Swaim's observations of reduced body condition of Pecos pupfish that overlap with gambusia, and the small number of juvenile pupfish they found. But it will likely take some additional observations to better explain these patterns in Pecos pupfish abundance and condition.

Photo by Ryan McShane.

A Pecos pupfish from Bitter Lake National Wildlife Refuge.

The relationships between Pecos pupfish numbers and physical factors have not been consistent across years so far, but one trait is clear. Pecos pupfish have a reputation for being able to tolerate highly saline (salty) water conditions, and this reputation appears to be well-deserved. Boeing and Swaim found pupfish in one sinkhole that was nearly four times as salty as the ocean, and contained almost no dissolved oxygen. But these conditions did not spell the end for the pupfish. The following year, Boeing and Swaim found that the conditions within the sinkhole had improved, and fish numbers had greatly expanded, despite the stressful conditions faced during the previous year. This is just one of the many changes that have been observed between years of the study so far. Boeing will continue her studies at Bitter Lake this coming year, with the assistance of Share with Wildlife funding. She's hoping that data from additional years and under different conditions will help illuminate some of the relationships between Pecos pupfish and the physical components of their habitat. Alternatively, the results might tell us that there aren't clear patterns over time, and instead it's the year-to-year variation that helps drive changes in Pecos pupfish populations. Stay tuned! ♦

Share with Wildlife is dedicated to the conservation of all New Mexico's wildlife. It is supported by donations only. The program funds four general categories of activity: research, wildlife rehabilitation, habitat protection, and public education. **Share with Wildlife** is committed to helping "wildlife in need," those species with no other source of funding.

Surf on in!

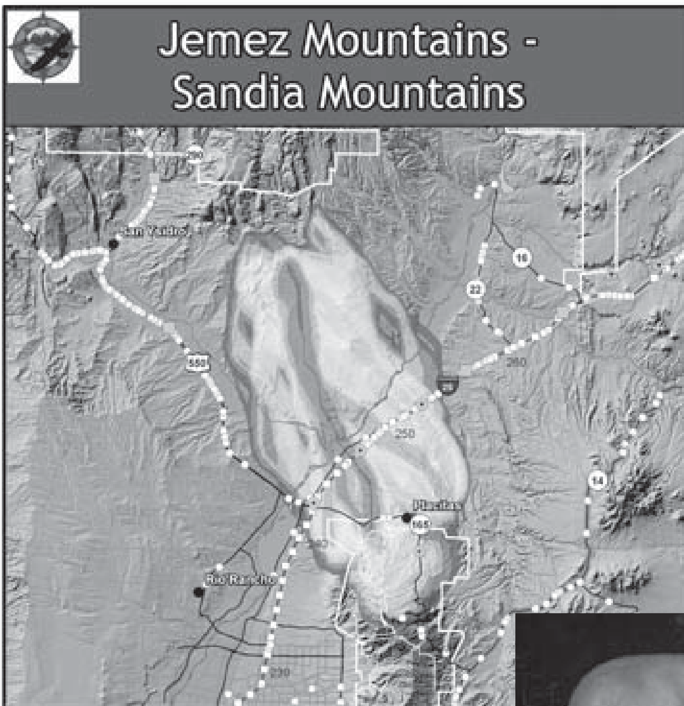
Share with Wildlife has its own Website/Internet address. Enter:

www.wildlife.state.nm.us to find the New Mexico Department of Game and Fish home page. Then click on the "Conservation" button under the Table of Contents. There you will find the **Share with Wildlife** Home Page with updates, project reports, and other links of interest.

Contact us via e-mail at chuck.hayes@state.nm.us

LINKS TO THE FUTURE:

Connecting Wild Places by Linking Cougar Habitats



A least cost path corridor for cougars between the Sandia and Jemez Mountains, crossing Interstate 25. Contours show the relative "cost' of following each path between the habitats, with the "best" corridors shown by the innermost contours. Map by Kurt Menke.

An elusive New Mexico cougar is caught by a camera trap as it passes through Bosque del Apache. Camera trap project by Matt Farley, Jennifer Miyashiro, and James N. Stuart.

You may have seen a bit about habitat linkages in the news lately. ABC News, the Christian Science Monitor and others have recently picked up on the story of a wildlife crossing at Tijeras Canyon—a busy stretch of Interstate 40 just east of Albuquerque that separates the Sandia and Manzano Mountains with 6 lanes of fast-moving traffic. For of you who are long-time subscribers to the Share with Wildlife update (don't worry, there's no quiz!), you may remember the winter 2003-04 issue featuring important cross-highway wildlife corridors that were identified as being in need of safe passage—both for wildlife and drivers trying not to collide with the wildlife. Safe wildlife highway crossings caught the attention of the New Mexico Legislature in 2003, thanks in no small part to concerned citizens including a group of elementary students known as the Wild Friends, who bring a wildlife-related matter to the Roundhouse each year. The Legislature pledged its support for this endeavor by passing House Joint Memorial 3, directing state entities to work together for safe passage. Subsequently, the New Mexico Carnivore Working Group, along with state and federal agencies, hosted a Critical Mass workshop of biologists, transportation specialists, and others to identify important locations for ensuring the safety of wildlife populations and drivers. Tijeras Canyon was identified as one of the state's top four priority areas in need of safe wildlife crossings. With the stretch of I-40 through Tijeras Canyon having been scheduled for renovation, an opportunity arose to build in measures that would allow wildlife to safely cross the highway. Fences were installed to direct animals toward the existing underpasses, brush was cleared from the underpasses so animals would be more likely to go through without fear of hidden predators, and motion-triggered lights were installed to alert motorists when wildlife are near the roadway. Construction of these components was completed in 2007, and since that time it has been documented that wildlife are using the intended crossings. The success at Tijeras Canyon can now serve as a model for maintaining cross-highway habitat connections while improving safety for motorists.

Tijeras Canyon is one of many habitat linkages that are needed in New Mexico to keep both wildlife and drivers safe (for example, the Critical Mass workshop identified 31 priority highway segments for wildlife crossing). **Kurt Menke** is very aware of this. He is a co-chair of the Tijeras Canyon Safe Passage Coalition (TCSPC), a citizen's interest group that helped push forward the installation of safe passage structures at Tijeras Canyon, and continues to be active in monitoring both the wildlife crossing and other matters related to wildlife safe passage at the local, state, and national levels. With its impressive website and the sustained interest of its participants, you might think that the TCSPC was run by a professional community organizer operating with an endowment. Hardly. TCSPC is an entirely volunteer organization. In fact, Menke serves as co-chair of TCSPC on his "free" time from his day job, as the owner of Bird's Eye View, where he specializes in using geographic information systems (GIS) technologies to address ecological and natural resource management issues. He has become well-known for contributions to southwestern conservation matters, including spatial analyses of borderland wild cats and their habitats, wilderness areas, and habitat connectivity. In fact, Menke had recently completed a project where he worked with New Mexico Game and Fish to map cougar habitats statewide. This background put him a unique position to utilize the latest techniques for determining the extent of fragmentation between

habitat patches, and for identifying areas that are important for connecting these habitats and maintaining cougar populations long into the future. With the assistance of a Share with Wildlife grant, Menke set out to undertake this study.

Cougars Carrying Umbrellas

Cougars are by no means the most endangered creature in New Mexico, nor are they the most common species involved in collisions with vehicles. So why choose cougars as the subject for this linkage project? Several factors combined to make them an ideal study organism for connecting habitat patches. First and perhaps foremost, cougars are large carnivores that live at relatively low densities and have extensive home ranges and potential dispersal distances. They can be considered as having somewhat generalized habitat requirements, living in environments ranging from low deserts to high montane forests. This means that effective cougar habitat patches are, by their very nature, made up of good-sized chunks of land that should also encompass the needs of many other species of wildlife. This concept can be referred to as an "umbrella species," and is often used in conservation planning. The fact that getting a large animal through some sort of linkage or crossing may be inherently more difficult than getting a smaller animal through, and that predators can only survive in places where they can find prey, provides further support for the idea that habitats and linkages which maintain cougar populations will overlap with those of other wildlife. Modeling habitat linkages requires knowledge of where patches of habitat occur and what habitat features are most suitable. As a result of the recent cougar habitat modeling, both of these pieces of information were available. Menke had also compiled statewide roadkill data for cougars and other wildlife, which pointed out areas that animals may be using to traverse between habitat patches, and where habitat linkages might be limited by intervening highways.

This underpass at Tijeras Canyon provides a corridor for wildlife moving across Interstate 40 east of Albuquerque. Photo courtesy of Tijeras Canyon Safe Passage Coalition.

With all the necessary background information in hand, Menke then availed himself of the latest analytical tools for identifying wildlife linkages. He obtained a program called CorridorDesigner that was created specifically for mapping wildlife linkages in Arizona. This software uses an approach known as least cost path analysis to delineate the best connections between habitat patches. The least cost path approach assumes that animals will prefer to travel through areas containing the features that they consider to be most suitable, and that a total "cost" of traveling across a piece of ground can be assigned based upon landscape characteristics. Think of it as how a person might choose to walk across town. Areas of high "cost" might be where rivers, steep terrain or busy freeways had to be crossed, while low cost areas might include existing paths, flat areas, and more direct routes that would reduce the total distance traveled. The same concept can be applied to cougars or other wildlife, except of course that they will probably seek out different habitat features than humans. Landscape variables that affected suitability for cougars included prey availability, distance to roads, human population density, boundaries of urban areas, and rugged terrain.

The Pathway Appears

Menke then crunched all this data to generate potential corridors at 26 different habitat linkages around the state. Carnivore roadkill locations had been recorded at 13 of these linkage areas, and at nine of the 13 areas roadkills were within the "best" linkage pathways produced by the model. The modeled corridor across Interstate 25 at Raton Pass near the Colorado border fell directly between two cougar roadkills, and the modeled corridor at Tijeras Canyon (the best-studied linkage area in the state) runs right through the wildlife crossing that was constructed along I-40. All of these findings suggest that cougar habitat linkage modeling provides a sound basis to begin identifying specific locations for wildlife habitat linkages.

While lines on a map are important, they do not tell the whole story. Ideally, the next step would be to repeat what was done at Tijeras Canyon for each of the possible linkages. The modeled corridors give us places to look, but they don't answer questions like whether there are existing road culverts or structures that could be used as cross-highway linkages, or what wildlife may be using these corridors based on evidence from tracks, scats, or photos take by motion-triggered camera "traps." As always, money is big consideration. Being able to piggyback installation of wildlife crossings onto highway renovation projects greatly improves cost efficiency and the likelihood that a crossing can be installed at a relatively small proportion of the entire highway project's costs. With the growing human population in New Mexico and mounting pressures on wildlife habitats through factors such as a changing climate, the $750,000 that was spent at Tijeras Canyon to benefit both wildlife and the safety of drivers seems like a small price to pay. ♦

On
Track With

SwW PROJECTS

Small Fish... Big Questions

Photo by Tom Kennedy.

Daniella Swenton-Olson prepares to set a minnow trap at a Bitter Lake National Wildlife Refuge sinkhole.

Daniella Swenton-Olson and **Dr. Astrid Kodric-Brown** from the University of New Mexico are continuing their studies of Pecos gambusia (*Gambusia nobilis*) in the lower Pecos River basin. This state- and federally-Endangered fish sometimes shares the water with its widely-distributed and frequently human-transported relative, the western mosquitofish (*G. affinis*). Swenton-Olson and Kodric-Brown are investigating how (and how well) the two *Gambusia* separate themselves, and whether the more common mosquitofish is threatening the remaining populations of Pecos gambusia.

Swenton-Olson is evaluating the degree of hybridization between these two fish species using genetic analyses. She has collected fish from Bitter Lake National Wildlife Refuge, at sites where both species occur together and where they are separate. Genetic samples are obtained using a non-destructive technique that involves clipping a small portion of fin tissue from a fish, which is then analyzed in a laboratory. Results of genetic analyses provide an idea of how much these related fishes are interbreeding, as hybrids are often visually indistinguishable from the parent species. Other aspects of Swenton-Olson's project will look at some mechanisms that may separate the two *Gambusia*. Mate choice experiments reveal how "attractive" the different fishes may be to each other. Initial results suggest that hybridization may be reduced through some cryptic preference of female Pecos gambusia for males of their own species, and the relatively poor success of the western mosquitofish's "live fast, die young" life history strategy within traditional Pecos gambusia habitats. Future work will include collaboration with colleague Tom Kennedy for diet analyses to compare foods items and foraging habitats of Pecos gambusia and western mosquitofish. Findings from this project will help managers assess the relative importance of physical separation between the two species for the long-term conservation of Pecos gambusia. ■

A Vision for Wildlife in Santa Fe County

Dr. David van Hulsteyn, co-founder of the conservation organization Wild Prairie Partners (WPP), has been working to ensure that wildlife habitats, and the lands that link these habitats, are maintained to ensure that wildlife populations can persist within Santa Fe County in perpetuity. Dr. van Hulsteyn and his associates undertook several tasks to advance the planning process for wildlife-related needs within the Galisteo Basin and the important wildlife habitats that are linked to it. WPP began working with scientists and agencies to determine what data layers exist, and what data need to be obtained. WPP made several personal contacts with large landowners and with potential funding sources to explore means of putting wildlife conservation measures in place. Perhaps most importantly, van Hulsteyn and WPP joined forces with the Galisteo Watershed Partnership, a coalition of interests with an active interest and commitment to the future of the Galisteo watershed. These joint forces have helped raise the local level of consciousness regarding the needs for wildlife habitats and habitat linkages through quarterly meetings of the partnership, media articles, and connections with other entities interested in conserving wildlife habitats.

The Partnership and its collective members (including WPP) are continuing to work with public and private land managers to ensure that wildlife-related needs are considered within watershed-level planning and on-the-ground actions. Dr. van Hulsteyn describes the project as "particularly timely in view of the fact that the Galisteo Watershed is one of the crucial areas where roads, fences and other obstructions are imperiling this connectivity. The overwhelming support that residents of the Watershed have given to the effort of creating wildways is a tribute to their recognition that we cannot preserve the rural character of an area without protecting its wildlife." ■

Photo by James N. Stuart.

Interested parties from Santa Fe County are working to ensure that local wildlife habitats remain intact for species like the pronghorn antelope, which may have difficulty crossing fences that fragment its grassland habitats.

Do Birds Improve Forest Health?

Photos by James N. Stuart.

This mountain chickadee and white-breasted nuthatch may be working to improve the health of northern New Mexico forests.

We probably all have some idea that healthy forest habitats are important to bird populations. But we may not have known that birds can be important in helping to shape our forests, also.

In a recent paper published in the journal Ecology, Dr. Kailen Mooney describes the effects of birds on pine trees and arthropods (a large group of invertebrates including insects and spiders) found on the trees. Mooney, now a professor at University of California-Irvine, "treated" some of the trees at his study site in Colorado using nets to exclude birds from tree branches, and a sticky paste to prevent ants from crawling up onto some trees. Mooney found that, on average, bird presence increased leaf growth on trees by 18 percent, and increased annual wood growth rate up to 34 percent.

As predators of insects living and feeding on pine trees, it may not be surprising that bird presence can increase tree growth. Ant densities in this study were reduced by 49 percent on trees that birds could access, compared to tree branches where birds were excluded. But it wasn't the direct predation of birds on ants that affected tree growth. Instead, birds indirectly affected tree growth through effects on aphid populations. Aphids are small insects that suck plant juices for food. Some species of aphids are "tended" by ants—ants protect the aphids in exchange for receiving nutrient-rich "honeydew" secreted by the aphids. Without birds present, ants were so successful in protecting aphids that ant-tended aphids increased by 196 percent. Since ant-tended aphids made up the largest group of plant-eating arthropods, we can see how bird presence decreases both ant and aphid numbers, and can increase tree growth.

So what does all this mean for our local New Mexico birds and forests? According to New Mexico Department of Game and Fish ornithologist Hira Walker, "This study demonstrates the importance of protecting avian communities and preserving ecological relationships when conducting forest management activities." The resemblance of the study's ponderosa pine forest location to areas of New Mexico suggests that similar dynamics may occur here, also. The most common birds observed in this study were mountain chickadee, pygmy nuthatch, yellow-rumped warbler, chipping sparrow, red-breasted nuthatch, and white-breasted nuthatch—all species that can be found regularly in New Mexico. And the importance of tree-feeding insects, including the pine-attacking *Ips* beetle, is easily seen by anyone who has witnessed the dead trees that have added a brown shadow to the wooded hillsides of northern New Mexico over the last few years.

In 1949, Aldo Leopold Wrote in Sand County Almanac about the role of predators in regulating the effects of herbivores on their habitats. Leopold's insights came largely from his observations of deer and their effects on vegetation, plus an encounter with wolves that occurred in the mountains along the New Mexico-Arizona border. Sixty years later, we are still learning how the same relationships can hold true even when talking about smaller and perhaps less charismatic species including aphids, ants, and songbirds. ■

NATIVE FISH IN THE PECOS: From Lakes to Small Springs

Bigscale logperch are found in deep-water habitats in the Pecos River basin. Sampling will continue in 2009 to provide an updated assessment of Pecos River fish population distribution and trends. Photo by New Mexico Department of Game and Fish.

Bigscale logperch and greenthroat darter are two state-listed fishes that occur in fragmented populations within the Pecos River basin. Both species have been observed during fish community surveys on the Pecos River by the U.S. Fish and Wildlife Service, Department of Game and Fish and others over the past 20 years. **Stephen Davenport** and **Thomas Archdeacon** of the New Mexico Fish and Wildlife Conservation Office compiled these records and supplemented them with field surveys to revisit sites where the two fishes had been previously sampled. They used the results of their work to assess the status of these state Threatened fishes, and to provide recommendations on how their status can continue to be monitored in the future.

Bigscale logperch was found at anywhere from 20-80% of sites sampled, with 50 percent of sites having logperch present during the most recent sampling year. The greatest number of logperch was found at the inflow to Brantley Reservoir, and two-thirds of the fish sampled in 2007 came from Santa Rosa Reservoir, reflecting the species preference for deep water flowing over a variety of substrates. Bigscale logperch was not found in the mainstem Pecos River during 2002-2004, when low and intermittent flows occurred in the Pecos River. Greenthroat darter, in contrast, was found in spring systems and associated spring runs. Darters were collected from Rattlesnake Spring at Carlsbad Caverns National Park, and on Bitter Lake National Wildlife Refuge near Roswell. Rattlesnake Spring was renovated to benefit native species in 2007, and greethroat darter was found consistently during monthly sampling following the spring renovation.

Overall, both species of fish appear to be persisting within the Pecos River drainage, but there are also causes for conservation concern. Greenthroat darter was found more consistently but within much more limited habitat than bigscale logperch. Maintenance of natural spring systems and potential transplants of greethroat darter into historic range would be of benefit to this species. The status of bigscale logperch is more difficult to assess. Logperch appears to be relatively easy to detect when present in reservoirs, but is apparently rare in other habitats. Surveys suggested that bigscale logperch is absent from the Pecos River below Brantley Reservoir, likely due to golden algae blooms. Archdeacon and Davenport will receive Share with Wildlife funds in 2009 to sample at additional sites for bigscale logperch and other Pecos River fishes. ■

PECOS BLUNTNOSE SHINER MONITORING In Both the River and the Laboratory

Genetic monitoring of Pecos bluntnose shiner compliments field surveys for imperiled fishes in the Pecos River drainage. Photo by J. Lusk, U.S. Fish and Wildlife Service.

Dr. Megan Osborne and **Dr. Thomas Turner** of the University of New Mexico have been conducting genetic monitoring of Pecos bluntnose shiner since 2002. Genetic monitoring is defined as tracking population changes in various genetic parameters, one of which is the genetic effective population size. The genetic effective size measures the amount of genetic material that is contributed to future generations, and expresses that number as an equivalent size for an "ideal" population that the population of study is acting like. Genetic effective size is generally smaller than the actual number of individuals in a population, because not all individuals mate and contribute to subsequent generations. For example, consider a hypothetical population of one male and one female fish that could produce an unlimited number of eggs, compared to 10 pairs of fish that produce the same number of eggs. The 10 mating pairs would obviously pass along a much greater range of genetic diversity to the next generation, even if they couldn't produce any more eggs than the single pair. This is essentially what the genetic effective population size measures. It is important for a population to have a wide range of genetic variation so that individuals are able to respond to future changes in the environment, exposure to diseases, or other factors.

Pecos bluntnose shiner was found at low densities during 2002-2005, based on field sampling by the U.S Fish and Wildlife Service and New Mexico Department of Game and Fish. More recent population monitoring data suggests that the population may be gradually rebounding from that low-density period. Effective population size of Pecos bluntnose shiner decreased in 2005 and 2006 on the heels of low-density years for bluntnose shiner populations. Although still fairly small, the genetic effective size has doubled since 2005-2006. This is encouraging in that it suggests that population "bottlenecks", where population numbers are reduced to very low numbers before rebounding, have not permanently eliminated the genetic variation from the Pecos bluntnose shiner population. This contrasts with the situation for Rio Grande silvery minnow, which can show dramatic changes in population density when river conditions are favorable, but its genetic population size is still relatively small. The difference between the effective size of Rio Grande silvery minnow and Pecos bluntnose shiner populations may be that Pecos bluntnose shiner persists in a relatively unfragmented reach of river. Some bluntnose shiners may move to refugia during drying conditions, and then recolonize previously dry areas when flows return. This process could result in fairly stable levels of genetic diversity in Pecos bluntnose shiner populations, even through low density periods. However, other factors such as reduced water quality and competition with non-native species may impact Pecos bluntnose shiner during reduced or intermittent river flows, and may have contributed to the lower fish densities observed in 2002-2005. ■

FINDING DESERT BIRDS ALONG THE GILA RIVER

UPPER: Is this Abert's towhee habitat? Roland Shook and his field assistant head into a canyon to find out. Photo by Chuck Hayes.

LOWER: An Abert's towhee in the brush. Photo by James N. Stuart.

Ask people in the United States how they picture a desert, and probably the most common description you'll get is a scene with no water in sight, lots of bare ground, rattlesnakes, and tall cacti with long arms standing under the bright sun. This is a somewhat stereotypical view of the Sonoran desert. The eastern extent of the Sonoran desert ends about 30 miles west of the New Mexico border, as the crow flies. While the freeze-limited signature cactus of the Sonoran desert (the saguaro) never makes it into New Mexico, several species of wildlife that we consider to be typically Sonoran do extend their ranges eastward, and become part of New Mexico's native fauna. Abert's towhee and Gila woodpecker are two bird species that fit this description. While they are fairly common and have been studied within their core range in the Sonoran desert, much of their biology within New Mexico has remained a mystery. To better understand the population status for these two bird species within New Mexico, **Dr. Roland S. Shook** from Western New Mexico University has been compiling records and conducting surveys for these two birds within the New Mexico portion of the Gila River valley.

Shook assembled a series of Abert's towhee and Gila woodpecker observations dating back to 1908. This helped determine the historic range of the two birds along the Gila River valley. The next step was to develop a protocol to systematically survey for these birds within their habitats. For Gila woodpeckers, this would seem to be a relatively straightforward endeavor. Gila woodpeckers are typically thought of as noisy birds that can be detected from relatively long distances, at least within the core portion of their range. Abert's towhees, on the other hand, would be expected to be a bit more difficult. Within the Gila River valley, Abert's towhees appear to be secretive, live at relatively low densities, and with fewer neighbors than in other parts of their range the birds may exhibit less of the territorial behavior that helps them to be detected.

Shook created a survey protocol by applying a technique utilized in other bird surveys and customizing it for Abert's towhees. He played Abert's towhee territorial calls and breeding season songs at points spaced throughout potential habitat for the birds, and then listened for a response. The birds responded readily to recorded territorial calls during the very early spring. However, both habitat use and detectability of Abert's towhees appeared to vary with seasons. Responses began to drop off as the season went on, which suggests that surveys may be more effective if they are conducted early in the year. In contrast, Gila woodpeckers rarely responded to recorded vocalizations, but their spontaneous vocalizations were heard more frequently later in the spring.

Now that Shook has made a trial run with his survey protocols, they will be put to test in 2009. Share with Wildlife is providing funding for another year of Abert's towhee and Gila woodpecker surveys in the Gila River valley. The information from both the historic records and from the 2008 surveys provided Shook with some valuable information regarding bird locations that will help direct future survey efforts. With some luck, we will soon have better information regarding numbers and habitat use for Abert's towhees and Gila woodpeckers at this far eastern edge of their distribution. ■

You *Can* Help New Mexico's Wildlife

Endangered species research and recovery, raptor migration counts, wildlife rehabilitation, and other wildlife projects are made possible by voluntary contributions. You can make a contribution to Share with Wildlife by completing this form and mailing it to:

Share with Wildlife
New Mexico Department of
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continued

have been developed in eastern New Mexico, without any apparent population-level effects to golden eagles. Stahlecker's study will help us ensure that a continued expansion of renewable energy development can proceed in a manner that is consistent with the persistence of golden eagle populations across northeastern New Mexico. ■

GOLDEN EAGLES IN THE WIND

When the spring winds come to New Mexico, many of us think about the warmer weather that's on its way, or wonder when the dust will stop flying through the air. For the last three years, **Dale Stahlecker** of Eagle Environmental, Inc. has spent some time each spring up in a small airplane, searching for golden eagle nests.

Golden eagles tend to nest on cliffs at the edge of wide open spaces such as mesa tops and canyon rims. In eastern New Mexico, these same geologic features often make up areas that are ideal for construction of wind energy facilities—high, flat places right along the edge of windy cliff faces. Golden eagles are one of the species most susceptible to impacts from nearby wind turbines, as has been evidenced by golden eagle deaths at Altamont Pass, California, and other locations. Golden eagle populations have relatively low reproductive capacity (they don't breed until 4-7 years of age and average only about one surviving youngster for every two nesting pairs). There also appears to have been a decline in numbers of nesting golden eagles in the nearby Texas panhandle over the last three decades.

"With increased interest in wind energy in eastern New Mexico, it became clear to me that we needed to know what the breeding population in the area was, and where territories were located" said Stahlecker, "if we were going to minimize the impact of more wind farms on this charismatic, culturally significant, and highly protected species. Agency biologists also saw the need." In attempt to gain more information about the golden eagle population in eastern New Mexico and help inform golden eagle conservation and management, Share with Wildlife teamed up with the U. S. Fish and Wildlife Service and New Mexico State Land Office to fund Stahlecker's aerial surveys.

Stahlecker's golden eagle surveys covered approximately the eastern 20 percent of New Mexico. Although he found no active nests in far southeastern New Mexico, Stahlecker estimated a population of about 100 golden eagle territories scattered across northeastern New Mexico. Follow-up flights in early June revealed that the number of fledgling golden eagles found was consistent with other published studies, except in the Caprock area where only about one in three active nests were successful in fledgling eaglets. Golden eagle populations in this area may be of concern. New Mexico golden eagle populations can now be tracked to see if population parameters appear to be stable, or whether populations experience changes over time. So far, three major wind energy facilities have been developed in eastern New Mexico, without any apparent population-level effects to golden eagles.

Share with Wildlife Supports Diverse Conservation Education Projects

Raptors on the Rio.
Jennifer Hajj, HawkWatch, International.

HawkWatch International provided free interpretive programs regarding Rio Grande birds of prey, including the bald eagle. Photo by Jim Dowling

Educators from HawkWatch, International (HWI) worked with information and education center managers throughout New Mexico to develop conservation messages relating to New Mexico Species of Greatest Conservation Need and the ecology of wildlife in the Rio Grande watershed. HWI offered the programs at no charge to State Parks visitors, and developed printed information with the objective of getting audiences to notice raptors in their area, and to consider raptors' needs as they make large and small decisions with potential ecological impacts. HWI delivered their habitat-oriented message regarding raptors of New Mexico to nearly 1,000 people at 39 programs presented to at New Mexico State Parks and other conservation-related venues. **Jennifer Hajj**, HWI's Education Director, summed up the project by saying "We enjoyed the opportunity to bring our program to audiences at State Parks. The parks provided a beautiful backdrop for our message of habitat conservation and protection of fragile ecosystems, not just for raptors or people, but for all life sustained by these relationships."

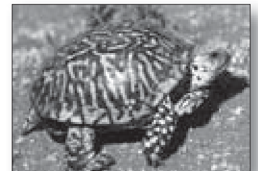
HWI will continue to receive support from Share with Wildlife in 2009, with a slightly different twist to their project. Look for HWI personnel conducting raptor migration counts and associated interpretive activities on central New Mexico mountaintops during spring and fall. ■

New Mexico Game and Fish Wildlife Notes.
Dr. Donna J. Howell.

Wildlife Notes are one-page writings that cover the natural history of New Mexico birds, mammals, reptiles and amphibians, fish, and even insects and other invertebrates. These are written by professional biologists but at a level that is accessible to anyone interested in nature and conservation. Teachers will be able to find information appropriate to all grade levels.

Dr. Donna Howell recently revised 21 of these Wildlife Notes, to include updated biological information, color photos, and standardized categories of information that are covered within each Wildlife Note. These notes are available from New Mexico Game and Fish free of charge to teachers, wildlife educators, and other interested persons. We encourage wildlife enthusiasts of all kinds to take advantage of these Wildlife Notes. They are available online at http://www.wildlife.state.nm.us/education/wildlife_notes/WildlifeNotes.htm ■

Native Wildlife Educational Trunks
Tricia Hurley, Gila Conservation Education Center.


The western box turtle is one of the species that students learn about through the Gila Conservation Education Center's Chihuahuan desert grasslands wildlife trunk. Photo by Charles W. Painter.

The Gila Conservation Education Center (GCEC) in Silver City created a Chihuahuan Desert Grassland trunk targeting students in K-7th grades. The GCEC trunks program is innovative in that it trains presenters to deliver the lessons and activities developed for the classroom. Seventh graders at La Plata Middle School were taught key concepts about desert grassland food webs and ecosystems in the spring of 2008. They then became mentors, teaching the food web chase activity to twelve 5th grade classes at the 5th Annual Gila Water Festival, while GCEC staff taught the same activity for twelve 4th grade classes at the water festival as well. An after school program also brought the curriculum to a group of 1st through 4th grade students.

Tricia Hurley of GCEC summed up the experience by saying "It's great to see the older kids grasping these ecological concepts; I think they are able to turn around and mentor the younger children in a more meaningful way." GCEC continues to play an important role in creating conservation education opportunities available in southwestern New Mexico. ■

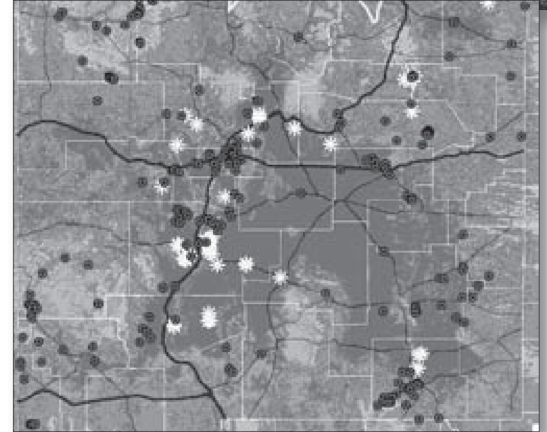
FINDING REPTILES AND AMPHIBIANS

All Over the State

Under a previous Share with Wildlife grant, **Dr. Howard Snell** and **J. Tom Giermakowski** of the University of New Mexico's Museum of Southwestern Biology modeled the potential distribution of reptile and amphibian Species of Greatest Conservation Need in New Mexico. The next logical step from that project was to examine and improve the results of predicted distributions in New Mexico, from both on-the-ground field surveys and from expert reviews of the predicted distribution maps. This is exactly what Snell and Giermakowski's more recent project accomplished. They obtained nearly 1400 new observations of 73 species of reptiles and amphibians from New Mexico, used a new method to predict occurrences, and incorporated results of field surveys to improve the predicted distribution maps.

Their newly developed approach to mapping predicting distributions used 29 different landscape variables representing factors thought to be important to reptiles and amphibians. Snell and Giermakowski split the entire state into grid cells of approximately 1 square kilometer, and compared the landscape variables of each cell to those of cells where reptile and amphibian specimens had been previously collected. Based on similarity to known locations for each species, they classified each cell as anywhere from "completely suitable" to "completely unsuitable" for occurrence of a given species. That's where the results of the field surveys came in. To evaluate their novel approach, new locations of reptiles and amphibians were compared to the suitability assigned to each cell.

Overall, the new model performed fairly well in predicting where locations of different species of reptiles and amphibians would be found. Of the 802 square kilometers where reptiles and amphibians were encountered during field surveys, 670 of them represented new localities. "Our field data support our new approach and this has resulted in quality maps that give a relative suitability of landscape for different species" said Giermakowski. When there is a need to determine whether a species occurs at a precise location, these maps provide a good estimate of that probability, and are especially appropriate for setting up field surveys to confirm presence/absence at a given location. The data can also be used for land use planning and management, such as efforts to identify and prioritize future conservation areas. ■



Potential landscape suitability for the collared lizard (*Crotaphytus collaris*), with more suitable locations in darker shades. Dots indicate where lizards were found previously, while new locations are shown as stars. Fifty-seven field observations of collared lizards were made at new locations, and helped to develop the statewide map. Map by Howard Snell and Tom Giermakowski; photo by Tom Giermakowski.

A HANDSOME FISH THAT IS SELDOM SEEN

Southern redbelly dace is a three to four inch long minnow that occurs throughout much of the Mississippi River drainage, and in several isolated populations toward the edge of its range. The species is named for the bright red color that male fish display on their underside during breeding seasons, below the black stripes with gold background that are found along the sides of the body. In New Mexico, this colorful fish is restricted to fragmented populations in cool, clear water with lots of aquatic vegetation. Although this fish seems to be fairly numerous where it occurs, the southern redbelly dace is known in New Mexico only from the upper Mora River drainage, primarily on private land. Because of its restricted distribution, southern redbelly dace is listed as a state Threatened species. With very limited opportunities to survey for this fish, we have only a few snapshots of its status in New Mexico. **Steven P. Platania, Lee Renfro**, and **Robert Dudley,** biologists with American Southwest Ichthyological Researchers, spent a couple years monitoring this fish, and provided the Department of Game and Fish with a better understanding of its basic biology and status during times of varying conditions.

From monthly sampling of redbelly dace populations in Coyote Creek, Platania and his fellow biologists found out that there were essentially three ages (year classes) of fish. The 2006 year class seemed to have failed. In 2006, two-year old fish were the most common, with almost no young of the year seen. By 2007, young of the year fish began to show up in the surveys by about August, while the one-year old fish (the 2006 year class) were still present only in small numbers. The reasons for the differences in year classes are not known. However, conditions in the creek were different in 2006 than in 2007. Flows were relatively low through the spring and much of the summer in 2006 (including the apparent peak spawning period in April-May), and did not increase substantially until very high flood-like flows occurred in late August. This combination seemed to make for a bad year in the production of young fish. By contrast, conditions the following year included higher spring water levels and then a flow peak that may have corresponded with snowmelt, in about May. This sequence seemed to be more conducive to a successful reproductive year for the redbelly dace.

The diets of southern redbelly dace in New Mexico were also examined in this study. Similar to what has been found in other areas, the most frequent foods were fine plant materials, including small, filamentous algae. Redbelly dace also supplemented their diets with invertebrates, and foods such as fly larvae and amphipods were relatively common. Overall, this pattern seems consistent with the feeding habits of southern redbelly dace in other portions of the range, with perhaps some local adjustments that reflect what may be available at a given site.

A study of a few years in duration represents just a short glimpse into the life history of these isolated populations of southern redbelly dace. However, it does offer a little better understanding of the current status of this species in New Mexico, and its needs for survival. Southern redbelly dace populations may exhibit annual variation, particularly in the number of young that are produced or survive, in response to changing environmental conditions. What exactly those conditions are remains uncertain at this time. However, it also appears that southern redbelly dace live long enough that a failed reproductive output for a single year will not doom an entire population (although a couple consecutive bad years might spell trouble). If the necessary habitat conditions can be kept intact with a changing climate and an increasing demand for water, we should be able to keep these colorful fish in New Mexico for years to come. ■

On Track continued

TAKING WING OVER A Changing Rio Grande

Photo by James N. Stuart.

Great egrets (photo above) and double-crested cormorants were two of the waterbirds surveyed in the middle Rio Grande.

The middle Rio Grande has seen some dramatic changes over the past few decades. Some of the more visible changes relate to water levels in Elephant Butte and Caballo reservoirs. At peak storage, Elephant Butte reservoir can extend upstream about 40 miles. Near-peak conditions in the reservoir were present from 1985-1998. However, reservoir levels began to drop with drought conditions beginning in 1999, and by 2002 the reservoir had dramatically receded upstream from a region known as The Narrows, leaving a marshy area that had served as a breeding location for colonial waterbirds relatively dry. New Mexico Game and Fish and others had intermittently conducted surveys beginning in 1975 that monitored double-crested and neotropic cormorants; great blue, little blue, and black-crowned night herons; and great, snowy, and cattle egrets. However, these surveys were conducted at irregular intervals, and were not identical in terms of the level of survey effort or specific methods employed. In an attempt to put together a more comprehensive picture of how colonial waterbirds have responded to changes in the middle Rio Grande, **Dale Stahlecker** of Eagle Environmental, Inc., compiled historic survey records and then conducted an aerial survey in the same area.

Stahlecker flew his survey in mid-May, and conducted follow-up ground visits to some of the accessible nesting areas later in May and again in June. He was then able to compare recent nesting numbers to previous surveys. Some individual species had too small numbers of birds observed over the various surveys to draw conclusions about their population trends (neotropic cormorant, great blue heron, little blue heron, cattle egret). However, other birds showed some interesting patterns. Minimum estimates of cormorant nests ranged from 146 to 600 in the period covering the mid-1970s through the 1990s. However, only 43 cormorant nests were found in 2007. Snowy egret nest counts also dropped, from a high of 200 nests in 1975 to only one in 2007. Similarly, black-crowned night herons had been found nesting by the hundreds at the marshy area above The Narrows during the 1970s, but fell to a total count of only 17 nests in 2007. On the other hand, the count of 38 great egret nests in 2007 was three to four times greater than the highest tally from the 1970s-1990s.

These changes in colonial waterbird numbers may relate to the habitat needs of each species. All of these birds except cattle egrets feed over the open water, eating fish and other aquatic organisms. Great egrets have been reported to have a longer average foraging distance than the other species, and therefore may be able to persist if there are suitable nesting locations within some radius (a distance farther than other waterbirds will travel) from foraging grounds. Filling in the blanks between the intermittent years of these bird surveys is difficult enough; identifying causes that relate to these population patterns can be even trickier. But we now have enough information to suggest that the distance between suitable nesting sites and foraging areas may be a critical factor.

"If it were possible for water levels to be managed in a way that standing water were present around nest sites within Elephant Butte or Caballo Reservoir" said Stahlecker, "nest sites and good foraging areas would be close enough that the birds would not have to 'commute' an unreasonable distance for food for their young." If we get any opportunity to try out this approach to water management, then perhaps we can increase the number of these impressive aquatic-feeding birds to a level that is reminiscent of previous decades. ■

WILDLIFE REHABILITATION AND EDUCATION

Wildlife Rescue's Education Coordinator, Madge Rice, talks to the visitors at the New Mexico Outdoor EXPO while holding a flammulated owl. Photo by Chuck Hayes.

The Wildlife Center (TWC) provides science-based, conservation education programs at their facility in Española, as well as off-site programs to other groups and organizations, and at public events. In the first half of 2008 alone, with the help of Share with Wildlife funds, TWC presented over 50 programs reaching over 1500 kids and 1000 adults. TWC continues to serve as the only wildlife rehabilitation facility in New Mexico that regularly assists New Mexico Game and Fish with the care and treatment of large wildlife such as big game animals. TWC utilizes its non-releasable animals and 20-acre facility to augment students' science learning, giving children an opportunity to make personal connections to local wildlife, wildlife habitats, and conservation needs. TWC's educational programs will continue to receive support from Share with Wildlife in 2009.

Last year, **Wildlife Rescue, Inc. of New Mexico** (WRI) took in over 2300 animals, the vast majority of which were received at WRI clinic location at the Rio Grande Nature Center State Park. These acquisitions included over 150 different species of birds, reptiles, mammals, and amphibians. The general trend of increasing wildlife acquisitions from 2001 continued through 2007, especially for birds and mammals. During the spring semester period of 2008, WRI presented over 120 hours of educational programs to school groups, museum audiences, state parks, and events such as the New Mexico Outdoor EXPO. These presentations reached over 3200 people and helped to inform audiences about local wildlife, plus the behavior and hazards of wildlife living in and around cities and human habitation.

A June event highlighted some of the things we are learning from WRI's efforts. A nestling bird, in pinfeathers, was brought to the clinic with a distinctive but unfamiliar gape for WRI staff. The entire mouth was a deep bright pink with moderately yellow flanges. Parallel to the flanges on each side, inside the mouth, was a shining bright iridescent blue/purple streak. Reference to the literature quickly narrowed the choices to waxwings, with cedar waxwing being the most likely. The arrival of this nestling in Albuquerque is additional confirmation that cedar waxwings are expanding their breeding range south in New Mexico.

WRI will continue to receive funds from Share with Wildlife in 2009 both for its rehabilitation and educational efforts. In addition, WRI will analyze multiple years of wildlife acquisition data and help assess trends and implications from that data.

The **Santa Fe Raptor Center** (SFRC) specializes in the care and rehabilitation of larger birds of prey that require specialized treatment and large areas for flying when they return to health. SFRC also uses non-releasable birds for educational programs. In the first half of 2008, SFRC presented nearly 40 programs reaching 2000 kids across northern New Mexico. The center's programs can be found at schools and a variety of other venues where people can learn about these majestic aerial predators of New Mexico. ■

For additional information or questions about wildlife rehabilitation in New Mexico, check out information from the web pages of the rehabilitators that Share with Wildlife works with:

The Wildlife Center: http://www.thewildlifecenter.org/

Wildlife Rescue, Inc., of New Mexico: http://www.wrinm.org/

Santa Fe Raptor Center: www.thesantaferaptorcenter.org

Chasing Native Mussels for Answers

A river carpsucker infected with glochidia from Texas hornshell. Photo by Todd Levine.

Texas hornshell mussels can be considered survivors—but just barely. This species is likely the last remaining of eight freshwater mussels that were native to New Mexico. However, its range in New Mexico has been restricted to a small portion of the Pecos River drainage. Texas hornshells in New Mexico are now disconnected from other hornshell populations in Texas, and can no longer interbreed or recolonize New Mexico populations if they die out (you can imagine that Texas hornshells moving upstream don't exactly set speed records!). Changes to water quality and river flows have affected mussels, and now they face another threat. Golden algae blooms have impacted fish populations in the lower portion of New Mexico's Pecos river drainage. But what do fish populations have to do with mussels?

Freshwater mussels have a complex life cycle, one in which tiny mussel larvae are released by female mussels into the water and then attach to a fish host. While attached, the mussel larvae grow and develop until they are able to detach and find a place to live along the bottom or bank of a stream. To better understand this life cycle and how it affects the success of conservation actions, Share with Wildlife provided funding for two Texas hornshell projects. Doctoral student **Todd Levine** and **Dr. David Berg** from Miami University recently completed a study to determine which fish species serve as hosts for Texas hornshell larvae. **Dr. Walter Hoeh** of Kent State University used adult specimens of Texas hornshells to determine the degree of genetic differentiation between populations from New Mexico and Texas, including an assessment of whether these now-separated populations can be considered different species.

Richard Seidel, Todd Levine, and David Berg (left to right) of Miami University search for adult Texas hornshell mussels.
Photo by Makiri Sei.

Because of the small size of larvae and the short duration they are attached to their fish hosts, it can be difficult to determine whether these larvae will attach to any fish in the water, or if they have preferred hosts. Levine and Berg undertook a novel approach to find the hornshell's host fishes—by looking to see if there was an immune response in the fish from being "infected" with mussel larvae. They proposed a set of experiments in a fish hatchery, and planned to compare these results to evidence of larval infection from fishes in the wild. Hatchery procedures were similar to those used in laboratory experiments that identified immunological responses of fishes in Virginia to infection by mussel larvae. Pecos river fishes were exposed to larvae that were obtained from a pregnant female Texas hornshell. Larvae were placed directly onto the gills of the fish or were suspended in the water and allowed to contact the face and skin of fish. Fish then carried these larvae until they matured. Once mussel larvae detached from fish, blood samples were taken from the fish and tested for antibodies to the mussel larvae. Unfortunately, no clear immune response by the fish to mussel infection was found. This might result from the short time that the larvae are attached to the fish, or it may be that not enough is known yet about the fish species in this river system to successfully apply these immunological methods.

However, field sampling by Levine and Berg offered some illuminating results. Over 2500 fish were examined in the wild. Only a few of these showed signs of having mussel larvae attached to them. This may be because the three fish species with the highest rates of infestation (river carpsucker, gray redhorse, and blue sucker) were all found in relatively low numbers compared to other fishes. "Our results suggest that only a few species of fishes serve as hosts for Texas hornshell larvae, and these are relatively rare species in these rivers. Successful conservation of this mussel will require the presence of these fish species, so management of Texas hornshell also requires management of native nongame fishes," according to Berg.

Interestingly, mussel larvae typically attached to the face and opercula (gill coverings) of these fish, instead of the gills themselves. The bottom-feeding habits and downward-facing heads of these three native sucker species may explain why they are more likely to encounter larvae from mussels living in stream bottoms, and why larvae are more likely to attach externally.

Dr. Hoeh's results also helped put together some pieces of the Texas hornshell conservation puzzle. He has generated DNA sequences that can be used for comparison among individual mussels, and obtained tissues from mussels that been previously collected. To date, he has analyzed DNA from 20 different individual mussels from New Mexico and Texas. The interim results suggest that the mussels from both New Mexico and Texas share a common ancestry, and all represent members of the same species. Hoeh's Share with Wildlife project will wrap up in 2009, with results from additional Texas hornshell specimens included in the final analysis. ♦

Jumping mice, *continued from page 1*

Museum specimens of jumping mice. Left to right: Preble's meadow jumping mouse, two western jumping mice, and two New Mexico meadow jumping mice. Photo by Jennifer K. Frey.

validity of Preble's meadow jumping mouse as a distinct subspecies and led to a petition for delisting the mouse from its Threatened status. When the dust settled, a further examination by multiple biologists concluded that the subspecies was in fact distinct from other jumping mice, and Preble's meadow jumping mouse remains protected under the Endangered Species Act--at least in the Colorado portion of its range that has faced greater alteration from urban development and other changes to the landscape.

But things change as we move south along I-25 into New Mexico. We don't have quite the level of development as seen along the edge of the Rocky Mountains, and Preble's meadow jumping mouse gives way to another subspecies, the New Mexico meadow jumping mouse (*Z. h. luteus*), along with another species, the western jumping mouse (*Z. princeps*). Both species occupy streamside habitats with dense vegetation in montane regions of New Mexico. The jumping mouse subspecies questions are much less muddy in New Mexico. One of the findings from all the recent studies and debates over Preble's meadow jumping mouse was that *Z. h. luteus*, the subspecies found in New Mexico, was the most distinct of all the western subspecies. So any issues with the identification and conservation of jumping mice in New Mexico should be much clearer and simpler than they are farther north.

Of Mice and Lawyers

However, few people would probably describe the situation with jumping mice in New Mexico as "simple." First, it is difficult to distinguish the New Mexico meadow jumping mouse from its neighbor, the western jumping mouse. In fact, all jumping mouse populations in New Mexico were considered to be western jumping mice until a 1981 study assigned some of the populations within the state as the New Mexico meadow jumping mouse. The New Mexico meadow jumping mouse is a habitat specialist restricted to areas with a high water table (often associated with beaver dams) that supports a tall and dense growth of sedges or other herbaceous vegetation. It was traditionally considered to occur in New Mexico within the Sacramento and Jemez Mountains, as well as within the Rio Grande drainage. With its limited distribution and the changes to the Southwest's riparian areas that occurred with grazing, drought, development, agriculture, recreation, fire, and reduction in beaver ponds, the New Mexico meadow jumping mouse has been listed as Endangered under New Mexico's Wildlife Conservation Act, and is a candidate for listing under the federal Endangered Species Act. Finally, the New Mexico meadow jumping mouse and the more common western jumping mouse are not only hard to tell apart, but their ranges also overlap. Some individuals collected from this area of overlapping ranges display characteristics that are intermediate to the two species, making identification difficult in many cases.

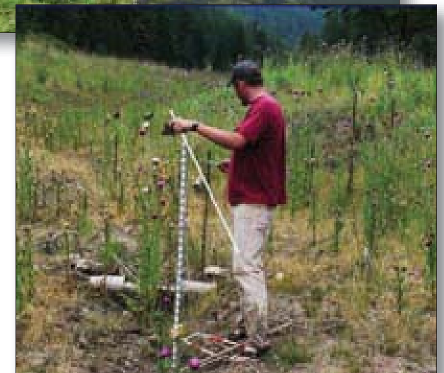
To address conservation issues surrounding the New Mexico meadow jumping mouse, the New Mexico Department of Game and Fish began developing a state recovery plan for the species, along with the Arizona montane vole--another native rodent that is restricted in New Mexico to streamside habitats along the state's far western border. The concept of the state recovery plan was to provide guidance for land managers and other parties to help secure the presence of these two riparian rodents in the state. The approval of the state recovery plan does not confer any authority over habitat and land uses to the Department of Game and Fish. The Department's authority is specifically for the management of the wildlife themselves, except for habitat on state-owned wildlife management areas. Even though identified measures within the state recovery plan are strictly voluntary, the plan still generated tremendous interest, including from those who feared that recovery actions might compete with other uses of New Mexico's limited and highly-desired riparian areas. In May 2008, the Middle Rio Grande Conservancy District obtained a restraining order preventing the Department from finalizing a state recovery plan for the two riparian rodents. The

plaintiffs claimed that although the draft recovery plan indicated that New Mexico meadow jumping mouse populations occurred within the middle Rio Grande, constituents in that area had not been given sufficient opportunity to provide input to the planning process. So despite the best laid plans, the recovery planning process is still on hold. During the planning hiatus, an important Share with Wildlife project was completed that will support conservation and recovery efforts for the New Mexico meadow jumping mouse.

Sorting Out the Mice

Because of the difficulty in correctly identifying jumping mice from both previous collections and current (or future) observations, some vital questions for recovery were still unanswered: What is the historical range of the meadow jumping mouse? How much of the historical range is still occupied, and what has (or has not) changed in these areas? What areas are available for recovery? Can New Mexico meadow jumping mice coexist with different members of the same genus (*Z. princeps*) or species (*Z. h. luteus*)? **Dr. Jennifer K. Frey** of Frey Biological Research recently completed a Share with Wildlife project that tackled some of these questions. Frey has studied New Mexico mammals for over 20 years, and has published over 40 peer-reviewed papers and technical reports regarding New Mexico mammals, making her uniquely qualified to perform this work. She looked at physical characteristics of existing jumping mouse specimens (skull and body measurements, teeth, and fur) to sort out the different jumping mouse species and subspecies. She also collaborated with Jason Malaney and Dr. Joe Cook from the University of New Mexico to use genetic analyses for confirmation of identifications made based on physical characteristics. By confidently assigning the various specimens and populations to the correct species and subspecies, Frey's work answers some of the important questions for developing and implementing a successful recovery plan.

Frey examined 755 jumping mouse specimens from museums and collections across the country. She found that by using a combination of tooth and fur characteristics, the state-listed New Mexico jumping mouse could be reliably separated from New Mexico's other jumping mouse, the western jumping mouse. The genetic data supported the findings from the physical characteristics that only the New Mexico meadow jumping mouse occurs along the Rio Grande and in the Jemez and Sacramento Mountains, while both species of jumping mouse were found from the San Juan and Sangre de Cristo Mountains. The



Before and after. The riparian area (upper) shows current New Mexico meadow jumping mouse habitat. The photo on the right is a former riparian area and historical New Mexico meadow jumping mouse location in the Sacramento Mountains that no longer supports jumping mice. Photos: (upper) James N. Stuart, (right) Jennifer K. Frey.

results of Frey's examinations of these specimens have changed our understanding of the historic distribution of the New Mexico meadow jumping mouse. For example, her results indicate that the New Mexico meadow jumping mouse had a historic range greater than was previously known in the Sacramento Mountains, and that it occurs in the Mora River drainage where the species had not been previously confirmed. While it had been previously thought that New Mexico jumping mice might be limited to elevations below about 8,000 feet, Frey's results showed that New Mexico jumping mice not only occurred at some higher elevation locations around Taos, but that both species of jumping mice may occur together at the same site.

A New Understanding

The overall picture of jumping mice in New Mexico now indicates that it is possible to tell the two species apart by expert examination of the mice's physical characteristics, and more expensive genetic tests are not required to reveal species-level differences. The historic range of the New Mexico jumping mouse is also broader than we had previously known. Is this good or bad news for the status of the New Mexico meadow jumping mouse? Probably some of both. Based

Continued on back page

share with wildlife Update

P. O. Box 25112
Santa Fe, NM 87504
(505) 476-8111

CHUCK HAYES
Share with Wildlife
Coordinator

Writer/Editor
CHUCK HAYES

E-mail:
chuck.hayes@state.nm.us

Typography/Design
LESLIE K. COLEMAN

Jumping mice, *continued from page 15*

on our current understanding of where New Mexico meadow jumping mice once occurred, it appears to have persisted at only 6% of historical locations surveyed in the Sacramento Mountains, 27% in the Jemez Mountains, 33% in the San Juan Mountains, and 40% in Sangre de Cristo Mountains (although there are areas in this region that have not been surveyed recently). These population declines may be more severe than had been previously understood, and likely reflect the extent to which montane riparian habitats across the state have been impacted. The good news is that a broader historical range means that there may be more potential habitat out there than was known before, and more areas could be surveyed to determine whether additional New Mexico meadow jumping mouse populations have persisted. Whatever the future brings, the interest in New Mexico meadow jumping mouse is not likely to disappear—and we hope the same can be said for the mouse itself! ♦

What will become of New Mexico meadow jumping mouse habitat? Recent construction of the new Highway 126 bridge at Fenton Lake attempted to minimize loss of the canarygrass marsh inhabited by jumping mice (growing to the right of the construction footprint), but still resulted in some loss of habitat. A stream meander restoration project below the lake is attempting to increase wetlands in the area. Photo by James N. Stuart