TRANSLOCATION OF ALLEGHENY WOODRATS TO INDIANA

Allegheny woodrat after release from live trap.

Current Status

5th of five years

Funding Sources and/or Partners

State Wildlife Grant, Purdue University, The Nature Conservancy, DNR Nongame Fund

Project Personnel

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Background(s) and Objective(s)

For the past 40 years, dramatic declines have been observed in Allegheny woodrat *(Neotoma magister)* populations throughout their range, leading to local extinctions in Connecticut and Massachusetts, and restricted distributions in New York, New Jersey, Pennsylvania, Maryland, Ohio and Indiana. Several hypotheses have been proposed as causes for the declines, both within Indiana and throughout the species' range; these include:

- Habitat fragmentation: Woodrats require rocky habitats located in deciduous forested communities. The viability and long-term stability of populations decrease as forests become increasingly fragmented.
- Reduction in food resources: Woodrat populations are affected by the availability of important winter food items such as seed crops from the American chestnut (extirpated by the 1930s) and annual acorn crops from oak trees (which have been negatively affected by gypsy moths and competition with other forest wildlife species).
- Increased mortality as a result of infection by raccoon roundworm *(Baylisascaris procyonis)*: Woodrats are particularly susceptible to parasitic infection by raccoon roundworm infection because they collect and store potential food items, including feces from other animals.
- Loss of genetic diversity: Woodrats often form small, spatially isolated populations whose viability is threatened by the loss of genetic diversity, resulting from reduced exchange among colony members, inbreeding depression, and other unpredictable events.

Woodrat in rock crevice.

Cassie Hudson (DNR) and Heather Walker (DNR) transfer captured Allegheny woodrat from trap to handling cone for processing.

Analysis of tissue samples from 51 woodrats collected in 2005 allowed us to assort Indiana's population into three genetically distinct subpopulations that had already lost much of their potential genetic diversity when compared to other populations throughout the species' range. Therefore, our objectives were to collect woodrats from large, genetically diverse populations in Kentucky and Tennessee, and release them in Indiana: (a) to re-establish populations at four vacant but historically occupied sites and (b) to supplement genetically and numerically depressed populations at two currently occupied sites.

We also sought to evaluate the potential impact of mortality associated with raccoon roundworm infection within these six woodrat populations. Thus, three populations were identified as treatment sites in which we distributed anthelmintic baits each month to passively deworm local raccoon populations and minimize woodrat mortality attributed to raccoon roundworm infection. The influence of roundworm infection as a causative factor in the species' decline will then be determined by comparing population levels between the three treated and three untreated sites after the release of out-of-state woodrats.

Methods

Before the onset of baiting and the release of woodrats, surveys of raccoon latrines were conducted across all sites in fall 2006. Raccoons often defecate at specific sites, such as the base of a tree or on top of a downed log. The accumulation of raccoon feces at these sites is called a latrine. Raccoon feces, which may contain roundworm eggs, often contains seeds and other partially digested items that are sought by other animals, including woodrats, for food. Woodrats are also known as "pack rats" because of their tendency to collect and store food and nonfood items in a localized pile referred to as a cache. This unique behavior may make woodrats more susceptible to infection because they will often cache raccoon feces and therefore incidentally may ingest infective roundworm eggs while handling feces.

Raccoon latrine surveys consisted of the systematic collection of raccoon feces from forested areas surrounding woodrat habitat. Using a fecal floatation technique similar to that used by veterinarians to detect worms in pet dogs and cats, the presence or absence of raccoon roundworm eggs was documented for each collected scat. After this initial assessment, monthly distribution of deworming baits in the forested areas surrounding woodrat habitat was initiated in the three treatment sites. To evaluate whether the monthly distribution of baits was having the desired effect on raccoon roundworm exposure risk, latrine surveys were repeated in spring 2007, fall 2007, and fall 2008. The prevalence of raccoon roundworm eggs was determined for each survey and the results compared between treated and untreated sites.

In spring 2007, we captured 54 Allegheny woodrats in Kentucky and Tennessee, and released them directly into suitable den sites among the six Indiana study sites. Woodrats were provided with an abundant supply of commercial rat food and nesting material to encourage them to settle at the release site. Many were radio-collared, which allowed us to monitor their survival for the first two months after release.

During summer 2007, we used live trapping to again

Scott Johnson holds an anesthetized woodrat from Tennessee.

Heather Walker processes rat.

A rat is ear tagged.

Heather Walker handles cone.

Ryan Walker weighs rat.

Cassie Hudson (DNR) weighs captured Allegheny woodrat in handling cone.

monitor the survival of released individuals and to evaluate reproductive rates and population growth. We set between 35 and 60 traps baited with apple slices within each woodrat population. Traps remained open for two consecutive nights and were checked daily. We recorded the sex, age class and body weight of each woodrat captured. Uniquely numbered tags were placed in each ear (which allowed us to identify recaptured individuals), and a small tissue sample was collected for DNA analysis.

After the initial release in 2007, we determined that the number of out-of-state woodrats added to the two supplementation sites was insufficient to obtain the desired restoration of genetic diversity. Therefore, we returned to Kentucky in spring 2008 and captured 14 more individuals to release into these sites. In summer 2008 and fall 2009, we again used live trapping to monitor the response of the translocated populations.

Progress to Date

In general, efforts to re-establish populations at the four vacant but historically occupied sites have responded as expected. Woodrats released into those sites receiving raccoon deworming baits appear to have successfully established stable and self-sustaining populations. Alternatively, releases of woodrats into untreated sites (those in which exposure risk to raccoon roundworm infection

Woodrat hides in a rock crevice.

Heather Walker (DNR) and Tim Smyser (Purdue) collect tissue from captured Allegheny woodrat for genetic assessment.

Nick Bergmeier and Jami Faller use radio telemetry to monitor short-term survival of released woodrats.

was unchanged) failed, and these sites eventually became uninhabited.

Conclusions associated with the two supplementation sites are slightly more complicated. An increase in woodrat abundance was observed among both the treated and untreated supplementation sites. The numbers of animals captured at the untreated supplementation site has varied but is now much higher than pre-release levels. Despite the second supplementation site not being treated with deworming baits, survival rates for released woodrats was high. This suggests that impacts of exposure to raccoon roundworm were minimal at that location. More important, analysis of DNA samples collected from offspring captured at both supplementation sites suggests genetic diversity has increased dramatically and, when evaluated in conjunction with the rebound of local abundance to historic highs, suggests a genetic rescue effect has occurred.

While the threat posed by raccoon roundworm varies across sites and over time, it appears as though distribution of deworming baits has had a positive effect on roundworm levels in habitats occupied by woodrats. We observed a decline in the percentage of raccoon latrines containing roundworm eggs with the continued distribution of baits when evaluated with two, 10, and 22 months of continued baiting. Interestingly, we observed a subtle decrease in prevalence from 2006 to 2007, followed by a rebound in 2008 among control sites, demonstrating the annual variability in prevalence among unmanipulated sites, likely as a result of dynamic raccoon demographic attributes.

Although the reintroduced populations were established with genetically diverse individuals, these populations were founded with few woodrats, and population sizes have remained small. Additionally, these populations still remain isolated from one another with little prospects for movement of woodrats among populations. Therefore, for the long-term survival of Allegheny woodrats in Indiana, additional and continued management actions are needed to ensure the maintenance of high levels of genetic diversity.

To address this need, a new project to develop a captive breeding program was started recently. In this program, woodrats are removed from isolated populations in Indiana and paired with woodrats collected from other populations in Indiana and Pennsylvania. In time, they and their genetically diverse offspring will be released in Indiana in a way that should help restore and maintain healthy levels of genetic diversity across all populations. In this way, Allegheny woodrat conservation in Indiana benefits from a well-planned research project that first identifies the obstacles to healthy populations and then determines effective management strategies to overcome those barriers